

Evaluation of North Carolina's Smart Start and NC Pre-K Programs: Follow-Up Through Eighth Grade

December 2018

Kenneth Dodge

Yu Bai

Helen F. Ladd

Clara G. Muschkin

Duke University

Durham, NC

Executive Summary

In several previous publications, we evaluated the impact of North Carolina's Smart Start (SS) and More at Four (MF) programs (now known as NC Pre-K) on children's outcomes as these students progressed through elementary school (Ladd et al. 2014; Muschkin et al. 2015; Muschkin et al. 2018; Dodge et al. 2018). We asked the policymaker's question: How much impact does the allocation of state funds to a county in a given year for SS or MF have on student outcomes? We measured these outcomes for the population of targeted young children residing in that county during the year funding was received. We found that each program had positive impacts on the population of targeted children, improving reading and math end-of-grade (EOG) standardized test scores when these children were in third grade, fourth grade, and fifth grade. In addition, each program reduced the probability of a student being placed in special education at least through Grade 3.

Research Goals

This new analysis extends the evaluation of the same students over the course of middle school through the end of Grade 8. We asked two main research questions: First, did each program continue to have a positive impact on math and reading test scores, decrease the likelihood of placement in special education service, and reduce the probability of retention in grade? Second, did program impacts differ significantly across population subgroups, defined by maternal education, family income, and the child's race? This evaluation was motivated in part by inconsistent findings from other studies of early childhood programs, suggesting that, in some cases, initial program effects might fade out as students progress through school.

Study Population

The student population was composed of sixth, seventh, and eighth graders who were born in North Carolina between January 1, 1988, and December 31, 2000, and who enrolled in North Carolina public schools (including charter schools) any time between school year 1999-2000 and school year 2015-2016. About 900,000 students were included in the study panel for each grade: 907,738 in Grade 6; 902,865 in Grade 7; and 896,349 in Grade 8.

Data and Methods

As in our previous studies, the data-analytic models are based on birth records for individual students, matched with their subsequent school records. We include school- and county-level variables that indicate whether a student resided in a county during a year when that county received state funding for SS or MF.

Academic outcomes include EOG math and reading standardized scores, special education placement in each grade and ever, and grade retention in each grade and ever. The key early childhood program variables are county-level average investments by year in SS and MF based on the county in which the students were born; these variables are matched to students based on the age or ages at which students were eligible for each program.

Control variables include student characteristics (gender, birth weight, race/ethnicity, and economically disadvantaged status), mother characteristics (years of mother's education, marital status, age, father information, immigration status, first born status, and racial groups), school characteristics (percent of non-Hispanic Black students, percent of Hispanic students, and charter school status), and birth county characteristics (percent of births to Black mothers, percent of births to Hispanic mothers, percent of births to low education mothers, number of births, total population, median family income, percent of population receiving food stamps, and percent of population receiving Medicaid).

The data-analytic models were estimated as linear regression models when the dependent variables were reading and math standardized test scores, and as logistic models when the dependent variables were 0/1 indicator variables for grade retention in a specific grade, grade retention ever since Grade 3, special education status in a specific grade, and special education status ever since Grade 3.

Results

Descriptive information for sixth, seventh and eighth graders

Because we have standardized the test scores, the averages of math standardized scores and reading standardized scores were zero for each year. The percentages of all children who repeated a grade were 1.54% in Grade 6, 1.45% in Grade 7, and 0.99% in Grade 8. The percentages of students placed into special education were 15.20% in Grade 6, 14.7% in Grade 7, and 14.10% in Grade 8, respectively. The county-average SS investment was about \$1,100 per child in the population (including investments summed across the full five years of child eligibility), and county-average MF investment was about the same during the years in which MF was implemented (recognizing that, for MF, some children received no direct funding and other children received full funding). For the entire evaluation period, which included years when MF was not funded at all, the average state MF investment was about \$330 per child across the state.

The number of male students was almost equal to that of female students. Eighty-two percent of students were born with normal birth weight. The majority of students were non-Hispanic whites (60.5%), 30% of students were non-Hispanic Blacks, 3.8% were Hispanic students, 1.0% were Asians, and 1.9% were Native Americans. The average years of education for birth mothers was 12.5 and their average age at the time of their child's birth was 25.8 years. During the research period, 2.48% of the sixth graders enrolled in charter schools. This percentage was stable across the grade (e.g., 2.44% in Grade 7 and 2.40% in Grade 8). Over 45% of the students were identified as economically disadvantaged in each grade (e.g., 46.4% in Grade 6, 46.1% in Grade 7, and 45.4% in Grade 8).

Estimated effects of programs on academic outcomes, by grade level

We find that both the SS program and the MF program improve individual students' test scores in reading and math in grades 6, 7, and 8. The estimated coefficients are quite similar across the three middle school years and are at least as large as the coefficients in elementary school, indicating no fadeout of impact across middle school years.

The MF program reduced the probability of grade retention among students in Grade 8. The SS program reduced the probability of repeating the eighth grade, but there were no effects on grade repetition in grades 6 and 7. Both the SS program and the MF program reduced the probability of repeating a grade at least one time between Grade 3 and Grade 8.

Both SS and MF programs reduced the probability of receiving special education services when students were in Grade 6, Grade 7, and Grade 8. The two programs also decreased the probability of ever receiving special education services since Grade 3.

In sum, our basic estimates of program effects are consistent with findings from our prior studies, and show no evidence that program impacts fade out over time.

Program effects on subpopulations

To examine whether SS and MF funding levels had different effects on student outcomes defined by the education levels of the mother or the student's racial or economic group, we added subgroup interaction terms to the basic models and tested for statistical significance. Three statistically significant interactions emerged, all of which apply only to the More at Four program. We find that the children of mothers with low education levels benefitted more in test score gains from MF than did children whose mothers had higher education. Similarly, students whose mothers were Black exhibited larger positive impacts on test scores compared to students of other race and ethnic groups. Finally, students who were economically disadvantaged gained more in test scores than their peers who were not economically disadvantaged.

Conclusions

The allocation of state funds for Smart Start and More at Four (NC Pre-K) programs to a county in a given year continued to have positive effects on the population of targeted students in that county as they progressed through middle school. Higher levels of program funding improved students' math and reading scores, decreased the likelihood that they would be placed in special education, and reduced the probability of repeating a grade. The More at Four program effects varied significantly across subgroups within the population, with larger positive impacts on children from less well-educated, more economically disadvantaged, and African American families.

Investments by the State of North Carolina in each of these programs have produced long-term positive impacts on targeted children that last through at least the end of middle school and do not fade out over time.