

**TECHNICAL BRIEF**

**Technical appendix for:  
Student achievement in 2021-22: Cause for hope and continued  
urgency**

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## 1. Introduction

The purpose of this technical appendix is to share more detailed results and to describe more fully the sample and methods used in the research included in the brief, *Student achievement in 2021-22: Cause for hope and continued urgency*.<sup>1</sup> We investigated two main research questions in this brief:

1. How do achievement gains across the 2021-22 school year compare to pre-pandemic trends? Are there any initial signs of rebounding or recovery<sup>1</sup>?
2. How does student achievement in spring 2022 compare to pre-pandemic levels?

In addition to these two primary research questions, we also investigated one supplementary research question regarding whether achievement has become more distributed over the pandemic.

## 2. Data

### 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 achievement and gains, 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. However, a set of school-level characteristics, including school-level free or reduced priced lunch (FRPL) eligibility was obtained from the 2019-20 school-level Common Core of Data (CCD) files from the National Center for Education Statistics<sup>ii</sup>

To measure achievement gains across the course of the COVID-19 pandemic, we follow separate cohorts of students across the most recent four school years (the full year prior to the onset of the pandemic to establish baseline equivalence and the three school years impacted by the pandemic). The left (dark green) side of the table below illustrates the grades and years used for our "COVID sample" of students. In total, our COVID analytic sample consists of approximately 8.3 million students in grades 3-8 in 25,000 public schools who took MAP Growth reading and math assessments across the 2018-19 to 2021-22 school years.

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<sup>1</sup> We use the term "rebounding" to describe growth trends that mirror or exceed pre-COVID trends. In contrast, we use the term "recovery" to indicate the possible end state of reaching equivalence with pre-COVID achievement levels. In other words, rebounding and recovery are not interchangeable but rather the former describes progress towards the latter.

Grade	COVID Sample (8.3 million students in 25K schools)				Pre-COVID Sample (8 million students in 24K schools)			
	2018-19	2019-20	2020-21	2021-22	2015-16	2016-17	2017-18	2018-19
K-3	K	1	2	3	K	1	2	3
1-4	1	2	3	4	1	2	3	4
2-5	2	3	4	5	2	3	4	5
3-6	3	4	5	6	3	4	5	6
4-7	4	5	6	7	4	5	6	7
5-8	5	6	7	8	5	6	7	8

We also defined a “pre-COVID sample” to serve as a reference distribution for each of the grade cohorts from the COVID sample (see the right (light green) side of the table above). The pre-COVID sample serves as a counterfactual for the achievement gains that may have been expected if the COVID-19 pandemic had not occurred. The pre-COVID cohort covered the same grade spans as the COVID sample but across the 2015-16 to 2018-19 school years. The pre-COVID sample consisted of 8 million unique students in 24,000 public schools. Descriptive information for the students in our overall sample by cohort, subject, and pre-COVID/COVID sample is provided in Table 1.

Descriptive information for the schools in our sample along with comparison information on the population of U.S. schools is provided in Table 2. The schools in our sample represent roughly one in three U.S. public schools in any given grade. Our sample reflects a diversity of schools from across various locales (urban, suburban, rural, and town). However, relative to the population of U.S. schools, our sample reflects schools serving slightly higher average percentages of Black students and lower average percentages of Hispanic students.

### Measure of achievement

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. 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.

In this study, we used students’ RIT scores as well as their achievement percentile ranks calculated using the NWEA 2020 MAP Growth norms.<sup>iii</sup> These norms reflect pre-pandemic achievement trends as they are based on a nationally representative sample of students from the 2015-16, 2016-17, and 2017-18 school years. The NWEA 2020 MAP Growth norms were applied to each term in our data to ensure a consistent normative distribution pre- and post-pandemic. Since MAP Growth can be estimated at any point during the school year, the MAP

Growth achievement norms condition on each student's grade, subject, and instructional week of testing (i.e., the week in the school calendar in which a student tested). Instructional weeks were calculated for each student based on their school start date and the individual student's testing dates (for more details on the calculation of instructional weeks, see the norms study). Within each subject, let  $Y_{igt}$  be a student  $i$ 's RIT score in grade  $g$  at instructional week  $t$ . The predicted mean ( $\hat{Y}_{gt}$ ) and standard deviation ( $SD(Y_{gt})$ ) for a given grade/subject/instructional week combination were pre-calculated based on the NWEA norms model (see Chapter 4 of the norms report). Based on these values, we calculated a standardized estimate of the student's RIT score:

$$z(Y_{igt}) = \frac{(Y_{igt} - \hat{Y}_{gt})}{SD(Y_{gt})}.$$

From the standardized score, we calculated the percentile rank (e.g., the proportion of the distribution that the student scored as well as, or better than):

$$p(Y_{igt}) = Pr(Y_{igt} \leq y_{gt}) = \int_{-\infty}^{y_{gt}} \phi(z) dz,$$

where  $\phi(z)$  represents the probability density function. The student normative percentile used in this study was scaled to range from 1 to 99:

$$\text{Perc} = 100 \times p_s(Y_{igt}).$$

### Missing data

In a prior reports using samples of NWEA data,<sup>iv,v,vi,vii</sup> we found that students of color and historically lower-achieving students who had tested in previous years were less likely to have taken the MAP Growth assessments during the 2020-21 school year. Therefore, focusing only on students who had complete data before and after the pandemic may underestimate the impact of the COVID-19 disruptions on learning. In the analyses presented in this report, we retained students that tested at any point during the four-school year span (2018-19, 2019-20, 2020-21, 2021-22 for the COVID sample; 2015-16, 2016-17, 2017-18, and 2018-19 for the pre-COVID sample), even if they did not test during the most recent school year in the panel. To examine the sensitivity of our results to differential attrition patterns, we re-estimated our study results under various alternate sample inclusion rules (see sensitivity section on p. 7).

## 3. Methods

### **RQ1: How do achievement gains across the 2021-22 school year compare to pre-pandemic trends? Are there any initial signs of rebounding or recovery?**

We calculated and plotted the average test score ( $\overline{RIT}_{tgs}$ ) in term  $t$  within cohort  $g$  (K-3, 1-4, 2-5, 3-6, 4-7, 5-8) for sample  $s$  (where  $s=PC$  for the pre-COVID sample and  $C$  for the COVID sample). RIT score means, SDs, and sample sizes are presented for each cohort/grade/term in Table 3 for reading and Table 4 for math. Achievement gains are calculated as the difference between the fall and spring mean score. Line plots connecting the mean RIT scores for each

cohort/subject combination are shown in Figure A1. RIT score means within each term of the COVID sample (2018-19 to 2021-22 school years) are plotted in dark green, while the pre-COVID reference line (light green) displays the means of the pre-COVID sample (students in the same grade span during the 2015-16 to 2018-19 school years). Spring 2020 data is asterisked because it is based on approximately 5% of the students relative to other terms due to the testing interruptions during COVID school closures.

Additionally, we calculated the standardized mean difference between average test scores in a grade/term between the pre-COVID and COVID samples. We use the term “achievement gap” to describe differences between the pre-COVID sample and the COVID sample. For example, the achievement gap (as an effect size) in the final spring term ( $t$ =spring 2019 for pre-COVID and  $t$ =spring 2022 for the COVID sample) in grade  $g$  was calculated as:

$$ES_{tg} = \frac{\overline{RIT}_{tgC} - \overline{RIT}_{tgPC}}{\sqrt{\frac{(N_{tgC} - 1)SD_{tgC}^2 + (N_{tgPC} - 1)SD_{tgPC}^2}{N_{tgC} + N_{tgPC} - 2}}}$$

where  $\overline{RIT}_{tgC}$  is the average COVID sample (spring 2022) test score in grade  $g$ ,  $\overline{RIT}_{tgPC}$  is the average pre-COVID (spring 2019) test score in grade  $g$ ,  $SD_{tgC}$  and  $SD_{tgPC}$  are the corresponding standard deviation (SD) estimates, and  $N_{tgC}$  and  $N_{tgPC}$  are the observed sample size in grade  $g$  in spring 2022 and 2019 respectively. The standardized effect sizes by grade, term, and subject are reported in Tables 3 and 4 (for reading and math, respectively).

We calculated two metrics to quantify changes in the achievement gaps across terms within a cohort. We compared the achievement gap in the spring 2021 (relative to spring 2018) versus the difference in spring 2022 (relative to spring 2019). First, we calculated the percentage change in effect size as

$$\%Change = \frac{ES_{tg} - ES_{t-2g}}{ES_{t-2g}} * 100,$$

where  $ES_{tg}$  is the estimated achievement gap in spring 2022 and  $ES_{t-2g}$  is the gap in spring 2021. Second, we calculated the number of years that would be needed to close the achievement gap assuming the change observed in the last year holds constant moving forward. Specifically, we divided the remaining gap in spring 2022 by the rate of change in the effect sizes across the last year (e.g., between spring 2021 and spring 2022):

$$\text{Years to recovery} = \frac{ES_{tg}}{ES_{tg} - ES_{t-2g}}$$

Both metrics are reported in Table 1 of the main report. Because this calculation involves dividing by a rate of change that may be close to or below zero (as in the final two math cohorts), it is possible to have estimates of the years needed to close gaps that approach infinity. To address this issue, we bin our reported year estimates into three categories (1-2 years, 3-5 years, or 5+ years). It is important to note that the “years to recovery” metric relies on strong assumptions that (a) our effect sizes are precisely estimated and (b) improvements will



continue at the same rate, but we provide these numbers as a rough estimate of the time it will take to reach recovery at the current pace of rebounding.

Additionally, to bolster our interpretation of patterns of gains examining changes in mean test scores across fall and spring test seasons, we also calculated the average raw fall-spring growth<sup>2</sup> within the 2020-21 and 2021-22 school years using the subset of students who had observed test scores in the fall and spring of each school year. The average fall-spring growth rate and SD of the growth within each year/subject/cohort are reported in Table 5. For reference, we presented the average growth rates during the corresponding grades per cohort from pre-COVID sample (2017-18 and 2018-19 school years). The ratio of COVID average growth and pre-COVID growth is also provided.

Further, we disaggregated the results by school poverty level. We compared two school poverty levels: (a) “Low Poverty” - less than 25% FRPL eligibility based on the 2019-20 CCD data and (b) “High Poverty” - greater than 75% FRPL eligibility. Results are presented for each cohort/subject combination in Figure A2 and in Tables 6A and 6B (for reading and math, respectively). RIT score means for the low-poverty schools are shown in blue, while the high-poverty school means are shown in purple (with the darker shade representing pre-COVID sample and the lighter shade representing the COVID sample). As with Figure A1, the spring 2020 data is asterisked because it is based on approximately 5% of the students relative to other terms due to the testing interruptions during COVID school closures.

## **RQ2: How does student achievement in spring 2022 compare to pre-pandemic levels?**

To address the second research question, we calculated the median student achievement percentile for each grade level and subject in spring 2019 (for the pre-COVID sample) and spring 2022 (for the COVID sample) based on the NWEA 2020 MAP Growth norms. The median percentile results are presented in Tables 3 and 4.

Additionally, we calculated median percentile rank and standardized differences between the pre-COVID and COVID samples separately by race/ethnicity and school poverty level. These results are presented in Tables 6A and 6B (we limit the results to spring 2021 and spring 2022, but other years/terms are available upon request).

## **Supplemental RQ: Has achievement become more distributed over the pandemic?**

Finally, we examined heterogeneity in student test scores prior to and following the pandemic. We calculated the RIT score corresponding to students at the 25th, 50th, and 75th percentiles of the observed<sup>3</sup> spring 2019 (pre-COVID sample) and spring 2022 (COVID sample) test score distributions. Additionally, we calculated the SDs of test scores in each grade/year and then

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<sup>2</sup> Note that we use both the term “achievement gains” and “growth” to refer to changes in students’ test scores between the fall and spring, but the estimate underlying each term is calculated differently. Achievement gains are calculated by comparing the mean RIT score in the fall with the mean RIT score in the spring, while growth is estimated by averaging each student’s fall-spring difference score. Given the number of students tested in each term varies slightly, these estimates will be similar but not equivalent.

<sup>3</sup> Unlike the percentiles used in RQ2 (which were based on the NWEA MAP Growth 2020 norms), the percentiles reported in this supplemental research question are calculated based on the raw score distribution observed in spring 2019 and spring 2022. Therefore, the RIT score corresponding to the 50<sup>th</sup> percentile in a given grade varies across the two spring terms.

took the ratio of the pre-pandemic and pandemic SDs. These results are presented in Figure A3. In reading, we see evidence of increased heterogeneity across all grades where standard deviations were between 1.04 to 1.08 times larger by spring 2022 than spring 2019. In math, increased heterogeneity is concentrated in grades 3-5 where standard deviations are 1.05 to 1.10 larger, with no evidence of increased SDs in the middle school grades. This increased test score variability appeared to be primarily driven by a spreading out at the bottom end of the distribution, with students at the 25<sup>th</sup> percentile more impacted than students at the upper half of the distribution.

### **Sensitivity of results to sample inclusion criteria**

Our descriptive analyses used an inclusive sample of students who tested in any fall/spring term during the four-school year span (2018-19, 2019-20, 2020-21, 2021-22 for the COVID sample; 2015-16, 2016-17, 2017-18, and 2018-19 for the pre-COVID sample). As a result, the number and composition of students included in the sample shifts across school years within a cohort as well as across the pre-COVID and COVID samples. To test the sensitivity of our results to this sample inclusion rule, we also re-ran our analyses under two more restrictive conditions: (a) requiring that students test in each of the four school years in their cohort, and (b) restricting the schools included in the sample to schools that tested both during the pre-COVID and COVID time spans. A comparison of the standardized differences between samples under our preferred sample restriction and these restrictive conditions is provided in Table 7 (comparisons of the size and characteristics for each sample available upon request). Overall, results did not appear to be sensitive to imposing stricter inclusion criteria.

## **4. Limitations**

There are several important limitations worth noting. It is possible that students who dropped out of the sample during the 2020-21 and 2021-22 school year are systematically different than our observed students in ways that could impact our results. While we tested the sensitivity of our findings to different sample inclusion criteria, our COVID estimates could still be biased by differential attrition during the pandemic. Additionally, we present test score results from three terms (spring 2020, fall 2020, and spring 2021) in which a sizable proportion of students may have tested remotely. While prior research<sup>viii</sup> has found that in-person and remote administration resulted in largely equivalent grade 3-8 test score patterns in fall 2020, we note that the trends presented in this report could be affected by shifting proportions of students testing remotely during COVID. Finally, we had 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.

**Table 1. Description of the pre-COVID and COVID student samples**

Grade (start of Cohort)	Grade (end of Cohort)	Sample	N	Male	Female	White	Black	Hispanic/ Latino	Asian	AIAN	Multi- Racial	Not Specified
Full Sample (across grades and subjects)												
—	—	Pre-COVID	8,058,454	0.51	0.49	0.47	0.17	0.19	0.04	0.02	0.04	0.07
—	—	COVID	8,298,076	0.51	0.49	0.45	0.18	0.21	0.04	0.01	0.05	0.06
—	—	Combined	13,008,961	0.51	0.49	0.46	0.17	0.20	0.04	0.02	0.04	0.07
Reading												
K	3	Pre-COVID	1,182,453	0.51	0.49	0.47	0.18	0.18	0.04	0.02	0.04	0.06
1	4	Pre-COVID	1,241,198	0.51	0.49	0.47	0.18	0.19	0.04	0.02	0.04	0.06
2	5	Pre-COVID	1,277,337	0.51	0.49	0.48	0.18	0.19	0.04	0.02	0.04	0.07
3	6	Pre-COVID	1,288,044	0.51	0.49	0.48	0.17	0.19	0.04	0.02	0.04	0.07
4	7	Pre-COVID	1,237,721	0.51	0.49	0.48	0.17	0.18	0.04	0.02	0.04	0.07
5	8	Pre-COVID	1,202,273	0.51	0.49	0.49	0.16	0.18	0.04	0.02	0.03	0.07
K	3	COVID	1,162,058	0.51	0.49	0.45	0.18	0.20	0.04	0.01	0.05	0.06
1	4	COVID	1,223,467	0.51	0.49	0.45	0.18	0.20	0.05	0.01	0.05	0.06
2	5	COVID	1,272,955	0.51	0.49	0.45	0.18	0.21	0.04	0.01	0.05	0.06
3	6	COVID	1,309,273	0.51	0.49	0.45	0.17	0.21	0.04	0.01	0.05	0.06
4	7	COVID	1,327,895	0.51	0.49	0.45	0.17	0.21	0.04	0.01	0.05	0.06
5	8	COVID	1,352,425	0.51	0.49	0.46	0.17	0.21	0.04	0.01	0.04	0.06
Math												
K	3	Pre-COVID	1,192,350	0.51	0.49	0.47	0.18	0.19	0.04	0.02	0.04	0.06
1	4	Pre-COVID	1,252,964	0.51	0.49	0.47	0.18	0.19	0.04	0.02	0.04	0.06
2	5	Pre-COVID	1,292,266	0.51	0.49	0.47	0.17	0.19	0.04	0.02	0.04	0.07
3	6	Pre-COVID	1,299,813	0.51	0.49	0.48	0.17	0.19	0.04	0.02	0.04	0.07
4	7	Pre-COVID	1,251,201	0.51	0.49	0.48	0.17	0.19	0.04	0.02	0.04	0.07
5	8	Pre-COVID	1,211,295	0.51	0.49	0.49	0.16	0.18	0.04	0.02	0.03	0.07
K	3	COVID	1,193,235	0.51	0.49	0.45	0.17	0.21	0.05	0.01	0.05	0.06
1	4	COVID	1,239,505	0.51	0.49	0.45	0.17	0.21	0.05	0.01	0.05	0.06
2	5	COVID	1,285,380	0.51	0.49	0.45	0.17	0.21	0.04	0.01	0.05	0.06
3	6	COVID	1,312,857	0.51	0.49	0.45	0.17	0.21	0.04	0.01	0.05	0.06
4	7	COVID	1,336,490	0.51	0.49	0.45	0.17	0.21	0.04	0.01	0.05	0.06
5	8	COVID	1,351,482	0.51	0.49	0.46	0.17	0.21	0.04	0.01	0.04	0.06

*Note.* AIAN= American Indian or Alaska Native. The pre-COVID samples cover the 2015-16 to 2018-19 school years, while the COVID samples cover the 2018-19 to 2021-22 school years. Many students tested in both math and reading, which is why the unique count of students for each

sample (top two rows) is not a sum of the sample sizes reported in the table. As a point of comparison, the projected percentage distribution of students enrolled in public elementary and secondary schools in the 2021-22 school year was 46% White, 15% Black, 28% Hispanic/Latino, 6% Asian, 1% AIAN, and 4% Other Race.<sup>ix</sup>

**Table 2. Sample school information relative to U.S. population of schools**

	Grade	Number of schools	Average School Enrollment	% FRPL	% White	% Black	% Hispanic	% Asian American	City	Rural	Suburb	Town
NWEA pre-COVID Sample	3-8	23,952	467	0.54	0.52	0.16	0.21	0.04	0.29	0.31	0.28	0.11
NWEA COVID Sample	3-8	24,138	481	0.55	0.51	0.16	0.22	0.04	0.31	0.31	0.28	0.11
U.S. Public Schools	3-8	76,960	472	0.55	0.49	0.15	0.25	0.04	0.28	0.32	0.28	0.12
NWEA pre-COVID Sample	3	17,743	446	0.55	0.51	0.17	0.21	0.04	0.31	0.32	0.27	0.10
NWEA pre-COVID Sample	4	17,642	446	0.55	0.50	0.17	0.21	0.04	0.32	0.32	0.27	0.10
NWEA pre-COVID Sample	5	17,141	450	0.56	0.50	0.17	0.21	0.04	0.32	0.31	0.27	0.10
NWEA pre-COVID Sample	6	11,196	483	0.56	0.51	0.17	0.20	0.03	0.31	0.26	0.33	0.10
NWEA pre-COVID Sample	7	9,310	501	0.56	0.50	0.18	0.20	0.03	0.31	0.25	0.33	0.11
NWEA pre-COVID Sample	8	9,211	502	0.56	0.50	0.18	0.20	0.03	0.31	0.24	0.34	0.11
NWEA COVID Sample	3	17,974	457	0.56	0.49	0.17	0.22	0.04	0.33	0.32	0.26	0.09
NWEA COVID Sample	4	17,852	457	0.56	0.49	0.17	0.22	0.04	0.33	0.32	0.26	0.09
NWEA COVID Sample	5	17,312	461	0.56	0.48	0.18	0.23	0.04	0.34	0.31	0.26	0.09
NWEA COVID Sample	6	11,243	499	0.56	0.49	0.18	0.21	0.03	0.32	0.26	0.32	0.10
NWEA COVID Sample	7	9,303	519	0.56	0.49	0.18	0.21	0.03	0.32	0.25	0.33	0.10
NWEA COVID Sample	8	9,188	519	0.56	0.50	0.18	0.21	0.03	0.32	0.25	0.33	0.10
U.S. Public Schools	3	54,037	453	0.56	0.48	0.15	0.26	0.04	0.30	0.33	0.26	0.10
U.S. Public Schools	4	53,801	453	0.56	0.48	0.15	0.26	0.04	0.30	0.33	0.26	0.10
U.S. Public Schools	5	52,523	455	0.56	0.47	0.15	0.26	0.04	0.31	0.33	0.27	0.10
U.S. Public Schools	6	37,493	482	0.56	0.49	0.15	0.26	0.04	0.29	0.29	0.32	0.11
U.S. Public Schools	7	32,375	483	0.56	0.50	0.16	0.24	0.03	0.27	0.27	0.34	0.12
U.S. Public Schools	8	32,616	485	0.56	0.50	0.16	0.24	0.03	0.27	0.27	0.34	0.12

*Note:* FRPL=free or reduced priced lunch. The NWEA pre-COVID Sample is defined as schools that administered MAP Growth in a given grade (or grade range) during the 2015-16 to 2018-19 school years, while NWEA COVID Sample is defined as schools that administered MAP Growth during the 2018-19 to 2021-22 school years. The source of the variables is 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 2019-20 and enrolled students in that grade level.

**Table 3. Student reading RIT score means, SDs by cohort and sample**

Grades	Terms	Pre-COVID Sample				COVID Sample				Standardized difference between samples
		Year	N	M (SD)	Median Perc.	Year	N	M (SD)	Median Perc.	
K-3	KF	2015-16	369,488	139.70 ( 9.86)	58	2018-19	491,277	138.18 ( 9.34)	52	-0.16
K-3	KS	2015-16	434,397	155.93 (12.45)	57	2018-19	582,766	155.47 (12.43)	57	-0.04
K-3	1F	2016-17	552,634	156.62 (13.06)	52	2019-20	640,700	156.48 (13.01)	52	-0.01
K-3	1S	2016-17	579,637	172.92 (14.41)	55	2019-20	27,771	172.18 (15.24)	53	-0.05
K-3	2F	2017-18	759,925	173.14 (16.07)	52	2020-21	621,537	174.74 (17.64)	55	0.10
K-3	2S	2017-18	790,834	186.68 (15.89)	56	2020-21	659,137	184.38 (17.23)	50	-0.14
K-3	3F	2018-19	838,895	187.44 (16.75)	57	2021-22	793,231	185.14 (17.95)	51	-0.13
K-3	3S	2018-19	819,747	197.80 (16.30)	57	2021-22	728,903	195.81 (17.58)	53	-0.12
1-4	1F	2015-16	507,741	157.26 (12.90)	54	2018-19	639,659	156.67 (13.08)	53	-0.04
1-4	1S	2015-16	533,648	173.41 (14.19)	56	2018-19	667,471	172.67 (14.26)	54	-0.05
1-4	2F	2016-17	719,044	173.43 (16.52)	53	2019-20	790,083	172.77 (16.16)	51	-0.04
1-4	2S	2016-17	744,419	187.22 (16.28)	58	2019-20	38,201	187.24 (16.93)	59	0.00
1-4	3F	2017-18	821,935	187.54 (16.87)	57	2020-21	693,976	188.46 (17.48)	59	0.05
1-4	3S	2017-18	794,962	198.02 (16.18)	57	2020-21	696,819	195.73 (17.35)	52	-0.14
1-4	4F	2018-19	838,321	197.82 (16.42)	58	2021-22	802,784	196.03 (17.26)	54	-0.11
1-4	4S	2018-19	809,980	205.21 (15.96)	56	2021-22	727,639	203.77 (16.95)	54	-0.09
2-5	2F	2015-16	654,286	173.82 (16.35)	54	2018-19	783,109	173.05 (15.99)	51	-0.05
2-5	2S	2015-16	682,567	187.71 (15.96)	59	2018-19	811,738	186.72 (15.90)	56	-0.06
2-5	3F	2016-17	768,070	187.80 (17.04)	58	2019-20	854,006	187.43 (16.84)	56	-0.02
2-5	3S	2016-17	746,605	198.40 (16.46)	59	2019-20	53,065	197.91 (16.43)	58	-0.03
2-5	4F	2017-18	813,704	197.54 (16.58)	58	2020-21	701,554	198.07 (16.70)	58	0.03
2-5	4S	2017-18	781,945	205.30 (15.97)	56	2020-21	693,789	203.20 (16.94)	52	-0.13
2-5	5F	2018-19	860,156	205.10 (16.13)	57	2021-22	816,026	203.45 (16.77)	53	-0.10
2-5	5S	2018-19	823,292	210.88 (15.71)	55	2021-22	731,999	209.33 (16.57)	53	-0.10
3-6	3F	2015-16	706,442	188.24 (16.89)	59	2018-19	837,324	187.61 (16.67)	57	-0.04
3-6	3S	2015-16	689,841	198.72 (16.13)	59	2018-19	818,421	197.97 (16.19)	57	-0.05
3-6	4F	2016-17	760,610	197.83 (16.75)	59	2019-20	858,191	197.77 (16.53)	58	0.00
3-6	4S	2016-17	743,451	205.70 (16.35)	57	2019-20	54,080	204.80 (15.87)	55	-0.06
3-6	5F	2017-18	831,281	204.92 (16.35)	56	2020-21	714,631	205.07 (16.34)	57	0.01
3-6	5S	2017-18	790,793	211.09 (15.73)	55	2020-21	702,698	208.97 (16.66)	51	-0.13
3-6	6F	2018-19	854,094	210.59 (15.89)	56	2021-22	806,542	209.08 (16.47)	53	-0.09
3-6	6S	2018-19	802,354	214.74 (15.76)	53	2021-22	706,685	213.14 (16.35)	50	-0.10
4-7	4F	2015-16	680,159	198.31 (16.50)	59	2018-19	840,274	197.86 (16.40)	58	-0.03
4-7	4S	2015-16	661,956	206.26 (15.95)	58	2018-19	811,748	205.26 (15.93)	56	-0.06
4-7	5F	2016-17	750,125	205.23 (16.58)	57	2019-20	888,310	204.97 (16.30)	56	-0.02
4-7	5S	2016-17	733,309	211.74 (16.22)	57	2019-20	61,912	210.97 (15.57)	56	-0.05
4-7	6F	2017-18	803,261	210.38 (16.23)	56	2020-21	687,104	210.80 (15.95)	57	0.03
4-7	6S	2017-18	750,271	215.03 (15.86)	54	2020-21	678,366	213.07 (16.61)	50	-0.12
4-7	7F	2018-19	800,652	214.85 (15.94)	56	2021-22	822,311	213.15 (16.48)	53	-0.10
4-7	7S	2018-19	752,063	218.20 (16.06)	54	2021-22	707,278	216.31 (16.73)	51	-0.12

5-8	5F	2015-16	672,951	205.81 (16.30)	58	2018-19	862,262	205.12 (16.11)	57	-0.04
5-8	5S	2015-16	653,778	212.32 (15.80)	58	2018-19	826,704	210.88 (15.70)	55	-0.09
5-8	6F	2016-17	728,446	210.56 (16.44)	57	2019-20	907,345	210.49 (16.00)	56	0.00
5-8	6S	2016-17	694,433	215.42 (16.24)	55	<i>2019-20</i>	<i>68,914</i>	<i>214.65 (15.42)</i>	<i>53</i>	<i>-0.05</i>
5-8	7F	2017-18	765,708	214.71 (16.30)	57	2020-21	680,820	214.93 (16.27)	57	0.01
5-8	7S	2017-18	705,537	218.57 (16.14)	55	2020-21	661,082	216.48 (16.97)	51	-0.13
5-8	8F	2018-19	765,284	218.72 (16.03)	56	2021-22	829,705	216.82 (16.63)	52	-0.12
5-8	8S	2018-19	692,719	221.34 (16.22)	54	2021-22	699,489	219.42 (16.93)	50	-0.12

*Note.* N=number of students, M=mean, SD=standard deviation, Perc. = percentile rank, KF=fall of kindergarten, KS=spring of kindergarten. Spring 2020 data is italicized to highlight that it should be interpreted with great caution.

**Table 4. Student math RIT score means, SDs by cohort and sample**

Grades	Terms	Pre-COVID Sample				COVID Sample				Standardized difference between samples
		Year	N	M (SD)	Median Perc.	Year	N	M (SD)	Median Perc.	
K-3	KF	2015-16	389,624	142.64 (10.52)	56	2018-19	507,633	141.47 (10.36)	54	-0.11
K-3	KS	2015-16	455,220	160.31 (12.44)	62	2018-19	599,748	160.28 (12.35)	63	0.00
K-3	1F	2016-17	576,507	160.66 (12.63)	55	2019-20	676,357	160.62 (12.67)	56	0.00
K-3	1S	2016-17	603,044	177.74 (13.45)	55	2019-20	23,973	178.56 (15.45)	56	0.06
K-3	2F	2017-18	776,253	175.78 (13.58)	55	2020-21	634,998	176.14 (14.96)	54	0.03
K-3	2S	2017-18	804,167	190.22 (13.79)	55	2020-21	689,206	187.00 (15.00)	46	-0.22
K-3	3F	2018-19	843,139	188.55 (13.67)	55	2021-22	812,757	185.34 (14.84)	45	-0.22
K-3	3S	2018-19	811,114	201.90 (14.36)	57	2021-22	737,969	199.13 (15.77)	52	-0.18
1-4	1F	2015-16	528,506	161.01 (12.44)	56	2018-19	669,987	160.52 (12.46)	55	-0.04
1-4	1S	2015-16	556,606	177.90 (13.09)	55	2018-19	700,376	178.06 (13.67)	56	0.01
1-4	2F	2016-17	729,987	176.12 (13.47)	56	2019-20	811,967	175.70 (13.77)	55	-0.03
1-4	2S	2016-17	751,651	190.82 (13.60)	57	2019-20	32,019	189.52 (14.79)	54	-0.10
1-4	3F	2017-18	821,138	188.91 (13.50)	55	2020-21	692,711	187.45 (14.11)	49	-0.11
1-4	3S	2017-18	787,404	202.02 (14.21)	57	2020-21	705,336	198.11 (15.51)	47	-0.26
1-4	4F	2018-19	848,588	200.57 (14.29)	57	2021-22	818,994	196.88 (15.42)	48	-0.25
1-4	4S	2018-19	813,215	211.68 (15.73)	57	2021-22	740,890	208.55 (17.05)	50	-0.19
2-5	2F	2015-16	677,845	176.43 (13.38)	56	2018-19	799,705	175.66 (13.53)	54	-0.06
2-5	2S	2015-16	705,421	191.10 (13.30)	58	2018-19	821,737	190.73 (13.81)	57	-0.03
2-5	3F	2016-17	769,794	189.22 (13.47)	56	2019-20	854,537	188.78 (13.69)	55	-0.03
2-5	3S	2016-17	742,709	202.55 (14.16)	58	2019-20	48,820	200.55 (14.47)	54	-0.14
2-5	4F	2017-18	815,457	200.67 (14.17)	57	2020-21	708,845	198.34 (14.32)	50	-0.16
2-5	4S	2017-18	779,955	211.92 (15.74)	57	2020-21	717,148	207.36 (16.55)	46	-0.28
2-5	5F	2018-19	871,747	210.05 (15.63)	56	2021-22	833,663	205.98 (16.42)	46	-0.25
2-5	5S	2018-19	827,566	219.75 (17.54)	55	2021-22	748,529	215.84 (18.40)	47	-0.22
3-6	3F	2015-16	712,554	189.89 (13.46)	58	2018-19	841,533	188.70 (13.59)	55	-0.09
3-6	3S	2015-16	698,254	202.89 (13.85)	58	2018-19	809,884	202.05 (14.26)	57	-0.06
3-6	4F	2016-17	763,113	201.03 (14.32)	58	2019-20	865,193	200.65 (14.36)	58	-0.03
3-6	4S	2016-17	741,787	212.35 (15.79)	58	2019-20	52,265	209.78 (15.44)	53	-0.16
3-6	5F	2017-18	836,219	210.14 (15.56)	56	2020-21	725,828	207.79 (15.49)	49	-0.15
3-6	5S	2017-18	791,980	220.11 (17.55)	56	2020-21	730,165	215.30 (17.85)	44	-0.27
3-6	6F	2018-19	867,572	214.82 (15.63)	53	2021-22	814,342	211.40 (15.79)	44	-0.22
3-6	6S	2018-19	808,705	222.57 (17.32)	52	2021-22	715,256	219.30 (17.57)	44	-0.19
4-7	4F	2015-16	690,280	201.45 (14.20)	59	2018-19	850,832	200.62 (14.27)	57	-0.06
4-7	4S	2015-16	674,097	212.65 (15.28)	58	2018-19	815,140	211.73 (15.71)	57	-0.06
4-7	5F	2016-17	754,585	210.51 (15.73)	57	2019-20	894,387	209.89 (15.63)	56	-0.04
4-7	5S	2016-17	733,192	220.79 (17.62)	58	2019-20	62,743	218.39 (16.93)	53	-0.14
4-7	6F	2017-18	809,113	214.95 (15.97)	54	2020-21	693,313	212.89 (15.15)	48	-0.13
4-7	6S	2017-18	757,269	222.96 (17.58)	53	2020-21	686,856	219.35 (17.43)	44	-0.21
4-7	7F	2018-19	807,067	221.29 (17.24)	55	2021-22	823,859	217.42 (16.98)	45	-0.23
4-7	7S	2018-19	754,080	227.50 (18.63)	54	2021-22	713,437	223.66 (18.53)	45	-0.21
5-8	5F	2015-16	683,696	210.82 (15.44)	58	2018-19	873,926	210.07 (15.61)	56	-0.05
5-8	5S	2015-16	669,643	221.22 (17.12)	58	2018-19	830,296	219.75 (17.53)	55	-0.08



5-8	6F	2016-17	736,146	215.32 (16.07)	55	2019-20	912,026	214.65 (15.46)	53	-0.04
5-8	6S	2016-17	701,471	223.40 (17.60)	55	<i>2019-20</i>	<i>65,581</i>	<i>221.23 (16.31)</i>	<i>49</i>	-0.12
5-8	7F	2017-18	763,404	221.52 (17.55)	56	2020-21	681,329	219.41 (16.47)	50	-0.12
5-8	7S	2017-18	708,777	228.08 (18.75)	56	2020-21	663,716	224.32 (18.50)	47	-0.20
5-8	8F	2018-19	736,107	226.41 (18.43)	55	2021-22	773,529	221.78 (17.95)	45	-0.25
5-8	8S	2018-19	662,158	231.35 (19.78)	53	2021-22	644,665	226.69 (19.30)	43	-0.24

**Note.** N=number of students, M=mean, SD=standard deviation, Perc. = percentile rank, KF=fall of kindergarten, KS=spring of kindergarten. Spring 2020 data is italicized to highlight that it should be interpreted with great caution.

**Table 5. Average fall-spring growth rates during the 2020-21 and 2021-22 school year relative to pre-COVID averages gains**

Subject	Cohort	COVID School Year	Grade	Pre-COVID Sample (fall-spring gains)			COVID Sample (fall-spring gains)			Ratio Gains
				N	Mean	SD	N	Mean	SD	
Reading	K-3	2020-21	2	707,389	13.65	9.58	549,540	10.16	13.35	0.74
Reading	K-3	2021-22	3	742,081	10.67	9.41	673,851	10.93	9.73	1.02
Reading	1-4	2020-21	3	720,091	10.64	9.46	590,176	7.74	11.60	0.73
Reading	1-4	2021-22	4	732,747	7.61	8.87	675,466	7.79	9.07	1.02
Reading	2-5	2020-21	4	706,103	7.85	8.98	587,956	5.43	10.27	0.69
Reading	2-5	2021-22	5	745,257	6.01	8.58	677,787	5.97	8.81	0.99
Reading	3-6	2020-21	5	714,121	6.28	8.70	594,484	4.14	9.72	0.66
Reading	3-6	2021-22	6	720,994	4.45	8.62	639,422	4.09	8.89	0.92
Reading	4-7	2020-21	6	672,734	4.74	8.81	550,819	2.55	9.62	0.54
Reading	4-7	2021-22	7	661,211	3.66	8.66	639,850	3.17	9.08	0.87
Reading	5-8	2020-21	7	620,898	3.84	8.90	531,232	1.73	9.71	0.45
Reading	5-8	2021-22	8	611,701	3.02	8.77	635,843	2.64	9.31	0.87
Math	K-3	2020-21	2	720,045	14.56	8.30	560,996	11.48	12.09	0.79
Math	K-3	2021-22	3	738,937	13.46	7.65	684,960	13.90	7.75	1.03
Math	1-4	2020-21	3	712,459	13.16	7.71	590,213	11.18	10.43	0.85
Math	1-4	2021-22	4	739,485	11.21	7.53	687,823	11.70	7.52	1.04
Math	2-5	2020-21	4	704,777	11.29	7.64	602,898	9.49	9.40	0.84
Math	2-5	2021-22	5	753,928	9.82	7.76	692,826	9.91	7.65	1.01
Math	3-6	2020-21	5	715,085	10.06	7.95	611,936	7.92	9.03	0.79
Math	3-6	2021-22	6	736,619	7.97	7.59	647,037	7.96	7.49	1.00
Math	4-7	2020-21	6	683,228	8.09	7.79	558,650	7.09	8.66	0.88
Math	4-7	2021-22	7	668,289	6.34	7.63	645,424	6.24	7.61	0.99
Math	5-8	2020-21	7	623,459	6.53	7.81	533,763	5.46	8.65	0.84
Math	5-8	2021-22	8	587,513	5.15	7.83	581,681	5.25	7.95	1.02

*Note.* The pre-COVID sample columns show gains from the 2017-18 and 2018-19 school years as a reference to the COVID sample's 2020-21 and 2021-22 fall-spring gains. Gains are calculated as spring RIT minus fall RIT for each grade/subject/year.

**Table 6A. Reading RIT score means, SDs by cohort, sample, and subgroup**

Cohort Grades	Group	Terms	pre-COVID Sample			COVID Sample			Standardized difference between samples
			N	M (SD)	Median Perc.	N	M (SD)	Median Perc.	
K-3	Asian	2S	32,327	192.45 (15.97)	71	27,524	192.37 (16.90)	72	0.00
K-3	Asian	3S	34,324	204.23 (15.34)	72	33,415	203.26 (16.50)	71	-0.06
K-3	White	2S	375,868	190.38 (15.01)	65	325,074	187.96 (16.11)	60	-0.16
K-3	White	3S	388,847	201.47 (15.08)	65	340,563	199.87 (16.12)	62	-0.10
K-3	Hispanic/Latino	2S	143,566	181.45 (15.43)	42	130,910	178.47 (17.01)	33	-0.18
K-3	Hispanic/Latino	3S	155,216	192.87 (16.35)	45	153,396	190.40 (17.66)	39	-0.15
K-3	Black	2S	144,271	180.88 (15.27)	40	100,282	178.12 (17.01)	31	-0.17
K-3	Black	3S	144,234	191.66 (16.18)	41	113,774	188.71 (17.59)	35	-0.18
K-3	AIAN	2S	11,786	180.05 (15.48)	37	7,634	177.59 (17.22)	30	-0.15
K-3	AIAN	3S	12,113	189.21 (16.90)	35	9,072	186.95 (17.99)	29	-0.13
1-4	Asian	3S	31,863	204.20 (15.64)	72	30,823	203.36 (16.06)	70	-0.05
1-4	Asian	4S	32,990	211.68 (15.17)	72	33,641	210.92 (15.96)	71	-0.05
1-4	White	3S	375,528	201.75 (14.97)	66	335,643	199.77 (15.87)	61	-0.13
1-4	White	4S	390,889	208.75 (14.66)	64	343,862	207.69 (15.33)	62	-0.07
1-4	Hispanic/Latino	3S	149,950	192.91 (16.17)	45	144,615	189.74 (17.40)	37	-0.19
1-4	Hispanic/Latino	4S	151,324	200.47 (16.18)	45	154,413	198.66 (17.26)	41	-0.11
1-4	Black	3S	140,167	192.32 (15.98)	43	105,081	188.60 (17.37)	33	-0.22
1-4	Black	4S	140,036	199.11 (15.97)	41	108,836	196.60 (17.23)	36	-0.15
1-4	AIAN	3S	12,607	189.50 (16.63)	35	8,251	187.69 (17.97)	31	-0.11
1-4	AIAN	4S	12,315	196.36 (16.85)	34	9,057	194.56 (18.13)	29	-0.10
2-5	Asian	4S	30,725	211.47 (15.84)	71	29,441	210.87 (15.76)	70	-0.04
2-5	Asian	5S	33,014	217.53 (15.25)	71	32,580	216.75 (15.72)	70	-0.05
2-5	White	4S	377,781	208.95 (14.70)	64	335,897	207.23 (15.23)	61	-0.12
2-5	White	5S	398,318	214.31 (14.42)	63	344,076	213.04 (14.99)	61	-0.09
2-5	Hispanic/Latino	4S	142,023	200.23 (16.08)	44	147,168	197.44 (17.27)	38	-0.17
2-5	Hispanic/Latino	5S	154,384	206.22 (15.99)	44	157,825	204.61 (16.98)	41	-0.10
2-5	Black	4S	136,692	199.32 (15.71)	41	101,782	196.00 (17.21)	33	-0.20
2-5	Black	5S	140,355	204.82 (15.65)	40	111,878	202.64 (16.81)	36	-0.13
2-5	AIAN	4S	12,674	197.08 (16.34)	35	8,486	195.41 (17.73)	32	-0.10
2-5	AIAN	5S	12,714	202.53 (16.45)	34	9,202	200.66 (17.77)	29	-0.11
3-6	Asian	5S	31,435	217.45 (15.45)	71	29,875	217.14 (15.26)	70	-0.02
3-6	Asian	6S	32,453	221.98 (15.07)	71	32,015	221.63 (15.40)	70	-0.02
3-6	White	5S	382,300	214.62 (14.45)	63	340,430	212.73 (14.92)	59	-0.13
3-6	White	6S	390,075	218.16 (14.49)	61	336,210	216.71 (14.90)	58	-0.10
3-6	Hispanic/Latino	5S	145,512	206.27 (15.85)	44	149,321	203.71 (17.17)	38	-0.15
3-6	Hispanic/Latino	6S	152,401	210.21 (16.02)	43	149,153	208.13 (16.60)	38	-0.13
3-6	Black	5S	135,620	204.98 (15.65)	40	102,456	201.79 (17.07)	33	-0.20
3-6	Black	6S	134,387	208.56 (15.62)	38	104,710	206.34 (16.30)	33	-0.14
3-6	AIAN	5S	13,246	202.83 (16.05)	34	8,651	200.89 (17.66)	30	-0.12
3-6	AIAN	6S	13,239	206.88 (15.97)	34	9,180	205.38 (16.84)	29	-0.09
4-7	Asian	6S	29,787	221.86 (15.72)	71	29,596	222.07 (15.31)	71	0.01
4-7	Asian	7S	29,549	225.70 (15.60)	72	31,670	225.24 (15.54)	71	-0.03
4-7	White	6S	367,872	218.53 (14.56)	62	333,387	216.57 (14.99)	57	-0.13
4-7	White	7S	370,321	221.57 (14.79)	62	336,242	219.84 (15.27)	58	-0.12
4-7	Hispanic/Latino	6S	136,729	210.20 (16.12)	43	140,767	207.64 (17.16)	37	-0.15
4-7	Hispanic/Latino	7S	140,494	213.47 (16.56)	44	149,482	211.13 (17.21)	39	-0.14
4-7	Black	6S	127,419	208.90 (15.71)	39	94,638	206.18 (16.81)	33	-0.17
4-7	Black	7S	124,236	212.11 (15.79)	40	104,627	209.83 (16.58)	34	-0.14
4-7	AIAN	6S	12,204	206.83 (16.14)	33	8,453	205.30 (16.99)	30	-0.09
4-7	AIAN	7S	11,564	209.89 (16.46)	34	8,879	208.58 (17.07)	31	-0.08
5-8	Asian	7S	28,456	225.56 (16.18)	72	28,677	225.84 (15.72)	72	0.02
5-8	Asian	8S	27,155	228.39 (15.98)	70	30,771	228.36 (15.83)	70	0.00
5-8	White	7S	349,974	221.95 (14.84)	63	327,021	219.84 (15.42)	58	-0.14
5-8	White	8S	344,552	224.54 (15.04)	61	331,942	222.77 (15.62)	57	-0.12
5-8	Hispanic/Latino	7S	125,691	213.62 (16.58)	44	136,570	211.06 (17.56)	39	-0.15
5-8	Hispanic/Latino	8S	127,116	216.75 (16.82)	44	148,726	214.48 (17.47)	39	-0.13
5-8	Black	7S	117,728	212.59 (15.90)	41	91,619	209.61 (17.17)	34	-0.18
5-8	Black	8S	114,222	215.62 (15.88)	40	103,911	213.26 (16.62)	36	-0.15
5-8	AIAN	7S	11,405	210.84 (16.41)	37	8,038	209.56 (17.30)	34	-0.08
5-8	AIAN	8S	11,308	213.53 (16.65)	36	8,843	212.64 (17.18)	33	-0.05
K-3	High Poverty	2S	228,120	180.21 (15.52)	38	172,635	176.62 (16.97)	28	-0.22

K-3	High Poverty	3S	232,029	191.30 (16.60)	41	191,885	187.96 (17.89)	33	-0.19
K-3	Low Poverty	2S	159,447	194.33 (14.28)	74	146,117	192.34 (15.29)	70	-0.13
K-3	Low Poverty	3S	171,931	205.19 (13.83)	73	165,371	203.75 (14.88)	70	-0.10
1-4	High Poverty	3S	228,529	191.64 (16.35)	42	182,062	187.50 (17.54)	31	-0.25
1-4	High Poverty	4S	219,157	198.71 (16.46)	40	186,277	196.10 (17.68)	34	-0.15
1-4	Low Poverty	3S	161,951	205.58 (13.78)	73	157,157	203.81 (14.64)	70	-0.13
1-4	Low Poverty	4S	172,995	212.44 (13.38)	71	169,612	211.23 (14.18)	69	-0.09
2-5	High Poverty	4S	212,637	198.66 (16.32)	40	177,030	195.06 (17.56)	32	-0.21
2-5	High Poverty	5S	220,513	204.47 (16.25)	39	186,059	202.17 (17.37)	35	-0.14
2-5	Low Poverty	4S	161,844	212.76 (13.52)	72	155,815	210.99 (14.03)	68	-0.13
2-5	Low Poverty	5S	177,065	217.94 (13.17)	70	167,883	216.55 (13.86)	68	-0.10
3-6	High Poverty	5S	195,627	204.36 (16.16)	39	159,591	200.93 (17.64)	31	-0.20
3-6	High Poverty	6S	191,988	208.23 (16.15)	38	155,551	205.76 (16.77)	32	-0.15
3-6	Low Poverty	5S	157,840	218.09 (13.33)	70	152,433	216.16 (13.95)	67	-0.14
3-6	Low Poverty	6S	161,658	221.71 (13.42)	68	157,549	220.22 (14.03)	65	-0.11
4-7	High Poverty	6S	177,196	208.24 (16.34)	38	144,053	205.13 (17.31)	31	-0.18
4-7	High Poverty	7S	173,556	211.51 (16.59)	39	149,136	209.01 (17.28)	33	-0.15
4-7	Low Poverty	6S	150,606	222.10 (13.39)	69	148,602	220.07 (14.17)	65	-0.15
4-7	Low Poverty	7S	151,843	225.15 (13.72)	69	155,140	223.32 (14.32)	65	-0.13
5-8	High Poverty	7S	163,336	212.02 (16.68)	40	138,110	208.83 (17.82)	33	-0.19
5-8	High Poverty	8S	158,563	215.17 (16.72)	40	148,415	212.58 (17.48)	34	-0.15
5-8	Low Poverty	7S	142,209	225.53 (13.71)	70	143,526	223.44 (14.62)	65	-0.15
5-8	Low Poverty	8S	135,563	227.91 (14.07)	67	150,735	226.06 (14.83)	64	-0.13

Note. AIAN= American Indian or Alaska Native, N=number of students, M=mean, SD=standard deviation, Perc. = percentile rank. We focus on schools in two poverty levels: (a) "Low Poverty" - less than 25% FRPL eligibility and (b) "High Poverty" - greater than 75% FRPL eligibility.

**Table 6B. 2018-19 and 2021-22 fall/spring math RIT score means, SDs by grade level and subgroup**

Cohort	Group	Terms	2018-19 (pre-COVID Sample)			2021-22 (COVID Sample)			Standardized difference between samples
			N	M (SD)	Median Perc.	N	M (SD)	Median Perc.	
K-3	Asian	2S	33,688	197.11 (14.37)	75	30,395	195.85 (15.84)	70	-0.08
K-3	Asian	3S	35,065	210.03 (14.65)	76	34,871	208.25 (15.99)	73	-0.12
K-3	White	2S	380,680	193.49 (12.69)	64	335,400	190.46 (13.44)	56	-0.23
K-3	White	3S	385,062	205.13 (13.12)	66	343,554	203.03 (14.00)	61	-0.16
K-3	Hispanic/Latino	2S	150,137	186.22 (13.46)	43	141,443	182.06 (14.66)	31	-0.30
K-3	Hispanic/Latino	3S	156,368	198.23 (13.97)	47	158,898	194.81 (15.48)	38	-0.23
K-3	Black	2S	142,927	184.21 (13.51)	37	103,115	179.84 (15.25)	24	-0.31
K-3	Black	3S	137,499	195.12 (14.22)	38	111,808	190.69 (15.84)	28	-0.30
K-3	AIAN	2S	11,770	185.08 (13.58)	39	7,776	181.74 (15.57)	29	-0.23
K-3	AIAN	3S	11,950	194.75 (14.92)	36	9,008	190.65 (16.52)	25	-0.26
1-4	Asian	3S	32,474	210.22 (15.01)	76	32,171	207.53 (15.89)	71	-0.17
1-4	Asian	4S	34,616	221.62 (16.52)	77	35,157	219.03 (17.67)	74	-0.15
1-4	White	3S	372,145	205.29 (13.00)	65	336,944	201.98 (13.75)	57	-0.25
1-4	White	4S	391,304	215.19 (14.43)	64	347,038	212.87 (15.22)	60	-0.16
1-4	Hispanic/Latino	3S	150,234	198.38 (13.78)	47	151,946	193.09 (15.24)	32	-0.36
1-4	Hispanic/Latino	4S	154,457	207.64 (15.25)	47	161,319	203.76 (16.55)	37	-0.24
1-4	Black	3S	135,692	195.54 (13.90)	39	102,650	189.85 (15.44)	23	-0.39
1-4	Black	4S	137,036	204.05 (15.13)	38	109,741	198.97 (16.65)	27	-0.32
1-4	AIAN	3S	12,538	194.73 (14.56)	36	8,117	190.94 (16.11)	26	-0.25
1-4	AIAN	4S	12,185	203.23 (15.99)	35	8,987	198.81 (17.38)	23	-0.27
2-5	Asian	4S	31,545	221.95 (16.99)	78	31,314	218.32 (17.43)	71	-0.21
2-5	Asian	5S	34,398	231.75 (18.47)	81	34,240	228.61 (19.63)	75	-0.16
2-5	White	4S	375,981	215.47 (14.48)	65	342,828	211.54 (14.85)	57	-0.27
2-5	White	5S	399,441	223.65 (16.27)	64	348,562	220.46 (16.85)	57	-0.19
2-5	Hispanic/Latino	4S	143,761	207.85 (15.20)	47	156,829	202.07 (16.01)	33	-0.37
2-5	Hispanic/Latino	5S	158,497	215.08 (16.78)	44	165,559	210.70 (17.21)	34	-0.26
2-5	Black	4S	132,918	204.34 (15.01)	38	104,374	198.42 (15.98)	24	-0.38
2-5	Black	5S	136,737	210.99 (16.45)	34	113,275	205.60 (17.22)	24	-0.32
2-5	AIAN	4S	12,630	203.97 (15.40)	37	8,397	199.33 (16.49)	25	-0.29
2-5	AIAN	5S	12,688	210.78 (16.97)	33	9,108	205.84 (18.14)	21	-0.28
3-6	Asian	5S	32,186	231.77 (18.47)	81	32,007	228.38 (19.04)	73	-0.18
3-6	Asian	6S	32,988	234.61 (17.93)	78	32,226	232.37 (18.90)	72	-0.12
3-6	White	5S	382,077	224.13 (16.25)	65	350,024	219.57 (16.37)	54	-0.28
3-6	White	6S	393,103	226.56 (16.05)	61	340,835	223.55 (16.23)	53	-0.19
3-6	Hispanic/Latino	5S	148,667	215.50 (16.68)	45	159,191	209.82 (16.80)	32	-0.34
3-6	Hispanic/Latino	6S	155,924	217.94 (16.41)	42	150,963	214.06 (16.32)	31	-0.24
3-6	Black	5S	132,809	211.23 (16.56)	34	105,398	205.57 (16.66)	23	-0.34
3-6	Black	6S	131,633	213.61 (16.36)	32	105,760	209.40 (16.07)	23	-0.26
3-6	AIAN	5S	13,069	211.32 (16.74)	34	8,693	206.35 (17.75)	23	-0.29
3-6	AIAN	6S	13,140	213.96 (16.46)	32	9,101	209.87 (16.97)	22	-0.25
4-7	Asian	6S	30,256	234.90 (18.70)	79	29,435	232.92 (18.50)	74	-0.11
4-7	Asian	7S	28,288	240.38 (19.83)	80	29,768	236.92 (20.01)	72	-0.17
4-7	White	6S	370,643	227.12 (16.11)	63	337,564	223.14 (16.05)	53	-0.25
4-7	White	7S	369,612	231.88 (17.27)	64	338,990	228.17 (17.27)	55	-0.21
4-7	Hispanic/Latino	6S	141,414	217.92 (16.93)	42	142,954	214.04 (16.54)	32	-0.23
4-7	Hispanic/Latino	7S	145,697	222.11 (17.83)	42	152,000	218.02 (17.31)	33	-0.23
4-7	Black	6S	125,171	213.96 (16.61)	33	96,836	210.22 (16.32)	24	-0.23
4-7	Black	7S	121,857	218.17 (17.44)	34	106,806	214.00 (16.88)	25	-0.24
4-7	AIAN	6S	12,083	213.96 (16.74)	33	8,488	210.46 (16.85)	24	-0.21
4-7	AIAN	7S	11,644	217.83 (17.54)	33	8,971	214.14 (17.67)	24	-0.21
5-8	Asian	7S	27,101	240.52 (20.19)	80	26,510	238.81 (20.10)	76	-0.08
5-8	Asian	8S	23,116	244.55 (21.87)	79	23,421	240.02 (22.07)	67	-0.21
5-8	White	7S	351,470	232.42 (17.30)	65	327,666	228.18 (17.12)	55	-0.25
5-8	White	8S	326,807	235.89 (18.61)	62	304,461	231.36 (18.29)	52	-0.25
5-8	Hispanic/Latino	7S	130,511	222.57 (18.07)	44	138,707	218.78 (17.67)	35	-0.21
5-8	Hispanic/Latino	8S	127,145	225.86 (18.88)	42	139,211	221.01 (17.90)	34	-0.26
5-8	Black	7S	115,545	218.84 (17.69)	36	93,945	215.11 (17.40)	27	-0.21
5-8	Black	8S	108,566	222.11 (18.27)	35	99,852	217.42 (17.31)	27	-0.26
5-8	AIAN	7S	11,160	218.86 (17.88)	36	8,221	215.78 (17.63)	28	-0.17
5-8	AIAN	8S	10,921	222.13 (18.61)	35	8,739	218.83 (18.10)	28	-0.18
K-3	High Poverty	2S	233,671	184.65 (13.72)	38	180,355	179.98 (15.23)	25	-0.32

K-3	High Poverty	3S	228,505	196.10 (14.48)	41	193,060	191.71 (16.11)	29	-0.29
K-3	Low Poverty	2S	164,424	196.77 (12.30)	72	154,285	194.12 (13.07)	66	-0.21
K-3	Low Poverty	3S	174,560	208.65 (12.79)	73	169,409	206.96 (13.50)	70	-0.13
1-4	High Poverty	3S	226,135	196.35 (14.14)	41	184,028	190.33 (15.59)	24	-0.41
1-4	High Poverty	4S	219,510	205.00 (15.52)	40	190,529	200.17 (17.03)	28	-0.30
1-4	Low Poverty	3S	162,576	209.20 (12.74)	74	160,407	205.96 (13.41)	67	-0.25
1-4	Low Poverty	4S	177,767	219.43 (14.27)	72	173,743	217.25 (14.97)	69	-0.15
2-5	High Poverty	4S	211,796	205.29 (15.42)	41	183,315	198.95 (16.27)	25	-0.40
2-5	High Poverty	5S	220,544	212.26 (16.91)	37	189,919	206.89 (17.62)	25	-0.31
2-5	Low Poverty	4S	164,260	219.97 (14.38)	73	161,860	216.08 (14.65)	66	-0.27
2-5	Low Poverty	5S	181,813	228.54 (16.06)	74	173,573	225.67 (16.70)	68	-0.18
3-6	High Poverty	5S	196,040	212.24 (16.92)	37	165,040	206.25 (17.14)	24	-0.35
3-6	High Poverty	6S	190,917	214.86 (16.68)	34	156,474	210.49 (16.36)	24	-0.26
3-6	Low Poverty	5S	160,325	228.91 (16.12)	74	159,914	224.29 (16.54)	64	-0.28
3-6	Low Poverty	6S	166,453	231.36 (15.78)	71	160,179	228.56 (16.38)	64	-0.17
4-7	High Poverty	6S	178,814	214.86 (17.08)	35	145,781	210.77 (16.68)	25	-0.24
4-7	High Poverty	7S	174,627	219.08 (17.93)	36	150,956	214.79 (17.31)	26	-0.24
4-7	Low Poverty	6S	155,791	231.92 (15.87)	72	149,320	227.83 (16.18)	63	-0.26
4-7	Low Poverty	7S	152,033	236.95 (17.00)	73	154,133	233.10 (17.36)	64	-0.22
5-8	High Poverty	7S	164,534	219.75 (18.16)	38	140,194	215.81 (17.86)	29	-0.22
5-8	High Poverty	8S	155,759	223.31 (18.85)	37	140,907	218.34 (17.91)	28	-0.27
5-8	Low Poverty	7S	142,832	237.50 (17.04)	74	141,279	233.19 (17.35)	65	-0.25
5-8	Low Poverty	8S	124,372	241.16 (18.71)	72	128,224	235.91 (18.74)	60	-0.28

Note. AIAN= American Indian or Alaska Native, N=number of students, M=mean, SD=standard deviation, Perc. = percentile rank. We focus on schools in two poverty levels: (a) "Low Poverty" - less than 25% FRPL eligibility and (b) "High Poverty" - greater than 75% FRPL eligibility.

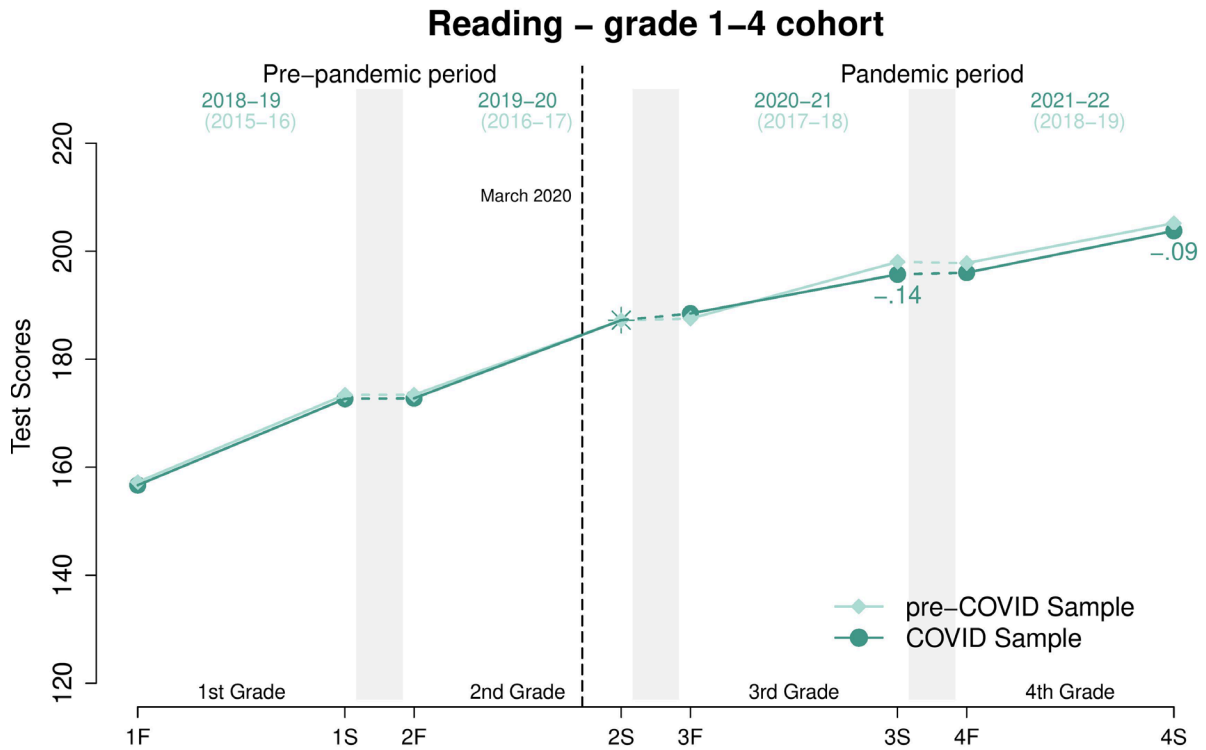
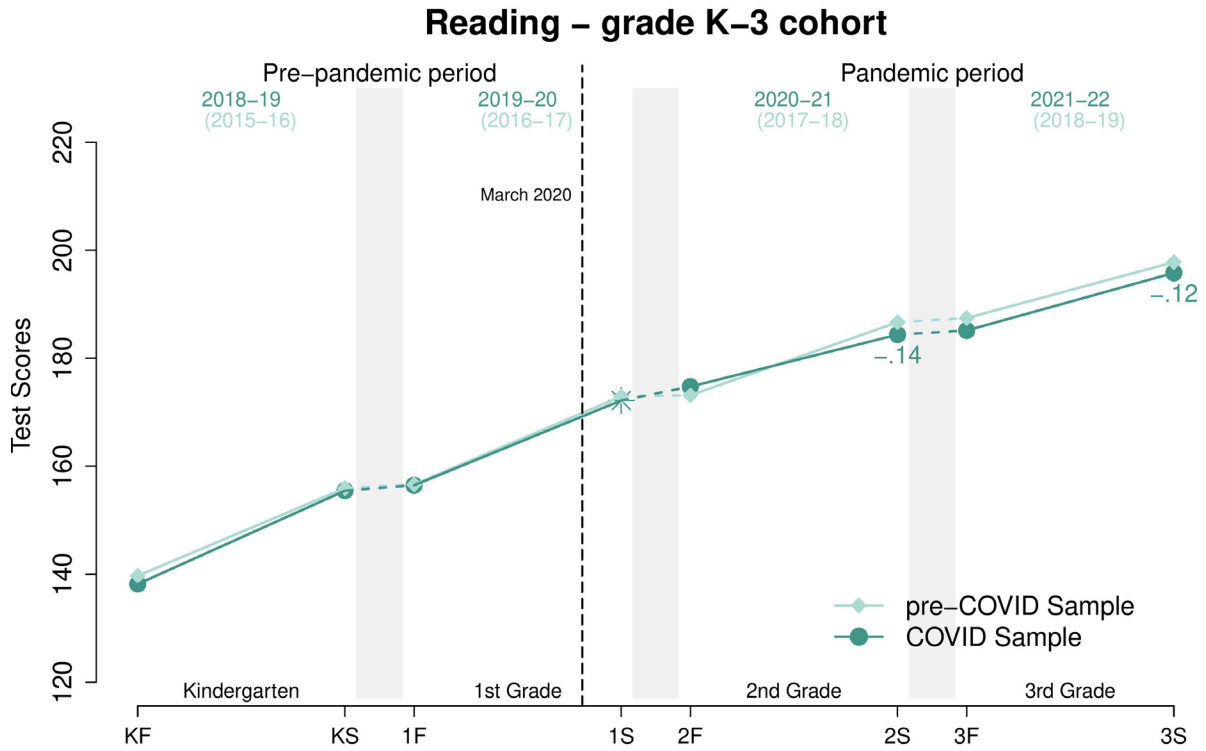
**Table 7. Comparison of standardized effect sizes based on sample restriction criteria**

Cohort	Term	Reading			Math		
		All Students	Students obs. in all four years	Consistent Schools	All Students	Students obs. in all four years	Consistent Schools
K-3	KF	-0.16	-0.15	-0.16	-0.11	-0.09	-0.11
K-3	KS	-0.04	-0.02	-0.04	0.00	0.01	-0.01
K-3	1F	-0.01	0.01	0.00	0.00	0.01	0.01
K-3	1S	-0.05	-0.05	-0.07	0.06	0.05	0.05
K-3	2F	0.10	0.06	0.10	0.03	-0.02	0.03
K-3	2S	-0.14	-0.18	-0.12	-0.22	-0.28	-0.21
K-3	3F	-0.13	-0.13	-0.12	-0.22	-0.23	-0.21
K-3	3S	-0.12	-0.13	-0.12	-0.18	-0.20	-0.18
1-4	1F	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04
1-4	1S	-0.05	-0.04	-0.05	0.01	0.02	0.01
1-4	2F	-0.04	-0.03	-0.04	-0.03	-0.02	-0.02
1-4	2S	0.00	-0.04	-0.01	-0.10	-0.13	-0.10
1-4	3F	0.05	0.02	0.06	-0.11	-0.15	-0.09
1-4	3S	-0.14	-0.18	-0.13	-0.26	-0.31	-0.26
1-4	4F	-0.11	-0.11	-0.10	-0.25	-0.24	-0.24
1-4	4S	-0.09	-0.11	-0.09	-0.19	-0.20	-0.19
2-5	2F	-0.05	-0.03	-0.04	-0.06	-0.05	-0.06
2-5	2S	-0.06	-0.05	-0.06	-0.03	-0.02	-0.03
2-5	3F	-0.02	-0.02	-0.02	-0.03	-0.04	-0.03
2-5	3S	-0.03	-0.06	-0.03	-0.14	-0.16	-0.13
2-5	4F	0.03	0.01	0.04	-0.16	-0.21	-0.15
2-5	4S	-0.13	-0.16	-0.12	-0.28	-0.32	-0.27
2-5	5F	-0.10	-0.11	-0.10	-0.25	-0.26	-0.25
2-5	5S	-0.10	-0.11	-0.10	-0.22	-0.23	-0.21
3-6	3F	-0.04	-0.02	-0.03	-0.09	-0.08	-0.09
3-6	3S	-0.05	-0.02	-0.04	-0.06	-0.06	-0.06
3-6	4F	0.00	0.01	0.00	-0.03	-0.02	-0.02
3-6	4S	-0.06	-0.04	-0.05	-0.16	-0.13	-0.14
3-6	5F	0.01	-0.01	0.02	-0.15	-0.19	-0.13
3-6	5S	-0.13	-0.16	-0.12	-0.27	-0.31	-0.25
3-6	6F	-0.09	-0.10	-0.08	-0.22	-0.23	-0.20
3-6	6S	-0.10	-0.12	-0.09	-0.19	-0.21	-0.17
4-7	4F	-0.03	0.01	-0.03	-0.06	-0.04	-0.06
4-7	4S	-0.06	-0.03	-0.06	-0.06	-0.04	-0.07
4-7	5F	-0.02	0.01	-0.01	-0.04	-0.03	-0.03
4-7	5S	-0.05	-0.01	-0.04	-0.14	-0.10	-0.13
4-7	6F	0.03	0.02	0.04	-0.13	-0.17	-0.12

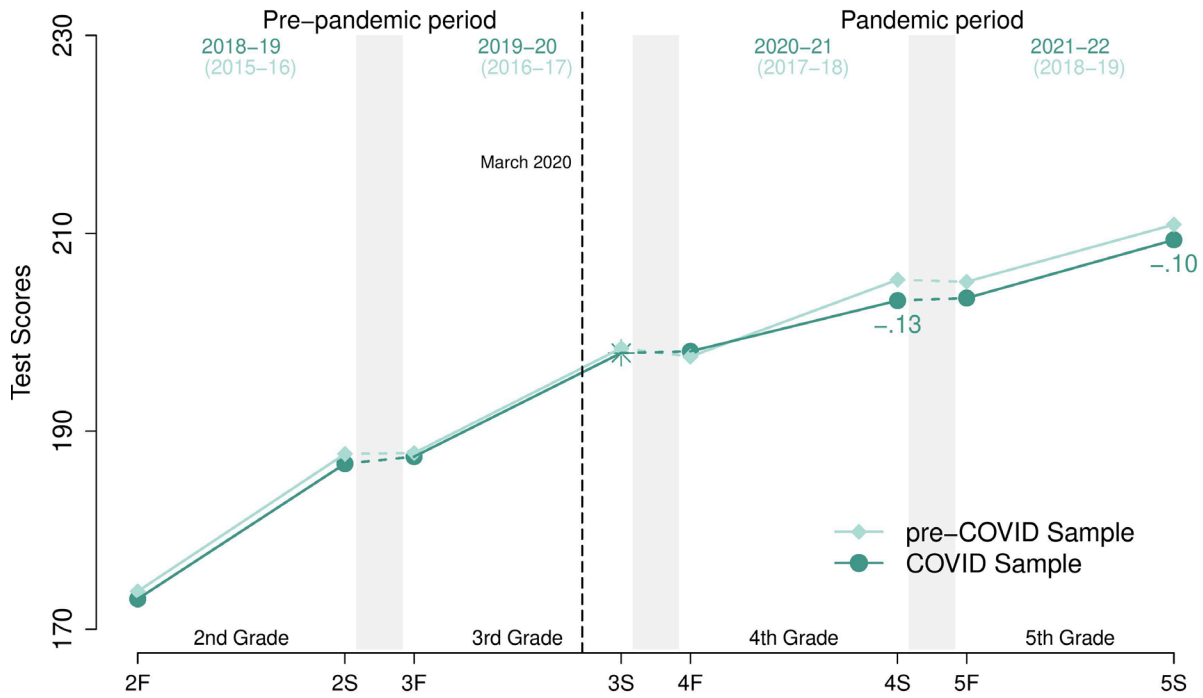
4-7	6S	-0.12	-0.15	-0.11	-0.21	-0.25	-0.20
4-7	7F	-0.10	-0.11	-0.10	-0.23	-0.23	-0.21
4-7	7S	-0.12	-0.13	-0.10	-0.21	-0.22	-0.19
5-8	5F	-0.04	0.00	-0.05	-0.05	-0.04	-0.06
5-8	5S	-0.09	-0.04	-0.10	-0.08	-0.07	-0.09
5-8	6F	0.00	0.02	0.00	-0.04	-0.06	-0.04
5-8	6S	-0.05	-0.04	-0.05	-0.12	-0.13	-0.12
5-8	7F	0.01	0.00	0.02	-0.12	-0.17	-0.11
5-8	7S	-0.13	-0.15	-0.11	-0.20	-0.25	-0.19
5-8	8F	-0.12	-0.12	-0.10	-0.25	-0.26	-0.22
5-8	8S	-0.12	-0.13	-0.10	-0.24	-0.25	-0.21



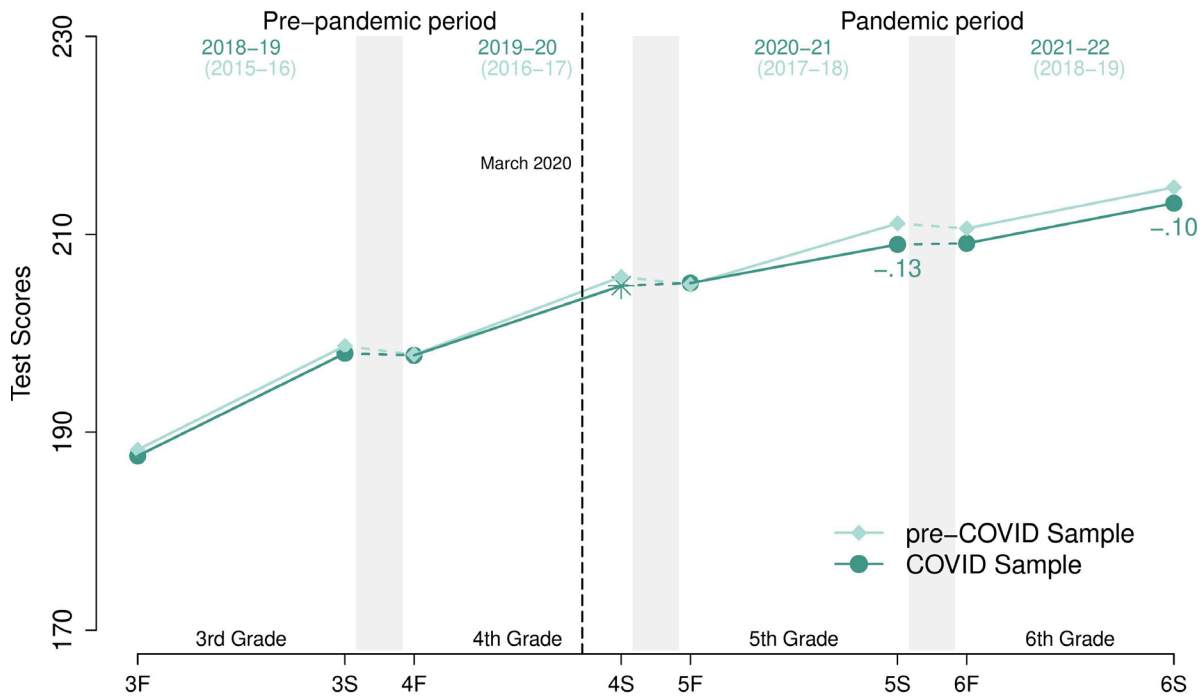
Figure A1. Average MAP Growth achievement across four school years for all cohorts and subjects.



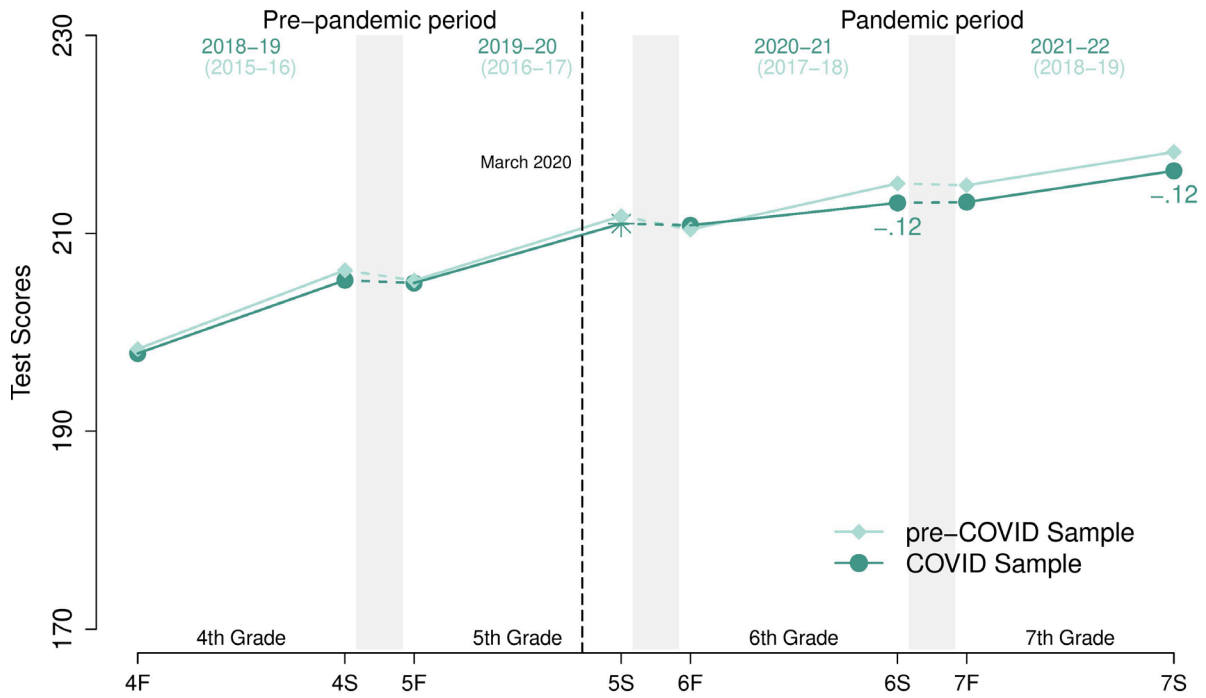
### Reading – grade 2–5 cohort



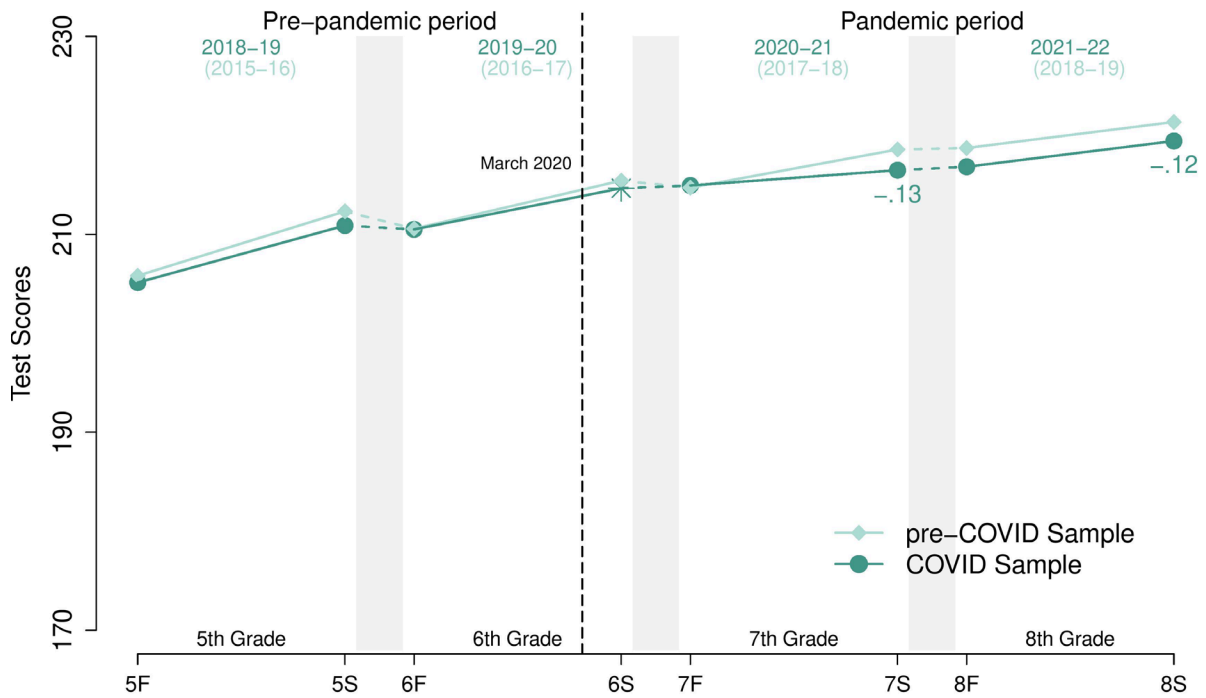
### Reading – grade 3–6 cohort



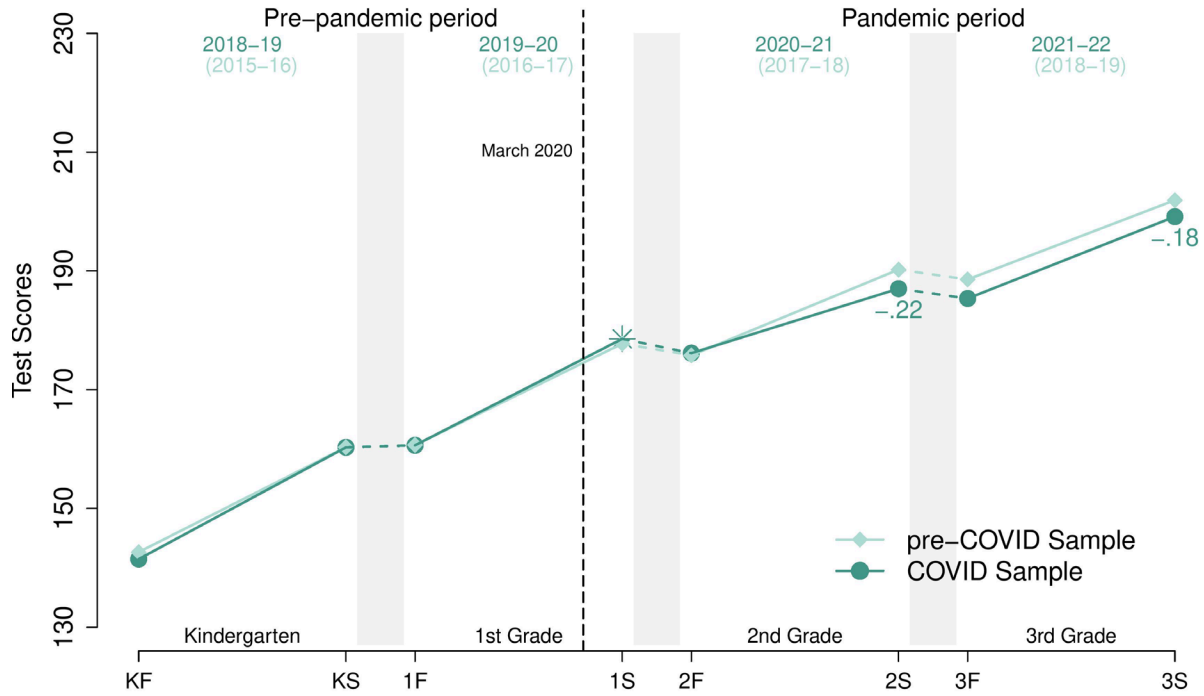
### Reading – grade 4–7 cohort



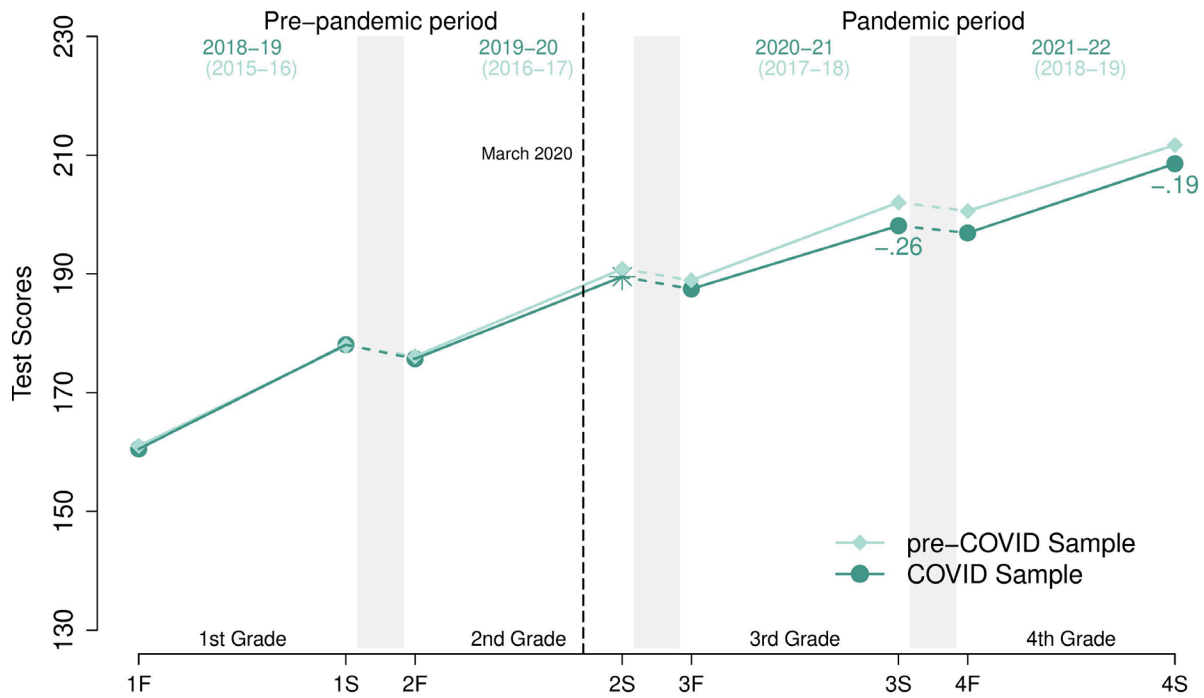
### Reading – grade 5–8 cohort



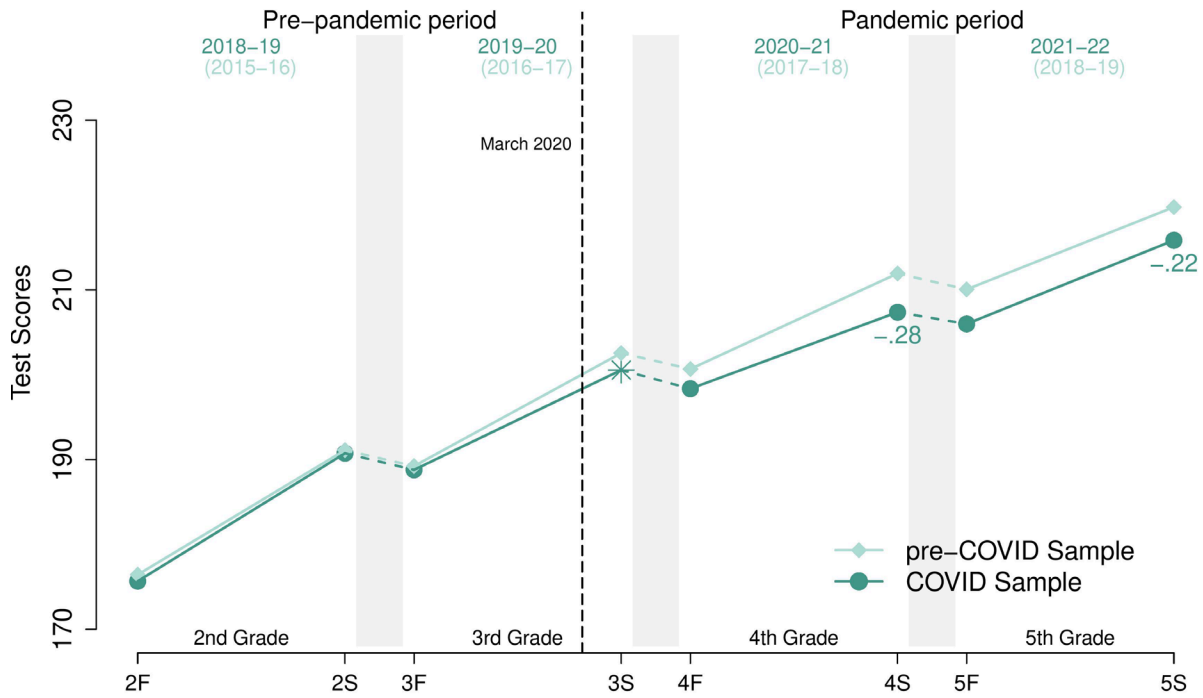
### Math – grade K–3 cohort



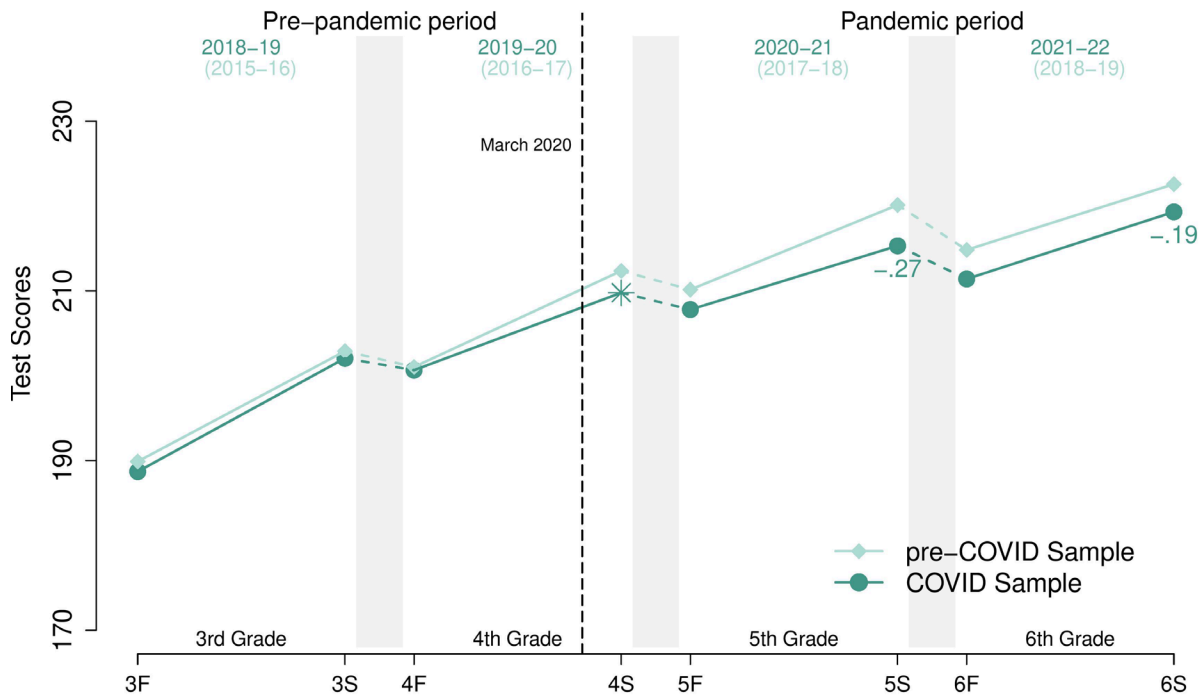
### Math – grade 1–4 cohort



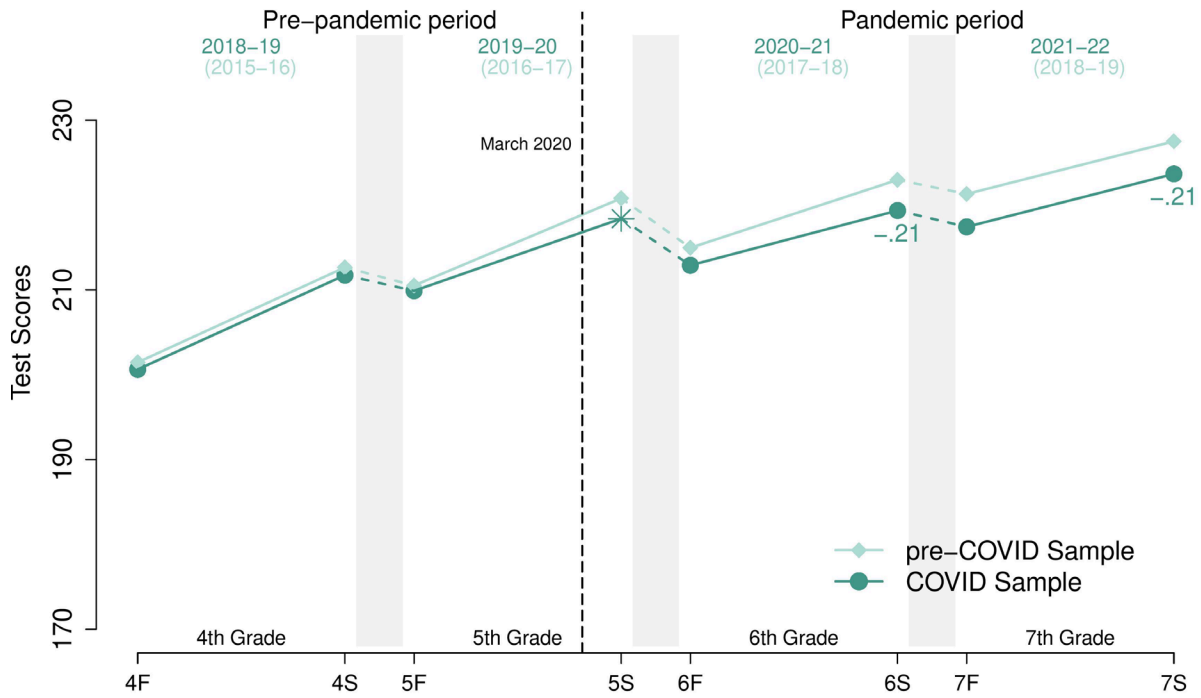
### Math – grade 2–5 cohort



### Math – grade 3–6 cohort



### Math – grade 4–7 cohort



### Math – grade 5–8 cohort

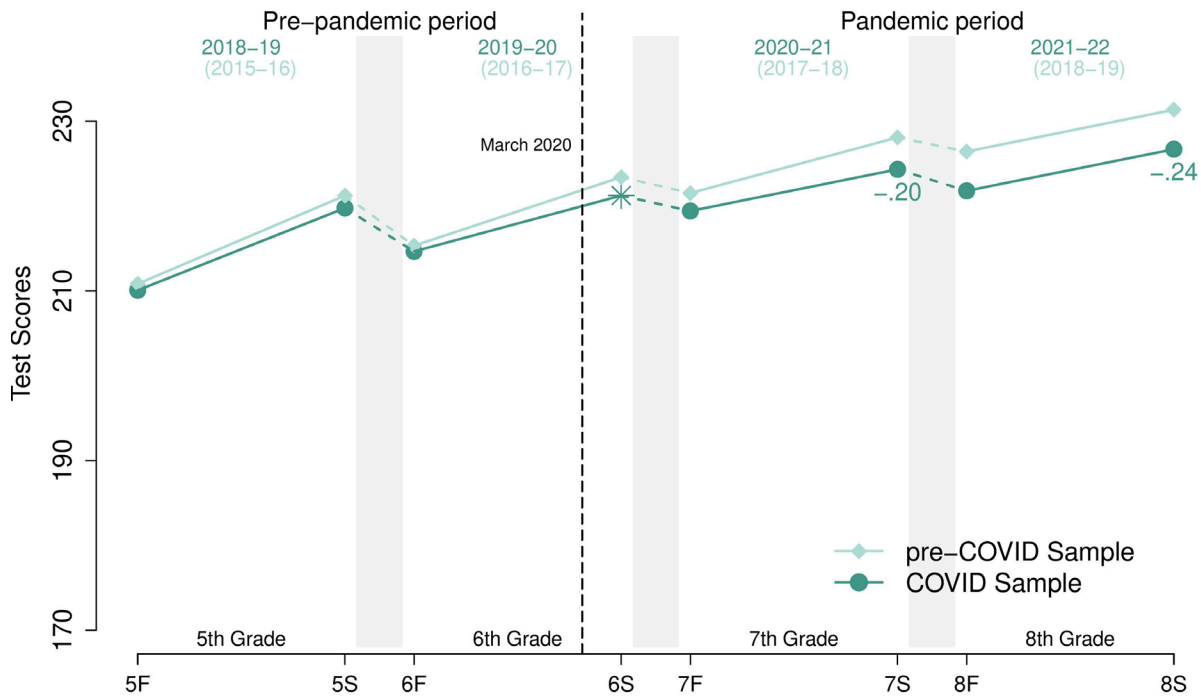
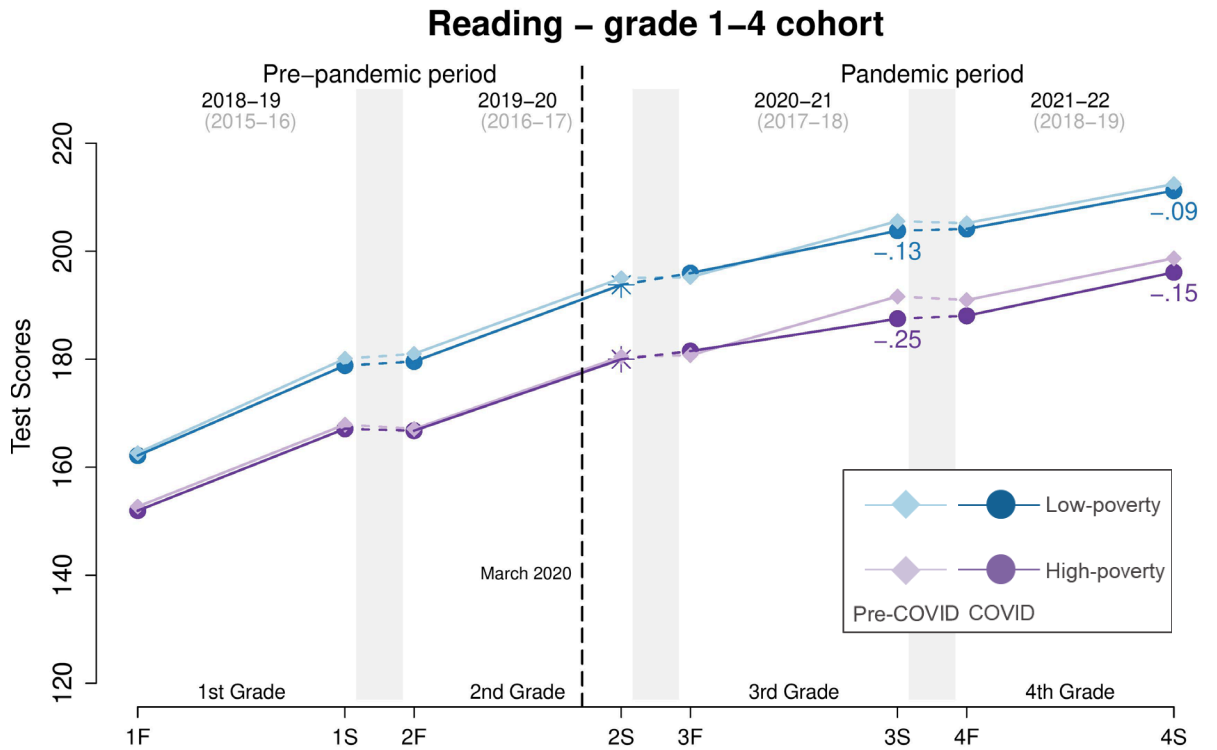
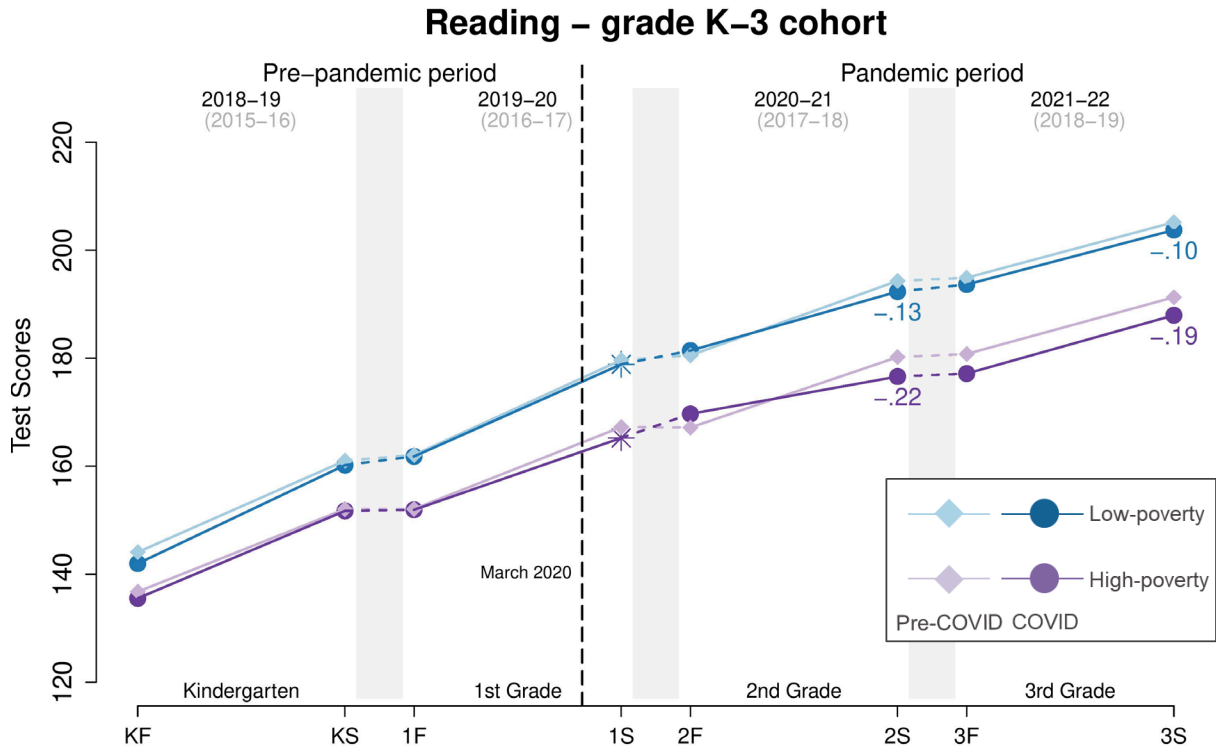
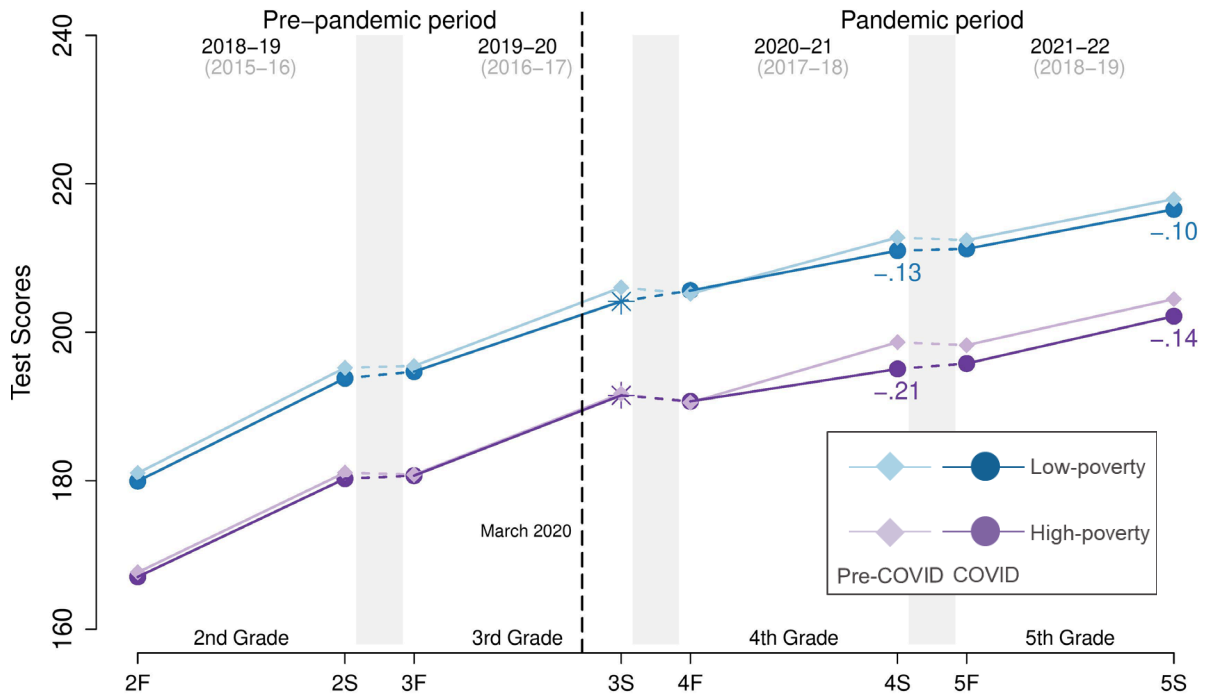


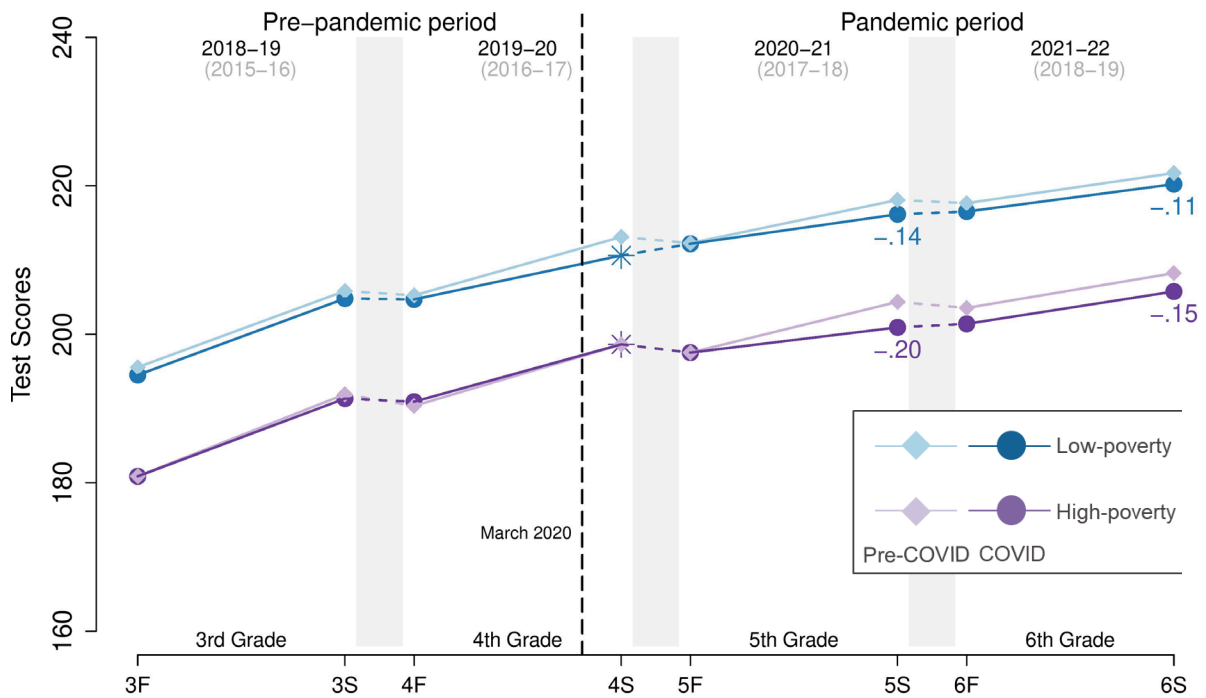
Figure A2. Average MAP Growth achievement by school poverty level and cohort.



### Reading – grade 2–5 cohort

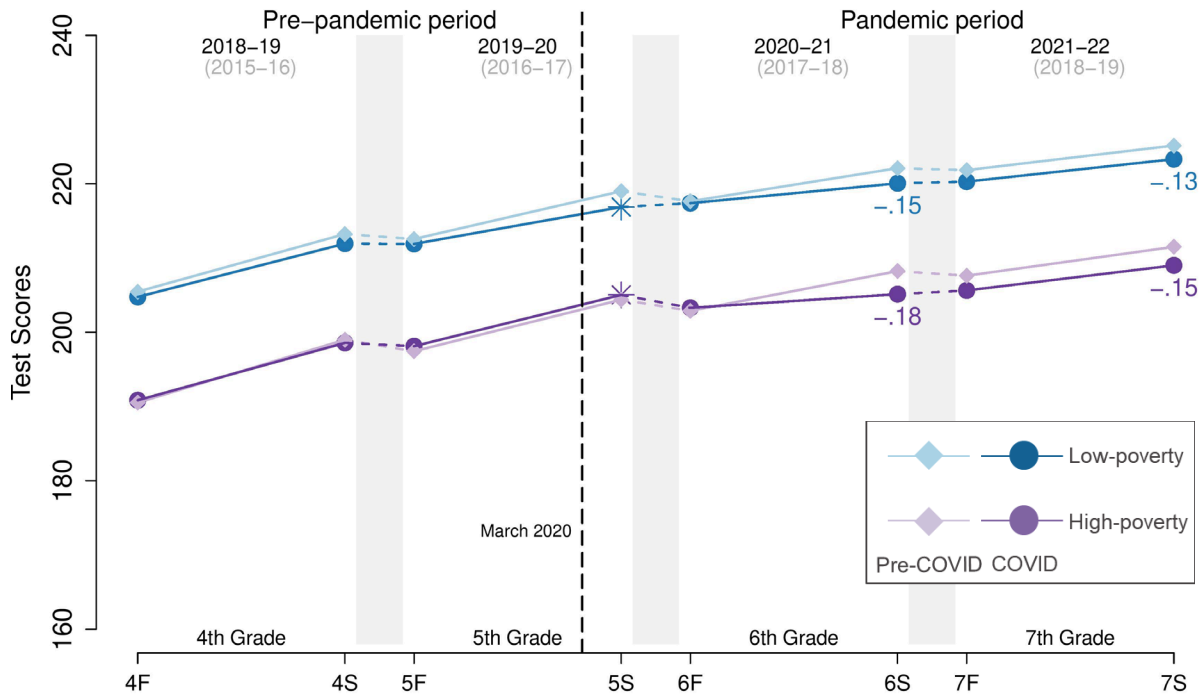


### Reading – grade 3–6 cohort

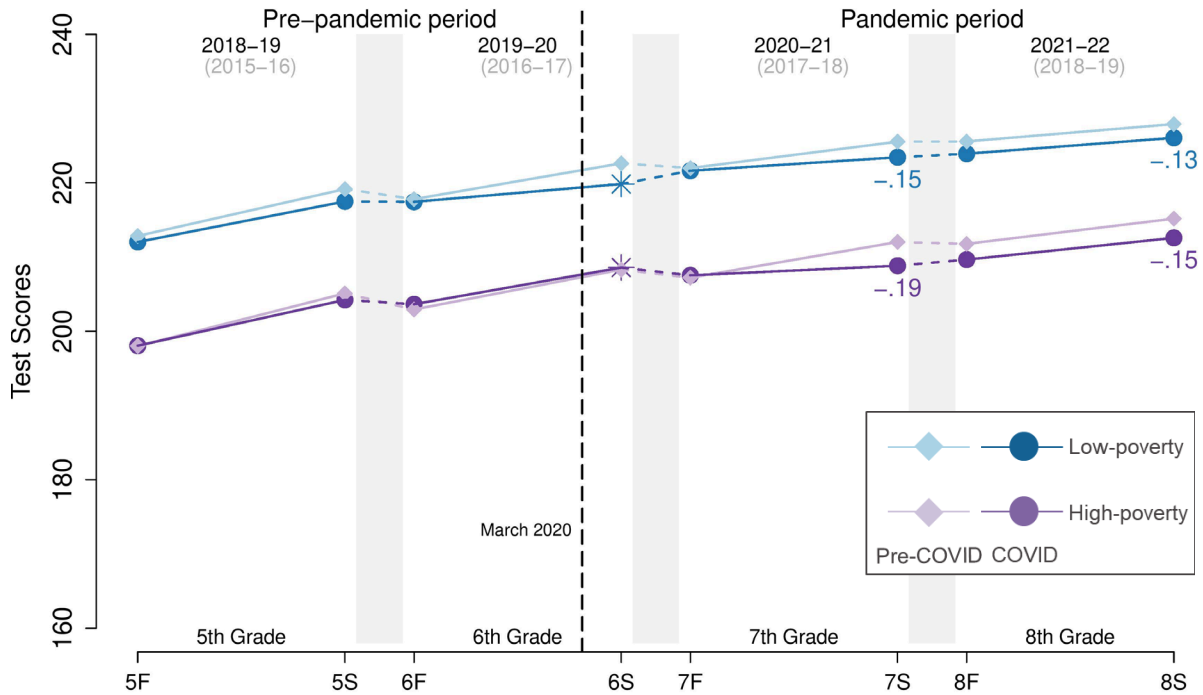




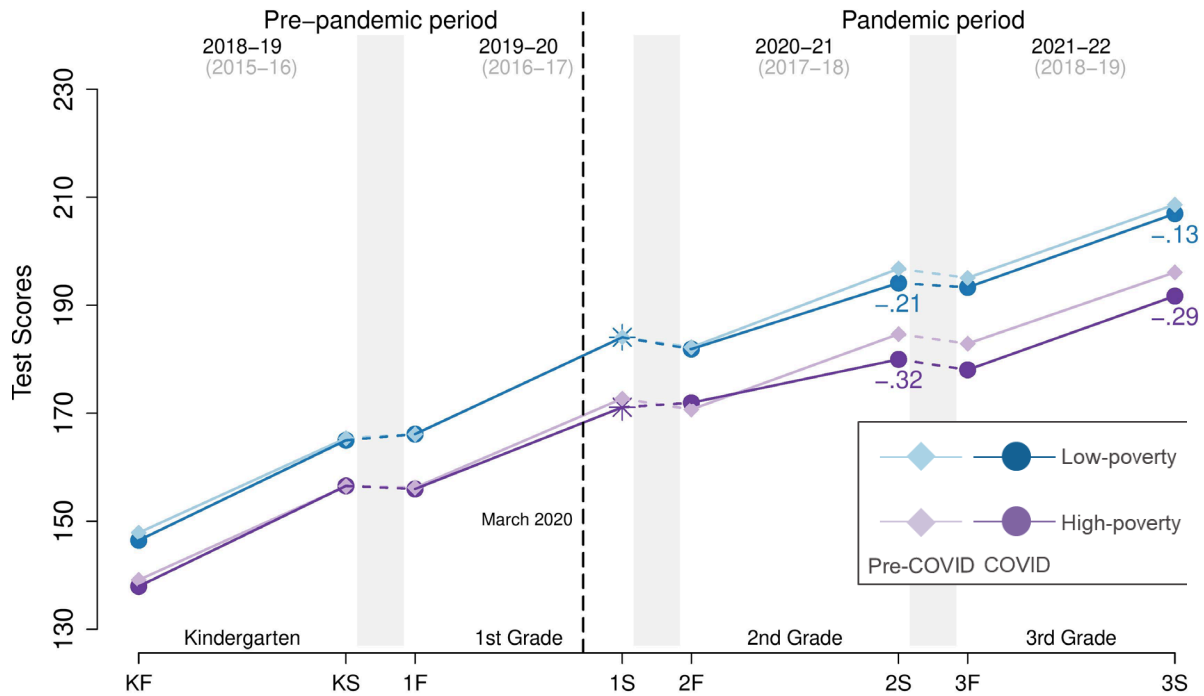
### Reading – grade 4–7 cohort



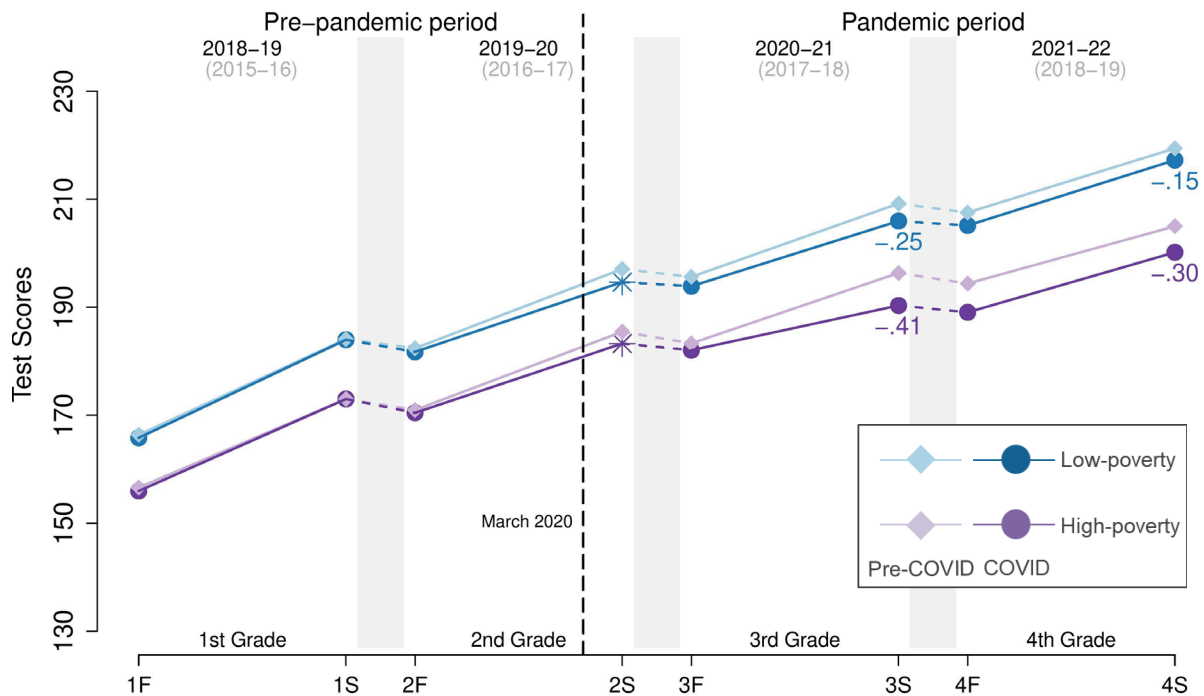
### Reading – grade 5–8 cohort



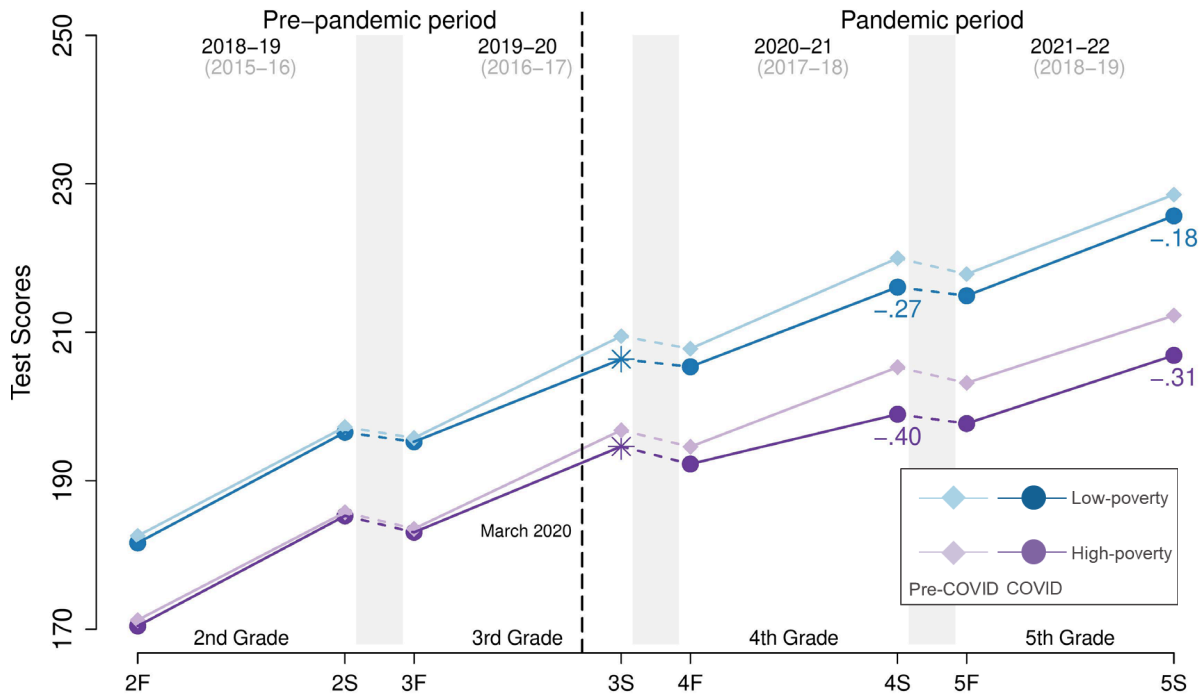
### Math – grade K–3 cohort



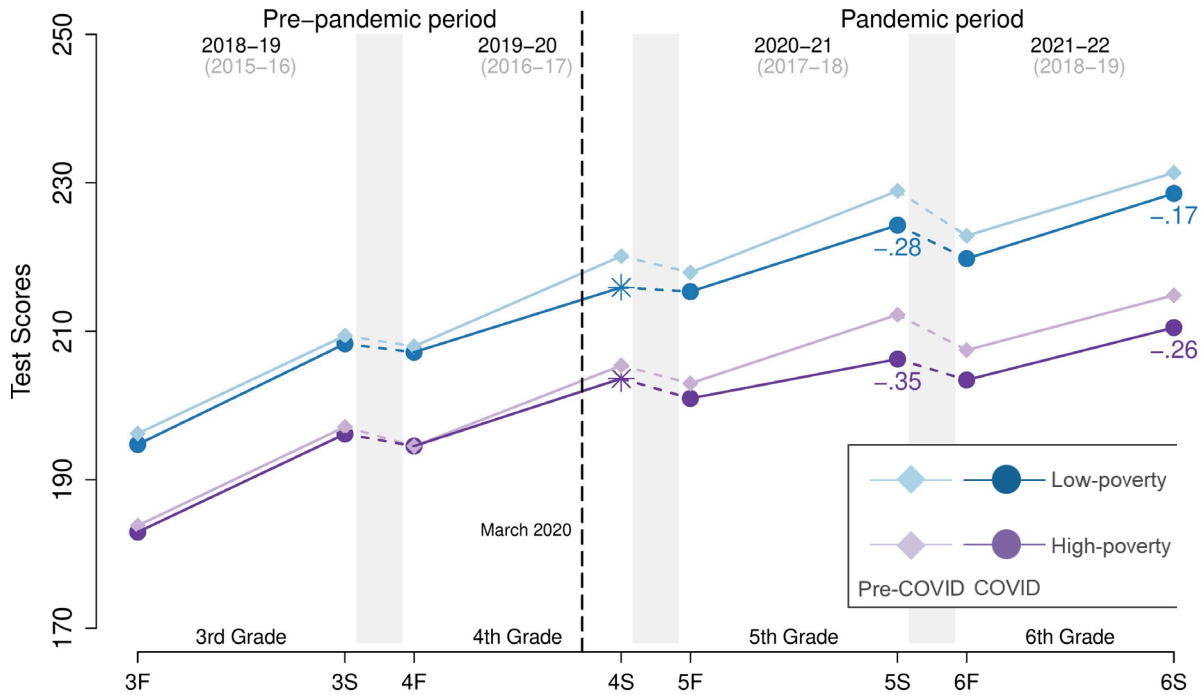
### Math – grade 1–4 cohort



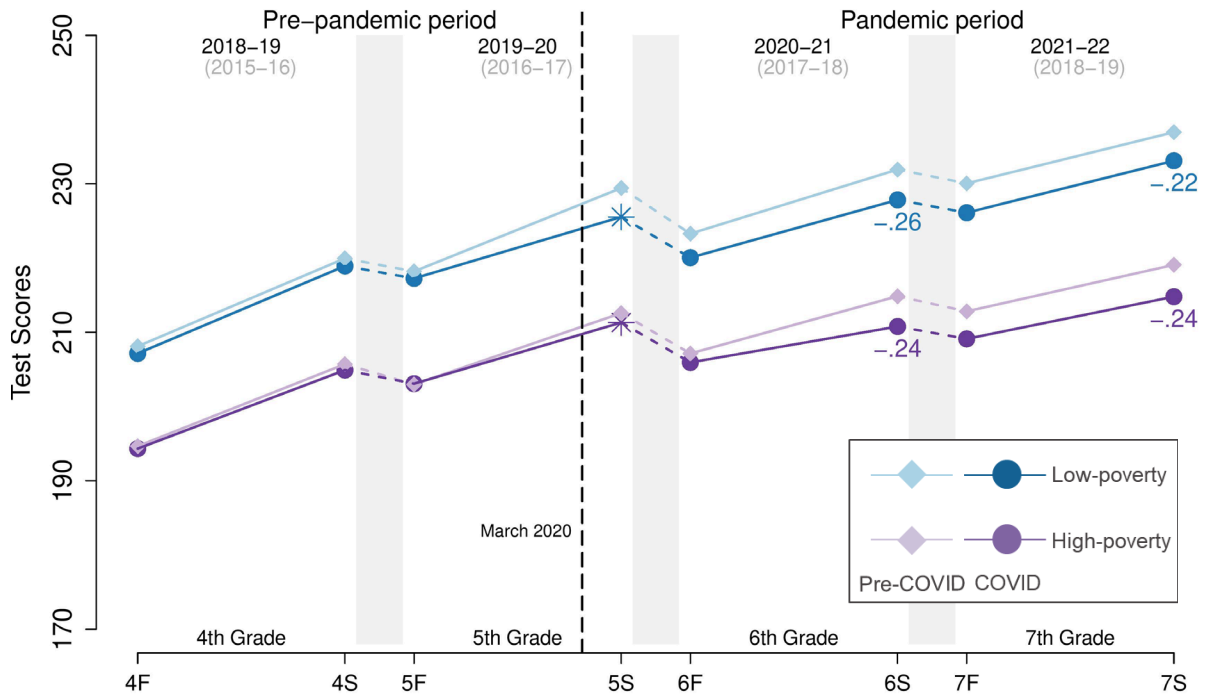
### Math – grade 2–5 cohort



### Math – grade 3–6 cohort



### Math – grade 4–7 cohort



### Math – grade 5–8 cohort

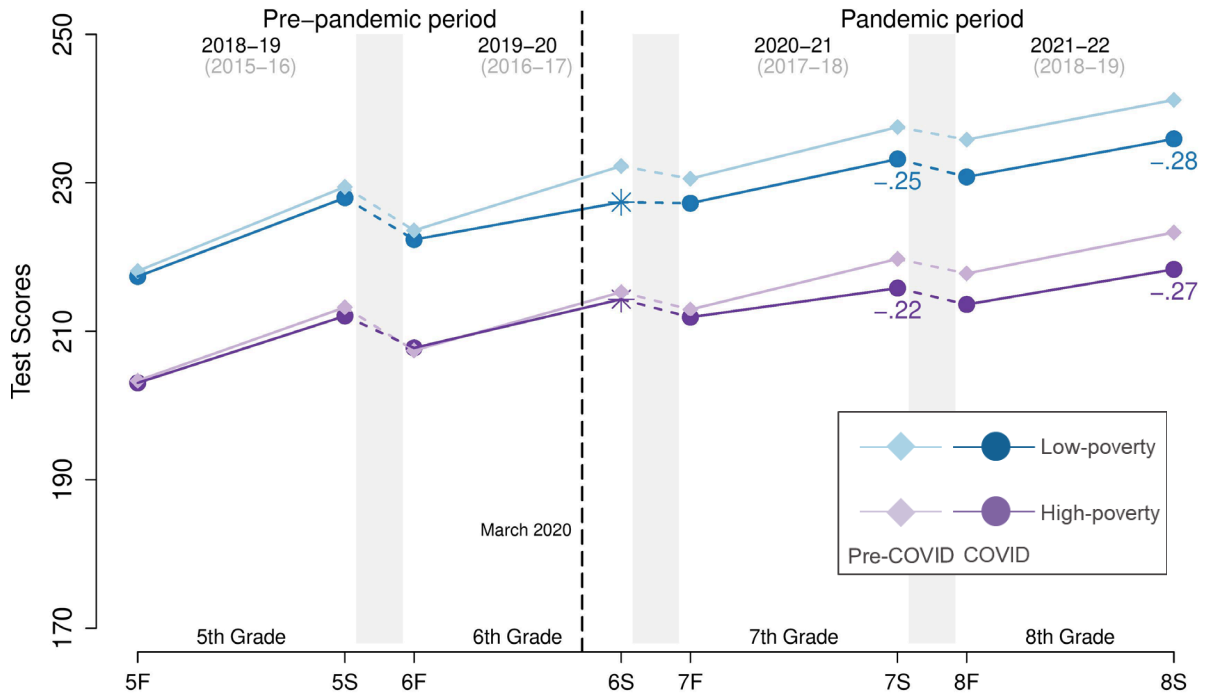
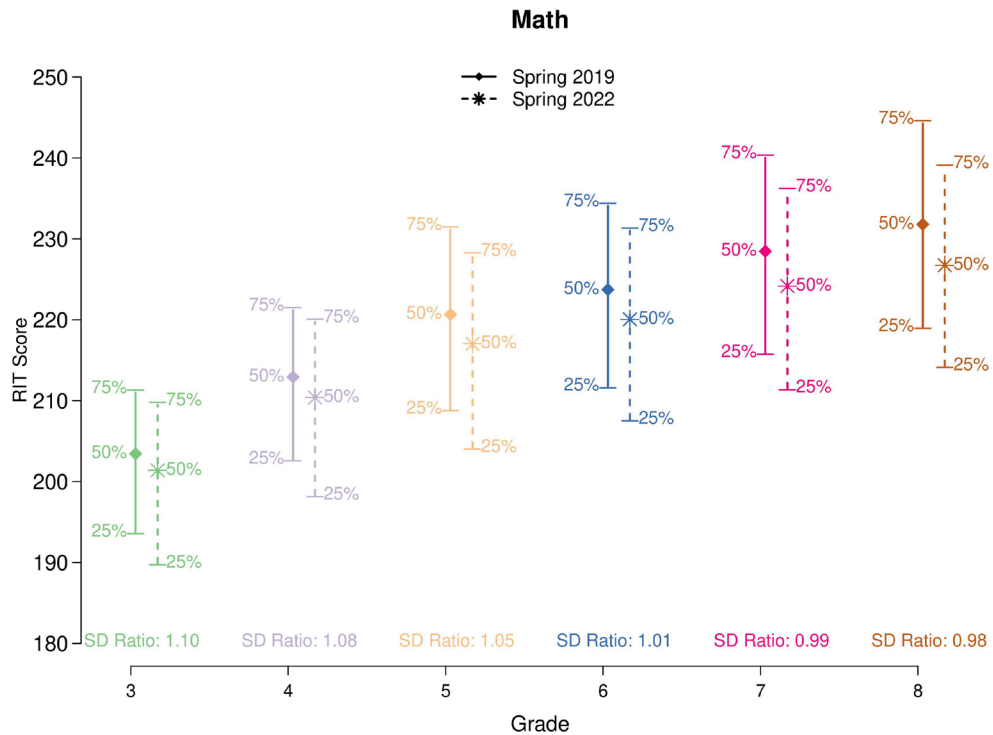
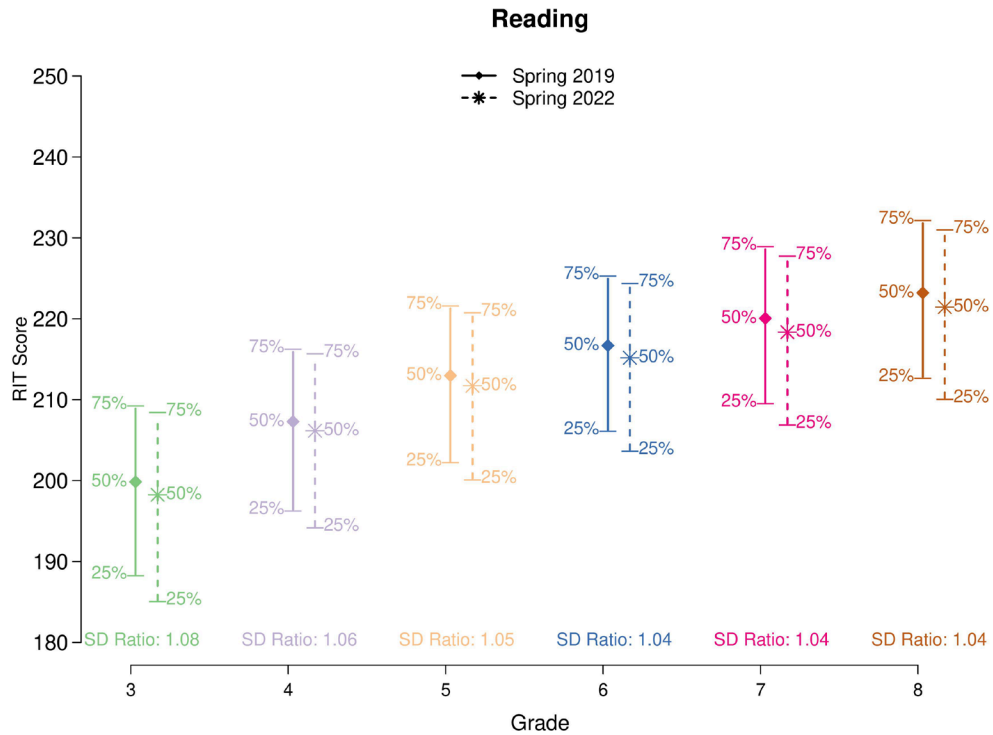


Figure A3. Test score heterogeneity in spring 2019 and spring 2022 by subject



## 5. References

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- <sup>i</sup> Kuhfeld, M. & Lewis, K. (2022). Student achievement in 2021-22: Cause for hope and continued urgency. NWEA. <https://www.nwea.org/research/publication/student-achievement-in-2021-22-cause-for-hope-and-continued-urgency>
- <sup>ii</sup> U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), 2019 - 2020, Public Elementary/Secondary School Universe Survey Data, (v.1a).
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- <sup>vi</sup> Lewis, K., & Kuhfeld, M. (2021). Learning during COVID-19: An update on student achievement and growth at the start of the 2021-22 school year. NWEA. <https://www.nwea.org/content/uploads/2021/12/Learning-during-COVID19-An-update-on-student-achievement-and-growth-at-the-start-of-the-2021-2022-school-year-Research-Brief.pdf>
- <sup>vii</sup> Lewis, K., Kuhfeld, M., Ruzek, E., McEachin, A. (2021). Learning during COVID-19: Reading and math achievement in the 2020-21 school year. NWEA. <https://www.nwea.org/content/uploads/2021/07/Learning-during-COVID-19-Reading-and-math-achievement-in-the2020-2021-school-year.research-brief-1.pdf>
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- <sup>ix</sup> U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary and Secondary Education," 2009–10 and 2018–19. See *Digest of Education Statistics 2020*, table [203.50](#)