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# Pre-K Effectiveness at a Large Scale

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# POLICY BRIEF

## Pre-K Effectiveness at a Large Scale

Timothy J. Bartik and Brad Hershbein, W.E. Upjohn Institute

### BRIEF HIGHLIGHTS

- We evaluate thousands of public school district pre-K programs throughout the United States over the past two decades.
- In states with high-quality programs, there is a significant gain of 2.8 percentiles on math tests.
- For majority African American districts, pre-K raises reading scores by 3.9 percentiles and math scores by 5.9 percentiles.
- For the average student in an average state and school district, the typical pre-K program has no positive effect on 4th grade test scores, special education assignment, or grade repetition.
- Pre-K programs can produce significant medium-term benefits, enough to pass a benefit-cost test, but this is more likely with high-quality programs or disadvantaged student populations.

For additional details, see the full paper, *Pre-K in the Public Schools: Evidence from within U.S. States*.

This can be found at [http://research.upjohn.org/up\\_workingpapers/285/](http://research.upjohn.org/up_workingpapers/285/).

In the past 15 years, state-funded pre-kindergarten in the United States has more than doubled, with one-third of four-year-olds now enrolled. Advocates have pushed for further expansion; for example, New York City Mayor Bill de Blasio in 2014 implemented a universal pre-K program.

Prior research has found that early childhood programs from decades ago had sizable benefits for students. Pre-K not only increased early test scores but also led to later increases in educational attainment and adult earnings. However, it is unclear whether the effects of previously-studied programs generalize to the typical pre-K program today. The earlier programs may have been of higher quality than today's pre-K programs, which often spend less per student.

We perform the first national analysis of public pre-K's effects on standardized test scores, special education assignment, and grade retention, using data from thousands of school districts throughout the country. We estimate the impacts of typical public school pre-K programs. We also estimate how impacts vary for districts of different types, and in states where pre-K quality is recognized as being high.

Our analysis reveals the following:

1. For districts in states with high-quality programs (based on prior assessment by other experts), pre-K boosts 4th grade math test scores by 2.8 percentiles, twice the necessary threshold to pass a benefit-cost test in terms of predicted future earnings of students.
2. For districts with majority African American enrollment, pre-K program effects are even larger, with increases of 5.9 percentiles in math and 3.8 percentiles in reading. Among such districts in high-quality states, the increases are 6.6 and 7.4 percentiles, respectively.
3. In contrast, the typical public pre-K program in a typical school district has no positive effects on 4th grade outcomes. We can rule out impacts from full pre-K adoption as small as 2 percentiles in math and reading test scores and 3 percentage points in special education assignment and grade retention.

Whereas many prior studies looking at high-quality programs analyze what a pre-K program *could do* under the right circumstances, we look at what public school pre-K programs *have done* in practice over the past two decades. These programs have substantively large benefits when they are either higher quality or operated in more disadvantaged school districts. In contrast, the average student, school district, and state receive relatively few benefits from typical public school pre-K programs.

Because much of the current policy debate is about the desirability of large-scale expansion of pre-K, these findings are highly policy relevant. For large-scale expansion of pre-K to make sense, policymakers must keep the quality up.

## Pre-K Effectiveness at a Large Scale

**Only modest medium-term effects are necessary for pre-K to have predicted long-term benefits greater than costs.**

### Analyzing Public School Pre-K across Thousands of Districts

To evaluate pre-K programs in public school districts, we need data on both pre-K enrollments and academic outcomes for many districts. We get both from the U.S. Department of Education. Pre-K enrollment is readily publicly available for almost every district every year. We create a scale measure by dividing a district's pre-K enrollment by its grade 1 enrollment. Since 1st grade enrollment is universal, this approximates the fraction of students in a district who were enrolled in pre-K each year.

In the early 1990s, the typical (or median) school district had no pre-K, but the top tenth of districts had at least one-quarter of each year's students in pre-K. By the 2007–2008 school year, the typical district had about one-fifth of its students attend pre-K, and the top tenth of districts had nearly 90 percent of their students attending pre-K.

Measuring academic outcomes at the district level is harder. We use confidential data from the National Assessment of Educational Progress (NAEP), also known as the Nation's Report Card, a nationally representative standardized test, with core subjects in math and reading for 4th graders. These data allow us to link average student outcomes at the school district level with the pre-K enrollment of the same districts five years earlier—when the tested 4th graders should have been of pre-K age. Although not every school district takes the NAEP every time it is administered, enough do that we have outcomes for math and reading test scores for more than 5,000 school districts from the late 1990s through 2013. (In the full paper, we look at other available outcomes that pre-K may influence, particularly those that rely on socioemotional skills: the fraction of students in special education and the fraction who repeated a grade.)

### The Effects of Public School Pre-K

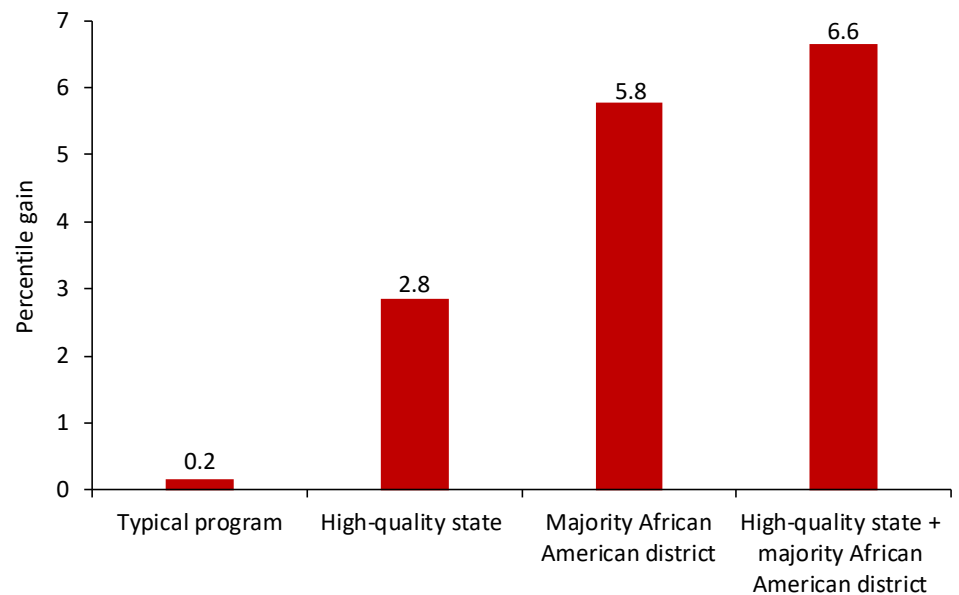
We estimate the impact of pre-K by comparing changes in outcomes among districts that expanded pre-K with changes in outcomes for districts that did not expand pre-K. This strategy allows us to control for permanent differences across districts. We also statistically adjust for changing characteristics of districts, notably per-student spending, as well as of students, such as sex, race and ethnicity, participation in the federal assisted lunch program, and whether the student is an English-language learner. (The full paper provides details on methodology.)

The first bar of Figure 1 shows the impact for a typical district of switching from no pre-K to full pre-K on math test score performance, measured in percentiles. The estimate of 0.2 means that moving from an environment in which none of a district's students attend public pre-K to one in which all the students attend pre-K is expected to raise math test scores by 0.2 percentiles—a tiny effect that is statistically indistinguishable from zero. What's more, although all statistical estimates come with a margin of error, the margin on this estimate is small enough that we can rule out effects as slight as 1.5 percentiles. As discussed below, this upper bound is just barely at the level needed to balance future social benefits (through higher future earnings of students) with program costs; it is also well below the benefit-cost ratio estimated for earlier, high-quality programs, such as Perry Preschool and the Chicago Child Parent Center.

However, states vary considerably in their funding and regulation of public pre-K programs, from per-pupil spending to necessary teacher credentials to teacher pay to curriculum. District implementation will vary within states, but is likely to be higher in states with stronger requirements. Drawing from expert opinion and findings from previous research, we identified—prior to our analysis—five states likely to have high-quality pre-K programs: Maryland, Massachusetts, New Jersey, North Carolina, and Oklahoma. The second bar in Figure 1 shows the impact of public school pre-K for districts in these five states. At 2.8 percentiles from switching from no pre-K to full pre-K, it is much larger than the impact for the typical district across all states and easily passes a benefit-cost test. Quality clearly matters for effectiveness.

**Pre-K programs in quality states and majority black districts suggest sizable benefit-cost ratios.**

**Figure 1 Pre-K Boosts 4th Grade Math Test Scores More When It's High-Quality and in Heavily African American Districts**



NOTE: The figure shows the estimated gain in percentiles for 4th grade math test scores when a school district of the indicated type shifts from no pre-K enrollment to full pre-K enrollment for the cohort. Pre-K enrollment is measured five years prior to 4th grade test scores.

SOURCE: Bartik and Hershbein (2018).

Additionally, among previous studies of smaller-scale early childhood education programs, the largest effects have generally been found for those that target heavily disadvantaged students. In the last two columns, we show pre-K impacts among districts that are majority African American, overall and within high-quality states. These districts, whether they are urban or rural, often have high poverty rates: roughly three-quarters of students are eligible for free or reduced-price lunch in the typical district. Pre-K effects in these districts are substantively large, at 5.8 percentiles overall and 6.6 percentiles in districts in high-quality states. Although not shown in the figure, we also find large impacts on reading scores of 3.8 percentiles overall and 7.4 percentiles among districts in high-quality states. The magnitude of these effects is consistent with earlier studies of smaller programs; we show that similar effects are found for larger-scale public programs.

Overall, these pre-K impacts are consistent with a reasonable story. Pre-K is of sufficiently high quality on average to create benefits for some disadvantaged students—notably, for students in majority black school districts. Furthermore, in high-quality states, pre-K can create benefits for broader groups of students. However, pre-K in the average district for the typical student is of insufficiently high quality to create large positive benefits.

### Factors to Keep in Mind When Evaluating Pre-K Programs

**Only modest impacts are necessary for pre-K to have predicted long-term benefits greater than costs.** The average state-funded pre-K program costs about \$5,700 per student per year. Research has found that a 1-percentile increase in 4th grade test scores raises lifetime earnings by about \$4,000. If pre-K boosts average test scores by just 1.4 percentiles, the expected future earnings gains are enough to pay for the cost of the program. Detecting these small effects requires a lot of data, as in the current analysis.

## Pre-K Effectiveness at a Large Scale

**Pre-K in the average state and for the average student and school is of insufficiently high quality to create large positive benefits.**

**Pre-K effects can be U-shaped when measured at different ages.** Many studies have found effects of pre-K immediately after the program, but that these effects may partially fade out during the late elementary and middle school years. Older programs have shown positive effects returning in adulthood, such as greater earnings and less contact with the criminal justice system. These patterns may occur if pre-K has lasting impacts on hard-to-detect socioemotional skills, but test scores are highly dependent on curriculum, which converges for students regardless of pre-K exposure. Our analysis cannot speak to the possibility of the average public pre-K program having long-term effects; therefore, our analysis is conservative.

**Children not attending public pre-K may be attending another early childhood education program.** The well-publicized evaluation of the Head Start Impact Study found little net impact later in elementary school. Subsequent research, however, found that this was because many children not assigned to Head Start attended another program instead; Head Start effects were much greater relative to students who attended no program. In our context, it is likely that some children not attending public school pre-K were attending private preschool or a standalone Head Start center. In the analysis, we statistically control for the availability of Head Start and private preschool slots geographically close to each public school district; these controls do not change our findings.

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