Curriculum Associates RESEARCH

School Readiness for Young Students Post-Pandemic

Reading and Mathematics
Annual Report, January 2024

i-Ready Inform™ is the new name for the *i-Ready Diagnostic* adaptive assessment.

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i-Ready

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SUMMARY

School closures from the COVID-19 pandemic have had significant, lasting, and well-documented impacts on student achievement (Curriculum Associates, 2023a; Lewis & Kuhfield, 2023; US Department of Education, 2023). Despite this knowledge, we know little about the pandemic's impact on children who were yet to enter formal schooling in March 2020. How did disrupted access to early childhood services manifest in school readiness for young students? To explore this question, we examined fall performance on the *i–Ready Diagnostic*, a criterion-referenced assessment offering insight into student performance relative to grade-level standards. To accurately reflect trends in student performance across the US, we leveraged a nationally representative sample of more than five million Grades K–2 students from 2019 (i.e., pre-pandemic) and following the return to in-person schooling from 2021 to 2023. Consistent with other research, our data suggest students are entering school less prepared for grade-level learning and more students are placing further behind. While reading performance shows some small signs of recovery, mathematics performance remains stagnant following an initial drop. Grade K students show latent impacts. Their performance did not decline immediately post-pandemic, but rather declined in fall 2022 and 2023, with limited signs of recovery. Examining trends by demographic group, we see historic racial/ethnic and economic inequities persist.

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INTRODUCTION

The negative impact of pandemic-related closures on student academic achievement is clear. Many studies have demonstrated students in elementary and middle school are performing behind pre-pandemic trends (Curriculum Associates, 2023a; Lewis & Kuhfield, 2023; US Department of Education, 2023). Though declines in Grades 3–8 have been well documented, little is known regarding the pandemic's impact on children who were in early childhood or pre–K settings in March 2020. Given the varied avenues through which early childhood education and care are offered (e.g., daycare, Head Start programs, early intervention services, pre–K), tracking closures in these settings and their impact has been challenging.

Access to high-quality early childhood and pre–K programs has been routinely shown to increase school readiness and support child development (Yoshikawa et al., 2013). School readiness, specifically mathematics and reading performance at school entry, is a key predictor of academic success (Duncan et al., 2007). Despite its positive effects, pre–K participation has varied over time and increasing access remains a consistent effort in educational policy. Even pre-pandemic, only 60% of children in the US regularly attended pre–K programs. During pandemic closures, these numbers plummeted to 8% (Barnett & Jung, 2020). COVID-19 disruptions expanded far beyond formal pre–K programs and interfered with continued delivery of all early childhood care and education (Lee & Parolin, 2021; McCoy et al., 2021). These services remained open longer and reopened sooner but not without major disruptions.

A shift to virtual learning allowed most students to continue to receive instruction from the safety of their homes, but this proved more challenging for young children. Parents and teachers alike cited difficulties engaging young students virtually (Ford et al., 2021; Prananda et al., 2021; Safrizal et al., 2021). With regular closures and inadequate alternatives for delivering instruction, young children had limited and disrupted access to educational services during the pandemic. It is critical to understand how these disruptions may manifest in child development, including academic school readiness. Initial research suggests that access to early childhood education was critical for preventing declines in children's receptive and expressive language abilities (Davies et al., 2021). Other research found that students entering school post-pandemic performed "worse or much worse" on measures of school readiness compared to students pre-pandemic, as reported by pre–K and kindergarten educators (Murphy et al., 2023).

In this report, we build on this research and explore how the pandemic may have impacted student academic school readiness. Performance on an independent and criterion–referenced measure, such as the *i–Ready Diagnostic*, at school entry offers an immediate assessment of academic readiness—data often not available until Grade 3 when students take a state summative test. We analyzed performance on the *i–Ready Diagnostic* for students in Grades K–2 for the fall testing window from 2019 (i.e., pre-pandemic) to 2023. Our goal is to trace school readiness over the course of the pandemic to gain insight into pandemic-related decline and possible recovery.

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METHODOLOGY

Research Questions

1. By grade and subject, how does achievement for Grades K–2 students at the beginning of the 2023–2024 school year compare to achievement in the years prior (i.e., fall 2022, fall 2021) and prior to the pandemic (i.e., fall 2019)?
2. How does achievement for Grades K–2 students at the beginning of the 2023–2024 school year vary by the racial or ethnic makeup of schools and the median household income of schools' locations, and how does that compare to achievement in the years prior (i.e., fall 2022, fall 2021) and prior to the pandemic (i.e., fall 2019)?
3. By grade and subject, how does achievement for Grades K–2 students in subject-specific domains at the beginning of the 2023–2024 school year compare to achievement in the years prior (i.e., fall 2022, fall 2021) and prior to the pandemic (i.e., fall 2019)?

Sampling Technique

To represent national trends in student performance, we created a nationally representative sample using a stratified sampling technique. Using data from the National Center for Education Statistics (NCES) and the US Census, we approximated the makeup of the US public school population based on region, locale, race/ethnicity, and median household income. This process involved three steps: (1) build a sampling frame of eligible students and schools, (2) set sampling targets to reflect the national public school population, and (3) use stratified sampling to select a sample of schools that mimic the US population demographics.

To create a sampling frame, students were deemed eligible if they had completed a Diagnostic in the fall testing window, the Diagnostic was taken in English, and was not flagged for rushing. To identify eligible schools, we used schools with an established link between the *i-Ready* and NCES school IDs—more than 80% of the schools in *i-Ready*. To be included, schools had to have non-missing race/ethnicity, locale, and zip code data in NCES (US Department of Education, 2022). Additionally, we required the number of students in the sampling frame for a given school, subject, and grade level be between 75% and 150% of the NCES-reported enrollment for that school and grade level. This ensures the school-level demographic information could be used as a strong proxy for the demographics of those students in the sampling frame. Finally, the school zip code, as reported by NCES, had to have a matching row with the median annual household income from the US Census dataset (US Census Bureau, 2022).

To create the sampling targets (i.e., the demographic distribution of the target population), we calculated the percentage of Black, Hispanic, and White students as well as the percentage of students in each combination of geographic region (i.e., Northeast, Midwest, South, and West) and locale (i.e., City, Suburban, and Town/Rural) by grade level from the NCES data. Ideally, the sampling targets would be based on the population of students in the given school year. However, the NCES data lag by one school year. As such, we used the 2019–2020 NCES data to define the 2019–2020 sampling targets and the 2021–2022 NCES data—the latest data available at the time of this work—

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to define the 2021–2022, 2022–2023, and 2023–2024 sampling targets. Finally, we merged median annual household income data from the US Census with schools' zip codes to create median annual income averages.

The stratified sampling was conducted at the school level to select a sample of schools in which the frequencies of students in each of the demographic categories and the median household income matched within plus or minus five percentage points of the sampling targets. This was done as follows:

1. We compared the demographic distributions and median income of the sample against the sampling targets (starting with the sampling frame).

If the sampling criteria were not met:

2. We selected a stratified sample with the sample size equal to 98% of the sample from Step 1.

We repeated Steps 1 and 2 until we arrived at a sample where the demographic distributions matched within plus or minus five percentage points of the sampling targets. We repeated the sampling process 10 times (i.e., 10 iterations with different random seeds) per school year to select a total of 40 nationally representative samples per subject and grade level. After selecting the samples, we calculated the percentage of students who scored on grade level or above and the average spring scale score for each sample. Upon reviewing the results for the 10 iterations, we determined that the results were very consistent across the samples. The results reported represent unweighted averages across the 10 samples in each school year, subject, and grade level.

Sampling Description

The total sample included 7,751,358 students for mathematics and 5,935,160 students for reading across all grades and school years. Average sample sizes ranged from 201,248 to 972,111 across individual grade and subject samples. Table 1 lists the average sample size across the 10 samples and the percentage of the sampling frame included in these samples. Final sample demographics and population targets by grade and subject are listed in the Appendix.

Table 1. Number and Percentage of Students in Sample and Frame by Year, Grade, and Subject

Grade	2019		2021		2022		2023	
	Sample n	% in Sample	Sample n	% in Sample	Sample n	% in Sample	Sample n	% in Sample
Mathematics								
Grade K	290,623	67.7%	406,516	59.1%	597,337	93.5%	386,508	58.7%
Grade 1	323,542	53.3%	857,629	98.3%	887,373	98.3%	900,147	98.3%
Grade 2	347,464	54.5%	906,880	98.3%	875,229	98.2%	972,111	98.3%
Reading								
Grade K	201,248	52.1%	344,186	62.2%	403,511	79.7%	340,788	64.8%
Grade 1	332,864	62.7%	444,729	61.6%	530,765	71.0%	557,247	73.3%
Grade 2	494,067	88.8%	747,563	98.1%	727,915	98.2%	810,280	98.3%

Sample n: average sample size across all 10 samples; % in Sample: percentage of the sampling frame included in the average sample

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Measures

Student achievement was measured with Curriculum Associates' *i-Ready Diagnostic* for Reading and for Mathematics. The Diagnostic is an online, adaptive, and criterion-referenced assessment of student learning for reading and mathematics in Grades K–8. It is built on the college- and career-readiness standards and provides grade-level placements. Most school districts administer the Diagnostic to students three times during the school year—in fall, winter, and spring. In the current study, we report out on student performance from the fall administration. It is recommended schools administer the fall Diagnostic within two weeks of the start of the school year for Grades 1 and 2 and four to six weeks into the school year for Grade K. This provides educators a baseline of student academic understanding, or their readiness for grade-level learning, early in the year to better inform instruction or targeted supports throughout the year. To learn more about the *i-Ready Diagnostic*, including a discussion of its reliability and validity, see the Appendix.

When students take the *i-Ready Diagnostic,* they receive a scale score that reflects their test performance and can then be used for comparison across grades and time. Scale scores are used to determine the student's criterion-referenced placement level relative to their chronological grade level. This placement level provides context for a student's performance that designates their performance as being on grade level, below grade level, or above grade level. For example, a Grade 2 student can place below grade level at the Grade 1 level (i.e., One Grade Level Below), at the Grade K level (i.e., Two Grade Levels Below), or above grade level at the Grades 3–8 level (i.e., Above Grade Level). See the Appendix for the *i-Ready* placement-level descriptors. Students who place Early On Grade Level have partially met grade-level college- and career-readiness standards, and students who are Mid or Above Grade Level have met or exceeded grade-level college- and career-readiness standards. Students who are Two Grade Levels Below are not yet close to meeting grade-level college- and career-readiness standards and may need additional instruction to fill in gaps in foundational concepts and knowledge.

To best contextualize changes in school readiness from pre- and post-pandemic, we report both changes in average scale score and the percentage of students by placement level. For the purposes of this report, students who placed Early On Grade Level or higher were designated as performing on grade level. Students below grade level could be one or two grade levels below depending on their chronological grade (i.e., the lowest a student can place in Grade K is One Grade Level Below or "Emerging K"). In the fall administration of the Diagnostic, the average student places One Grade Level Below given no prior exposure to the chronological grade-level content and no expectation to have met or partially met these grade-level standards. Though students are not expected to place on grade level at the beginning of the school year, we report out on changes to this placement level to represent the shifting of the entire placement distribution.

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RESULTS

Fall Achievement Shows Declines in School Readiness

Reading

To evaluate school readiness for students who had experienced early childhood care and education disruptions (see Table 2), we examined changes in average scale scores and placement levels from fall 2019 compared to fall 2021, 2022, and 2023 to identify post-pandemic differences and trends indicating recovery.

Grade K students demonstrate a unique trend in year-over-year school readiness compared to Grades 1 and 2 students. Interestingly, during the initial return to in-person schooling (i.e., fall 2021), Grade K students show remarkably similar trends to pre-pandemic cohorts, with a slight increase in their average scale score from fall 2019 to fall 2021 (see Figure 1). This scale score trend was reflected in placement levels, with nearly identical patterns in the distribution of students (see Figure 2). Unfortunately, in years since, Grade K students have begun to show decreases in school readiness since pre- and immediately post-pandemic, with an approximate three-point decline from fall 2021 to fall 2022 in average scale scores. This trend is again mirrored in placement levels, with proportionally fewer students entering on grade level, and more students beginning the school year below grade level, suggesting a slightly delayed impact of pandemic disruptions.

For Grade 1 students, we see relatively small changes in scale scores and placement levels. Unlike Grade K students, Grade 1 students showed an initial, albeit small decline immediately post-pandemic (i.e., fall 2021) in reading performance at school entry. Average scale scores dropped 2.8 points and have continued to decline. Evaluating trends by placement levels, we see similar patterns, with students placing on grade level marginally declining, with 1.2% fewer students on grade level in fall 2023 compared to pre-pandemic. Concurrently, there has been a small but steady increase in the students placing well below grade level, with a 2% increase in students placing Two Grade Levels Below.

For Grade 2 students, there was a large initial decline in school readiness, with average scale scores dropping over 9 points from pre- to immediately post-pandemic. Students appear to be less prepared for grade-level learning, with fewer students performing on grade level (Early On or Mid/Above Grade Level) and more students placing well below grade level (Two Grade Levels Below). However, in years since, Grade 2 students have shown small but incremental increases in their average scale score, perhaps indicating slow and incremental recovery in fall performance. Despite this encouraging movement, school readiness, or performance at school entry, remains behind pre-pandemic trends, with scores 6.7 points behind pre-pandemic averages, and approximately 5% more students well below grade level.

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Table 2. Current Cohort Age during March 2020

Age during March 2020:	Ages 1-2	Ages 2-3	Ages 3-4
Fall 2023 Grade:	Grade K	Grade 1	Grade 2

Figure 1. Change in Average Scale Score by Grade and Year from 2019—Reading

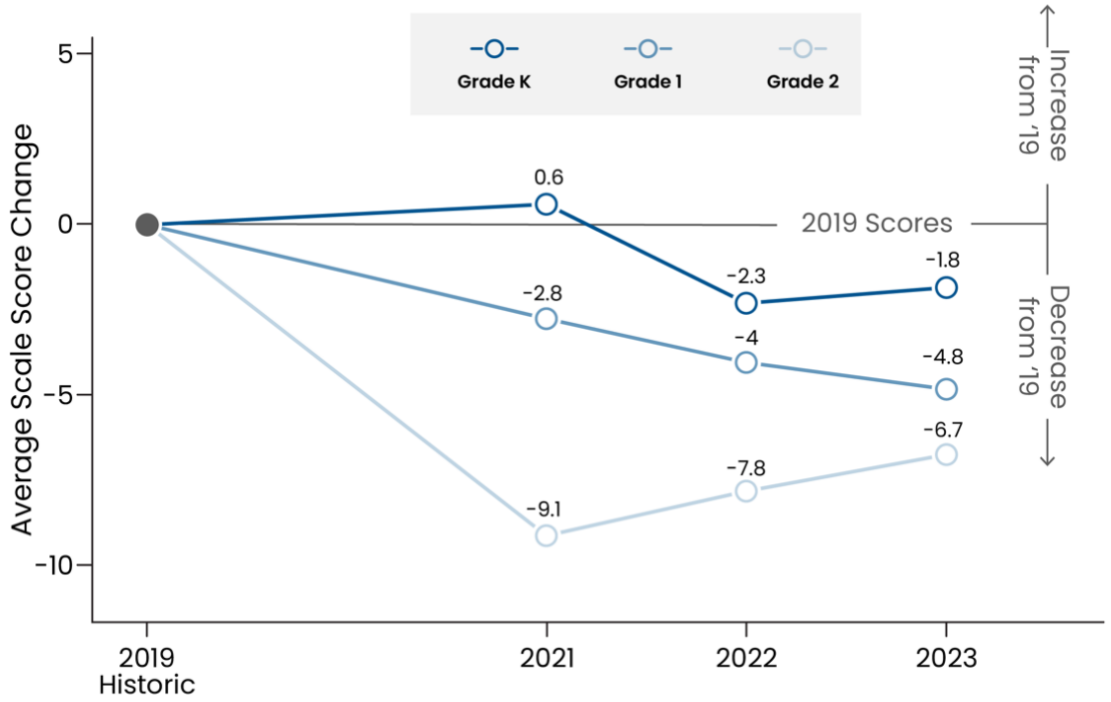

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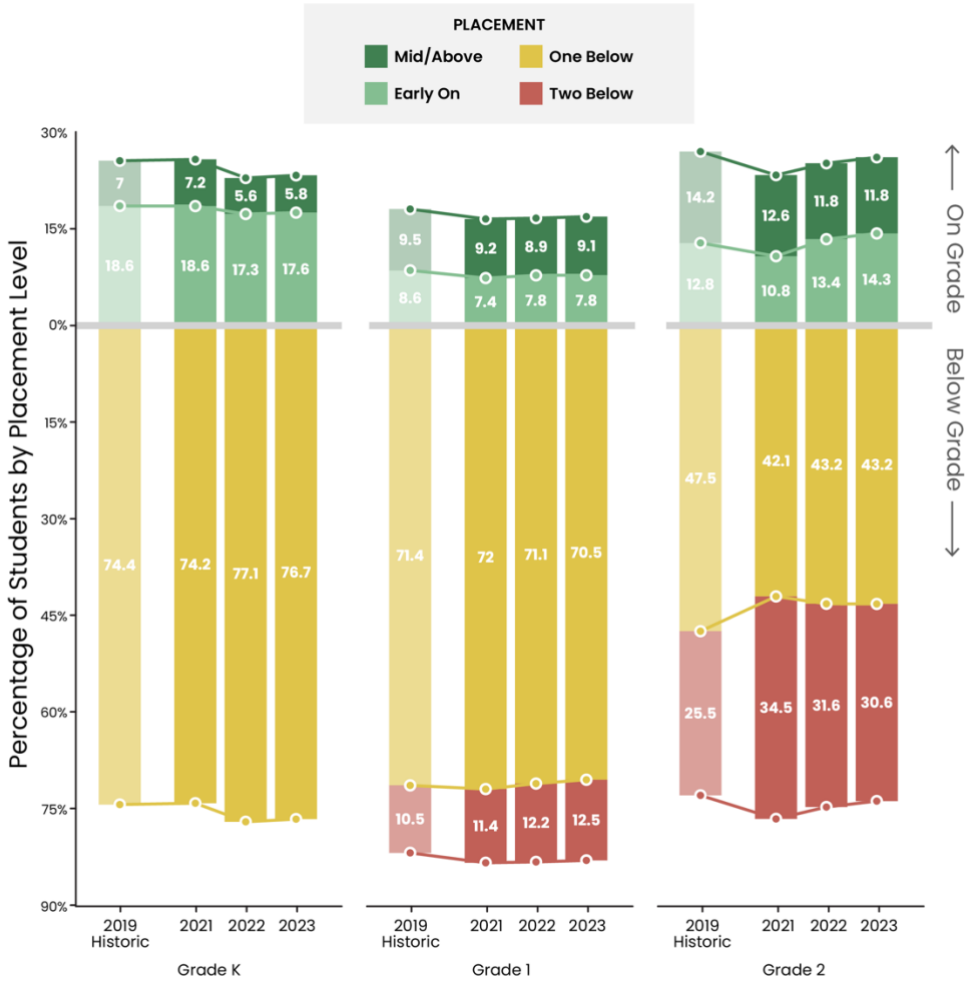
Figure 2. Placement Levels by Grade and Year—Reading



Note: For Grade K, "One Below" is equivalent to the placement of "Emerging K" since students cannot score one grade level below Grade K, but similarly indicates students have not yet met the college- and career-readiness standards for their grade. We expect most students to place in Emerging K/One Below in the fall as they enter school with no expectation to meet or partially meet grade-level standards.

Mathematics

Overall, grade-level trends in mathematics achievement mimic those in reading but with limited signs of recovery or return to pre-pandemic trends in school readiness. Similar to reading trends, Grade K students show a delayed impact of pandemic disruptions, with near identical trends in fall 2019 to fall 2021, but then declines in achievement in fall 2022 and 2023 (see Figures 3 and 4). However, these changes appear small, with average scale scores declining by approximately 2 scale score points, and only 2.2% fewer students performing on grade level (Early On and Mid/Above Grade Level).

In Grade 1, mathematics achievement at school entry demonstrates a small initial decrease from pre- to post-pandemic but with continued decline. Average scale scores continue to drop and are currently 4.3 points lower than pre-pandemic averages. These trends are mirrored in placement-

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level changes, with proportionally fewer students placing on grade level, concurrent with greater proportions of students placing below grade level. Though the percentage of students placing Two Grade Levels Below did not show a large increase immediately post-pandemic, the proportion of students in this placement level continues to increase year over year.

In Grade 2, like the reading trends, students are entering school less prepared for grade-level mathematics than prior to the pandemic. Average scores dropped nearly 6 points in 2021 and have remained far below pre-pandemic averages. Proportionally, fewer students are performing on grade level compared to pre-pandemic trends, and proportionally more students are performing below grade level. Recovery in mathematics achievement at school entry appears stalled, as these distributions have remained relatively consistent in years since the pandemic. The percentage of students placing Two Grade Levels Below remains more than 9 points higher than pre-pandemic proportions.

Figure 3. Change in Average Scale Score by Grade and Year from 2019—Mathematics

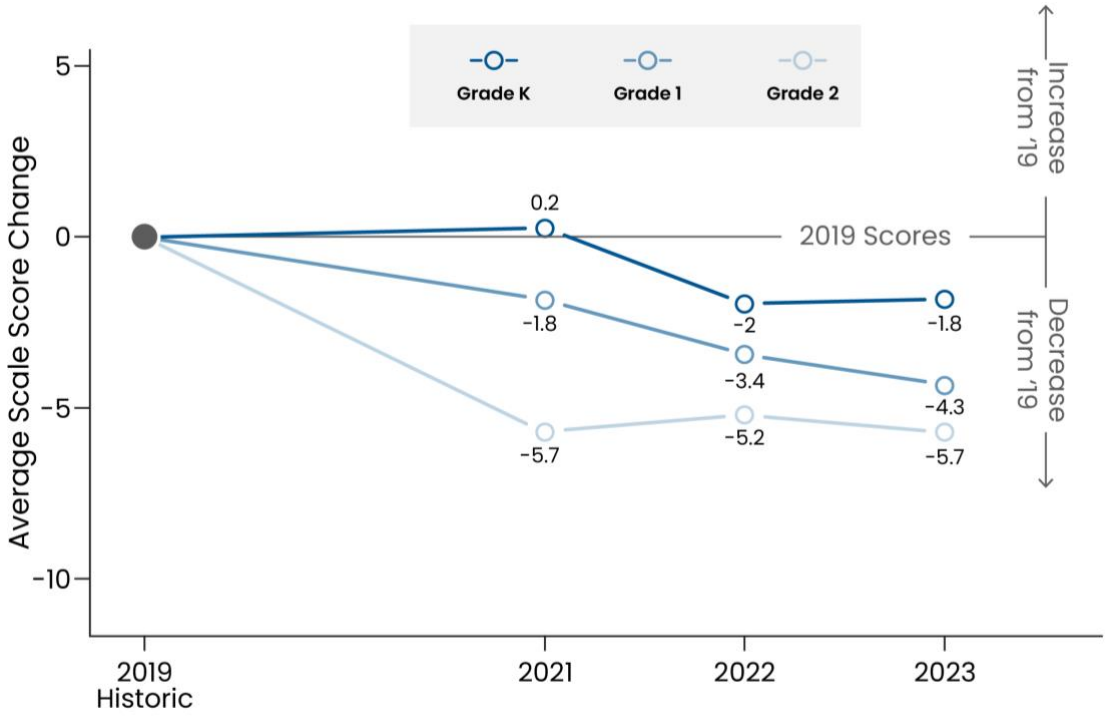

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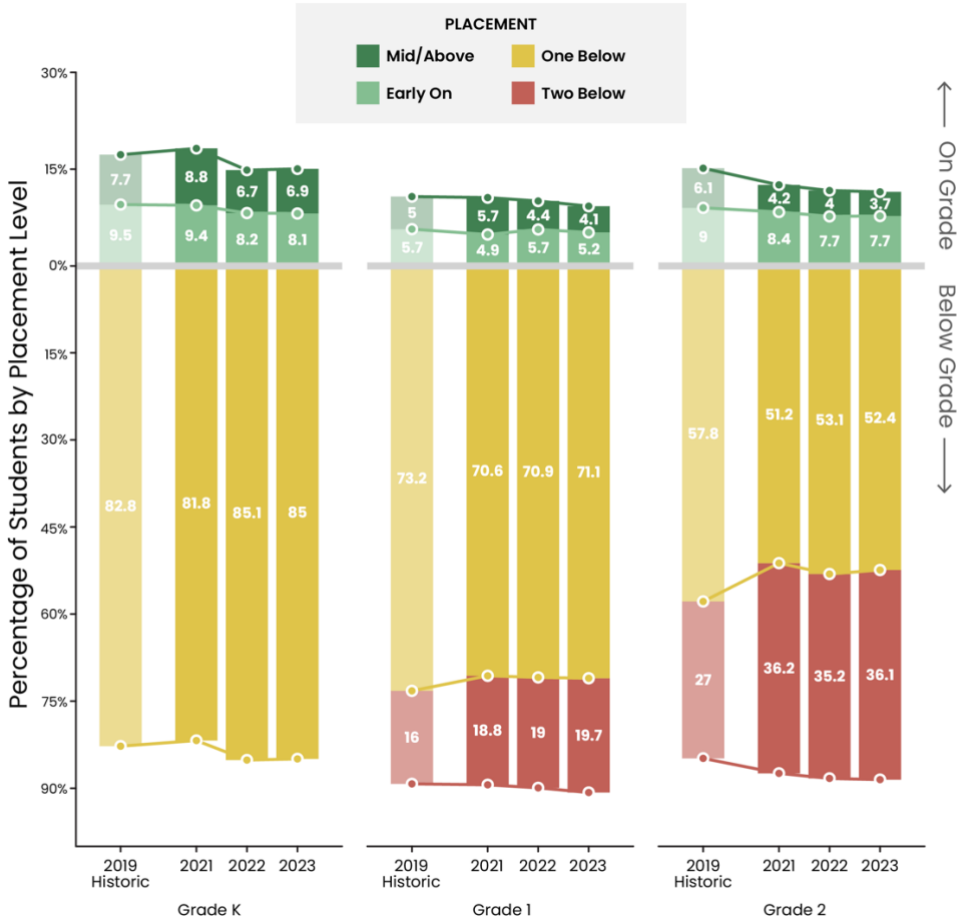
Figure 4. Placement Levels by Grade and Year—Mathematics



Note: For Grade K, "One Below" is equivalent to the placement of "Emerging K" since students cannot score one grade level below Grade K, but similarly indicates students have not yet met the college- and career-readiness standards for their grade. We expect most students to place in Emerging K/One Below in the fall as they enter school with no expectation to meet or partially meet grade-level standards.

Racial/Ethnic and Economic Inequities in School Readiness Persist

School-Level Demographic Disparities

Disparities in pre-pandemic school readiness by demographic group are well documented. In some cases, the pandemic has exacerbated these disparities, widening gaps between White students and historically minoritized students (US Department of Education, 2022). With existing inequities in access to early childhood services (US Department of Education, 2015), it is critical to understand how these may manifest in school readiness, or academic achievement at school entry, by demographic group. Examining pre- and post-pandemic reading placement-level trends by demographic group, we see mirrored patterns of declines and recovery by grade as in the overall sample (i.e., latent effects in Grade K, immediate declines in Grades 1 and 2, with greater signs of recovery in Grade 2 across all demographic groups). Overall, historical inequities continue.

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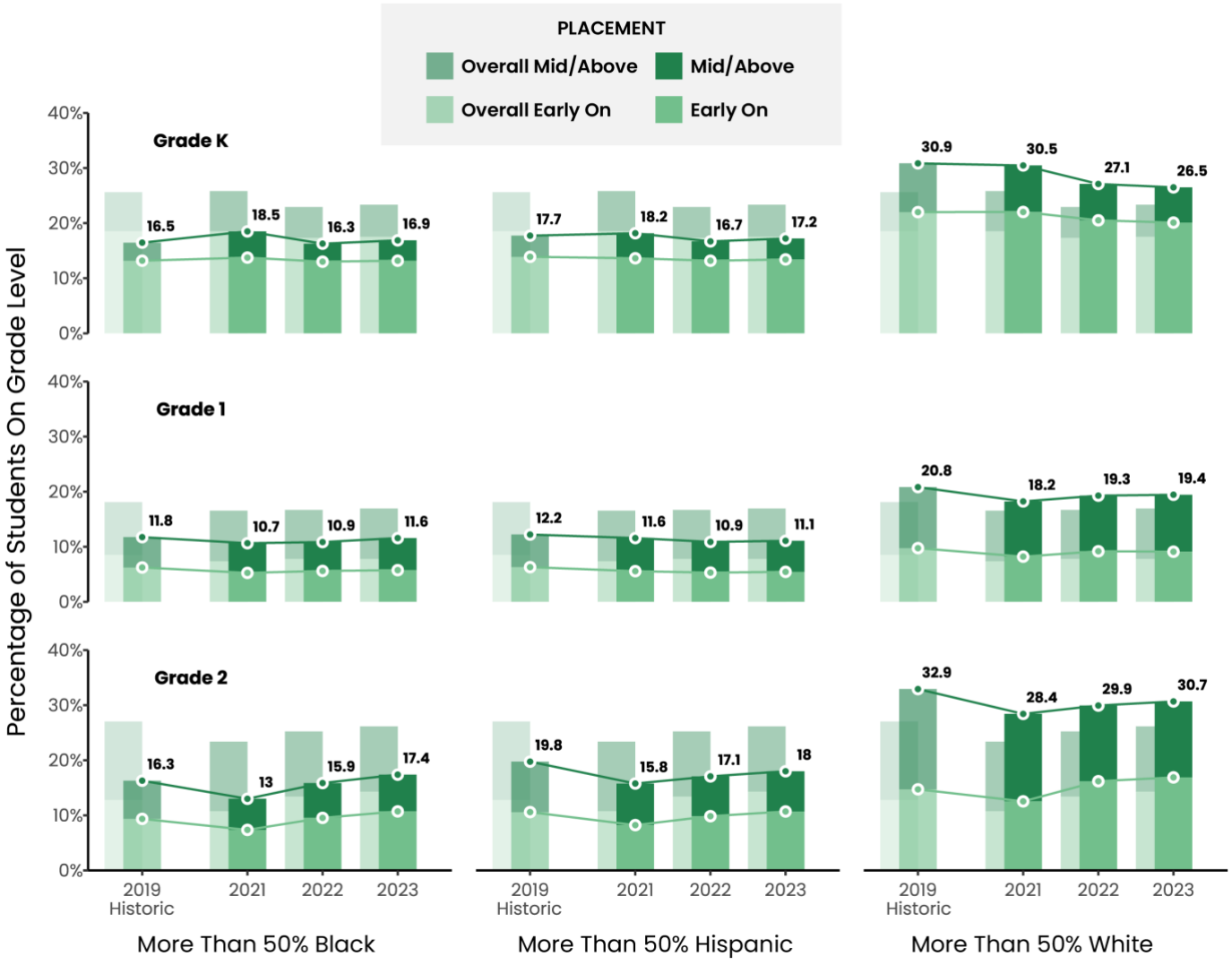
Though schools serving majority Black students are near or exceeding pre-pandemic levels of reading achievement at school entry, this recovery has done little to narrow inequities (see Figure 5). Compared to the overall sample trends, majority Black and Hispanic schools still have proportionally far fewer students entering the school year on grade level, while majority White schools have greater proportions of students performing on grade level at school entry.

Figure 5. Placement Levels by Schools Serving Majority Black, Hispanic, or White Students Compared to Overall Trends in Reading



Note: Values represent the total percentage of students placing "Early On" and "Mid Above" to reflect students considered "On Grade Level." The "Overall" bars represent the percentages in these placement levels for the entire sample.

In mathematics, disparities in school readiness by demographic group persist post-pandemic (see Figure 6). As in the overall sample, there is no indication of recovery in mathematics achievement at school entry by any demographic group with the percentage of students prepared for grade-level learning remaining behind pre-pandemic levels. Though differences between majority White

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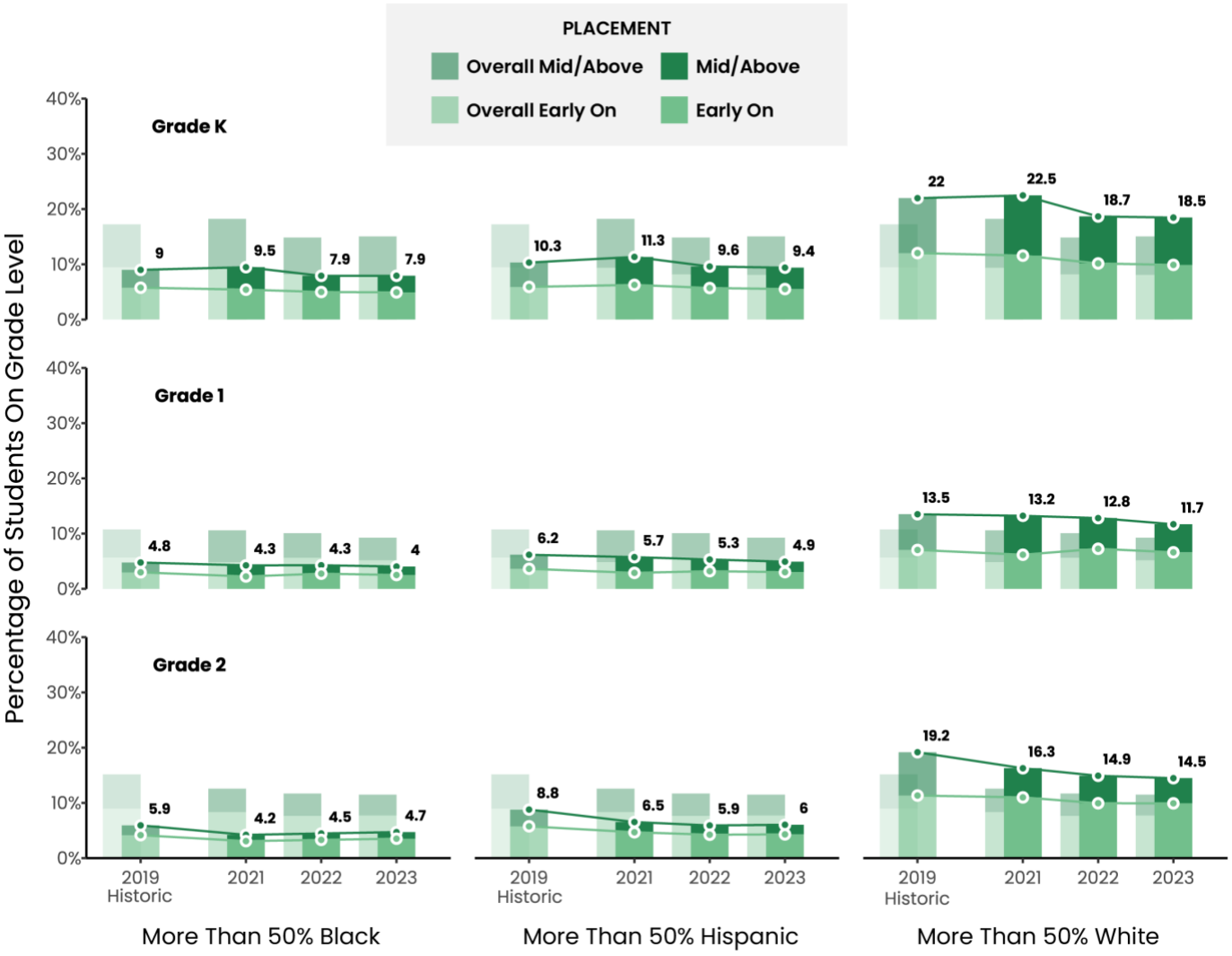
schools and majority Black and Hispanic schools appear to have decreased, any narrowing of inequities has resulted from stalled progress in schools serving majority White students. Despite larger year–over-year declines, this subgroup is still performing above the entire sample trends, while schools serving majority Black and Hispanic students remain below overall sample trends.

Figure 6. Placement Levels by Schools Serving Majority Black, Hispanic, or White Students Compared to Overall Trends in Mathematics



Note: Values represent the total percentage of students placing "Early On" and "Mid Above" to reflect students considered "On Grade Level." The "Overall" bars represent the percentages in these placement levels for the entire sample.

School-Level Income Disparities

Examining these trends by median household income for schools, similar results emerge (see Figure 7). In Grade 2, as in the whole sample, there are small signs of recovery in reading achievement at school entry occurring across each income bracket, and so has done little to narrow disparities in student achievement among these groups. Despite this small recovery, across all grades and

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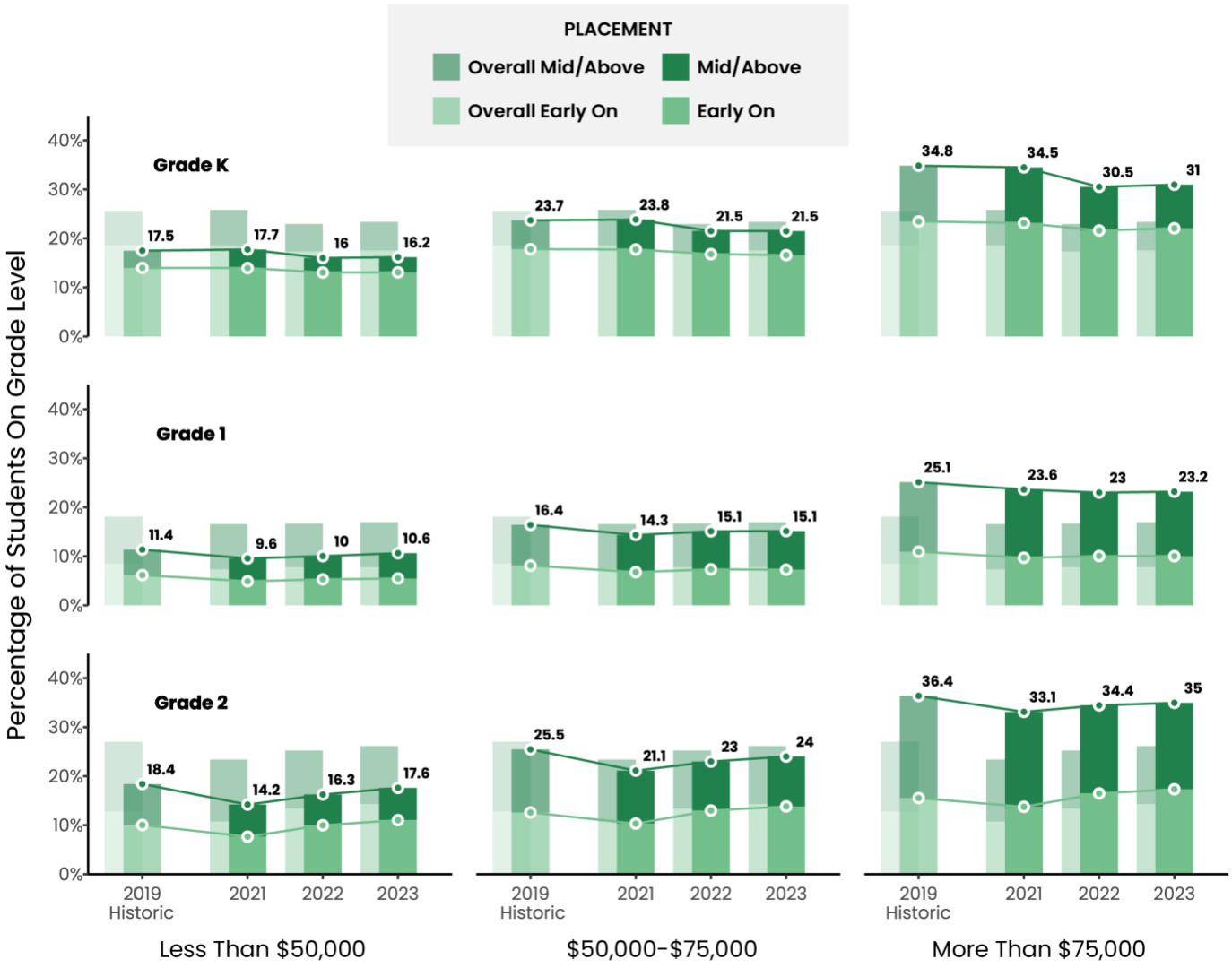
income levels, the percentage of students entering on grade level in reading remains behind pre-pandemic trends. Though differences among income groups have narrowed, these changes, at most, represent a 2.5-percentage-point decrease in the delta between high- and low-income communities, which remain at least 12.6 points apart in the percentage of on-grade level students. As anticipated, schools from lower-income communities are performing behind the overall sample trends, while higher-income communities demonstrated greater proportions of students performing on grade level than the overall sample proportions.

Figure 7. Placement Levels by Median Household Income Compared to Overall Trends in Reading



Note: Values represent the total percentage of students placing "Early On" and "Mid Above" to reflect students considered "On Grade Level." The "Overall" bars represent the percentages in these placement levels for the entire sample.

In mathematics, trends by median household income mirror those of the entire sample, with no indication of recovery. The percentage of students entering on grade level in 2023 remains behind pre-pandemic trends across all grades and income brackets (see Figure 8). Given limited change to performance, historical economic inequities persist. In instances in which the differences among

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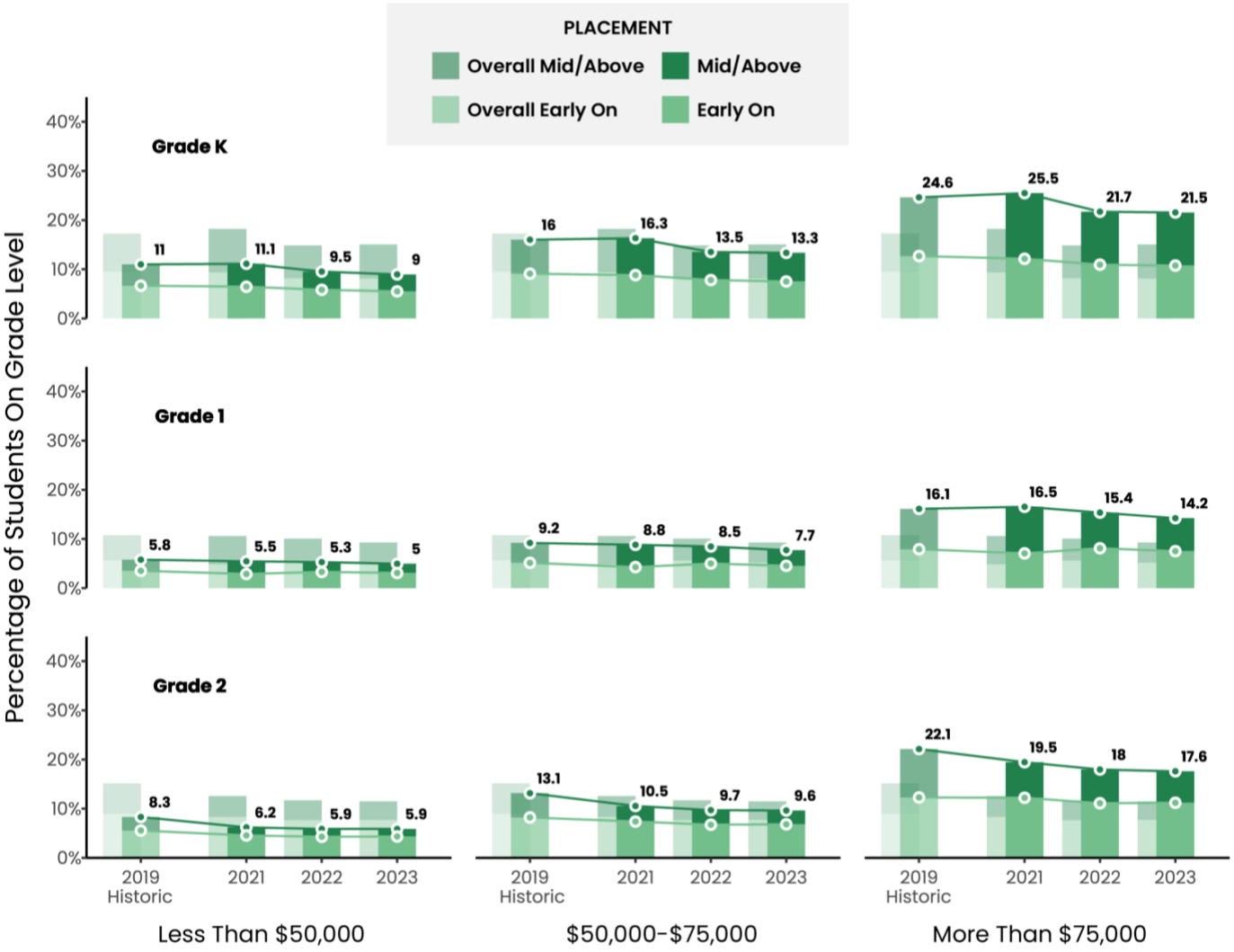
high- or low-income communities appear to narrow, this results from stalled progress in high-income communities despite demonstrating greater proportions of on-grade level students than the overall sample proportions.

Figure 8. Placement Levels by Median Household Income Compared to Overall Trends in Mathematics



Note: Values represent the total percentage of students placing "Early On" and "Mid Above" to reflect students considered "On Grade Level." The "Overall" bars represent the percentages in these placement levels for the entire sample.

Domain-Specific School Readiness Shows Recovery in Phonics, Predictor of Later Reading Ability

Phonics Domain

Examining trends by *i-Ready* subject domains, we see similar results to the overall reading and mathematics trends, with limited recovery in Reading domains and stagnant or declining performance in Mathematics domains at school entry. Encouragingly, examining Phonics performance—a strong predictor of later reading ability (Curriculum Associates, 2023b)—average

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scales scores have improved or are returning to pre-pandemic averages across all grades (see Figure 9). Grades K–2 students all saw initial and varying declines in Phonics performance, but each year since, all three grades have demonstrated scores that are improving and approaching pre-pandemic averages. Additionally, the percentage of students performing on grade level at school entry is nearing or exceeding pre-pandemic trends across Grades K–2 (see Figure 10). Though proportions of students performing Two Grade Levels Below at school entry remains higher than pre-pandemic trends, in Grades 1 and 2, there are signs of recovery, with percentages slowly decreasing post-pandemic. For performance across all Reading domains, see Appendix Tables 7 and 8.

Figure 9. Change in Average Scale Score by Grade and Year from 2019—Phonics Domain

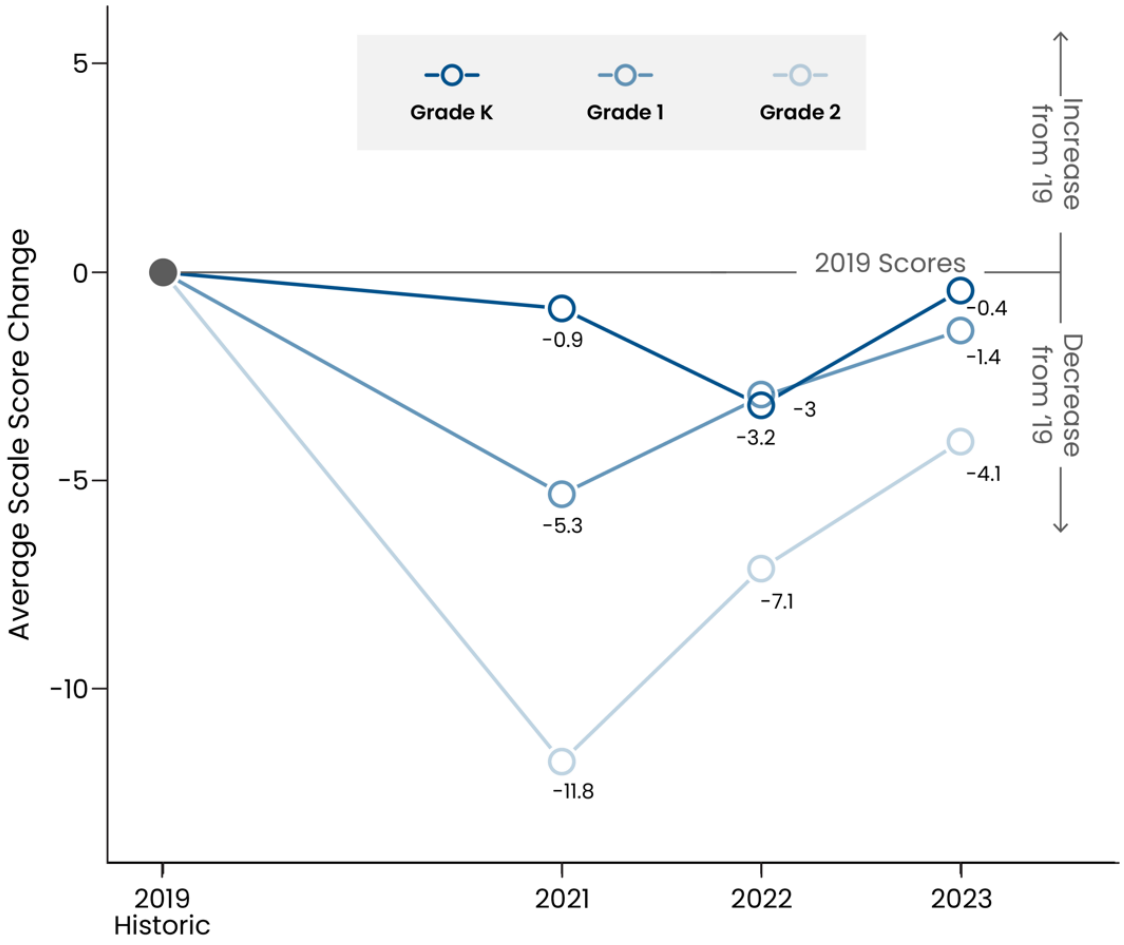

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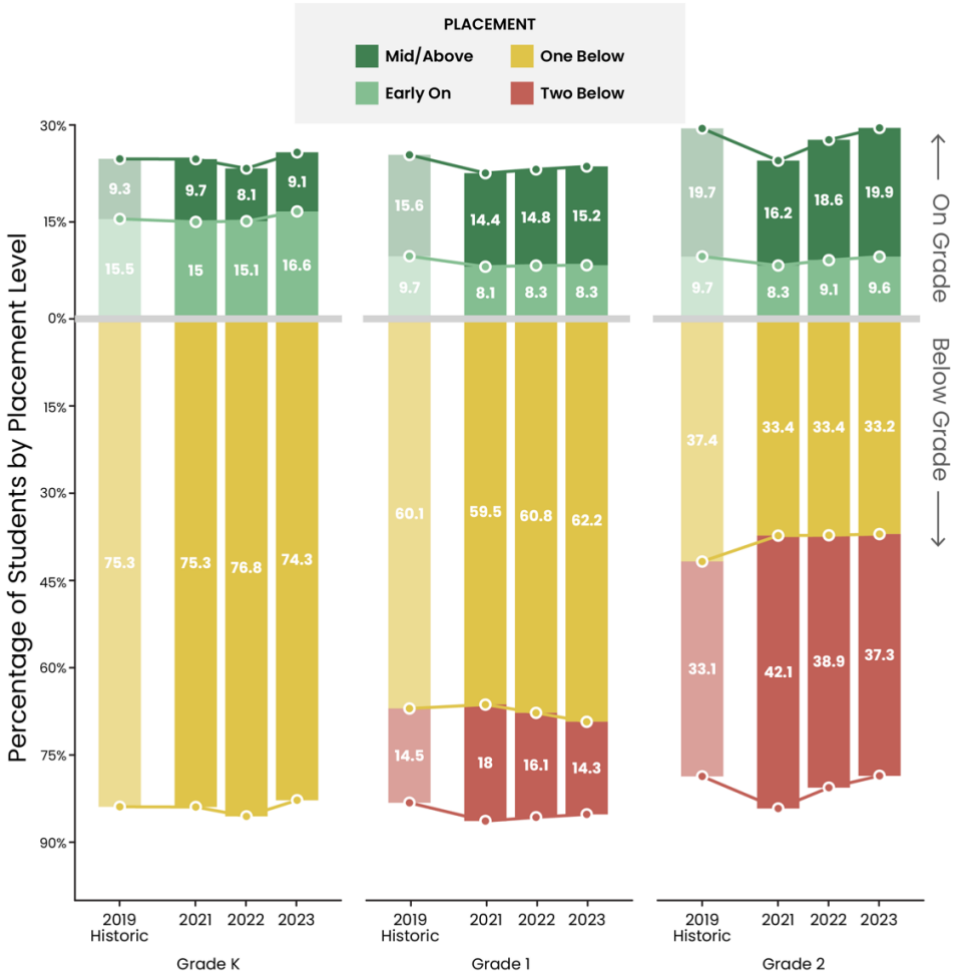
Figure 10. Placement Levels by Year in Phonics Domain



Note: For Grade K, "One Below" is equivalent to the placement of "Emerging K" since students cannot score one grade level below Grade K, but similarly indicates students have not yet met the college- and career-readiness standards for their grade. We expect most students to place in Emerging K/One Below in the fall as they enter school with no expectation to meet or partially meet grade-level standards.

Number and Operations Domain

Examining the Number and Operations domain, which is foundational to students' understanding and performance in mathematics, achievement mimics overall mathematics achievement, with limited signs of recovery and stagnant performance across grades. Average scale scores showed small, latent declines in Grade K, small and continued declines in Grade 1, and larger declines, with only small signs of rebounding, in Grade 2 (see Figure 11). Though the proportion of students performing on grade level did not markedly decline post-pandemic in Grades K and 1, these numbers remain low, with only 12%–15% of students beginning on grade level (see Figure 12). Students are not expected to enter the school year on grade level, but these numbers coincide with increases in the proportion of students performing Two Grade Levels Below in Grades 1 and 2, remaining 3%–5% higher than pre-pandemic values. Together, these data may indicate students

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are entering the school year less prepared for grade-level mathematics content than students prior to the pandemic. For performance across all mathematics domains, see Appendix Tables 9 and 10.

Figure 11. Change in Average Scale Score by Grade and Year from 2019—Number and Operations Domain

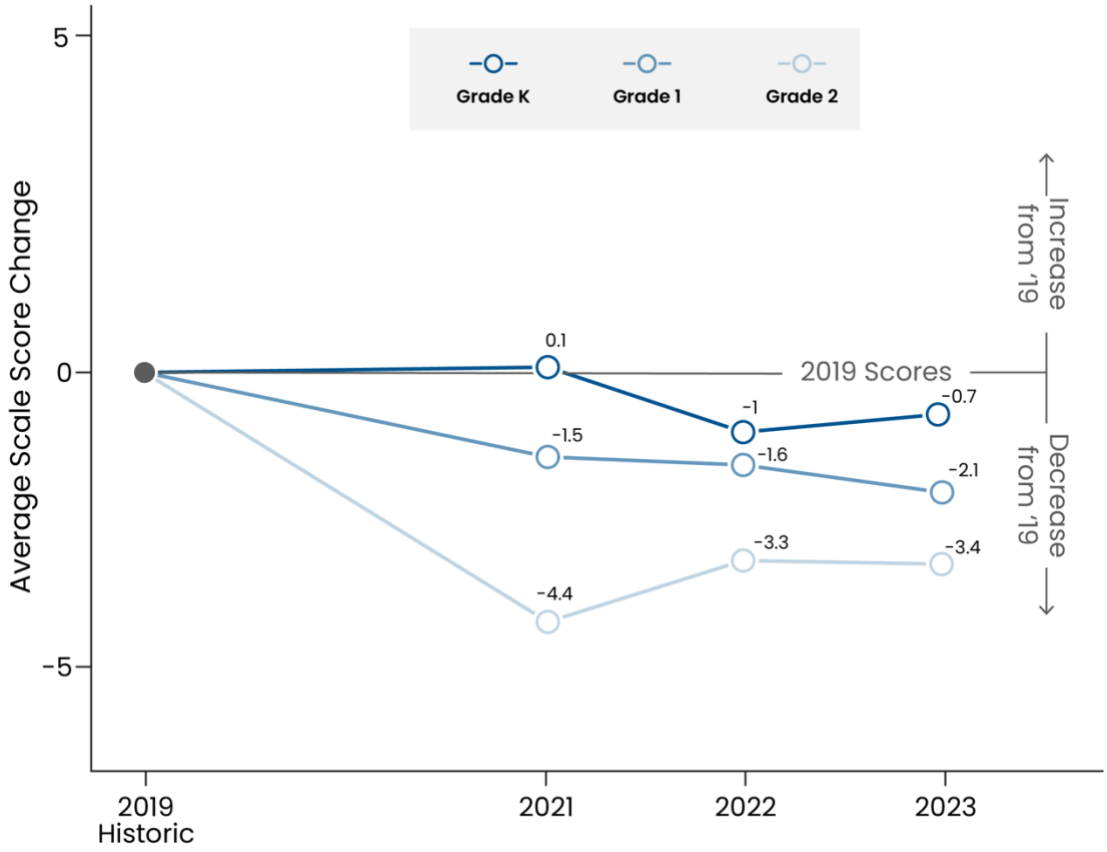

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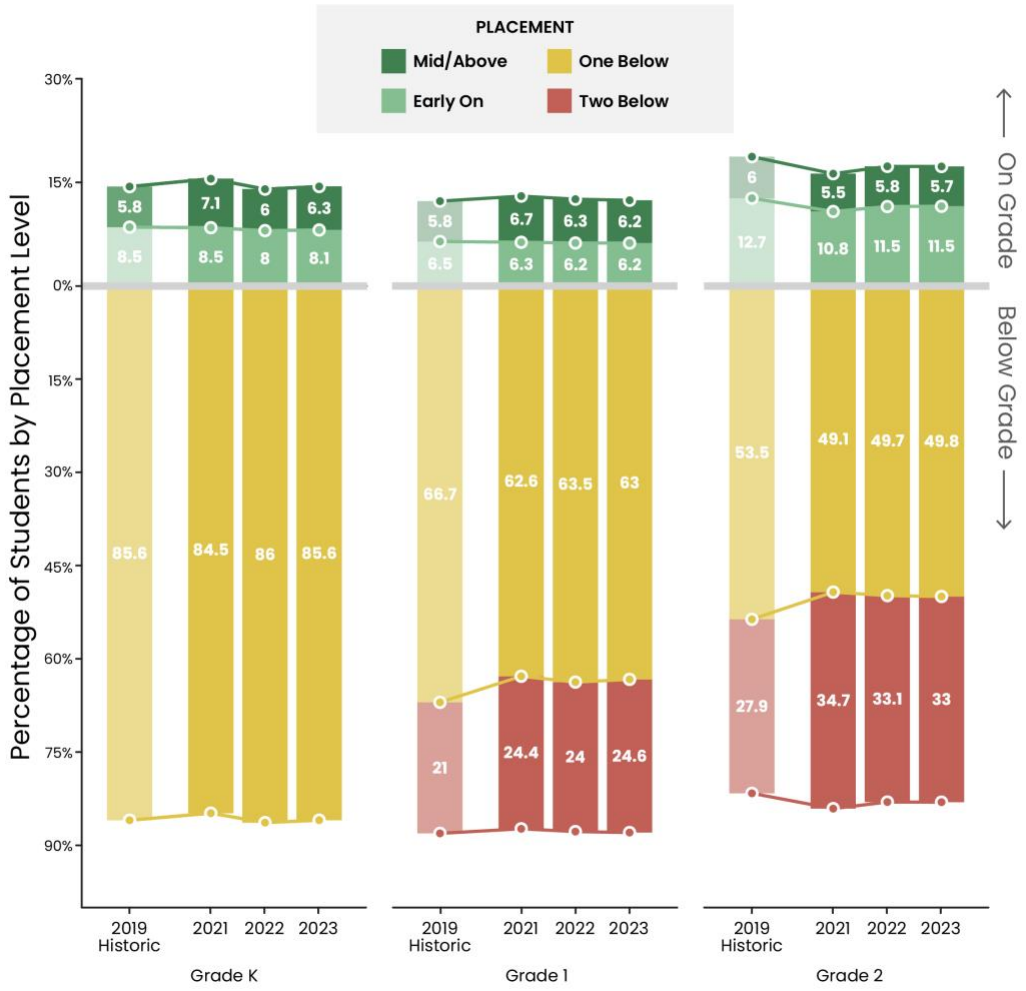
Figure 12. Placement Levels by Year in Number and Operations Domain



Note: For Grade K, "One Below" is equivalent to the placement of "Emerging K" since students cannot score one grade level below Grade K, but similarly indicates students have not yet met the college- and career-readiness standards for their grade. We expect most students to place in Emerging K/One Below in the fall as they enter school with no expectation to meet or partially meet grade-level standards.

CONCLUSION

Nearly four years following the abrupt education and childcare closures resulting from the COVID-19 pandemic, there are continued effects on student academic achievement. While these effects have been well documented in Grade 3 and beyond, this report offers an initial glimpse into how pandemic-related disruptions to early childhood care and education may have manifested in school readiness for children who entered formal schooling after March 2020. We found these students are performing behind pre-pandemic levels, with limited signs of recovery. Across grades, there are varied trends, with Grade K showing a latent impact of pandemic disruptions. Scores and placements for Grade K appeared almost identical from 2019 to 2021 in both mathematics and reading. Unfortunately, in 2022, Grade K students began to show declines in performance relative to the prior two years. It is possible children who entered Grade K in 2021 had accessed some pre–K

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services prior to the pandemic and entered with stronger school readiness skills than following cohorts.

In contrast, students in Grades 1 and 2 demonstrated an initial decline in both mathematics and reading performance in 2021, with more prominent declines in Grade 2. In mathematics, achievement at school entry remains stalled with little to no improvement in overall scores or placements. Though in some subgroups there were only small declines from pre- to post-pandemic, the percentage of students beginning the year well below grade level has grown substantially in some grades, with no sign of recovery or return to pre-pandemic levels. While all grades in mathematics and Grades K and 1 in reading show stalled progress or further decline post-pandemic, Grade 2 reading offers a small bright spot, with signs of recovery and trends slowly returning to pre-pandemic levels.

The Phonics domain in reading mirrors this promising pattern with Grades K–2 students slowly returning to pre-pandemic levels. This finding is encouraging, as Phonics performance is a strong indicator of later reading ability (Curriculum Associates, 2023b). Mathematics domain performance, in contrast, proves more concerning, with stagnant or further decline across all domains in all three grades examined.

Though the pandemic was disruptive to all early childhood care and services, the impact of this disruption was not equally felt across communities (Barnett & Jung, 2020; Nana-Sinkam et al., 2021; Piacentini et al., 2021; US Department of Education, 2022). Many minoritized communities relied on continued access to public pre–K programs and thus lost services entirely with pandemic closures (Barnett & Jung, 2020). Between these and existing inequities, disparities in service access and experiences may have manifested into the differences in student achievement seen in the current study. Though some communities have demonstrated an encouraging return to pre-pandemic trends, this recovery has done little to narrow inequities. Minoritized communities are still performing far behind overall sample trends, while high-income or White communities perform well above overall sample trends. More work is needed to further address these disparities.

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APPENDIX

Limitations

The results from the current study are descriptive. For this reason, we refrain from making any strong inferences. These results also do not offer causal evidence of the impact of the pandemic or recovery efforts taking place nationwide. Instead, we simply provide and describe trends in student performance across pre- and post-pandemic time frames. In addition, our stratified sampling techniques—although creating a closer representation of the nation—relies on school-level demographics as opposed to student level. Using school-level demographics is coarse and insensitive to variation compared with student-level data and therefore may diminish patterns at the student-level demographic group. Though the sample is nationally representative, we did not have the data required to report out on other demographic groups, including multilingual learners, students with disabilities, or other student populations inequitably impacted by pandemic disruptions. Despite these limitations, this report offers a pulse check on the academic school readiness of young students nationwide. Ultimately, these results indicate more work is needed to remedy the gaps in learning from lost instructional time, eliminate historical inequities, and expand access to needed early childhood care and education services.

Assessment Measure

The *i-Ready Diagnostic* was developed to serve several purposes: establish a metric that will allow for an accurate assessment of student knowledge that can be monitored over a period of time to gauge student improvement; accurately assess student knowledge for different content strands within each subject; provide information on what skills students are likely to have mastered and likely need to work on next; and link the assessment results to instructional advice (Curriculum Associates, 2018).

Upon completion of the Diagnostic, each student's results are reported as scale scores, placement levels, and norm-referenced percentile scores. *i-Ready Diagnostic* scale scores are linear transformations of logit values. For each assessment in reading and mathematics, an overall score is calculated, as are domain scores for each content strand. Scale scores can range in value from 100 to 800. In *i-Ready*, the placement is an on-grade level interpretation of the scale score (Curriculum Associates, 2018). When a student's scale score is within the range for their grade level, their placement level is designated as Early On Grade Level, Mid On Grade Level, or Late On Grade Level. If the scale score is below or above the range for the grade level, the placement level is designated as Grade X (with X corresponding to the appropriate grade level). The scale score ranges that correspond to each placement level by subject, domain, and grade are listed in the *i-Ready* scale score placement tables.

The mean standard error of measurement (SEM) for overall scores across grade levels is low in both the reading (i.e., 9.3–10.9) and mathematics assessments (i.e., 6.3–6.5), with many approaching the theoretical minimum SEM. The item response theory analogue to classical reliability estimation is called marginal reliability and operates on the variance of the theta scores and the mean of the expected error variance (Samejima, 1977; Sireci et al., 1991). This marginal

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reliability uses the classical definition of reliability as proportion of variance in the total observed score due to true score. The true score variance is computed as the observed score variance minus the error variance. Like a classical reliability coefficient, the marginal reliability estimate increases as the SEM decreases; it approaches 1 when the SEM approaches 0. The estimated reliability for reading is .97, and the estimated reliability for mathematics is .96 (Curriculum Associates, 2018). The results from several linking studies support the strong external validity of the *i-Ready Diagnostic*. Not only did the *i-Ready* scores correlate closely with Lexiles®, Quantiles®, and state assessments when the tests were taken within a short period of time, but the results on the fall and winter *i-Ready Diagnostic* correlations with spring state assessments also show high correlations (most at .90 and higher).

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i-Ready Placement-Level Descriptors

	Three or More Grade Levels Below	Two Grade Levels Below	One Grade Level Below	Early On Grade Level	Mid or Above Grade Level	
Placement Relative to Grade-Level College- and Career-Readiness Standards	Are not close to meeting			Only partially met	Met	
Instructional Recommendations	**Likely need intensive intervention of foundational concepts**	**May need intensive intervention** of material that is **two grade levels below** to help fill in gaps in students' foundational knowledge	**May benefit from review or remediation of material** that is **one grade level below**	**Will benefit from on-grade level instruction** to help them meet the expectations of college- and career-readiness standards for their grade level	**Mid On Grade Level:**	Will benefit from instruction in late on-grade level topics
					Late On Grade Level:	Will benefit from late on-grade level enrichment and will be ready for instruction focused on topics typically covered in the beginning of the subsequent grade level
					Above Grade Level:	Will benefit from above-grade level instruction

Appendix Table 1. Sample Demographics with Differences from Population Targets—Reading

Grade	2019	2021	2022	2023
% White				
Grade K	43.6% (2.53%)	43.5% (1.3%)	42.7% (2.11%)	44.4% (.45%)
Grade 1	44.2% (1.99%)	44.1% (.76%)	43.3% (1.5%)	43.5% (1.29%)
Grade 2	41.5% (4.5%)	40.1% (4.74%)	40% (4.84%)	41.2% (3.71%)
% Black				
Grade K	17.1% (-2.45%)	17.2% (-2.85%)	17.5% (-3.2%)	16.9% (-2.59%)
Grade 1	16.9% (-1.81%)	16.6% (-1.91%)	16.7% (-1.97%)	16.7% (-1.97%)
Grade 2	18.1% (-2.91%)	18.4% (-3.5%)	17.9% (-2.97%)	17.8% (-2.97%)
% Hispanic				
Grade K	27.5% (-.02%)	28.3% (.17%)	28.5% (-.05%)	27.2% (1.22%)
Grade 1	27.4% (-.25%)	27.6% (.65%)	28.3% (-.01%)	28% (.3%)
Grade 2	29.1% (-1.6%)	29.3% (-1.17%)	29.8% (-1.74%)	28.9% (-.77%)
Median Income				
Grade K	$64,060 (.29%)	$64,806 (.85%)	$63,781 (.75%)	$65,128 (1.35%)
Grade 1	$64,435 (.84%)	$65,789 (2.16%)	$65,388 (1.53%)	$65,390 (1.54%)
Grade 2	$62,353 (2.97%)	$63,510 (1.86%)	$64,207 (.79%)	$64,182 (.82%)

Appendix Table 2. Sample Demographics with Differences from Population Targets—Mathematics

Grade	2019	2021	2022	2023
% White				
Grade K	44.2% (2%)	44.7% (.18%)	44.3% (.53%)	45% (-.15%)
Grade 1	45.4% (.79%)	42.3% (2.56%)	42.7% (2.09%)	42.9% (1.96%)
Grade 2	45.3% (.71%)	42.1% (2.83%)	42.6% (2.26%)	43% (1.88%)
% Black				
Grade K	17.1% (-2.51%)	16.4% (-2.06%)	18.3% (-3.92%)	16.4% (-2.02%)
Grade 1	16.4% (-1.3%)	17.6% (-2.83%)	17.3% (-2.55%)	17.3% (-2.59%)
Grade 2	16% (-.85%)	17.3% (-2.38%)	16.8% (-1.96%)	16.8% (-1.95%)
% Hispanic				
Grade K	27.7% (-.27%)	27.7% (.81%)	26.3% (2.19%)	27.2% (1.24%)
Grade 1	26.9% (.23%)	27.8% (.42%)	27.6% (.69%)	27.5% (.72%)
Grade 2	27.3% (.21%)	28.2% (-.13%)	28.1% (.02%)	27.9% (.17%)
Median Income				
Grade K	$63,478 (.62%)	$65,435 (1.82%)	$61,238 (4.71%)	$65,259 (1.55%)
Grade 1	$65,121 (1.91%)	$63,383 (1.58%)	$64,148 (.39%)	$63,714 (1.07%)
Grade 2	$65,590 (2.06%)	$63,877 (1.3%)	$64,480 (.37%)	$64,225 (.76%)

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Appendix Table 3. Region/Locale Distributions with Differences from Population Targets—Reading

Grade	2019			2021			2022			2023		
	City	Suburban	Town/Rural	City	Suburban	Town/Rural	City	Suburban	Town/Rural	City	Suburban	Town/Rural
Midwest												
K	3.8% (1.6%)	5.8% (1.4%)	6.3% (1.6%)	3.7% (1.7%)	5.8% (1.5%)	6.2% (2%)	3.9% (1.4%)	5.9% (1.4%)	6% (2.2%)	4.4% (1%)	7.1% (.3%)	6.6% (1.6%)
1	3.8% (1.6%)	5.5% (1.8%)	5.6% (2%)	3.5% (1.9%)	6% (1.3%)	5.9% (1.9%)	3.7% (1.7%)	6% (1.3%)	5.8% (2.1%)	3.8% (1.6%)	6.1% (1.2%)	6% (1.8%)
2	3.4% (2%)	4.3% (3.1%)	4.4% (3.2%)	3.6% (1.7%)	4.4% (3%)	4% (3.8%)	3.5% (1.9%)	5% (2.4%)	4.3% (3.5%)	3.9% (1.5%)	5.2% (2.2%)	4.6% (3.2%)
Northeast												
K	4.1% (.2%)	5.3% (2.3%)	2.3% (.5%)	3.4% (.7%)	7.5% (.2%)	2.2% (.6%)	3.8% (.3%)	7.4% (.3%)	2.3% (.5%)	3.6% (.5%)	8.1% (-.4%)	2.3% (.5%)
1	4.5% (.1%)	6.8% (1.2%)	2.4% (.4%)	3.9% (.3%)	8.3% (-.4%)	2.2% (.6%)	3.8% (.3%)	8.2% (-.3%)	2.4% (.4%)	3.8% (.3%)	8.3% (-.3%)	2.3% (.5%)
2	5.5% (-1%)	6.5% (1.6%)	2.4% (.4%)	4.8% (-.6%)	7.6% (.5%)	2.3% (.6%)	4.9% (-.6%)	7.5% (.6%)	2.3% (.5%)	4.8% (-.5%)	7.7% (.4%)	2.3% (.6%)
South												
K	13.3% (-2%)	18.7% (-4.9%)	15.3% (-1.8%)	13.5% (-2.1%)	18.6% (-4.9%)	16% (-1.6%)	13.8% (-2.3%)	18.7% (-4.9%)	16.1% (-1.6%)	12.6% (-1.2%)	18.7% (-4.9%)	15% (-.6%)
1	12.7% (-1.1%)	19.4% (-5%)	14.2% (-.4%)	12.9% (-1.1%)	19.3% (-4.9%)	15.1% (-.4%)	12.9% (-1.1%)	19.3% (-4.9%)	15.1% (-.4%)	13% (-1.2%)	19.2% (-4.9%)	14.6% (.1%)
2	12.2% (-.7%)	19.5% (-5%)	13.7% (-.1%)	11.5% (.1%)	18.6% (-4.3%)	14% (.3%)	11.4% (.2%)	18.8% (-4.5%)	14.3% (0%)	11.9% (-.3%)	18.2% (-3.8%)	14.5% (-.2%)
West												
K	9.2% (1.1%)	11.6% (-1%)	4.3% (.9%)	8.3% (1.4%)	10.7% (-.8%)	4.1% (1.3%)	7.2% (2.5%)	10.9% (-1%)	4.1% (1.3%)	7.7% (2.1%)	9.9% (0%)	4.2% (1.2%)
1	9.8% (-.3%)	11% (-1.1%)	4.4% (.7%)	8.9% (.3%)	9.9% (-.6%)	4.1% (1.1%)	8.7% (.5%)	9.8% (-.5%)	4.3% (.9%)	8.7% (.5%)	9.8% (-.4%)	4.4% (.8%)
2	9.9% (-.4%)	13.6% (-3.6%)	4.5% (.5%)	10.5% (-1.2%)	13.9% (-4.3%)	4.9% (.4%)	10% (-.7%)	13.4% (-3.9%)	4.6% (.6%)	9.1% (.2%)	12.9% (-3.4%)	5.1% (.2%)

Appendix Table 4. Region/Locale Distributions with Differences from Population Targets—Mathematics

Grade	2019			2021			2022			2023		
	City	Suburban	Town/Rural	City	Suburban	Town/Rural	City	Suburban	Town/Rural	City	Suburban	Town/Rural
Midwest												
K	3.4% (2%)	5.5% (1.7%)	6.3% (1.5%)	4% (1.4%)	6.3% (1%)	6.4% (1.7%)	4.4% (1%)	5.4% (2%)	5.5% (2.7%)	4.4% (1%)	7.2% (.1%)	6.9% (1.3%)
1	3.6% (1.8%)	6.1% (1.2%)	6% (1.6%)	3.5% (1.9%)	4.3% (3%)	4.5% (3.4%)	3.8% (1.5%)	4.7% (2.6%)	4.8% (3.1%)	4.1% (1.3%)	4.7% (2.7%)	4.9% (3%)
2	3.4% (1.9%)	6% (1.4%)	6.1% (1.5%)	3.5% (1.8%)	4.4% (3%)	4.5% (3.3%)	3.7% (1.7%)	5% (2.4%)	4.8% (3.1%)	4% (1.4%)	4.9% (2.5%)	5% (2.9%)
Northeast												
K	4.3% (.1%)	5.7% (1.9%)	2.3% (.4%)	3.9% (.2%)	7.9% (-.2%)	2.2% (.6%)	5% (-1%)	7.1% (.6%)	2.1% (.7%)	3.7% (.3%)	7.8% (-.1%)	2.4% (.4%)
1	4.5% (.1%)	7.4% (.5%)	2.3% (.5%)	5.2% (-1%)	7.3% (.6%)	2% (.8%)	5.2% (-1.1%)	7.6% (.3%)	2.2% (.6%)	5.2% (-1%)	7.9% (.1%)	2.3% (.5%)
2	4.5% (0%)	7.6% (.4%)	2.4% (.5%)	5.2% (-1%)	7.5% (.6%)	2.1% (.7%)	5.3% (-1.1%)	7.6% (.5%)	2.2% (.6%)	5.2% (-.9%)	8% (.1%)	2.3% (.5%)
South												
K	12.9% (-1.5%)	18.7% (-4.9%)	15.4% (-1.9%)	12.5% (-1.1%)	18.7% (-4.9%)	15.4% (-1%)	12.9% (-1.5%)	18.2% (-4.4%)	17.4% (-3%)	12.5% (-1%)	18.7% (-4.9%)	14.9% (-.5%)
1	11.9% (-.2%)	19.4% (-5%)	14.6% (-.7%)	11.7% (.1%)	19.1% (-4.8%)	15% (-.3%)	11.1% (.7%)	17.4% (-3%)	14.9% (-.2%)	11.9% (-.1%)	17.3% (-3%)	15.1% (-.4%)
2	11.4% (.1%)	19.4% (-4.9%)	14.5% (-.8%)	11.4% (.2%)	18.6% (-4.3%)	14.1% (.2%)	11% (.6%)	17.4% (-3%)	14.2% (.2%)	11.8% (-.2%)	17.2% (-2.8%)	14.5% (-.2%)
West												
K	9.1% (1.2%)	11.8% (-1.2%)	4.5% (.8%)	8.7% (1%)	10.1% (-.2%)	4% (1.4%)	7.7% (2%)	9.7% (.2%)	4.7% (.7%)	7.9% (1.8%)	9.7% (.2%)	4.1% (1.3%)
1	9.4% (.1%)	10.7% (-.8%)	4.1% (.9%)	10% (-.8%)	12.7% (-3.3%)	4.8% (.3%)	9.9% (-.8%)	13.1% (-3.7%)	5.3% (-.1%)	9.3% (-.1%)	12.2% (-2.8%)	5.2% (0%)
2	9.6% (0%)	10.9% (-.9%)	4.2% (.9%)	10.3% (-1%)	13.2% (-3.7%)	5.1% (.2%)	10.2% (-.9%)	13.4% (-3.9%)	5.3% (0%)	9.3% (0%)	12.5% (-3%)	5.4% (-.2%)

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Appendix Table 5. Percentage of Students for School-Level Demographics and Income by Year—Reading

Category	2019	2021	2022	2023
	n = 1,028,178	n = 1,536,478	n = 1,662,190	n = 1,708,314
Median Household Income				
Less Than $50,000	26.2%	24.7%	25.0%	24.9%
$50,000–$70,000	41.3%	41.3%	41.0%	40.4%
More Than $75,000	32.5%	34.0%	34.1%	34.7%
Demographics				
More Than 50% Black	11.2%	11.4%	11.1%	11.0%
More Than 50% Hispanic	20.2%	20.2%	20.9%	19.9%
More Than 50% White	43.5%	42.1%	41.8%	43.0%

Appendix Table 6. Percentage of Students for School-Level Demographics and Income by Year—Mathematics

Category	2019	2021	2022	2023
	n = 961,628	n = 2,171,024	n = 2,359,940	n = 2,258,766
Median Household Income				
Less Than $50,000	25.2%	24.8%	25.4%	25.1%
$50,000–$70,000	41.3%	40.8%	40.9%	40.4%
More Than $75,000	33.5%	34.3%	33.7%	34.6%
Demographics				
More Than 50% Black	10%	10.7%	11%	10.6%
More Than 50% Hispanic	19.4%	19.6%	19.3%	19.3%
More Than 50% White	46.4%	42.8%	43.6%	43.7%

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Appendix Table 7. Percentage of Students On Grade Level in Reading

	Mid/Above				Early On			
Grade	**2019**	**2021**	**2022**	**2023**	**2019**	**2021**	**2022**	**2023**
Phonological Awareness								
Grade K	6.37%	6.46%	5.83%	5.51%	28.29%	31.56%	30.33%	30.74%
Grade 1	28.66%	27.10%	22.52%	17.77%	8.56%	7.95%	8.60%	7.84%
Grade 2	76.02%	66.39%	68.21%	70.14%	.00%	.00%	.00%	.00%
High-Frequency Words								
Grade K	14.33%	14.53%	11.11%	10.65%	7.17%	6.57%	6.65%	6.33%
Grade 1	24.28%	21.88%	21.63%	22.69%	6.72%	5.58%	6.18%	5.45%
Grade 2	49.97%	43.57%	32.75%	37.82%	11.78%	10.39%	19.42%	19.46%
Phonics								
Grade K	9.26%	9.68%	8.13%	9.11%	15.46%	15.00%	15.11%	16.62%
Grade 1	15.62%	14.43%	14.84%	15.24%	9.72%	8.09%	8.26%	8.31%
Grade 2	19.74%	16.18%	18.57%	19.86%	9.67%	8.27%	9.10%	9.63%
Comprehension: Informational								
Grade K	19.95%	19.53%	17.62%	17.81%	22.87%	22.88%	22.51%	20.66%
Grade 1	12.52%	13.04%	11.80%	11.73%	11.71%	11.36%	10.59%	10.74%
Grade 2	16.55%	14.79%	14.63%	13.66%	11.81%	9.98%	10.21%	10.24%
Comprehension: Literature								
Grade K	18.19%	17.90%	16.25%	16.33%	21.40%	21.70%	21.28%	21.02%
Grade 1	12.58%	12.98%	11.47%	11.05%	12.63%	12.58%	11.84%	11.98%
Grade 2	15.35%	13.24%	12.97%	11.60%	11.97%	10.01%	10.13%	10.03%
Vocabulary								
Grade K	11.83%	11.12%	9.88%	9.72%	23.33%	22.76%	22.40%	21.85%
Grade 1	9.73%	10.26%	9.61%	9.57%	10.44%	10.05%	9.62%	9.63%
Grade 2	12.66%	12.20%	12.86%	12.51%	11.57%	10.01%	10.53%	10.80%

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Appendix Table 8. Percentage of Students Below Grade Level in Reading

	One Below				Two Below			
Grade	**2019**	**2021**	**2022**	**2023**	**2019**	**2021**	**2022**	**2023**
Phonological Awareness								
Grade K	65.34%	61.99%	63.84%	63.76%	.00%	.00%	.00%	.00%
Grade 1	49.88%	52.05%	55.77%	61.13%	12.89%	12.90%	13.10%	13.25%
Grade 2	6.22%	8.00%	6.62%	3.80%	17.77%	25.61%	25.17%	26.05%
High-Frequency Words								
Grade K	78.50%	78.90%	82.24%	83.02%	.00%	.00%	.00%	.00%
Grade 1	51.92%	51.06%	49.24%	47.71%	17.08%	21.48%	22.95%	24.16%
Grade 2	17.50%	17.03%	19.08%	16.47%	20.74%	29.01%	28.75%	26.25%
Phonics								
Grade K	75.28%	75.32%	76.76%	74.27%	.00%	.00%	.00%	.00%
Grade 1	60.12%	59.52%	60.79%	62.17%	14.55%	17.96%	16.11%	14.28%
Grade 2	37.44%	33.44%	33.39%	33.20%	33.15%	42.10%	38.94%	37.30%
Comprehension: Informational								
Grade K	57.19%	57.59%	59.87%	61.53%	.00%	.00%	.00%	.00%
Grade 1	63.65%	63.27%	64.10%	63.30%	12.11%	12.33%	13.51%	14.23%
Grade 2	42.65%	40.20%	39.73%	40.93%	29.00%	35.03%	35.43%	35.17%
Comprehension: Literature								
Grade K	60.42%	60.40%	62.47%	62.65%	.00%	.00%	.00%	.00%
Grade 1	60.30%	59.77%	60.55%	60.19%	14.49%	14.67%	16.14%	16.77%
Grade 2	42.67%	41.65%	41.43%	42.52%	30.01%	35.10%	35.47%	35.85%
Vocabulary								
Grade K	64.85%	66.11%	67.72%	68.43%	.00%	.00%	.00%	.00%
Grade 1	63.27%	61.08%	61.11%	60.40%	16.56%	18.61%	19.66%	20.41%
Grade 2	47.35%	43.20%	42.60%	42.68%	28.42%	34.59%	34.01%	34.01%

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Appendix Table 9. Percentage of Students On Grade Level in Mathematics

	Mid/Above				Early On			
Grade	**2019**	**2021**	**2022**	**2023**	**2019**	**2021**	**2022**	**2023**
Number and Operations								
Grade K	5.85%	7.06%	5.98%	6.27%	8.55%	8.47%	8.04%	8.14%
Grade 1	5.82%	6.66%	6.32%	6.17%	6.45%	6.34%	6.24%	6.22%
Grade 2	6.00%	5.45%	5.79%	5.73%	12.66%	10.76%	11.47%	11.51%
Algebra and Algebraic Thinking								
Grade K	5.66%	7.00%	5.97%	6.22%	8.79%	9.09%	8.70%	8.89%
Grade 1	12.67%	13.34%	11.67%	11.28%	9.99%	8.93%	9.16%	8.97%
Grade 2	8.97%	7.89%	8.18%	7.92%	14.54%	12.17%	12.04%	11.91%
Geometry								
Grade K	26.49%	26.51%	20.63%	20.55%	8.37%	7.82%	7.46%	7.59%
Grade 1	18.65%	17.23%	13.37%	10.85%	8.18%	7.17%	6.18%	5.94%
Grade 2	19.98%	13.80%	10.52%	10.19%	8.18%	8.16%	9.40%	9.20%
Measurement and Data								
Grade K	16.01%	16.90%	13.83%	13.75%	6.34%	6.01%	5.77%	6.30%
Grade 1	13.03%	11.54%	9.99%	8.97%	7.87%	7.49%	6.73%	6.29%
Grade 2	12.00%	9.94%	9.84%	9.43%	10.75%	8.52%	8.53%	8.29%

Appendix Table 10. Percentage of Students Below Grade Level in Mathematics

	One Below				Two Below			
Grade	**2019**	**2021**	**2022**	**2023**	**2019**	**2021**	**2022**	**2023**
Number and Operations								
Grade K	85.61%	84.47%	85.98%	85.59%	.00%	.00%	.00%	.00%
Grade 1	66.73%	62.55%	63.49%	63.05%	21.00%	24.45%	23.95%	24.55%
Grade 2	53.45%	49.09%	49.65%	49.79%	27.89%	34.70%	33.08%	32.96%
Algebra and Algebraic Thinking								
Grade K	85.56%	83.91%	85.33%	84.88%	.00%	.00%	.00%	.00%
Grade 1	60.33%	58.02%	59.97%	59.96%	17.01%	19.71%	19.20%	19.79%
Grade 2	57.62%	53.49%	54.96%	55.00%	18.87%	26.45%	24.83%	25.17%
Geometry								
Grade K	65.14%	65.67%	71.91%	71.86%	.00%	.00%	.00%	.00%
Grade 1	56.90%	56.09%	59.17%	61.39%	16.27%	19.51%	21.28%	21.82%
Grade 2	43.14%	40.23%	43.95%	43.37%	28.70%	37.81%	36.12%	37.24%
Measurement and Data								
Grade K	77.66%	77.09%	80.40%	79.95%	.00%	.00%	.00%	.00%
Grade 1	57.22%	56.65%	57.46%	57.95%	21.88%	24.32%	25.82%	26.78%
Grade 2	50.02%	47.82%	48.07%	47.70%	27.23%	33.72%	33.56%	34.59%

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