

The Effects of South Carolina's Early Childhood Programs on Young Children's School Readiness

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The Effects of the South Carolina's Child Development Programs on Young Children's School Readiness

Executive Summary

This study measures the effects of South Carolina's state-funded preschool programs on entering kindergartners academic skills using an innovative research model. Early literacy and language skills were assessed in a sample of 777 children from across South Carolina. We find that South Carolina's state-funded preschools have strong, statistically significant and meaningful impacts on children's literacy skills at the start of Kindergarten, and find evidence of an enhanced program effect for print awareness skills for children in low-income families.

Specifically:

1. South Carolina's programs produce an increase in children's vocabulary scores of over 5 raw score points, 42 percent more growth over the year due to the program (and a 10 percent increase in average vocabulary scores). This improvement translates into an additional four months of progress in vocabulary growth due to the program. This outcome is particularly important because the measure is strongly predictive of general cognitive abilities.
2. South Carolina's programs have large effects on children's understanding of print concepts. The programs increase all children's print awareness scores by nearly 19 percentage points, a doubling of growth over the year due to the program (and a 42 percent increase in children's average print awareness scores). The programs additionally boost scores for children from low-income families another 8 percentage points higher. Children who attend the programs know more letters, more letter-sound associations, and are more familiar with words and books concepts.
3. We found no significant effects on a measure of children's skills in phonological awareness. As this measure is relatively new, it is difficult to determine the extent to which the result is due to a true lack of program effects.

South Carolina's state-funded preschool program evaluation is part of a larger multi-state study of the effects of state-funded preschool, which includes 5071 preschool and kindergarten children sampled across four additional states – Michigan, New Jersey, Oklahoma, and West Virginia. South Carolina was the first state to participate in this research and its study focuses only on language and literacy. Math was subsequently added as an outcome in the other states.

Introduction

State-funded preschool programs have become increasingly common across the country, having been established to some extent in up to 40 states. While myriad services these programs may provide to families are influenced by complex parental needs which may include longer hours, transportation, health services and the like, the main goal of all state-funded preschool programs is the preparation of young children for the increasingly rigorous challenges of kindergarten. Effective preschool programs lay a foundation for children's subsequent school success by imparting the basics – colors, shapes, numbers, letters, how to look at a book, how to get along with classmates, how to live by the rules in school - sending children to kindergarten with solid successes in preschool and the real confidence that success creates. As the number of state-funded preschool programs grows, it is important to determine how effective these programs are in improving children's potential for school success.

The Child Development Program Context

South Carolina's Half-Day Child Development Program (4K) served 18,561 children in FY 04 using \$28 million in state funding. Under a separate First Steps to School Readiness initiative, South Carolina also provides state funds, predominately distributed at the local level, to be used for a variety of purposes for young children and their families. The First Steps funds can be used to supplement 4K, add new preschool classes or serve additional children in half-day classes. In 02-03 approximately 320 children were served in 16 First Steps public-private partnership sites.

The NIEER *2004 State of Preschool: State Preschool Yearbook* analyzed state funded preschool initiatives in FY '02-03 based on access, resources and quality. Each state was ranked on access to and resources for preschool education. South Carolina ranked 4th in the nation in access for 4-year-olds. Importantly, South Carolina requires that teachers in the preschools have a bachelor's degree with specialized training in early childhood development. South Carolina also requires a maximum class size of 20 and a staff to child ratio of 1:10.

Methods

Study Design

South Carolina's preschool program evaluation is based on regression-discontinuity (RD) design, a statistical model with several strengths. The design reduces the likelihood that the study suffers from one of the most vexing problems in educational research, that of selection bias. Typically, program effects are estimated by comparing the test scores of children who attended a program with the scores of similar children who did not go. Where programs are universal, the problem of finding a "comparable" group of children who did not go to preschool is obvious. Yet, even where programs target only some children, a problem remains: those who go to preschool are *not* the same

those who do not. Preschool programs that target specific types of children create these differences, but differences also come about because some parents choose to enroll their children and others do not. In sum, children who go to preschool differ from those who do not because programs select children and families select programs.

Our solution is to compare two groups of children who select (and are selected by) the state program, using a fairly stringent age cutoff for enrollment eligibility to define groups. This concept is easier to understand when considered in the extreme case: consider two children who differ only in that one was born the day before the age cutoff and the other the day after. When both are about to turn 5 years old the slightly younger child will enter the preschool program and the slightly older child will enter kindergarten having already attended the preschool program. If both are tested at that time, the difference in their scores can provide an unbiased estimate of the state preschool program's effect. Obviously, if only children with birthdays one day on either side of the age cutoff were included in a study, the sample size would be unreasonably small. However, the approach can be applied to wider age ranges around the cutoff. In fact, all children entering kindergarten from the state preschool program, and all children beginning preschool in the same year can be included using regression-discontinuity statistical techniques that adjust for the effects of age.

The research question of interest is whether attendance in the state-funded preschool program at age 4 has an impact on children's academic skills at kindergarten entry. This question is addressed with identical methods and measures across the five study states, with one exception. South Carolina was the first state to participate in this research and its study focuses only on language and literacy. Math was subsequently added as an outcome in the other states. The programs in Michigan, New Jersey and South Carolina are targeted to at-risk children while the programs in Oklahoma and West Virginia are universal. Each state program is unique, but all required licensed teachers with four-year college degrees and certification in early childhood (with minor exceptions in Michigan).

Sampling Strategy

To choose a sample of children we first randomly selected state-funded preschool classrooms from a list of the total number of state-funded preschool classrooms across the state. We then sampled the same number of kindergarten classrooms as preschool classrooms within the districts from which the preschool classrooms were selected. From each of these classrooms we then randomly selected approximately four children.

Trained research staff from the University of South Carolina visited each sampled program site, selected children into the sample using a procedure to ensure randomness, and conducted the child assessments as early as possible in the school year. A liaison at each site gathered information on the children's preschool status, usually from existing school records but occasionally from parent report, and was reimbursed \$5 per selected child.

Sample

As mentioned above, the evaluation requires two groups of children. One group, currently attending kindergarten and who attended the state-funded preschool program the previous year, is called the "Preschool" group, or the experiment group. The second group, currently attending the state-funded preschool program is called the "No Preschool" group, or the control group. This group is called the "No Preschool" group despite the fact that they are currently enrolled in the state-funded preschool program, because they are only at the very beginning of their preschool year and have not had the preschool "treatment" yet.

In South Carolina, an initial random sample of 139 preschool classrooms across the entire state was drawn, and a matching number of kindergarten classrooms were then randomly selected by district. The initial sample included 53 districts, of which 14 (26 percent) are not included in the final sample due to school- or district-level refusals. Thirteen new districts were added and samples in two districts were increased. As a result of district, school or classroom refusals, data was gathered from 188 classrooms, with an average of four children per class. In South Carolina, the total sample size is 777 children, 422 in the No Preschool group and 355 in the Preschool group. The sample is 49 percent male, and includes children of different ethnicities in numbers that closely represent the overall state percentages, as follows: White -- 44 percent; African-American -- 50 percent; Hispanic -- 3 percent; Asian -- 2 percent; American Indian -- 0.3 percent; and all other ethnicities -- 0.7 percent.

Findings for the South Carolina sample are not directly comparable discussed to findings from the larger study sample of 5071 children from four additional states (Michigan, New Jersey, Oklahoma and West Virginia) because of differences across programs (for instance, children in other states may begin state-funded preschool at age 3) and other circumstances that affect the experiences of children who do not attend state-funded preschool programs. The larger sample is 48 percent male with ethnicities as follows: White -- 47 percent; African American -- 25 percent; Hispanic -- 21 percent; Native American -- 2.5 percent; Asian -- 2 percent; and all other ethnicities -- 2 percent.

Measures of School Readiness

Receptive Vocabulary

Children's receptive vocabulary was measured by the Peabody Picture Vocabulary Test, 3rd Edition (PPVT-3) (Dunn & Dunn, 1997). The PPVT is commonly used as quick test of IQ and can be used as a rough assessment of general cognitive abilities. The PPVT is a direct measure of vocabulary size and the rank order of item difficulties is highly correlated with the frequency with which words are used in spoken and written language. The test is adaptive (to avoid floor and ceiling problems),

establishing a floor below which the child is assumed to know all the answers and a ceiling above which the child is assumed to know none of the answers. Reliability is good as judged by either split-half reliabilities or test-retest reliabilities. Raw scores are reported.

Phonological Skills and Print Awareness

Phonological skills development was measured using the Blending subtest of the Preschool Comprehensive Test of Phonological & Print Processing (Pre-CTOPPP; Lonigan, Wagner, Torgeson & Rashotte, n.p.) The Pre-CTOPPP was designed as a downward extension of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgeson & Rashotte, 1999), which measures phonological sensitivity in elementary school-aged children. Although not yet published, the Pre-CTOPPP has been used with middle-income and low-income samples and includes a Spanish version. As the Pre-CTOPP has only been very recently developed, very little technical information is available about its performance and psychometric properties.

The Blending subtest includes items that measure whether children can blend initial phonemes onto one-syllable words, initial syllables onto two-syllable words, and ending phonemes onto one-syllable words. The percentage of items the child answered correctly out of the 21 total subtest items is reported.

Print Awareness was measured using the Print Awareness subtest of the Pre-CTOPPP. Items measure whether children recognize individual letters and letter-sound correspondences, and whether they differentiate words in print from pictures and other symbols. The percentage of items answered correctly out of the 36 total subtest items is reported.

Results

The main results for the effects of South Carolina's programs are displayed in individual figures for each outcome measure. Each figure displays a regression line of the children's predicted test scores by the distance away in days their birth date is from the program enrollment cut-off date. The discontinuity in the regression line at the cut-off date is the estimated effect of the preschool program.

Receptive Vocabulary

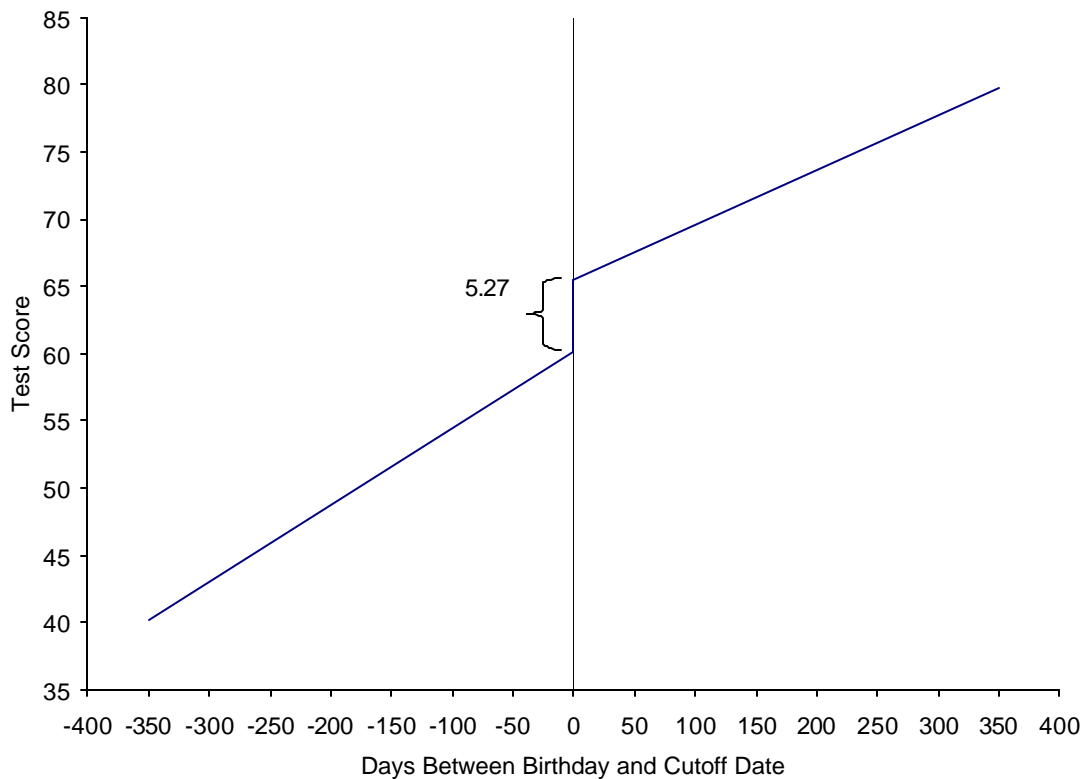
The effect of state-funded preschools on children's receptive vocabulary as measured by the PPVT is statistically significant for South Carolina's program. Attendance in South Carolina's preschool programs is estimated to increase children's PPVT scores by about 5.27 raw score points. For children of preschool and kindergarten age on this measure raw score points translate into about the same number of standard score points, so the improvement is about 35 percent of a normed standard deviation. The effect of the programs can also be understood as 42 percent more growth in

vocabulary scores over the year or a 10 percent increase over children's average vocabulary scores.

Age equivalence scores provide a measure of children's vocabulary knowledge using a normed estimate of the average age of children who score the same. Results indicate that the average improvement due to the program in South Carolina is approximately an additional four months of vocabulary development.

Figure 1 below portrays a regression line of the children's predicted PPVT scores by the distance in days their birth date is from the program enrollment cut-off date. The discontinuity in the regression line at the cut-off date represents the estimated effect of the preschool programs which is 5.27 raw score points.

Figure 1. The Effect of South Carolina's State-Funded Preschool Programs on Children's Receptive Vocabulary Scores

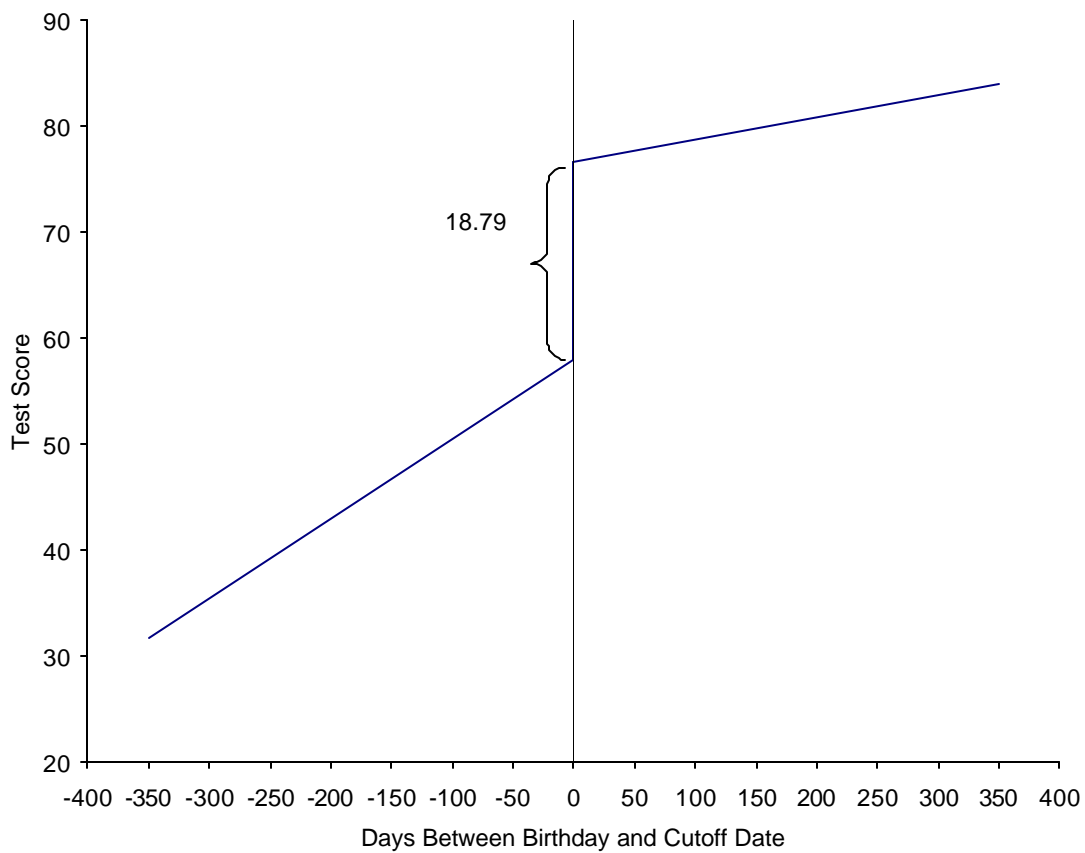


Print Awareness

The effect of state-funded preschool on children's Print Awareness scores is statistically significant for South Carolina's program. South Carolina's preschool programs increase children's Print Awareness scores by about 18.79 percentage points, an improvement of about 71 percent of a standard deviation on the Print Awareness subtest. The effect of the programs can also be understood as 102 percent more growth over the year and a 42 percent increase over children's average print awareness scores.

Figure 2 below portrays a regression line of the children's predicted Print Awareness scores by the distance in days their birth date is from the program enrollment cut-off date. The discontinuity in the regression line at the cut-off date represents the estimated effect of the preschool program, or 18.79 raw score points.

Figure 2. The Effect of South Carolina's State-Funded Preschool Programs on Children's Print Awareness Scores



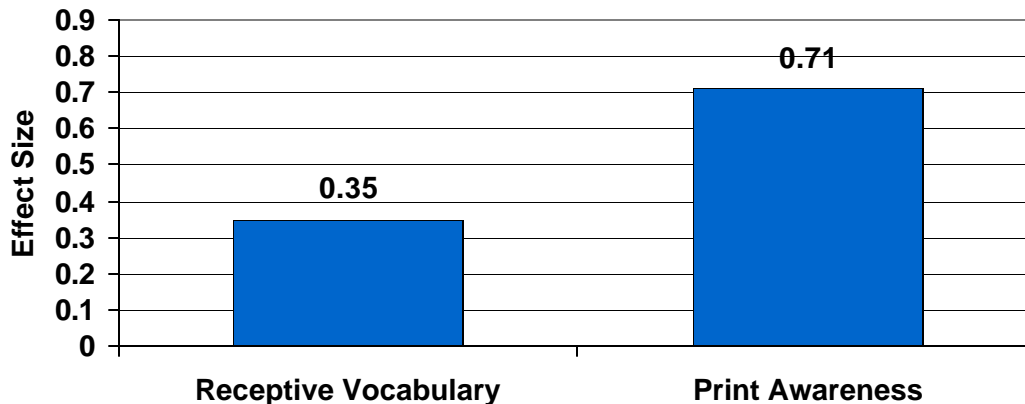
Phonological Skills

Results indicate that the effect of South Carolina's preschool programs on children's phonological development scores is minimal and not statistically significant. While the difference in Blending subtest scores between the groups may seem large (75 percent of items correct for the No Preschool group versus 83 percent for the Preschool group), the difference due to the program is not significantly different from zero. The remainder of the difference is most likely accounted for by the fact that the Preschool group children are older than the No Preschool group children, and they have developed the skills to score higher outside of the preschool program.

Summary

By way of summary, Figure 4 below portrays the effect sizes of the impact of South Carolina's preschool program on children's receptive vocabulary and print awareness scores. These effect sizes are another way of standardizing the estimated effects of the program so that they may be compared to estimated effects in other studies.

Figure 4. The Effect of South Carolina's State-Funded Preschool Program on Children's Scores across Measures



Preschool Effects and Family Income

Family income, measured by whether children qualify for free or reduced price lunch status as reported by the school, was not included in the primary analyses presented here because missing data on this measure reduced sample size by nearly 20 percent overall and by more than 50 percent in one state. However, we conducted separate analyses to test whether or not effects were larger for children from lower income families. In South Carolina, these separate analyses found that the effect of the preschool program on children's print awareness skills is stronger for children who qualify for free or reduced price lunch than for those from higher income families. The preschool program increased their scores by an additional 8 percent more items on the print

awareness test than it did for children who did not qualify for free lunch. No differences in effects were found on receptive vocabulary. Otherwise, results are virtually identical to those presented here when free lunch status is included in the statistical analyses. South Carolina's preschool programs target children at elevated risk of school failure, including economically disadvantaged children. Of the 89 percent of sample children for whom we have data, 61 percent receive free or reduced price lunch.

Differences Between Programs

In separate analyses we also investigated whether First Steps-funded preschool and 4K preschool differed in their results. Keep in mind that differences in outcomes can be due to differences in the populations served by the two programs, including differences in their access to other kinds of preschool education, and cannot be attributed to differences in the programs. Our results indicate significantly larger gains (25% higher) for children who attended a First Steps preschool classroom on Print Awareness scores alone. There were no significant differences in effects between the two programs on any of the other measures.

Discussion

These study findings provide strong evidence of the positive impact of South Carolina's state-funded preschool programs on children's language and literacy skills development. This evidence indicates that the South Carolina's programs produce the kinds of effects that lead to increased school success and later improvements in children's reading skills. For example, children's early print awareness and receptive vocabulary skills have been found to predict later reading abilities in the early elementary grades (Snow, Burns, & Griffin, 1998). The effects found in this study are the first link in a chain that produces the long-term school success and economic benefits documented by preschool studies that have followed children into adulthood (Schweinhart, Montie, Ziang, Barnett, Belfield, & Nores, 2005; Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Reynolds, Temple, Robertson, & Mann, 2002).

Important positive effects were found for children's receptive vocabulary and print awareness skills, with South Carolina's programs effects on children's scores similar to those found for the overall study. State-funded preschool programs, including South Carolina's, appear to have their largest effects on children's early print awareness skills. South Carolina's preschool programs also provide an extra boost in print awareness skills for children from lower income families, evidence that, while everyone gains, disadvantaged students gain most from the preschool programs.

We did not find that state-funded preschool programs significantly improved children's blending skills, our sole measure of phonological awareness. Perhaps these preschool classrooms did not provide as much support for these skills as they did for vocabulary development and print awareness (Lamy & Frede, 2005). In that case, activities and interactions to support children's phonological sensitivity – hearing smaller

sounds within the spoken word that may be parsed out and switched for others to create rhymes and alternate endings – may need to be increased. However, additional construct measurement issues may influence this finding. The No Preschool sample children produced higher average scores on this measure than the average scores reported by the instrument authors. Higher scores at preschool entry would mitigate the impact of preschool on those scores at kindergarten entry; however, the fact that even highly disadvantaged children had higher average scores while scoring relatively lower on other measures may indicate that this instrument is not measuring those skills well for children of this age. Our results suggest that more research is needed on the measure itself.

Results indicate that estimated program effects varied among the study states on print awareness, but not on vocabulary. We do not discuss these variations in detail here because their interpretation is not straightforward. It is possible that some of the variation is due to differences among the programs, however, the broader context of available preschool experiences is not the same across states, nor is population served. The samples varied across states, from highly disadvantaged to a cross-section of the general population, as programs vary from highly targeted to universal. For example, in New Jersey's Abbott program the majority of the sample children attended the same program at age three. In the other states, many fewer children (in some cases none) attended the state-funded program at age three, but they could have attended Head Start or a private preschool program or child care center and it is likely that many did (Yarosz & Barnett, 2001).

This study's results are consistent with findings from other rigorous studies of state preschool education programs (Gormley et al., 2004; Barnett et al., 2004; Frede & Barnett, 1992; Irvine, Horan, Flint, Kukuk, & Hick, 1982). Where direct comparisons can be made, the size of the impacts is quite similar to those found in the recent study of Oklahoma's program in Tulsa. These estimated effects for state-funded prekindergarten programs are smaller than those found for highly intensive model programs that had much better student-teacher ratios and provided more than one-year of education at age 4 (Barnett, 1998).

The states studied almost universally require prekindergarten teachers to be licensed teachers with BA degrees and certification in early childhood education. Head Start requires that 50 percent of teachers have two-year Associates' degrees and the others must have a Child Development Associate (CDA) credential or its equivalent. A CDA represents 120 hours of training. Public preschool programs with weak standards for teacher qualifications (and low teacher pay) might increase their effectiveness by raising their teacher qualifications standards and compensating teachers accordingly.

In sum, this study finds that South Carolina's state-funded preschool programs produce significant, meaningful improvements in children's early language and literacy skills development at entry into kindergarten, similar to the results of other relatively high-quality programs across the country.

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