Chapter 5

Research Evidence About Program Dosage and Student Achievement

Effective Public Prekindergarten Programs in Maryland and Louisiana

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High-quality prekindergarten (pre-K) programs have been promoted as an effective means to produce gains in young children’s learning and as a cost-effective strategy to help end the intergenerational cycle of poverty (e.g., C.T. Ramey, Ramey, & Lanzini, 2006; Heckman, 2008). The most frequently cited scientific findings as the foundation for providing public pre-K programs come from three independent lines of scientific inquiry: 1) the Abecedarian Project and its 11 replication studies (c.f. C.T. Ramey & Ramey, 2006); 2) the Chicago Child–Parent Centers, which included natural variations and replications (Reynolds, 2002; Reynolds et al., 2002); and the single Perry Preschool Project (Schweinhart et al., 2005).
HISTORICAL SCIENTIFIC CONTEXT
FOR EARLY CHILDHOOD EDUCATIONAL PROGRAMS

These scientific studies were launched in the 1960s and 1970s, and thus are able to provide scientific evidence about the long-term effects of the preschool educational program on the children's lives. Each of these projects also has been subjected to multiple economic analyses to yield estimates of return on investments, which have been important in the political decision-making process in many states and school districts that have developed plans for providing pre-K as a means to improve the skills of children who are at risk of poor academic achievement during the elementary school years.

This section selectively highlights key findings from these three projects, all of which helped to inform the two states (Louisiana and Maryland) where we have conducted new research to measure the effect of large-scale, public pre-K programs on children's outcomes. These new state and school district programs built directly on the earlier research findings, yet they differ in many important ways from the original research and demonstration projects. This overview of the earlier research helps to provide a context for understanding the new programs and for interpreting their findings.

The Abecedarian Project and its Replication Studies

The Abecedarian Project\(^1\) was a randomized controlled trial (RCT) launched in 1972, when it enrolled the first of four successive Cohorts that comprise the final study sample of 111 children. The central guiding question for the Abecedarian Project was the following: “Can the developmental trajectories—especially as indexed by children's intellectual development and school readiness—of children living in extreme poverty be improved by providing high-quality, theory-driven education during the first 5 years of life?”

The Abecedarian Project's RCT design permitted rigorous testing of the efficacy of the preschool educational program itself. The project enrolled families with high scores on a Risk Index, a composite of 13

\(^1\)We describe the Abecedarian Project in greater detail here than the Chicago Child-Parent Centers or the Perry Preschool Program for two reasons. First, Craig Ramey conceptualized, developed, and then launched this project and its replications as the principal investigator, so we know these projects through more than 35 years of firsthand experience. Second, the Abecedarian Project's design features and approaches to measurement directly contributed to the two new large-scale projects that we present in this chapter.
risk conditions, such as extreme levels of poverty (well below the 50% level of the federal poverty index), low education of mothers and fathers (averaging less than a 10th-grade education), parental unemployment, single parenting, and poor school performance of older siblings. At the time of a child’s birth, families and children were assigned to one of two treatment conditions: an educational treatment group and a control group. The educational treatment group was scheduled to receive 1) an intensive, year-round, full-day program that used a specially developed curriculum (Learninggames) and provided ongoing professional development for staff, monitoring of program quality, and individualizing the curriculum on a weekly basis, starting at the age of 6 weeks and continuing until children entered public kindergarten 5 years later; 2) high-quality pediatric care, following all recommendations from the American Academy of Pediatrics for well-child care as well as treating illnesses and injuries; and 3) ongoing, high-quality, and personally responsive social services for the family to address a wide range of issues, such as housing, employment, mental health and substance abuse issues, and domestic violence. The control group in the Abecedarian Project also received many supports and services and thus is not an untreated group of children and families. The control group received the same type and level of health care and social services as those in the educational treatment group. The health care and social services provided to families were documented for both groups during the entire first 5 years of the children’s lives. This design feature has been an extremely valuable one in discerning whether the benefits of the educational program provided to children resulted in their improved outcomes versus the provision of universally needed health care and social services to families living in challenging and, often times, dire circumstances. This research ethic of not having an untreated control group was adhered to in all of the replication studies of the original Abecedarian Project as well—for both important humanitarian purposes and increasing the scientific specificity about the factors that influence the course of children’s lives.

The Abecedarian Project’s findings have been reported in detail in many peer-reviewed scientific articles, including scientific journal articles that summarize the long-term findings (e.g., Campbell et al., 2002; C.T. Ramey et al., 2000), as well as in popular books, such as Hillary Clinton’s It Takes a Village and Other Lessons Children Teach Us (1996) and Ronald Kotulak’s Inside the Brain: Revolutionary Discoveries of How the Mind Works (1996), and television specials (e.g., by Walter Cronkite, Diane Sawyer, and National Geographic’s Brilliant Minds). Table 5.1 provides an overview of the major findings regarding the impact of the high-quality educational program that was provided for the first
Table 5.1. Summary of key findings on the effects of preschool education from the Abecedarian Project from 18 months—21 years old

<table>
<thead>
<tr>
<th>Preschool education increases</th>
<th>Preschool education decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligence (IQ)</td>
<td>Grade repetition</td>
</tr>
<tr>
<td>Positive mother-child interactions</td>
<td>Special Education placement</td>
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<tr>
<td>Reading and math skills</td>
<td>Teen pregnancies</td>
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<tr>
<td>Academic locus-of-control</td>
<td>Teen depressive symptoms</td>
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<tr>
<td>Social competence</td>
<td>Smoking and drug use</td>
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<tr>
<td>Years of school</td>
<td></td>
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<tr>
<td>Attendance at college, especially 4-year college/university</td>
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<tr>
<td>Full-time employment in early adulthood</td>
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All benefits are statistically significant and reported in peer-reviewed journal articles. Preschool education was not associated with any negative outcomes. (e.g., poor mother-child attachment, disruptive behavior, lowered self-esteem)

Other benefits: Mothers were more likely to continue their own education and be employed.

5 years of children’s lives. The arrows that point upward indicate significant gains, whereas those that point downward reflect decreased levels of the indicated outcome. All of these findings have been previously published and are documented by statistically rigorous analyses. (The Abecedarian Project has been archived and is publicly available as a national resource at the University of Michigan.)

The Abecedarian findings support a highly consistent pattern of performance for those children who received the intensive, high-quality educational intervention—these children consistently performed better than did the children in the comparison group on all major outcomes, starting at 18 months of age and continuing through 21 years of age. In other words, these benefits did not fluctuate (such as children reading at higher levels at some ages but not other ages), but rather a stable pattern of long-term positive outcomes in multiple domains emerged. The final data collection is being completed for the 30-year follow up of these children. At age 21, 99% of the children still living participated in the follow-up assessment, and at no age was there less than 90% participation (Campbell et al., 2002); thus, the Abecedarian findings are unlikely to be biased by selective attrition (that is, lack of data on some children in one of the groups).

The findings relevant to successful school transition are that the children in the control group, who did not receive the systematic preschool program, performed at significantly lower levels (well below national averages) on all indicators of academic progress, including receiving lower scores on individually administered, standardized tests of reading achievement and math achievement. They also showed
higher rates of grade retention (repeating a grade), and placement in special education compared with those in the educational treatment group. The children in the control group exhibited more signs of depression, higher levels of smoking and drug abuse as young adults, and lower levels of college attendance and full-time employment (Campbell et al., 2002).

Replications of the Abecedarian Project

The first Abecedarian Project replication was launched 5 years later, in the same location, and with the same enrollment criteria, the same preschool setting and teaching staff, and the same study design. Its purpose was to determine whether the early benefits detected in the Abecedarian Project would be upheld in a new and independent sample of children born into similar life circumstances. The replication also added a second type of treatment group to determine whether an intensive 5-year home visiting program using the educational curriculum would yield benefits. In fact, despite the positive reception by families and home visitors to this new treatment approach, there were no major or lasting benefits for the children associated with the home visiting program. This project, The Carolina Approach to Responsive Education, or Project CARE, found almost identical benefits for children in the center-based Educational Treatment Group as those found in the Abecedarian Project (C.T. Ramey & Ramey, 2004; Wasik, Ramey, Bryant, & Sparling, 1990). These children also have been followed into adulthood and showed similar long-term positive outcomes (Campbell et al., 2008).

The Abecedarian Project was replicated with two other groups, each differing in their risk conditions from the original Abecedarian Project and Project CARE. The Infant Health and Development Program (IHDP, 1990) enrolled children at birth on the basis of prematurity and low birth weight (LBW). IHDP was conducted in eight sites and enrolled 985 infants. The IHDP control group received free health and social services, whereas the educational treatment group received an intensive educational program modeled after the Abecedarian program, using the Partners for Learning curriculum (Sparling, Lewis, & Ramey, 1995), in addition to free health and social services. In IHDP, children began participating in the center-based educational program when they were 12 months of age. Prior to that, they received an intensive home visiting program that took into account their special needs as premature infants who were LBW. The center-based program and home visiting activities continued until children were 3 years of age.

In IHDP, children came from a wide range of socioeconomic, ethnic, and racial groups, whereas 100% of the Abecedarian and Project
CARE families lived in poverty and 99% were African American. Key findings from IHDP at age 18 affirm lasting cognitive and language gains, with greater benefits for children from lower income and less-educated families and children who participated at higher levels, as indexed by days of attendance at the preschool center and home visits (Blair, Ramey, & Hardin, 1995; McCormick et al., 2006; C.T. Ramey et al., 1992).

Finally, we conducted two replication studies using an RCT design in Romania in the children’s leagans (institutional care settings, often labeled incorrectly as orphanages by outsiders) in response to requests and funding from philanthropic international relief organizations. These two replication studies involved translating the Abecedarian curriculum into Romanian; making cultural and practical changes as needed; training local staff to provide the program; and setting up rooms to provide the educational program with the comparable staffing ratios used in the Abecedarian Project, Project CARE, and the eight IHDP sites. In Romania, there was a 1:4 teacher–child ratio in the 1- to 3-year-old age group. The Romanian replications addressed two scientific questions: "Can children benefit from this form of educational intervention even after they have experienced the extreme deprivation of institutionalization?" and "Will younger children show greater benefits than older children?" In the Control condition, additional enrichment materials and staff training were provided, but there was no change in the staffing levels or systematic rearrangement of the children’s activities during waking hours to ensure that the enrichment supplies and staff training would result in altered care.

The major findings from providing 12–14 months of educational intervention were that 1) young children, regardless of their age group, benefited in all measured areas of language, general cognition, social-emotional development, and fine motor development from the Abecedarian curriculum and program; and 2) the gains measured indicate typical or healthy developmental growth—approximately 1 year of growth (advance in assessed skills) for 1 year of participation in the educational treatment, but that true catch-up did not occur. That is, the large detected delays in children’s development at the start of the project (e.g., 15-month-old children performed, on average, at the level of 7- to 8-month-old infants) were not overcome by 1 year of educationally enriching experiences. In other words, the educational intervention served to prevent further decline and delays in the children’s development, which continued to occur for the children in the control group (Sparling et al., 2006).

To summarize, the Abecedarian Project is frequently referred to as one of the “landmark studies,” distinguished by demonstrating long-
lasting benefits of the preschool educational program and by being replicated with both similar and different groups of children in 10 different cities over a period from the 1970s to the 1990s. In all of these studies, the educational intervention involved full-day, year-round, theory-driven educational programs that had ongoing staff professional development, systematic and direct monitoring (with immediate corrective actions if any deviations from the program’s fidelity were detected), and assessment of children at regular intervals. To the extent possible, these features served as guiding principles in the research partnerships we have established in many communities, including our ongoing research in pre-K programs in Montgomery County, Maryland, and the state of Louisiana (c.f. C.T. Ramey, Ramey, & Lanzi, 2006; S.L. Ramey & Ramey, 2007).

Positive Long-Term Effects of Pre-Kingergarten from the Chicago Child–Parent Centers and the Perry Preschool Project

The Chicago Child–Parent Centers provided a naturalistic study (rather than an RCT) with a large sample and operated via federally and locally funded programs, with natural variation in the duration and other program features. Although the educational intervention was not systematically controlled, considerable documentation occurred, and a long-term study was funded later to track high school age and young adult outcomes. The major conclusions are that the center-based educational experience resulted in significant and lasting gains for the children. Furthermore, receiving 2 years of the program sometimes resulted in larger benefits than receiving 1 year. A set of sophisticated data analyses that tested different hypotheses about the primary mechanisms responsible for the positive outcomes resulted in the conclusion that the cognitive and academic-related experiences were the primary pathways responsible for children’s improved school performance. Similar to the Abecedarian Project, there were benefits to the children in multiple areas including higher educational attainment, lower school dropout, and lower rates of juvenile arrests (Reynolds et al., 2002).

The Perry Preschool Project is the oldest landmark study, launched in mid-1960s in Ypsilanti, Michigan. This project included only children living in poverty who already showed significant developmental delays by the age of 3, with all children in the study having tested IQ scores of less than 85 when enrolled. This project provided valuable information about whether children who already displayed intellectual impairment could benefit significantly from a high-quality early educational experience, with a similar comparison group. The Perry Preschool findings included decreased rates of grade retention and
special education placement, but did not detect significant gains in children’s IQ scores or their performance on standardized tests of academic achievement. This study is frequently cited, however, for the long-term benefits of reduced adult criminal incarceration and increased employment, which are factors that contribute to estimates of high return on investment. (Schweinhart et al., 2005).

We consider these landmark studies—all characterized by their emphasis on improving school readiness and children’s educational attainment—important for demonstrating that although the children varied in their initial risk for school failure, lived in different geographical areas, and received different intensive center-based educational programs, they showed significant and long-lasting benefits. The pre-K movement currently underway, however, often seeks to serve a much broader group of children, many with lesser degrees of initial risk for school failure, and often provides a less-intensive educational program, as indexed by hours per days and total days per year. Furthermore, many studies confirm that there is a wide range of quality in these pre-K programs and community centers nationwide, with much of it being poor quality (e.g., NICHD Early Child Care, 2005).

PRESSING NATIONAL AND SCIENTIFIC QUESTIONS ABOUT PRE-K

In almost all press coverage and policy discussions, questions are raised about whether the positive findings from the landmark studies can truly be realized through the types of large-scale, public and private sector programs that strive to provide high-quality early education to young children. Foremost is the question, “Are public school systems and communities prepared and willing to provide comparably high-quality, educationally driven, and actively monitored programs, including assessment of children’s progress?” This question often is framed as one of scalability or scale-up. In other words, can large-scale, sustainable programs be established that will produce comparable or at least demonstrable benefits for enrolled children? Figure 5.1 illustrates the complex web of supports needed from many sectors in order to provide high quality pre-K programs to benefit young children.

In this chapter, we provide new evidence from two large-scale pre-K programs operated with state and local district funding: in Louisiana, the statewide LA-4 program that was started in 2001 and scaled up each year so that in 2008-2009, more than 14,000 children were served in LA4; and in Maryland, the Montgomery County Public Schools, which has expanded its pre-K classes consistent with state pre-K standards to serve more than 2,500 4-year-olds in 2006-2007.
Figure 5.1. The complex framework of sources needed to provide high-quality pre-kindergarten education to all children. (Source: Ramey & Ramey, 1992, 1998, 2000).
In both of these large-scale public pre-K programs, we established active research partnerships that permitted prospective study of children's outcomes and monitoring of pre-K program quality. Because these public programs operated in two quite different geographical areas and served diverse types of children, we are able to provide new scientific evidence that the "promise of pre-K programs" is not beyond reach, but one that can yield measurable benefits.

Similarities Between the Louisiana and Maryland Pre-K Programs

Both the Louisiana and Maryland pre-K programs resulted from careful planning, with strong support from superintendents and an intention to build on what was already known about the science of effective early educational programs. Specifically, important similarities between these two major public pre-K programs were the following:

- They were implemented in classrooms in public elementary schools.
- They served 4-year-old children, with a priority on serving high-risk families (indexed primarily by family income) but included some children who were not living in poverty.
- Each classroom had a certified teacher with a bachelor's or master's degree and specialization in early childhood with a qualified teacher's assistant or paraeducator.
- The teachers received wages and benefits comparable to those of other public school teachers.
- The classroom sizes were restricted to a maximum of 20 students.
- The classrooms had a specified pre-K curriculum with an explicit focus on language and early literacy.
- The programs had designated statewide learning standards and benchmarks for children's progress.
- Professional development was provided for all teachers, typically exceeding 18 hours per year (and sometimes considerably higher).
- Programs had the full range of additional supports available to elementary school classrooms, including specialists in reading, language, special education, and learning English.
- Children's progress was measured at least twice a year by classroom teachers themselves as part of the program to monitor indi-
vidual children’s progress and make adjustments in classroom instructional activities based on children’s progress.

- Collaboration and coordination occurred with other needed services and supports, such as health and mental health, child care (wraparound services), and social services.

Differences Between the Louisiana and Maryland Pre-K Programs

The most notable differences in these two large-scale programs concerned program dosage as indexed by the length of the school day and the diversity of the children served. Specifically, the differences that are important to consider when comparing outcomes from these public pre-K programs are the following:

- Louisiana offered the program for a full day and it was identical in length to the elementary school day, approximately 6 hours, whereas Montgomery County Public Schools offered their pre-K for a half day (ranging from 2.5 to 3.25 hours).

- Montgomery County Public Schools prioritized enrollment of children based on screening of families. The risk factors (in order of importance considered) were family income (below poverty or near poverty), immigration status, family spoke a language other than English at home, and single parent status. In contrast, Louisiana did not screen individual families based on risk, but rather funded school districts that applied to offer the LA4 program. In Louisiana, children whose families were below the poverty level received the LA4 program for free, whereas some tuition was charged for families with higher incomes.

- In Maryland, the demography of both the county and the pre-K children served was far more diverse, as indexed by the number of languages children spoke at home, the racial and ethnic groups represented, and immigration status of families. In Louisiana, the population served was almost exclusively African American and Caucasian/non-Hispanic, with extremely low rates of other linguistic or ethnic/racial groups.

- The poverty rates in the locales where the pre-K programs operated differed markedly. In Montgomery County, children living in poverty represented a relatively small minority, considerably below the national level of child poverty. In Louisiana, the rate of child
poverty exceeded the national rate, and children living in poverty represented the majority of children enrolled in the public schools.

THE MARYLAND AND LOUISIANA PARTNERSHIP PARADIGM FOR STUDYING EDUCATIONAL INITIATIVES

The paradigm we developed for conducting long-term, practically useful research in Maryland and Louisiana (as well as in other locales) has been one of true partnership. This collaboration has involved initial endorsement and support from leadership at the highest levels, including school district and state superintendents who make public commitments to implementing high-quality pre-K programs—largely as a means to improve children's school readiness and close the achievement gap—and to measuring the degree to which the programs achieve their goals. These partnerships were established specifically with educational scientists (Drs. Craig and Sharon Ramey and Billy Ray Stokes) and their academic institutions (major universities) in a manner that involved extensive initial joint planning, preparing documents that represented the partnership's memorandum of understanding (including the purpose of the long-term partnership as well as the roles and responsibilities of the partners), and then publicly announcing the partnership and making appropriate commitments to long-term research intended to directly benefit the schools and children, as well as to advance scientific understanding of the factors that promote (or decrease) children's school preparedness and later school success.

These partnerships are not projects set up for the purpose of one study only or to answer just a single question. Rather, the partnerships are focused on in-depth study of early childhood education and the operation of effective public systems to support children and families. We have created databases that are shared, openly engaged all partners in planning and reviewing data analyses and their reporting, and shared the findings first with key project participants and school systems and later with professional groups and the public. As developmental and educational scientists, we actively participate in many planning and review sessions about the progress and the future direction of the pre-K programs; comparably, many of the public school leaders and their educational boards engage in reviewing the scientific findings and selecting topics for future research efforts. Each of these partnerships has been active for more than 5 years, with an original intention that they would last approximately 10 years. These partnerships have received funding from multiple sources, depending on the opportunities and the issues that have arisen and that continue to evolve. These partnerships also acknowledge what we refer to as the dual self-interest principle—in
other words, there are major differences in the missions and evaluative criteria used in public school systems for children and in higher education and scientific communities (C.T. Ramey & Ramey, 1994). To sustain partnerships, they cannot be one sided, serving mostly the needs of the schools but not the scientists, or vice versa. From the start, we openly talked about and recognized these substantial, preexisting differences in values, as well as acknowledging and respecting that there will be differences in how "home" institutions or systems operate. Without a doubt, these partnerships take time and nurturing from many people in both the school and scientific arenas. At the same time, we strongly endorse the value of this so-called new style of educational research partnerships (C.T. Ramey & Ramey, 1994). Our experiences affirm that these public partnerships help to promote high scientific integrity, breadth, continuity, practical usefulness, and policy relevance.

GENERAL CONCEPTUAL FRAMEWORK GUIDING THE RESEARCH IN LOUISIANA AND MARYLAND

The conceptual framework used to inform the research builds on systems theory and scientific evidence about the factors that promote children's learning. Broadly, the Ramey and Ramey framework referred to as Applied Biosocial Contextual Development, or the ABCD model (for an expanded discussion, see C.T. Ramey, Ramey, & Lanzl, 2006), set the stage for the research presented here. In the ABCD framework, we show children's educational achievement as part of a larger context of their health, social-emotional well-being, and family–school relationships. This framework has been valuable in helping to generate and then test particular hypotheses (ideas) about the relationship of pre-K program elements, such as its timing (age when children enrolled and when children leave), its intensity or dosage (how many hours per day and days per year), its curriculum focus (or the effectiveness of a particular curriculum), and amounts and types of professional development to children's outcomes. Also, the ABCD conceptual framework has offered a common picture to the working partnership about the multiple sources of influences on the lives of children, which is helpful when developing, monitoring, measuring, and then refining or improving programs and supports for successful transitions to schools. We often develop a project-specific conceptual framework for each major research endeavor that shows the specific interventions or program supports being tested, particularly when the study involves an RCT.

In this chapter, we selectively highlight two types of findings that our partnerships have judged useful for their local and state considerations, as well as providing relevant data to answer pressing national
questions. The first set of findings concerns a key issue of whether 4-
year-old children can make meaningful educational gains that repre-
sent an acceleration of their rate of development during the course of 1
school year. In other words, does the pre-K education move the chil-
dren to higher levels of academic readiness for kindergarten? If so, how
large are these gains? If these gains are significant, will they result in
improvements in children’s performance once they enter kindergarten
(sufficient data for long-term findings are only available for Louisiana
at this time).

The second set of findings concerns differential child outcomes in
Louisiana and Maryland and the degree to which they are consistent
with a principle of program intensity or dosage. The dosage of the pre-
K program in Louisiana was at least twice that in Montgomery County
Public Schools and, as we describe next, appears to be the most likely
single factor accounting for the differential benefits. Of note, the LA4
program itself had a built-in test of the intensity principle because in its
first year of implementation, it operated for only one half of the school
year due to the late availability of funds. Because children were stud-
ied even in the partial-year (pilot) implementation, estimates of magni-
tude of benefits can be calculated, and these support the same conclu-
sion that the amount of time children receive the educational pre-K
program relates in a linear way to the magnitude of academic benefits.

Can Large Public Pre-K Programs
Operated by School Systems Produce
Measurable Benefits for Children’s Kindergarten Transition?

The section seeks to answer the question of whether large public pre-K
programs operated by school systems produce measurable benefits for
children’s transition into kindergarten. As outlined previously, the LA4
program and the Montgomery County Public Schools pre-K program
had standards that uphold many of the agreed-on features to ensure a
high-quality program. Within each of these large-scale systems, we gath-
ered classroom environmental indicators on tools such as the Early
Childhood Environmental Ratings Scale-Revised (ECERS-R; Harms,
Clifford, & Cryer, 2004), the Early Language and Literacy Classroom Ob-
ervation (ELLCO; Smith & Dickenson, 2002), and other observational
assessments that affirmed that, on average, these programs were pro-
viding good to excellent classroom supports. Before testing the major
hypothesis about benefits to children, we consider it informative to con-
sider the evidence that the programs were provided as intended. Indica-
tors of program quality can include measures such as classroom ECERS-
R scores in a representative sample of LA4 programs randomly selected for each successive year (five Cohorts thus far) the program has operated and fall and spring scores on the ELLCO in the Maryland pre-K programs we studied. In addition, we have other indicators such as children’s attendance (very high in both state settings) and direct observations of teacher and paraeducator instructional activities in Maryland.

Environmental indicators of classroom quality in Louisiana, for example, establish that the LA4 classrooms, on average, were among the highest ECERS-R scores reported in the literature, and these scores are at or above the level that the ECERS-R authors state is indicative of a high-quality classroom. Specifically, the mean ECERS-R scores for the LA4 classrooms are 5.7 (7.0 is the highest obtainable) for Cohort 1, 6.0 for Cohort 2, 6.0 for Cohort 3, and 5.9 for Cohort 4. A further indicator of uniformly good to high-quality classrooms in the LA4 program is that the range was very narrow, with virtually no programs scoring below 4.0, and some programs with scores in the high 6s. In the Maryland classrooms, the Early Language and Literacy Classroom Observation (ELLCO; Smith & Dickinson, 2002) scores had average ranges of 90–100, which are consistent with the observation that these were literacy-enriched environments with many supportive language and literacy learning activities.

Key Findings from Louisiana’s Statewide LA4 Program

Figures 5.2, 5.3, and 5.4 present findings about children’s academic progress on the Developing Skills Checklist (DSC; CTB Macmillan/ McGraw-Hill, 1990) in the LA4 program for the pilot year (when children were enrolled in January) and the first four cohorts. The DSC scores are presented in the figure in terms of children’s national percentile ranks in the areas of language (Figure 5.2), print (Figure 5.3), and math (Figure 5.4).

General Language Development

As Figure 5.1 shows, LA4 children entered the program scoring at about the 10th percentile in terms of their general language development, and for each of the full-year cohorts, they exited the program at a median score of the 50th national percentile. During the pilot year, however, children entered with slightly higher scores, consistent with evidence that they were acquiring some skills due to maturation and other educationally relevant experiences prior to being enrolled in LA4, and they exited at a median percentile rank of 31. Thus, the pilot year children demonstrated benefits, but to a significantly lesser degree than
Figure 5.2. National percentile ranks on the Developmental Skills Checklist for language as a measure of children's progress in Louisiana's LA4 program.

Figure 5.3. National percentile ranks on the Developmental Skills Checklist for print as a measure of children's progress in Louisiana's LA4 program.

Figure 5.4. National percentile ranks on the Developmental Skills Checklist for math as a measure of children's progress in Louisiana's LA4 program.
those receiving the full-year program. During the years of scale-up of the LA4 program, each successive cohort has involved a considerable increase in the number of schools operating LA4 programs and in the total number of children served. In the pilot year, approximately 1,400 children were served, and cohort 1 served about 3,700 children and cohort 5 served 7,900 children, an almost six-fold increase in less than 5 years. The highly consistent pattern of benefits for each successive cohort indicates that the scale-up in program did not lead to a decline in its positive effects on children. Furthermore, we note that achievement gains of this magnitude are impressive in terms of their educational meaning for schools. Children entering kindergarten with developmental skills at national average are far better prepared to succeed than they would have been if they entered near the 10th percentile (that is, the developmental trajectory they had been on only a year earlier).

Print and Math Skills

In the area of print skills, the pattern of performance of children in the LA4 program is highly similar to that in language. Year after year, the LA4 children entered close to the lowest 10% of children in the nation and exited with scores that placed them above the national 50th percentile. On average, the successive cohorts of LA4 children performed near the 60th percentile rank in the spring of their pre-K year. Once again, the gains were significantly lower for the pilot year children who had only half a year of the LA4 program. Finally, children's math performance indicated that the LA4 children started the pre-K year at about the 5th percentile rank and exited between the 46th and 52nd percentiles, depending on the cohort. Once again, each cohort demonstrated large magnitude gains, with much smaller benefits for children in the pilot half-year program.

Grade Retention

To what extent were the gains in the pre-K year sufficient to improve the performance of the LA4 children when they entered kindergarten programs throughout the state? Early indicators show that the benefits of the LA4 program had a direct affect of the children's early school performance as revealed by their significant decreases in rates of grade repetition (i.e., not advancing to first grade on schedule) and placement in special education. Figure 5.5 summarizes the findings about kindergarten grade retention for the first two cohorts.

In these data analyses, we have considered the topic of differential risk and differential benefits by displaying the data separately for those children whose families differed in income level, as indexed by their
eligibility for free and reduced meals. In each year, the vast majority of the LA4 children were eligible for free and reduced meals, although about 20% of the children in cohorts 1 and 2 were from higher income families. Figure 5.5 indicates two major sets of findings. First, for both cohorts, in the large group of children who did not receive any public pre-K or Head Start, the rates of kindergarten retention were significantly higher for children in the free and reduced meals group than for those from higher income families. For children from the lower family income group, nearly 1 in 8 repeated the kindergarten year (approximately 12%), in contrast to only 1 in 14 children in the higher family income group (approximately 7%). Second, the LA4 program reduced the rates of grade repetition for children in both family groups, although the benefits reached practical significance only for the children in the free and reduced meals group. For these children who are at higher risk, the LA4 program decreased their grade failure rate by more than 35%. More detailed data analyses confirmed that the benefits of the LA4 program on reducing kindergarten repetition occurred for both boys and girls and for African American and Caucasian children.

Another way of considering the effects of the LA4 program for these first two cohorts is that more than 1,700 children likely would have been prevented from unnecessary retention in kindergarten if the LA4 program been available statewide to those children who received no public pre-K or Head Start. This would have decreased the negative effects on children and their families, the additional cost to the public
school system, and the costs related to additional educational planning and administration.

Another important indicator of early school success relates to transfer from the regular education system into the special education system. Figure 5.6 summarizes the rates of special education placement for cohorts 1 and 2 for children in the free and reduced meals group and those not in the group. For the children who received no public pre-K or Head Start and who were eligible for free and reduced meals, slightly more than 14% were placed in special education by the spring of their kindergarten year. This is a significantly higher rate than for children with higher family incomes, who average just below 10%. The LA4 program resulted in decreases in placement rates for children in both family income groups. Specifically, the special education placement rates were reduced to 8.6% and 9.0% for the LA4 children from the lower family income group in cohorts 1 and 2, respectively; whereas rates declined to 7.0% and 5.8% for the LA4 children who did not receive free and reduced meals. The magnitude of these reductions is large and practically significant in terms of major cost implications and the tremendous effect on children and families associated with early transfer into the special education system after a child fails to meet expectations during the kindergarten year. Similar to the previous findings about grade repetition, there were significant benefits for both
boys and girls and for African American and Caucasian children. Once again, the magnitude of documented benefits was significantly larger for children from the lower versus higher family income group.

Key Findings About Pre-K Education in a Large, Urban-Suburban School District in Maryland

The historical context for providing pre-K education in Maryland’s Montgomery County Public School system is quite different from the LA4 program. Montgomery County is a very large school district serving more than 144,000 students. Montgomery County has long been considered a relatively economically affluent and high-performance school district according to many indicators, such as student achievement scores, high school graduation rates, college attendance rates, and frequent identification of its high schools as among the nation’s best. Since the late 1990s, however, there has been a rapid and large shift in the economic, linguistic, and racial diversity of the student population. A particular challenge has been the successful inclusion of students from very low-income, low-educated households; recently immigrated students; and students from multirisk families (e.g., single-family households, families with substance abuse and domestic violence, highly mobile families). Dr. Jerry Weast, Montgomery County Public Schools superintendent during the time of this project, and the school board developed and implemented a plan to maximize “success for all” that has added pre-K and Head Start classrooms in the public schools as part of its strategy to help prepare children from high-risk circumstances for successful transition to kindergarten. The Head Start and pre-K classrooms are identical in terms of staffing qualifications and the educational curriculum framework and standards. The one difference is that the Head Start classrooms operate for 3.25 hours per day, the minimum required by the federal Head Start program, whereas the pre-K classrooms that serve children from slightly higher income families operate for 2.5 hours per day.

In 2002, Montgomery County Public Schools and Georgetown University partnered to focus on school readiness and the pre-K/Head Start program. During the first 4 years, we conducted research on alternative levels of job-embedded coaching to promote full implementation of an evidence-informed curriculum; evaluation of a new teacher-administered assessments for 4-year-olds; evaluation of the Early Reading First program enacted in five elementary schools; and study of the overall effectiveness of the pre-K/Head Start program in promoting children’s school readiness. In this chapter, we selectively highlight findings from representative classrooms about children’s progress
in emergent literacy skills from the fall to spring, as well as from the RCT conducted in 24 classrooms that demonstrated benefits to both classrooms and children when additional professional development was provided to teachers using an individualized coaching model.

Figure 5.7 summarizes data from the ELLCO, with higher scores indicative of more literacy- and language-enriched environments. Three types of classrooms are represented in this figure: 1) representative classrooms from the Montgomery County Public School program; 2) classrooms that received year-long, monthly coaching using Scholastic’s Building Language for Literacy (BLL) curriculum developed by Neuman and Snow (2000); and 3) classrooms that received year-long, weekly coaching in BLL implementation. The curriculum coaching provided was a structured intervention with coaches who had master’s degrees in reading and who received additional training from Scholastic and Dr. Susan Neuman regarding the BLL curriculum. Dr. Neuman provided ongoing supervision throughout the study. All coaching sessions were documented using a BLL Curriculum Fidelity Checklist and supplemented with systematic field notes about activities that occurred. Coaching lasted for the entire length of the school day. In addition, we provided teachers in the coaching conditions with monthly group professional development sessions. (Attendance was voluntary; teachers were paid the school district’s standard professional development stipend for participating.) Attendance was uniformly high for these monthly meetings.
As Figure 5.7 indicates, classrooms in both coaching conditions earned higher mean ELLCO scores than did those in the comparison classrooms. Furthermore, classrooms that received weekly coaching had the highest ELLCO scores. We also note that these ELLCO scores for classrooms in all conditions are consistent with the conclusion that these are enriched language and literacy classrooms. As mentioned earlier, all classrooms had certified teachers with a specialty in early childhood education; the school system provided ongoing professional development for the entire pre-K program; and the school system implemented a variety of monitoring strategies, including teacher-administered, systematic assessment of all children three times per year. In this chapter, all findings presented from Montgomery County Public Schools derive from data collected by trained, independent research associates from Georgetown University's Center on Health and Education.

We assessed children's achievement in early literacy by individually administering the Test of Early Reading Abilities (TERA; Reid, Hresko, & Hammill, 2001) in the fall and spring, along with Get It! Get It! Get It! Go! (University of Minnesota College of Education and Human Development, 2006) and Concepts of Print (from the Developing Skills Checklist (CTB Macmillan/McGraw-Hill, 1990). Figure 5.8 shows the findings regarding the Montgomery County Public Schools children's performance on the TERA. On average, the children in Montgomery County Public Schools started their pre-K year performing near the

![Figure 5.8](image-url)
15th national percentile. By spring, those children in the comparison classrooms demonstrated significant gains, to a mean of the 25th percentile (a 10-point gain for this group). In contrast, the children in the two BLL coaching conditions displayed even larger gains—those whose teachers received monthly coaching had a mean score placing them in the 30th national percentile and those whose teachers had weekly coaching placed in the 39th national percentile. These findings indicate that children in all classrooms benefited from this Montgomery County Public School program, with far greater gains associated with additional professional development for teachers, primarily through systematic and documented job-embedded coaching.

Comparison of Student Performance
in the LA4 and Montgomery County Public School
Pre-K/Head Start Classrooms

These two separate, large-scale pre-K programs provide new evidence about the feasibility of scale-up programs that serve a wide range of children who are at risk, are informed by current scientific evidence about what comprises quality programs, and have made a commitment to actively monitoring their effectiveness. The findings to date provide a naturalistic opportunity for considering variations in the magnitude of detected student benefits. Length of the school day, or the overall intensity (dosage) of the pre-K program children received, is the major difference in these two programs. In Louisiana, the dosage issue also was addressed while implementing the LA4 program because the pilot year provided only a half-year or half-dose to the children. Figure 5.9 combines the findings using national percentiles as the common metric (although the children were assessed with the different tools as described earlier).

Surprisingly, children served in the LA4 program, in a state with one of the nation’s lowest levels of family income and educational attainment among adult citizens, were only slightly lower in their initial emergent literacy skills than were children in the Montgomery County Public School program who were at risk and from low-income families. In both pre-K programs, children showed large gains, although the magnitude of the gains was nearly double from the full-day and full-year LA4 program compared with the half-day Montgomery County Public School program and the half-year (pilot year) LA4 program. Because both public pre-K programs were considered to be solid, well staffed, and environmentally enriched, we consider the data to
provide new and strong support for the principle of program intensity or dosage, through independent validation using a variety of standardized tools (see S.L. Ramey & Ramey, 2006, for an updated summary of the major principles of effective literacy interventions from RCTs). These findings also are highly consistent with the public policy theme of Return on Investment (ROI), with the larger investment in a full-day program yielding significantly higher returns. These returns already transcend the pre-K year and in Louisiana extend to practical cost savings due to lower rates of grade repetition and placement in special education.

These findings are part of ongoing partnerships focused on collecting useful, trustworthy data for practice, policy, and educational science; and we are continuing to study these programs in depth and soon will have longitudinal findings that track multiple aspects of the children’s performance into later elementary school grades. At this time, the evidence from these states affirms that quality preschool education can definitely boost the children’s academic performance significantly—to levels that place the children at much greater likelihood of succeeding in elementary school than if they had not received such early educational supports. These findings are consistent with the three landmark studies—the Abecedarian Project and its replications, the Chicago Parent-Child Centers, and the Perry Preschool Project.
REFERENCES


