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Meta-analysis of Academic Recovery after COVID-19

2022

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CREDO, the Center for Research on Education Outcomes at Stanford University, was established to improve empirical evidence about education reform and student performance at the primary and secondary levels. CREDO at Stanford University supports education organizations and policy makers in using reliable research and program evaluation to assess the performance of education initiatives. CREDO's valuable insights help educators and policy makers strengthen their focus on the results from innovative programs, curricula, policies, and accountability practices.

Acknowledgments

CREDO gratefully acknowledges the support of the state education agencies that contributed their data to this partnership. Our data access partnerships form the foundation of CREDO's work, without which studies like this would be impossible.

Disclaimer

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Introduction

By mid-May of 2020, almost every state either ordered or recommended that schools close due to the COVID-19 pandemic, affecting more than 55 million US students.[1] This upheaval challenged education systems across the nation and caused a shift to distance learning. This transition was not planned, and the distance and online systems were not designed for mass education. As a result, many students did not learn as much as they would have in the absence of the public health emergency. Early forecasts and recent data alike show massive learning losses among students. The results from the National Assessment of Education Progress (NAEP), for example, show regression to pre-NCLB (No Child Left Behind) years.[2] Learning losses have grave consequences, not just for each student's school or college career, but also for students' future earnings.[3] The predictions from our analysis synthesize the local stories that dovetail with the national and international macroeconomic estimates of reductions in lifetime earnings or country productivity. Here, the impact is presented at a student level over a period of a few years.

Policy makers and school and district administrators recognize the urgent need for remedies to help all students recover from their pandemic-related learning losses. Most approaches, however, cannot adequately address the needs of students because they fail to factor in the pace at which students learn or how much this pace varies. This oversight distorts the potential value of the prevailing interventions that add teaching time at the margin. It also obscures better chances for success that focus on changing the rate at which students learn.

The Center for Research on Education Outcomes (CREDO) at Stanford University is uniquely positioned to offer insights into the recovery trajectory of students in the post-pandemic era. CREDO holds recent student-level data for over 30 states as part of our research consortium. We devised a multi-step process to create estimates of the time it will take students to recover from pandemic-related learning losses. Ultimately, we provided estimates of recovery times for 16 states/district. The participating states/district are shown in Table 1.

Table 1: *Participating States/District*

Arkansas	Indiana	New Jersey	South Carolina
Arizona	Kentucky	New Mexico	Texas
District of Columbia	Missouri	Nevada	Utah
Illinois	North Carolina	Rhode Island	Wisconsin

Combining pre-pandemic student-level data and a range of learning loss scenarios, we created individual estimates of recovery time. For each state/district, we built simulations of the average time students will need to reach established performance benchmarks as their learning recovers from the pandemic under each

[1] See https://www.edweek.org/leadership/map-coronavirus-and-school-closures-in-2019-2020/2020/03
[2] See https://www.nationsreportcard.gov/highlights/ltt/2022/
[3] Every year of schooling is estimated to raise earnings by 8 to 10 percent a year. See Claudio E. Montenegro and Harry Anthony Patrinos, "A Data Set of Comparable Estimates of the Private Rate of Return to Schooling in the World, 1970–2014," *International Journal of Manpower,* 2021. See also Eric A. Hanushek and Ludger Woessmann, "The Economic Impacts of Learning Losses," *OECD Education Working Papers*, no. 225 (2020) OECD Publishing, Paris, https://doi.org/10.1787/21908d74-en.

scenario. This meta-analysis synthesizes the results of all 16 states and provides recovery time estimates across all students in participating states.

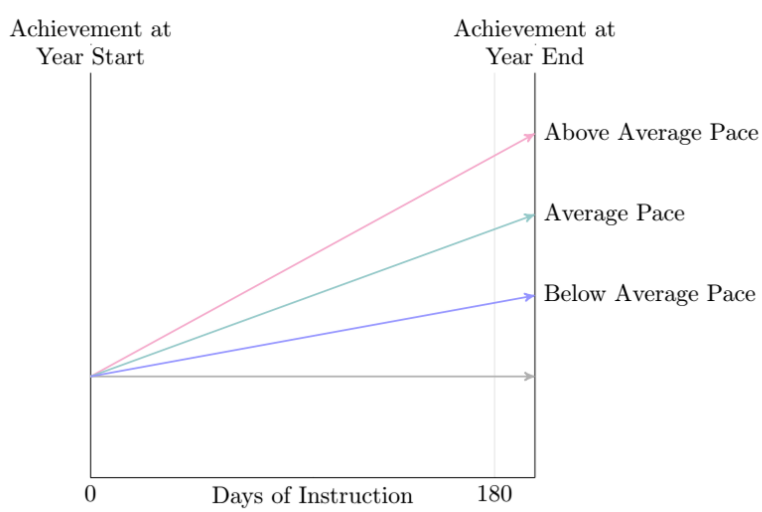
This paper is organized in three parts. In the following section, we outline our methodological approach. Next, we discuss the results across all students, the results by grade, and the results when we stratify students by student and school characteristics. Finally, we discuss the policy implications of the results, examining remedial approaches based on their underlying mechanism and their potential effectiveness in supporting student success.

Estimating the Recovery Horizon

Our analysis relies on three elements. The first is the observed academic standing of students in 2018–19. We assume that if COVID had not occurred, each student would have advanced by a full year in 2019–20. We treat the 2019–20 estimate with nine different scenarios of learning losses, based on research that shows that impacts vary across schools and across student groups. Finally, for each student, we compute their personal yearly pace of learning (POL) by averaging the year-to-year growth we observe the student makes between 2014–15 and 2018–19. The accompanying sidebar describes the association between pace of learning and achievement. Figure 1 also provides a visual representation of the association between pace of learning and achievement.

Based on these ingredients, we estimate how long it will take for each student to reach the milestone of the 50th percentile achievement for 12th grade. The milestone of 50th percentile achievement in grade 12 represents typical knowledge for students graduating from high school and reflects readiness for a career or college. To illustrate how this approach works for students, table 2 presents three examples of 5th-grade students with leaning losses equivalent to 90 days.

Figure 1: Schematic of Pace of Learning



Notes: The slope of each line represents the pace of learning that results in the observed magnitude of academic progress. Average pace (of learning) in each subject/grade equates to 180 days of learning in 180 days of instruction.

We consider three recovery horizons. The first is 12 years of schooling. In other words, we present the percentage of students reaching the milestone of 12th-grade knowledge by grade 12. We also consider the percentage of students reaching this milestone when three (i.e., 15 years total) and five (i.e., 17 years total) additional years of schooling are offered.

Table 2: Examples of Students' Recovery Time to Reach 12th Grade Average Knowledge

Student with	*1*	*Knowledge **25%** of a year above grade-level*	***90** days of losses, and a pace*	***20%** of a year **above** average*	*will need*	***No** additional years beyond grade 12*
Student with	*2*	*Knowledge **at** grade level*	***90** days of losses, and a pace*	***5%** of a year **above** average*	*will need*	***3** additional years beyond grade 12*
Student with	*3*	*Knowledge **at** grade level*	***90** days of losses, and a pace*	***20%** of a year **below** average*	*will need*	***More than 3** additional years beyond grade 12*

Note: Each of these examples considers a 5th-grade student with COVID learning losses equivalent to 90 days of learning.

Recovery Horizons Across States

In this meta-analysis, we present the results across all students in participating states/district graphically in figures 2 through 7. The length of the bars in each figure reflects the share of students reaching the milestone of average knowledge in grade 12. The difference between 100 and the share represented in the bars is the share of students not meeting the milestone.

Even if no learning loss occurred during COVID, substantial portions of students across the 16 participating states/district would not reach the knowledge benchmark by grade 12. Roughly 32 percent of all students would miss the mark in reading and 33 percent of them would miss it in math. As learning losses increase, the shares of students who are not on track by 12th grade increases. For example, for students who lost 90 days of learning, the sample-wide share of students who will miss the grade-12 knowledge milestone by the end of 12 years of schooling rises to 36 percent in reading and 37 percent in math. If we consider the scenario of 180 days of learning losses, figures 1 and 2 plot the percentage of students reaching the 12th-grade milestone under each recovery timeline and each learning loss scenario in reading and math, respectively. Detailed analytic results are provided in appendix tables 3 and 4 for reading and math, respectively. It is important to note that these findings show average results for the entire sample of states. State-level results spread around these overall average roughly minus-three to plus-three percentage points.

We can extend the analysis by considering the impacts of additional investments in learning. We estimate the status of each student with three additional years of instruction. We find that even with three additional years and no learning losses from the pandemic, approximately 26 percent of all students would miss the milestone in reading and math. Under the 90-day loss scenario and three additional years of instruction, the share of students missing the milestone increases to 29 percent in reading and math. Figures 1 and 2 as well as tables 3 and 4 provide estimates when we provide five additional years of instruction beyond grade 12.

Students in higher grades at the start of the pandemic are more likely to require additional years of effort beyond 12th grade to master 12th-grade knowledge, as they have a shorter runway to recover from their losses. Specifically, figure 3 and appendix tables 5 and 6 show that even with no learning losses only about 61 percent of high school students will exit their 12 years of schooling with 12th-grade knowledge in reading; for math the share of high school students expected to meet 12th-grade benchmarks is 58 percent. With learning losses of 90 days, the proportion of high school students with on-time benchmark performance falls to 56 percent in reading. In math, the share is 53 percent. This means that nearly half of high school students will require additional years of effort to meet average performance in 12th grade.

Because research has shown that the pandemic impacts on learning vary by student and school characteristics, we estimated how recovery time would differ as well. Across the entire sample—and likewise within individual states—the results vary for different student groups and for different school characteristics. These differences provide educators and policy makers deeper insight about student needs to guide decisions. Figures 4 and 5 show the share of students reaching average 12th-grade knowledge stratified by student groups in reading and math, respectively. Tables 7 and 8 provide detailed results by student groups in reading and math, respectively. Outcomes for some student groups are worse owing to their reduced rates of learning. We find fewer students who are members of historically underserved groups meeting the benchmark in every scenario compared to their more advantaged peers. Students who receive lunch subsidies, have special education needs, are English language learners, or are Black, Hispanic, or Native American have smaller shares meeting the 12th-grade benchmark in both the "no loss" and the "90-day loss" scenarios. Moreover, the magnitude of the differences with their peers is dramatic, as much as 30 percentage points in some cases. These results are consistent with the findings on how COVID affected students differently.

The different results for student groups are associated with the schools they attend, so it is not surprising that similar patterns emerge when the analysis examines school characteristics. Figures 6 and 7 plot the share of students reaching average 12th-grade knowledge stratified by school characteristics in reading and math, respectively. Tables 9 and 10 report results by school category in reading and math, respectively. Across the entire sample, there is no real difference seen between district schools and charter schools. When the locale of schools is used to group schools, differences emerge, with urban, virtual, and high schools showing lower shares of students able to reach the benchmark.

It is important to note that while the present analysis uses years of schooling, the relationship holds when smaller increments of additional instruction are proposed. The students who will need recovery support the most will have lower impacts due to their smaller POL.

Different Ways of Thinking about COVID Recovery

The aim of this meta-analysis is to make technical and policy contributions to the efforts across the nation to devise strategies to mitigate the impacts of the COVID-19 pandemic on public school students. The findings in no way denigrate the heroic efforts of policy makers, district and school administrators, teachers, and parents to find alternative ways to educate students in safe environments during the pandemic. At the same time, as education leaders attempt to reestablish a regular cadence of instruction and begin to address learning losses of their students, the effectiveness of the available avenues of remedial action has remained obscure. In the post-COVID environment, there are three different approaches to remediation: add instructional time to the current scheme; relax the time base of instruction; and re-engineer the pace of learning for students.

Add instructional time to the current scheme

Recent decisions to address the learning loss of students have focused on identifying inputs seen in other settings to improve student learning. The general approach has been to "add on" with extra programs or services to increase instructional time for students. Longer school days, extra days to the school year, or intra-year infusions of instruction such as tutoring are examples.

This approach has the effect of increasing the dosage of what students already receive. A visual way to think of this is to imagine shifting the "end of the year" axis in figure 1 by the amount of extra instructional time students are offered.

This alternative has a particularly tempting feature: the essential blueprint for school operations and instruction remains largely untouched. However, there are several drawbacks to dosage-based solutions:

1) The primary drawback is that during the additional period of instruction, a student's prevailing POL is the best we can expect to realize. In fact, it would be wise to consider the pre-COVID POL the upper bound on newer gains. Students will add learning at the same pace as they learn under regular conditions. If a student has a historical pace of learning that is 50 percent of the expected gain from regular instruction, then the expected yield of additional instruction would be 50 percent as well. Thus, the students who need the extra help the most are likely to gain the least from it.
2) The math does not add up. Adding resources at the margin cannot occur at such a volume or scale that the learning loss is retired (see NWEA[4] and Kane[5] articles on the effect gap). There are simply not enough hours of intervention possible.
3) The intervention will be time-limited and constrained by funding, and then the system will return to its former levels of performance.
4) Supply challenges affect many of the neediest communities.[6]
5) We do not know if the impacts seen in short-term solutions hold over a longer period. Other extended interventions show ceiling and taper-off effects.

Relax the time base of instruction

One option is to modify the fixed time-base of learning and let students progress at their own pace toward established benchmarks. This could be achieved through a transformation of grade-level organization to

[4] See https://www.edworkingpapers.com/sites/default/files/ai20-226-v2.pdf
[5] See https://cepr.harvard.edu/files/cepr/files/5-4.pdf?m=1651690491
[6] See https://www.ed.gov/news/press-releases/us-department-education-answers-president-bidens-call-action-spur-academic-recovery.

mastery-based learning as the basis for advancement and open-ended enrollment as long as students continue to progress. High-achieving students can reach the benchmarks faster than we usually allow and move on to more distant goals. Early completion frees up resources currently spent on students who are required to spend the entire school year in classrooms, whether they need to or not.

If we reallocate the "savings" from faster progressing students to improving the pace of learning of below average students, the overall results will improve—an increase in both effectiveness and efficiency.

This option is not without its challenges. There are important redesign requirements for this approach:

1) There is a need to define in greater detail what the benchmarks cover. Many states have made commendable progress on defining "the profile of a graduate" to detail the learning and skills that students must achieve to meet the standard of high school graduation.
2) Assessments of student performance must become mastery-based, centered on explicit demonstrations of content knowledge and advanced cognitive and noncognitive abilities.
3) Instructional plans must become more individualized. Many schools already use personalized learning plans to one extent or another. Learning management systems hold promise for more extensive individualization and tracking of student learning. Integration with mastery-benchmarked assessments could be the key to allowing each student to progress as they are able.
4) Universal records of student mastery are needed that create common maps of knowledge and skills; this could eventually be integrated into skill maps for occupations or pathways for additional study and work.

Re-engineer the pace of learning for students

The most impactful way to address the problem of learning loss is to improve the rate at which students learn. In this case, we mean shifting the POL—i.e., the slope of the learning line—upward for students.

To realize greater student learning gains, students need to receive higher quality instruction. The record is clear: better teachers derive more learning from their students than their peers.[7] Ensuring high quality instruction in every classroom is the Holy Grail for policy makers and educators alike.

We already identify the best teachers through a number of competitions; the purpose here is both more serious and more impactful. We could use the qualitative and quantitative information at hand to identify teachers with outsized impacts on students. The extensive data on student-level standardized tests is one important source of data on how much learning occurs with each teacher. Concern about variation in the mix of students from year to year smooths out if we look at a teacher's impact over a number of student cohorts. These estimates become stronger with additional assessments from principals, peers, and other experts. Reliable estimates of teacher performance are well within reach.

We could then deploy high-impact teachers in new ways. One approach would be to offer incentives to motivate higher quality teachers to add students to their classes. For example, we could offer better teachers an additional increment in pay for adding students to their roster. Alternatively, they could earn credit for each

[7] See Eric A. Hanushek, "The Trade-off between Child Quantity and Quality," *Journal of Political Economy* 100, no. 1 (February 1992): 84–117.

extra student for later sabbatical or special training. Drawing in students with a slower pace of learning gives them a high quality teacher and higher performing peers, both of which stimulate student performance.[8]

A second option is possible where the supply of high-need students outstrips the supply of high-impact teachers. For credentialing reasons, each state needs to implement this plan separately. For each grade, we seek out the best teacher for a given subject. For example, we could find the best 5th-grade math teacher in Georgia. That teacher would receive a substantial payment to have their entire year of teaching for that subject recorded. The videos and all the supporting materials—lesson plans, worksheets, quizzes, etc.—would be digitized and posted online for other teachers to use.

We call this approach the Instructional Commons. It offers significant benefits: a peer-to-peer training model, the opportunity for teachers to observe high quality instruction in depth, a ready resource for their own lesson planning (better than a Sunday night Google search), and a common standard for educators and administrators to employ for professional development. If adopted successfully, this approach would elevate the caliber of the existing teacher force at a relatively modest cost and without political battles.

[8] See Ronald Heck, "Teacher Effectiveness and Student Achievement: Investigating a Multilevel Cross-classified Model," *Journal of Educational Administration* 47, no. 2 (March 2009): 227–49.

Conclusion

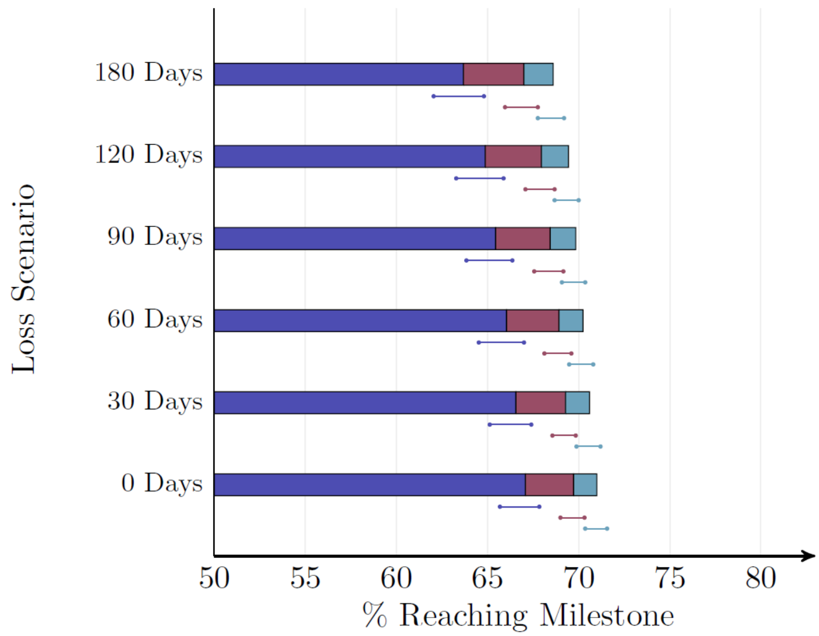
As our understanding of the impact of COVID on student knowledge becomes clearer and widespread losses are documented, students, their communities, and the nation critically need remedies. This is particularly true for students who were struggling academically even before the pandemic. Our results demonstrate how widely the historical pace of learning differs across students. In a typical 180-day school year, some students' learning gains amount to less than a full year of learning and others realize more than a year. These differences create much longer timelines for recovery from COVID than is currently discussed. Current proposals for remedial action have failed to consider these differences in choosing COVID recovery approaches.

Efforts to supplement the existing modes of learning with tutoring or mentoring will yield only the historical pace of learning for students because these infusions occur at the margin of an unchanged system. There are significant time and resource constraints that make it highly unlikely that students receive enough of these programs to erase their learning deficits from COVID. We conclude that the path to real mitigation lies in approaches that recognize the differences in students' pace of learning and either exploit them for better outcomes for all or seek to change them for the students who need the extra learning.

Each of the considered approaches carries both promise and risk which could be expected to vary across schools and districts. State-level leaders need to provide guidance and political support as these approaches develop. They also must serve a critical function of implementation monitoring and performance measurement to provide all stakeholders the transparency needed to make clear-eyed decisions to meet the needs of students.

Figure 2: *Percentage of Students Reaching the Milestone of 12th-grade Knowledge*

Panel A: Reading



Panel B: Mathematics

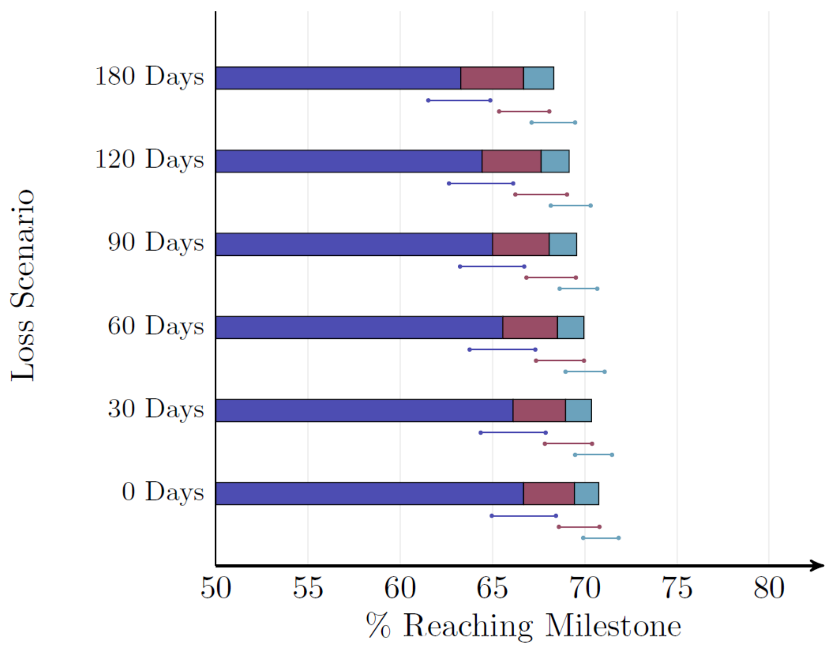


Figure 3: *Percentage of Students Reaching the Milestone of 12th-grade Knowledge by Grade*

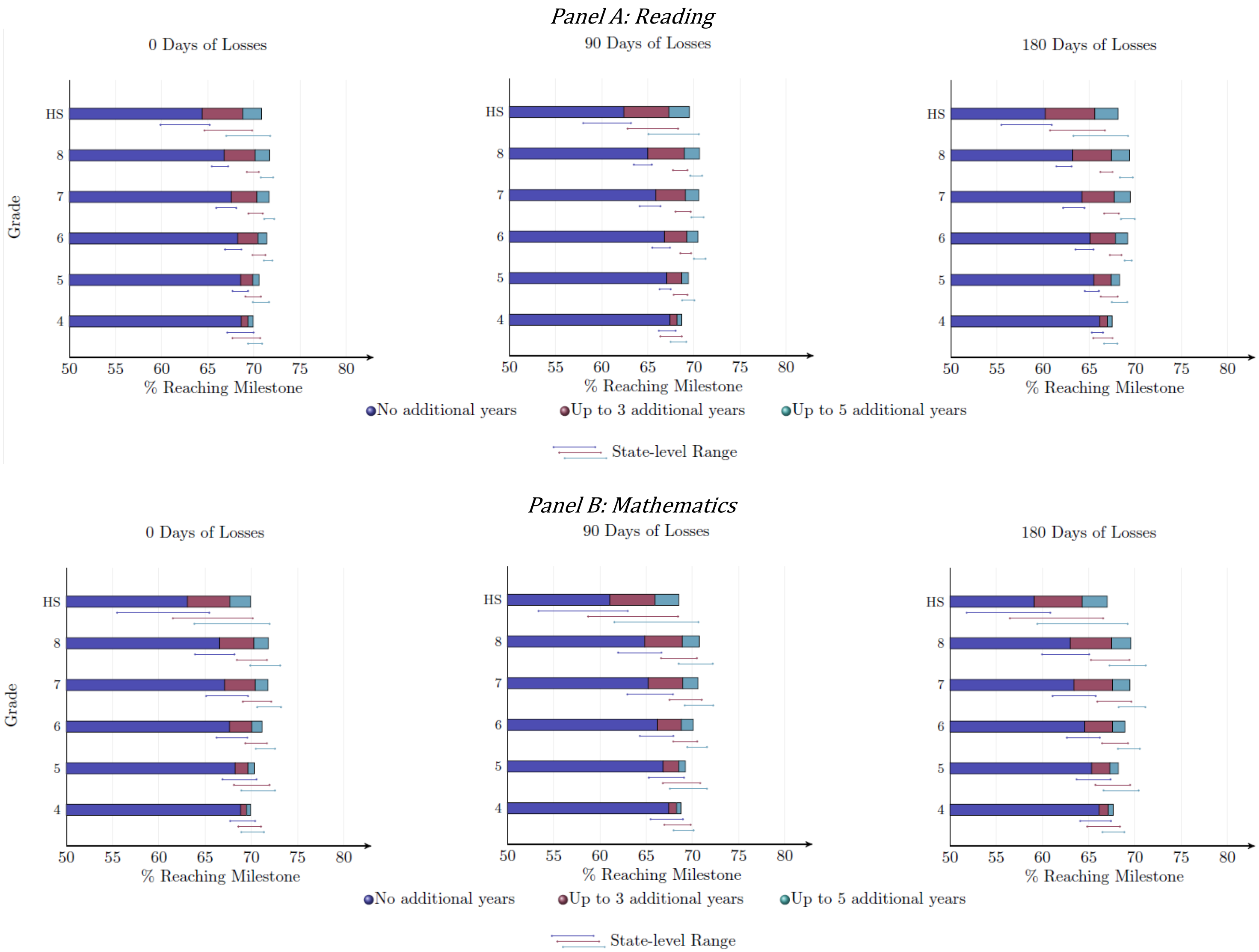


Figure 4: *Percentage of Students Reaching the Milestone of 12th-grade Knowledge by Student Group in Reading*

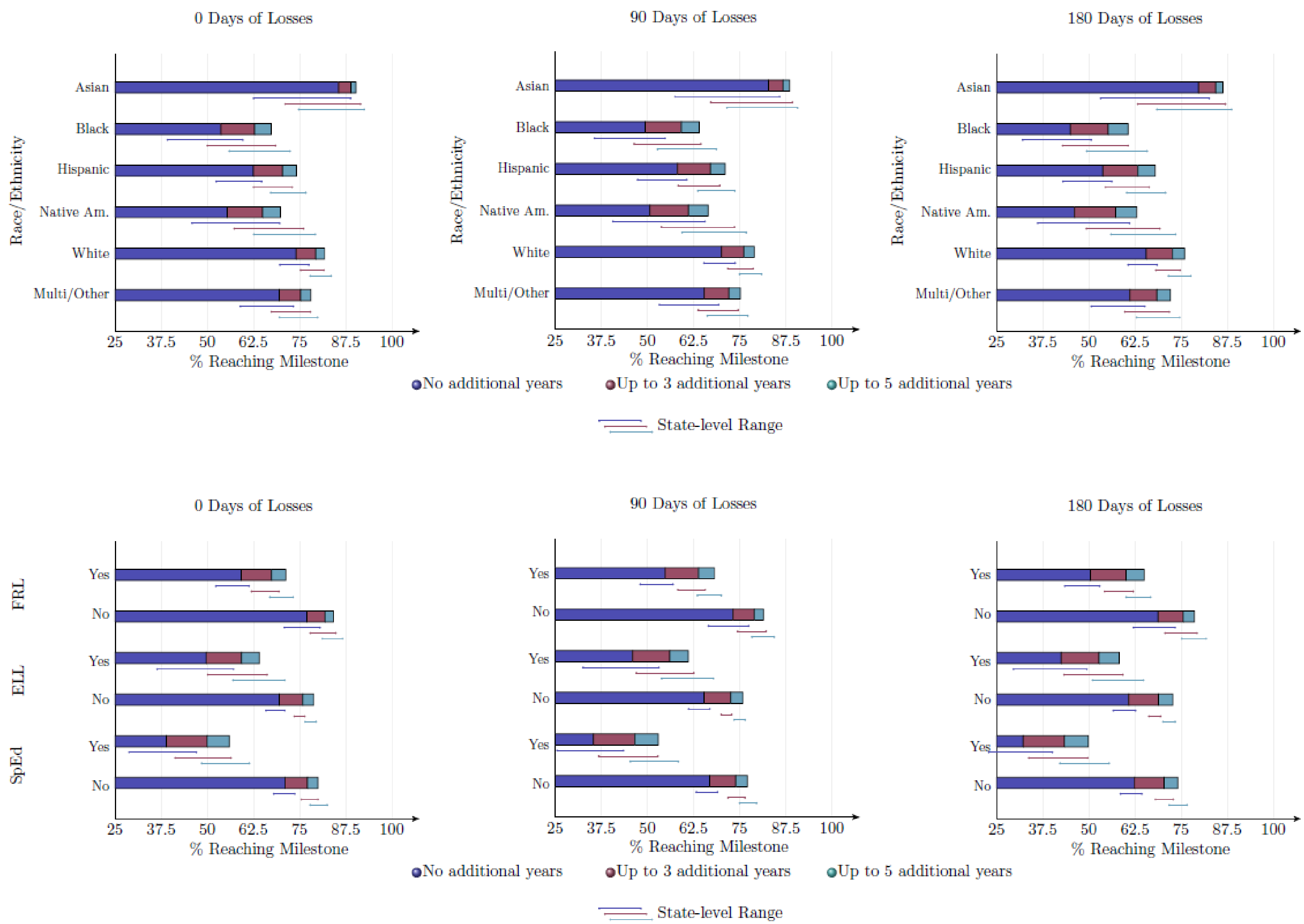


Figure 5: *Percentage of Students Reaching the Milestone of 12th-grade Knowledge by Student Group in Mathematics*

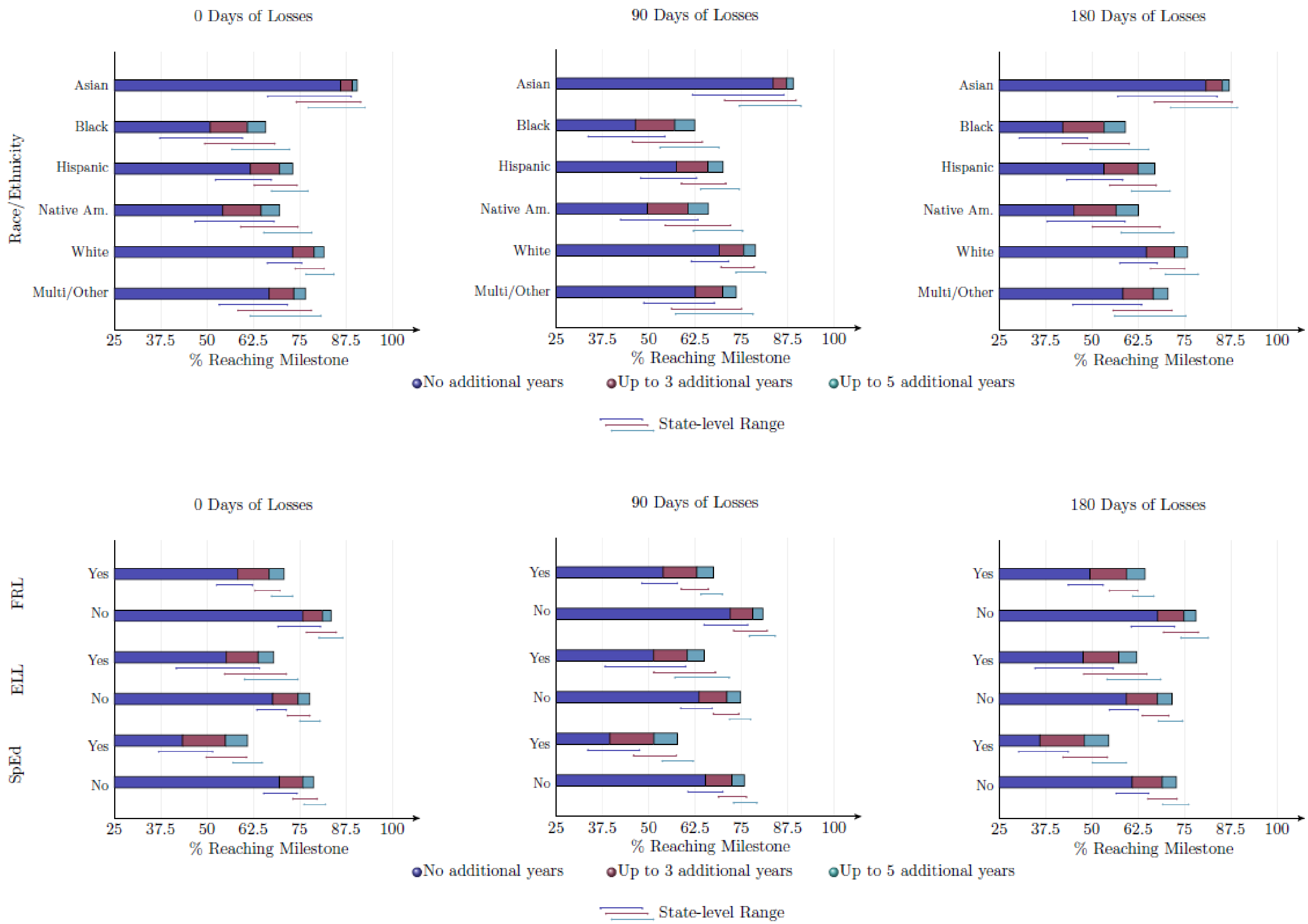


Figure 6: Percentage of Students Reaching the Milestone of 12th-grade Knowledge by School Category in Reading

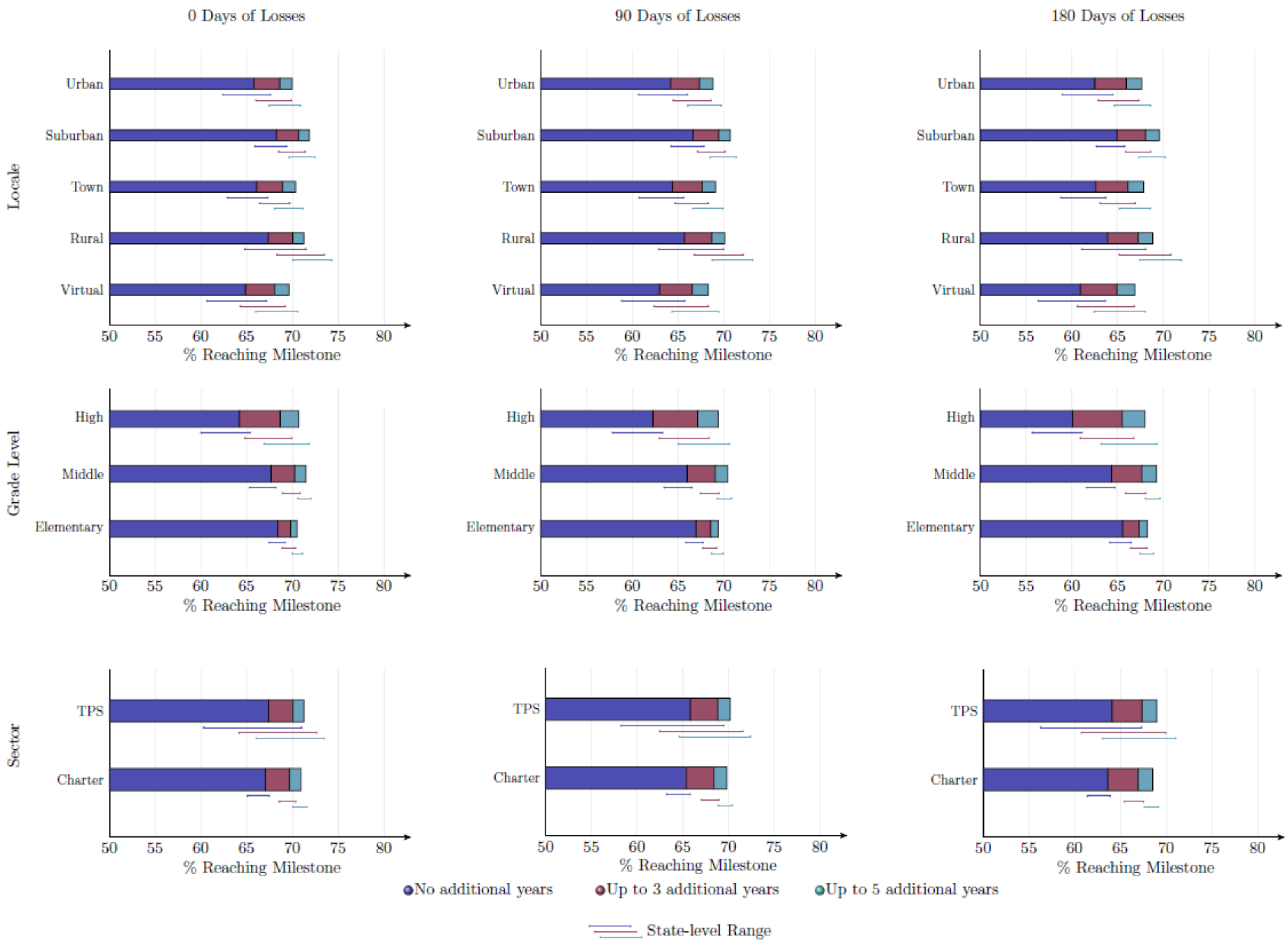
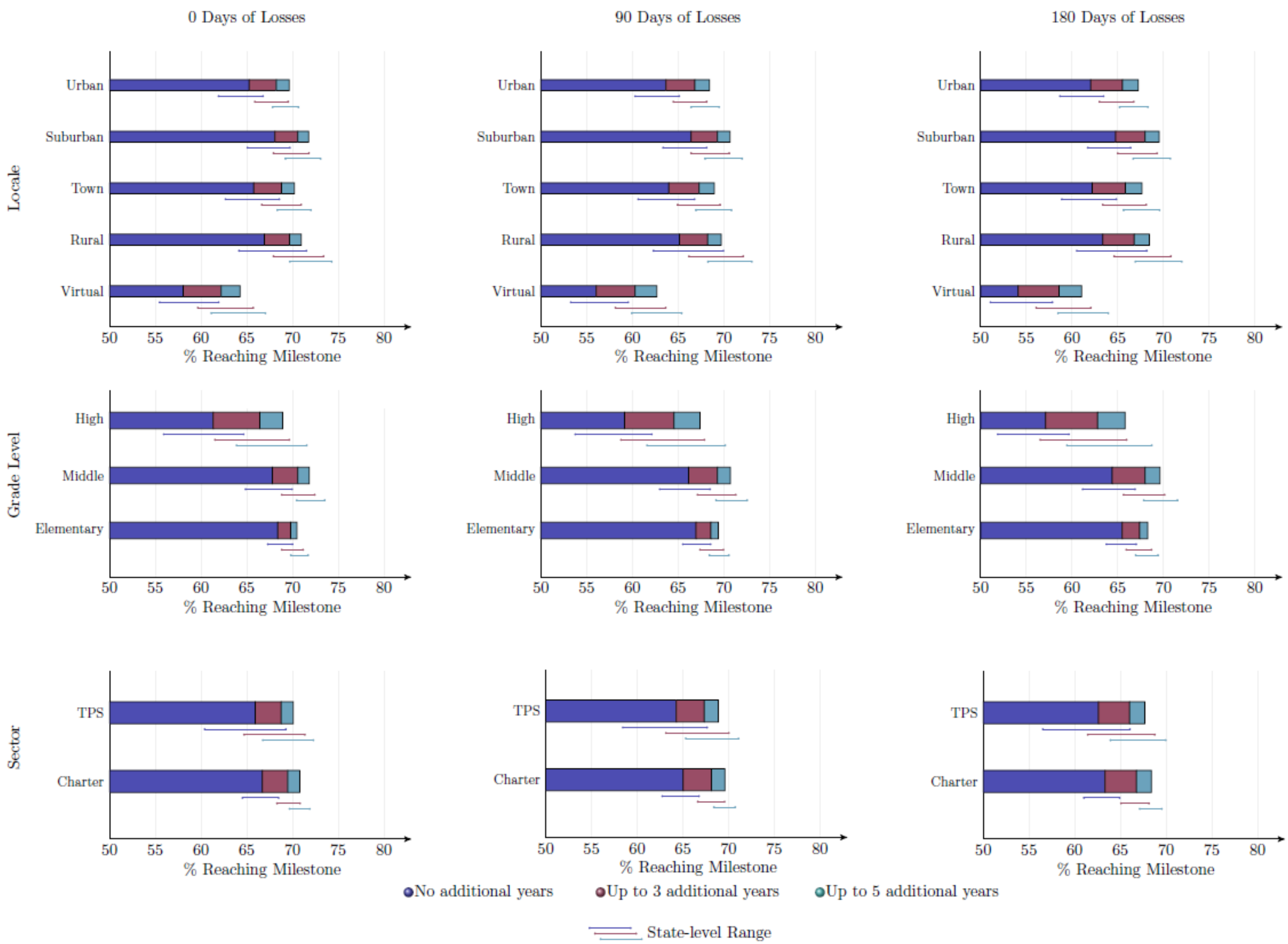


Figure 7: Percentage of Students Reaching the Milestone of 12th-grade Knowledge by School Category in Mathematics



Appendix

Methodological Approach

Our approach can be summarized by the following equation:

$$Years\ to\ Milestone = f(\ Covid - impacted\ Achievement,\ Past\ Progress\ Rate)$$

where COVID-impacted achievement is obtained as follows. We use a student's achievement (standardized scores from state assessments) in 2018–19 as a proxy for achievement in 2019–20 and create nine learning loss scenarios for a student's starting point at the beginning of the 2020–21 school year. Each learning loss scenario is reflected in a number of days of lost learning due to the pandemic.[9] This step produces nine scenarios of COVID-impacted achievement. For brevity, this meta-analysis shows six scenarios, ranging from 0 days of loss to 180 days of loss.

To estimate each student's past progress rate or pace of learning, we take his/her average progress (i.e., change in standardized scores) from 2014–15 to 2018–19. For each of the nine starting points, we apply the student's pace of learning each year for 2020–21 and beyond. The 50th percentile by grade 12 is used as the achievement milestone. As mentioned earlier, this milestone represents typical knowledge of students graduating high school and may reflect readiness for a career or college study. We estimate whether the student will reach the milestone of 50th percentile of achievement by grade 12 or whether they will require additional years of effort. In particular, we consider whether each student will reach the milestone when three or five additional years of schooling are offered beyond grade 12.

The years to milestone are calculated based on the assumption that the past progress rate is as fast as we can possibly expect students to progress in the future in the current school system. This conceptual exercise used ad hoc scenarios of learning loss. Should actual learning loss data become available, it would be possible to re-calculate the share of students reaching the milestone.

Analytic Results

Tables 3 and 4 present results for all students across participating states/district for reading and math, respectively. Tables 5 and 6 show the results stratified by grade for reading and math, respectively.[10] Tables 7 and 8 report the percentage of students reaching the milestone by student group in reading and math, respectively. Tables 9 and 10 present results by school characteristics in reading and math, respectively.

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[9] We transform days of learning to z-scores using a standard transformation procedure. This procedure was built by Dr. Eric Hanushek and Dr. Margaret Raymond based on the 2017 4th and 8th grade test scores from the National Assessment of Educational Progress (NAEP). Using a standard 180-day school year, each one standard deviation (s.d.) change in effect size was equivalent to 590 days of learning in this study. For more details on this methodology, see Eric A. Hanushek, Paul E. Peterson, and Ludger Woessmann. "Achievement Growth: International and US State Trends in Student Performance. PEPG Report No.: 12-03." Program on Education Policy and Governance, Harvard University (2012).

[10] HS stands for High School and encompasses grades nine through 12.

Table 3: *Percentage of Students Reaching Milestone at Grade 12 or with Additional Years in Reading*

Loss Scenario (in Days)	No additional years	Up to 3 additional years	Up to 5 additional years
0	67.7 [64.2, 69.6]	74.3 [72.5, 75.8]	77.5 [75.9, 78.9]
30	66.4 [62.8, 68.5]	73.2 [71.4, 74.6]	76.5 [74.7, 78.0]
60	65.1 [61.3, 67.5]	72.3 [70.3, 74.0]	75.6 [73.7, 77.0]
90	63.6 [59.6, 65.9]	71.1 [68.9, 72.9]	74.6 [72.7, 75.9]
120	62.2 [58.2, 64.7]	69.9 [67.7, 71.7]	73.6 [71.7, 75.0]
180	59.2 [55.1, 62.0]	67.5 [64.9, 69.4]	71.5 [69.4, 73.0]

Notes: Numbers represent percentages. Each cell represents calculations across all students in participating states. Minimum and maximum state-level values are reported in brackets.

Table 4: *Percentage of Students Reaching Milestone at Grade 12 or with Additional Years in Math*

Loss Scenario (in Days)	No additional years	Up to 3 additional years	Up to 5 additional years
0	66.7 [62.4, 71.1]	73.6 [71.5, 77.0]	76.9 [74.8, 79.6]
30	65.3 [60.9, 69.7]	72.4 [69.6, 76.0]	75.9 [73.7, 78.7]
60	63.9 [59.4, 68.3]	71.3 [68.4, 74.9]	74.9 [72.4, 77.7]
90	62.5 [58.1, 66.8]	70.2 [67.1, 73.8]	73.9 [71.6, 76.7]
120	61.1 [56.6, 65.3]	69.1 [65.6, 72.6]	72.9 [70.4, 75.8]
180	58.2 [53.8, 62.2]	66.7 [62.4, 70.2]	70.8 [67.8, 73.7]

Notes: Numbers represent percentages. Each cell represents calculations across all students in participating states. Minimum and maximum state-level values are reported in brackets.

Table 5: Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by Grade in Reading

	No Losses			90 Days of Loss			180 Days of Loss		
Grade	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
4	71.6 [67.8, 74.9]	73.4 [69.2, 76.7]	74.8 [73.4, 77.2]	68.5 [65.5, 70.0]	70.4 [65.9, 71.7]	71.7 [68.7, 72.9]	65.3 [63.2, 66.2]	67.4 [63.6, 68.8]	68.7 [66.5, 70.1]
5	71.4 [69.2, 73.4]	74.7 [72.7, 76.9]	76.4 [74.7, 79.1]	67.6 [65.7, 68.7]	71.7 [69.5, 73.2]	73.5 [71.8, 75.1]	63.7 [61.3, 65.1]	68.4 [65.6, 70.2]	70.7 [68.6, 72.8]
6	70.6 [67.2, 71.6]	76.1 [74.6, 78.1]	78.5 [77.7, 80.0]	67.0 [63.7, 68.5]	73.1 [71.3, 74.2]	76.1 [75.0, 78.1]	62.7 [58.8, 63.6]	69.6 [68.1, 71.2]	72.9 [72.1, 74.0]
7	68.9 [64.8, 70.2]	75.8 [73.5, 77.4]	79.1 [77.8, 80.5]	64.7 [60.3, 65.9]	72.7 [70.0, 74.1]	76.3 [74.3, 77.6]	60.5 [55.4, 61.2]	69.3 [66.5, 70.5]	73.6 [71.1, 74.8]
8	67.0 [63.6, 68.0]	75.3 [73.1, 76.3]	79.2 [76.9, 80.2]	62.5 [58.7, 63.6]	72.4 [69.3, 73.2]	76.5 [74.0, 77.2]	58.0 [53.6, 57.7]	68.5 [65.5, 68.8]	73.4 [70.8, 74.3]
HS	61.0 [49.7, 63.0]	72.0 [61.6, 74.5]	77.1 [67.5, 79.4]	56.0 [45.0, 57.9]	68.2 [57.0, 70.7]	73.8 [62.7, 76.3]	50.6 [38.7, 52.3]	64.0 [51.9, 66.7]	70.3 [58.2, 73.0]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each grade in participating states. Minimum and maximum state-level values are reported in brackets.

Table 6: Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by Grade in Mathematics

	No Losses			90 Days of Loss			180 Days of Loss		
Grade	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
4	72.1 [69.3, 76.0]	73.7 [71.5, 77.6]	74.8 [72.3, 78.4]	68.6 [63.7, 72.4]	70.7 [67.4, 74.5]	71.9 [69.9, 75.3]	65.3 [60.2, 68.5]	67.8 [62.1, 70.9]	69.1 [66.2, 72.1]
5	70.6 [67.2, 76.4]	74.1 [70.3, 79.9]	75.8 [72.3, 81.4]	67.1 [63.2, 72.7]	71.3 [67.0, 77.1]	73.1 [68.9, 78.9]	63.3 [59.2, 68.4]	68.2 [64.3, 73.7]	70.5 [66.5, 76.0]
6	69.1 [65.6, 73.9]	75.1 [73.4, 79.2]	77.9[76.2, 81.4]	65.5 [60.8, 69.8]	72.0 [69.8, 76.3]	75.2 [73.6, 78.9]	61.4 [56.6, 65.5]	68.9 [66.1, 73.1]	72.3 [70.4, 76.3]
7	67.8 [62.8, 74.1]	76.0 [72.7, 80.4]	79.5[76.6, 83.0]	63.1 [57.4, 69.7]	72.4 [68.8, 77.5]	76.5 [72.9, 80.6]	58.5 [52.7, 64.4]	68.9 [64.8, 74.0]	73.6 [70.6, 77.8]
8	66.4 [59.8, 70.4]	75.7 [71.1, 79.2]	79.6[74.7, 82.8]	62.1 [54.9, 66.6]	72.3 [66.5, 76.2]	76.8 [71.3, 80.5]	57.5 [49.9, 62.6]	68.7 [63.1, 73.5]	73.9 [68.1, 77.9]
HS	57.7 [38.7, 63.6]	69.2 [53.8, 75.4]	74.8[59.6, 79.9]	52.7 [33.4, 57.5]	64.9 [46.8, 71.1]	71.3 [53.9, 76.6]	47.7 [29.5, 52.1]	60.7 [41.2, 66.4]	67.5 [48.6, 73.0]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each grade in participating states. Minimum and maximum state-level values are reported in brackets.

Table 7: Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by Student Group in Reading

	No Losses			90 Days of Loss			180 Days of Loss		
Student Group	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
Not FRL Eligible	77.0 [70.9, 80.5]	81.9 [77.9, 84.8]	84.2 [81.2, 86.6]	73.2 [66.6, 77.4]	79.0 [74.5, 82.2]	81.5 [78.3, 84.4]	68.8 [62.1, 73.4]	75.6 [70.7, 79.3]	78.6 [75.2, 81.8]
FRL Eligible	59.2 [52.3, 61.3]	67.4 [62.0, 69.4]	71.3 [67.0, 73.2]	54.8 [48.1, 56.9]	63.9 [58.3, 65.7]	68.2 [63.6, 70.0]	50.4 [43.5, 52.9]	60.1 [54.3, 62.0]	65.0 [60.2, 66.7]
Not ELL	69.5 [65.9, 71.0]	75.8 [73.6, 76.4]	78.8 [76.5, 79.5]	65.3 [61.2, 66.9]	72.6 [70.0, 72.8]	75.9 [73.5, 76.5]	60.8 [56.6, 62.7]	68.9 [66.3, 69.4]	72.8 [70.1, 73.4]
ELL	49.7 [36.4, 57.1]	59.3 [50.2, 66.2]	64.1 [57.0, 71.0]	46.0 [32.6, 53.1]	56.1 [47.0, 62.6]	61.1 [53.9, 67.9]	42.5 [29.6, 49.5]	52.8 [43.3, 59.2]	58.2 [51.0, 64.8]
Not in Special Ed	71.1 [68.0, 73.7]	77.2 [75.5, 80.0]	80.0 [77.9, 82.5]	66.9 [63.3, 69.0]	74.0 [71.9, 76.5]	77.1 [75.0, 79.6]	62.4 [58.6, 64.3]	70.4 [68.1, 72.9]	74.1 [71.8, 76.6]
In Special Ed	38.9 [28.8, 47.0]	50.0 [41.3, 56.4]	56.0 [48.5, 61.4]	35.4 [25.5, 43.5]	46.6 [36.9, 52.9]	53.0 [45.4, 58.4]	32.2 [22.9, 40.1]	43.4 [33.8, 49.7]	49.9 [42.2, 55.5]
Asian	85.6 [62.5, 88.8]	88.9 [71.1, 91.5]	90.3 [74.8, 92.5]	82.8 [57.5, 85.8]	86.8 [67.2, 89.3]	88.5 [71.6, 90.7]	79.7 [53.2, 82.6]	84.4 [63.3, 87.0]	86.4 [68.5, 88.7]
Black	53.7 [39.2, 59.6]	62.8 [50.0, 68.5]	67.3 [56.0, 72.4]	49.4 [35.7, 54.8]	59.2 [46.4, 64.5]	64.1 [52.8, 68.7]	45.0 [32.1, 50.6]	55.3 [42.9, 60.6]	60.7 [49.5, 65.8]
Hispanic	62.5 [52.4, 64.7]	70.4 [62.5, 73.0]	74.2 [67.2, 76.7]	58.2 [47.4, 60.7]	67.1 [58.4, 69.6]	71.1 [63.7, 73.7]	53.8 [43.0, 56.2]	63.3 [54.6, 66.3]	68.0 [60.3, 70.8]
Native Am.	55.4 [45.9, 69.6]	65.0 [57.3, 76.0]	69.8 [62.6, 79.3]	50.7 [40.7, 65.6]	61.2 [53.8, 73.6]	66.5 [59.4, 76.8]	46.1 [36.2, 61.0]	57.3 [49.4, 69.2]	63.0 [56.0, 73.5]

White	74.1 [69.7, 77.5]	79.4 [75.3, 81.6]	81.8 [77.9, 83.5]	70.1 [65.3, 73.8]	76.2 [71.8, 78.7]	79.0 [75.0, 80.9]	65.6 [60.7, 68.5]	72.7 [68.2, 74.7]	76.0 [71.6, 77.6]
Multi/Other	69.5 [59.0, 73.3]	75.3 [67.4, 77.9]	78.0 [69.6, 79.9]	65.4 [53.3, 69.3]	72.1 [63.8, 74.6]	75.2 [66.3, 77.2]	61.1 [50.7, 65.2]	68.5 [59.8, 71.8]	72.1 [63.0, 74.6]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each group in participating states. Minimum and maximum state-level values are reported in brackets.

Table 8: *Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by Student Group in Mathematics*

	No Losses			90 Days of Loss			180 Days of Loss		
Student Group	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
Not FRL Eligible	75.9 [69.2, 80.6]	81.2 [76.9, 84.9]	83.5 [80.3, 86.6]	72.0 [65.0, 76.7]	78.1 [73.0, 82.0]	80.9 [77.2, 84.2]	67.8 [60.7, 72.3]	74.9 [69.4, 78.7]	78.1 [74.1, 81.4]
FRL Eligible	58.3 [52.6, 62.3]	66.8 [63.0, 69.7]	70.8 [67.5, 73.1]	53.9 [48.2, 57.7]	63.0 [58.8, 66.1]	67.5 [64.2, 69.9]	49.5 [43.7, 53.0]	59.4 [54.8, 62.4]	64.3 [61.1, 66.7]
Not ELL	67.8 [63.5, 71.4]	74.6 [71.8, 77.7]	77.7 [75.1, 80.5]	63.6 [58.7, 67.1]	71.1 [67.5, 74.3]	74.8 [71.8, 77.5]	59.3 [54.8, 62.5]	67.7 [63.7, 70.7]	71.7 [68.0, 74.5]
ELL	55.2 [41.8, 64.2]	63.8 [54.8, 71.4]	68.0 [60.2, 74.5]	51.3 [38.3, 59.9]	60.4 [51.4, 68.0]	65.0 [57.1, 71.7]	47.6 [34.7, 55.7]	57.3 [47.8, 64.8]	62.1 [54.2, 68.6]
Not in Special Ed	69.5 [65.4, 74.3]	75.9 [73.3, 79.7]	78.8 [76.3, 82.0]	65.3 [60.6, 70.0]	72.5 [68.9, 76.4]	75.9 [73.0, 79.2]	60.9 [56.6, 65.3]	69.0 [65.1, 72.9]	72.8 [69.2, 76.1]
In Special Ed	43.4 [37.0, 51.5]	55.0 [49.8, 60.6]	60.9 [57.1, 64.9]	39.5 [33.6, 47.5]	51.4 [45.9, 57.5]	57.8 [53.7, 62.0]	36.0 [30.3, 43.6]	48.0 [42.3, 54.2]	54.6 [50.2, 59.3]
Asian	86.1 [66.4, 88.9]	89.2 [74.2, 91.5]	90.6 [77.4, 92.6]	83.6 [61.9, 86.5]	87.3 [70.5, 89.8]	89.0 [74.5, 91.1]	80.8 [57.1, 83.8]	85.2 [66.9, 87.8]	87.1 [71.3, 89.3]
Black	50.9 [37.3, 59.6]	60.9 [49.4, 68.3]	65.8 [56.8, 72.2]	46.5 [33.7, 54.3]	57.0 [45.6, 64.5]	62.4 [53.1, 69.0]	42.2 [30.4, 48.8]	53.3 [42.1, 60.1]	59.0 [49.6, 65.3]
Hispanic	61.8 [52.3, 67.4]	69.6 [62.8, 74.3]	73.2 [67.5, 77.2]	57.5 [47.9, 62.9]	65.9 [58.9, 70.8]	70.1 [64.1, 74.4]	53.2 [43.3, 58.3]	62.5 [54.9, 67.3]	67.0 [60.8, 71.1]
Native Am.	54.3 [46.8, 68.1]	64.7 [59.2, 74.5]	69.6 [65.4, 78.2]	49.7 [42.4, 63.3]	60.6 [54.5, 72.1]	66.1 [62.1, 75.4]	45.2 [38.0, 58.9]	56.6 [50.2, 68.4]	62.6 [58.0, 72.1]

White	73.2 [66.3, 75.6]	79.0 [73.9, 81.6]	81.6 [76.8, 84.2]	69.1 [61.6, 71.5]	75.7 [69.6, 78.5]	78.8 [73.6, 81.6]	64.7 [57.6, 67.6]	72.3 [65.9, 75.0]	75.8 [69.9, 78.7]
Multi/Other	66.8 [53.4, 71.7]	73.5 [58.4, 78.1]	76.6 [61.8, 80.7]	62.6 [48.7, 67.7]	70.0 [56.2, 75.1]	73.6 [57.3, 78.2]	58.4 [44.9, 63.4]	66.6 [55.8, 71.6]	70.5 [56.2, 75.3]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each group in participating states. Minimum and maximum state-level values are reported in brackets.

Table 9: Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by School Category in Reading

	No Losses			90 Days of Loss			180 Days of Loss		
School Category	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
TPS	67.6 [62.7, 68.7]	74.3 [71.5, 75.9]	77.4 [75.2, 79.0]	63.5 [58.1, 64.5]	71.0 [67.7, 72.3]	74.5 [72.2, 76.0]	59.1 [53.5, 59.7]	67.4 [63.7, 68.8]	71.4 [69.1, 72.9]
Charter	68.6 [50.8, 77.5]	75.2 [60.5, 81.7]	78.2 [65.2, 83.7]	64.6 [45.7, 73.7]	72.1 [56.2, 78.9]	75.5 [61.6, 81.0]	60.3 [40.8, 68.3]	68.5 [51.9, 74.9]	72.5 [57.7, 77.6]
Urban	64.5 [56.1, 69.0]	71.6 [65.1, 74.7]	75.0 [68.7, 77.2]	60.5 [51.8, 65.1]	68.4 [61.2, 71.5]	72.1 [65.2, 74.3]	56.3 [47.4, 61.1]	64.9 [57.2, 68.2]	69.1 [61.6, 71.5]
Suburban	70.7 [64.8, 73.5]	76.8 [71.3, 78.5]	79.7 [74.2, 81.2]	66.6 [60.7, 69.6]	73.7 [67.9, 75.4]	76.8 [71.3, 78.4]	62.3 [56.7, 64.4]	70.1 [64.7, 71.5]	73.9 [68.3, 75.5]
Town	65.3 [57.3, 68.2]	72.4 [66.1, 74.3]	75.9 [70.2, 77.9]	61.0 [52.0, 64.0]	69.1 [61.7, 70.8]	72.8 [66.6, 74.8]	56.5 [47.0, 59.2]	65.3 [57.7, 67.3]	69.6 [63.1, 71.4]
Rural	68.5 [62.1, 78.7]	75.1 [70.9, 83.7]	78.2 [75.2, 85.7]	64.3 [57.3, 75.0]	71.8 [67.0, 80.3]	75.3 [71.9, 82.9]	59.7 [52.7, 70.1]	68.1 [63.0, 77.0]	72.1 [68.5, 79.9]
Virtual	62.2 [51.8, 67.9]	70.2 [60.8, 73.1]	74.1 [65.0, 76.5]	57.5 [47.2, 64.3]	66.4 [56.0, 70.8]	70.8 [60.9, 73.6]	52.3 [40.8, 59.1]	62.3 [51.5, 67.0]	67.2 [56.1, 70.0]
Elementary School	71.1 [68.7, 73.0]	74.5 [72.3, 75.8]	76.3 [75.0, 77.8]	67.5 [64.7, 69.3]	71.5 [69.3, 73.0]	73.5 [71.7, 74.9]	63.9 [60.4, 66.1]	68.3 [66.0, 70.4]	70.6 [68.6, 72.3]
Middle School	69.2 [63.4, 70.5]	75.7 [72.4, 77.1]	78.7 [76.5, 80.0]	65.1 [58.8, 66.2]	72.7 [68.7, 73.7]	76.1 [73.3, 77.1]	60.8 [54.0, 61.7]	69.1 [64.7, 70.1]	73.1 [70.1, 74.1]
High School	60.6 [50.1, 63.4]	71.7 [62.1, 74.8]	76.8 [67.4, 79.6]	55.7 [44.7, 58.3]	67.9 [57.4, 71.0]	73.5 [62.6, 76.5]	50.2 [39.2, 52.7]	63.7 [52.3, 66.9]	70.0 [58.1, 73.2]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each category in participating states. Minimum and maximum state-level values are reported in brackets.

Table 10: Percentage of Students Reaching Milestone at Grade 12 or with Additional Years by School Category in Mathematics

	No Losses			90 Days of Loss			180 Days of Loss		
School Category	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years	No additional years	Up to 3 additional years	Up to 5 additional years
TPS	66.8 [61.3, 71.2]	73.7 [70.8, 77.1]	77.0 [74.2, 79.7]	62.6 [56.9, 66.9]	70.3 [66.6, 73.9]	74.0 [71.0, 76.8]	58.3 [52.5, 62.3]	66.9 [62.7, 70.3]	71.0 [67.8, 73.8]
Charter	64.8 [51.0, 73.2]	71.9 [61.8, 78.4]	75.2 [66.9, 80.7]	60.7 [46.1, 69.1]	68.4 [57.9, 75.1]	72.2 [63.3, 77.7]	56.5 [41.3, 65.1]	65.0 [53.6, 71.9]	69.2 [59.8, 74.9]
Urban	63.2 [54.8, 66.9]	70.6 [64.7, 73.8]	74.1 [69.6, 76.6]	59.2 [50.8, 62.8]	67.1 [61.2, 70.3]	71.1 [66.1, 73.7]	55.1 [46.7, 58.6]	63.8 [57.5, 66.9]	68.1 [63.0, 70.7]
Suburban	70.2 [62.7, 74.3]	76.5 [69.8, 79.5]	79.4 [73.1, 82.7]	66.1 [58.4, 70.3]	73.3 [66.1, 76.5]	76.7 [69.9, 80.0]	61.9 [54.3, 66.0]	70.0 [62.5, 73.2]	73.8 [66.7, 76.9]
Town	64.4 [56.7, 71.4]	72.0 [66.6, 77.4]	75.5 [70.9, 80.0]	60.0 [51.6, 67.0]	68.3 [62.4, 74.0]	72.4 [67.4, 77.1]	55.5 [47.2, 62.1]	64.6 [58.4, 70.3]	69.1 [64.1, 73.9]
Rural	67.3 [60.4, 78.8]	74.2 [69.8, 83.5]	77.4 [74.3, 85.7]	62.9 [55.8, 74.9]	70.6 [65.5, 80.3]	74.3 [70.7, 82.7]	58.4 [51.3, 70.4]	67.0 [61.5, 77.0]	71.1 [67.3, 80.0]
Virtual	45.1 [38.7, 54.8]	55.5 [49.1, 64.3]	60.7 [52.8, 67.6]	40.1 [33.2, 48.9]	50.8 [45.4, 59.1]	56.7 [49.9, 63.5]	35.3 [27.7, 44.6]	46.4 [40.2, 55.1]	52.6 [46.2, 59.9]
Elementary School	71.0 [68.3, 75.0]	74.5 [72.1, 77.9]	76.2 [74.6, 79.3]	67.4 [63.8, 71.4]	71.5 [68.5, 74.9]	73.5 [71.1, 76.4]	63.7 [59.4, 67.5]	68.5 [64.8, 71.7]	70.7 [67.4, 73.5]
Middle School	69.5 [62.2, 74.9]	76.5 [72.1, 81.1]	79.6 [76.2, 83.8]	65.4 [57.5, 71.2]	73.3 [67.8, 78.3]	76.8 [72.9, 81.4]	61.0 [52.9, 67.2]	70.0 [64.1, 75.3]	74.0 [69.6, 78.8]
High School	53.3 [39.8, 61.6]	66.1 [53.8, 74.1]	72.3 [59.7, 78.9]	47.9 [34.4, 55.3]	61.4 [46.9, 69.7]	68.5 [54.0, 75.4]	42.8 [29.7, 49.1]	57.0 [41.3, 64.9]	64.5 [48.6, 71.8]

Notes: Numbers represent percentages. Each cell represents calculations across all students in each category in participating states. Minimum and maximum state-level values are reported in brackets.