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The Efficacy of School-Based Pre-K Program Sites in a Metro-Atlanta School District

Henry T. Woodyard, Tim R. Sass, and Ishtiaque Fazlul

Metro Atlanta Policy Lab for Education

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Introduction

It is well established that there is a strong link between K–12 performance and later adult outcomes, such as post-secondary education attainment, teenage pregnancy, criminal activity, and adult employment and earnings (Cunha & Heckman, 2007, 2009; Heckman et al., 2010a, 2010b; Heckman et al., 2013; Day & Newburger, 2002). Given that differences in educational performance appear early in life and the fact that it is increasingly difficult to remediate disparities in education as children age, many have suggested prioritizing early educational interventions as a means of improving performance in childhood and later in life (Heckman, 2000, 2008; Carneiro & Heckman, 2003; Cunha et al., 2006). This view has its theoretical foundations in the child psychology literature (Justice et al., 2009; Stipek, 2006) and is supported by early studies of high-quality but small-scale pre-K programs such as the HighScope Perry Pre-School Program (Heckman et al., 2019) and the Carolina Abecedarian Project (García et al., 2017), which find substantial benefits to participants in the short-run and long-run. Fueled in part by evidence from these small-scale experiments like Perry Preschool and Abecedarian, some states initiated or significantly expanded pre-K education programs in the 1980s and 1990s (Mitchel, 2001). While most of these state-funded pre-K programs have income thresholds, as of 2017, 11 state programs (including Georgia’s) are “universal” programs that have no income restriction for participation (Friedman-Krauss et al., 2018).

Georgia’s Pre-K Program is a lottery-funded early education program for four-year-old children in Georgia that is administered by Bright from the Start: Georgia Department of Early Care and Learning (DECAL). The program began in 1992, and its goal is to prepare children for success in kindergarten and in later-school years. Currently, there are approximately 84,000 available slots in Georgia’s Pre-K Program spread over roughly 4,000 sites that are located throughout the state (Goldring, 2020). Some Georgia Pre-K Program sites are located at public elementary schools and are operated by public school districts (i.e., school-based pre-K sites or SBPK for the purposes of this report), while other Georgia Pre-K Program sites are operated by private child development centers, independent of local school systems (i.e., non-school-based pre-K sites or non-SBPK hereafter).¹

In this report, we estimate the impacts of being selected in an enrollment lottery for Georgia’s Pre-K Program and attending a school-based site on students’ academic achievement, attendance, and discipline in later grades in a metro-Atlanta school district (henceforth “the District”). Our comparison

group is students with similar characteristics who sought admission to an oversubscribed SBPK in the District but were not selected in the enrollment lottery and did not end up enrolling in any site (school-based or non-school-based) in Georgia's Pre-K Program. Thus, we are not comparing the impact on achievement, attendance, and discipline of attending a SBPK program relative to a non-SBPK program. Rather, we are comparing outcomes for students in school-based sites in Georgia's Pre-K Program to students whose families sought admission to a SBPK program but were not granted admission and ended up either attending an early-learning program (e.g., a Montessori or private school) outside of Georgia's Pre-K Program or no formal early-learning program at all.

In addition to average outcomes, we also show how the effects of enrolling in a SBPK vary based on the socio-demographic characteristics of children, like free or reduced-price meals (FRPM) eligibility—a crude measure of poverty. Finally, we characterize the early-childhood-education decisions made by families of children who enter lotteries for oversubscribed SBPK sites but are not selected in the lottery and are thus not offered admission. More specifically, we address the following questions:

1. What is the effect of enrolling in a metro-Atlanta school district's Georgia's Pre-K Program site for students who would otherwise not attend Georgia's Pre-K Program on future test scores, attendance, and behavior in K–4?
2. How does the effect of enrolling in a school-based Georgia's Pre-K Program site in metro-Atlanta vary by families' economic status?
3. For students who are not offered admission to an oversubscribed school-based site in a metro-Atlanta school district in Georgia's Pre-K Program, what factors determine if they enroll in other sites in Georgia's Pre-K Program?

Background on Georgia's Pre-K Program

Early education providers in Georgia may apply to become a Georgia's Pre-K Program Provider; upon approval, they receive reimbursement conditional on meeting DECAL guidelines. The level of and requirements for reimbursement are almost identical between SBPK and non-SBPK Georgia Pre-K sites. For example, conditional on a teacher's level of education and certification, DECAL grants equal funding for teacher salaries at both types of sites, and only slight differences exist between the two in the amount of funding given for non-wage

benefits and classroom operating expenses. However, the District in this study supplements the DECAL-provided salaries of teachers in school-based sites to match the District's pay scale for K–12 teachers. It is not clear whether non-school-based sites also supplement teacher funding or the extent to which differences in salary translate to differences in teacher quality. In addition, both SBPK and non-SBPK sites are required to choose from a set of DECAL-approved curricula for instruction. It is doubtful, then, that students in non-SBPK sites will learn significantly different content than those in SBPK sites. Despite this, competition for school-based sites tends to be greater, owing to a perception by parents that SBPK sites are of higher quality (Moore et al., 2019). While this report does not compare students in non-SBPK sites to those in SBPK sites, our results might be less generalizable if the choice of site type is influenced by family characteristics that affect student outcomes.

Families whose children are enrolled in either a SBPK or non-SBPK site in Georgia's Pre-K Program face no out-of-pocket costs for regular instruction. Providers in Georgia's Pre-K Program are prohibited from charging fees for the 6.5-hour instructional day, and additional funding is granted to providers for assisting students from households experiencing low income. To this end, providers are required to classify enrolled students into two categories based on their income: A child is eligible for Category One if they or their family participate in the Supplemental Nutrition Assistance Program (SNAP), Supplemental Security Income (SSI), Medicaid, Temporary Assistance for Needy Families (TANF), or the Childcare and Parent Services (CAPS) program; otherwise, a child is classified as Category Two. Providers are prohibited from charging fees for meals or transportation for Category One students.

Despite the nearly identical provisions for SBPK and non-SBPK providers, a few practical differences exist that may influence parental choice. In addition to SBPK sites requiring applicants to reside in the school district, families may be limited in the number of school-based sites to which they can apply. In the District, parents may only apply for a single school-based site. Meanwhile, there is no limit on the number of non-SBPK sites to which families can apply. In practice, families may apply to both.

The rate at which transportation is provided is another key difference between SBPK and non-SBPK sites. While providers cannot charge fees for transportation to Category One students, offering transportation is optional. According to DECAL's public data on providers, almost all school-based sites (98.7%) in the District provide transportation to and from school. Meanwhile, only a small proportion (5.5%) of non-school-based sites in the District do

the same (a difference likely arising from the availability of existing busing infrastructure at school-based sites). DECAL compensates providers for transportation at a rate of \$16.50 per month per eligible child. This rate may be commensurate for a larger-scale, efficient busing system, but implementing transportation could be economically infeasible for sites where few children would use or need transportation.

The stark difference in the rate at which school-based and non-school-based providers implement transportation raises some concerns about the equity of access to universal pre-K. Providing transportation imposes direct costs to families in the form of fuel, vehicle maintenance, or public transportation fees. It also presents indirect costs to families; time spent taking a child to school is time that a caregiver could have spent working or engaging in some other activity. The fact that some families may have one or no vehicle or no ready access to public transportation exacerbates the issue. Assuming the extent to which these costs are relevant varies based on income, families experiencing low income could effectively have fewer choices even among programs with no out-of-pocket costs.

The number of children seeking entrance to SBPK programs frequently exceeds the number of seats available. DECAL does not dictate how programs allocate these seats in oversubscribed programs, leaving room for variation in enrollment processes. For example, Peisner-Feinberg et al. (2014) surveyed programs across the state during the 2012–13 year and found that, while most programs (77%) use a first-come-first-served system, the remaining programs (23%)—including the District—use a lottery to determine assignment. In the District, enrollment lotteries for attendance during the next academic year occur each spring. To participate, a child must be four years old by September 1 of the calendar year in which they apply and reside within the District’s attendance boundaries.

Prior Evidence

Past research shows ample benefits from high-quality early childhood education programs. Evidence suggests that interventions early in life are more effective at producing equitable outcomes than those that occur in adulthood (Currie, 2001). Randomized experiments, like the HighScope Perry Preschool Program in the 1960s and the Carolina Abecedarian Project (CAP) in the 1970s, demonstrated extraordinary value for participating children from families experiencing low income.

Attendees of these programs enjoyed benefits that lasted well beyond their years in school. Being selected to participate in the Perry Program raised children's lifetime earnings by about \$200,000 (Belfield et al., 2006). Male CAP participants earned \$20,000 more at age 30, and female CAP participants were more likely to be employed at 30 (García et al., 2017). Children who were selected to participate in the Perry Preschool Program spent significantly less time in prison or on probation, received about \$3,000 less in government assistance, and earned around \$200,000 more over their lifetime (Belfield et al., 2006). Meanwhile, children who received services from the CAP had greater earnings, were more likely to be employed, and were less likely to be arrested in adulthood (García et al., 2017). Benefits extended beyond the children: Parents of CAP participants saw increases in earnings between \$7,000 and \$14,000. Indeed, the Perry Preschool Program and Carolina Abecedarian Project, respectively, generated \$12.90 and \$7.30 of public benefit for every dollar invested (Belfield et al., 2006; García et al., 2017).

Among the earliest public interventions in early childhood care is Head Start, which began in the 1960s and delivers early learning, health, and family support services to low-income children between the ages of three and five. While Head Start is not a pre-kindergarten program, it is relevant to this report insofar as it demonstrates the potential benefits of early interventions. Children who attend Head Start have greater achievement in early elementary school (Deming, 2009) and are more likely to graduate from high school (Ludwig & Miller, 2007). The benefits seem to be greatest for children who ranked below average in testing before their preschool year (Lee et al., 1990). Participants are also more likely to be immunized (Currie & Thomas, 1995) and less likely to die from preventable causes (Ludwig & Miller, 2007).

The large benefits exhibited by the experimental programs in the second half of the twentieth century focusing on families experiencing low income, as well as the mostly positive impacts shown for children who attend Head Start, have generated widespread advocacy for public implementation of early childhood education and care. However, the benefits of universal pre-K programs (no income basis for admission) are less clear. van Huizen and Plantenga (2018) reviewed 30 studies on universal early childhood education conducted between 2005 and 2017 and find that only one in three studies show positive effects, while one in six show negative effects. Even among studies observing the same type of outcome, results can be mixed. For example, Durkin et al. (2022) find evidence that attendees of the Tennessee Voluntary Pre-K Program may later have worse behavior than non-attendees, while studies of other programs show behavioral improvements (Chor et al., 2016; Belfield, 2005). Belfield (2005)

even finds that non-attendees benefit from the presence of attendees in a kindergarten classroom.

The body of evidence on the benefits of universal pre-K within Georgia yields conflicting results. Children who attended Georgia's Pre-K Program scored higher on Grade 3 end-of-grade assessments in the 2015–2016 school year than similar non-attendees (Early et al., 2019). On the other hand, one recent longitudinal study of Georgia's Pre-K Program through Grade 3 finds gains on standardized assessments of skills during the Pre-K year that persist into kindergarten, followed by a leveling off in Grade 1 and a small decrease in scores through Grade 3 (Soliday Hong et al., 2021).

The typical finding is that children who participate in any type of pre-K tend to perform better on achievement tests or cognitive measures shortly after the pre-K year (Lipsey et al., 2018; Chor et al., 2016; Lee et al., 1990; Currie & Thomas, 1995). However, these effects are commonly shown to diminish and perhaps disappear completely over time.² Creating long-term changes in children's cognitive ability is difficult in the first place (Currie, 2001), and elementary schools might not be taking advantage of the greater preparation of pre-K attendees (Lipsey et al., 2018). Fading quickly, the academic benefits of pre-K can disappear by Grade 1 or 2 (Lipsey et al., 2018; Lee et al., 1990). One study found that the rate at which benefits decline varies among students with different characteristics. For example, Currie and Thomas (1995) find that Black students experience the greatest decreases in impact over time, suggesting differences in program delivery or in the types of schools attended by students of different races after early learning.

The uneven findings from research on universal pre-K lies in stark contrast to the preponderance of evidence supporting targeted, high-quality ("model") programs like the Carolina Abecedarian Project and the Perry Preschool Program. These disparate findings extend to cost-benefit analyses. The cost and benefits of universal pre-K is generally found to be in the range of \$2 to \$4 for each dollar invested (Bartik et al., 2012; Karoly, 2016). This clearly departs from estimated benefits as high as \$17 for model programs (Karoly, 2016). Previous explanations of this discrepancy have noted differences in the funding and intensity of model and public pre-K programs (Currie, 2001; van Huizen & Plantenga, 2018). The Carolina Abecedarian Project, for example, spent more than \$20,000 per child each year adjusted for inflation (Arnold Ventures, 2017)—about four times as much as the Georgia Pre-K Program (Friedman-Krauss et al., 2019). It also involved children from eight weeks old to five years old, had no more than six children to a teacher, and operated year-round

(Arnold Ventures, 2017). Meanwhile, Georgia's Pre-K program, like other state-funded universal pre-K programs, includes only four-year-olds and permits up to 11 children per teacher.

Even if programs today had the same funding and intensity, it is possible that their measured benefits would still pale in comparison to those of past programs. The effect estimated depends on the counterfactual—the education a child would have received had they not attended pre-K—and some argue that this comparison is changing. Lipsey et al. (2018) makes this argument, contending that children today have more educational resources (e.g., the Internet) at home. Furthermore, Karoly et al. (2016) notes that children in the past were less likely to attend any pre-K program. Students from families experiencing low income who may have less opportunity to learn at home tend to benefit the most from universal pre-K (van Huizen & Plantenga, 2018).

Data and Methods

Our study centers on admission lotteries that took place in the District between 2012 and 2018. Site rosters and waitlists help identify selected and non-selected families, respectively. Georgia's Pre-K Program (GAPK) sites submit rosters of all enrolled students four times a year to DECAL. Likewise, those sites also send an updated list of students who are actively waiting for spots in the site four times each year. In other words, providers are responsible for maintaining the waitlist by identifying students who no longer wait. While these waitlists do not explicitly identify students not selected in a lottery, they do record when students enter the waitlist for each site. In the District, full sites accept late applications until August 31; however, these sites only process the applications after exhausting the waitlist. While a more ideal research strategy would be to identify students who entered the waitlist just after the lottery, the earliest date of entry sites can select when adding students to the waitlist is July 1. Therefore, we assume that students were not selected in a lottery if they entered the waitlist on that date.

Students who participate in a lottery and are not selected may appear later on the roster of another GAPK site. Additionally, a student could be removed from the waitlist if a spot opens at their preferred site and causes them to leave the waitlist. Otherwise, they can enroll in another school-based or non-school-based site. In some cases, both happen: A student enters a non-school-based site in Georgia's Pre-K Program but later enrolls in the site for which they were waitlisted. With that in mind, for questions one and two, we compare students

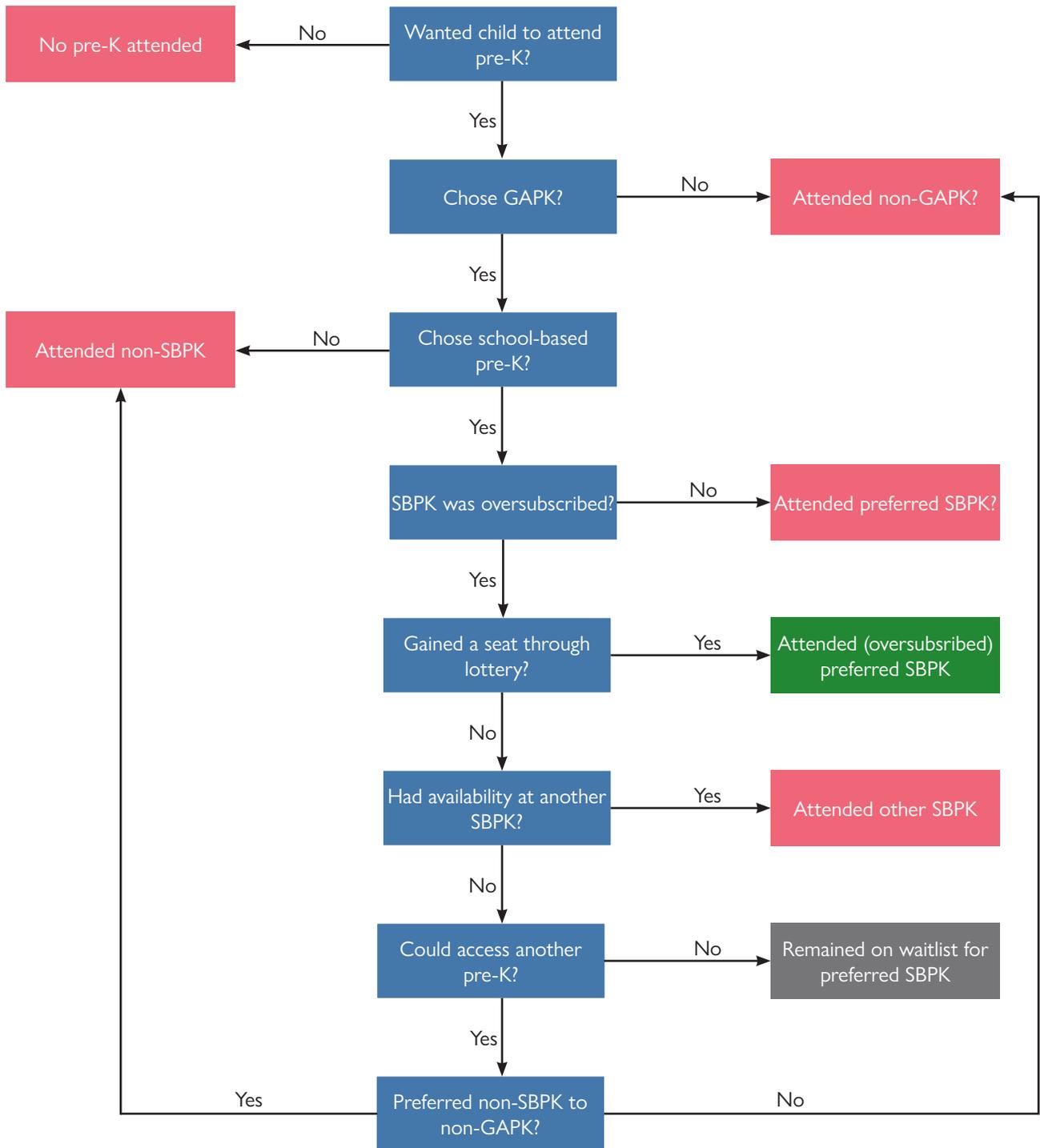
who were selected in the lottery to those who were not selected and never enrolled in any site in Georgia's Pre-K Program. We define lottery sites as sites that had at least one student not selected in a given year. A student is defined as selected in a lottery if they appear on a roster for a lottery site but never appear on that site's waitlist.

To measure the effects of attending SBPK on K–4 outcomes, we use administrative panel data on students who attended public school in the District. The data were collected by the District in the normal course of operations. In addition to demographic information like gender, race/ethnicity, English learner status, and free or reduced-price meals eligibility, we also observe key outcomes: absences, disciplinary infractions, and performance on the Measures of Academic Progress (MAP) formative assessments in math and reading. Using these data, we follow students for several years after exiting pre-K and enrolling in the District.

A challenge to estimating the impacts of school-based sites in Georgia's Pre-K Program is that families decide (a) whether or not to seek admission into a specific program for their child and, (b) conditional on whether they are offered admission to the desired program, what early learning program (if any) into which they choose to enroll their child. Figure 1 illustrates the many choices parents face with respect to their child's early education. If parental choice over programs is influenced by factors that also drive student outcomes (e.g., family income), then a simple comparison of outcomes for students who attend a SBPK program with those who do not attend any GAPK site would conflate the true impacts of the program with the characteristics of the children and their families.

To mitigate potential bias from parental decisions to apply for admission to a SBPK program, we limit our analyses to students whose parents applied for admission to an oversubscribed SBPK program in the District and were thus participants in an enrollment lottery. Given that admission offers are randomly assigned to lottery participants, the characteristics of students selected in a lottery (who are offered admission) and the characteristics of non-selected students (who are not initially admitted) should be equal on average and thus eliminate any bias from unobserved family characteristics associated with the decision to apply for a slot in a SBPK program. Figure 1 highlights these groups in green and gray, respectively.

Figure 1. Example Decision Tree for Parents



Using multivariate regression analysis, we estimate student outcomes in each grade as a function of being selected in an enrollment lottery (and attending) a SBPK while controlling for student demographic characteristics. We compare students who were selected in a lottery and attended to students who were not selected and did not go to any GAPK site. Our model generates a coefficient: a number which estimates the effect on outcomes in each grade from attending an oversubscribed SBPK relative to not attending any DECAL-administered site. While including student characteristics in the model would be unnecessary in a fully-randomized lottery, our sample is only partially randomized. For it to be fully-randomized, the decision to go to a GAPK site would need to be unrelated to student characteristics. Because this an untenable assumption, controlling for student demographic characteristics helps mitigate bias arising from selection into the control group.

While the characteristics of students should be balanced between those selected and those not selected within a given lottery, the characteristics of students are not balanced between lotteries across multiple sites. In other words, selected students will not be very different on average than non-selected students within a lottery. However, those selected in one lottery may be nothing like those selected in another lottery (and vice-versa); comparing the two could introduce bias. To this end, our analysis generates estimates by comparing outcomes in a given grade between those selected and not selected in each lottery.³ To do so, we use fixed effects⁴ for the lottery in which a student participated. In short, the use of fixed effects makes it so that students are being compared within lotteries, controlling for systematic differences between students across lotteries. We also use a fixed effect for the year in which an outcome was measured. In doing so, we account for potential variation over time in outcomes for all students that is unrelated to attendance of a GAPK.

Limitations

Restricting the analysis to participants in enrollment lotteries does not, however, eliminate potential group differences from subsequent family decisions about where to enroll their child. Students who are selected in a SBPK lottery are eligible to attend but may choose not to attend. If the attendance decision is correlated with factors that drive student outcomes, it could lead to biased estimates of the impact of SBPK attendance. For example, suppose that more affluent families frequently decide to send their child to a private early learning program outside of Georgia's Pre-K Program (even when they are selected in the school-based admission lottery), whereas families experiencing low income

cannot afford non-subsidized private alternatives and almost always enroll their child in a SBPK site (if they are selected in the lottery). Assuming that more affluent families can also provide additional educational support that raises student outcomes, this would make it look like the SBPK is less effective than it truly is. Similarly, our comparison group consists of children not selected in the lottery and who do not attend any GAPK. If more affluent families who are not selected in the school-based lottery are more likely to find a non-SBPK site in Georgia's Pre-K Program for their child (rather than no formal child care at all), they would be underrepresented in our control group, which could depress outcomes for the control group and overstate the efficacy of attending SBPK.

A second concern is that we do not observe the early childhood educational choices of students that do not attend any site in Georgia's Pre-K Program. While our data cover all public and private sites that are part of the system overseen by DECAL, families have a variety of options (of varying quality) outside of Georgia's Pre-K Program. For example, some early learning centers in the District that are generally perceived as high-quality (e.g., Montessori schools) are not administered by DECAL.⁵ Students who attend these schools could raise the average readiness for the control group. This, in turn, would lower the size of the effect we estimate. On the other hand, children who are not selected in the SBPK lottery and do not attend any site in Georgia's Pre-K Program could end up in informal childcare settings (e.g., staying with a neighbor or relative) that may or may not provide strong early learning opportunities.

Our later analyses attempt to discern the effect of gaining a seat in an oversubscribed SBPK for students who qualify for free or reduced-price meals (a rough measure of poverty). While this is an important analysis from an equity perspective, it also partially addresses the concern raised previously. Namely, it deals with the possibility that families experiencing low income face different options for early childhood education than families experiencing higher income. Families experiencing lower income might be less able to afford high-quality sites outside of Georgia's Pre-K program requiring tuition payments but also may have access to other options like Head Start.

Third, our analytical strategy relies on comparing selected and non-selected students within oversubscribed schools. Our estimates measure the effect of attending an SBPK relative to no attendance in any site in Georgia's Pre-K Program. The extent to which our findings apply to pre-K sites that are not oversubscribed is not clear. The level of oversubscription at pre-K sites is highly likely to be non-random. Demand for "good" early-learning sites could cause

effective pre-K sites to be oversubscribed. Thus, one cannot necessarily extend our findings to school-based sites that are not oversubscribed. Similarly, our results come from only one school district and may not be generalizable to other school districts in Georgia or elsewhere.

The fourth issue pertains to the likelihood that a student enrolls in the District in later years and whether being selected in a lottery affects that likelihood. Our data on elementary school outcomes only cover students who ever attended an elementary school in the District, and some students may be more likely to appear than others. For example, some students may choose to attend a private school rather than enroll in the District. This may be a problem if the types of students who are more likely to leave also tend to get a different level of benefit from attending pre-K.

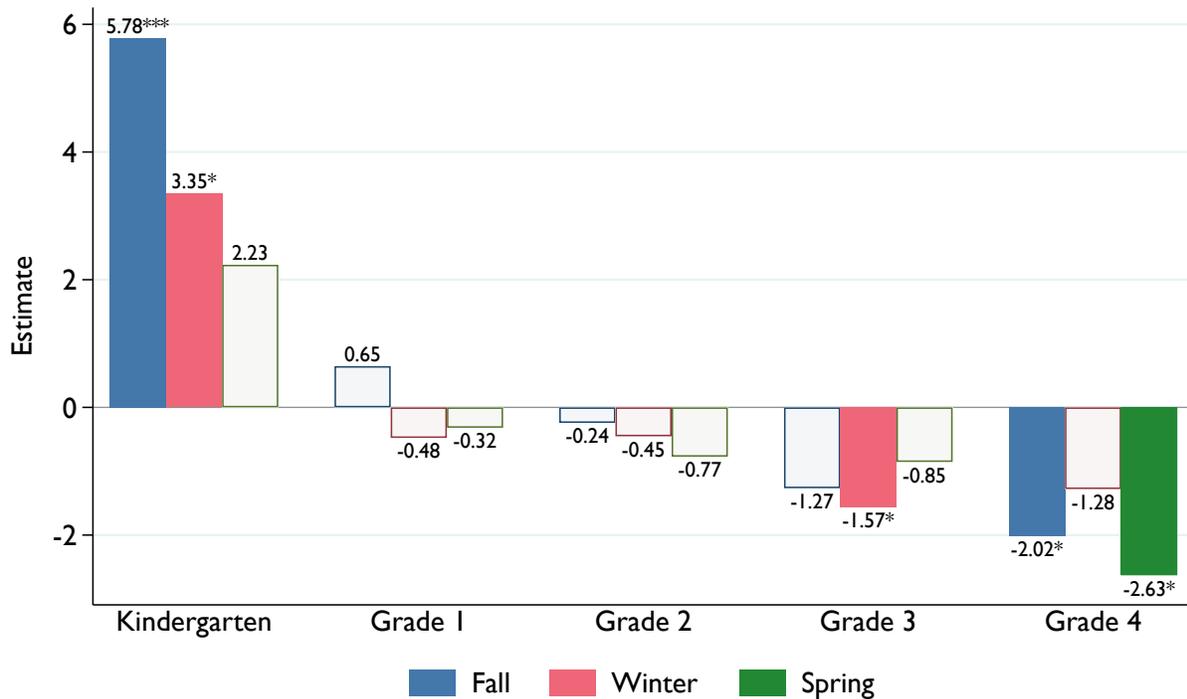
Finally, this study uses administrative data sources. While these provide a wealth of information, they do not include indicators related to the experiences of the children attending pre-K or other settings. The data and analyses do not control for any quality indicators in pre-K or children's subsequent elementary schooling. The quality of school-based Pre-K across Georgia varies from low-quality to high-quality, with most being medium-quality (Maxwell et al., 2009; Peisner-Feinberg et al., 2013). It is not clear how the quality of school-based pre-K in the District compares to others in Georgia's Pre-K Program.

Finding 1: School-Based Pre-K and Achievement

School-based Pre-K in the District has immediate, positive effects on achievement that fade during kindergarten.

We begin by estimating the effect on academic achievement in kindergarten and beyond from being selected in an enrollment lottery and attending an oversubscribed SBPK program. Academic performance is measured using national percentile ranks in math and reading from the MAP, a nationally-normed adaptive assessment used throughout the United States. Students in the District take these exams for math and reading at each grade level in the early fall, winter, and late spring through Grade 8. This structure permits evaluating how well prepared a student enters a grade and how their performance evolves over that school year. The MAP exam taken during the fall of kindergarten is of particular interest. Such timing permits little instruction

Figure 2. Effect of School-Based Pre-K Attendance on MAP Percentile in Math (Relative to Not Attending Georgia’s Pre-K Program)



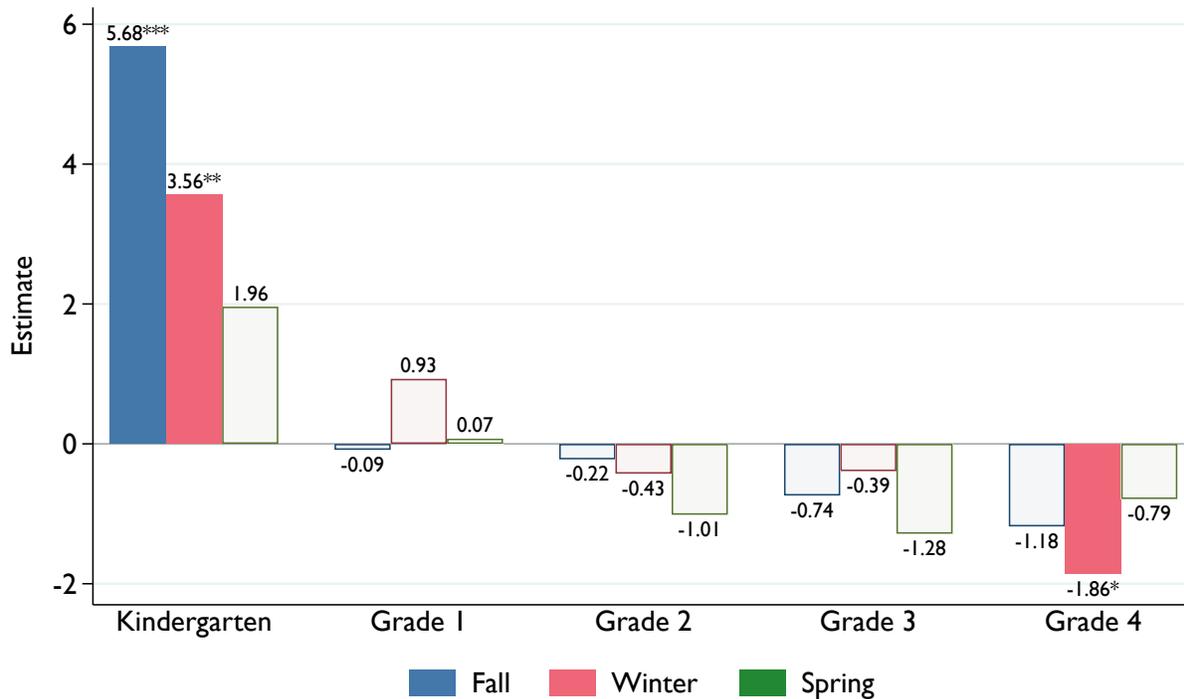
Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

prior to testing, meaning that experiences before kindergarten should drive differences in this score.

Figure 2 depicts the estimated effect of attending an oversubscribed SBPK in the District on national math percentiles by grade and test timing. The height of the bar represents the expected difference in math percentile rank between students who are selected in an enrollment lottery and attend a SBPK site and students who are not selected in a lottery at the same site and end up at a non-GAPK early learning center or in no formal pre-K. In short, it answers the following question: If the average student who was not selected in a lottery (and then never attended any GAPK site) had instead been selected and attended, how would we expect their national percentile to change? Shaded bars represent estimated differences in outcomes that we can be 95% confident are not zero.

Students in the treatment group score 5.75 percentiles higher in math on the fall MAP exam in kindergarten. A near six percentile difference is quite large, suggesting that attendees tend to be much better prepared for kindergarten.

Figure 3. Effect of School-Based Pre-K Attendance on MAP Percentile in Reading (Relative to not Attending Georgia’s Pre-K Program)



Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

However, this effect is cut almost in half after a semester of instruction in kindergarten: SBPK attendees score just 3.36 percentiles higher in math on the winter test than do non-selected students who did not attend any GAPK. Math percentiles for the spring test differ by just 2.36 percentiles, continuing the attenuation that began in the winter. We cannot confidently rule out the possibility that the true difference is zero by the time of the spring exam in kindergarten. From the winter of Grade 1 through the end of Grade 3, estimates fall below zero and are not statistically significantly different from zero (i.e., the treatment has no discernible effect on math percentiles in those grades). Last, negative and significant coefficients surface in Grade 4. We discuss these after presenting the results for reading.

Figure 3 shows the effect of participating in a SBPK in the District on MAP reading percentiles. As a whole, the results for reading mimic those for math. Students who won an enrollment lottery for an oversubscribed SBPK program and attended scored nearly six percentile points higher than non-selected students who never attended a GAPK site. Once again, this difference fades as time passes. Presumably, students in the non-GAPK group “catch up” as

they gain additional instruction in kindergarten. No clear relationship emerges in Grades 1 through 3. Similar to the math results, however, treated students perform about two percentiles worse in reading on the Grade 4 winter exam than those in the control group.

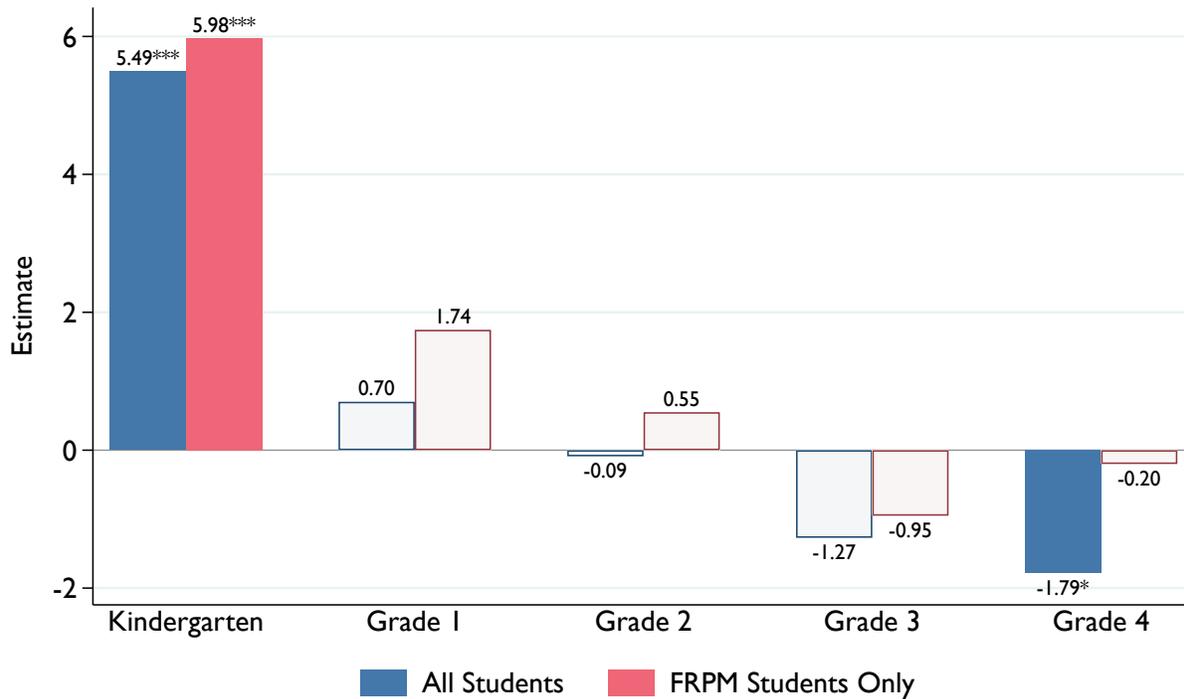
At first glance, the emergence of statistically significant negative impacts of SBPK attendance on test scores in Grade 4 is surprising. However, significant negative effects from attending universal pre-K are not unheard of. Durkin et al. (2022) find some negative effects in later grades when evaluating Tennessee's Voluntary Pre-K Program, and van Huizen and Plantenga (2018) indicate that one in six evaluations of universal pre-K programs show significant negative effects. However, our results may also suffer from the sources of bias discussed in the limitations section. In particular, some students who were not selected in a lottery and never attended a site in the GAPK program could instead go to a high-quality, non-GAPK private program. Because the data cover only GAPK sites, such students appear to have never attended pre-K and therefore enter the control group. Students who attend high-quality non-GAPK options may perform better academically regardless of pre-K. If the effect of attending pre-K fades for both groups, a difference in later grades could reflect only the differences in group characteristics or differences in elementary educational experiences. While this issue may be affecting the level of our estimates, it is unlikely to be changing their pattern. Overall, it seems that attending an oversubscribed SBPK confers a significant boost to students when they enter kindergarten that fades rapidly as non-selected peers catch up.

Finding 2: FRPM-Eligible Students

School-based Pre-K appears to have greater, longer-lasting effects for FRPM-qualifying students in the District.

Evidence suggests that early childhood education can play a significant role in the development of children from families experiencing low income (Currie, 2001). Universal pre-K is, in part, organized around the belief that an early intervention can have large effects for students from families experiencing low income by reducing the disparity in resources available to children from different economic backgrounds. To better understand the role of early childhood education for students from families experiencing low income, we estimate the effects of pre-K attendance on fall MAP percentiles in math and reading for each grade. Within each grade, we generate estimates for

Figure 4. Effect of School-Based Pre-K Attendance on MAP Percentile in Math, by Income Category (Relative to Not Attending Georgia’s Pre-K Program)

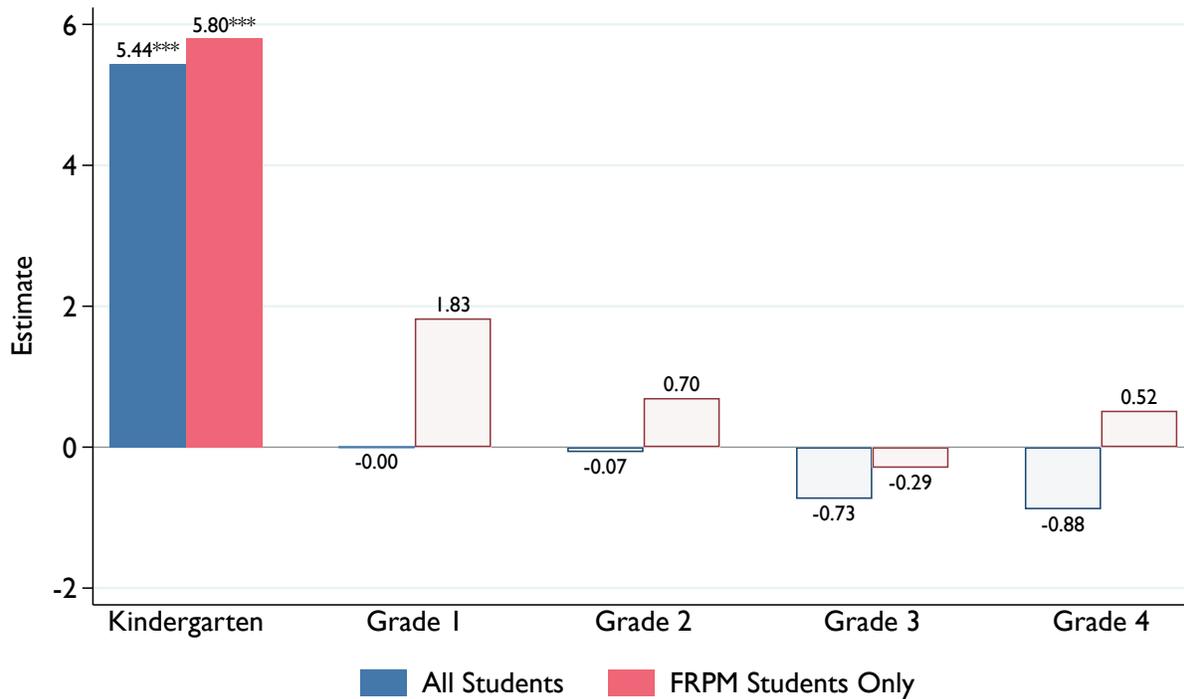


Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

all students and then only children who ever qualified for free or reduced-price meals. Figure 4 presents these estimates. The blue and red bars show the estimated effect of treatment for all students and just FRPM students, respectively.

Among children who qualify for FRPM, children who are selected in an enrollment lottery and attend a SBPK program score 5.98 percentiles higher on the kindergarten fall MAP exam in math than do FRPM students who apply, are not granted admission, and end up not attending any GAPK. This is slightly higher than the estimate for all students (which also includes FRPM students), indicating that FRPM students may benefit more from pre-K attendance in the District. Throughout each of the remaining grades, the estimated effect is persistently higher for FRPM students, although these effects cannot be distinguished from zero with confidence. In Grade 4, the effect for FRPM students is close to zero while the effect for all students is significantly negative. In other words, attending an oversubscribed SBPK in the District has almost no effect on scores in Grade 4 for FRPM students (compared to not attending any GAPK site) and a modest negative effect for non-FRPM students.

Figure 5. Effect of School-Based Pre-K Attendance in the District on MAP Percentile in Reading, by Income Category (Relative to Not Attending Georgia’s Pre-K Program)



Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

Next, we estimate these effects for reading percentiles (shown in Figure 5). Once more, the estimated effect of school-based Pre-K attendance for FRPM students on MAP reading percentiles in the fall of kindergarten is greater than that of the average student. After kindergarten, the estimated effect for non-FRPM students falls below zero throughout the remaining grades. Meanwhile, the effect for FRPM students remains positive in Grades 1, 2, and 4, although we cannot confidently differentiate these effects from zero.

Two explanations are plausible for the pattern of results exhibited on both subject tests. Recall that because of the limitations of our data, we are unable to distinguish between going to a non-GAPK site (like many Montessori schools) and not going to any pre-K site. Our control group consists of children who do not attend any pre-K and children who attend a non-GAPK program. We can expect that non-FRPM students are more likely to be able to afford non-GAPK options and hence are less often classified correctly as not having attended any pre-K. This implies that the “true” effect is being captured less frequently among non-FRPM students. Second, early interventions for students experiencing low income could benefit those students beyond direct

education. Entering education at age four rather than age five may help remedy resource disparities between children experiencing high income and children experiencing low income by, for example, providing nutritious meals or by giving parents—especially mothers—greater flexibility in employment.

Finding 3: Attendance and Disciplinary Conduct

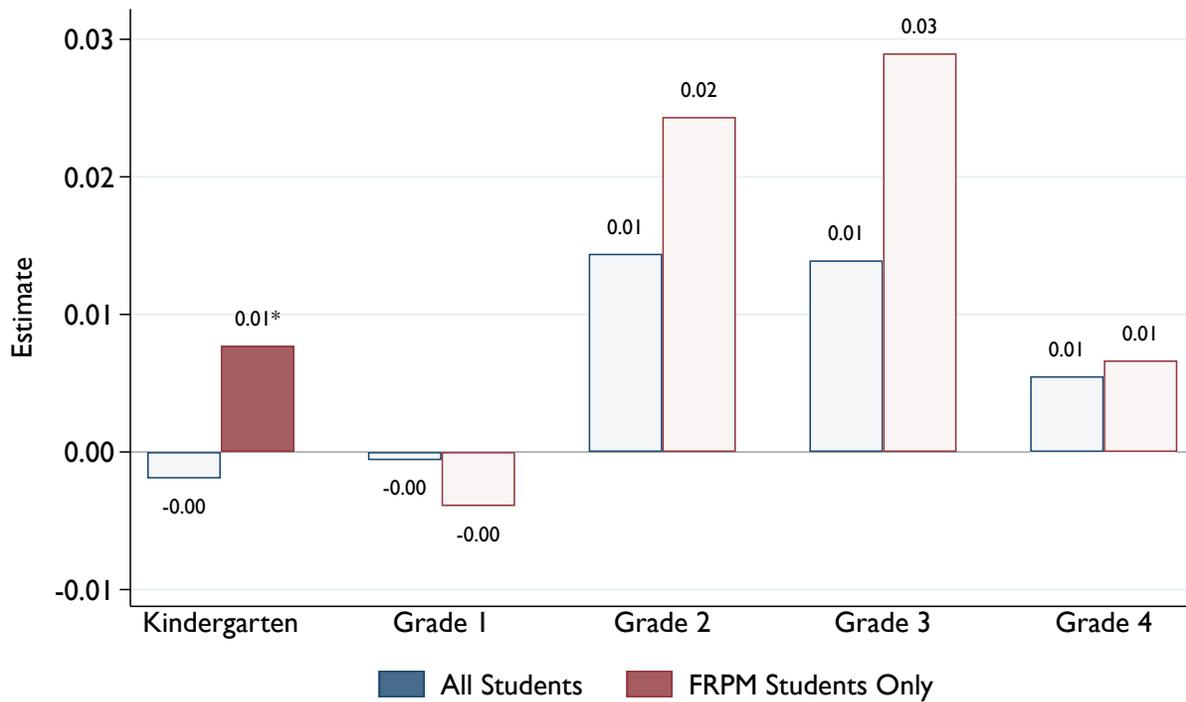
School-based Pre-K attendees in the District miss fewer days in elementary school but are no different in terms of discipline.

In the previous section, we showed that attending an oversubscribed SBPK yields large gains in math and reading percentiles at the start of kindergarten that do not persist as students entered later grades. Prior research has shown that high-quality pre-K programs can yield benefits beyond just helping students score higher on tests, however. School-based Pre-K in the District seeks to promote social-emotional well-being for students in addition to enhancing their educational achievement. We do not have any direct measures for social-emotional well-being. However, given prior literature's findings about non-test score effects, we broaden our analysis to examine two other measures: later attendance and disciplinary conduct. We generate estimates once again by comparing the outcomes of selected and non-selected students within lotteries.

Figure 6 shows the effect of oversubscribed SBPK attendance on the number of disciplinary infractions in each grade and for each group. While we see that FRPM-selected students have 0.01 *more* infractions in kindergarten on average relative to FRPM-non-selected students who never attend GAPK, this is the lone significant result. In general, we do not find a relationship between attending a SBPK and disciplinary infractions in later grades. While we cannot measure the students' social and emotional competency, we find it valuable to note non-test score measures nonetheless.

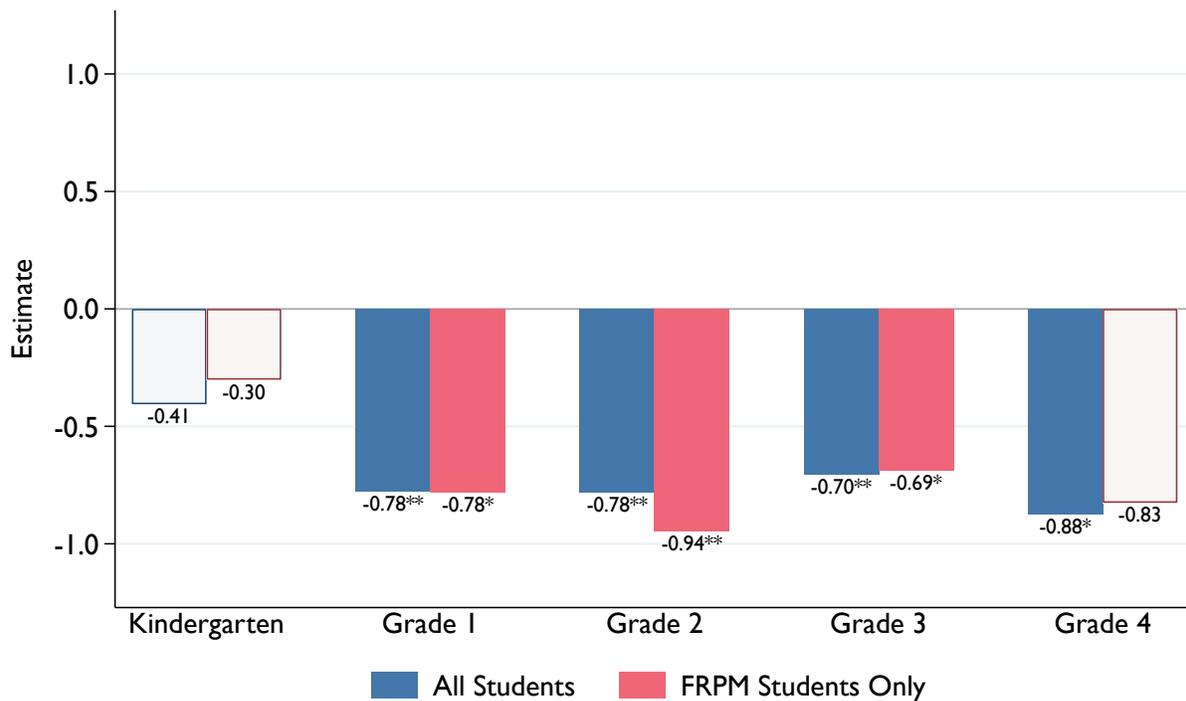
Next, we consider attendance. Figure 7 depicts the relationship between oversubscribed SBPK attendance and the number of absences in later grades by subgroup. SBPK attendance seems to have no relationship with absences in kindergarten for either the average student or FRPM students. From Grade 1 onward, however, we find a consistently negative and significant relationship between attending an oversubscribed SBPK and the number of days a student is absent in each grade. Taken as a whole, the relationship we find is modest, with

Figure 6. Effect of School-Based Pre-K Attendance in the District on Number of Disciplinary Infractions, by Subsample (Relative to Not Attending Georgia’s Pre-K Program)



Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

Figure 7. Effect of School-Based Pre-K Attendance in the District on Number of Days Absent, by FRPM Status (Relative to Not Attending Georgia’s Pre-K Program)



Notes. Shaded bars indicate significant estimates (i.e., estimates that are at least 95% likely to be different from zero).

the average selected student attending roughly three and a half more days of school between kindergarten and Grade 4.

Finding 4: Pre-K Among Non-Selected Students

Nearly half of non-selected students never enroll at any site in Georgia’s Pre-K Program.

Students who participate in an enrollment lottery but are not selected have some other options for early childhood education. Students may enroll in a non-SBPK or may opt for another SBPK site in their district if open seats remain. Other students may choose to seek other options outside of Georgia’s Pre-K Program. Lastly, some might remain at home. Because our data only cover sites in Georgia’s Pre-K Program, we cannot distinguish between cases where a child does not attend any formal pre-K and cases where they attend an early learning option outside of Georgia’s Pre-K Program.

Figure 8 shows the number and percentage of students who attend each type of pre-K site we can observe in our data. The most common outcome for children who are not selected in a SBPK enrollment lottery is not to attend any site in Georgia’s Pre-K Program, accounting for nearly half of all non-selected students (49.6%). For the other half of students who remain in a site in Georgia’s Pre-K Program, the typical choice (28.4%) is to enroll in a non-SBPK; this constitutes more than half (56.3%) of non-selected students who attend sites in Georgia’s Pre-K Program. Some non-selected students (18.9%) do later attend a SBPK, with the majority (11.6%) attending their preferred school—the SBPK for which they originally were not selected in an enrollment lottery. Finally, a small number of students attend multiple sites. The most frequent (2.4%) situation in which this occurs is when a child attends both a non-SBPK and their preferred SBPK over the course of a year.

Looking at whether a child ever attends each type of pre-K site is useful, but leaves our understanding wanting. Among non-selected students who eventually enrolled at a GAPK site, some will have been enrolled for weeks or months longer than others. To understand this dynamic better, Table 1 reports the average number of days non-selected students are enrolled at each type of site between August 15 and May 31 of each academic year. There are 289 days in this span.⁶ Non-selected students spend most (55.4%) of these days not observed in any GAPK. Of the roughly 127 days non-selected students spend

Figure 8. Early Childhood Education Decisions of Non-Selected Students

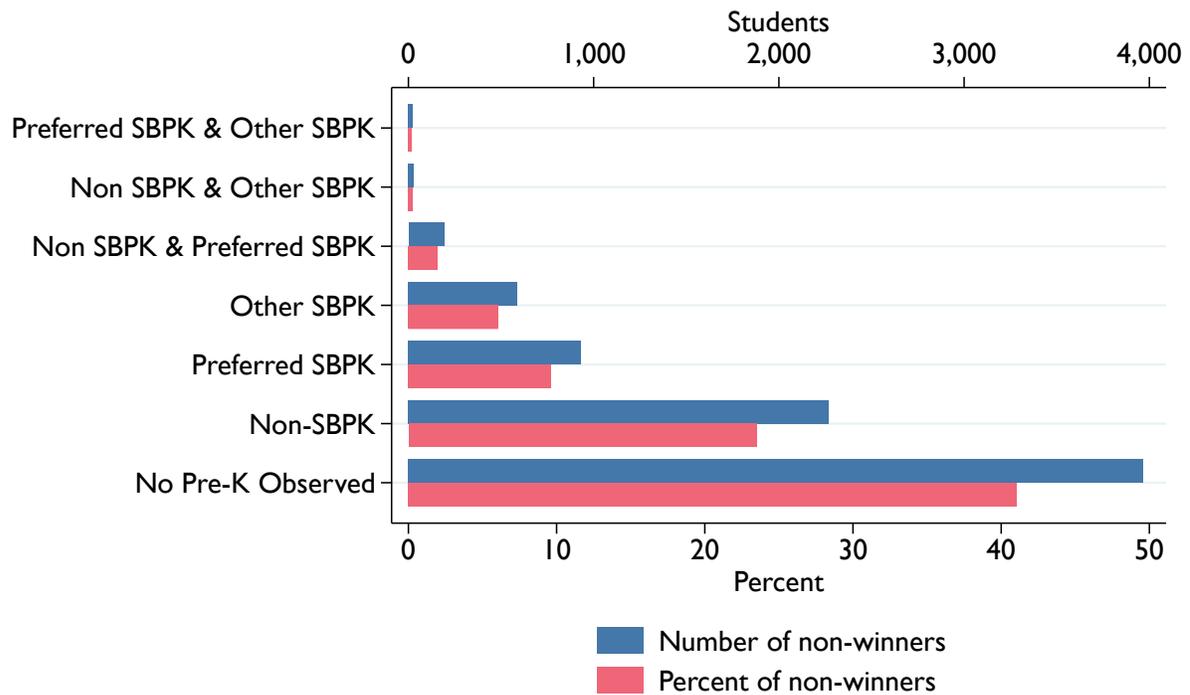


Table 1. Average Number of Days Spent in each Type of Pre-K Site between August 15 and May 31

	Non-selected students		Never on waitlist	
	Mean	% of span	Mean	% of span
Days not enrolled in Pre-K	160	55.4	41	14.0
Days enrolled in GA Pre-K	127	43.8	246	85.2
Days in non-SBPK	74	25.6	141	48.7
Days in any SBPK	53	18.2	105	36.5
Days in preferred SBPK	33	11.3	—	—
Days in other SBPK	20	7.0	—	—

Notes. If a student is not selected in a lottery for an SBPK, that SBPK is considered “preferred” by that student. The “span” is 289 days between August 15 and May 31.

enrolled in GAPK, most days (74) are spent enrolled at non-school-based sites. Of the remaining days (53) at sites in GAPK, the majority (33) happen in preferred school-based sites, and the remainder (20) occur at other school-based sites.

Comparatively, children who are not selected in an enrollment lottery for an oversubscribed SBPK end up spending far fewer days enrolled in GAPK than other students. It does not seem to be the case, however, that the preferences of non-selected students for school-based and non-school-based sites differ from that of the average student who was never on a waitlist. Non-school-based sites account for 58.4% of the total days spent in GAPK for non-selected students (compared to 57.2% for other students).

Certain characteristics of students are predictive of whether and where students attend GAPK. English language learners who are not selected in an enrollment lottery are about 50% less likely to attend a SBPK and 20% less likely to attend a non-SBPK relative to not attending GAPK at all. In contrast, FRPM-qualifying students who are not selected in an enrollment lottery are about 50% more likely to attend a SBPK and 60% more likely to attend a non-SBPK than not attending GAPK. White non-selected students are slightly less likely to attend a SBPK and significantly less likely to attend a non-SBPK than no site in Georgia's Pre-K Program. Black non-selected students are almost twice as likely to attend either a SBPK or non-SBPK than not attending Georgia's Pre-K Program.

Because our data cannot distinguish students who attend a pre-K unaffiliated with the GAPK Program from those who truly do not attend any pre-K at all, it is difficult to interpret these results. White children are less likely to be observed in any Georgia Pre-K site, potentially reflecting the use of options outside Georgia's Pre-K Program (e.g., at-home care or private [non-GAPK] options). The finding that English learners who are not selected in a SBPK lottery are more likely to not attend GAPK rather than attend a SBPK or non-SBPK may be explained by limited access to English-learner services in non-SBPKs, which could result in staying at home or participating in informal pre-K settings. The choices of FRPM-qualifying students are more difficult to rationalize. Given that few non-SBPK programs offer transportation, it is surprising that FRPM non-selected students are relatively more likely to attend a non-SBPK than not attending GAPK at all (compared to non-FRPM students). Please note that these explanations are merely conjecture as this study does not have data on options outside of Georgia's Pre-K Program.

Further research on pre-K in Georgia would greatly benefit from data with more detail on the choices of students who do not attend any pre-K affiliated with Georgia's Pre-K Program; however, gathering quality data from a variety of independent early childhood education centers presents a significant challenge. In addition, this research cannot measure how differences in pre-K or elementary quality might affect the size or persistence of benefits. Understanding the settings that yield longer-lasting gains could be valuable for policymakers.

Conclusion and Policy Implications

In this report, we estimated the effects of attending an oversubscribed school-based Georgia's Pre-K Program on achievement, attendance, and discipline in elementary school. Using the results of lotteries for oversubscribed school-based Pre-K sites in one metro-Atlanta school district, we compared students who gained a seat through an enrollment lottery and attended a school-based site in Georgia's Pre-K Program to students who did not gain a seat through a lottery and did not go to any site in Georgia's Pre-K Program. We find that students selected in a lottery enter kindergarten significantly more prepared academically, scoring around six percentiles higher than their non-selected peers as measured by national percentile rankings on the Measures of Academic Progress (MAP) math and reading tests. However, these gains fade by the end of kindergarten, and some negative effects on achievement emerge by Grade 4. The negative effects in later grades may be driven by students in the control group who attend options outside of Georgia's Pre-K Program. Measured effects are larger when we only consider students who qualify for free or reduced-price meals (FRPM), suggesting that attending pre-K may be more beneficial for students experiencing low income—a common finding in the early education literature (Lee et al., 1990; Currie, 2001). While selected students were no less likely than non-selected students to commit a disciplinary infraction in any grade, they did miss about one fewer day of instruction in each grade after kindergarten.

Importantly, we find that students who qualify for free or reduced-price meals almost always benefit more from being selected in a lottery for a school-based pre-K site and attending. Students experiencing low income who are not in a formal setting may have more limited access to educational resources than their peers, which is a disparity that pre-K attendance alleviates. Another factor that may be relevant for families experiencing low income is the difference

in transportation provision between school-based and non-school-based sites in Georgia's Pre-K Program. While almost all school-based sites offer transportation (which is free for students from families experiencing low income), almost no non-school-based sites do, and the effects of not being selected in a lottery could be more acutely realized for families experiencing low income who have limited transportation availability.

The limitations of our analysis make us cautious in providing policy recommendations. However, due to the disparities in transportation access across sites, offering students with limited transportation options priority at sites that offer transportation could be impactful. In the long-term, additional funding could help non-school-based sites overcome the cost of providing transportation as they do not have the economies of scale that elementary schools do. Finally, providing additional information to parents could be a relatively inexpensive and potentially impactful way to increase the number of students served. In particular, informing parents of non-selected students of next steps and other options within Georgia's Pre-K Program may reduce the chance that their child does not attend any formal pre-K. Our results give suggestive evidence that this type of intervention could be particularly beneficial if aimed at families with limited language proficiency, as they may face a greater barrier for accessing information.

It is possible that providers in Georgia's Pre-K Program are preparing students in ways that we are not measuring (e.g., socio-emotional development). We can measure two non-test score outcomes. We have null results for impacts on discipline. Little variation exists in the number of infractions per student, meaning that our model might not be well-suited to detecting a relationship. On the other hand, we do find a consistent, positive relationship of pre-K with later elementary school attendance. This is encouraging insofar as it indicates that attending a school-based pre-K can have a persistent effect on a student, but it is unclear what mechanism drives this decrease in absenteeism. It could also be possible that students who attend pre-K generate positive effects for non-attendees in their classrooms as Belfield (2005) suggests. For instance, pre-K attendees may be more prepared or easier to teach, allowing teachers to perform their job more effectively. In theory, these spillovers would raise the readiness of the control group and diminish the estimated effect of attending a school-based pre-K on later outcomes. We cannot conclusively explain the mechanisms driving the patterns shown in this report.

The broad patterns we find are consistent with previous studies of the efficacy of universal pre-K programs elsewhere: Attending a school-based pre-K does

prepare students well academically for kindergarten, but these measured benefits do not appear to persist for long. It is not clear why this is the case. One study has suggested that elementary schools might fail to capitalize on the greater academic preparedness of pre-K attendees (Currie & Thomas, 1995). More research is needed to understand the pathways that connect early educational outcomes to those later in childhood.

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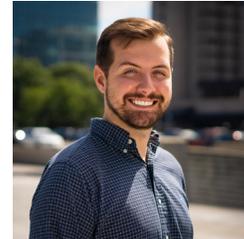
Endnotes

1. A small number of other types of programs exist under the umbrella of Georgia's Pre-K Program, including some Head Start programs and U.S. Department of Defense early childhood education programs.
2. One dissenter is Huizen and Plantenga (2017), whose meta-analysis of universal early childhood education studies suggests no fade out.
3. The lottery fixed effect is defined as a site-year combination. If a school was observed having a lottery five years in a row, it would generate five different lottery fixed effects.
4. The use of a fixed effect compares students within the group for which the fixed effect is used (a lottery in this case) by changing the values of the variables in the model to differences from the group mean of each variable.
5. Although DECAL does not administer all early learning programs, it licenses all early learning centers in Georgia.
6. DECAL mandates 180 instructional days each year.

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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.

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