

# **1. EARLY CHILDHOOD EDUCATION**

## **EXECUTIVE SUMMARY**

### **SUMMARY OF RESEARCH FINDINGS**

Pre-kindergarten education for disadvantaged children can greatly increase their cognitive abilities, leading to long-term increases in achievement and school success. Although general cognitive abilities as measured by IQ may only temporarily increase, persistent increases can be produced in the specific abilities measured by standardized achievement tests in reading and math. In addition, programs can have positive effects on children's long-term social and emotional development, reducing crime and delinquency. To reap all of their potential benefits, pre-kindergarten programs for disadvantaged children must be intensive, high in quality, and emphasize both cognitive and social development.

### **RECOMMENDATIONS**

- Class sizes and child-teacher ratios must be kept low.
- Teachers must be highly qualified, with at least a bachelor's degree and with specialized training in early education, and must be paid well.
- Curricula must be intellectually rich and sufficiently broad to address children's developmental needs in all domains.
- Programs must have an infrastructure adequate to support best practices, professional development, and ongoing evaluation and accountability.
- Programs must engage in an active partnership with parents and accommodate their needs, including their needs for child care.
- Programs should start no later than age three.
- Resources should be focused primarily on disadvantaged children.
- The existing array of public school, Head Start, and private programs all can be used, but both standards and resources must be substantially increased to produce the desired results.

# **1: EARLY CHILDHOOD EDUCATION**

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A number of long-term social and economic trends have contributed to increasing interest in the education of children under five over the past several decades.<sup>1</sup> Before 1960, the education of young children was regarded as primarily a matter of parenting in the home. Since that time the percentage of young children cared for by someone other than a parent has risen steadily. Today, most young children in the United States spend much of their day away from their parents, and most attend a center-based program prior to kindergarten. Attendance at a center-based program is becoming the norm at ages three and four. In 1999, center-based program participation was 70% at age four and 45% at age three.<sup>2</sup>

The center-based programs attended by children at ages three and four go by a variety of names – child care, preschool, day care, and nursery school. They provide different numbers of hours, from a couple of hours one or two days per week to 10 hours per day 250 days per year. They also operate under a variety of auspices – churches, independent non-profits, for-profits, public schools, and Head Start. Parents regard virtually all of these programs as educational regardless of the nomenclature used to describe the program, the hours of operation, or the auspices under which they operate.<sup>3</sup> Participation rates increase with income and parental education, despite greater government support for programs targeting children in low-income families. Children under three are much less likely to attend center-based programs, and parents seem to

view infant and toddler care as of less educational consequence.<sup>4</sup>

As non-parental education of young children becomes the norm, the extent to which such programs affect children's learning and development has become a vital question for families and governments. Inequalities in early care and education may be responsible for much of the inequality in later educational outcomes in the United States.<sup>5</sup> Moreover, there are concerns that parents may be unaware of the potential for their decisions about early care and education to have either adverse or positive impacts on their children's development. Some have raised hopes that public support for early education might provide a means for improving the productivity of our educational system and reducing educational and social inequalities.<sup>6</sup>

This report seeks to clarify the potential benefits and possible adverse effects of early care and education, with particular emphasis on the effects for children disadvantaged by social and economic circumstances. In addition, it seeks to summarize what is known about the extent to which variations in child characteristics, program characteristics, and the social environment alter the magnitude of the educational benefits from early education. Key issues in the review are the nature and duration of program effects. Often there is no dispute about whether programs have immediate or short-term effects on children, but there are disputes about the meaning or importance of the observed effects and whether they persist or result in other long-term effects that are more consequential.<sup>7</sup>

# **EARLY CHILDHOOD EDUCATION RESEARCH**

## **SHORT-TERM STUDIES**

A great deal of research has been conducted on the immediate and short-term effects of early education and child care. Much of this research is found in two largely separate but related sets of literature: one on child care and the other on educational interventions. Traditionally, these two bodies of research have focused on different questions and had different theoretical and methodological orientations. In recent years, there has been some convergence, but differences remain.

### **Early Intervention Program Studies**

In many cases, but not all, the educational interventions have been half-day or school-day programs that operate over a school year. Some have been home-based programs seeking to improve parent-child interactions in ways that are hypothesized to contribute to improvements in child development. A few home-based programs have provided educational services directly to the child. Some programs have delivered both center-based and home-based services and some have worked fairly extensively with both parents and children. Virtually all center-based programs have made efforts to involve parents in some way. These programs typically target children who are expected to have greater difficulty with school and high rates of grade repetition, special education, and other problems.

Children have been identified for intervention based on social and economic factors that are taken as indicators of risk of school failure, or based on individual assessments of developmental delay or disability. Poverty is the most frequently used criterion for disadvantage or risk, but other factors that might be employed include low

levels of parental education or IQ, poor health or nutrition, poor housing, maternal depression, and family and neighborhood violence.<sup>8</sup> Targeting based on socioeconomic disadvantage and based on developmental delay are clearly different conceptually. As socioeconomic disadvantage can lead to developmental delay, however, there is some overlap.

The early intervention literature has focused on looking for positive effects on children's development, most often looking at cognitive development, but assessing effects in other domains as well. There are hundreds of studies of immediate and short-term effects, and their findings have been conveniently summarized in both quantitative meta-analyses and traditional literature reviews.<sup>9</sup> Across these studies, the average initial effect on cognitive abilities is about 0.50 standard deviations, 7 or 8 points on an IQ test. Average effects on such socio-emotional outcomes as self-esteem, self-efficacy, motivation, and social behavior also were positive, though somewhat smaller, 0.25 to 0.40 standard deviations. No evidence of consistent negative effects appears in these studies. A strength of this literature is that similar results are found across studies employing a wide variety of research designs, including randomized trials and single-subject designs in which the "treatment" was experimentally manipulated. Effects are similar in size for disadvantaged populations and for children with disabilities or developmental delays.

Recent years have produced important advances in research as randomized trials, sometimes on a quite large scale, have been employed to examine the effects of specific approaches to early educational intervention at specific ages. The findings of these studies add substantially to the knowledge provided by the studies summarized in

previous reviews of the literature. In particular, these randomized trials have tested the effects of home visitation and other approaches that focus on parents and the improvement of parenting as means to improve the development of young children. These include models emphasizing case management to coordinate and increase the use of existing services for children beginning in the first year of life. Randomized trials may be especially important for studies of these types of programs; unmeasured differences among parents might play a large role in who chooses to enroll in such programs, leading to substantial biases when researchers attempt to estimate program effects simply by comparing program families and children to others who did not choose to enroll.

Results of these studies indicate that home visit programs frequently fail to influence parenting or to improve children's cognitive development. Two randomized trials have been conducted in California on Parents as Teachers (PAT).<sup>10</sup> Both found small and inconsistent effects on parenting knowledge, attitudes, and behavior and no effects on child development. A randomized trial of the Home Instruction Program for Preschool Youngsters (HIPPO) serving children ages four and five found significant effects on cognitive development for one cohort, but not another, and found no explanation for the inconsistent findings.<sup>11</sup>

The Carolina Approach to Responsive Education (CARE) study randomly assigned children to three conditions: full-day, year-round educational child care and home visits for parent education, parent education alone, and control.<sup>12</sup> Treatment began shortly after birth and continued to age five. The home-visit group of children had no better outcomes than the no-treatment controls. A randomized trial of home visits in Head Start similarly found no effects of home visits on home environment or child

development.<sup>13</sup>

A test of Levenstein's Verbal Interaction Program (VIP) in Bermuda failed to find positive effects, replicating the results of Levenstein's own earlier experimental results, but contradicting findings from quasi-experimental studies.<sup>14</sup> One potential explanation for lack of consistent effects comes from a randomized trial that varied frequency of visitation and found that three visits per week were necessary to produce significant cognitive benefits.<sup>15</sup> Most programs have provided home visits much less frequently.<sup>16</sup>

Several studies of attempts to provide comprehensive services in "two generation" models also have produced disappointing results. A multi-site randomized trial of the Comprehensive Child Development Program (CCDP) found that CCDP substantially increased maternal participation in parenting education, mental health services, and their own schooling while producing modest increases in children's participation in health services and early care and education over the first five years of life.<sup>17</sup> At age two, small effects were found on some parent behaviors and child development (2 points on the Bayley Scales of Mental Development, an effect size of 0.10 standard deviations<sup>18</sup>). No meaningful effects were found at the age five follow-up, however.<sup>19</sup> Similarly, studies of the Avance family support program, Child and Family Resource Program, and New Chance all failed to find significant effects on child development.<sup>20</sup> Research on Even Start found small effects, at best, on child development.<sup>21</sup> The recent large-scale multi-site randomized trial of Early Head Start found very small effects on child development and parent outcomes at age two, replicating the early findings of the CCDP study with 2 points on the Bayley and 0.10 effect sizes generally.<sup>22</sup>

The results of research on home visitation and two-generation approaches that do

not provide substantial direct services to children in centers strongly suggest two conclusions. First, attempts to influence child development indirectly through parents are relatively weak. Second, the size of the effect on child development varies with the amount, in frequency and in duration, of intervention provided. These conclusions are consistent with conclusions from earlier reviews of the literature.<sup>23</sup> A fairly intensive level of direct service may be required to consistently produce effects on child development of the average size observed in the literature generally.

A few seeming exceptions in the literature suggest that further research is warranted on the circumstances under which parent-directed programs might be highly effective.<sup>24</sup> Recent studies, however, also document the high costs of parent-focused programs, which are so substantial that even programs that demonstrate positive effects are unlikely to be deemed cost-effective.<sup>25</sup>

Although the evidence presented above is not encouraging regarding the effects of home visitation on children's cognitive development, there is evidence that some home visitation programs can improve the lives and development of young children in other ways. Over 20 years, David Olds and colleagues have found that a program in which nurses conducted home visits to economically disadvantaged new mothers produced significant positive effects: reducing the number and improving the timing of pregnancies and births after the first child, and reducing children's need for health care for injuries or ingestions.<sup>26</sup>

The Infant Health and Development Program (IHDP) study was a multi-site randomized trial to investigate the effects of weekly home visits starting just after birth, with the addition of full-day educational child care from ages one to three for low-birth



weight children.<sup>27</sup> The IHDP substantially increased IQ (by more than 0.50 standard deviations) and decreased parent-reported problem behaviors through age three. Effects were found to be larger for children with less educated mothers and for children with heavier birth weights.<sup>28</sup> At the age five and age eight follow-ups, significant effects were no longer found for the total sample. Significant (though reduced) effects, however, were found for the heavier birth weight stratum on IQ at ages five and eight and on mathematics achievement at age eight. No differences in treatment effects were found for any of the parental education subgroups.<sup>29</sup>

Why effects for the total group in the IHDP study disappeared is not clear. It is possible that lower-birth weight children in the control group had access to additional services – such as early intervention services or preschool special education programs – before the age of three and between the ages of three and five, which could lead to the disappearance of differential findings. Conversely, the lighter birth weight stratum might have greater incidence of neurological damage that limited the effectiveness of the program. Some researchers have disputed the follow-up findings of effects for the heavier birth weight group.<sup>30</sup> It is worth noting, however, that the birth weight strata were defined prior to the analysis, differential effects for the two birth weight strata were found at three different points over five years, and plausible explanations have been offered.

### **Child Care Studies**

Research on child care has tended to study the effects of typical programs on the general population, though some studies have focused on children in low-income families, with an emphasis on social and emotional development. In particular, child care researchers have been concerned with the potential for separation from the mother to

harm social and emotional development. More recently, the field has broadened its attention to cognitive development and the potential for positive effects, just as educational research has increased its concerns with social and emotional development and potential negative effects. Most child care studies have relied on statistical analysis of natural variation rather than experiments or even quasi-experiments with specific “treatments.” Over time, child care research has evolved from asking about the average effects of care to asking how the effects of care vary depending on interactions among the characteristics of care, children and families.<sup>31</sup>

Although programs for young children under a wide variety of names provide both care and educational experiences, child care is distinguished from preschool education by having as a primary goal enabling parents to work or pursue other activities. Child care centers are open for the hours parents work – typically 10 hours a day, 5 days a week – and children often attend more than 30 hours per week. Of course, child care centers are not the only providers of child care – family day care homes, nannies, and others, including relatives and neighbors, provide care outside or inside the child’s home. However, the focus here is on child care centers and their influences on learning and development.

Looking across many studies, child care for young children, especially care for infants and toddlers, appears to produce small negative effects in the short term on child-mother attachment and on social behavior, particularly aggression.<sup>32</sup> The effects on aggression may be contemporaneous or at entry to school. Although there is much agreement about these findings, some researchers have questioned the conceptualization and measurement of attachment, and it is essential to recognize that the social behaviors

of the vast majority of children in care are in the normal range.<sup>33</sup> In addition, there is no evidence that negative effects on social behavior persist past the first few years of school or result in other later problems.<sup>34</sup> Some studies have failed to find negative effects on aggression and have found positive effects on other social behaviors.<sup>35</sup>

Recently, new evidence on the short-term effects of child care on social behavior has come from the NICHD study of early child care, which had a sample of over 1,300 children across 10 sites.<sup>36</sup> Media reports based on a conference paper indicated that new findings contradicted previous work and the views of most “experts” that child care was not harmful for children’s social and emotional development.<sup>37</sup> In fact, the NICHD results reveal nothing new. Child care (of all types, including father care) for 30 hours or more per week was associated with more reported behavior problems at age two, but not at age three, and then again at ages four and five. At age five, children who received child care for 30 or more hours per week during the first four years of life had higher rates of reported problem behavior than those who had attended less than 10 hours per week. However, as in other studies, the effects were small. Behavior problems for children with 30 or more hours of care were not more common than would be expected for the general population. In addition, the negative effects on problem behavior were somewhat reduced for higher quality child care.<sup>38</sup>

Child care also has been found to produce modest positive effects (effect sizes in the neighborhood of 0.10-0.15) on cognitive and language development.<sup>39</sup> Some studies find that effects are larger for children who enter care earlier.<sup>40</sup> Some studies find larger effects for children from economically and educationally disadvantaged families. In addition, some studies have found that there may even be small negative effects of child

care (in the first three years) for children from homes offering the richest environments.<sup>41</sup> There is an implication that the difference between the resources provided to the child through parental and non-parental care is the active factor. This is consistent with evidence that the magnitude of effects increases with the quality of child care as well as evidence on the effects of parental education and other home resources.<sup>42</sup>

Recent large-scale longitudinal studies provide additional evidence regarding the effects of child care on the development of language and cognitive abilities. The NICHD study of early child care found associations between quality and child's language and cognitive development throughout the first three years of life.<sup>43</sup> At age four, higher child care quality was associated with greater language abilities and better short-term memory and attention. Child care centers were associated with better language and cognitive test scores at age four than other forms of care. In addition to associations with observed quality, it was found that children enrolled in child care centers meeting a greater number of professional guidelines for child-staff ratio, group size, teacher training, and teacher education had higher cognitive and language ability, and higher school readiness. All of these associations were modest in size, controlling for family background and home environment.<sup>44</sup> Variations in effects with family background have not been found consistently.<sup>45</sup>

A follow-up of the Cost, Quality, and Outcomes study investigated the effects of child care classroom quality on over 800 children in four states from ages four through eight, statistically controlling for family background.<sup>46</sup> This study found that children who attended higher quality child care classrooms had higher scores on the Peabody Picture Vocabulary Test-Revised (PPVT-R) and on achievement tests for pre-reading and

math abilities at age four. The PPVT-R is a test of receptive language, but it often is used as a “quick” IQ test. Continued follow-up found significant effects on PPVT-R scores through kindergarten, but effects declined as children moved toward age eight (controlling for quality of later schooling). Effects on math scores persisted through age eight. Depending upon the specifics of the analysis, effects on pre-reading and math achievement are found for children with less well-educated mothers, but not for children with highly educated mothers.<sup>47</sup>

## **LONG-TERM EFFECTS**

Reviews that simply summarize the results of studies of early care and education have found that cognitive effects frequently decline over time and are negligible several years after children leave the programs.<sup>48</sup> This pattern has led some to conclude that even intensive preschool programs produce no lasting effects on cognitive development. In this view, initial effects are either artificial (children learn to answer test questions better, but are not really smarter) or do not lead to long-term gains in cognitive ability. Others have called attention to differences among programs and concluded that large-scale public programs for children in poverty produce no meaningful improvements in cognitive abilities, while more intensive, small-scale (and impractical) programs may produce small gains in cognitive development. For example, Herrnstein and Murray conclude: “Head Start, the largest program, does not improve cognitive functioning. More intensive, hence more costly, preschool programs may raise intelligence, but both the size and the reality of the improvements are in dispute.”<sup>49</sup> They and others contend that to the extent more intensive programs have substantive long-term benefits these are more likely due to socialization than to effects on cognitive abilities.<sup>50</sup>

Barnett challenged this view through a review of the literature with a specific focus on the long-term effects of programs on achievement and school success, selecting studies for inclusion if they met four criteria: (1) children entered the program as preschoolers (in Head Start this could include some five-year-olds prior to the availability of kindergarten); (2) the program served economically disadvantaged children; (3) at least one measure of achievement or school success was collected at or beyond age eight (Grade 3); and, (4) the research design identified treatment and no-treatment groups from program records.<sup>51</sup> The requirement for follow-up through third grade allowed sufficient time to observe the fade-out in effects that is widely believed to occur.<sup>52</sup>

Thirty-seven studies were found that met these criteria, a larger number of long-term studies than had been included in previous research reviews and syntheses. All are studies of educational interventions, although five of the model programs provided services through full-day child care. The studies can be divided into two categories: one for small-scale research models, the other for large-scale public programs. In 15 studies, researchers developed model programs to study the effects of controlled treatments. In 22 other studies, researchers investigated the effects of on-going, large-scale public programs: 10 studied Head Start programs, eight examined public school programs, and four studied a mix of Head Start and public school programs.<sup>53</sup>

### **Model Program Studies**

The model program studies varied in entrance age, duration, services provided, and historical context (1962 to 1980). In later years, significant percentages of the comparison groups are likely to have attended a preschool or child care program, leading to underestimation of program effects. All focused on highly disadvantaged populations.

The average level of mother's education was under 12 years in all studies, and under 10 years in five studies. The majority of children were African-American in every study except for one, in which they were Hispanic. From program descriptions of teacher qualifications, class size, student-teacher ratio, and other information, it is apparent that model programs were much more resource-intensive, and therefore more expensive, than typical public programs for young children. Two studies limited their samples in additional ways that could have affected their results. The Perry Preschool study selected children based on low IQ scores, and its sample had substantially lower IQ's at age three than children in other studies.<sup>54</sup> The Milwaukee study selected children whose mothers had IQ's below 75.<sup>55</sup>

Seven of the model program studies were randomized trials. Two stand out because they began with sample sizes larger than 30 in each group, and had low attrition throughout follow-up: the Abecedarian and Perry Preschool studies.<sup>56</sup> The others suffered from extremely small initial samples or serious attrition. The remaining eight model program studies constructed comparison groups, and it is possible that the groups differ in ways that may have biased the comparisons either for or against the program. When randomized trials are not used, it is difficult to distinguish program effects from the effects of pre-existing differences (which may be unmeasured) between children and families in the preschool group and the comparison group, a problem sometimes referred to as “selection bias.”

### **Large-Scale Public School Programs**

The 22 large-scale public program studies generally represent public preschool programs targeting children in poverty. Most programs served children part-day for one

school year at age four. Four programs served children from age three. In nearly all of the studies children moved on to regular public elementary schools. In the Child Parent Center (CPC) studies, intervention continued through third grade, and the effects of the preschool and school-age programs have been estimated separately. All of the large-scale public program studies used quasi-experimental designs. In most studies, comparison groups were identified later, and there are no pre-program measures of children's cognitive abilities to verify that the two groups began with the same abilities. Many studies employ family background measures to assess comparability and adjust for initial group differences, but the family background measures tend to be crude, increasing the risk that unmeasured differences between groups bias the results.

## **Study Findings**

### IQ

All of the model program studies found positive initial effects on IQ. In most cases IQ effects were sustained at least until school entry. Estimated effects for 12 model program studies with IQ data at age five ranged from 4 to 11 IQ points (effect sizes of 0.25 to 0.75), with the exception of two studies, one quasi-experimental reporting no effect and one randomized trial of a highly intensive program reporting an estimated effect of 25 points. None of the large-scale program studies provided IQ test data, but a few administered the PPVT; these reported no significant effects on the PPVT after school entry. In all but two studies, the effects on IQ clearly are transitory.

Randomized trials of two model programs (the Milwaukee and Abecedarian interventions) that provided full-day intensive interventions over the first five years of life provide evidence that such programs may produce very long-term, possibly



permanent, increases in IQ. The long-term effect is about 5 IQ points, which is substantially smaller than the initial effects of the programs. Their findings contrast sharply with the apparent failure of later, less intensive interventions to produce lasting IQ gains. This suggests that very early intensive interventions may have more fundamental or general effects on the cognitive development of children in poverty.

The IQ findings of both studies have been discounted by scholars advocating the importance of heredity as an explanation for the low cognitive abilities of children in poverty.<sup>57</sup> Even the strongest claims for heredity leave sufficient room for the estimated effects, however. Moreover, their arguments that the study results are questionable because IQ effects appear early (in the Abecedarian study) or are inconsistent with insignificant effect estimates for school outcomes (Milwaukee) do not hold up to scrutiny. The Abecedarian study finds persistent IQ effects after controlling for maternal IQ and infant home environment, presumably sources of pre-existing differences in IQ between groups.<sup>58</sup> Estimated effect sizes for special education, grade repetition, and academic achievement are large in the Milwaukee study. With the limited statistical power provided by a very small sample size, it is inappropriate to construe lack of statistical significance as evidence that IQ effects occurred without effects on academic success.<sup>59</sup>

### Achievement

In contrast to the IQ findings, results regarding long-term effects on achievement varied considerably across studies. Five of 11 model program studies with achievement data found statistically significant positive effects on achievement test scores beyond Grade 3. Evidence of achievement effects was strongest in the seven randomized trials, as

all found statistically significant effects on achievement at some point. The two randomized trials with low attrition rates, the Abecedarian and Perry Preschool studies, found effects on test scores persisting into high school. Nine studies of large-scale programs never found statistically significant effects or lost statistical significance by Grade 3. Twelve studies of large-scale programs found significant positive effects on achievement at least through Grade 3.

Much of the variation in findings regarding long-term effects on achievement across programs can be explained by differences in research methods and procedures. Detailed analyses indicate that in many studies the apparent fade-out in effects on achievement can be attributed to flawed research methods, which bias estimated effects toward zero, and high rates of attrition, which decrease statistical power over time. Reliance on achievement test data from schools' routine testing programs is a major source of potential problems. As testing typically is conducted by grade level for children in regular education, studies systematically lose the more poorly performing students from year to year as the cumulative percentage of children retained in grade, placed in special education, or otherwise omitted from testing grows. Program and comparison group children with valid test scores become more similar over time (essentially equated on grade level), gradually hiding the true differences between the groups.<sup>60</sup>

### School Progress and Placement

School progress and placement were primarily measured by the percentage of children repeating grades, given special education services, and graduating from high school. Cumulative school records data on these outcomes are not subject to the attrition bias introduced by the use of school test data. Estimated effects on school progress and

placement are uniformly positive and overwhelmingly statistically significant. The evidence regarding high school graduation is highly consistent as well. All six studies (including model, Head Start, and public school programs) produced large estimates of effects on the graduation rate, although only in the four with larger sample sizes were these statistically significant.

Estimated effects on grade repetition and special education placements can be combined across studies to estimate average effects across studies and compare the effects of model and large-scale programs. Model programs were associated with 20 percentage point lower rates of special education placement and 15 percentage point lower rates of grade repetition. The comparable figures for large-scale public programs are 5 percentage points and 8 percentage points, which are significantly less than the model program estimates in both cases.<sup>61</sup>

### Social Development

Most long-term studies of educational interventions for disadvantaged children have emphasized research on cognitive and academic outcomes. However, most studies that assessed effects on social behavior have found positive effects (though a few have found no significant effects), and no study reported elevated aggression beyond Grade 1.<sup>62</sup> Five studies of educational interventions that investigated long-term effects on social behavior found positive effects on classroom behavior, social adjustment, and crime and delinquency reports.<sup>63</sup> This includes two of the three studies that found elevated aggression associated with full-time child care that began in infancy.<sup>64</sup> The third found no long-term effect on crime and delinquency, but rates were low for both groups.<sup>65</sup>

## **New Long-Term Research**

Recent research on the long-term effects of Child Parent Centers (CPC) in Chicago provides an extremely valuable addition to knowledge regarding early education for disadvantaged children.<sup>66</sup> This longitudinal study with a sample of over 1,500 children estimated the effects of a Title I funded half-day preschool and extended elementary program from ages three to nine operated by the Chicago public schools. Separate estimates are provided for the preschool and elementary components and effects are estimated through age 21. Controlling for family economic disadvantage, CPC preschool participants had significantly lower rates of special education placement, grade retention, juvenile arrest, and arrest for a violent offense. They also had significantly higher achievement test scores in reading and math through age 15 and a higher rate of high school completion. Effect sizes are in the 0.20 to 0.50 range, perhaps on the high side for large-scale programs generally. Effects are somewhat larger for children in the highest poverty neighborhoods.

In addition, the CPC study data were used to estimate structural models to investigate the chain of effects from preschool program to long-term outcomes. These analyses support the view that early education's long-term effects on achievement and school success primarily result from initial effects on cognitive abilities. These results replicate findings of structural equation modeling with the much smaller Perry Preschool data set, and the estimated chain of effects is remarkably similar to that for the Perry Preschool program.<sup>67</sup>

## **Costs and Benefits**

While skeptics of making early education more broadly available through public

funds frequently cite cost as the basis of their objections, some research has shown that quantifiable benefits result that can make a high quality early education program cost-effective when properly accounted for. Barnett has estimated the costs of benefits of a high quality early education program based on the findings of the Perry Preschool study.<sup>68</sup> The cost savings to society from avoiding crime and delinquency contribute a great deal to benefits. However, there also are important economic benefits from reducing the direct costs of educational failure and from increasing adult economic success by preventing educational failure. These benefits are not hypothetical, but are based on demonstrated increases in earnings and employment and decreases in reliance on public assistance. His estimates reveal a high rate of return, comparable or better than one could expect to earn from investing in the stock market. Even after discounting to calculate present value (a financial technique for making present costs and future benefits comparable), the estimated benefits are roughly ten times the costs.<sup>69</sup> It is important to note that this includes none of the economic benefits that a full-day, year-round program might generate by enabling parents to work more or participate in education and training. Barnett's results have been confirmed by a recent Rand report<sup>70</sup> that scrutinized his estimates and by similar estimates finding that the benefits of the Chicago Child Parent Centers far exceeded costs.<sup>71</sup>

## **PROGRAM DESIGN AND EFFECTIVENESS**

From the evidence reviewed so far, it should be clear that some programs are more effective than others. Educational interventions for disadvantaged children, including Head Start and public school programs, have larger estimated effects than child care programs. This is true whether child care program effects are estimated for the

general population or for disadvantaged children. Model programs have larger estimated effects than Head Start and public school programs. However, some caution is required in drawing conclusions because programs vary with respect to the disadvantage of the children served and their social, political, and economic contexts, as well as in their design.

Nevertheless, it seems clear that a dose-response is observed with respect to quality, or intensity of resources provided. Studies of the effects of child care quality find that higher quality is associated with greater effects, and the quality of child care generally is lower than the quality of large-scale public programs, which in turn are of lower educational quality than model programs.<sup>72</sup> Child care programs typically produce smaller effects even with disadvantaged children, compared with Head Start and public school programs. Studies that compare model programs with large-scale public programs (including child care) serving the same population find model programs to be more effective, confirming the cross-study inference.<sup>73</sup>

Additional guidance regarding program design can be gleaned from analyses of the model programs, cross-study comparisons of programs and their outcomes, research on variations in the quality and effects of child care programs, and research on the effectiveness of elementary school education. Conclusions drawn from all of these sources are remarkably consistent. More highly educated, better prepared, and better compensated teachers are more effective.<sup>74</sup> Smaller class sizes and better teacher-student ratios result in better teaching, more individual attention, and larger cognitive gains that improve achievement and school success, especially for disadvantaged students.<sup>75</sup> Other characteristics of programs that have generated the largest achievement and other gains

for disadvantaged children include: a strong focus on language, strengthening children's cognitive abilities generally, interactions that prepare children for the discourse patterns and other demands of school without pushing down the elementary school curriculum, individualized support for learning, regular opportunities for teachers to reflect with highly knowledgeable leaders or others, and collaborative relationships with parents to support the child's learning and development.<sup>76</sup>

Research provides less guidance than policy makers and administrators might like regarding two key aspects of program design that have significant implications for cost: age of start and hours per year (length of day and days per year). Highly intensive programs beginning earlier have had larger effects than those in which children start later, but the optimal entry age is unclear as each additional year adds to cost. Two longitudinal studies indicate that programs beginning at age three produce substantial long-term benefits for disadvantaged children and that the benefits substantially exceed the costs.<sup>77</sup> Even intensive programs beginning at age four might bring significantly fewer disadvantaged children up to the thresholds of learning and development required for early school success. With respect to length of day and number of days per year, the research on the relative lack of progress for disadvantaged elementary school children during the summer is suggestive, and many parents may choose not to send their children to programs that do not address their needs for child care.<sup>78</sup> In addition, benefits from effects on parental employment associated with child care should be incorporated into any assessment of costs and benefits.

## **SUMMARY AND RECOMMENDATIONS**

Pre-kindergarten education for disadvantaged children can greatly increase their

cognitive abilities, leading to long-term increases in achievement and school success. Although general cognitive abilities as measured by IQ may only temporarily increase, persistent increases can be produced in the specific abilities measured by standardized achievement tests in reading and math. In addition, programs can have positive effects on children's long-term social and emotional development, reducing crime and delinquency. To reap all of their potential benefits, pre-kindergarten programs for disadvantaged children must be intensive, high in quality, and emphasize both cognitive and social development.

Pre-kindergarten programs for disadvantaged children are among the most strongly evidence-based of those approaches to improving academic achievement and educational attainment that have been tested. However, they will produce the desired results only if implemented in accord with the principles for effective programs that emerged in this review. These include:

- Class sizes and child-teacher ratios must be kept low. The research literature suggests that the best practice is probably a class size of 15 with a teacher and an aide.
- Teachers must be highly qualified, with at least a bachelor's degree and with specialized training in early education, and must be paid well.
- Curricula must be intellectually rich and sufficiently broad to address children's developmental needs in all domains.
- Programs must have an infrastructure adequate to support best practices, professional development, and ongoing evaluation and accountability.
- Programs must engage in an active partnership with parents and



accommodate their needs, including their needs for child care.

- Programs should start no later than age three. Beginning prior to age three might produce substantially better results, but only if a highly intensive center-based program is provided up to school entry.
- Resources should be focused primarily on disadvantaged children, recognizing that income is not the only risk factor for poor achievement and that the poverty line is an arbitrary cut-off for educational purposes. Universal pre-kindergarten programs can target resources on disadvantaged children by providing them with smaller classes, better teachers, more hours, and a sliding fee scale so that higher-income families share the cost.
- The existing array of public school, Head Start, and private programs all can be used, but both standards and resources must be substantially increased to produce the desired results. There are many advantages to such a strategy, but the time and costs of increasing quality to the necessary level should not be underestimated.

The way that educational costs are conventionally calculated, the foregoing recommendations will be seen as expensive. However, they are not as expensive as the costs of failing to implement them: poor achievement, high rates of school failure and special education, low productivity, and high crime and delinquency. Also, because disadvantaged children are highly concentrated geographically, these costs contribute to problems of segregation, urban decay, and suburban sprawl that add to the costs of current policy.<sup>79</sup> From this perspective, it is difficult to see how society can afford not to implement high-quality pre-kindergarten education for disadvantaged children.

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