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Success by Ten

Intervening Early, Often, and Effectively
in the Education of Young Children

The Hamilton Project seeks to advance America's promise of opportunity, prosperity, and growth. The Project's economic strategy reflects a judgment that long-term prosperity is best achieved by making economic growth broad-based, by enhancing individual economic security, and by embracing a role for effective government in making needed public investments. Our strategy—strikingly different from the theories driving economic policy in recent years—calls for fiscal discipline and for increased public investment in key growth-enhancing areas. The Project will put forward innovative policy ideas from leading economic thinkers throughout the United States—ideas based on experience and evidence, not ideology and doctrine—to introduce new, sometimes controversial, policy options into the national debate with the goal of improving our country's economic policy.

The Project is named after Alexander Hamilton, the nation's first treasury secretary, who laid the foundation for the modern American economy. Consistent with the guiding principles of the Project, Hamilton stood for sound fiscal policy, believed that broad-based opportunity for advancement would drive American economic growth, and recognized that "prudent aids and encouragements on the part of government" are necessary to enhance and guide market forces.





Success by Ten

Intervening Early, Often, and Effectively
in the Education of Young Children

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This discussion paper is a proposal from the authors. As emphasized in The Hamilton Project's original strategy paper, the Project is designed in part to provide a forum for leading thinkers across the nation to put forward innovative and potentially important economic policy ideas that share the Project's broad goals of promoting economic growth, broad-based participation in growth, and economic security. The authors are invited to express their own ideas in discussion papers, whether or not the Project's staff or advisory council agree with the specific proposals. This discussion paper is offered in that spirit.

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Abstract

Success by Ten is a proposed program designed to help every child achieve success in school by age ten. It calls for a major expansion and intensification of Head Start and Early Head Start, so that every disadvantaged child has the opportunity to enroll in a high-quality program of education and care during the first five years of his or her life. Because the benefits of this intensive intervention may be squandered if disadvantaged children go from this program to a low-quality elementary school, the second part of the proposal requires that schools devote their Title I spending to instructional programs that have proven effective in further improving the skills of children, especially their ability to read.

The proposal is based on the principle that early intervention is particularly important because of the brain's unusual "plasticity" during a child's early years. Children from different family backgrounds currently experience very different types of learning environments during the early years. The result is that large disparities in cognitive and noncognitive skills are found along race and class lines well before children start school, even before they can enroll in the federal Head Start preschool program at age three or four years. Most of America's social policies try to play catch-up against these early disadvantages—and most disadvantaged children never catch up.

Findings from a number of rigorously conducted studies of early childhood and elementary school programs suggest that intervening early, often, and effectively in the lives of disadvantaged children from birth to age ten may substantially improve their life chances for higher educational attainment and greater success in the labor market, thereby helping impoverished children avoid poverty in adulthood. Another consequence would be to greatly improve the skills of tomorrow's workforce, thereby enhancing future economic performance. These benefits for children would be accompanied by benefits for their parents, many of whom work full time and need high-quality child care, such as the program would provide.

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1. Introduction

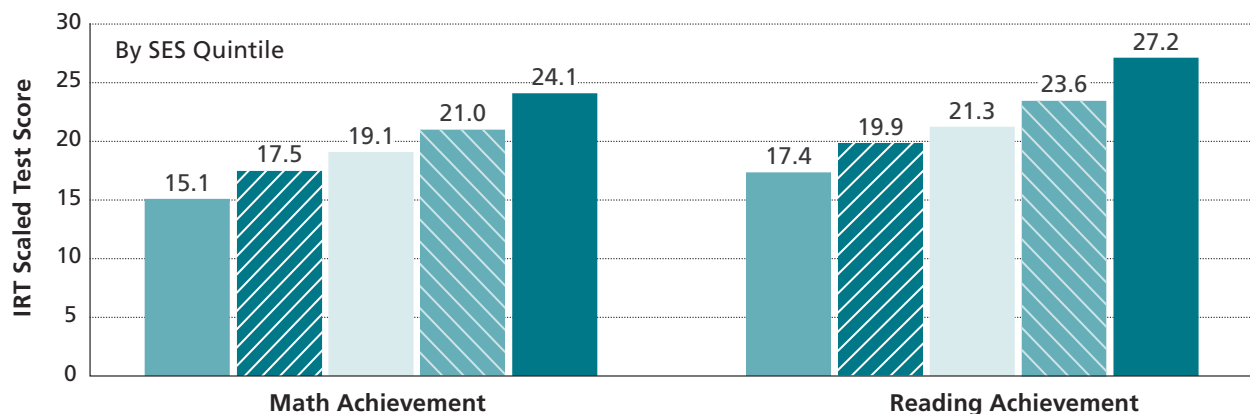
Children cannot choose their parents. While people disagree about how social policy should treat adults who have been unlucky or unwise, there is something fundamentally unfair about making children’s life chances hostage to the circumstances of their parents. The reality, though, is that family background has a powerful influence on how children develop, beginning early in their lives. Our society’s goal should be to intervene early, often, and effectively in the lives of disadvantaged children from birth to age ten, so that by the end of this period we substantially narrow—or eliminate—disparities in cognitive and noncognitive skills across race and class lines.

The human brain grows and changes at an astonishingly rapid rate during the first few years of life (Friedman 2004, Shonkoff and Phillips 2000, Knudsen et al. 2006). The brain’s unusual “plasticity” seems to make young children unusually responsive to environmental influences. Psychologists often refer to these early years as a sensitive period for the child’s development of several important cognitive and other skills (Nelson 2000a, 2000b).

Children’s environments during these early years differ dramatically across race and class lines. For example, compared with kindergarteners from families in the bottom fifth of the socioeconomic distribution (measured by a combination of parental education, occupation, and income), children from the top fifth of all families are four times more likely to have a computer in the home, have three times as many books in the home, are read to more often, watch far less television, and are more likely to visit museums or libraries (Lee and Burkam 2002).

These differences in early environments contribute to large gaps in test scores, which show up at a very early age. Numerous studies have compared the outcomes of preschool children from different socioeconomic backgrounds, or racial or ethnic groups, and find large differences in cognitive skills in children as young as three or four years old (Jencks and Phillips 1998, Fryer and Levitt 2004, Lee and Burkam 2002, Rouse et al. 2005, Rock and Stenner 2005). Figure 1 summarizes some recent results showing marked differences in average math and reading scores by socioeconomic status for a

FIGURE 1
Math and Reading Achievement at the Beginning of Kindergarten, by Quintiles of Socioeconomic Status



Note: Sample is of children who started kindergarten in 1998. Uses the Item Response Theory scaling method to equate math and reading scores.
 Source: Lee and Burkam 2002, Figure 1.3, p. 18.

nationally representative sample of children who started kindergarten in 1998.

Of course, averages conceal the fact that there is a lot of variability among children from every socioeconomic group. Some children with low socioeconomic status will attain high scores on math and reading tests, while some children with high socioeconomic status will have low scores on those tests. However, a common finding of studies that compare test scores of preschool children is that about five-sixths of the preschool children with high socioeconomic status perform better than the average child with low socioeconomic status, while only about one-sixth of the preschool children with low socioeconomic status outperform the average child with high socioeconomic status. In statistical terms, this represents a difference of about one standard deviation in the average test scores of children from high- versus low-socioeconomic backgrounds.

The early years also appear to be a sensitive period for the development of noncognitive skills, such as those relating to emotion and affect (Nelson 2000a, 2000b). The large differences in noncognitive outcomes (such as physical aggression) between children in families above the poverty line compared with those below it have been documented at ages as young as seventeen months (Tremblay et al. 2004; see also Cunha et al. 2005 for a summary of other results). Noncognitive skills are important: the abilities, for example, to sit still, pay attention, and get along with others are central to success in elementary school. The attributes that make children eager learners in school may also influence the willingness of parents to engage them in learning activities in the home.

These early gaps in cognitive and noncognitive skills tend to persist through the school years and into later life. Those who score poorly before entering kindergarten are likely to do less well in school,

to become teen parents, to engage in crime, and to be unemployed as adults (Rouse et al. 2005). For example, by the end of high school the size of the gap in achievement test scores between White and African American children is not much different from the size of the gap among those groups of students in preschool (Phillips et al. 1998; see Ludwig 2003 for a discussion of measurement issues). Moreover, problem behavior during the early years, such as physical aggression, seems to be highly predictive of criminal behavior later in life (Reiss and Roth 1993).

The importance of these early years in affecting the ability of children to realize their full potentials is not matched by government budget priorities. The United States currently spends around \$7,300 on elementary and secondary public schooling for each school-age child (five to seventeen years old), for a total of around \$530 billion (see U.S. Department of Education 2005).¹ But family background generates large differences in child outcomes well before children start school and even before they are old enough to participate in the federal government's preschool program for disadvantaged children, Head Start. Per student spending in Head Start is similar to that in public elementary and secondary schools, but the program's annual budget of \$7 billion covers only 49 percent of income-eligible three- and four-year-olds (HHS 2005). The newer Early Head Start program is designed to provide preschool and other services to disadvantaged children during the highly malleable years between birth and age three years, but Early Head Start's budget is only around \$700 million and covers just a small fraction of all eligible children (ibid). Most of America's social policies try to play catch-up against these early disadvantages—and most disadvantaged children never catch up.

Our Success by Ten proposal argues for a major expansion and intensification of Head Start and

1. The U.S. Census Bureau (2005, Table 244) reports average per pupil spending for children in elementary and secondary schooling of around \$8,200 in 2004. These data also suggest that around 89 percent of all school-age children are enrolled in public schools, so public school spending per school-age child equals about \$7,300 (i.e., 89 percent of \$8,200).

Early Head Start, so that every disadvantaged child has the opportunity to enroll in an intensive, high-quality program of education and care during the first five years of life. Our proposal is based on a growing sense among scientists that intervening early in the lives of disadvantaged children may be particularly important and productive. Research from a variety of sources (see §§3.1–3.2) shows that early education can make a dramatic difference for impoverished children, despite their disadvantaged environmental surroundings. The benefits of this intensive intervention may be squandered, however, if disadvantaged children go from this program to a low-quality elementary school, and there is currently little reason to believe that compensatory federal Title I spending does much to improve these children’s schooling experiences. As a result, the second part of our proposal is to require that schools devote their Title I spending to instructional programs that are proven effective, which would further improve the skills of poor children and help guard against “fade out” of preschool gains. In short, our Success by Ten proposal argues both for more resources and for using existing resources more effectively.

The specific proposal we outline below would provide economic and social benefits that far exceed the program’s costs. Moreover, over the long term, the

program will even cover its costs from the narrower perspective of the government’s balance sheet by increasing educational attainment and thus stimulating economic growth and consequently tax revenues, as well as reducing government costs for line items such as special education and incarceration. Finally, the proposal should help improve continuity of child care for poor families and support the bipartisan goals of the No Child Left Behind Act (U.S. Congress 2001) to close educational gaps between rich and poor, and minority and nonminority children.

The remainder of our paper fleshes out one specific proposal for achieving this ambitious set of goals. Our paper is not intended to provide a comprehensive survey of the early childhood education literature; excellent reviews of this and related literatures can be found elsewhere (Barnett 1995, Shonkoff and Phillips 2000, Currie 2001, Carneiro and Heckman 2003, Krueger 2003, Blau and Currie 2004, Cunha et al. 2005, Magnuson and Waldfogel 2005, Knudsen et al. 2006). In fact, none of the ideas presented here is entirely new. Our primary goal is to selectively craft pieces of this existing literature into a coherent and specific policy proposal and to highlight the reasons why scholars working in this area believe that investing early, often, and effectively is such a promising policy.

2. The Principles behind Success by Ten

Our strategy rests on three central principles: intervene early, intervene often, and intervene effectively.

Intervene early. Large disparities in children’s outcomes by family background are evident, even at the age children are eligible to enroll in Head Start. We should be trying to prevent rather than remediate these educational disadvantages.

Intervene often. Intervening early improves the ability of children to benefit from schooling in later periods (Carneiro and Heckman 2003; see also Dickens and Flynn 2001), which also implies that this benefit may be squandered if high-quality preschool programs are followed by time spent in low-quality classrooms. We need to improve the learning environments of children, not only during the preschool years but also during the elementary school years. One-shot interventions added to the existing public school options for low-income children are not enough.

Intervene effectively. While improving the educational environments of poor children is an important goal with great potential, it is equally im-

portant to ensure that the money allocated to this goal is spent well. A central feature of Success by Ten is the requirement that all federal money that is allocated to the initiative be dedicated to proven methods—interventions that have been subjected to rigorous evaluation, have led to better outcomes for children, and have passed a benefit-cost test.

Our third principle, intervening effectively, guides our decisions about specific programmatic recommendations, but also presents a challenge: while science is helping illuminate how human development unfolds and what types of intervention strategies might be most promising, important gaps remain (Shonkoff and Phillips 2000, Knudsen et al. 2006). In our view, given the magnitude of the problem and the promise demonstrated in previous research, the combination of risks and returns justifies important new investments in this area. What follows is our attempt to spur a serious discussion about the specific form these investments should take, with the recognition (and the hope) that this dialogue and the accumulation of new research in this area will lead to the evolution of new ideas, including ones that may differ from the specific programmatic features of our proposal.

3. Proposal Design and Background

What would Success by Ten look like? In light of our principle to intervene effectively, and given the research evidence currently available, we think the most promising way to improve the learning outcomes of disadvantaged children would be to provide them with five years of high-quality, full-time early education and care outside the home, starting with birth. This conclusion stems in part from an unusually promising model program called Abecedarian, but also from evaluations of other programs (including other small model programs and large-scale programs such as Head Start or state-funded universal pre-K programs) as well as from a growing body of evidence from neuroscience, developmental psychology, and even research on animals (Shonkoff and Phillips 2000, Currie 2001, Gormley et al. 2005, Barnett et al. 2005, Knudsen et al. 2006, Ludwig and Miller 2007, Ludwig and Phillips 2007). While there is evidence to support the cost effectiveness of a wide variety of different programs that vary in their intensity, particularly encouraging are the results of the unusually intensive Abecedarian program, which was able to generate lasting impacts even on outcomes such as IQ scores (discussed in §3.1).

To preserve and build on the gains from this type of intensive preschool program, we propose that disadvantaged children follow the early education program by spending the first five years of their elementary school careers (from K through grade four) in a proven instructional program. One of the few elementary school programs that has been rigorously evaluated and shown to be effective is called Success for All. This program emphasizes the development of reading skills, assesses children regularly, and provides one-on-one tutoring to children who fall behind. To ensure that disadvantaged children get to participate in a high-quality program such as

Success for All, we recommend that Title I funds be limited to programs certified by the National Academy of Sciences to have been rigorously evaluated and found effective.

To begin the discussion of our proposal, we first look at the two programs whose encouraging evidence motivates the early education and elementary school follow-up components of our Success by Ten proposal—Abecedarian and Success for All—and we describe the elements and impacts of those interventions (§§3.1–3.3). Next, we discuss the implementation of our Success by Ten proposal and the anticipated costs and benefits (§§3.4–3.5). Throughout this discussion, we emphasize that our proposal’s structure (especially the phase-in and scale-up process) is designed to facilitate research and experimentation with the goal of finding program alternatives that could be even more cost effective. Next we address potential questions and concerns with regard to, *inter alia*, the scaling-up process, eligibility, funding, and how our proposal would fit into the existing panoply of state and federally based programs, such as Head Start (§4). We offer conclusions in §5.

3.1. The Abecedarian Program

In 1972, a population of low-income, at-risk pregnant women (nearly all of whom were African American) was identified in Chapel Hill, North Carolina to participate in a unique early education program called Abecedarian.² The children born from this population were randomly assigned to either a control group or an Abecedarian “treatment” group. The latter received year-round, full-time care from 7:30 a.m. to 5:30 p.m., five days a week, 50 weeks a year, for five years starting in the child’s first year of life. The intensity of this program shows a clear contrast with Head Start,

2. Mothers who gave birth to infants with evidence for mental, sensory, or motor problems were not eligible.

which usually provides children around age three or four years with one or two years of services during the academic year.

The Abecedarian program included transportation, individualized educational activities that changed as the children aged, and low child-staff ratios (three to one for the youngest children and up to six to one for older children). Abecedarian teachers followed a clear curriculum that focused on language development, and the program explained to teachers the importance of each task and the way to teach each task. Regular assessment and monitoring was also an important part of Abecedarian; staff administered the Bayley Scales of Infant Development to children ages three to eighteen months every three months and administered IQ tests to children between the ages of twenty-four and sixty months every six months. The program also provided families with additional social services and nutritional supplements (Ramey and Campbell 1979, Campbell et al. 2002, Masse and Barnett 2007).

We can draw strong conclusions about the efficacy of Abecedarian because the model program was implemented as a randomized experiment, with some mothers and their children randomly assigned to the Abecedarian program and others assigned to a control group. The great advantage of randomized assignment is that parents and children in the program should be, on average, similar to those randomly assigned to the control group. Differences in outcomes for treatments and controls can therefore be attributed to the effects of the program with high confidence.

The results of Abecedarian were dramatic. Children assigned to the control group typically ended up having IQ scores that were as far below the national average for that age, as one would expect for children from a lower socioeconomic group (see Figure

1). However, children assigned to the Abecedarian treatment group had IQ scores at about the national average through age five. Similarly large effects were also observed for achievement on verbal and quantitative tests (Ramey and Campbell 1984). The implication is that if a scaled-up program (such as the one proposed in this paper) could achieve similar impacts, then most of the difference in early childhood outcomes between low- and middle-income children could be eliminated.

For children who received the Abecedarian program intervention, the college entry rate was 2.5 times the control group's rate. Teen parenthood and marijuana use in the group that received the Abecedarian intervention were around half of the average rates for the control group that did not receive the intervention. Rates for smoking were about 30 percent lower for those who received the Abecedarian intervention compared with the average for the control group (Campbell et al. 2002). More suggestively, arrest rates were lower for students in the treatment group than for students in the control group, although the absolute numbers of those arrested in the two Abecedarian groups were small enough that it is impossible to prove statistically that this particular difference did not result from chance.

3.2. Abecedarian and Other Early Childhood Education Programs

These impressive results motivate our decision to suggest that the early education component of our Success by Ten proposal be as intensive as that employed in Abecedarian. As discussed below, these benefits stand out even when compared with other early education programs. But in addition to being a high-benefit program, Abecedarian was also high-cost, at about \$16,600 per year for each of the child's first five years (Masse and Barnett 2002).³

3. Where indicated, amounts are in estimated 2007 dollars using the estimated GDP Price Index from Congressional Budget Office (2007, Table D.1). Masse and Barnett (2002) cite a total cost of \$73,646 for five years of Abecedarian in 2002 dollars, within a public school setting where teachers are given compensation comparable to those in regular public schools. The \$16,600 value is the approximate yearly average, converted to estimated 2007 dollars.

TABLE 1
Alternative Early Childhood Education Programs: Program Characteristics

	Abecedarian	Perry Preschool	Chicago Child-Parent Center (CPC)	Head Start	Early Head Start
Ages covered	0–5 years	3–4 years	3–9 years	3–4 years	0–3 years
Quantity (coverage) per year	7:30–5:30, 5 days/week, 50 weeks/year	2.5 hours/day, 5 days/week, academic year	Half-day preschool (1.5 years), full-day K, after-school for children 3–9 years/academic year	Varied	Varied
Teacher qualifications	Mostly high school for teachers of children birth–2, mostly BA for teachers of children 3–5 ^a	≥BA plus education certificate	≥BA plus early education teaching certificate	31% BA, 33% AA, 22% early education teaching certificate ^b	21% BA, 34% AA, 33% early education teaching certificate ^c
Teacher salaries	Comparable to public schools	Comparable to public schools (plus 10%)	Comparable to public schools	About one-half public school salaries	About one-half public school salaries
Pupil-staff ratios	3:1 infants & toddlers, 6:1 older children	5:1 or 6:1	17:2	9.7:1 (average)	4:1
Number of students involved in the study/program	112 (initial), 104 (end) (about 57 treatment, 54 control)	123 (58 program, 65 control)	1,539 (989 program, 550 control) 1983–86 study	855,000	62,000
Program population	Low-income African American, Chapel Hill, NC	Low-income, low-IQ African American, Ypsilanti, MI	Poor, 93% African American, 7% Hispanic, Chicago	Mostly low-income, national	Mostly low-income, national
Curricular emphasis	Communication skills plus motor, social, cognitive skills	Logic, math, literacy, creativity, social	Varied	Varied	Varied
Nonacademic services	Medical and nutrition	1.5 hours/week home visits with mother and child	Home visits, health screening, nursing service	Dental, other health, nutrition	Health and mental health services for children and mothers, nutrition
Total cost per year per student	\$16,600	\$9,500	\$5,500 (preschool)	\$7,100	\$10,700
Total cost per student (present value at birth, 3% discount rate)	\$78,000	\$17,000	\$7,500 (preschool)	\$6,500 ^d	\$17,900 ^e

Note: All values approximate and in estimated 2007 dollars.

a. Stephen Robblee and Frances Campbell, personal communication, September 16, 2005. These data are based on Campbell’s recollections rather than actual program records on teacher qualifications.

b. 2005 data.

c. 2004 data.

d. Assuming one year of participation at age three years, similar to Garces et al. 2002. A child who participates for two years would cost approximately \$12,800. About 70 percent of Head Start participants spend one year in the program, and the remaining 30 percent usually participate for two years (Craig Turner (Administration for Children and Families), personal communication, January 29, 2007).

e. Assuming twenty-one months of participation culminating at age three years. Twenty-one months was the average duration of service reported in the study by Love et al. (2002).

Sources: Abecedarian program description and cost estimates as presented in the paper and from Ramey and Campbell (1984), Campbell and Ramey (1994), Campbell et al. (2002), and Galinsky (2006), p. 10. Perry Preschool description and estimates from Schweinhart et al. (2005), Schweinhart (2003), and Heckman and Masterov (2006). Evidence on CPC from Reynolds (1998), Reynolds et al. (2001), Reynolds et al. (2002), and Heckman and Masterov (2006). Head Start description and data from Hamm (2006b), p. 6, Currie and Neidell (2003), Table 1, Office of Head Start (2006), Hart and Schumacher (2005), Zill et al. (2003), and Puma et al. (2005). Early Head Start description and data from Craig Turner (Administration for Children and Families), personal communication, January 29, 2007, Irish et al. (2003), Administration for Children and Families (n.d.), Love et al. (2002), Hamm (2006a), and Office of Head Start (n.d.).

The relevant column of Table 1 summarizes many of the key features of the Abecedarian program. To understand why Abecedarian is more expensive than most other early childhood interventions, Table 1 compares the program's features with the current large-scale Head Start and Early Head Start programs and with two other small-scale model programs that are often cited as evidence for the efficacy of early intervention: Perry Preschool and the Chicago Child-Parent Center.

Abecedarian cost more than other early childhood programs in large part because of differences in program duration. While most of these other programs serve children for just a few hours per day for one or two years, under the Abecedarian program, children had access to full-day, year-round services for five full years before starting school. In addition, teacher salaries under Abecedarian were comparable to those of regular public school teachers—about twice what Head Start or Early Head Start teachers are usually paid. Abecedarian also had smaller pupil-staff ratios than at least some of these alternative programs.

Conversely, Table 2 shows how the gains from Abecedarian compare with those from other early childhood programs.⁴ The table reveals several key points.⁵ First, the increase in test scores during early childhood was much larger for Abecedarian than for either Head Start or Early Head Start—which makes sense, given that Abecedarian was a much more intensive intervention. Abecedarian and Perry Preschool generated similar gains during early

childhood, but these comparisons may be misleading because the two programs served very different populations. Specifically, the average IQ of children enrolled in Perry Preschool was lower than that of children in Abecedarian because Perry explicitly selected children to participate who were “borderline educable mentally impaired” (Schweinhart et al. 2005).⁶ We think Abecedarian's impacts may be more generalizable to the larger population of poor children in America.

Second, Abecedarian is the only program for which there is rigorous evidence for long-term effects on cognitive outcomes such as IQ test scores, as shown in the bottom of Table 2. An evaluation of Abecedarian participants at age twenty-one showed IQ scores that were about 0.38 of a standard deviation higher for the treatment group than for the control group, with similarly large improvements in reading and math scores. The magnitude of this IQ effect from Abecedarian was smaller at age twenty-one years than at younger ages, but was still impressively large in an absolute sense. This problem of partial fade-out of program impacts, which has been widely documented for a variety of different early childhood programs, is consistent with the idea that fully exploiting the effects of early interventions on the child's ability to learn requires high-quality follow-up learning environments (in line with our proposal in §3.3).

Finally, it is important to note that all of these early childhood programs, even the large-scale Head

4. The “ns” designation in the table, or “not statistically significant,” is the policy analyst's way of saying that, while a difference was found, it was small enough to be statistically indistinguishable from chance variation.

5. There are at least three complications with making comparisons across these studies. First, the studies do not all measure the same thing: for example, Abecedarian measured IQ scores for three-year-olds, but Head Start does not. The second problem is that there is a wide array of tests for measuring math scores, reading scores, and IQ scores; the tests are all scored on their own separate scales. To address this problem, researchers convert the raw scores into standard deviation units that show how much a test score has changed relative to the size of the average score and the distribution of scores for that test, as a result of an intervention. Using standard deviation allows us to compare results from different tests, even when those tests use different metrics to measure success. The results in Table 2 are expressed in terms of how much of a change, measured in standard deviation units, occurs for the group that received the intervention relative to the control group. Since the goal is to close a gap that is roughly one standard deviation in size, these results can be roughly interpreted as what percentage of the preschool achievement gap each program was successful in closing. Third, each of these programs serves slightly different populations of children, which makes it difficult to distinguish differences in program impacts and differences among program participants in their responses to a given type of program (as seen in the table).

6. While the IQ scores of the Perry Preschool group becomes somewhat more similar to those of other African American children nationwide over time (Schweinhart et al. 2005), their IQ scores remain lower than those of the control group in Abecedarian.

TABLE 2

Alternative Early Childhood Education Programs: Short- and Long-Term Program Impacts

	Abecedarian	Perry Preschool	Chicago Child-Parent Center	Head Start	Early Head Start
Short-term impacts					
Evaluation method	Experimental	Experimental	Non-experimental	Experimental	Experimental
IQ scores, age 3	1.22 sd	0.88 sd			0.12 sd
Reading/verbal, age 3	0.69 sd	0.74 sd		0.35 sd	0.13 sd
Math/quant., age 3	0.71 sd			0.21 sd (ns)	
Aggressive behavior, age 3				-0.10 sd (ns)	-0.11 sd
Behavior problems, age 3				-0.19 sd	
IQ scores, age 4	0.93 sd	0.87 sd			
Reading/verbal, age 4	0.68 sd	0.91 sd		0.33 sd	
Math/quant, age 4	0.57 sd			0.16 sd (ns)	
Aggressive behavior, age 4				-0.04 sd (ns)	
Behavior problems, age 4				-0.01 sd (ns)	
IQ scores, age 5	-0.66 sd				
Reading/verbal, age 5					
Math/quant, age 5					
IQ scores, age 6					
IQ scores, age 6		0.32 sd			
IQ scores, age 12	0.50 sd				
Long-term impacts					
Evaluation method	Experimental	Experimental	Non-experimental	Non-experimental	
Age outcomes measured	21	40	21 (pre-K pop.)	23	
High school graduation	70% vs. 67% (ns)	77% vs. 60%	61% vs. 52%	86% vs. 65% (Whites)	
College entry	36% vs. 14%				
Years of school completed			11.09 vs. 10.74		
Ever arrested		71% vs. 83%	17% vs. 22% (by age 18)		
Arrested 5x or more		36% vs. 55%			
Employment rate	26% vs. 45%	76% vs. 62%			
Teen parent	18% vs. 39%				
Marijuana use		48% vs. 71% (males)			
IQ Scores	0.38 sd				

Note: Abecedarian test score impacts for reading and math achievement reported for age four and five years in our table were actually measured for Abecedarian at forty-two and fifty-four months. For Perry Preschool, the age-three results are actually for “end of first preschool year” and age-four test results for “end of second preschool year,” which should roughly correspond to ages three and four years (Schweinhart et al. 2005). The effects of Head Start participation presented in the table equal the effects of assignment to the Head Start experimental treatment group on children’s outcomes divided by the effects of treatment-group assignment on the probability of participating in Head Start. Results for Head Start’s long-term impacts come from Garces et al. (2002) and show the mean high school completion rate among all Head Start children in their sample versus this mean added to the estimated Head Start effect for Whites (the White mean is not reported separately in the paper). Note that Ludwig and Miller (2007) find complementary evidence suggesting that Head Start’s impacts on schooling attainment is large for African Americans as well as Whites.

ns = not statistically significant (results otherwise statistically significant at conventional 5% cutoff); sd= standard deviation.

Sources: Abecedarian program description and impacts from Ramey and Campbell (1984), Campbell and Ramey (1994), and Campbell et al. (2002). Evidence on CPC from Reynolds et al. (2002) and Reynolds (1998). Results from Head Start from Hart and Schumacher (2005), Zill et al. (2003), Garces et al. (2002), and Puma et al. (2005). Results for Early Head Start from HHS (2005), Irish et al. (2003), Administration for Children and Families (n.d.), and Love et al. (2002). Results for Head Start short-term impacts are estimates from Ludwig and Phillips (2007) for the effects of Head Start participation per se, calculated based on data from the recent randomized Head Start experimental evaluation (HHS 2005).

Start and Early Head Start programs, seem to improve young children's IQ or achievement test scores. Commentators sometimes refer to these Head Start impacts as disappointing, but both the costs and benefits of Head Start during these early years are about the same size as those gained from reducing class sizes in kindergarten through grade three, as was done in the Tennessee Student Teacher Achievement Ratio (STAR) experiment (Krueger 1999, 2003).⁷ The perceived success of STAR has been one motivation for the statewide class-size reduction efforts that took place recently in California and Florida. The short-term impacts found with Head Start and STAR are plausibly large enough for both programs to generate long-term benefits to society that are large enough to justify their costs (Krueger 2003, Schanzenbach forthcoming, Ludwig and Phillips 2007).

Other early education programs have also demonstrated encouraging evidence for long-term effects, such as the randomized experimental evaluation of Perry Preschool, which revealed substantial long-term impacts on educational attainment and criminal behavior. Unfortunately, the experimental studies of Head Start and Early Head Start followed children for only one or two years after program participation, so ironclad evidence for the long-term effects on participants from these two large-scale programs is currently not available. Nevertheless, a growing body of research provides at least suggestive evidence that even Head Start may generate lasting impacts on children that yield benefits to society that are large enough to justify program costs (Currie and Thomas 1995, Currie 2001, Garces et al. 2002, Ludwig and Miller 2007, Ludwig and Phillips 2007). Hence, while Abecedarian's benefits were impressive compared with these other early education programs, it is also true that early education programs have generally demonstrated benefits exceeding their costs.

3.3. Success for All

The original Abecedarian experiment included a follow-on elementary school component that did not seem to do much good for children who participated (Campbell et al. 2002). This means that, in practice, the children who received Abecedarian's intensive, high-quality early childhood services went on to experience a learning environment that was essentially equivalent in quality to whatever the usual elementary school offerings were for low-income African American children in that part of North Carolina. One of the important differences between our own proposal and Abecedarian is that we believe more can be done to improve the learning environments of children in elementary school than the limited intervention that followed the original Abecedarian project.

We strongly believe that early childhood intervention should be followed up with additional support, at least in the early grades of school, but the current evidence available on most schooling interventions is limited. Based on our reading of available research, one of the few programs supported by evidence from a rigorous randomized experiment is Success for All, a comprehensive, whole-school reform model focusing on reading achievement that is already in operation in more than twelve hundred schools.⁸

The philosophy of the Success for All elementary school reading program is to focus on the prevention of reading problems. The primary maker of success is the ability to read. Other subjects are important, but Success for All emphasizes the development and use of language through the reading of children's literature. Consistent with this emphasis, children receive ninety minutes each day of reading instruction in groups that are organized across grade levels, based on each child's current reading level, which helps teachers to target instruction. Students

7. Class sizes were reduced from an average of twenty-two to an average of fifteen per class.

8. Direct Instruction is another program that has received high marks for effectiveness in the American Institutes for Research's review of curricular interventions.

engage in cooperative learning exercises in which they discuss stories or learn from each other, which helps to reinforce what teachers do and builds social skills. Children are assessed at eight-week intervals, using both formal measures of reading competency and teacher observations. Children who are falling behind are given extra tutoring or other help with whatever might be impeding success (such as health or behavior problems).

Over the years, a number of Success for All evaluations have found positive and large effects for the program. However, a degree of uncertainty has surrounded these studies because differences between the schools that did and did not adopt the program could have been responsible for at least part of the difference attributed to the program.

A recent evaluation of Success for All funded by the Department of Education's Institute for Educational Sciences, however, provides much more rigorous evidence of the program's effectiveness (Borman et al. 2005). Because the schools were randomly assigned to Success for All or to the control group, comparing the results of the two groups becomes much more credible and meaningful. Two years later, the differences between children in the treatment and control schools were positive and statistically significant, usually on the order of about 0.2 standard deviations (about one-fifth the gap between low- and high-socioeconomic-status children).⁹

Success for All uses instructional methods and curricular materials that have been found to be effective, consistent with our own larger focus on evidenced-based education. Reading Roots is one example of a

Success for All program whose elements have been proven to be effective in a randomized experimental evaluation. The Reading Roots curriculum for beginning readers includes teacher instructions, books, puppets, and even a mascot, Alpie (apparently an alligator or some other type of lizard or dragon). The program uses regular classroom teachers who receive brief initial training, ongoing coaching, and other forms of support and professional development. Details on the program are available in Borman et al. (2005) or on the Success for All Web site (<http://successforall.com/>).

Our current recommendation for use of Title I money on Success for All in kindergarten through grade four is motivated by the fact that this is one of the only programs we have found that, in a rigorous experimental evaluation, has been demonstrated to be successful. If and when new evidence develops, schools would be eligible to use their Title I money on other proven programs. In fact, our requirement that programs be proven successful to be funded under Success by Ten provides a powerful financial incentive for increased experimental evaluation of new curricula and reform models.

Clues about what program ingredients might prove to be most important over time come from some of the striking similarities between Abece-darian and Success for All. These similarities include an emphasis on the development of language and reading skills; frequent assessments of children's developmental progress through regular testing; and clear, prescriptive curricular materials for teachers to follow (in contrast with more open-ended teacher- and student-initiated learning environments).

9. Arguments over pedagogy are never fully resolved, and critics have raised some concerns and issues about the Success for All study. First, while the control schools did not implement Success for All in grades K–two, they were asked to implement Success for All in grades three through five, so there could have been some spillover to earlier grades. However, any spillover would tend to make the control schools look better, so the beneficial impact of Success for All would only be understated. Second, because children move between schools, only about two-thirds of the children who started the Success for All program in kindergarten could be tested two years later. However, there does not appear to be any evidence that the students who left the study started off any better or worse on average than the students who stayed in the study, so this may not be a major concern. Finally, the leader of the Borman et al. (2005) team that carried out the study was also the main developer of the Success for All curriculum. Although the study was done using a rigorous randomized experimental design under the guidance of a technical review panel of independent experts, so the possibilities for bias in the results was minimal, there would clearly be additional value in having Success for All subject to an experimental evaluation with a principal investigator who was completely unaffiliated with the program.

3.4. Program Implementation and Governance

The preschool piece of our proposal could in some sense be thought of as “Head Start on steroids.” It involves combining, expanding, and transforming the current early education infrastructure, including Early Head Start and Head Start, into a program that is much more intensive, on the scale of the Abecedarian program. The second part of our proposal calls for adding an elementary school component that emphasizes the effective use of existing Title I funding streams. While the evidence in favor of such an approach is quite strong, it comes from a set of experiments that are relatively small in number and scale. Therefore, we recommend that this transformation be phased in over ten years in a way that fosters rigorous evaluation of the program’s impacts and allows experimentation with alternative interventions that might prove to be even more cost effective than the specific proposal outlined here.

Our proposal would work as follows: a high-poverty school (defined as a school in which at least 40 percent of the children are eligible for the school lunch program) would form a partnership with a local Head Start program or another early childhood program. This partnership would apply to the federal government for the extra funds that would be needed to serve all of the poor children in the local area. Eligibility for the preschool component would be based on family income.

Funding would be jointly administered by the Department of Education and the Department of Health and Human Services. As with the current Head Start system, the federal government would provide funding directly to the local providers, instead of using state governments as intermediaries, which is the practice with some current educational and social programs. Competitive grants would be

made based on the quality of the local plan; this quality would be evaluated based on, *inter alia*, a willingness to implement the key elements of Success by Ten, assurances that the two agencies (typically Head Start and the local school) could work together, a commitment by the school system to maintain electronic student-level data on children in their enrollment areas that would be made available to program evaluators, and a willingness to allow the program’s impacts and implementation to be independently evaluated.

The key to our implementation strategy is to use lotteries to decide which of the communities submitting acceptable proposals would receive Success by Ten funding during the early years of the phase-in. We expect that more communities would submit acceptable proposals than could be initially funded.¹⁰ Using lotteries to determine which of these communities would receive funding not only would be fair, but also would support real-time program evaluation that would be as rigorous as a controlled, randomized experiment. Our proposal thus departs dramatically from the conventional practice of paying lip service to the importance of evaluation but then implementing programs in ways that all but rule out the chance for truly rigorous study.

The lottery would assign acceptable proposals to one of three possibilities: (1) Success by Ten, (2) an experimental version of Success by Ten, or (3) no services. The experimental versions of Success by Ten would vary specific programmatic elements to try to identify program models that might be more cost effective than the very intensive default version of our early childhood program. Particularly important is to learn more about the role played by the duration of the intervention. As noted in §3.2, previous studies suggest that even early childhood interventions that begin at age three or four years can achieve long-term benefits for participants’ schooling attainment, earnings, and other outcomes, even

10. If fewer acceptable proposals are received than could be funded given initial budget levels for the program, then the federal government could prime the pump by conducting another round of proposal solicitations to include technical assistance to proposal writers, including those communities submitting inadequate proposals during the first round. This procedure could be repeated until there is an excess supply of adequate proposals, given available funding.

if the program models that have been tried to date have not been able to achieve lasting impacts on IQ scores. So there remains an important question about how the cost effectiveness of the intervention we propose would change if we started at age three years rather than at birth, which would at the very least substantially reduce the overall cost of the program. In addition, the experimental versions of Success by Ten could include controlled alterations in pupil-staff ratios, teacher qualifications and salaries, the nature of the curriculum, the nature of nonacademic services, and eligibility rules.¹¹ Such controlled variations also might identify ways in which the program could be tailored to the particular needs of local communities—for example, low-income children in rural parts of West Virginia might benefit from slightly different types of early childhood learning activities than would immigrant children in New York City.

Children living in communities that receive funding for some version of Success by Ten would be compared with children in surrounding communities that had applied for Success by Ten resources but were not selected in the lottery. Ideally, we would like to follow up with children over time to understand “fade out” and the general persistence of program impacts. Given that some children will move across communities over time, this evaluation strategy would classify children into “treatment” and “control” groups based on their community of residence at the time of the initial proposal lottery, regardless of whether or where children moved subsequently; this is known in the program evaluation literature as the “intent to treat” effect.

We propose phasing in Success by Ten over ten years. An initial six-year phase would be designed to allow one cohort of children to complete the en-

tire five-year early education program and give researchers an additional year to rigorously study and evaluate the results from that cohort. The program would be scaled up to full implementation over the following four years.

3.5. Estimates of Costs and Benefits

What would our proposal cost, and what would be the benefits? Federal spending would be approximately \$6 billion higher than it is now during each of the first six years, enough to serve about five hundred thousand children, which is almost the same as Head Start began with in 1965 (and more than half of what Head Start serves today). If all eligible children participated when the program was fully implemented, federal spending would be approximately \$56 billion higher than it is under current law. Ultimately, the take-up rates would almost certainly fall somewhere below full participation. There is unavoidable uncertainty as to what that lower rate would be, but based on the experiences of other pre-K programs, it seems reasonable to make the rough guess that no more than 75 percent of eligible children would participate in the program. In that case, federal outlays would be no more than \$40 billion higher than under current law, after taking into account the reallocation of current federal funds (as discussed below). The estimated benefits to American society from these outlays would be on the order of about two times that amount.

For our cost calculations, our starting point is to assume that the costs per child would be about the same as the costs and benefits per child for Abecedarian and the Success for All programs. We then calculate the costs of implementing this program nationwide for children in families below the poverty line in the United States.

11. On eligibility rules, for example, one could allow all children living in the area of a high-poverty school to participate in Success by Ten. Such an approach would be simpler to administer, less stigmatizing for families, and not require that families whose incomes change from one year to the next be dropped or added to the program. It would assume that if a family lives in a low-income neighborhood, the family's children are at risk. A possible downside of this approach, however, is that it would be more expensive and less effective than a more highly targeted program. An alternative, therefore, would be to limit eligibility of schools to those that have particularly high proportions of children from low-income families and limit eligibility for the preschool component not only to those children who live in the neighborhood of a high-poverty school, but also to those in families with below-poverty-line incomes.

To maximize the chances that a large-scale intensive preschool program achieves large, long-term effects on participants, the preschool part of our proposal should be as intensive as the Abecedarian model program, including five full years of eligibility from birth through the start of kindergarten, full-day full-year services, teacher salaries that are competitive with regular public schools, and low pupil-staff ratios. Ideally, we would like to know exactly which of these program features are crucial for achieving important gains for children and preserve those features while cutting program costs wherever possible. Right now, though, the independent contribution of each feature in existing early childhood programs is not well understood. Under our proposal, local providers assigned by lottery to the main Success by Ten phase-in group would implement a program that includes all of the big-ticket items associated with the Abecedarian model program, while those communities assigned to the experimental group could scale back along important dimensions—in particular, duration of program participation—to help identify ways of reducing program costs without compromising the program’s effectiveness (as mentioned in §3.4).

We assume a cost of \$16,600 per year, about what has been estimated for the preschool component of Abecedarian (see footnote 3). The actual cost per pupil for the preschool part of our proposal could be somewhat lower than with small-scale Abecedarian if there are economies of scale in service provision. The costs could be somewhat higher if salaries need be increased to secure enough talented teachers for the program.

There are approximately 4.1 million children under age five living in households that are below the poverty line (U.S. Census Bureau 2006). Multiplying the per child cost by the number of children, the

gross cost of the program’s preschool part each year would be \$68 billion if all eligible children were to participate in the program. Actual participation rates would likely be lower, and would probably be no more than around 75 percent, which would yield gross early education program costs of about \$51 billion per year.

However, not all of this spending would need to be new money. Table 3 shows that the federal government currently spends around \$16 billion per year for Head Start and other childcare or preschool programs that are targeted mainly at poor children. Our proposal would obviate the need for, or build on, some of these programs. If we assume that we could redirect, say, three-quarters of the \$16 billion to our proposal, then the estimated net new cost of the preschool share of our program would be about \$39 billion per year. We would add another \$1 billion for research, technical assistance, and teacher training, for a total of about \$40 billion.

The elementary school follow-up piece to Success by Ten would require schools to dedicate Title I money to “proven effective” programs, which, based on evidence available to date, would default to the Success for All program described above.¹² Title I is a funding program rather than a defined intervention, so school districts have wide latitude in determining how Title I funds are spread across schools or classrooms and in choosing the programs or services paid for with federal funds. Current law requires that Title I funds be used for activities that are backed up by scientifically based research, although what this means in practice remains ambiguous (Jacob and Ludwig 2005). Moreover, school districts can currently pick and choose components of several tested programs without evidence that their specific recipe will lead to better outcomes. A key aspect of our proposal is that

12. Existing elementary schools would be able to implement the Success for All component of our proposal with potentially no additional funding and with few administrative changes. While in many of the early Success for All demonstration programs schools were required to have a majority of teachers vote to adopt the program, Success for All has now been implemented districtwide in some areas without requiring a majority vote. In these cases, districts ensure that teachers “buy in” after the fact (Robert Slavin, personal communication, August 22, 2005).

TABLE 3

Summary of Existing Federal Early Childhood Education and Child-Care Expenditures

Program	Green Book FY2003 (in billions \$)	White House FY2002 (in billions \$)
CCDBG	\$3.9	\$4.8
TANF	\$2.1	\$4.0
Title XX	\$0.2	\$0.165
Head Start	\$6.7	\$6.5
Title I	\$0.2	
Early Reading First	\$0.075	
Even Start	\$0.25	
Special education grants for preschool and infants	\$0.551	
Total	\$15.7 billion	\$16.5 billion

Note: Figures for Title XX of the Social Services Block Grant reflect spending on child-care services. TANF child-care estimate for fiscal 2002 is an estimate that captures all federal and state spending, while figure for 2003 reflects federal funds transferred in 2002.

CCDBG = Child Care and Development Block Grant; TANF = Temporary Assistance for Needy Families

Sources: U.S. Congress (2004), Table 9–15, and White House (n.d.).

we would require elementary schools to faithfully implement interventions that have been rigorously tested in random-assignment studies.

Assuming that Success for All is the only rigorously evaluated program identified at the time our proposal goes into effect, how much of this program could schools implement with existing Title I funding? Success for All costs about \$930 per student per year, after averaging higher start-up costs with lower ongoing costs of the program (Borman and Hewes 2003).¹³ About two-thirds of this cost is associated with the tutoring component of Success for All. Currently, spending under Title I is around \$880 per eligible student. If we make the simplifying assumption that nonpoor students would not need tutoring, then schools in which at least 75 percent of students are eligible for Title I could implement Success for All “as is” schoolwide without many additional resources. The No Child Left Behind Act allows schools that have at least 40 percent of Title I-eligible students to implement schoolwide programs that use Title I funds to benefit all children at the school. Other schools would have the

option of either implementing less-intensive versions of Success for All (for example, by reducing the number of hours of tutoring for children) or redirecting Title I funding from grades five and up, to grades K through four. Currently, 64 percent of Title I funds go to students in grades one through six, while another 12 percent is dedicated to K or pre-K children, so our proposal would not require a major reallocation of existing funds.

The cost to society from redirecting Title I resources in the way that we propose here depends in part on what is being accomplished now with Title I funds. Unfortunately, there is very little evidence that Title I dollars have done much to improve children’s educational outcomes. The most recent large-scale study of Title I, known as Prospects, followed children in grades one, three, and seven for up to three academic years. It finds that those who received Title I services did no better academically than those who did not (Puma et al. 1997). Other studies, such as Kesters and Mast (2003) come to a similar conclusion. One partial explanation for these discouraging results could be that school dis-

13. Borman and Hewes (2003) estimate the annual per pupil expenditure to be \$795 in 2000 dollars. We converted this value to estimated 2007 dollars.

tricts may offset extra Title I money, to some degree, by reducing local spending on schools (Gordon 2004).

In sum, after taking into account program up-take, offsetting reductions in expenditures for related programs, and a reallocation of Title I funding, we estimate that the additional costs for our proposal would be no more than about \$40 billion annually.

What would be the benefits of our proposed preschool and elementary school intervention? A starting point for thinking about the answer to this question is the benefit-cost analysis of the Abecedarian model program by Leonard Masse and Steven Barnett (2007). The costs of early childhood intervention are incurred relatively soon, while many of the benefits are received much later. In comparing costs and benefits, this difference in timing matters. Policy analysts use the tool of “present discounted value” to adjust for the timing of costs and benefits. The present discounted value of costs is the total amount that would need to be set aside right now, in the present, so that it would be enough with accumulated interest earned over time to cover all current and future costs. Similarly, the present discounted value of benefits is the total amount that would need to be received right now, in the present, so that it would be equal with accumulated interest earned over time to the sum of all future benefits.

Using an annual interest rate of 3 percent to discount future costs and benefits, the present value of the gross costs of these preschool services is about \$78,000. With the offsetting cost savings in other programs, our best guess is that the net cost to the federal government for each child of our expanded preschool intervention would be about \$60,000 in present value terms.

Masse and Barnett (2007, Table 2) estimate that the present value of the benefits from Abecedarian are

on the order of \$147,000 per child. Listing all these benefits in terms of their present discounted value, they include approximately \$9,940 in savings to the K–12 schooling system from reductions in special education placements, \$20,000 from improvements in health, \$42,200 in increased earnings for participants, \$6,400 from increased earnings of their children, \$77,300 from increased maternal earnings, and \$220 in social program (welfare) savings. These benefits are partially offset by costs of \$9,100 resulting from the program’s positive effect on college enrollment rates (all estimated 2007 dollars).¹⁴

While these estimates come from a rigorous randomized experimental study of Abecedarian, there nevertheless remains some room for uncertainty about the program’s actual benefits. For example, the Abecedarian program followed program participants only through age twenty-one. Thus, some of the program impacts must be projected from the fact that the intervention increases schooling attainment and IQ, which in turn are correlated with other important outcomes, such as future earnings.

But the Masse and Barnett (2007) calculations may understate the benefits in one important way: that is, the benefit calculations for Abecedarian do not include any estimate of savings from a reduction in criminal activity. As noted earlier (§3.1), those who received the Abecedarian intervention had a crime rate that was about one-third lower than the rate for those in the control group, a proportionately large difference. However, the number of criminal participants in both groups was small enough that it is impossible to state with a high degree of confidence whether this decline was a result of the Abecedarian program or simply a statistical fluke (Campbell et al. 2002).

Our own hunch is that Abecedarian would be found to reduce criminal involvement of participants if there were a larger group to study. After

14. All values from Masse and Barnett (2007) discounted and deflated values in 2002 dollars, converted to estimated 2007 dollars. All of these benefits are calculated with a 3 percent discount rate. Masse and Barnett’s cost-benefit analysis, however, shows that benefits exceed costs even above a 7 percent discount rate when taking into account avoided childcare costs.

all, Abecedarian had proportionately large and statistically significant effects on IQ scores, college enrollment, teen parenthood, and drug use. Given that all of these characteristics are highly correlated with the likelihood that people become involved with crime, it would be surprising if Abecedarian had *not* affected criminal behavior. Also, the Perry Preschool project, where a relatively larger share of both the experimental and especially control groups had been arrested at least once by age forty, found that those who had received early childhood intervention had a lower crime rate; the difference was large enough to say with confidence that it was due to the Perry intervention (Schweinhart et al. 2005). If the Abecedarian program did, in fact, reduce criminal activity by about one-third, then the benefits to society might be on the order of an additional \$20,000 to \$40,000 per person.¹⁵ Thus, adding the potential benefit of reduced crime to the other benefits would make the expected benefits of Abecedarian more than two times the costs.

What about the benefits of implementing the Success for All program? Studies suggest that this program might increase achievement test scores by around one-fifth of a standard deviation (Borman et al. 2005). If these gains persisted over time, the benefits would be quite substantial—for example the increase in lifetime earnings alone might be worth between \$5,000 and \$45,000 per child (Krueger 2003). However, we have no way of knowing how the benefits from an intensive early childhood program and Success for All would interact. Rather than giving a best-case scenario, we conservatively assume that the main effect of Success for All would be to reduce the chances of “fade out” from the intensive preschool component we propose and to increase the odds that our large-scale early childhood intervention would achieve large gains in the

direction of (if not exactly equal to) gains from the Abecedarian model program.

Another way to measure the possible benefits of our Success by Ten proposal is in terms of its impact on productivity and economic growth in the United States. Technology has increased the demand for skilled labor in recent decades, as evidenced by a sharp increase in the earnings of more-educated workers relative to their less-educated counterparts. In a knowledge-based economy, the productivity of the workforce depends not just on the amount invested in plants and equipment, but also on the skills and education that workers bring to their jobs. If Success by Ten is as successful as we hope, then eventually educational attainment will rise in the United States, which will translate into more growth and a higher standard of living.

Although many people have made these arguments at a general level, we have taken a well-specified model of economic growth and asked what the effects would be if our proposal could achieve impacts such as those of the Abecedarian model program. Suppose our intervention was successful in increasing educational attainment by 0.6 years by age twenty-one among participating children relative to those who did not participate. Assuming that about 15 percent of all children participated (equal to about 75 percent of all children below the poverty line), educational attainment would increase by 0.09 years for the population as a whole (0.15 times 0.6). Under analysis with a preferred set of assumptions, we project that a 0.09 year increase in average educational attainment would boost the rate of growth and produce about a 0.8 percent higher real GDP by 2080, which translates to an extra \$493 billion.¹⁶

15. A rough estimate of the average social costs of crime might be \$60,000 per person in poor neighborhoods, an estimate that is based on the lifetime arrests of poor urban youth aged fifteen to twenty-five from highly disadvantaged neighborhoods in Baltimore, Boston, Chicago, Los Angeles, and New York (Kling et al. 2005). The costs might be twice as high when we account for the fact that not all crimes result in arrest. If the per person costs of criminal activity among disadvantaged populations is \$60,000 to \$120,000, then the value of a one-third reduction in these costs is \$20,000 to \$40,000.

16. These estimates are based on a simulation using a set of growth models developed at Brookings by William Dickens, Isabel Sawhill, and Jeffrey Tebbbs. These models differ in the extent to which they assume that technological change is embedded in physical or human capital

All these estimates clearly have an element of uncertainty. However, we think the chances are extremely good that the benefits to society from our proposal would outweigh the costs. If our proposal achieved the same benefits as the small-scale Abecedarian program, we would expect the present value of benefits to outweigh the costs by more than two times. But even if we assume that the benefits would be somewhat attenuated by the scaling-up process (see §4.1), they would still likely outweigh costs by about two times. The large-scale version of the intensive program that we are proposing here would need to be *substantially* less effective than earlier model programs before it would fail a benefit-cost test.

3.6. An Evolving Proposal

As more early childhood and elementary school interventions are identified as successful through ongoing research, the specifics of this intervention package could, in principle, change over time or

vary from district to district. But based on current evidence, this intervention portfolio, which uses an intensive early childhood program design that incorporates features from the Abecedarian program from birth to age five and the Success for All model for kindergarten through grade four, seems to us to be the one that has the strongest supporting evidence.

Before expanding the menu of programmatic interventions that could receive preschool or elementary school funding under Success by Ten, there should be convincing evidence that shows that program benefits are larger than the intervention's costs. Because this criterion will inevitably involve some judgment about how strong the evidence is in support of any candidate intervention, Congress should fund the National Academy of Sciences to partner with the Department of Education's Institute for Educational Sciences to determine the efficacy of different interventions that would be eligible for funding under our proposal.

and thus in the extent to which the growth process is endogenous (self-perpetuating). This particular estimate assumes no attenuation of educational benefits from scaling up the program. If scaling up the program reduces its benefits by 15 percent (see §4.1), then the effects on GDP should be scaled back proportionately. For details, see Dickens et al. (2006a, 2006b).

4. Questions and Concerns

Large policy interventions such as the one we propose inescapably involve a number of risks and difficult choices. Perhaps the most important risk associated with Success by Ten is that “going to scale” with our proposal may generate watered-down impacts, compared with the model programs on which our results are based (§4.1). Other potential criticisms of our proposal include concerns about reducing the autonomy of local schools in deciding how to spend Title I funds (§4.2); the argument that the pre-K part of our proposal is not adequately ambitious and should cover all children and not just poor children (§4.3); the opposite argument that our proposal is too ambitious and should instead simply call for expanding Head Start to cover all eligible three- and four-year-olds (§4.4); the question of whether states should be given more responsibility and control (§4.5); and concerns over how Success by Ten would be funded (§4.6). We take up each of these issues in turn.

4.1. Will the Benefits Persist in a Large-Scale Program?

Possibly the most important concern with our proposal is that we are arguing for an investment of up to an estimated \$40 billion per year in additional federal spending on preschool without direct evidence that a similarly intensive large-scale program would achieve the impacts that we hope for. How can we be sure that we could achieve improvements in children’s lives that are as impressive as those found with smaller-scale early childhood model programs? (There is less concern with the

Success for All component to our proposal, since it has already been widely adopted.)

The answer is that we cannot be sure. In fact, we are pretty sure that we cannot achieve gains of the sort found with the Abecedarian model program on a massive national scale. The model Abecedarian program that was implemented in Chapel Hill almost surely drew from a pool of teachers who were more committed and perhaps more talented than the average teacher, and the fidelity with which the program was implemented will surely be much better in a small-scale model than in a national program.¹⁷

How can we justify our proposal in the face of this uncertainty? We have five responses:

(1) Our proposal for increased investment in early childhood education for disadvantaged children does not rest solely on the encouraging results from the Abecedarian model program. As summarized in Table 2 (and discussed in §3.2), randomized experimental evaluations have been conducted for many early childhood programs. We now have ample evidence that, in principle, early childhood intervention can improve the life chances of disadvantaged children.

(2) We have examples of other preschool programs that have been successfully taken to scale. The early days of Head Start in 1964 and 1965 were filled with debates about whether to focus on implementing small experimental programs that could be evaluated and refined or instead

17. One reason the intervention could have more modest effects than the original program when implemented on a large scale has to do with the program population itself. The value added of an Abecedarian-style intervention comes from the difference in the developmental environment for the child between the program and the child’s alternative care arrangements. Abecedarian’s program population was quite disadvantaged—on average, mothers were about twenty years old with around a grade ten education (Ramey and Campbell 1984). While eligibility under our proposal is limited to families below the poverty line, the population of children served under our proposal may, on average, have developmentally “better” family environments than those in Abecedarian, if only because of the widespread increase over time in parental schooling levels.

follow what was ultimately President Johnson's wish to immediately implement a large nationwide program (Gillette 1996, Greenberg 2004). How much of a problem was scaling up Head Start? It is difficult to answer definitively, but here is our rough-and-ready guess: Table 1 shows that per child spending for Head Start is about 40 percent of that for Perry Preschool, a model program that started just a few years before Head Start. If we are willing to assume that effects on children are proportional to spending, then we would expect the impacts of Head Start to be about 40 percent of the impacts of Perry Preschool, if nothing were lost during the scale-up process. The recent randomized experimental study of Head Start (summarized in Table 2) suggests that the program has impacts at age four that are about one-third as large as those of Perry.¹⁸ This simple exercise suggests that scale-up might reduce the effectiveness of the program by around 15 percent.¹⁹

The important point is that while Head Start may have lost some effectiveness as part of the program's large scale compared with Perry as a model, Head Start is nonetheless an effective program. As mentioned earlier, if the achievement impacts summarized in Table 2 persisted, they would be large enough to justify Head Start's costs (Krueger 2003, Ludwig and Phillips 2007). Although experimental data are not available on the long-term effects of Head Start on participants, fairly rigorous nonexperimental studies yield encouraging evidence for Head Start's long-term effects on schooling, health, crime, and other outcomes, which together would be enough for the program to pass a benefit-cost test (Currie and Thomas 1995, Garces et al. 2002, Ludwig and Miller 2007). Other examples of successful scaling-up in this area come from the variety of state pre-K programs that have been implemented and evaluated across the country (Gormley

and Gayer 2005, Gormley et al. 2005, Barnett et al. 2005).

(3) The phase-in design of our proposal would generate rigorous evaluation evidence for at least short-term impacts and highlight whether and how the scaled-up preschool piece was working. Planned deviations in some localities from the proposed model might uncover ways to make the program more effective, less expensive, or both. At the same time, our rigorous phase-in evaluation would provide a circuit breaker to help slow things down and refine implementation if early evidence for the program's impact was found to be disappointing.

(4) Our strongest hedge against the risk that a scaled-up version of an intensive early childhood program will produce smaller benefits than previous model programs is our proposal to strengthen the elementary school follow-up component compared to previous model early childhood interventions. As noted in §3.3, the elementary school follow-up piece adopted as part of the original Abecedarian model program in Chapel Hill did not seem to have much of an independent effect on children (Campbell et al. 2002). Our proposal instead follows an Abecedarianesque preschool component with a proven elementary school intervention (Success for All) that yields impressive program impacts in its own right.

(5) Finally, we do not *need* Success by Ten to be as effective as model programs such as Abecedarian in order for our proposal to substantially change future economic growth and to improve the life chances of disadvantaged children. In fact, Success by Ten would pass a benefit-cost test even if the combined preschool and elementary school components that we propose were even one-half as effective as the small-scale Abecedarian preschool

18. The benefits of Head Start recorded in Table 2 reflect results achieved after children had been in the program for only one year; the benefits of Perry Preschool reflect results achieved after children had been in that program for two years. Accordingly, Table 1 compares the cost of providing one year of Head Start and two years of Perry Preschool.

19. One complication with this simple calculation is that the experimental estimates for the effects of Head Start apply to recent cohorts of children, which might be different from the effects Head Start had during the early years on earlier cohorts of participating children, who, on average, came from even more disadvantaged family backgrounds than recent participants.

program alone. Thus, we think the chances are good that our proposal would pass a benefit-cost test despite the inevitable problems associated with bringing programs to scale.

4.2. Is it Desirable and Feasible to Reallocate Title I Dollars?

Title I is essentially a block grant that provides enormous flexibility to local school districts. As one education researcher put it:

Although the Title I program was a massive funding program, it did not represent a unified or coherent treatment program. . . . There did not seem to be any one, or even small, set of programs that could be classified Title I [and] any attempt to evaluate the effectiveness of the Title I program is faced with the problem that Title I was better defined as a funding program than as an educational treatment. (Carter 1984, p. 11)

Local districts like this kind of flexibility, and predictably will resist any effort to dictate to them how to spend these funds. But as noted in §3.5, the overwhelming evidence is that these funds have not been used in ways that improve student performance. That said, schools face major challenges in implementing the provisions of the No Child Left Behind Act, and it may be necessary to provide them with some additional funding to make the elementary school component of our proposal feasible. It may also be necessary to give them some flexibility in the design of the program, subject to continued evaluation and assessment of the results.

4.3. Why Not Universal Pre-K?

Why not finance a universal rather than targeted early childhood program? After all, more than forty states are adopting pre-K programs, and the momentum for extending the public education system down the age scale is currently quite strong.

Our proposal targets disadvantaged children in part to maximize the benefits per federal dollar. Most studies of early childhood interventions, including those of Head Start (Love et al. 2002), the Tennessee STAR class-size experiment (Krueger 1999), and Abecedarian itself (Campbell et al. 2002) find larger impacts for disadvantaged or minority children than for nonpoor or White children. One exception seems to be evaluation of Oklahoma's pre-K program in Tulsa (Gormley et al. 2005).

In any case, states would be free to use their own funds to expand the scope of our proposal to include children in families above the poverty line. This possibility would lead to even greater benefits for poor children if peer effects in learning are important. Expanding the program to include nonpoor students might also provide some more-limited benefits for these children and help build a larger political constituency for the program. Even though benefit-cost ratios seem to decline for many early childhood programs as they include more nonpoor children, programs such as the Tennessee STAR class-size reduction seem likely to pass a benefit-cost test even though they do not focus exclusively on serving poor children (Krueger 2003). The Tulsa pre-K program costs less per child than STAR and may produce even larger achievement-test score gains (Gormley and Gayer 2005), so if these gains persisted over time (and it is not known whether this is true), the program would pass a benefit-cost test as well.

4.4. Why Not Expand Head Start?

A number of people argue that Head Start is a strong program with a network of centers around the country providing a base on which to build. They assert that all that is needed is to provide the system with additional resources so that all eligible children aged three or four years can be served for at least one year. While there is a growing body of evidence to suggest that Head Start may have important long-term benefits, whether these long-term impacts generalize to current cohorts of poor children is subject to some uncertainty, as is our

ability to scale up more intensive programs to a national level.²⁰ Given the scale of the problem we are trying to address, our default position is to suggest a more- rather than less-intensive intervention, and then use controlled variation during the implementation stage to determine whether modified versions of the program are capable of generating similarly large benefits at lower cost.

In our view, there is also a general argument to be made in favor of prevention over remediation; as noted in §1, family background generates large differences in outcomes across children even before they are old enough to enroll in Head Start. While Early Head Start was launched for this reason, Abecedarian seems to be a more cost effective intervention for the first few years of life; the evidence from Tables 1 and 2 suggests that Early Head Start costs around one-quarter of what Abecedarian costs per child but yields a short-term impact on children's test scores (measured at age three years) that is only about one-tenth as large.

Finally, we note that Early Head Start and Head Start providers would be eligible for funding under Success by Ten and, in fact, would be eligible for much more federal funding than they currently receive. In that sense, Success by Ten can be thought of as a major expansion and intensification of Head Start.

4.5. Should States Be Given More Responsibility and Control?

Education is primarily a state responsibility in the United States, with the federal government providing no more than 7 percent of the total funding

for elementary and secondary schooling. Moreover, states are especially active right now in their attempts to add a pre-K component to the existing system. However, states have different fiscal capacities, and these, together with the exigencies of local politics, can produce unequal chances for poor children. Moreover, with an increasingly mobile population, a poor child who grows up in Mississippi may end up living as an adult in Illinois, whose residents then bear the costs if that child has not been given a good education earlier in life. For these reasons, we believe that there is a federal role in funding a program such as Success by Ten. Nonetheless, efforts should be made to persuade states of the benefits of the program and to encourage them to supplement the program with their own resources. Indeed, one way to reduce the costs of the program to the federal government is to require states to match federal funding on a dollar-for-dollar basis, for example.

4.6. How Should Success by Ten be Funded?

Full implementation of Success by Ten would represent a significant claim on federal budget resources and would complicate efforts to reduce the deficit and restore much-needed fiscal discipline. The fiscal challenge is substantial: several independent projections suggest that the deficit over the next ten years will reach about \$3.5 trillion, or approximately 2 percent of GDP. Thereafter, as the Baby Boomers increasingly reach retirement age and claim Social Security and Medicare benefits, government deficits and debt are likely to grow even more sharply.

20. Currie and Thomas (1995) and Garces et al. (2002) compare outcomes for siblings who have participated versus those who have not participated in Head Start, and they find long-term effects on achievement test scores and educational attainment for Whites but not for African Americans, and effects on later criminal behavior for African Americans but not for Whites. However, there necessarily remains some question about what causes some siblings and not others to participate in Head Start, and whether this unknown factor might also be relevant for child outcomes in its own right. Ludwig and Miller (2007) use a discontinuity in Head Start funding across counties to identify program impacts and find that a 50 to 100 percent increase in program funding per four-year-old county resident increases average educational attainment by around six months. However this estimate is for the program impact on very poor children living in the most disadvantaged counties of the South in the 1960s and 1970s. The average preschool environment for current Head Start children nationwide is surely better than among the sample studied by Ludwig and Miller (2007), so their study probably overstates the long-term effects from the existing Head Start program.

While the challenge is great, many feasible options already have been put forward for tackling the nation's long-term fiscal deficit. The principal problem now is one of political choice and will; what is most needed is a bipartisan political process for deciding among the options. We recommend that funding for Success by Ten be part of a broader deficit-re-

duction package that allows increased public investment in select growth-enhancing programs while reducing the overall deficit through both revenue increases and spending reductions, as proposed in several recent publications (e.g., Rivlin and Sawhill 2004, Frenzel et al. 2007).

5. Conclusion

Ideally, we would prefer no uncertainty about what our proposal will accomplish. But of course, this is not how real life works, either for private individuals or for government policy makers. People make decisions in the face of uncertainty all the time: which job to take, how to invest, whom to marry. Government policy makers similarly are forced to make policy decisions before the available science is perfect.

It is also important to note that there is unlikely to be much new information in the foreseeable future that could substantially reduce the uncertainty associated with launching a large-scale intensive early childhood program. Even if a government agency or private foundation launched a randomized evaluation of a large-scale version of an intensive early childhood model program, we would not know about the scaled-up intervention's effects on people at, say, age forty, for another . . . forty years. At that point there would still be uncertainty about whether a yet larger version of the program would produce the same average treatment effects, which would require another forty years to evaluate.

The real question is whether the uncertainty associated with this policy change is tolerable in light of the alternative of doing nothing. The growing body of research from neuroscience, developmental psychology, and even animal studies about the developmental importance of the early years of life; the existing evidence supporting model programs such as Abecedarian and Perry Preschool; and the fact that a number of these interventions—Head Start, a number of state universal pre-K programs, and Success for All, among others—operate with apparent beneficial impacts on a large scale suggest to us the value of proceeding. We propose moving forward with some built-in features that facilitate evaluation, such as phased-in implementation over a random selection of localities to generate reliable estimates of at least short-term effects. Preserving the status quo has its own consequences. Specifically, a course of inaction runs the risk that our society forgoes the chance to help all our children realize their full potential and to improve the skills (and consequent competitiveness) of America's future workforce. Based on the available evidence, we think that present knowledge strongly favors our proposal of stepped-up investments in early education from birth to age ten.

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