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The Impact of a 2021 Summer School Program on Student Achievement

Sarah S. Barry
Georgia State University, sbarry8@student.gsu.edu

Tim Sass
Georgia State University, tsass@gsu.edu

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Sarah S. Barry and Tim R. Sass

Metro Atlanta Policy Lab for Education

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Background and Motivation

Motivation

At the onset of the COVID-19 pandemic in March 2020, school districts around the country were forced to close their physical schools and transition to remote or virtual instruction. Many schools, including those in metro Atlanta, remained closed at the beginning of the subsequent fall 2020 semester—with schools reopening for some students later in the school year (2020–2021). Research from early in the pandemic showed lower achievement growth compared to pre-pandemic levels as well as widening achievement gaps.[1,2,3,4] The slowdown in achievement growth prompted many school districts to consider various acceleration strategies to address disparities in educational experiences during the pandemic and help students catch up after lost instructional time.

In this report, we analyze one such effort: a summer school program implemented in one metro-Atlanta school district (hereafter, "the district") in summer 2021. The district had previously offered a virtual summer school program early in the pandemic in summer 2020. Prettyman and Sass (2021) studied the efficacy of the summer 2020 program, finding that only about one-quarter of students who were expected to attend actually participated. Participants experienced greater achievement gains in math than did non-participants, with the gains concentrated in elementary grades. These differences do not necessarily reflect the true impact of summer school participation, as the observed achievement growth differences may be the result of unmeasured student characteristics (e.g., student motivation or family resources) that affected participation and student test scores.[5]

About the Program

The district's 2021 summer school program was open to students in all grades, though various criteria were used to invite students to participate in the program. The purposes, content and delivery mode of the summer program varied across grades. For high school students, the program was intended to allow students to make up failed or incomplete courses or provide opportunities for acceleration by taking additional courses. Most of the high school offerings were virtual. For middle and elementary school students, the program was intended to provide additional instruction in particular subject areas based on student needs. Most elementary and middle school sessions were delivered in a face-to-face format (with the exception of middle school world language instruction).

The summer program included a three-week June session (all grades) and a three-week July session (only elementary and high school), with elementary and high school students having the option of registering for both sessions. While high school students received instruction in the specific course(s) needed, elementary and middle school students received more generalized instruction—with elementary students receiving instruction in both math and reading and middle school students registering for instruction in math, reading/English Language Arts, science, social studies, and/or world language instruction. The program had no tuition or fees, except for high school students who wanted to do acceleration coursework.

While providing academic instruction, the in-person summer school program also offered additional holistic benefits: Students received free breakfast and lunch, and most students received free transportation to face-to-face sessions.

Invitation to the Program

The district used a total of 12 criteria to determine whether a student would be invited to the summer school program. These criteria broadly fall into several categories:

- below-grade-level formative test scores (Grades 1–8),
- incomplete course grades (Grades 2–12),
- failing course grades (Grade 6–12),
- low assignment completion (less than 51% engagement) during remote learning (Grades K–1),
- retention consideration (Grades K–8),
- teacher recommendation (all grades),
- certain adapted curriculum benchmarks (all grades),
- registration for course acceleration (Grades 9–12), and
- opting in to attending without an invitation (all grades).

A student was invited based on the test-score criterion if they obtained a score on the school year (SY) 2020–21 mid-year (winter) i-Ready assessment that was categorized as “below grade level” for their grade level and subject area (math or reading). The district defines a failing course grade as a grade below

70%. Invitations were sent home in April 2021 to all students who met one or more of the eligibility criteria, with a registration deadline in May 2021.

Existing Literature

Summer school programs were a popular acceleration method even before the pandemic. However, there are few rigorous studies of the impact of voluntary summer school programs on student outcomes. The available evidence suggests that summer school programs can have positive effects on student achievement, particularly in mathematics.[6] However, the magnitude of these effects depends on the content and duration of summer programs as well as the level of student attendance.[7,8,9] The estimated impacts of summer school participation on various student sub-groups are mixed.[10,11,12] Additionally, many studies report low attendance rates for summer programs, especially among students from households experiencing low income.[13,14] While we focus on the effects of summer school on student achievement in this study, prior research has linked participation in summer programs to increased student engagement and improved social-emotional outcomes.[15,16]

Research Questions

We address two research questions:

1. Which students were invited to participate in summer school, and which students actually attended the program?
2. How did the summer school program impact achievement for students who were invited to attend relative to those who were not invited and did not attend?

Data

We use data from the district covering student formative assessment scores from fall and winter of SY 2020–21 and fall of SY 2021–22, middle school course grades, student demographic characteristics, and summer school attendance. While students could be invited to summer school for any one of 12 reasons, we cannot identify students who were invited for 4 less-common reasons: acceleration (applies only to high school), teacher recommendation, retention consideration, and failure to master an adapted curriculum. We also cannot directly identify students who opt in to the program due to a personal or family request. We see these students (as well as those invited for the four less common reasons enumerated above) as attending summer school but without a documented reason.

Given these limitations, in the main analysis, we exclude students who attended summer school for any reason other than below-grade-level test scores on the prior winter exam. Nevertheless, this sample accounts for a majority of the students invited to participate (77% of all known invitees). This sample restriction also mitigates potential bias from self-selection into the summer program. For students who were not invited but chose to participate, their observed outcomes may be a result of summer school participation or unobserved factors like student motivation or parental preferences that led to be registered for summer school.

We focus the analysis on students in Grades 1 through 8 as these grades comprise students for whom we have formative assessment data. Among elementary and middle school students who were invited to participate in summer school, virtually all (97%) had below-grade-level scores on the prior winter formative assessment. An analysis based on a much smaller group of middle school students who were invited due to failing a course is included in the appendix to this report.

Because students were invited based on their winter SY 2020–21 i-Ready scores, we use those scores to measure how close they were to cutoff for invitation. Winter i-Ready scores were re-centered to have a value of zero for the cutoff value in the relevant grade and subject. We use each student's lowest (re-centered) score between math and reading, as being below grade level in one subject would yield an invitation to summer school. We then use formative test scores from the beginning of SY 2021–22 as the outcome variable with separate analyses for math and reading and a summed score of both math and reading. Grade 1 students are only considered in the reading analysis because math scores were only an eligibility criterion for students in Grade 2 and above.

We use data on summer school eligibility to determine which students were initially invited and for what reason and data on summer school attendance to determine which students attended the program. Combined with student demographic data, we can examine which students attended by demographic sub-group, the extent of summer school participation, and the school at which a student participated.

Methodology

Given that the district used specific criteria to invite students to summer school, we use a regression discontinuity design (RDD) to examine the impact of the summer school program on students who were invited compared to those who were not. Essentially, the RDD compares outcomes of students who were barely ineligible for summer school (i.e., barely at grade level) on the mid-year i-Ready assessment to students who were barely eligible (i.e., students who were barely below grade level) to determine the impact of eligibility on student achievement in the following fall semester.

The primary advantage of the RDD is that it helps us understand the true impact of the program. In other words it yields unbiased estimates of the causal impacts of the summer school program (much like a randomized experiment). Students just above or just below the invitation threshold should be similar in their observable characteristics (e.g., test scores and race/ethnicity) and in their unobserved traits (e.g., motivation or parental resources). By guessing right on a couple of exam questions, a student that would otherwise have fallen below the at-grade-level benchmark would have been considered to be at grade level, thus making the invitation decision as good as random for the students near the cutoff.

One drawback of the RDD is that we are only measuring impacts for students near the eligibility cutoff, so our results may not generalize to as wide a range of students. Students with prior scores well below the grade-level threshold could experience different benefits from the summer school program than those near the cutoff. By focusing on students near the invitation threshold, we also effectively rely on a smaller sample to determine impacts, which makes it more difficult to detect a meaningful effect.

Another caveat is that we consider students who were *invited* rather than those who *attended*, as there may be unobservable characteristics for the students who attended that would influence the results.[17] Using this analytical approach means that students who were invited but chose not to attend may be influencing the results. However, focusing on invited students is most relevant for policy decisions as it captures both the extent of participation as well as the impact of the program on those who participate. Technical details for the RDD and associated robustness checks are provided in the appendix.

In addition to evaluating the causal impact of invitation, we explore the variation in achievement growth among different student groups who attended the summer program relative to the variation in achievement growth across groups of students who did not attend. We consider differences across gender, free or reduced-price meals (FRPM) eligibility (a crude proxy measure for economic disadvantage), English learner status, and whether students attended one or both summer sessions.

Finding 1: Summer School Invitation and Attendance

Among students invited to attend summer school, participation was low. Of those who attended, a high proportion were from families experiencing low income and/or English learners.

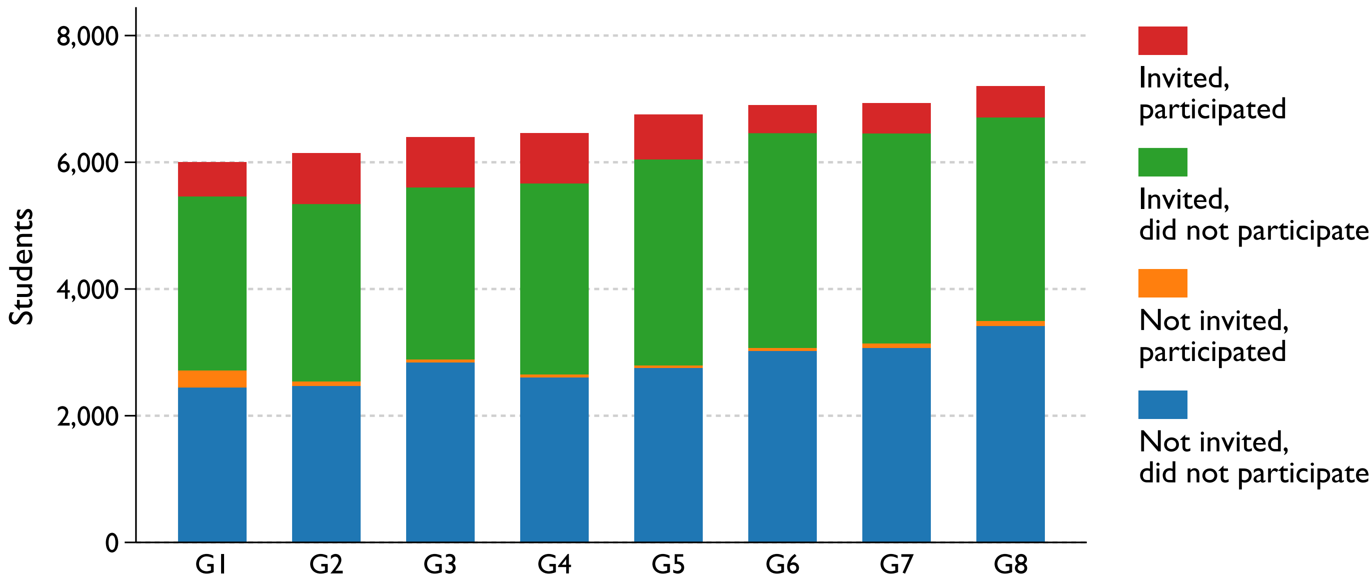
For our analysis of the impact of being invited to summer school, all students in the district fall into one of the following four categories:

- They were not initially invited to participate (due to not having a below-grade-level i-Ready score), and they did not attend the summer school program;
- They were not initially invited because their i-Ready scores placed them in the "at-grade-level" category but attended for some other reason;
- They were initially invited to participate due to below-grade-level i-Ready scores but did not attend; or
- They were initially invited to participate due to low i-Ready scores and attended.

Overall, 18% of students who were initially invited to participate in the summer program attended. Similarly, among elementary and middle-school students who were invited based on prior below-grade-level i-Ready scores, 17% attended. Among elementary and middle school students who attended, the vast majority (88%) were invited due to low i-Ready scores.

Figure 1 shows the breakdown by grade level of students who were eligible for the summer school program due to below-grade-level i-Ready scores and the students who actually participated in the program. In all grade levels, a comparable number of students were invited and not invited, with a large majority opting not to attend. In addition, slightly more students opted to

Figure 1. Summer School Invitation and Participation by Grade Level



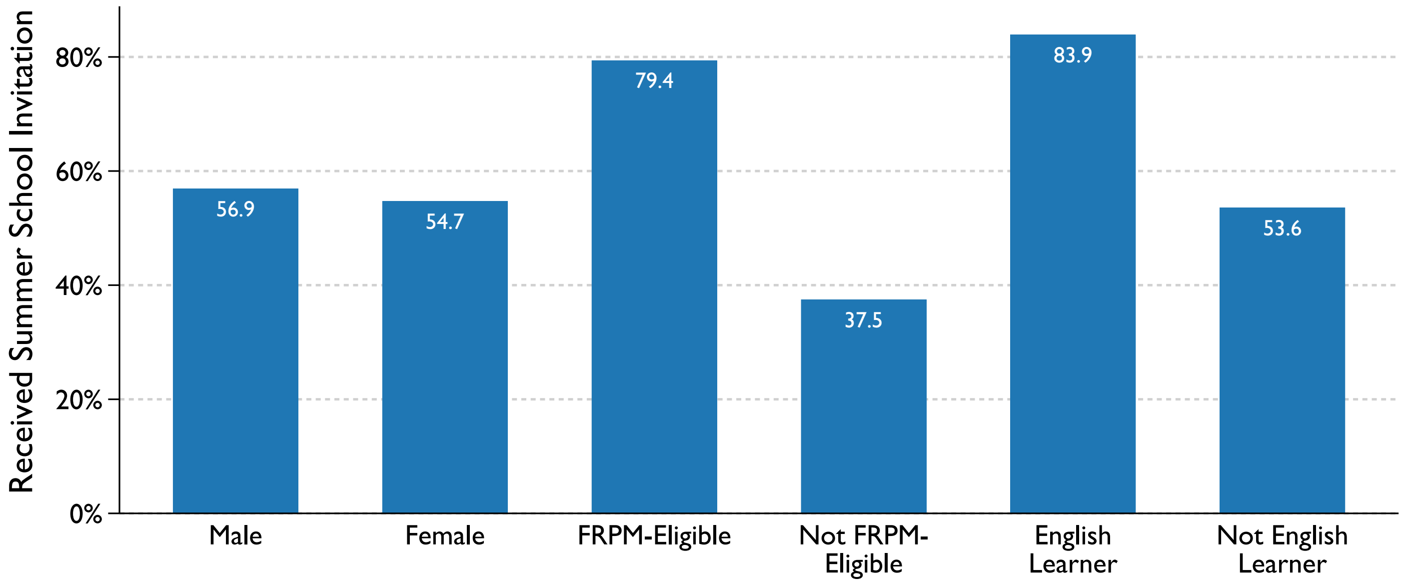
Notes. Figure shows the number of students who received an invitation due to having a below-grade-level score on the middle of year i-Ready assessment in the 2020–21 school year and their subsequent participation in summer school.

attend in elementary grades than in middle grades. The number of students who attended but were not invited due to i-Ready scores is relatively constant across grades levels—except for first grade—which had additional eligibility criteria.

Figure 2 shows the proportion of elementary and middle school students receiving summer school invitations due to below-grade-level i-Ready scores by demographic characteristics. A similar proportion of male and female students were invited to participate. However, we see substantial differences in the likelihood of invitation by eligibility for FRPM and English learner status. Nearly 80% of FRPM-eligible students were invited to summer school, whereas fewer than 40% of non-FRPM-eligible students received invitations. Likewise, more than 80% of English learners received invitations, while less than half of English-proficient students were invited to participate in summer school.

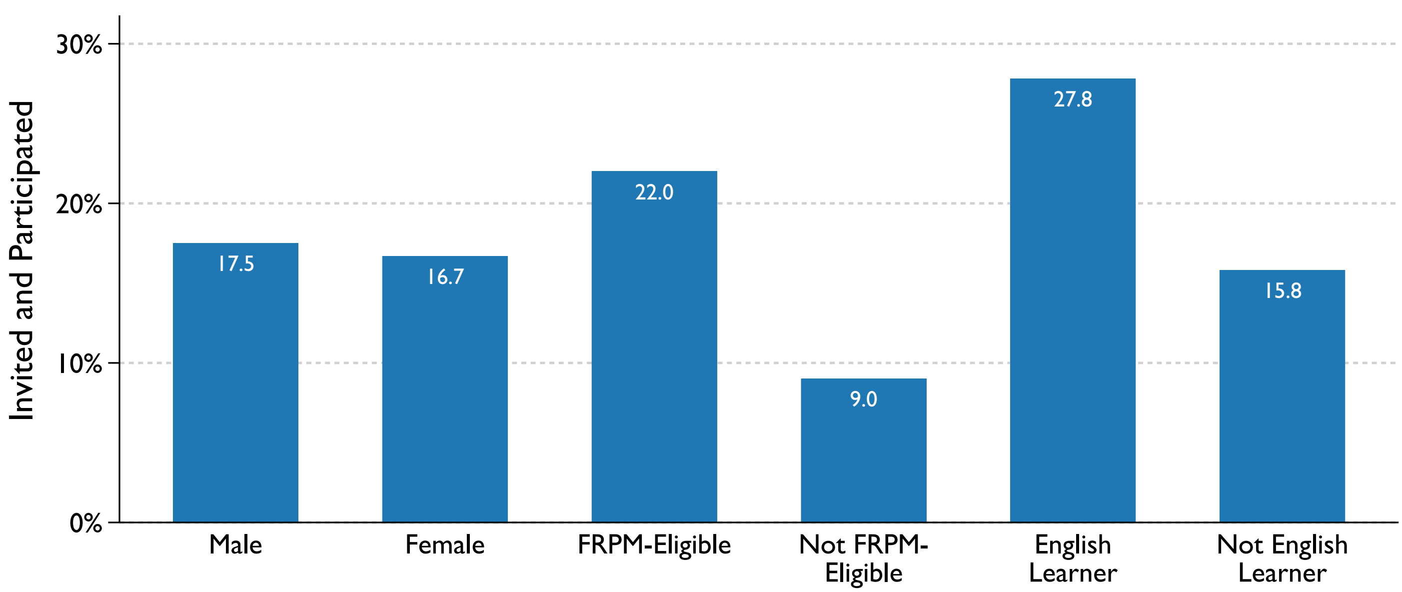
Figure 3 shows the participation rates of students who were invited to participate, by demographic sub-group. Participation rates were similar for male and female students. Conditional on invitation, however, participation rates were much higher among students from economically-disadvantaged backgrounds and English learners. Given the high invitation rate and high participation rate (conditional on invitation) among FRPM-eligible students, nearly 80% of summer school participants were FRPM-eligible while slightly more than 20% of non-participants were FRPM-eligible.

Figure 2. Summer School Invitation by Subgroup



Notes. Percentages denote the percentage of students in each sub-group who received an invitation due to a below-grade-level score on the middle-of-year i-Ready assessment in the 2020–21 school year.

Figure 3. Summer School Participation Among Invitees



Notes. Percentages denote the percentage of students in each sub-group who were invited due to having a below-grade-level i-Ready score who opted to attend the summer program.

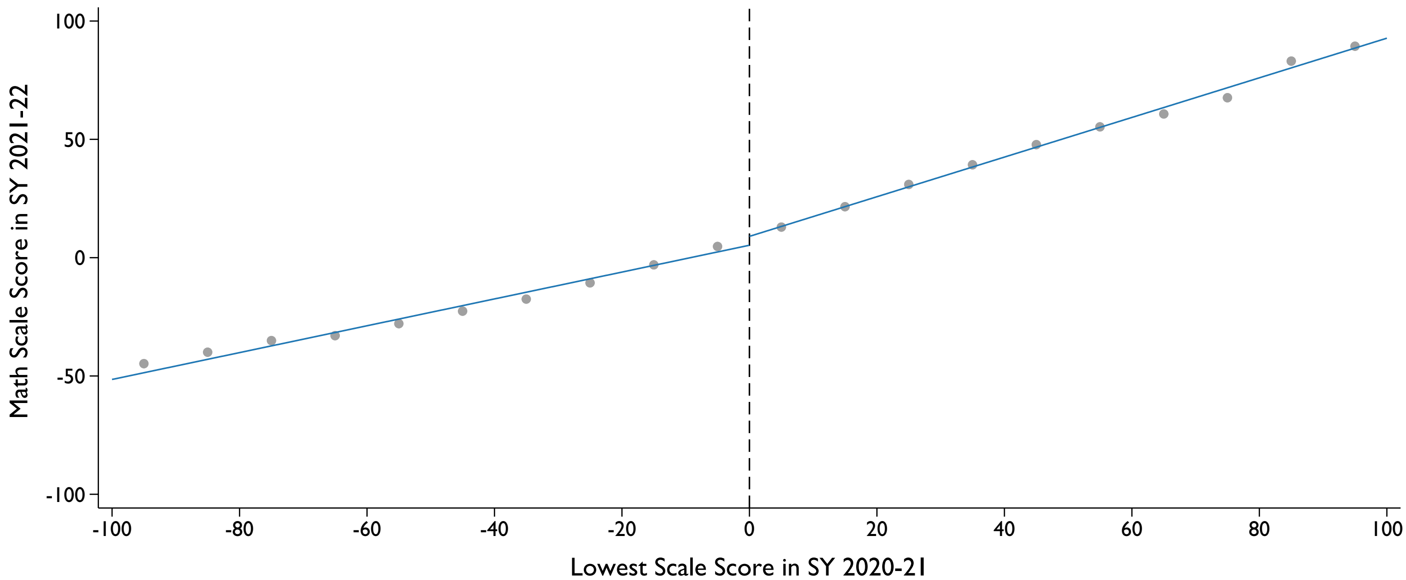
Finding 2: Impacts of Being Invited to Summer School

Summer school invitations had little impact on student achievement.

We estimate the impact of being invited to summer school by analyzing student formative assessment scores at the beginning of the 2021–22 school year. Specifically, we compare students who were just below the grade-level cutoff in the winter of SY 2020–21 to those just above the cutoff to estimate whether summer school invitations impacted achievement levels at the beginning of the following school year. This approach also accounts for trends in the outcome of fall test scores as we observe students with prior-winter test scores that are further from the cutoff.

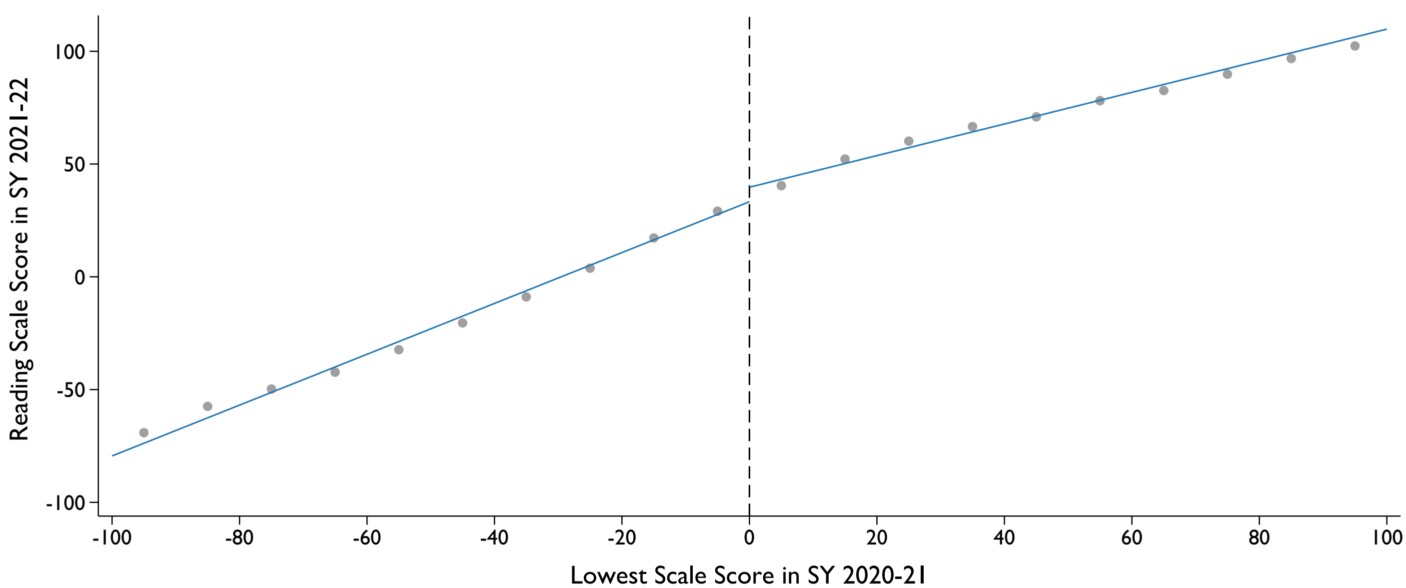
Figures 4 and 5 graphically show the results of the analysis. Middle-of-year (MOY) winter test scores for SY 2020–21 are on the horizontal axis, expressed as deviations from the relevant grade-level cutoff. The below-grade-level cutoff is denoted by the black vertical line at 0. If the invitation to summer school (and associated increase in the likelihood of attending) affected student achievement, we would expect to see a distinct drop in fall SY 2021–22 test scores moving from the left of the cutoff to the right of the cutoff. This is not what we observe, however, indicating that an invitation to the summer school program did not boost student achievement levels when students returned to school after the summer. This finding applies to both math achievement (Figure 4) and reading achievement (Figure 5). In addition, we do not see any meaningful impacts of invitations when considering various student sub-groups separately (see Figures A3–A5 and the associated estimated effects in Tables A4–A6 in the appendix).

Figure 4. RD Analysis of Fall 2021 Math Test Scores



Notes. Points represent the average (centered) fall math scale within a segment (bin) of prior winter scale scores. There are 10 bins of equal size on each side of the cutoff. Lines represent the linear trend in fall scores, relative to prior winter scores, on each side of the invitation eligibility cutoff.

Figure 5. RD Analysis of Fall 2021 Reading Test Scores



Notes. Points represent the average (centered) fall math scale within a segment (bin) of prior winter scale scores. There are 10 bins of equal size on each side of the cutoff. Lines represent the linear trend in fall scores, relative to prior winter scores, on each side of the invitation eligibility cutoff.

Finding 3: Variation in Achievement Growth Across Sub-groups by Summer School Participation Status

Summer school attendance is associated with moderate reductions in pre-existing achievement gaps, but due to student/family self-selection, this relationship may not be causal.

To gauge how the subsequent performance of students may have varied among summer school participants and non-participants, we separately estimated models of student achievement growth for both students who were invited to summer school and attended (henceforth, "attendees") and students who were invited to summer school but chose not to participate (henceforth, "non-attendees"). The models control for the student characteristic of interest (e.g., English proficiency) and a student's formative assessment score on the prior winter exam. For example, the model of FRPM eligibility yields an estimate of the difference in fall test scores between FRPM-eligible attendees and FRPM-ineligible attendees (controlling for prior-winter scores).

We then compare the achievement growth differences among attendees with the achievement growth differential among non-attendees. This difference-in-differences approach controls for baseline differences in achievement among sub-groups and implicitly assumes that if the participating students had not attended summer school, the sub-group achievement growth differences would have equaled the differences among students who chose not to participate.

Unlike the regression discontinuity analysis, which compares outcomes for students near the invitation eligibility cutoff (i.e., students with similar pre-summer scores and likely similar unmeasured characteristics), the multivariate regression models do not control for any observed characteristics (other than the sub-group of interest and prior winter scores). The models also do not account for unobserved factors, like student motivation and family resources, that may determine summer school attendance and fall test scores. Consequently, the resulting estimates may be biased measures of program impact. For example, if students/families who were more motivated or expected to gain the most from attending summer school were more likely to accept the invitation to participate, the analysis would overstate the benefits of summer school participation. Consequently, the results cannot be viewed as

Table 1. Fall 2021 Sub-group Achievement Differences Conditional on Winter 2021 Achievement Levels by Summer School Attendance

	Math			Reading		
Subgroup comparison	Invited and attended	Invited, did not attend	Diff.	Invited and attended	Invited, did not attend	Diff.
Female vs. male	0.337 (0.830)	-0.418 (0.369)	0.755***	6.881*** (1.337)	1.215* (0.611)	5.666***
FRPM vs. non-FRPM	-6.636*** (1.041)	-8.543*** (0.380)	1.907***	-7.788*** (1.694)	-13.425*** (0.625)	5.637***
EL vs. non-EL	1.191 (1.008)	-2.121*** (0.619)	3.312***	-1.661 (1.617)	-5.133*** (0.994)	3.472***
Lower-income vs. Higher-income region	-6.927*** (0.893)	-9.646*** (0.439)	2.719***	-6.599*** (1.429)	-13.883*** (0.730)	7.284***
Attended 2 sessions vs. 1 session	0.368 (1.037)			-0.068 (1.663)		
Attendees vs. non-attendees	-2.461***			-6.207***		

Notes. Reported coefficients represent the estimated change in re-centered scale scores. Asterisks denote statistical significance. ***p<0.001, **p<0.005, *p<0.01

causal estimates of differences in the efficacy of summer school participation across sub-groups of students and should be interpreted with caution.

The regression model estimates are presented in Table 1. Overall, summer school attendees experienced higher achievement growth between the winter SY 2020–21 and fall SY 2021–22 exams than did invitees who did not participate (last row of Table 1), though this may simply reflect differences in the observable and unobservable characteristics between students who chose to attend and those who were invited but did not attend.

For attendees and non-attendees, we observe that achievement growth is lower for students eligible for FRPM than for non-FRPM-eligible students. The differences are substantial, ranging from seven scale points for attendees in math to 13 points for non-attendees in reading (equivalent to about one academic year of growth for an on-grade-level Grade 5 student).[18] However, when we compare the difference in the FRPM/non-FRPM achievement growth differential between attendees and non-attendees, the gap is much more modest—about 1.9 scale-score points less in absolute value for attendees in math and 5.6 scale-score points less for attendees in reading. Once again, due to self-selection into summer school, the smaller gap for attendees does not necessarily imply that attending summer school reduced achievement gaps.

We observe a similar pattern for achievement growth differences between English learners (ELs) and non-ELs. The EL/non-EL achievement growth differential was smaller for attendees than for invited non-attendees in math and reading. The differences were about 3.3 scale-score points in math and 3.5 scale-score points in reading.

We also compared gender differences in achievement growth between summer school attendees and students who were invited but chose not to attend. In math, gender differences in achievement growth were small for summer-school attendees and non-attendees. The difference in the gender gaps in math achievement growth among attendees and the gender gap among non-attendees was only 0.8 scale-score points. In reading, the gender achievement growth differential in favor of females was quite substantial among attendees (6.9 scale-score points). Correspondingly, the difference in the gender achievement growth differential was higher for attendees than for non-attendees by 5.7 scale-score points.

Finally, we compared outcomes for students living in the less-affluent region of the district compared to the more-affluent region. Similar to the FRPM/non-FRPM comparison, achievement growth was substantially lower for students attending schools in the less-affluent area of the district in math and reading. The difference in achievement growth differentials between attendees and non-attendees was smaller but still statistically and educationally meaningful: 2.7 scale-score points in math and 7.3 scale-score points in reading.

In addition, we estimated fall test scores for elementary school students attending two sessions rather than one session. However, the difference in achievement growth was not significantly different from zero. One cannot necessarily infer that increasing the length of summer school had no impact, however, as students who chose to attend two sessions rather than one may have been struggling more academically than students who attended a single session. Alternatively, families experiencing economic hardships may have been more likely to send their children to both sessions to free up time for paid employment and ensure that their children received additional subsidized meals.

Discussion

We find that students who were invited to participate in summer school due to having mid-year formative test scores just below the threshold for grade-level performance scored no better on fall exams the following year than did similar students whose mid-year scores placed them barely above the bar for being on grade level (and were thus not invited to summer school). A major reason why inviting students to attend summer school was ineffective in boosting student achievement is because only 18% of known invited students actually attended summer school. Participation rates among FRPM-eligible students and English learners who were invited were higher (22% and 28%, respectively), suggesting that the free meals being offered during summer school may have been an inducement for these groups.

Whether attending summer school (rather than simply being invited) had any effect on student achievement is less clear. Participation was subject to the choices of students and their families. Thus, while we generally observe better relative achievement growth among students from households experiencing low income and English learners who attended summer school, we cannot necessarily infer that these differences were a result of summer school attendance.

Given the low participation rate and the fact that prior research finds that strong attendance is related to positive student outcomes, districts should consider mechanisms to promote attendance (e.g., requiring students to attend with an "opt out" provision rather than having to "opt in").[19] Modifying the program to include more fun and engaging activities might boost attendance as well.[20,21] Beyond promoting participation, increasing the duration of the summer program may improve outcomes as prior research finds that summer school offerings should be at least five weeks long.[22]

Finally, prior research has indicated that after-school programs may be more effective than summer programs alone and that a combination of both after-school programs and summer programs are optimal for student achievement growth.[23] Thus, districts may want to place more emphasis on in-school and after-school acceleration programs and rely less on summer school as a tool for addressing reductions in student achievement growth brought about by the COVID-19 pandemic.

Of course, the potential benefits of summer school may go beyond boosting student achievement. Recent evidence suggests that a well-designed summer program can reduce absenteeism during the school year.[24] Further, as the program provided students with free transportation, supervision during part of the day, and two free meals, the students who participated may have benefited along non-academic dimensions. Any cost-benefit analysis of future summer school offerings would need to weigh both the academic and non-academic benefits when considering the potential value of future summer school programs.

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17. When individuals choose whether to attend a program, a common method to gauge the causal impact of attendance is the "instrumental variables" (IV) approach. The IV approach involves predicting the likelihood of attendance based on exogenous factors (instruments) and then using this predicted value, rather than the actual attendance, to estimate the causal effect of attendance on the outcome of interest (student achievement in our case). The IV approach requires finding an instrument that is correlated with attendance but is uncorrelated with unmeasured factors affecting achievement. The most obvious choice for an instrument in the present case would be receipt of an invitation. Unfortunately, given the fact that only 18% of invitees attended and many non-invitees attended, receipt of an invitation is a relatively weak instrument.

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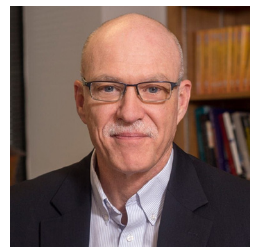
About the Authors

Sarah S. Barry

Sarah S. Barry is a graduate research assistant with the Georgia Policy Labs. She is currently pursuing a Ph.D. in economics at Georgia State University. She holds a bachelor's degree in economics and mathematics from Mercer University. Her research interests are broadly related to education policy and experimental methods.

Tim R. Sass



Tim R. Sass is a Distinguished University Professor in the department of economics at Georgia State University and the W.J. Usery Chair of the American Workplace in the Andrew Young School of Policy Studies. He is also the faculty director of the Metro Atlanta Policy Lab for Education (MAPLE). His research interests include the teacher labor supply, the measurement of teacher quality, and school choice. His work has been published in numerous academic journals and has been supported by several federal and philanthropic grants. He has acted as a consultant to school systems across the country. He is also a senior researcher at the Center for Analysis of Longitudinal Data in Education Research (CALDER).

About the Georgia Policy Labs

The Georgia Policy Labs is an interdisciplinary research center that drives policy and programmatic decisions that lift children, students, and families—especially those experiencing vulnerabilities. We produce evidence and actionable insights to realize the safety, capability, and economic security of *every* child, young adult, and family in Georgia by leveraging the power of data. We work alongside our school district and state agency partners to magnify their research capabilities and focus on their greatest areas of need. Our work reveals how policies and programs can be modified so that every child, student, and family can thrive.

Housed in the Andrew Young School of Policy Studies at Georgia State University, we have three components: the Metro Atlanta Policy Lab for Education (metro-Atlanta K-12 public education), the Child & Family Policy Lab (supporting children, families, and students through a cross-agency approach), and the Career & Technical Education Policy Exchange (a multi-state consortium exploring high-school based career and technical education).

Learn more at gpl.gsu.edu.