Investing Early

Taking Stock of Outcomes and Economic Returns from Early Childhood Programs

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Preface

The past two decades have been characterized by a growing body of research from diverse disciplines—child development, psychology, neuroscience, and economics, among others—demonstrating the importance of establishing a strong foundation in the early years of life. The research evidence has served to document the range of early childhood services that can successfully put children and families on the path toward lifelong health and well-being, especially those at greatest risk of poor outcomes. Our RAND report, published in 2005 and titled *Early Childhood Interventions: Proven Results, Future Promise* (Karoly, Kilburn, and Cannon, 2005), provides a comprehensive assessment of the evidence available at that time regarding proven programs in terms of the evidence of impact and economic returns.

The aim of this report is to update our earlier analysis based on the research that has accumulated in the intervening years. Since our earlier study, we expanded the scope of intervention models examined to encompass those more directly focused on health, those implemented in community-based settings, and those adopting a two-generation approach. Through a comprehensive literature review, we provide a synthesis of the available evidence from rigorous evaluation research to address the following questions:

- What program approaches to providing services for families and children from the prenatal period to school entry have been rigorously evaluated?
- What outcomes did these programs improve in the short or long term?

- What are the costs and benefits of effective programs and returns to government or society?

Answers to these questions will provide decisionmakers in the public and private sectors with the information to help them make cost-effective investments in early childhood programs based on the most-current, rigorous research evidence.

The study was funded through a grant from the Robert Wood Johnson Foundation. The report should be of interest to policymakers at all levels of government, as well stakeholders in the private sector, focused on the effectiveness of and economic returns from early childhood interventions.

This research was undertaken within RAND Labor and Population. RAND Labor and Population has built an international reputation for conducting objective, high-quality, empirical research to support and improve policies and organizations around the world. Its work focuses on children and families, demographic behavior, education and training, labor markets, social welfare policy, immigration, international development, financial decisionmaking, and issues related to aging and retirement with a common aim of understanding how policy and social and economic forces affect individual decisionmaking and human well-being.

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Summary

Prominent developmental theories from psychology, neuroscience, economics, and other disciplines have continued to affirm the importance of the early years for promoting lifelong health and well-being. Motivated by these theories, targeted and universal interventions, starting as early as the prenatal period, have evolved to address the various stressors and other risk factors in the first few years of life that can compromise healthy development. As these early childhood interventions have proliferated, researchers have evaluated whether the programs improve children's outcomes and, when they do, whether the improved outcomes generate benefits that can outweigh the program costs. This report examines a set of evaluations that meet criteria for scientific rigor and aggregates the results to better understand the outcomes, costs, and benefits of early childhood programs. We focus on evaluations of early childhood programs serving children or parents of children from the prenatal period to age 5. Although preschool is perhaps the best-known early childhood intervention, our study also evaluated such programs as home visiting; parent education; health-related visits; and government transfer programs, such as food and housing subsidies.

Overall, we found that most early childhood programs improve one or more outcomes for children and that, where formal benefit–cost analyses (BCAs) have been performed, most programs largely pay for themselves through benefits to participants, government, and other

members of society. More specifically, our study sought to answer three questions:

- What program approaches to providing services for families and children from the prenatal period to school entry have been rigorously evaluated?
- What outcomes did these programs improve in the short or long term?
- What are the costs and benefits of effective programs and returns to government or society?

In doing so, we build on two prior RAND studies. In 1998, we published *Investing in Our Children* (Karoly, Greenwood, et al., 1998), one of the first policy reports to synthesize the available evidence on the effectiveness that different early childhood interventions have for children's outcomes. It identified ten programs with rigorous evaluations and estimated positive economic returns for two that were most amenable to BCA. In 2005, *Early Childhood Interventions: Proven Results, Future Promise* (Karoly, Kilburn, and Cannon, 2005) expanded on the original research—examining the effectiveness of 20 programs and seven BCAs. This work demonstrated that many benefits of childhood programs continue into adulthood and that the economic returns of five programs more than covered the program costs.

Since 2005, the field has decidedly evolved, and the evidence continues to accumulate. The present study therefore aimed to bring our understanding of the effects of early childhood programs up to date. Using criteria to define the nature of the early childhood programs of interest and the required rigor for the accompanying evaluation, we identified 115 programs to be the focus of our review. Relative to our prior reports, this report examines a broader scope of the programs, also encompassing early childhood programs that are health-focused, are government transfers, are implemented in community-based settings, and take a two-generation approach. For 25 of the 115 programs, we also identified a formal economic evaluation defined as a cost analysis, cost-effectiveness analysis (CEA), or BCA. Following a systematic process for reviewing each study, we used methods, includ-

ing meta-analysis and metaregression, to synthesize the evidence for the programs we identified.

In the remainder of this summary, we highlight key findings with respect to each of the three study questions. We conclude by identifying implications of our findings for policy, practice, and future research.

What Types of Early Childhood Programs Have Been Rigorously Evaluated?

We identified 115 programs aimed at ultimately improving outcomes for children that had evaluations meeting our criteria for scientific rigor. At the same time, many programs currently lack a research base that met our screening criteria and therefore are not captured in our review. For the set of programs included in our analysis, we first characterized the program approach and the nature of the evaluation.

Evaluations Cover Varied Approaches to Early Childhood Programs

Drawing on a conceptual framework of how early childhood programs contribute to child outcomes, directly through child development inputs, by increasing parenting capacity, or both, we identified four primary approaches that we labeled

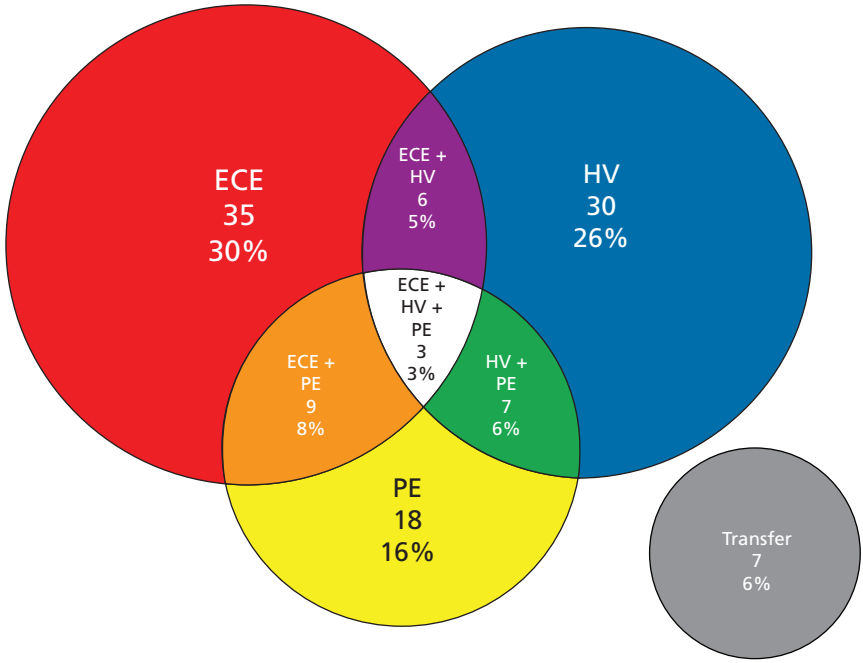
- *early care and education (ECE):* 35 programs providing services to children in a group setting, such as preschools or formal play groups, to promote child development
- *home visiting:* 30 programs providing individualized services to primarily parents in a home-based setting to promote parent skills and knowledge
- *parent education:* 18 programs providing group or individualized services to parents in a non–home-based setting to improve parent skills and knowledge
- *transfers:* seven programs providing cash or in-kind benefits (such as vouchers for food or nutrition, child care, housing, or health care) directly to families.

Of the 115 programs we reviewed, 78 percent took primarily one of these four approaches, and the rest used a combination of approaches (nine programs combining ECE and parent education; seven that combine parent education and home visiting; six that combine ECE and home visiting; and three that combine ECE, home visiting, and parent education) (see Figure S.1).

The programs also varied in other ways, although some approaches were more common:

- *focal person:* Most programs interacted primarily with parents, primarily with children, or both. Other intended participants included teachers and health care providers. Programs typically

Figure S.1
Early Intervention Programs Included in the Study, by Approach



NOTE: PE = parent education. HV = home visiting.
RAND *RR1993-S.1*

delivered services either one-on-one or in a group-based setting, although some used both.

- *targeting mechanism:* Almost all programs were designed to serve at-risk or otherwise disadvantaged children and families, typically defined by low incomes. Only a few of the programs we reviewed (18) served families and children universally, without regard to their characteristics.
- *starting age:* By our selection criteria, the programs began during the prenatal period up to school entry. The dominant starting ages were during infancy (0 to 11 months) or preschool ages (36 to 60 months), in part reflecting the dominance of home visiting and ECE programs in our analysis set. Less common were programs that began in the prenatal period or with toddlers.
- *length of intervention:* Most programs provided services for less than a year (the typical ECE or parent education program), although 23 programs (mostly home visiting alone or in combination) offered services for three years or more.

Evaluations Measured Short- and Longer-Term Outcomes in Multiple Domains

The evaluations we reviewed—nearly all of which used randomized-control trials to compare outcomes for those participating in a given program with outcomes for those who are not—examined 3,183 child outcomes. We grouped the measured outcomes into 11 broad domains. About 75 percent of the outcomes examined fall under the first three domains:

- behavior and emotion (e.g., social skills, internalizing behaviors)
- cognitive achievement (e.g., literacy, self-regulation)
- child health (e.g., birth outcomes, body-mass index [BMI], access to health care, nutrition)
- developmental delay (e.g., mental development, physical development, general)
- child welfare (e.g., maltreatment, abuse, neglect)
- crime (e.g., involvement by child or parent with courts, police, criminal activity)

- educational attainment (e.g., years of schooling, attendance, special education)
- employment and earnings in adulthood
- family formation in adulthood
- use of social services in adulthood
- composite measures of multiple domains.

Some outcomes were measured over the short term, either during the intervention or soon after it ended. When follow-up of program participants continued, evaluations captured the impact on outcomes for participating children during the school-age years or even adulthood. More than half of the programs we analyzed measured at least one child outcome past the immediate end of the program, and 13 measured outcomes more than ten years later.

In addition to the outcomes examined and length of the follow-up, the evaluations we reviewed varied by such characteristics as the time period during which they were performed, program scale, and evaluation sample size. The included programs had evaluations that spanned the past 50 years, although most were conducted for cohorts of program participants in the 1990s and 2000s. With the exception of transfer programs, the evaluation studies were most commonly model demonstrations conducted at the local level rather than multistate or national scale. Consequently, sample sizes for treatment and control groups combined tended to be small: More than half of all programs had maximum evaluation cohort sizes of fewer than 300, and the median size across programs was 244.

Which Outcomes Did Early Childhood Programs Improve?

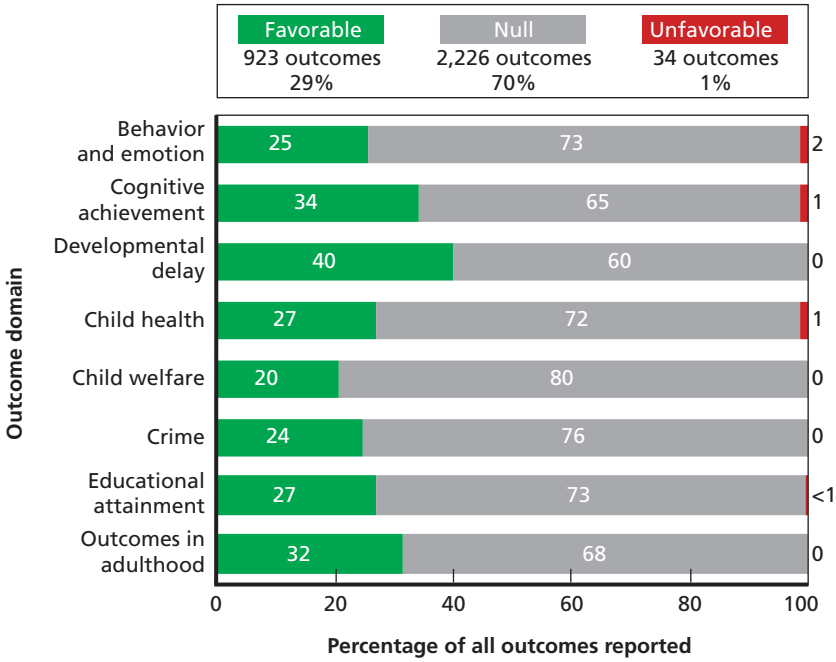
We designated each child outcome measured in an evaluation as positive, negative, or null (meaning that there was no statistically significant difference between participants and nonparticipants for the outcome being measured). For example, if a program was shown to decrease a child's BMI and the measured impact was statistically significant, we deemed the outcome positive, or favorable.

Early Childhood Programs Can Improve an Array of Early and Later Outcomes

Across the 115 programs we reviewed, 102 (89 percent) had a positive effect on at least one child outcome, indicating that it is relatively rare, among published evaluations, to find programs that have no demonstrable impacts on child outcomes. Almost one in three outcomes were improved: Twenty-nine percent of outcomes (923) were positive, only 1 percent (34 outcomes) were negative, and the rest were null. The domains of cognitive achievement and developmental delay saw larger shares of positive outcomes than the other domains did (see Figure S.2).

Early childhood programs have long been considered one of the few policy areas for which evidence demonstrates that they work. As

Figure S.2
Favorable, Null, and Unfavorable Distribution of Outcomes, by Domain



NOTE: Percentages are based on the total number of outcomes within domains, as noted in Table 3.2 in Chapter Three.

RAND *RR1993-S.2*

a result, it might come as a surprise that less than one-third of all outcomes measured were demonstrably positive. However, statistically, one would expect one in 20 outcomes to improve at random; the fact that this analysis shows improvement in roughly six of 20 outcomes is meaningful.

Sizes of Improvements in Outcomes Varied

Policymakers care not only whether improvements exist but also about their magnitude. Research methods known as meta-analysis and metaregression can be used to summarize, across programs, how large the impacts are.

Prior meta-analyses of early childhood programs have demonstrated that the impacts from early childhood programs can be sizable. Our 2005 study found an average effect size for early cognitive skills measured near the beginning of elementary school of 0.33 for nine ECE programs combined with other approaches (home visiting or parent education) and 0.21 for six programs that were either single-approach home visiting or parent education programs (Karoly, Kilburn, and Cannon, 2005). These magnitudes are consistent with other meta-analyses of early intervention programs, which suggest a range of significant impacts for various early intervention approaches on child outcomes of 0.1 to 0.4, in which most syntheses have estimated effect sizes for the cognitive achievement or the behavior and emotion domain.

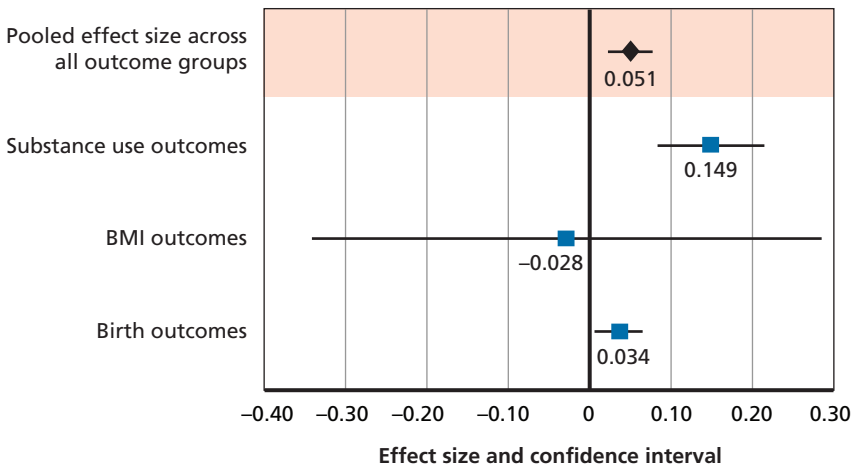
We add to the literature on the size of impacts from early childhood programs by conducting meta-analysis and metaregression on outcomes in the child health domain, which has typically not been examined in meta-analyses of early childhood programs. We estimated the size of impacts for three outcome categories in the child health domain: birth outcomes, BMI, and substance use. We selected this subset because these categories included a relatively large number of outcomes and studies with measures reported in common metrics, included at least five programs that measured the outcomes, and they span early childhood to adult outcomes. We also selected these three for analysis because they are measures of child health outcomes per se, unlike some of the other categories in the child health domain, which

measured child health inputs, such as emergency-department visits and hospitalizations, timely immunizations, and child access to health care.

The estimated average effect size, based on meta-analysis for the three health-related domains combined, is small (0.05), but it masks variation across the three domains (see Figure S.3):

- *birth outcomes:* The size of the improvement in birth outcomes is very small (effect size of 0.03). This is in line with many other recent meta-analyses that have found little effect that lifestyle and other interventions during pregnancy have on pregnancy outcomes. It is noteworthy that none of the effects is negative.
- *BMI outcomes:* The results indicate that early childhood programs in our sample did not have a preventive effect on BMI at later ages in elementary school (i.e., a null effect size). In fact, two programs had the unintended effect of increasing BMI.

Figure S.3
Pooled Effect Sizes and Confidence Intervals, by Outcome Category and for All Three Health Outcome Categories Combined



SOURCE: Authors' calculations based on sources in the "Study" column of Table C.3 in Appendix C.
NOTE: The diamond and squares plot the estimated average effect size based on the meta-analysis. The horizontal bars show the 95-percent confidence intervals.
RAND *RR1993–S.3*

- *substance use outcomes:* On average, substance use outcomes had a modest effect (effect size of 0.15). The program participants' outcomes clearly exceeded those of the control groups, and, given that early childhood programs serve very young children, the effects are relatively large compared with effects for substance use programs delivered in adolescence.

Overall, when we examined how the size of program effects varied by approach, we found that ECE programs had larger effects than other program approaches for the three health outcomes that we analyzed. In addition, the magnitude of the effects declined in the past half century, with more-recent evaluations having smaller effects than earlier ones. This is likely due to the experiences of the control group changing over time, such that many children in the control group today also receive some alternative services, whereas control group children in earlier decades were unlikely to have received any services.

What Are the Costs and Benefits of Early Childhood Programs?

Out of the 115 programs included in this study, 25 were the subject of formal economic evaluation, which came in three forms:

- *cost analysis:* the resources required to implement a given program and the foundation for a CEA or BCA
- *CEA:* the cost to obtain a given outcome. Alternatively, a CEA can report the amount of an outcome obtained for each dollar invested.
- *BCA:* the economic value of all program effects relative to the program cost. Metrics include net benefits (benefits minus costs) or the benefit–cost ratio (benefit divided by cost).

In seeking to value all outcomes, BCA is the most comprehensive of the three methods and preferred for use with early childhood programs, which often affect multiple outcomes. Reflecting this preference, the

available economic evaluations we examined are predominantly BCAs, with a small number of cost analyses and CEAs. The growth over time in economic evaluations of early childhood programs reflects the increased demand for evidence of the resources required to implement a program and the potential economic returns. At the same time, some form of economic evaluation, even a formal cost analysis, remains the exception rather than the rule.

The Resources Required for Early Childhood Programs Vary Widely

The evidence from cost analyses for 25 programs—either a stand-alone analysis or one conducted as part of a CEA or BCA—shows tremendous variation in the per-child or per-family costs. As measured in 2016 dollars, the cost estimates range from about $150 per family for a parent education program to nearly $48,800 per family for a program that combined ECE with home visiting, among other comprehensive services. The variation is almost as large among programs that use the same approach. For example, the cost for the six home visiting programs ranges from about $720 per family to nearly $10,200 per family. Much of this variation within and across program approaches can be traced to key program features, such as the intensity and duration of the services delivered. Because most cost analyses are specific to the location where the program was implemented, some of the variation also reflects differences in local prices for personnel, facilities, materials, and other required resources.

Most Programs with Benefit–Cost Analyses Show Positive Returns, but Those Results Are Not Guaranteed

The 19 early childhood programs with BCAs reviewed in this study demonstrate that positive economic returns are possible but are not realized for every program. Positive returns mean that the dollar value of the program's observed or projected effects on child or parent outcomes exceeds the program costs, where the comparison accounts for the fact that program costs are typically incurred up front, while benefits accrue over time, potentially over the child's lifetime.

Findings from the analysis of the economic returns for the 19 programs include the following:

- Benefit–cost ratios are typically in the range of $2 to $4 for every dollar invested, although higher ratios are possible. This occurs when very low-cost programs have an effect on costly outcomes, such as health care costs. Higher returns are also evident for more resource-intensive programs that have longer-term follow-up and thereby capture effects on parent and child outcomes with larger economic consequences (e.g., earnings, crime).
- Positive economic returns have been demonstrated for three of the four main approaches we identified and many of the combination approaches. Both less and more resource-intensive programs can show positive returns, as can programs using both targeted and universal approaches.
- The monetary benefits from early childhood programs derive from multiple outcome domains, and they can be due to improved outcomes for the children, the parents, or both. Earnings (of the parent or child) are often the single largest source of benefits. Another major source of benefits can be public- and private-sector savings from reductions in crime, although few of the interventions we reviewed have evidence measuring effects on crime, either for participating parents or their children.
- Benefits to the government (federal, state, and local), albeit positive in many cases, are not always large enough to offset the program cost. It is possible that, with longer-term follow-up, programs would generate further savings to government that could help to cover the program cost.
- The benefits of early childhood investments unfold over time and can take years or even decades to reach the point at which cumulative benefits exceed the up-front costs. This reflects the fact that the participating child's earnings in adulthood are often a major source of benefits, and such benefits do not begin to accumulate until the participating child reaches adulthood 15 to 20 years after the program began. There are exceptions when programs with a modest up-front investment generate immediate effects on

such outcomes as use of medical services or parent economic outcomes (e.g., employment, criminal activity).
- Programs that do not show positive returns either have no significant impacts or have affected outcomes that could not be valued in dollars and counted as an offset to program costs. It is possible that a more comprehensive BCA based on longer-term follow-up or measurement and monetization of other outcomes would show positive net benefits for these programs.

Overall, the results from 19 BCAs reviewed in this report demonstrate the proof of the principle that early childhood programs can generate economic benefits that outweigh program costs. At the same time, it is important to recognize that there is considerable uncertainty in estimates of economic return, reflecting the precision with which program effects are measured, the inability to assign an economic value to all outcomes that are affected, and the absence of measurement for many potential outcomes, including those that will take time to be realized.

There Is Scope to Improve the Application of Economic Evaluation to Early Childhood Programs

The paucity of economic evaluations that accompany impact evaluations of early childhood programs reflects several factors. Researchers conducting a program outcome evaluation often lack the expertise to also measure program cost. Where comprehensive cost estimates are available, implementing a BCA can be challenging. Notably, many of the outcomes affected by early childhood programs are not readily expressed in monetary values so that they can be aggregated and compared with program cost. Furthermore, because BCA methods vary across studies, apples-to-apples comparisons are not possible, which limits the ability to identify the programs with the largest "bang for the buck." Improvements in the quality and comparability of economic evaluations can only strengthen the usefulness of these methods for decisionmakers seeking to make efficient use of available resources.

This Study Has Implications for Multiple Stakeholders

For Policymakers and Practitioners

Research on early childhood program effectiveness and economic returns can help inform how decisionmakers in the public and private sectors set policy with respect to such programs and how practitioners implement them. Our findings have implications both policy and practice.

Policymakers can be highly confident that well-designed and well-implemented early childhood programs can improve the lives of children and their families. This report describes multiple approaches to early childhood intervention that have been rigorously demonstrated to improve child outcomes and more than pay for their costs. Although not every program improves every outcome, evidence is strong across time, locations, and program models that most of the early childhood programs we identified improve some child outcomes.

With a robust base of early childhood programs that have been proven to be effective based on rigorous evaluation, decisionmakers should integrate other criteria when selecting programs to implement. With multiple proven programs from which to choose, decisionmakers can go beyond considering only whether a program is "evidence-based" to incorporate other criteria, such as the fit with the community's needs, the desired outcomes, the population to be served, and the available assets and resources. Numerous resources can help communities identify the best programmatic fit.

Program implementers adopting or expanding evidence-based models should pay attention to quality of replication and effects of scale-up. Selecting evidence-based programs helps increase the chances of achieving the desired outcomes, but programs must be implemented with fidelity to be effective. Fidelity of implementation is important because most of the program evaluations we have reviewed tell us that an early childhood program works but not which features were responsible for the demonstrated outcomes (the so-called black box). Further, given that many of the effective programs documented in this report were undertaken as smaller-scale demonstration projects, it is important to address fidelity and program quality in the context

of program scale-up. The growing field of implementation science and increasing technical assistance associated with funding streams, such as the Maternal, Infant, and Early Childhood Home Visiting Program and Head Start, provide support for effective implementation.

New approaches to universal programs raise the possibility that they can complement rather than substitute for targeted programs. An ongoing debate in early childhood programming has been whether a program should seek to serve all families or target those with greater needs. A new generation of universal programs demonstrates that the approaches can be employed together. For example, Durham Connects provides a low-intensity home visiting program to all families while identifying children and families that might benefit from additional, more-intensive services.

Benefits can take decades to exceed costs, posing challenges for funding mechanisms that require short-term payoffs. Social impact bonds and other pay-for-performance mechanisms are increasingly being used to attract private financing for early childhood programs. These mechanisms are premised on the expectation that shorter-term impacts on program participants will produce public-sector savings that can be used to pay back the private investors' upfront financing. Programs in areas that, for example, improve parents' earnings, reduce health care costs, or decrease the use of other social welfare benefits for parents can be more amenable to these financing mechanisms than programs with outcomes that take longer to realize.

For Researchers

Our synthesis of research evidence points to opportunities and challenges for the research community to further advance its understanding of early childhood program effectiveness and economic impact. Our findings have implications for ongoing dissemination of the research evidence.

Decisionmakers would benefit from head-to-head comparisons of early childhood programs. For many program models, it is becoming increasingly challenging to establish a control group that does not experience the early childhood program of interest. There also are more evidence-based early childhood programs from which

to choose. Decisionmakers would benefit from research that makes explicit head-to-head comparisons of the program alternatives.

The next generation of research needs to get inside the black box of effective programs. Although the past decade has seen growth in the number of effectiveness and efficacy studies, we still found few studies that examine which specific program components drive effectiveness. Conducting comparative effectiveness studies would help to address this need. One barrier to expanding the knowledge base regarding the features that make early childhood programs effective is the high cost of conducting rigorous evaluations, such as randomized control trials. However, evidence from careful quasi-experimental designs would be better than having no evaluation evidence at all.

Early childhood programs improve a range of outcomes, so evaluations should collect outcomes across a range of domains. The findings from our synthesis demonstrate that programs that promote child development enhance multiple facets of individual well-being. Measuring only a subset of these facets of well-being is likely to miss some of the potential dividends that early childhood programs can pay across a lifetime.

Outcomes for two generations should be captured in early childhood program research. Ideally, program evaluations and economic evaluations of early childhood interventions should focus on outcomes for both participating children and their parents. Parents in particular can benefit from early childhood programs when they are the focus of the intervention, such as in parent education programs and many home visiting program models. Parents can also benefit in terms of greater labor force participation and higher earnings from ECE programs when the hours of care and early learning are sufficient to allow parents to increase their work hours, work experience, or education and training. BCAs that monetize parent outcomes allow programs to potentially reach a break-even point more quickly (because parental outcomes are often realized sooner than those for their children), account for benefits in a comprehensive way, and improve the comparability of BCAs.

There is a need for more studies that conduct longer-term follow-up to determine whether early program impacts are

sustained. This review includes many more studies than our 2005 report, including many more BCAs. However, most of the newer studies follow study participants for short periods after program services end. Conducting more long-term studies should be a research priority. Making greater use of administrative data from the criminal justice system, social welfare programs, the child welfare system, and the unemployment insurance system is one lower-cost strategy for measuring longer-term outcomes for evaluation cohorts. Where longer-term follow-up is not feasible or too costly, researchers could make greater use of longitudinal studies that link outcomes in early childhood with outcomes later in childhood or adulthood. Research that establishes the causal relationship between outcomes in early childhood and outcomes in adulthood can be used to forecast the longer-term effects of early childhood programs and facilitate BCAs by linking measured outcomes to later outcomes that can be more readily valued in monetary terms.

Incentivizing cost data collection, as well as standardizing BCA methods, would facilitate comparisons across programs. The ability to compare BCA findings across early childhood programs is limited because of differences in the outcomes measured and the length of follow-up conducted for the program evaluation, the lack of cost data, and methodological differences in economic evaluation methods. Establishing a set of core outcomes to be measured in early childhood program evaluations (e.g., within any given domain in which a program is designed to produce effects), encouraging the routine collection of cost data, and incentivizing the use of standardized methods could boost the degree of comparability across economic evaluations. This will also provide policymakers with relevant, high-quality information to guide their decisionmaking in the years ahead.

Looking beyond these direct implications of our study for policy, practice, and research, we must also place our findings regarding early childhood interventions in the context of the broader literature around supports for healthy child development at any age. A range of researchers, including economists and psychologists, have argued that investing early can provide the highest payoff because skill development is cumulative. But without experiences and goods that support

development in middle childhood and high school, the developmental foundations laid in early childhood are less likely to be fully capitalized on. Thus, whether targeted or universal, early childhood programs are just the foundational component of a continuum of effective supports for healthy development throughout childhood.

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In computing effect sizes, we were occasionally missing needed statistics. In those cases, we contacted study authors to see whether they could provide the missing statistics from their files. We are extremely grateful to these researchers who searched for and sent us missing statistics that enabled us to do this analysis: Gay Armsden, Michelle Englund, Sarah Hamersma, and Chris Herbst. Additionally, we would like to extend a special thanks to James Heckman and Jorge Luis García for providing unpublished results for the full sample needed to estimate the HighScope Perry Preschool Project effect sizes from the model used in Heckman, Moon, et al. (2010).

The RAND Labor and Population review process employs anonymous reviewers, including at least one reviewer who is external to

RAND, and we are grateful to the two anonymous reviewers for their thoughtful reviews of this report. We take full responsibility for any errors.

Abbreviations

ABC	Attachment and Biobehavioral Catch-Up
BCA	benefit–cost analysis
BELL	Building Early Language and Literacy
BMI	body mass index
CACFP	Child and Adult Care Food Program
CAPS	Childhood Asthma Prevention Study
CARE	Carolina Approach to Responsive Education
CCDF	Child Care and Development Fund
CCDP	Comprehensive Child Development Program
CDA	child development account
CEA	cost-effectiveness analysis
CMA	Comprehensive Meta-Analysis Version 3.0
COPE	Creating Opportunities for Parent Empowerment
CPC	child–parent center
CPEP	Child Parent Enrichment Project
CPI	consumer price index

CPP	Chicago Parent Program (sometimes also called the Chicago Parenting Program)
CSRP	Chicago School Readiness Project
DTBY	DARE (Decision-Making, Assertiveness, Responsibility, Esteem) to Be You
DWL	deadweight loss
ECE	early care and education
ECEAP	Early Childhood Education and Assistance Program
ED	emergency department
EIP	Early Intervention Program
EITC	earned-income tax credit
FCU	Family Check-Up
HFNY	Healthy Families New York
HIPPY	Home Instruction for Parents of Preschool Youngsters
HV	home visiting
IHDP	Infant Health and Development Program
IQ	intelligence quotient
n/a	not applicable
NAP-SACC	Nutrition and Physical Activity Self-Assessment for Child Care
NFP	Nurse–Family Partnership
NICU	neonatal intensive care unit
NIDCAP	Newborn Individualized Developmental Care and Assessment Program

NIRN	National Implementation Research Network
OK529	Oklahoma 529 College Savings Plan
PALS	Play and Learning Strategies
PALS I	Play and Learning Strategies for infants only
PALS II	Play and Learning Strategies for toddlers only
PAT	Parents as Teachers
PATHS	Promoting Alternative Thinking Strategies
PCDC	Parent Child Development Center
PCIT	Parent–Child Interaction Therapy
PDV	present discounted value
PE	parent education
PIP	Pride in Parenting
RCT	randomized control trial
REACH	Research and Education Advancing Children's Health
RECAP	Reaching Educators, Children, and Parents
REDI	Research Based, Developmentally Informed
REST	Reassurance, Empathy, Support, and Time-Out
SCHIP	State Children's Health Insurance Program
SEED OK	SEED for Oklahoma Kids
SEEK	Safe Environment for Every Kid
STAR	Sit Together and Read
UCLA	University of California, Los Angeles
UK	United Kingdom

WIC	Special Supplemental Nutrition Program for Women, Infants, and Children
WSIPP	Washington State Institute for Public Policy

CHAPTER ONE

Introduction

In 1998, RAND published *Investing in Our Children*, one of the first policy reports to synthesize evidence of the effectiveness of various early childhood interventions—from home visiting to early care and education (ECE)—for addressing the stressors in the first five years of a child's life that can compromise healthy development (Karoly, Greenwood, et al., 1998). At that time, we identified ten programs with rigorous evaluations, cataloged the multiple domains in which benefits were demonstrated to accrue for the children and adults who participated in the programs, and estimated positive economic returns for two of the programs most amenable to benefit–cost analysis (BCA).

Seven years later, RAND published a follow-on report—*Early Childhood Interventions: Proven Results, Future Promise*—that expanded the list of programs with scientifically sound evaluations to 20 (Karoly, Kilburn, and Cannon, 2005). The report served to further demonstrate the existence of multiple early childhood programs with rigorous evaluation evidence and employing a variety of intervention models that produced favorable outcomes for participants during the early childhood years. In several cases, based on evidence from longer-term follow-up, the beneficial effects were shown to continue through childhood and into adulthood. At that time, seven of the 20 programs had been the subject of BCAs, which again afforded an estimate of the economic returns to the early childhood investment. According to the existing evaluation evidence, five of the programs achieved the distinction of having estimated benefits that more than covered the program cost.

Since our 2005 study, the field has continued to evolve. Prominent developmental theories from psychology, neuroscience, economics, and other disciplines have continued to affirm the importance of the early years for promoting lifelong health and well-being (Center on the Developing Child, 2007; Heckman, 2007; Kilburn and Karoly, 2008). Empirical evidence further points to the salience of early childhood experiences for adult outcomes, with evidence that key measures of adult well-being are related to early-life outcomes, such as exposure to adverse events before age 18, psychological problems in childhood, early cognitive or behavioral development, and early physical health (Felitti et al., 1998; Flaherty et al., 2006; James Patrick Smith and Smith, 2010; Ford et al., 2011; Cunningham, Kramer, and Narayan, 2014). This research suggests that devoting resources to early health will promote health and well-being throughout adulthood (Case and Paxson, 2010; Center on the Developing Child, 2010; Kilburn, 2013).

At the same time, evidence from evaluations of individual early childhood interventions has continued to accumulate. New economic evaluations demonstrating positive, and often sizable, economic returns from early childhood investments have further buttressed calls to shift more societal resources toward evidence-based services for children as a way to better promote a healthy population (Robert Wood Johnson Foundation Commission to Build a Healthier America, 2014). Other research points to the high societal costs of failing to improve outcomes for at-risk children and youth. For example, recent estimates indicate that racial and ethnic gaps in student achievement depress gross domestic product growth by 2 to 4 percent (McKinsey and Company, 2009). Every youth who is disconnected from school or work is estimated to cost society more than $700,000 in 2011 present-value dollars over his or her lifetime in terms of lost productivity, higher crime, and other undesirable outcomes (Belfield, Levin, and Rosen, 2012). Given the magnitude of these costs of failing to act, it is not surprising that research documenting the economic return to early childhood programs has played a central role in the growing support for making investments in young children a priority (Kilburn and Karoly, 2008).

With more than a decade since our last synthesis, we aim in this report to once again take stock of the available body of evidence

regarding the impacts of early childhood programs with a rigorous evaluation and with estimates of the magnitude of the economic returns.[1] Relative to our earlier studies, we expanded the scope of intervention models examined to encompass those more directly focused on health, those implemented in community-based settings, those adopting a two-generation approach, and transfer programs (i.e., cash or in-kind benefits to low-income families). Through a comprehensive literature review, we provide a synthesis of the available evidence from rigorous evaluation research to address the following questions:

- What program approaches to providing services for families and children from the prenatal period to school entry have been rigorously evaluated?
- What outcomes did these programs improve in the short or long term?
- What are the costs and benefits of effective programs and returns to government or society?

To address these questions, our literature review for this study identified 115 early childhood programs that met a set of well-defined criteria regarding the scope and scientific rigor of the program's accompanying evaluation evidence (outlined in the next section). Twenty-five of the identified programs also have corresponding economic evaluations—a cost analysis, cost-effectiveness analysis (CEA), or BCA—that describe the size of the investment required and, in most cases, the magnitude of the economic returns.

In the remainder of this introduction, we provide an overview of our approach to identifying the early childhood programs that are the subject of our review and the strategy for synthesizing the evidence of their effects on child and adult outcomes and economic returns. We conclude with a road map for the remainder of the report.

[1] Throughout this report, we use *program* interchangeably with *intervention*, as in *early childhood program* or *early childhood intervention*.

Approach

Our goal in this study was to identify and synthesize the evidence of impact and economic return for early childhood interventions serving children prior to school entry that had been rigorously evaluated and with findings that were well documented and publicly available. To accomplish this objective, our study required the following steps: (1) establish criteria for interventions and their evaluations to be included in the review; (2) conduct the systematic literature search using well-defined and replicable methods; (3) finalize the list of evaluations that met the established criteria; (4) extract information from study evaluation publications required to understand the program model, evaluation design, and evaluation findings; and (5) synthesize the resulting information, including the use of meta-analysis methods for a subset of outcomes. Because the first step established the scope of the study, we highlight here the criteria we used to determine which early childhood interventions were eligible for our review. We discuss additional details regarding the inclusion criteria and the remaining steps in the next chapter and document them further in Appendix A. In Appendix B, we provide brief descriptions of the 115 programs included in our review, along with citations to their associated impact and economic evaluations.

The inclusion (or exclusion) criteria we established for the studies in this review addressed the nature of the early childhood intervention itself, as well as the features of the program impact evaluation. In Table 1.1, we summarize several key criteria, along with the criteria used in our two previous syntheses. In terms of the early childhood program, we required the following for inclusion in our review:

- The program was referred to by a specific name that distinguished it from other programs or generic approaches.
- The program targeted at least one of the following: any child from birth up to age 5 (or prior to kindergarten entry), any parent or caregiver of a child from birth to age 5, or any pregnant mother or parent expecting a child.

Table 1.1
Criteria for Identifying Early Childhood Interventions and the Resulting Number of Programs Included Across Three RAND Studies

Study	Criteria	Number of Programs	
		Included	With Economic Evaluation
Karoly, Greenwood, et al. (1998)	• Intervenes from prenatal period up to kindergarten entry; is designed to improve development for at-risk children • Has an evaluation with the following features: has a rigorous experimental or quasi-experimental design; includes follow-up, preferably past intervention; has a sample of 50 or more children in treatment group plus control group; has less than 50% attrition at follow-up	10	2
Karoly, Kilburn, and Cannon (2005)	• Intervenes from prenatal period up to kindergarten entry; is designed to improve cognitive or social–emotional development for at-risk children; does not focus primarily on special-needs children; is implemented and evaluated in the United States • Has an evaluation with the following features: has a rigorous experimental or quasi-experimental design; measures at least one child outcome for at least one evaluation in the United States; includes follow-up at least through approximately kindergarten entry; has a sample of 20 or more children in each of treatment and control groups; has been published (or publicly available) since 1960	20	7
This study	• Intervenes from prenatal period up to kindergarten entry; is designed to improve child development through direct child intervention or improving parenting capacity; does not focus primarily on special-needs children • Has an evaluation with the following features: has a rigorous experimental or quasi-experimental design; measures at least one child outcome for an evaluation in the United States; has been published or publicly available	115	25

- The intervention did not focus on a special-needs population, such as children with autism spectrum disorders or children who are deaf or blind.

The requirement that the program be "named" facilitated the process of identifying evaluation studies associated with the intervention. In some cases, the formal name of a program changed over time as it was implemented in new sites or brought to scale. We also required that the program have a clear treatment, dosage, and implementation setting. Given that early intervention programs can target a parent (or expecting parent), the child, or both, we allowed for interventions that adopted varied approaches for reaching parents and children during the prenatal period until kindergarten entry. This also meant that interventions could deliver services and supports in the home or a home-based setting or in settings outside the home, such as ECE centers, clinical settings, or other public or private community-based settings (e.g., library). To keep the scope of the study manageable, we excluded interventions that focused exclusively on children with special needs. Many of the interventions we do review are inclusive in delivering services and supports to children regardless of special-needs status.

With respect to the evaluation of the program, we required that the evaluation

- employ a rigorous experimental or quasi-experimental design
- be conducted with children or families in the United States
- measure at least one child outcome from the treatment received during the period prior to school entry
- be formally published.

Many of the programs we review have been evaluated in other countries, but we did not want to confound the country context in our analysis of impacts and economic returns, so we focused our review on program impacts as measured for U.S. populations of families and children. According to the second evaluation-related criterion, we did not include early childhood interventions that reported only parent

outcomes, such as behavioral changes or parenting practices.[2] We included programs that measured, at any point in time, at least one child outcome that could be related to having received the program's services before kindergarten entry. In Chapter Two, we discuss additional inclusion and exclusion criteria.

These criteria can be compared with those applied in our 1998 and 2005 syntheses of early childhood programs (see Table 1.1). In many respects, the type of early childhood interventions that was of interest was the same across the three studies: programs that served children, parents, or both starting as early as the prenatal period and continuing until school entry. Although programs targeting at-risk children were the central focus, we included universal programs in the 2005 synthesis and in this analysis. In all three studies, the criteria regarding the evaluations were designed to ensure scientific rigor. The specific criteria established to achieve that objective have changed over time in response to the availability of new methods. We identified more than five times as many studies as in the 2005 report and more than ten times as many studies as in the 1998 report. This reflects both the use of more-systematic literature search techniques for the present study than in the prior efforts and the rapid growth since 2005 of publicly available evaluations of early childhood programs.

It is important to acknowledge that, given our inclusion criteria, our review does not consider all early childhood intervention programs, nor does it consider all early childhood intervention programs with evaluation evidence. Our criteria for identifying the programs of interest means that we exclude programs evaluated only in countries outside the United States and that we exclude programs that first intervene with children after they have already entered kindergarten. We also omit programs in which the accompanying evaluation is not sufficiently rigorous (i.e., based on the criteria we established) or for which no child outcomes were measured. Further, despite systematic search efforts, it is possible that we failed to identify programs that would otherwise meet the inclusion criteria we established.

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[2] For example, we did not include breastfeeding as an eligible child outcome because we considered it a parenting behavior that is a moderator for a later child outcome.

At the same time, we note that our review encompasses a broader range of early childhood programs than other recent syntheses and meta-analyses, many of which focus exclusively on one type of early childhood program, such as home visiting programs or center-based preschool programs delivered one or two years before kindergarten entry. For example, Filene et al. (2013) contains a systematic review and meta-analysis of 51 targeted or universal home visiting programs implemented in the United States and serving families with children from birth through age 3. Filene and her colleagues excluded any program that served a specialized population (e.g., children with developmental disabilities or chronic illness). They excluded any evaluation that used a single-case method, did not have a control or comparison group, or was missing the information needed to calculate effect sizes. Camilli et al. (2010) reports a meta-analysis of 123 center-based preschool evaluations with criteria that limited studies to those evaluated with experimental or quasi-experimental designs and implemented in the United States since 1960. Camilli and his colleagues explicitly excluded home visiting programs from the review. Duncan and Magnuson (2013) likewise provides a meta-analysis of 84 preschool programs, also limited to programs evaluated using experimental or quasi-experimental designs and implemented and published in the same approximate time frame as the Camilli et al. (2010) review. By focusing on a wider array of early childhood programs, as was the case with our 2005 report, we synthesize evidence across the spectrum of early childhood programs rather than a single approach, as has been the case with other syntheses. Furthermore, by examining evidence of both impact and economic returns, we capture the two key aspects of the evidence base that matter for practitioners, policymakers, and the public: Do programs work? And are they worth the investment?

Road Map of the Report

We begin in Chapter Two by providing additional information on the inclusion and exclusion criteria for the early childhood programs that we include in our review. We also present a framework for classifying

programs based on their approaches in terms of the services and other supports provided to young children and their families. Within that framework, we then examine key features of the programs and their associated evaluations.

In Chapter Three, we summarize the findings from the outcome evaluations of the 115 programs we reviewed. Our discussion centers on the outcomes the evaluations measured for participating children, as well as whether those outcomes were improved. For a subset of the outcomes, specifically the health-related outcomes, we also summarize the magnitude of the impacts estimated in the evaluations.

Chapter Four examines the available evidence from the subset of the 115 programs with economic evaluations. A first consideration is the methods associated with the economic evaluations and the implications for comparability across studies. For the 25 programs with cost analyses, CEAs, or BCAs, we examine the estimates of cost, cost-effectiveness, and benefit–cost.

Chapter Five returns to our study questions and summarizes our key findings. We also draw out the implications of the results for policy and practice, as well as for research.

A series of appendixes provides additional methodological detail and features supplemental results.

CHAPTER TWO

Features of the Early Childhood Programs Included in Our Analysis

The programs identified for this analysis span a range of features, reflecting the spectrum of approaches employed by early childhood programs serving children and families. In this chapter, we describe a framework for characterizing early childhood programs and then use that framework to describe the early childhood programs that we included in our analysis. We begin by providing further information about the criteria employed for program identification. We then describe the most-common program approaches, followed by a summary of the key features of the programs included in our study and their associated evaluations. The outcomes measured in the evaluations of these programs are the subject of Chapter Three.

Program Inclusion Criteria

Evaluation studies for programs that met our initial criteria described in Chapter One—a named program serving children or parents of children from the prenatal period to age 5 that was not exclusively children with special needs—were further reviewed in detail to determine final inclusion in our analysis. We included or excluded studies based on the following additional criteria:

- The authors published results for the full sample of focal children as designed for the evaluation. We excluded publications reporting only subgroup analyses. The primary aim of this report is to discuss program effectiveness and economic returns in the context of

the full population the intervention intended to serve. For example, if a program served both boys and girls, we do not include evaluations that present results solely by gender.[1] Although subgroup analyses are important for further contextualization of a program's effectiveness, they are outside the scope of this report.

- The research design was rigorous and appropriate for drawing causal inferences. In addition to RCTs, we included a study if it used one of the following quasi-experimental designs: regression discontinuity, two-stage least squares, interrupted time series, difference in differences, and propensity score matching. We did not conduct formal examinations of the specific methodological details of individual studies, but rather noted whether the overall research design met our list of design types for inclusion. We also did not rule out any trials based on sample sizes and note that only one evaluation cohort sample size was smaller than ten children in both treatment and control groups. Karoly, Kilburn, and Cannon (2005, pp. 27–29) includes a more detailed discussion of the features of rigorous evaluations and threats to evaluation credibility.

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[1] We note one exception in which we were able to gather additional data from study authors. Independent, published analysis of the original HighScope Perry Preschool Project data determined that the intended randomized control trial (RCT) design was not implemented in a truly randomized fashion, with notable exceptions for some families (Heckman, Moon, et al., 2010). Given this further evidence, we determined that the originally published studies using that evaluation design did not meet our RCT inclusion criteria. In the subsequent independent reanalysis to statistically correct for the lack of true randomization, outcomes were published only for gender subgroups because of significantly stronger program impacts for boys than for girls. Results for the total sample population compared with those for the control group were not reported in Heckman, Moon, et al. (2010). However, the study authors provided us with their outcome estimates for the total sample, and we include these estimates in our analysis.

In the course of our review, we did not discover reanalyses of other early childhood programs that would suggest that earlier evaluations should be excluded because of design flaws. However, we acknowledge that some research designs in our analysis set are arguably weaker than others for establishing causality, either in terms of their intended design or in the execution of the design.

- The authors provided sufficient information on statistical significance tests to determine whether effects were statistically significant at the 5-percent level.
- The comparison group for the evaluation was a "usual care" group. For example, we excluded a study if its comparison group consisted of only modifications of the intervention itself, such as varying dosage.
- The treatment group for the intended program was distinctly identified in results and not pooled with participants in another program in the reporting of results.
- The reported results isolated the effects for children receiving the intervention prior to school entry (e.g., for children ages 0–5 rather than children ages 0–12).

We identified 115 programs and 205 unique evaluation cohorts across those programs that met our study inclusion criteria and for which we include at least one measured child outcome in our analysis. A program can have one evaluation study with one evaluation cohort or multiple evaluation studies across multiple cohorts. A program can have been evaluated at one point in time or longitudinally. (See Box 2.1 for definitions of key terms.) We include each evaluation cohort as long as it represents a unique set of children examined with respect to at least one child outcome that we include in our analysis.

Box 2.1
Definitions of Key Terms

program. The named intervention, policy, or program delivered and evaluated as a distinct intervention model. For the purposes of our analysis, we included a program with the same name but two or more distinctly different intervention strategies—such as the approach used or the intended program length—as two or more separate programs. For example, we include four Early Head Start "programs" in our analysis set (see Boxes 2.2–2.6) because evaluations have been conducted for four different models of the program depending on the use of ECE, home visiting, or both approaches. For each program, the published evaluation provides intervention information, such as who delivers the services, the targeted audience for service receipt, the expected dosage of services, and specified activities included in intervention delivery.

program approach. A primary strategy for program service delivery that is considered essential for the program model. This is the approach described in the corresponding evaluation studies included in this analysis. Sometimes, a program might use an approach but we do not include it in our study because it does not have an evaluation meeting our inclusion criteria.

evaluation cohort. A sample of participants under study representing a unique treatment and control group that are evaluated in relation to each other. The participants can be located across sites and include more than one group of treatment or control children, as long as they are evaluated together in a pooled group representing one treatment and one control group for analysis. If evaluators break out cohorts or sites for analysis, each is considered a unique evaluation cohort and abstracted separately. If evaluators present more than one treatment group compared with a usual care control group, we consider each treatment–control comparison to be a unique evaluation cohort. A single evaluation cohort can be studied at one point in time or longitudinally across publications.

evaluation study. An overarching evaluation of a program, which can consist of more than one evaluation cohort.

treatment group. A group within a given evaluation study that receives the program intervention services. This can also be called an *intervention arm* for the evaluation study.

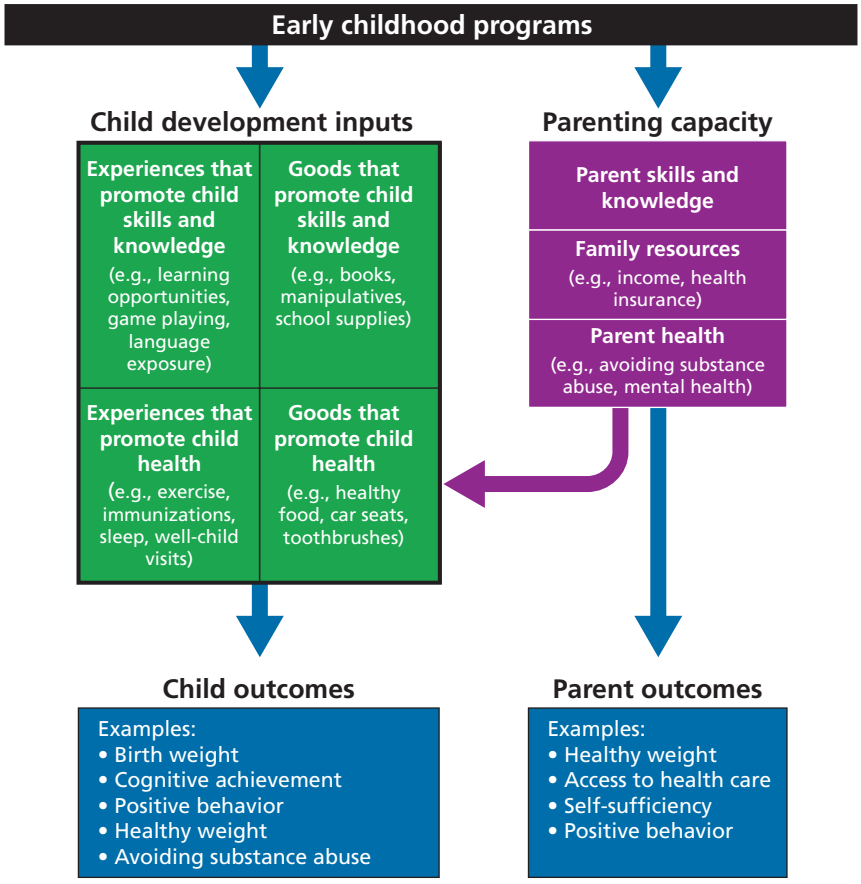
control group. A group within an evaluation study that receives no program intervention services and to which the treatment group is compared within an evaluation cohort. This can also be called a comparison group. The members of the control group typically receive usual care services that would be available in the absence of the intervention or otherwise do not overlap with program services under study.

outcome. A measured result representing the treatment effect reported for an evaluation cohort.

A Framework for Characterizing Early Childhood Programs

Early childhood programs generally share the ultimate goal of promoting children's outcomes, but their approaches for achieving this goal and the specific outcomes improved vary in a range of ways. In Figure 2.1, we present a framework that helps organize this variation, and then we use the framework to describe the programs in our study.

Figure 2.1
Framework for How Programs Can Influence Child Development



RAND *RR1993-2.1*

In the lower left corner of this framework, a blue box shows the ultimate goal, which is to promote child outcomes. The box lists some examples of outcomes, but there are many others—in fact, hundreds, as we describe later. Many early childhood programs also improve parent outcomes, as shown in the blue box in the lower right corner, but we assume that promoting parent outcomes is a secondary objective for most early childhood programs.

Inputs to child development are shown in the green boxes at the top of the framework. These are experiences and goods that contribute to the development processes that generate child outcomes, and this is shown by the heavy blue arrow that points from "Child development inputs" to "Child outcomes." We have divided the experiences and goods into two groups: those related to the development of child skills and knowledge and those related to child health. The literature sometimes refers to skills and knowledge as "human capital" (Kilburn and Karoly, 2008), and examples of this include children's noncognitive skills, such as the ability to follow directions, interact with other children appropriately, and control impulsivity (Heckman and Kautz, 2012). It also includes knowledge, such as vocabulary or letters and numbers.

By *experiences*, we mean an undertaking over a period of time that contributes to child development. That could include formal activities outside the child's home, such as spending time in a preschool classroom or receiving an exam at a well-child health visit, as well as structured activities at home with a parent or other caregiver, such as reading a book or engaging with puzzles. However, it also includes less formal experiences that promote child development, such as playing ball at a local park or joining a parent on a shopping trip at the farmer's market. Examples of experiences that promote the development of child skills and knowledge and child health are in the green boxes on the left side of the "Child development" segment of the figure.

It is recognized that goods also facilitate child development (Kilburn and Karoly, 2008; Rosenzweig and Schultz, 1983). Most of the experiences that contribute to child development require some level of resources or involve some physical items. Preschool is relatively expensive for many families, and a well-child health visit is affordable

for most families only when at least partially covered by some type of insurance. Even the examples of less formal experiences in the previous paragraph involve a toy, money for shopping, and some form of transportation to the park or farmer's market. Figure 2.1 includes goods that contribute to the development of child skills and knowledge and child health on the right side of the "Child development" segment of the figure.

Figure 2.1 indicates that there are two sources of child development inputs. The first is parenting capacity, and the purple arrow indicates that this is the primary driver of child development inputs. Parents make most of the decisions about what experiences and goods contribute to child development, and they control the resources devoted to child development, whether they involve family resources or securing outside resources to help with child development. Parents' skills and knowledge are a factor in these decisions and resources, and the relevant parents' skills and knowledge include both parenting-specific and general skills and knowledge. An example of the former is knowledge about early language and brain development, and an example of the latter is organizational skills that can help the parent create more-stable family routines or maintain the recommended well-child visit schedule. Underlying parenting capacity is parents' physical and mental health, which provides a foundation for parents being able to endure the emotional, cognitive, and physical demands that parenting presents. In addition to improving child outcomes via their contributions to child development inputs, the factors that enhance parenting capacity also improve parent outcomes, and this is shown by the blue arrow from "Parenting capacity" to "Parent outcomes."

A second source of child development inputs is early childhood programs, and this is shown by the top box in the figure. Early childhood programs improve child outcomes either by directly contributing to child development inputs, as shown by the top left blue arrow, or by promoting parenting capacity, as shown by the top right blue arrow. One of the major ways in which early childhood programs differ is whether they work directly with children to provide experiences and goods that will promote development or whether they focus

on improving a parent's ability to provide positive experiences and activities, as we demonstrate in the next section.

Not shown in this figure are many other potential actors who can contribute to child development. These include family members, such as grandparents; community organizations, such as faith-based organizations; and other resources ranging from libraries to parks. We recognize the value that these other people and community resources can bring to child development, but, because the focus of this report is on early childhood programs that typically target parents and children, we have omitted them from the figure for simplicity.

Although this framework is clearly a simple representation of a very complex process, it provides value by organizing the ways in which early childhood programs function to achieve their ultimate goal of improving child outcomes. For purposes of this report, the framework illustrates the following central features:

- Early childhood programs can contribute to child outcomes directly through child development inputs, by increasing parenting capacity, or both.
- Early childhood programs and parenting capacity can promote child development through both enriching activities and goods.
- Child development includes physical and mental health creation, as well as skill and knowledge building, and the latter includes both cognitive and behavioral and emotional components.
- Although not the primary goal of early childhood programs, those that increase parenting capacity can also improve parent outcomes.

As we apply this framework to characterize the approaches taken across the early childhood programs analyzed in this report, we acknowledge that some programs can deviate from the framework to some extent. Nevertheless, we believe that the framework captures the essential process for promoting child development for most early childhood programs.

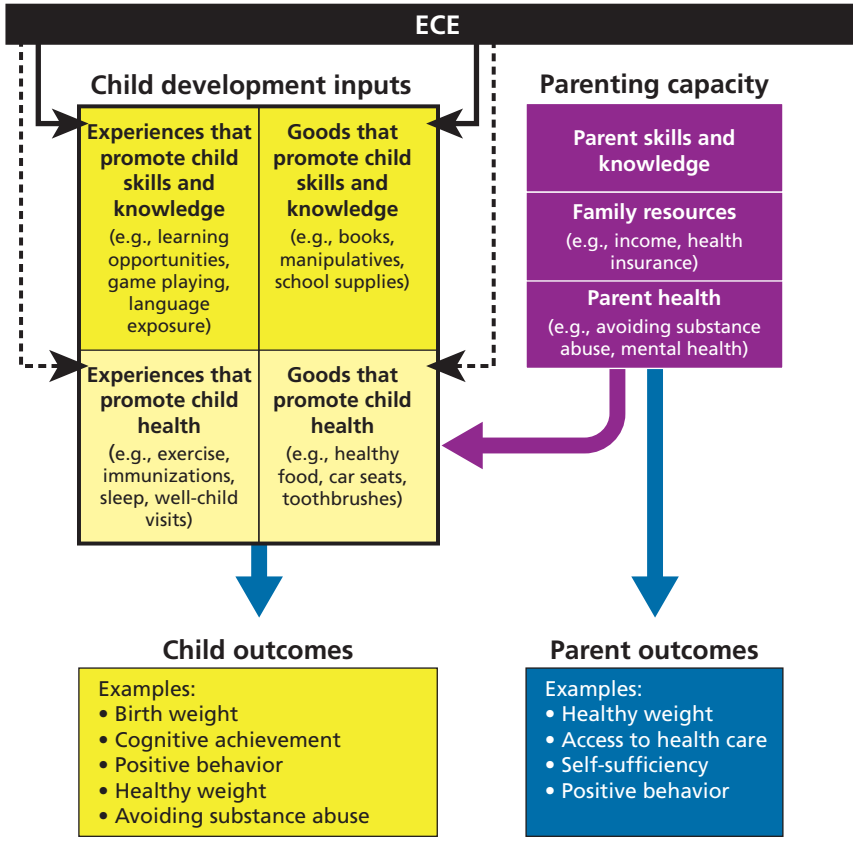
Applying the Framework to Characterize Early Childhood Programs

We now apply the framework as part of classifying early childhood programs into four main approaches: ECE, home visiting, parent education, and transfers. For each approach, we provide a general characterization of the approach and how it relates to the framework. These generalized descriptions are intended to capture a typical program, but not every program using a given approach will have exactly the same features. Further, as we see when classifying the 115 programs we review, these approaches can be used alone or in combination. Note that we use dark yellow shading in the inputs and outcomes boxes of the framework, as appropriate, to show the expected primary inputs and outcomes of the approach and light yellow to show expected secondary inputs and outcomes. We describe each of the four approaches in turn.

Early Care and Education

ECE programs typically deliver services to children in a group setting, such as center-based preschool or formal child play groups, intended for promoting child development. Although ECE programs generally focus on the child as the participant, they can also include services that aim to improve the quality of ECE settings (e.g., teacher training, healthy meal provision). ECE programs improve child outcomes primarily via child development inputs rather than parenting capacity. This is shown in Figure 2.2 by the solid black arrows from the "ECE" box to the experiences and goods components of the "Child development inputs" (shaded dark yellow). These programs typically engage children in learning activities and experiences that promote children's skills and knowledge and, in doing so, also employ goods, such as books and art materials, that are designed to enhance skills and knowledge. Many ECE programs can also engage in activities that promote child health, as shown in Figure 2.2 by the dotted black lines from the "ECE" box to the lower components of "Child development inputs" (shaded light yellow). Changing these child development inputs is then expected to have a direct effect on child outcomes (also shaded dark yellow). These

Figure 2.2
Framework for Early Care and Education Programs



NOTE: Dark yellow shading in the input and outcome boxes of the framework shows expected primary inputs and outcomes of the approach. Light yellow shading indicates the expected secondary inputs and outcomes of the approach.

RAND *RR1993-2.2*

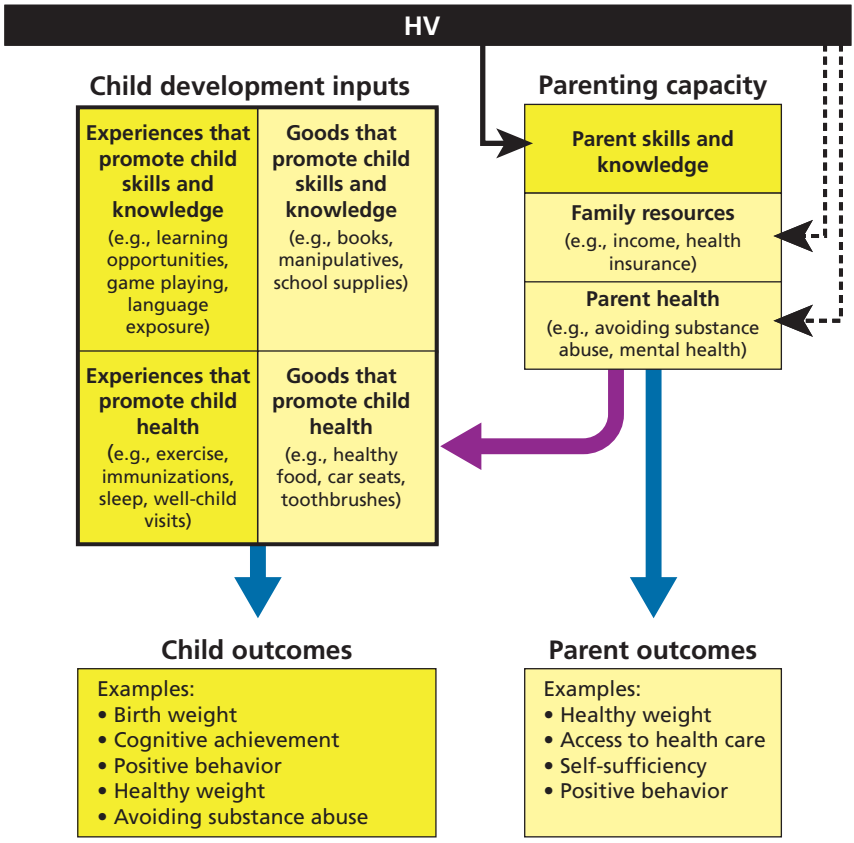
activities can include vision and hearing screening, ensuring that the children get exercise, or other health-promoting activities.

Home Visiting

Home visiting programs provide individualized services to parents and, in some cases, children in a home-based setting. Services are often

provided by a health care or social service professional. Home visiting programs improve child outcomes primarily via promoting the parent skills and knowledge component of parenting capacity, as shown in Figure 2.3 by the solid black arrow from the "HV" box. These programs typically emphasize developing parents' skills and knowledge related to child development so that parents will engage in more activi-

Figure 2.3
Framework for Home Visiting Programs



NOTE: Dark yellow shading in the input and outcome boxes of the framework shows expected primary inputs and outcomes of the approach. Light yellow shading indicates the expected secondary inputs and outcomes of the approach.

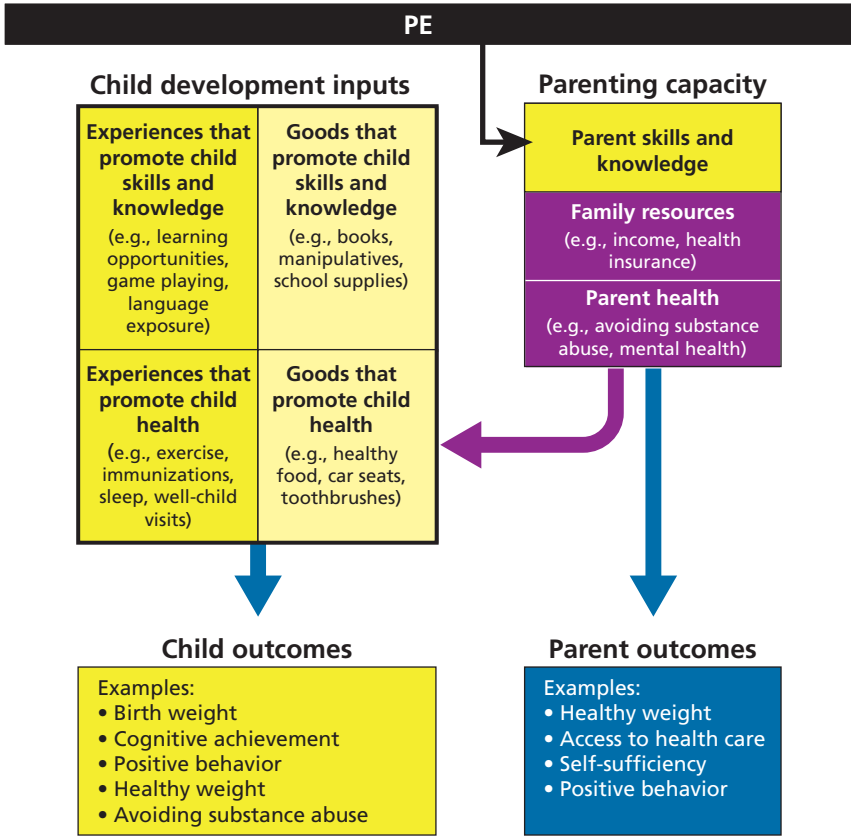
RAND *RR1993-2.3*

ties that enhance child development, such as learning or language activities or well-child visits. However, home visiting programs often also facilitate families' acquisition of additional resources and improve parental health, as shown by the dotted black arrows in Figure 2.3. For instance, these programs often include referrals to community services to address specific family needs identified during visits and follow-up on service receipt. Additional resources would promote child development through the provision of goods, such as additional books in the home or improved nutrition, or by increasing family resources as a result of helping families gain access to income supports, formal education, or job training. Home visiting programs can also increase parenting capacity through parental health components, such as screening parents for mental health, substance use, or other conditions and referring them to appropriate treatment. This can boost parent outcomes, as well as parenting capacity. Home visiting programs represent a varied set of content and supports that are intended to address child and parent needs within a family's home and personal context. They typically, though not always, focus on a broader set of supports and parenting capacities than parent education programs, which often have a narrower focus (compare Figure 2.3 and Figure 2.4).

Parent Education

Parent education programs deliver a set of services to parents in a non–home-based setting to improve the quality of parenting behaviors. Services can often be offered by social service professionals through parent group meetings or individual interactions. Similar to home visiting programs, non–home-based parent education programs improve child outcomes primarily via the parent skills and knowledge component of parenting capacity, as shown in Figure 2.4 by the solid black arrow from the "PE" box. These programs typically promote parenting skills and knowledge so that parents' provision of experiences and goods facilitates child development. Unlike home visiting programs, parent education programs typically do not focus on other parenting capacity components or boost parent outcomes. These programs most often focus on parenting skills in relation to promoting child health and development rather than broader supports for the family.

Figure 2.4
Framework for Parent Education Programs



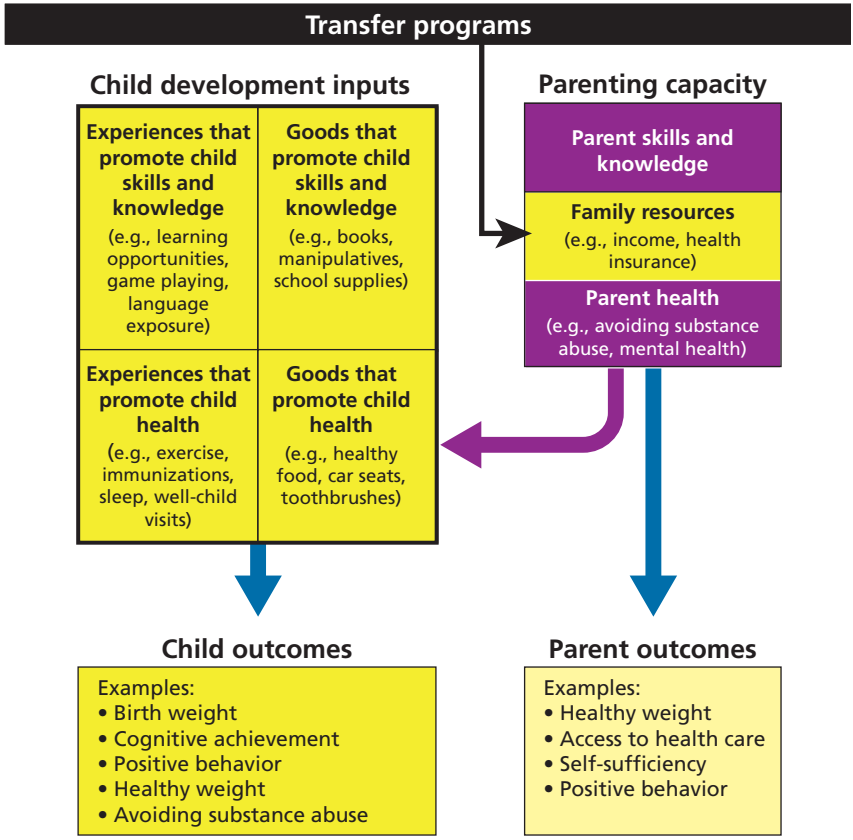
NOTE: Dark yellow shading in the input and outcome boxes of the framework shows expected primary inputs and outcomes of the approach. Light yellow shading indicates the expected secondary inputs and outcomes of the approach.

RAND *RR1993-2.4*

Transfers

Transfer programs provide cash or in-kind benefits, such as vouchers for food or nutrition, child care, housing, or health care, directly to families for their benefit. Transfer programs improve child outcomes primarily via increasing family resources, as shown in Figure 2.5 by the solid black arrow from the "Transfer programs" box to the family

Figure 2.5
Framework for Transfer Programs



NOTE: Dark yellow shading in the input and outcome boxes of the framework shows expected primary inputs and outcomes of the approach. Light yellow shading indicates the expected secondary inputs and outcomes of the approach.

RAND *RR1993-2.5*

resources component of parenting capacity. These programs typically seek to improve child outcomes by facilitating families' acquisition of goods, such as learning materials or meals, that promote child skills, knowledge, or health, and families can also purchase activities, such as ECE or pediatric visits, that promote child development. Increasing

family resources also can promote parent outcomes, such as access to health care, in addition to child outcomes.

Approaches That Early Childhood Programs with Rigorous Evaluations Use

We classified each of the 115 identified programs into one or more of the four program approaches and found that about three-fourths (78 percent) of the programs use a single primary approach to services and the remaining one-quarter (22 percent) use two or more approaches together, to which we refer as combination approaches. Boxes 2.2 through 2.9 provide a complete list of programs by approach category. (See Appendix B for brief descriptions of each program and citations for the evaluation studies we abstracted.) We note that our categorization and other program details described in this chapter are based on information provided in the evaluation studies we referenced and might not reflect all approaches used by programs in current operation if they have been expanded or modified.

ECE, home visiting, and parent education represent the vast majority of the single-program approaches. Furthermore, the programs using a combination of more than one approach most often include either ECE or home visiting. Transfer programs are not offered in combination with another approach. Figure 2.6 illustrates the relative size and overlap among program approaches in our analysis set.

In these 115 programs, we identified 205 evaluation cohorts that had been studied using a research design meeting our criteria. Table 2.1 shows the representation of these evaluation cohorts across program approaches. We also examined how many programs had more than one evaluation cohort (Figure 2.7). The majority of programs in our analysis (72) have single evaluation cohorts.

Box 2.2
Programs Included in Our Study That Use Primarily Early Care and Education

Breakthrough to Literacy
Building Blocks
Building Early Language and Literacy (BELL)
Carolina Abecedarian Project
Chicago School Readiness Project (CSRP)
Child and Adult Care Food Program (CACFP)
Childhaven Therapeutic Child Care
Children Get a Head Start on the Road to Good Nutrition
Curiosity Corner
DaisyQuest
Doors to Discovery
Early Childhood Education and Assistance Program (ECEAP)
Early Childhood Friendship Project
Early Head Start (center based)
Foundations of Learning
Head Start
Head Start REDI (Research Based, Developmentally Informed) Program
Headsprout Early Reading
Hip-Hop to Health Jr.
I Can Problem Solve
Incredible Years (teachers)
Interpersonal Skills Program
Learning Language and Loving It: The Hanen Program for Early Childhood Educators
Let's Begin with the Letter People
Literacy Express
Nutrition and Physical Activity Self-Assessment for Child Care (NAP-SACC)
Oklahoma Pre-K
Project STAR (Sit Together and Read)
Promoting Alternative Thinking Strategies (PATHS) for Preschool
Reaching Educators, Children, and Parents (RECAP)
Ready, Set, Leap!
Ready to Learn
Story Talk: Interactive Book Reading Program
Tools of the Mind
Waterford Early Reading Level One

Box 2.3
Programs Included in Our Study That Use Primarily Home Visiting

Active Parenting
Attachment and Biobehavioral Catch-Up (ABC)
Chicago Doula Project
Child First
Child Health Supervision
Child Parent Enrichment Project (CPEP)
Childhood Asthma Prevention Study (CAPS)
Circle of Security
Durham Connects
Early Head Start (home based)
Family Check-Up (FCU)
Family Spirit
Family Thriving Program
Hawaii's Healthy Start
Healthy Families Alaska
Healthy Families New York (HFNY)
Healthy Families Oregon
Healthy Start
Minding the Baby
MOM Program
Nurse–Family Partnership (NFP)
Parent–Child Assistance Program
Parent–Child Home Program
Play and Learning Strategies (PALS); PALS for infants only (PALS I); PALS for toddlers only (PALS II); PALS for both infants and toddlers (PALS I and II)
Project CARE (Carolina Approach to Responsive Education) without ECE
Promoting First Relationships
REST (Reassurance, Empathy, Support, and Time-Out) Routine
SafeCare Augmented (SafeCare+)

NOTE: NFP was formerly Prenatal/Early Infancy Home Visitation by Nurses. The Parent–Child Home Program was formerly the Mother–Child Home Program.

Box 2.4
Programs Included in Our Study That Use Primarily Parent Education

CenteringPregnancy
Chicago Parent Program (CPP)
Creating Opportunities for Parent Empowerment (COPE)
DARE (Decision-Making, Assertiveness, Responsibility, Esteem) to Be You (DTBY)
Family Foundations
FluText
Helping the Noncompliant Child
Incredible Years (parents)
Legacy for Children to age 3
Legacy for Children to age 5
My Baby U
Newborn Individualized Developmental Care and Assessment Program (NIDCAP)
Parent–Child Interaction Therapy (PCIT)
Reach Out and Read
Safe Environment for Every Kid (SEEK)
STAR (Stop, Think, Ask, and Respond) Parenting Program
Toddler–Parent Psychotherapy
Video Interaction Project

NOTE: Parent education is provided in a non–home-based setting. The Chicago Parent Program is sometimes also called the Chicago Parenting Program.

Box 2.5
Programs Included in Our Study That Use Primarily Transfer

Child Care and Development Fund (CCDF)
Child Development Accounts (CDAs) through SEED for Oklahoma Kids (SEED OK)
Earned-income tax credit (EITC)
Medicaid
Smart Start
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
State Children's Health Insurance Program (SCHIP)

Box 2.6
Programs Included in Our Study That Use a Combination of Early Care and Education and Home Visiting

Comprehensive Child Development Program (CCDP)
Early Head Start (mixed home and center based)
Early Head Start (national study including all approaches)
Early Training Project
HighScope Perry Preschool Project
Project CARE (Carolina Approach to Responsive Education)

Box 2.7
Programs Included in Our Study That Use a Combination of Early Care and Education and Parent Education

Chicago Child–Parent Center (CPC)
Even Start
Incredible Years for parents and teachers
Kids in Transition to School
Making Choices and Strong Families
Parent Child Development Center (PCDC) in Birmingham, Alabama
PCDC in Detroit, Michigan
PCDC in New Orleans, Louisiana
ParentCorps

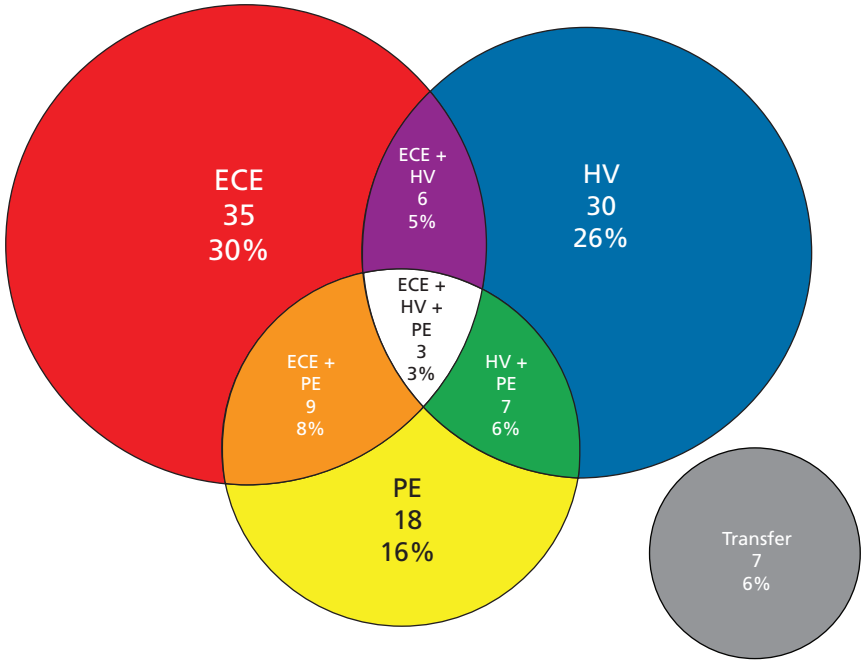
Box 2.8
Programs Included in Our Study That Use a Combination of Home Visiting and Parent Education

Early Intervention Program (EIP) for Adolescent Mothers
Healthy Steps for Young Children
Home Instruction for Parents of Preschool Youngsters (HIPPY)
Mother–Infant Transaction Program
Parents as Teachers (PAT)
Pride in Parenting (PIP)
University of California, Los Angeles (UCLA) Family Development Project

Box 2.9
Programs Included in Our Study That Use a Combination of Early Care and Education, Home Visiting, and Parent Education

Incredible Years (parents, augmented)
Infant Health and Development Program (IHDP)
PCDC in Houston, Texas

Figure 2.6
Proportional Representation of Number of Programs, by Approach



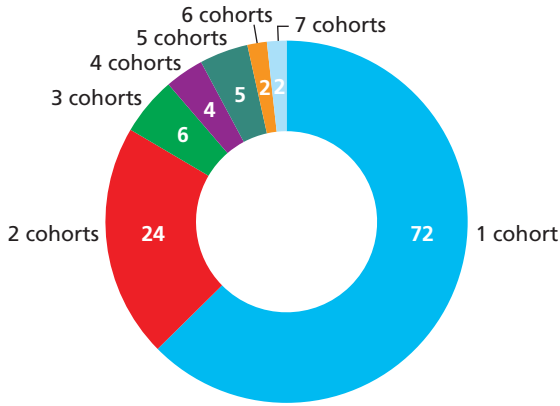
RAND *RR1993-2.6*

Table 2.1
Number of Programs and Evaluation Cohorts Included in Our Analysis

	Programs		Evaluation Cohorts	
Program Approach	**Number**	**Percentage of All Programs**	**Number**	**Percentage of All Cohorts**
Single primary approach				
ECE	35	30	66	32
HV	30	26	48	23
PE	18	16	33	16
Transfer	7	6	21	10
Combination approach				
ECE + HV	6	5	7	3
ECE + PE	9	8	15	7
HV + PE	7	6	11	5
ECE + HV + PE	3	3	4	2
Total	115	100	205	100

NOTE: Percentages might not sum to 100 percent because of rounding.

Figure 2.7
Number of Programs, by Number of Evaluation Cohorts



NOTE: Sample consists of 115 programs.
RAND *RR1993-2.7*

Other Key Dimensions of Early Childhood Programs with Rigorous Evaluations

In addition to the differences across approaches that the framework captures for promoting child development, we use several other dimensions to describe variation across early childhood programs, and these are listed in Table 2.2. As shown, programs can vary by the people targeted for services, the age of the child at time of intervention, intensity and reach of the program, where the services are provided, and activities and outcomes for either the child or parent (see Karoly, Kilburn, and Cannon, 2005, for further explication of these dimensions). Now that we have described the early childhood approaches, we describe variation in across several of these other dimensions in the programs in our study.

Targeted Participants

Children and parents are the primary intended intervention participants across the 115 programs in our analysis, as might be expected.

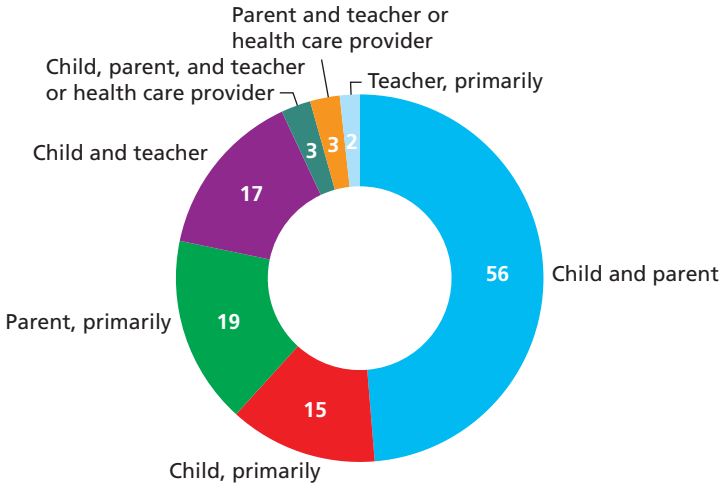
Table 2.2
Key Dimensions of Early Childhood Programs

Dimension	Examples	
Focal person	Child, parent, child–parent dyad, family unit	
Level of service provision	Individual, small or large group	
Targeting mechanism	Low-income families, child health problems, parental problems, universal	
Age of child during the program	Prenatal to age 5, shorter and longer intervals	
Intensity of intervention	Starting to ending age, hours per week, weeks per year	
Program reach	National, multistate, statewide, regional or local setting	
Location of services	Home, center or school, other provider	
Activity	Child: Provide health inputs, improve human capital (i.e., skills, knowledge, behavior)	Parent: Improve parenting skills and knowledge, increase family resources, promote general human capital (e.g., planning skills, interpersonal skills), improve parent health
Outcomes targeted	Child: Health, cognitive development, behavioral development	Parent: Health, parenting skills, self-sufficiency

Almost four in five programs have the child, the parent or caregiver, or both groups as the intended participants (Figure 2.8). At the same time, several programs also target teachers and health care providers as part of the intervention.

Across programs, there is variation in the level at which services were provided, ranging from a one-on-one individualized focus with participants (i.e., child, parent, or child–parent dyad) to a group focus (Figure 2.9). Serving participants individually or in a group setting can have implications for program costs. More than half (65) of the programs provide at least some services at the individual level, and another 42 provide primarily group-level services to participants. We do not assign a service level to eight programs for which one would not be applicable (i.e., all seven transfer programs and one ECE program that targets child care centers for funding passed through to recipients).

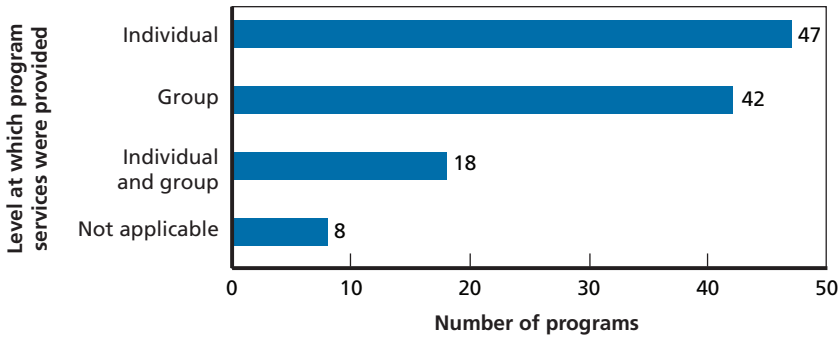
Figure 2.8
Number of Programs, by Intended Participant



NOTE: Sample consists of 115 programs. Parent categories can also include caregivers, such as foster parents or guardians.

RAND *RR1993-2.8*

Figure 2.9
Level of Program Service Provision

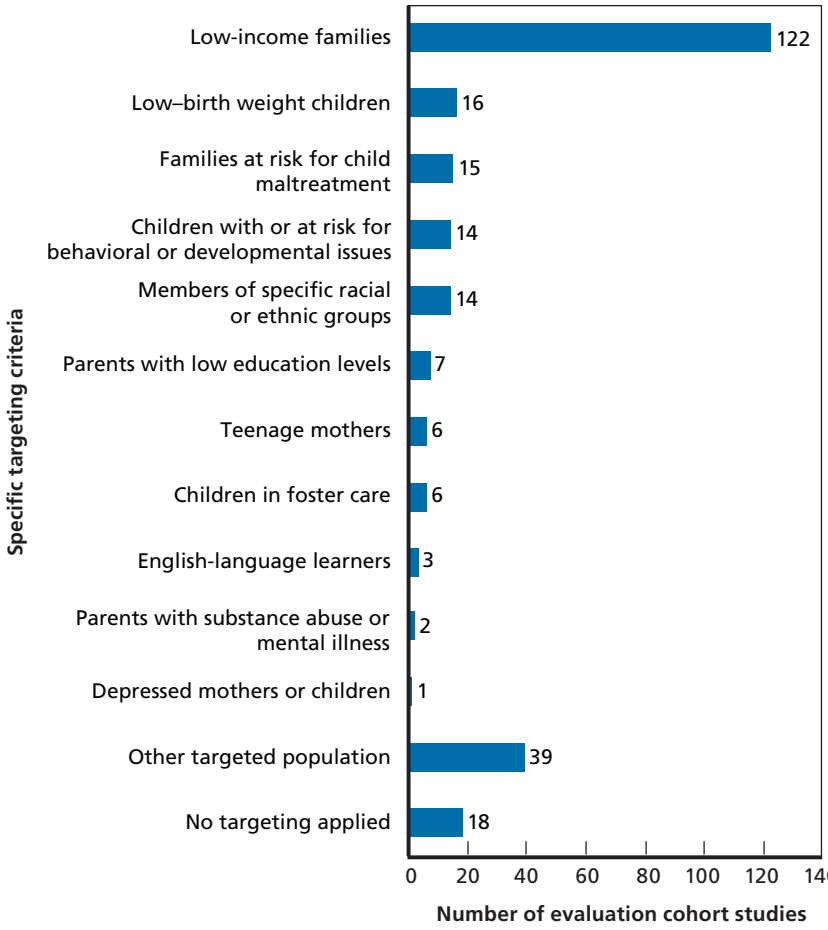


NOTE: Sample consists of 115 programs.

RAND *RR1993–2.9*

Most evaluation studies across the 205 evaluation cohorts we examined targeted a specific child or family characteristic to determine whom the intervention program will serve. That is, most programs in our analysis set are not considered universally applied programs as evaluated. We note that, for this discussion, we are reporting on the evaluation cohort level—this is a more relevant discussion than the program level because some programs could have more than one evaluation cohort and could specifically test different targeting criteria as part of evidence building. That said, it is notable that 122 (60 percent) of evaluation cohorts targeted low-income children and families (Figure 2.10). This can include targeting specific families by income status, as well as providing interventions within settings, such as Head Start, that serve low-income families. Several evaluation cohorts targeted children with low birth weight or who were considered at risk for behavioral or developmental issues, families considered to be at risk for child maltreatment, or specific racial or ethnic groups (from 14 to 16 cohorts each). Only 18 of the 205 evaluation cohorts had no specific child or family targeting criteria.

Figure 2.10
Number of Evaluation Cohorts Targeting Specific Criteria



NOTE: Sample consists of 205 evaluation cohorts. The total exceeds 205 because a cohort can have more than one targeting criterion.

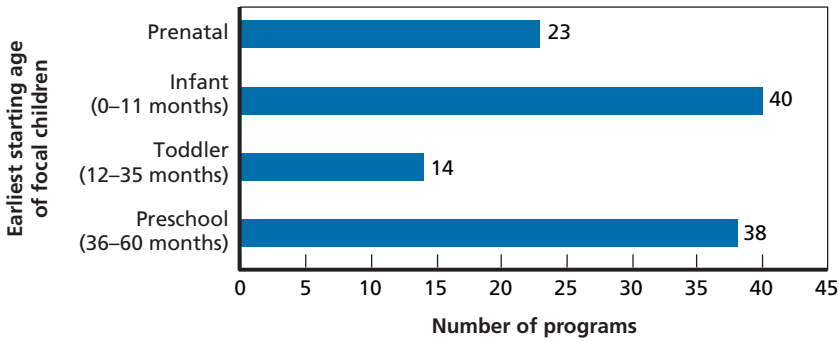
RAND *RR1993–2.10*

Youngest Age of the Focal Child at the Start of the Intervention

We categorized the youngest age of the focal children reported across evaluation cohorts to determine the earliest starting age within each program. However, we note that some programs enroll children at older ages, so this does not reflect the full range of potential starting

ages for intervention participants.[2] Figure 2.11 demonstrates variation across youngest starting age groups within our set of programs, with the majority of programs including focal children starting the intervention as infants or preschoolers. These age group patterns are loosely associated with the program approach used. For example, we see in Table 2.3 that the preschool starting age group is associated primarily with ECE programs, which make up many preschool interventions. Likewise, programs with home visiting approaches, which often target prenatal to age 3, are associated with the prenatal and infant age groups.

Figure 2.11
Earliest Starting Age Within a Program's Evaluation Cohorts



NOTE: Sample consists of 115 programs.
RAND *RR1993–2.11*

[2] Programs can enroll children at younger ages in other program implementation scenarios beyond the evaluation study we include here (e.g., enrolling prenatally instead of at six months like in the evaluation).

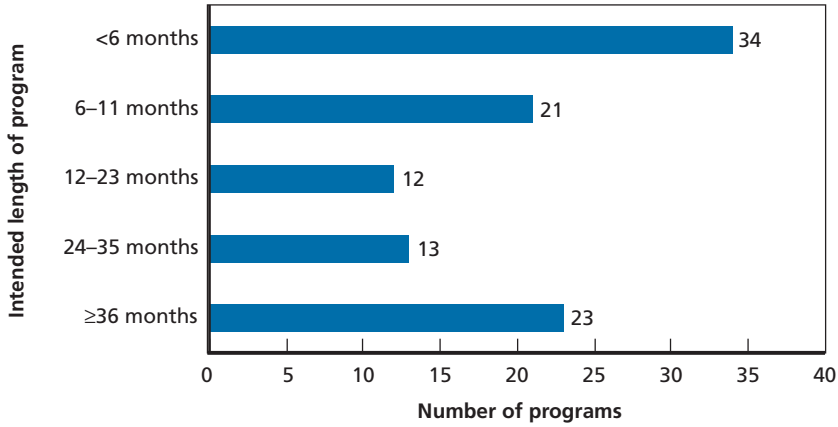
Table 2.3
Earliest Starting Age, by Program Approach

Program Approach	Prenatal	Infant	Toddler	Preschool
Single primary program approach				
ECE	1	3	1	30
HV	9	17	4	0
PE	4	8	5	1
Transfer	3	4	0	0
Combination of program approaches				
ECE + HV	3	1	0	2
ECE + PE	0	3	2	4
HV + PE	3	3	0	1
ECE + HV + PE	0	1	2	0
Total programs	23	40	14	38

Intended Program Intervention Length

We also examined the length of time programs in our analysis set were intended to provide services for participants and found variation across programs, with some clustering at the lower and higher levels. More than half of the programs (55) for which we could determine a specified intended program length provided intervention services for less than one year (Figure 2.12). Another 23 programs intended to provide services for three or more years. Of the longer-term programs, 16 of the 23 used a home visiting approach alone or in combination with another approach (Table 2.4). The majority of evaluated programs using a single ECE primary approach were intended to intervene for less than one year.

Figure 2.12
Intended Length of Program Services, in Months



NOTE: Sample consists of 103 programs. We exclude six programs because they are transfer programs with no specified length of services; three programs have varied lengths, depending on family situation; and three programs did not report sufficient information to determine intended length.

RAND *RR1993–2.12*

Table 2.4
Intended Length of Program Services, by Approach

Program Approach	Intended Length, in Months					Total
	<6	6–11	12–23	24–35	≥36	
Single primary program approach						
ECE	11	16	2	2	2	33
HV	9	2	3	4	10	28
PE	9	2	2	1	2	16
Transfer	0	0	0	0	1	1
Combination of program approaches						
ECE + HV	0	0	1	0	5	6
ECE + PE	4	0	1	4	0	9
HV + PE	1	1	2	1	2	7
ECE + HV + PE	0	0	1	1	1	3
Total programs	34	21	12	13	23	103

NOTE: Sample consists of 103 programs. We excluded six programs because they are transfer programs with no specified length of services; three programs have varied lengths depending on family situation; and three programs did not report sufficient information to determine intended length.

Key Features of the Evaluations for Identified Programs

Across the 115 programs, we identified 205 unique evaluation cohorts and report information in this section by program based on a summary of evaluation cohort information within a program. As mentioned earlier, a program can have been evaluated in more than one study and using more than one evaluation cohort. Cohorts can have been studied at one point in time or longitudinally. For each of our descriptive analyses, we note whether we are discussing individual evaluation cohorts or summary information at the program level across evaluation cohorts.

Evaluation Cohort Decade

The timing of when an intervention is studied can relate to such factors as what the typical counterfactual is expected to be or which child outcome measures were in common use or available at the time. For example, in the 1960s, an evaluation of an ECE program might have had a counterfactual of no ECE for comparison group children, but, by the 2000s, many preschool-age children were participating in some type of ECE program. Thus, the counterfactual for an ECE intervention evaluated starting in 2000 might look different from one with an evaluation starting in 1970. Additionally, programs that were implemented in earlier years are the most likely to have had longitudinal evaluations with estimates of the effects on participants' outcomes in adolescence and adulthood.

With this in mind, we examine the timing of our set of evaluation cohorts and programs based on the decade when each identified evaluation cohort first entered the intervention study. For instance, if the first children or families to enroll in an intervention and its associated evaluation study began receiving services in 1975, we would consider that evaluation cohort and the program to have an effective "evaluation cohort decade" of 1970. This holds even if the participants are followed longitudinally—we attribute the decade to the entry time point. Some programs can have multiple evaluation cohorts studied in different decades, so a program can be "counted" in more than one decade, depending on the timing of different evaluation cohorts that are studied for the same program.

Table 2.5 presents the number of programs and evaluation cohorts, by evaluation cohort decade. We note that we have fewer programs and cohorts in the first and last decades in our range. The latter is a result of the timing of our data collection. We gathered information on studies published through 2015, and we recognize that many programs that are under way starting in the 2010 decade have not published evaluation results yet, and others might start evaluation studies later in the decade.

Table 2.5
Number of Programs and Evaluation Cohorts, by Decade of Cohort Entry into the Evaluation Study

Decade Enrolled	Programs	Evaluation Cohorts
1960s	4	6
1970s	13	24
1980s	12	18
1990s	40	62
2000s	63	87
2010s	6	8
Total	138	205

NOTE: A program can have been evaluated in more than one cohort entering in more than one decade, so the program total exceeds 115. Evaluation cohorts that are studied longitudinally are counted only once and attributed to the starting decade for entry into the intervention.

Research Design

Almost all (105 of 115) programs we identified employed an RCT design with at least one evaluation cohort. Four in five (166 of 205) evaluation cohorts overall were studied in an RCT. Of the ten programs evaluated with solely quasi-experimental designs, three used a single ECE approach, one is a program combining ECE with parent education, and six are transfer programs.[3] Only one of the transfer programs in our analysis set employed an RCT. This is typically because the transfer programs we examined are available for all eligible recipients, which makes an RCT more challenging to implement. Instead, quasi-experimental designs can exploit variation at the time a transfer program began, in the timing of the program rollout across geographic areas, or in eligibility when a program expands. These so-called natural experiments often rely on large administrative data sets to study the

[3] The ten programs are Chicago CPC, CACFP, CCDP, ECEAP, EITC, Oklahoma Pre-K, Medicaid, Smart Start, SCHIP, and WIC.

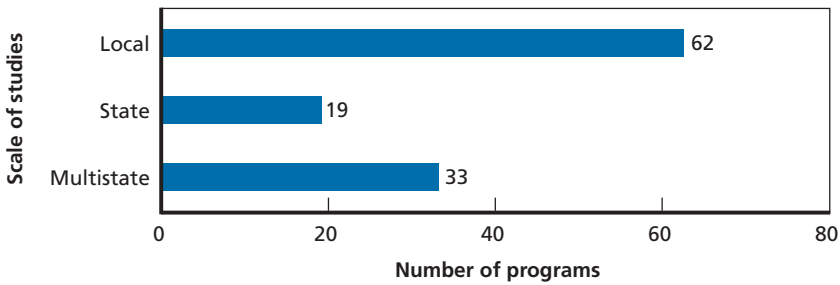
outcomes of the transfer program. (The resulting differences by scale and sample sizes for these evaluations are noted next.)

Scale of Evaluation Cohort Studies

The majority of the evaluation cohorts we identified have been studied at a local level, including a single city or region within a state. When examining the largest evaluation cohort scale within a program, we determined that 62 programs have been evaluated solely on a local scale (Figure 2.13). We note that this is based on the evaluations we identified for our analysis and does not necessarily reflect the scale of a program's implementation in practice. That is, a program can be noted here as having a local evaluation scale yet be operating currently across the United States. We examined two other scale levels: state, including more than one city or region within a single state, and multistate or national, including evaluation cohorts in two or more states. Almost one-third (33) of programs have been evaluated with participants in more than one state, either within a single large-scale evaluation study or in two or more evaluation cohorts in different states.

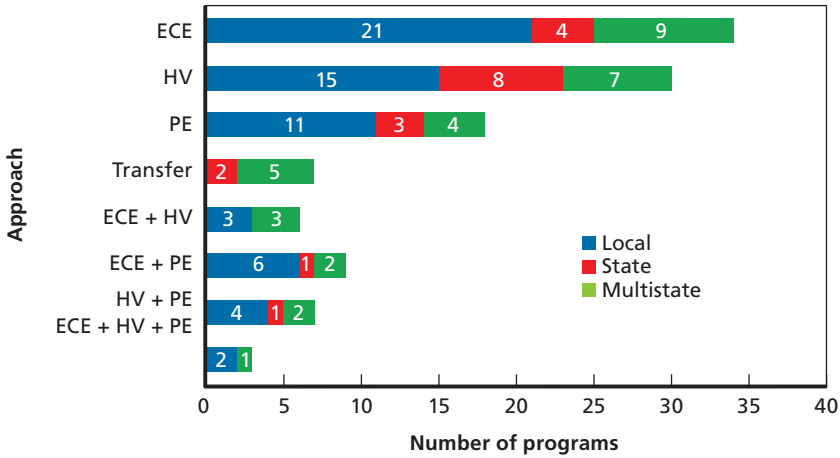
Figure 2.14 shows how program scale breaks out by program approach. Programs that use primarily ECE, home visiting, or transfer approaches have more evaluations conducted in more than one state than the other approaches do. However, all approaches have at least one program evaluated in more than one state.

Figure 2.13
Number of Programs, by Largest Scale of Evaluation Cohort Studies



NOTE: Sample size is 114 programs. Information was not available for one program.
RAND *RR1993–2.13*

Figure 2.14
Program Evaluation Scale, by Approach



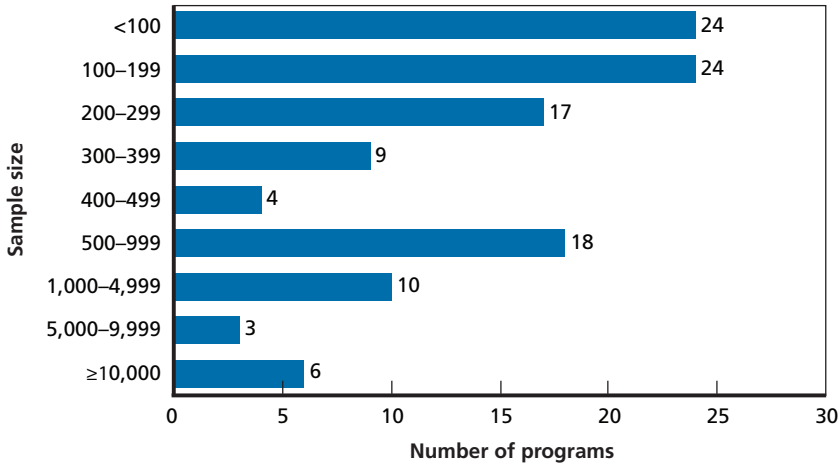
NOTE: Sample size is 114 programs. Information was not available for one program.
RAND *RR1993–2.14*

Sample Size

We find that the evaluation cohorts in our analysis set tended to have relatively small sample sizes, with a few notable exceptions. For each of the 115 programs, we determined the program's largest evaluation cohort (total of treatment and control) at the first measured time point, to which we refer as *maximum cohort size*.[4] Figure 2.15 presents the distribution of programs across sample size categories and shows that more than half (57 percent) of all programs have a maximum cohort size of fewer than 300. The median maximum cohort size across programs is 244, yet the mean maximum cohort size is 107,987. This can be explained by the fact that the programs categorized as transfer programs have disproportionately large samples (Table 2.6). These transfer

[4] In the few cases in which sizes for the first measured time point were not provided, we relied on the initial total sample size for the evaluation cohort. However, this can bias upward, to some degree, the total sample sizes because initial sizes are generally larger than the first measured time point because of attrition before measurement. We could not determine sizes for four evaluation cohorts using this method, and we do not include them in these analyses.

Figure 2.15
Number of Programs, by Maximum Evaluation Cohort Sample Size



NOTE: Sample size is 115 programs.

RAND *RR1993–2.15*

program evaluation studies tend to rely on larger administrative data sets than the other programs in our analysis set. When we exclude the seven transfer programs from the calculation, the mean maximum cohort size is 830. In addition to transfer programs, we see in Table 2.6 that the programs using an ECE or parent education single primary approach and that the programs using a combination of ECE and home visiting have larger mean sample sizes than the other approaches.

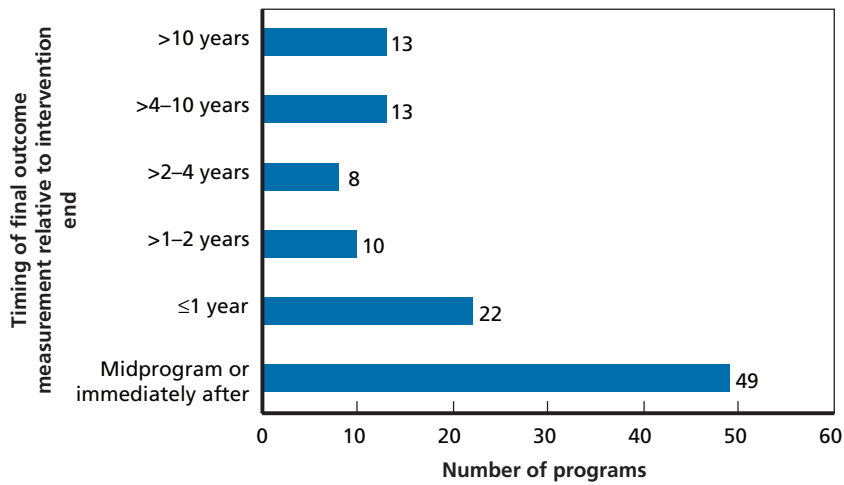
Table 2.6
Number of Programs, by Maximum Cohort Size and Program Approach

Maximum Sample Size Within the Program	Single Primary Program Approach				Combination of Program Approaches			
	ECE	HV	PE	Transfer	ECE + HV	ECE + PE	HV + PE	ECE + HV + PE
<100	5	8	4	0	2	2	2	1
100–199	5	9	3	0	1	3	3	0
200–299	6	4	6	0	0	0	0	1
300–399	5	1	1	0	0	1	1	0
400–499	3	0	0	0	0	1	0	0
500–999	6	7	2	0	1	1	0	1
1,000–4,999	4	1	0	1	2	1	1	0
5,000–9,999	0	0	2	1	0	0	0	0
≥10,000	1	0	0	5	0	0	0	0
Total programs	35	30	18	7	6	9	7	3
Mean sample size	1,382	312	977	1,761,265	1,073	420	410	417
Minimum sample size	35	40	26	2,228	38	37	64	99
Maximum sample size	29,726	1,173	7,574	8,762,018	2,948	1,531	1,987	908

Longitudinal Follow-Up

More than half (66 of 115) of the programs in our analysis measured at least one child outcome past the immediate end of the program (Figure 2.16). Of those, 26 measured at least one child outcome more than four years after the program ended, including 13 that measured outcomes more than ten years after the program. Longitudinal follow-up is necessary to measure certain medium- or long-term outcomes program participation can affect, such as school performance, substance use, and adult outcomes, which can also inform BCAs. As we document in Chapter Four, monetary benefits attributed to early childhood programs are often due to outcomes measured more than ten years after the program ended. However, among the 115 programs included in this review, only 13 measured outcomes for this long horizon. Table 2.7 indicates that programs primarily using an ECE or home visiting approach are more likely to have the longest follow-up in our analysis.

Figure 2.16
Number of Programs with Longitudinal Follow-Up of One or More Evaluation Cohorts



NOTE: Sample size is 115 programs.

RAND *RR1993–2.16*

Table 2.7
Number of Programs with Longitudinal Follow-Up, by Program Approach

	Single Primary Program Approach				Combination of Program Approaches			
Timing of Final Outcome	ECE	HV	PE	Transfer	ECE + HV	ECE + PE	HV + PE	ECE + HV + PE
>10 years	3	3	0	1	3	2	0	1
>4–10 years	2	4	2	1	1	1	1	1
>2–4 years	1	4	0	2	0	0	1	0
>1–2 years	3	1	3	1	0	1	0	1
≤1 year	6	6	3	0	0	3	4	0
Midprogram or immediately after	20	12	10	2	2	2	1	0
Total programs	35	30	18	7	6	9	7	3

Summary of Included Programs

Our search identified 115 programs that met our inclusion criteria for rigorously evaluated early childhood programs, and, for the majority of these programs, we include only one evaluation cohort in our analysis. For the included programs, we characterized four common approaches to improving child development: ECE, home visiting, parent education in a non–home-based setting, and transfers. These approaches are most commonly used alone but can also be used in combination. Most of the identified programs used an ECE or home visiting approach alone or in combination with another approach.

The programs we include vary on several key dimensions:

- *focal participant:* Most programs target the child, the parent or caregiver, or both as the intended participants.
- *universal or targeted:* Most programs are not universally applied programs as evaluated; being a low-income family is the most common criterion for identifying intervention participants.
- *age of child at start:* The majority of programs include focal children who start the intervention as either infants or preschoolers. These age group patterns are loosely associated with the program approach used (e.g., home visiting or ECE).
- *length in years:* Most commonly, programs intended to provide the intervention services for less than one year (often the case with ECE programs), but 23 programs intended to provide services for three or more years (most often the case with home visiting programs).

We also characterized the key features of the specific evaluation cohort studies we include in our analysis:

- *decade:* Evaluation cohorts began receiving program services from the 1960s to the 2010s, and most of those we analyzed participated in the program in the 1990s and 2000s.
- *research design:* Almost every program had at least one RCT study.
- *model versus scaled-up version:* Evaluation studies were most commonly model demonstrations conducted at the local level rather

than a multistate or national scale. Transfer programs are an exception, with larger-scale studies the norm within those seven identified programs.

- *sample size:* Sample sizes tended to be small in the included studies. More than half of all programs had maximum cohort sizes of fewer than 300, and the median size across programs was 244. Again, transfer programs are an exception and have large samples because of the use of administrative data sets.
- *length of follow-up:* Most programs do not evaluate child outcomes in the longer term. About one-fifth of identified programs measured at least one child outcome more than four years after the program ended, including 13 programs that measured outcomes more than ten years after the interventions ended.

Chapter Three presents further details on the specific outcomes that are measured across the evaluation cohort studies and the magnitude of selected child health effects.

CHAPTER THREE

Which Outcomes Did the Programs Improve?

Chapter Two described the 115 early childhood programs included in our analysis. In this chapter, we summarize the findings from evaluations of these programs with a focus on child outcomes. We extracted information on the child outcomes reported in the evaluations regardless of whether the effect of the intervention was favorable, null (meaning no statistically significant difference between participants and nonparticipants for the outcome being measured), or unfavorable, and we describe our extraction methods in Appendix A.

This chapter reports on three aspects of the outcomes reported for these programs:

- Which outcomes did the evaluations measure?
- Did the programs improve the outcomes?
- What were the magnitudes of the outcome effects for a subset of the child health outcomes, and do the effects vary by program approach or other characteristics?

The remainder of this chapter examines each of these questions in turn.

Which Outcomes Did the Evaluations Measure?

Evaluations of the 115 programs reported the effects of the programs for 3,183 outcomes. The measures used to characterize the outcomes were highly diverse, so we created 45 outcome domain categories within 11 broad domains to characterize the outcomes evaluated. In Table 3.1,

Table 3.1
Broad Domains and Categories Used to Classify Outcomes

Outcome Domain	Outcome Category Included in Domain
Behavior and emotion	Internalizing behaviors, externalizing behaviors, social skills or attachment, general behavior or emotion
Cognitive achievement	Assessments: language or literacy; math; other subjects, not general; general, IQ, or mental indices; executive function or self-regulation, other cognitive measures
Child health	Birth outcomes, BMI or weight gain, access to health care, ED visits and hospitalizations, injury and safety, nutrition and physical activity, dental care, general health status or rating, substance use, sexual health and pregnancy, timely immunizations, well-child visits, physical health in adulthood, other health outcomes
Developmental delay	Developmental delay, including mental development, physical development, and general developmental status
Child welfare	Official reports of maltreatment, parent or child self-reported abuse or neglect, other
Crime	Justice system involvement, parent or child self-reported criminal activity, other
Educational attainment	School attendance, school engagement, grade retention, special education, school performance, years of completed schooling, high school graduation, college enrollment, college graduation, other
Employment and earnings in adulthood	Employment and earnings
Family formation in adulthood	Family formation
Use of social services in adulthood	Use of social services
Composite measures	Composite measures, including outcomes from a broad range of outcome categories

NOTE: IQ = intelligence quotient. BMI = body-mass index. ED = emergency department.

we detail these domains and categories. The broad domains approximate those used in Karoly, Kilburn, and Cannon (2005) to classify program impacts, and we created the categories to capture subgroups

within the broad domains that had a sizable number of programs evaluating an outcome domain.

Although the domain categories we used to classify the intervention outcomes are somewhat subjective, their patterns are nevertheless instructive (Table 3.2). The most–frequently reported type of outcomes are those in the behavior and emotion domain (933 outcomes), followed by those in the cognitive achievement domain (833 outcomes). Child health is the third most–often reported type of outcome (679 outcomes), and these three domains together account for more than three-quarters (77 percent) of all the outcomes in our data. Table 3.3 further details the distribution of categories within these three domains. Language and literacy assessments are most often measured, followed by general behavior and emotion and social skills and attachment outcomes. See Table C.1 in Appendix C for the number and percentage values in all 45 outcome categories.

Table 3.2
Distribution of Outcomes by Outcome Domain

Broad Outcome Domain	Number of Outcomes	Percentage of All Outcomes Reported in Studies
Behavior and emotion	933	29.3
Cognitive achievement	833	26.2
Child health	679	21.3
Developmental delay	237	7.5
Educational attainment	211	6.6
Child welfare	132	4.1
Crime	89	2.8
Employment and earnings in adulthood	30	0.9
Family formation in adulthood	14	0.4
Use of social services in adulthood	13	0.4
Composite measures (multiple domains)	12	0.4
Total	3,183	100.0

Table 3.3
Distribution of Outcomes, by Category, Within the Three Largest Domains

Domain Category	Number of Values	Percentage of Values Reported for All Studies
Behavior and emotion	933	29.3
General behavior or emotion	356	11.2
Social skills or attachment	270	8.5
Externalizing behaviors	199	6.3
Internalizing behaviors	108	3.4
Cognitive achievement	833	26.2
Assessments: language or literacy	413	13.0
Executive function	151	4.8
Assessments: general, IQ, or mental indices	144	4.5
Assessments: math	118	3.7
Other cognitive measures	4	0.1
Assessments: other subjects, not general	3	0.1
Child health	679	21.3
Birth outcomes	106	3.3
Other child health	94	3.0
Nutrition and physical activity	89	2.8
ED visits and hospitalizations	67	2.1
BMI or weight gain	62	2.0
Access to health care	45	1.4
Timely immunizations	44	1.4
General health status	42	1.3
Injury and safety	40	1.3
Substance use	35	1.1
Well-child visits	25	0.8

Table 3.3—Continued

Domain Category	Number of Values	Percentage of Values Reported for All Studies
Dental care	15	0.5
Sexual health and pregnancy	13	0.4
Physical health in adulthood	2	0.1

NOTE: Percentages are based on the total number of outcomes (*N* = 3,183).

We find a similar pattern among the most-reported outcome domains when examining the number of programs with at least one evaluation reporting a particular outcome (Table 3.4). The outcome domain that program evaluations were most likely to report is cognitive achievement, with 77 of the 115 programs (67 percent) reporting values in this outcome domain. This is closely followed by the behavior and emotion domain, for which 71 programs (62 percent) reported outcomes. Almost half of programs reported outcomes in the child health domain, and just under a third of programs reported outcomes in the developmental delay domain. It is notable that such a small number of programs evaluated the outcomes that are collected only in adulthood: Only four programs contributed outcomes in the domains of employment and earnings, and only three programs reported outcomes in the domains of family formation and use of social services. We return to this issue in the next section, when we present information on the long-term costs and benefits of early intervention programs.

Although there are commonalities in the outcome domains and categories that evaluations measured, there is little standardization in the measures used in most domains and categories. Exceptions are in some of the physical health categories, such as low birth weight and cutoff values of BMI used to define obesity and overweight. Furthermore, even in cases in which some measures are used often—such as Bayley scales to measure developmental delays—there appears to be a lack of consensus on the most-appropriate measures to employ or the adoption of an "industry standard" in terms of measures for particular outcome constructs. There are ongoing attempts to identify uniform measures in such domains as behavior and emotion (e.g., Jones,

Table 3.4
Number and Percentage of Programs That Reported Outcomes in Each Outcome Domain

Outcome Domain	Number of Programs That Reported Outcomes in That Outcome Domain	Percentage of Programs That Reported Outcomes in That Outcome Domain
Behavior and emotion	71	62
Cognitive achievement	77	67
Child health	57	50
Developmental delay	36	31
Educational attainment	26	23
Child welfare	13	11
Crime	9	8
Employment and earnings in adulthood	5	4
Family formation in adulthood	3	3
Use of social services in adulthood	3	3
Composite measures (multiple domains)	4	3

NOTE: Items in the "Number of Programs" column are not mutually exclusive: A program can report outcomes in more than one domain. So the sum of values in the column exceeds 115, but the maximum number in any given cell would be 115. The second column indicates how many of the 115 programs reported an outcome in this domain.

Crowley, and Greenberg, 2017; Organisation for Economic Co-operation and Development, 2015), and this is an activity that would facilitate the comparison of effects across programs.

The outcome domains that program evaluations reported vary by program approach, reflecting the differences in the objectives of the programs. Table 3.5 shows the outcome domains reported for the program approaches in which the program employed primarily one approach—that is, not a combination of approaches—and all combination approaches are contained in the "Combination" column. ECE

Table 3.5
Percentage of Outcomes Reported in Each Outcome Domain, by Program Approach

	Primary Program Approach					
Outcome Domain	ECE	HV	PE	Transfer Programs	Combination	All Programs
Behavior and emotion	28	32	32	6	31	29
Cognitive achievement	39	18	12	11	27	26
Child health	20	21	24	63	15	21
Developmental delay	2	4	29	3	7	7
Educational attainment	5	5	1	16	10	7
Child welfare	0	15	3	0	2	4
Crime	3	3	0	0	3	3
Adult outcomes[a]	1	1	0	0	3	2
Composite measures (multiple domains)	1	0	0	0	0	0

[a] Includes earnings and employment, family formation, and use of social services.

programs were much more likely to report outcomes in the cognitive achievement domain than the other program approaches, which is in keeping with the general focus of these programs on school readiness skills. About 39 percent of the outcomes reported for ECE programs are in the cognitive achievement domain.

Home visiting programs are notable in that 15 percent of home visiting program outcomes are in the child welfare domain, but few child welfare outcomes are reported in studies of the other primary program approaches.

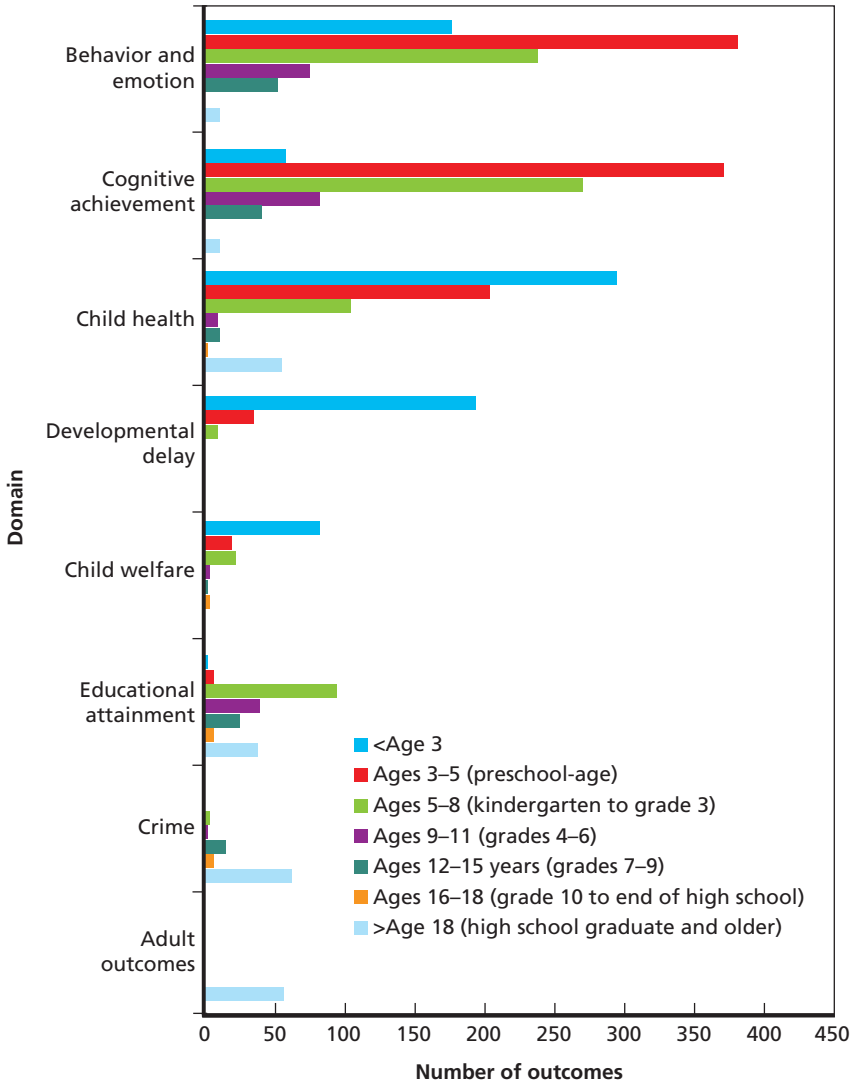
Parent education program outcomes are skewed toward the behavior and emotion and developmental delay domains, with 32 and 29 per-

cent of the outcomes in these domains, respectively. Nearly another quarter of parent education program outcomes are in the child health domain, with other domains having lower representation. Transfer programs have the most–highly concentrated outcomes in one domain out of all the program approaches. Nearly two-thirds (63 percent) of transfer programs' outcomes are in the child health domain. Transfer programs are also the most likely to measure educational attainment, with about one in six reported outcomes being in this domain.

Finally, although they are low in percentage terms, we observe that ECE programs and home visiting programs measure outcomes in the crime and adult outcome domains, but none of the transfer programs or parent education programs measures outcomes in these domains. The distribution of the specific combination approaches is similar to the patterns one would expect based on that of the primary approaches in Table 3.5.

We observe some clear patterns in terms of which outcomes the evaluations of early childhood programs captured over the life cycle, and these are shown in Figure 3.1. Not surprisingly, more than half of the outcomes were collected before the study subjects turned five years old or entered kindergarten. Because some children turn five years old before they enter kindergarten, we consider "preschool age" to be roughly three and four years old, but it can also include five-year-olds. Kindergarten students are generally age 5. In our reporting, we distinguish whether outcomes were measured for children when they are "preschool age" and thus before school entry. Additionally, among the outcomes collected before children entered kindergarten, 82 percent are in the broad domains of health, cognitive achievement, and behavior, with most of the remaining outcomes being in the developmental delay and child welfare domains. As children entered kindergarten and then progressed in school, the outcomes continued to include those in the behavior domain about a third of the time, and outcomes in the cognitive domain were also still measured more than a quarter of the time. Educational attainment measures were most common early in elementary school and declined in prevalence as children reached higher grades. However, outcomes in the developmental delay and health domains declined in prevalence as children aged.

Figure 3.1
Number of Outcomes Measured in Each Outcome Domain, by Age at Measurement



RAND *RR1993–3.1*

At the same time, outcomes capturing criminal activity or interaction with the criminal justice system were collected with greater frequency

for ages 12 and higher. Although it is true that several types of outcomes were observed only in adulthood—employment and earnings, family formation, and use of social services—it is still the case that health and crime are among the most–frequently measured outcomes in adulthood (over age 18). Figure 3.1 presents the number of outcomes reported in each domain by the age of measurement. In Tables 3.6 and 3.7, we present the percentage of *programs* that measured any outcomes

Table 3.6
Percentage of Programs That Reported Outcomes, by Outcome Category and Age: From Birth to Age 11

Outcome Category	<Age 3 (105 programs)	Ages 3–5 (preschool) (147 programs)	Ages 5–8 (K–grade 3) (99 programs)	Ages 9–11 (grades 4–6) (40 programs)
Behavior and emotion	23.5	40.9	24.3	6.1
Cognitive achievement	15.7	46.1	28.7	11.3
Child health	25.2	20.0	9.6	6.1
Crime	0.0	0.0	2.6	0.9
Child welfare	7.0	5.2	2.6	0.9
Developmental delay	19.1	13.0	4.3	0.0
Educational attainment	0.9	2.6	14.8	7.0
Employment and earnings in adulthood	0.0	0.0	0.0	0.0
Family formation in adulthood	0.0	0.0	0.0	0.0
Use of social services in adulthood	0.0	0.0	0.0	0.0

NOTE: Each cell reports the percentage of the 115 programs that reported outcomes in that outcome category and age group. The number of programs at the top of each column is the number of programs that reported outcomes in that age category. The educational attainment measures for children under age 3 relate to special education placement or plans.

within a domain, by age group, and the patterns observed in these tables are similar to those in Figure 3.1.

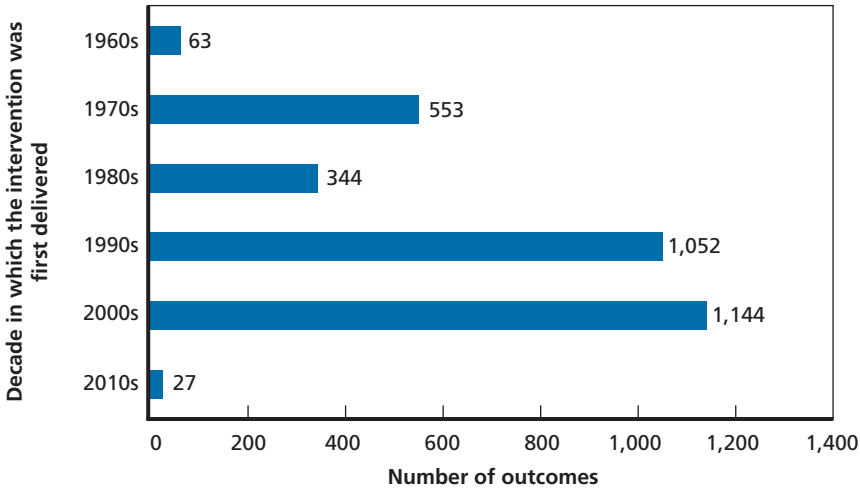
The programs that contributed information to this study spanned the 1960s to the 2010s (see Chapter Two). As displayed in Figure 3.2, more than two-thirds of the outcomes in our analysis are from programs that served children and families in the 1990s and 2000s.

Table 3.7
Percentage of Programs That Reported Outcomes, by Outcome Category and Age: Age 12 and Up

Outcome Category	Ages 12–15 (grades 7–9) (24 programs)	Ages 16–18 (grade 10–end of high school) (7 programs)	Ages 18–25 (24 programs)	>Age 25 (14 programs)
Behavior and emotion	2.6	0.0	1.7	0.9
Cognitive achievement	9.6	0.0	0.9	0.0
Child health	1.7	0.9	3.5	2.6
Crime	1.7	0.9	2.6	2.6
Child welfare	0.9	0.9	0.0	0.0
Developmental delay	0.0	0.0	0.0	0.0
Educational attainment	4.3	2.6	5.2	2.6
Employment and earnings in adulthood	0.0	0.0	3.5	2.6
Family formation in adulthood	0.0	0.0	1.7	1.7
Use of social services in adulthood	0.0	0.0	1.7	1.7

NOTE: Each cell reports the percentage of the 115 programs that reported outcomes in that outcome category and age group. The number of programs at the top of each column is the number of programs that reported outcomes in that age category. The educational attainment measures for children under age 3 relate to special education placement or plans.

Figure 3.2
Number of Outcomes, by Decade in Which the Intervention Was First Delivered



RAND *RR1993–3.2*

Programs that served participants in the 2010s contribute only 27 outcomes to our analysis, primarily because we capture evaluations published through November 2016, and there is a lag between when participants would enter the program, participants would be served, outcomes would be observed, and findings would be published.

Outcomes measured when the participants were older are necessarily from the programs in the earlier decades, and we will have to wait to learn the long-term outcomes from more-recent programs. This is illustrated by comparing the distribution of outcomes across decades for outcomes measured before children enter school and outcomes measured at age 18 or older. Of the 1,823 outcomes measured before children enter kindergarten, less than 16 percent are from programs delivered before the 1990s. For outcomes measured when children are 18 or older, all but two of the 235 outcomes were from programs delivered before the 1990s.

The patterns described in this section reflect several features of the set of evaluations in our data set:

- The most-common outcomes are straightforward to collect and analyze, such as parent-reported or researcher-collected measures. The outcomes are unlikely to include biological samples, measures that require a long time to collect (e.g., calories consumed in a day) or special training to collect (e.g., anthropometrics) or are burdensome on families (e.g., time diaries).
- The outcomes tend to reflect the developmental objectives of most early childhood interventions. That is, they aim to promote healthy child development, which is conceptualized as a comprehensive array that includes behavioral, cognitive, and health outcomes. Furthermore, the outcomes reported by programs using the various approaches, such as ECE or home visiting, mirror the objectives of those types of programs.
- The reported outcomes are those that display variation across children and are modifiable by interventions. For example, although child mortality and children being in good health might be among the most-important outcomes, child mortality is rare, and most children are healthy. This implies that there will be little variation in measures of these outcomes in all but the largest data sets, and few interventions modify these outcomes enough to detect effects.

In the next section, we examine whether the programs improved the outcomes we have just described.

Do the Interventions Improve These Outcomes?

We coded the values of the 3,183 outcomes as being favorable, null, or unfavorable. To be coded as favorable or unfavorable, an estimated effect had to be statistically significant at the 0.05 level (5-percent level). By *favorable*, we mean outcomes that improve child well-being; by *unfavorable*, we mean outcomes that reduce child well-being. For example, if an intervention was shown to increase BMI, we would

code this as an unfavorable effect, even though the measured indicator was higher for the treatment group than for the control or comparison group.

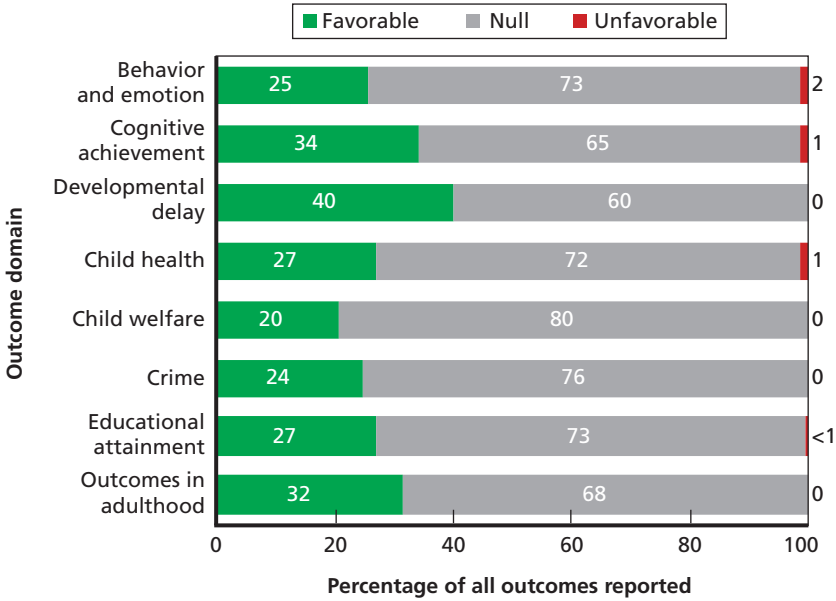
We observed that 34 of the outcomes were unfavorable, which represents about 1 percent of all measured outcomes. Finding that only 1 percent is unfavorable can reflect *publication bias*, or the tendency for researchers to report only favorable findings and for favorable findings being more likely to be published if reported. However, it could also indicate that the early childhood programs included in this report are unlikely to do harm to participants.

Out of the 3,183 outcomes in our data set, 923 (29 percent) of these were favorable. This is a much larger percentage than one would expect from chance using a 5-percent significance level. In sum, about one in three of the measured outcomes were favorable and about two in three were null. Figure 3.3 shows the distribution of unfavorable, null, and favorable values by broad outcome domain. Cognitive and developmental delay domains show a somewhat larger percentage of favorable outcomes than the other domains do.

In Table 3.8, we show the percentage unfavorable, null, and favorable for the outcome categories measured more often. As reported earlier, 29 percent of measured values in our sample were favorable. The results in Table 3.8 show that the outcome categories measured most often are not necessarily those that are most likely to have favorable results—these categories are about equal in terms of being more likely and less likely to have more-favorable results than the sample average. Early childhood programs were more likely to improve the assessments, developmental delay, and birth outcomes, whereas the measures of behavioral outcomes had lower percentages of favorable values.

The domain categories that had the lowest incidence of favorable outcomes were adult physical health outcomes (0 percent favorable), self-reported criminal activity (0 percent favorable), and sexual health and pregnancy (7 percent favorable). However, note that adults' physical outcomes and self-reported criminal activity were rarely measured, and, in fact, outcomes in adulthood were favorable at a rate close to that of all the measured values. It is noteworthy that the outcomes decades after the program ended are favorable at a rate similar to

Figure 3.3
Favorable, Null, and Unfavorable Distribution of Outcomes, by Broad Outcome Domain



NOTE: Percentages are based on the total number of outcomes within domains, as noted in Table 3.2.

RAND *RR1993-3.3*

those of the outcomes closer to the time the program ended. There has been a lot of discussion about "fade-out" of effects of early childhood programs (Barnett, 2011), and it could be the case that outcomes affected by behavioral changes exhibit "sleeper effects" that lead them to strengthen rather than weaken over time (Kumkale and Albarracín, 2004).

Another way to characterize the tendency for early childhood programs to improve outcomes is to count the number of programs that yield no favorable effects in any outcome domain. Out of the 115 programs in our set, 13 improved no child outcome. Note that a few of these programs did not have promoting child outcomes as their primary objective, nor did they measure many child outcomes, so it would not be surprising if they did not improve any outcomes we

Table 3.8
Distribution of Values for the Most–Frequently Measured Outcome Categories

Outcome Category	Total Number of Times Measured	Percentage of Outcomes with a Given Result Type		
		Unfavorable	Null	Favorable
Assessments: language or literacy	412	1	64	35
General behavior or emotion	356	1	76	23
Social skills or attachment	270	3	69	29
Developmental delay	237	0	60	40
Externalizing behaviors	199	2	73	25
Executive function or self-regulation	151	1	75	25
Assessments: general, IQ, or mental indices	144	0	57	43
Assessments: math	118	3	65	32
Internalizing behaviors	108	1	74	25
Birth outcomes	106	3	57	41

examined. A related issue is that programs often emphasize a particular aspect of child development—such as school readiness or nutrition—so it might be the case that they improve the outcomes aligned with their objectives but not outcomes beyond the focus of their programs. It is beyond the scope of this study to consult the curricula or manuals for all programs included in the analysis in order to assess the correspondence between outcomes improved and program objectives.

In sum, the early childhood programs included in this study improve reported outcomes nearly 30 percent of the time. This might be considered low for a set of interventions that are often held up in public health and social sciences as among those with the strongest evidence base (Heckman, 2013). The set of programs in this study includes a diverse range of approaches across more than half a century. Hence, finding that six in 20 outcomes were improved when using a significance level for which one would expect that one in 20 outcomes were improved implies that early childhood programs in general are effective more than could be due simply to chance. Although improving outcomes is one component of being deemed "effective," decisionmakers also care about the magnitude of the improvements associated with early childhood programs. We turn to this issue in the next section.

What Is the Size of the Improvements in the Outcomes?

We just reported the frequency with which outcomes from rigorously evaluated early childhood programs in our analysis reported favorable, null, or unfavorable findings. Overall, evaluations reported that early childhood programs improved about three in ten outcomes. In addition to caring about whether or not early interventions improve outcomes, decisionmakers care about the magnitude of those improvements. In this section, we first summarize the findings from previous meta-analyses of early childhood program evaluation that have been conducted since 2005, examine child outcomes, and use methods similar to those used in this analysis. Then, we estimate the size of the improvements in outcomes in three child health categories.

Effect Sizes

We summarize the magnitudes of the impacts of early childhood programs by calculating effect sizes. An effect size is a way to express effects comparably for outcomes that use different measures or have different sample sizes. For example, effect sizes would facilitate the comparison of a reduction in the rate of low birth weight from one study to the BMIs in another study. We calculate the most common effect size,

known as *Cohen's d*, and this creates a standardized effect of the treatment. For an RCT, this is calculated by dividing the effect (the difference between the outcomes for the treatment and control groups) by the standard deviation of the treatment and control groups combined. In this way, the mean effect is standardized by a measure of the spread of the outcome (Lipsey and Wilson, 2001). An effect size of 0.50 indicates that the treatment group mean was 0.50 standard deviations above the control group mean. Whether an effect size is large or small is subjective; however, the Cohen (1988) designation of an effect size of 0.20 as "small," 0.50 as "medium," and 0.80 as "large" is widely cited.

Although the effect size calculation standardizes the mean effects by a measure of the spread for each outcome, the effect sizes from different studies might still not be strictly comparable because of other considerations. For instance, some outcomes are more amenable to change than others, making it more likely that a larger effect size is calculated for interventions measuring that outcome. Another example is that, over time, the baseline might have changed, so the differences between the control and treatment groups can change over time. Despite these caveats related to effect size measurement, it is nevertheless instructive to estimate effect sizes to assess such questions as whether early childhood interventions can meaningfully improve outcomes in particular domains and whether some features of early childhood interventions are associated with large effect sizes.

Previous studies have estimated the relative size of early childhood intervention effects by using meta-analysis to combine effect sizes across program evaluations. Most of these examine either ECE or home visiting programs, rather than the full spectrum of early childhood programs covered in this report. Moreover, most meta-analyses of early childhood programs have focused on cognitive achievement or behavior and emotion outcome domains. As described earlier, our previous research estimated the magnitude of the effects that early childhood programs can have on cognitive and achievement scores and included ECE, home visiting, and parent education programs (Karoly, Kilburn, and Cannon, 2005). This analysis found that nine combination programs—ECE combined with either home visiting or parent education—yielded a mean effect size of 0.325 (p-value of 0.001) for

cognitive assessments at school entry and that six programs that were either home visiting alone or parent education alone had a mean effect size of 0.212 (p-value of 0.041) on the same outcome. Two more-recent studies have conducted meta-analyses for preschool programs. Camilli et al. (2010) reports a significant mean effect size of 0.231 for cognitive outcomes and 0.156 for social–emotional outcomes. This study also estimated an effect size of 0.137 for school progression outcomes. Duncan and Magnuson (2013) reports a significant effect size of 0.21 for cognitive and achievement scores.

Another recent meta-analysis (Filene et al., 2013) estimated effect sizes for home visiting programs. That study examined four types of child outcomes: birth outcomes, cognitive outcomes, physical health, and child maltreatment. Only the estimate of 0.25 for cognitive outcomes was significantly different from 0. A meta-analysis of parent education programs for expectant parents or parents of children younger than six months of age (Pinquart and Teubert, 2010) found pooled effect sizes of similar magnitudes, but this study included some interventions from outside the United States, so it might not be directly comparable to the other studies we cite here. The authors estimated statistically significant pooled effects for cognitive development, motor development, social development, and mental health both right at the end of the program and at longer-term follow-ups, and all effect sizes were between 0.12 and 0.35. Although the studies summarized here have different inclusion criteria from those in our study, they illustrate that the estimated pooled effect sizes for early childhood interventions have been in the 0.1-to-0.4 range, with most estimates being between 0.2 and 0.3, and the outcomes examined most often have been in the behavior and emotion and cognitive achievement domains.

As documented in Table 3.2, the most-measured outcome domains in the studies we examine are behavior and emotion (29 percent of studies), cognitive achievement (26 percent of studies), and child health (21 percent of studies). We add to the literature on the size of impacts from early childhood programs by conducting meta-analysis and metaregression on outcomes in the child health domain, which has been the subject of meta-analysis less often. We estimate the size of impacts for three outcome categories in the child health domain: birth

outcomes, BMI, and substance use. We selected this subset because these categories included a relatively large number of outcomes and studies with measures reported in common metrics, included at least five programs that measured the outcomes, and spanned early childhood to adult outcomes. Another important reason we selected these three for analysis is that they are measures of child health outcomes per se rather than some of the other categories in the child health domain, which were measures of child health inputs, such as ED visits and hospitalizations, timely immunizations, and child access to health care.

In addition to presenting the effect size estimates for each study we included across the three health outcome categories, we conduct meta-analysis to summarize the effect size of the interventions in our study by combining the effect sizes from each study into a "pooled" estimate for all the outcomes in the category. This approach creates a summary statistic that weights each study according to its sample size, so that studies that have larger sample sizes contribute more to the pooled effect size. We used the random-effect model in the Comprehensive Meta-Analysis Version 3.0 (CMA) software package to calculate the pooled effect sizes (Borenstein et al., undated). Appendix A provides more details regarding our estimation of effect sizes, and Appendix C reports the effect size estimated for each study and for each subcategory within outcome category.

In Figure 3.4, we show the effect size for each study with a birth outcome and the pooled effect size for all birth outcomes. For each estimate, the box in the figure indicates the estimated effect size and the lines from the box show the 95-percent confidence interval for the estimate. Next to the vertical axis, we indicate the program approaches for each study.

These plots show that there is considerable variation in the effect size estimate across studies and that the majority of the studies have an effect size confidence interval that includes 0, meaning that we cannot say with certainty that the program improves birth outcomes. Many transfer programs have no confidence interval in the figure, and that is because they have very small confidence intervals, so they are not visible in the figure. The first effect size in the figure, which is shaded, is the pooled effect size for birth outcomes across all the programs.

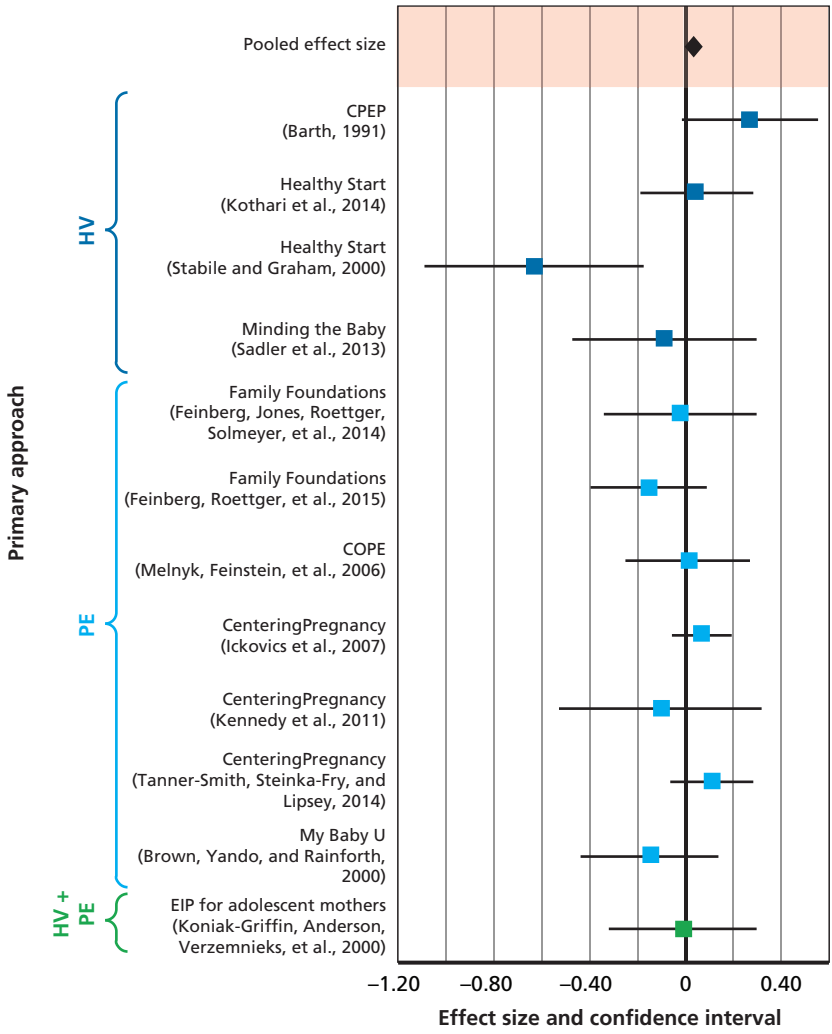
Although the birth outcome effect size estimate is greater than 0, the size of the estimate is relatively small—about 0.03.

This small effect is in line with other recent meta-analyses that have found little effect of lifestyle and other interventions during pregnancy on pregnancy outcomes (Oteng-Ntim et al., 2012; Thangaratinam et al., 2012). Exceptions have been a meta-analysis of studies of smoking-cessation interventions for pregnant women conducted in the mid-1990s (Dolan-Mullen, Ramírez, and Groff, 1994) and a meta-analysis that found higher birth weights due to multimicronutrient supplementation (Shah and Ohlsson, 2009). Another meta-analysis that estimated improvements in birth weight and gestational age found that birth intervals greater than 18 months were associated with better outcomes (Conde-Agudelo, Rosas-Bermúdez, and Kafury-Goeta, 2006).

For the BMI and substance use outcome categories, we also present the effect size estimates for individual studies and the pooled estimates as shown in Figures 3.5 and 3.6, respectively. Both of these categories include less than half as many studies as the birth outcome category, and they include fewer transfer programs than the birth outcome category. Furthermore, the BMI and substance use outcome categories include ECE programs, which were clearly not among the programs that measured birth outcomes. BMI and substance use effect sizes are presented so that positive effect sizes always represent a favorable outcome (e.g., less substance use) and negative effect sizes represent an unfavorable outcome (e.g., more substance use). BMI was measured in middle childhood, and substance use was generally measured for teens and adults.

Although there were no negative effect sizes in the birth outcome analysis, we estimated that two programs had a negative and statistically significant effect on BMI (estimates on the left of Figure 3.5). Most interventions that target BMI are attempting to reduce overweight, so we coded the effect sizes here to be negative if the treatment children had higher BMI than the control children. However, IHDP, with the estimate in maroon on the left of Figure 3.5, targets children with low birth weights, and, for this particular program, it might be the case that weight gain is better for children rather than worse and this esti-

Figure 3.4
Effect Sizes and Confidence Intervals for Birth Outcome Category Studies and Pooled Effect Size

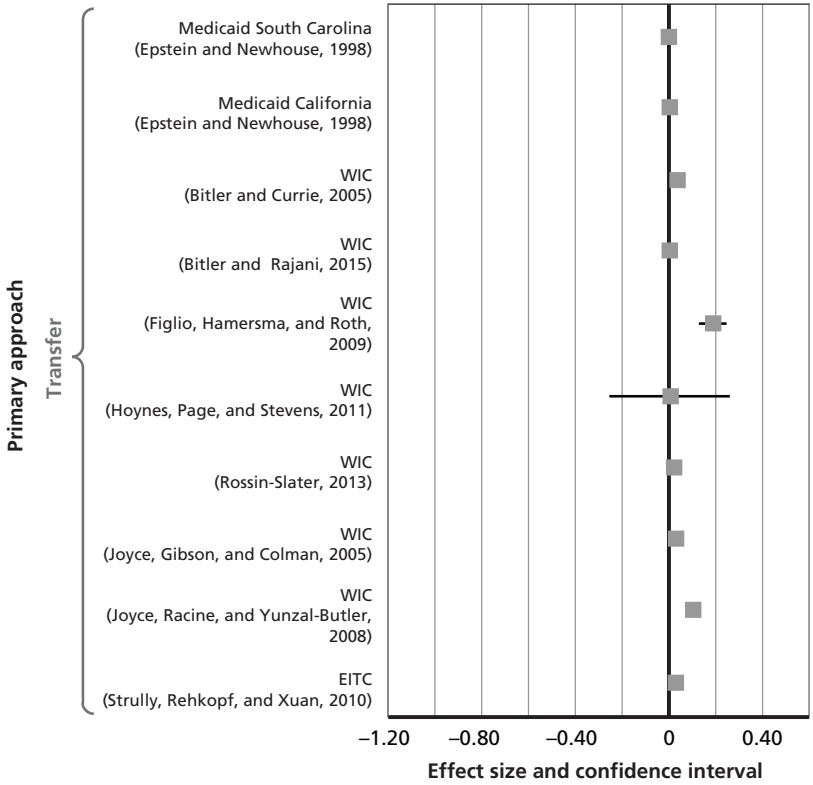


NOTE: The horizontal bars show the 95-percent confidence intervals.

RAND *RR1993–3.4*

mate is not strictly comparable. However, this outcome was measured when the children were age 8, an age at which we might expect these

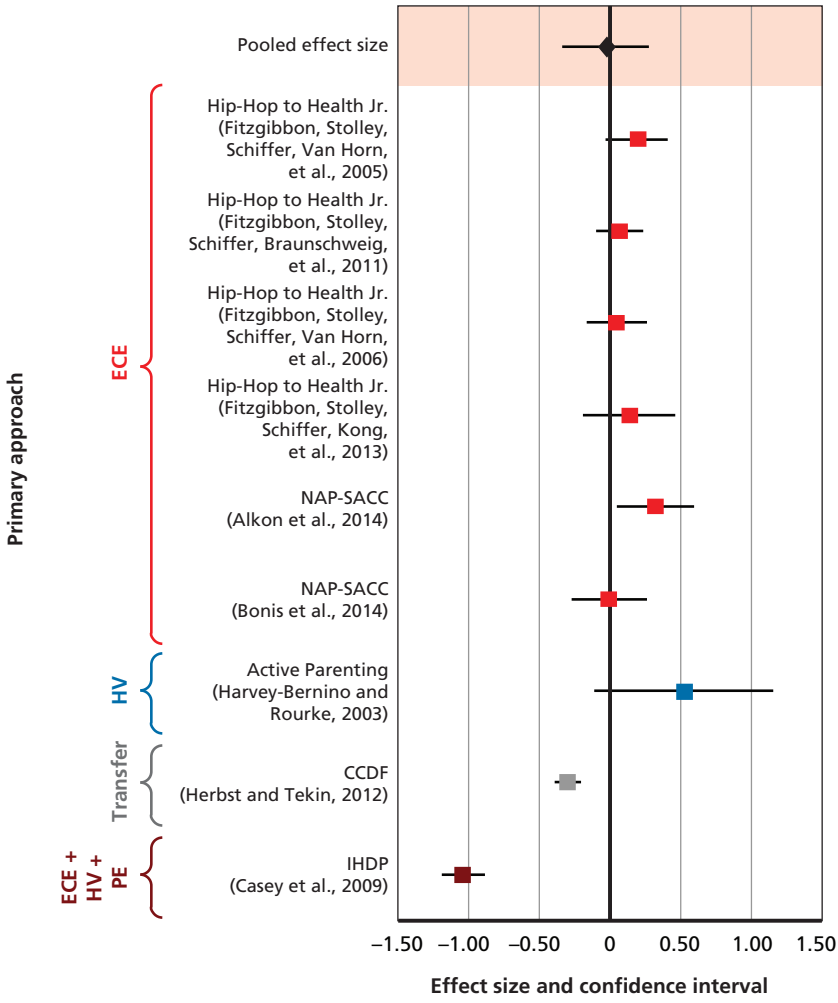
Figure 3.4—Continued



SOURCE: Authors' calculations based on sources in the "Study" column of Table C.3 in Appendix C.
NOTE: See Table C.3 in Appendix C for individual study details. For any study with more than one effect size, effect size measures have been pooled within studies. The horizontal bars show the 95-percent confidence interval.
RAND *RR1993–3.4 (continued)*

children to no longer be challenged by being underweight. The pooled estimate of BMI effect sizes has a 95-percent confidence interval that includes 0, indicating that the BMI estimate is not different from 0. If we remove the IHDP value from the pooled estimates because of the potential lack of comparability with the other estimates, we find that the effect size is unchanged. Our results indicate that early childhood programs in our sample do not have a preventive effect on BMI

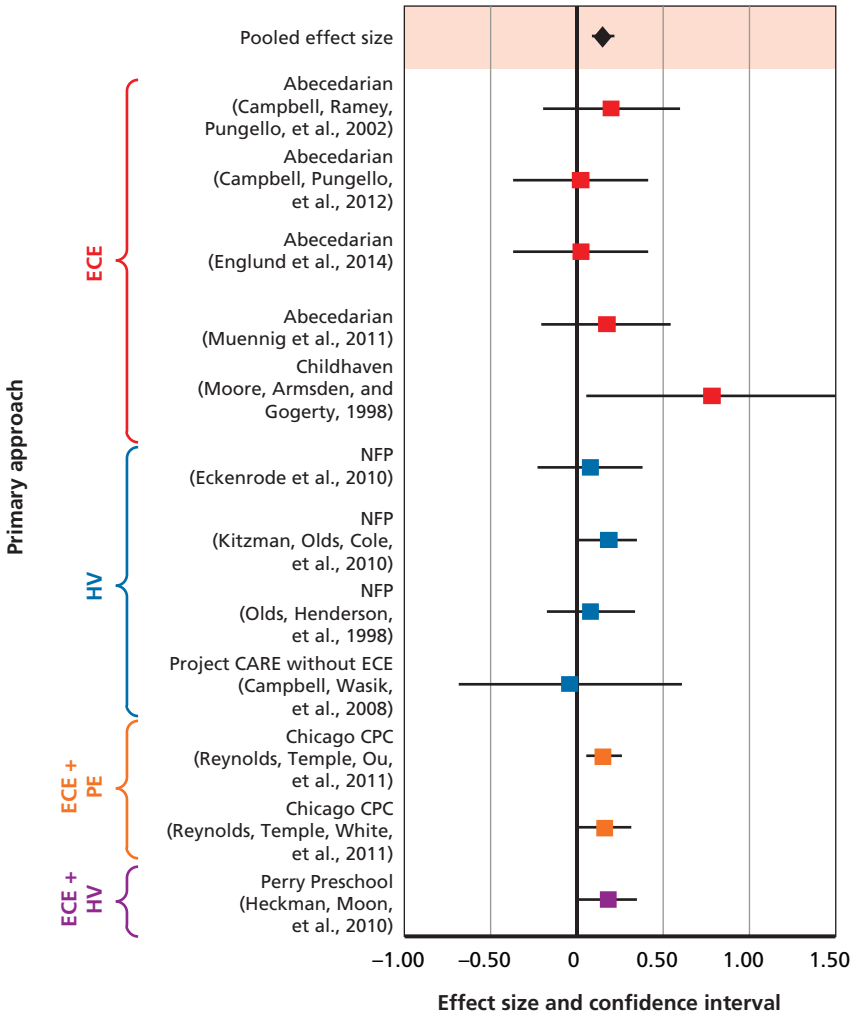
Figure 3.5
Effect Sizes and Confidence Intervals for Body-Mass Index Category Studies and Pooled Effect Size



SOURCE: Authors' calculations based on sources in the "Study" column of Table C.3 in Appendix C.
NOTE: See Table C.3 in Appendix C for individual study details. For any study with more than one effect size, effect size measures have been pooled within studies. The horizontal bars show the 95-percent confidence interval.

RAND *RR1993–3.5*

Figure 3.6
Effect Sizes and Confidence Intervals for Substance Use Category Studies and Pooled Effect Size



SOURCE: Authors' calculations based on sources in the "Study" column of Table C.3 in Appendix C.
NOTE: See Table C.3 in Appendix C for individual study details. For any study with more than one effect size, effect size measures have been pooled within studies. The horizontal bars show the 95-percent confidence interval.

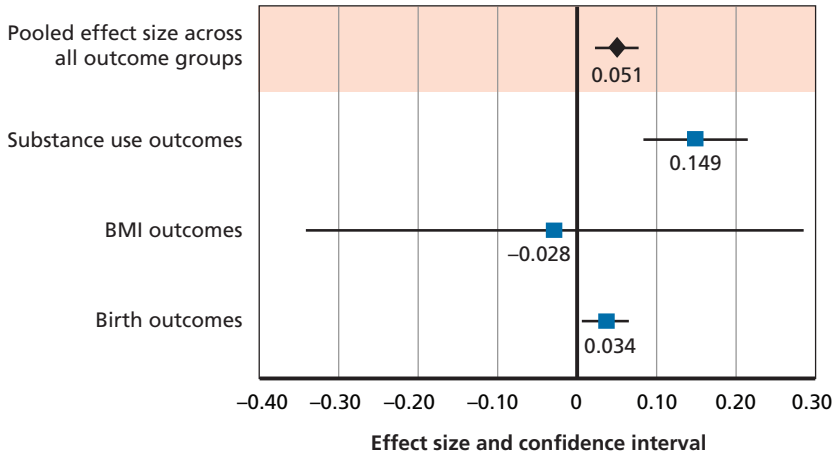
RAND *RR1993–3.6*

at later ages; other meta-analyses have shown that some interventions during elementary school can improve BMI, although these findings are mixed (Y. Wang et al., 2013; Ho et al., 2012; van Grieken et al., 2012: Metcalf, Henley, and Wilkin, 2012; Wahi et al., 2011).

The effect size estimates for the substance use outcomes in Figure 3.6 also show that most estimates are not significantly different from 0, but, in this case, every estimated effect size except for one is positive (favorable). The effect size for substance use outcomes is modest at 0.15, but this estimate is statistically different from 0, as shown by the fact that the confidence interval does not include 0. This estimate can be interpreted as showing that, on average, the treatment groups had substance use outcomes that were about 0.15 standard deviations better than those of the control groups. The effect size of early childhood programs on substance use many years—even decades—later seems relatively large given the effect sizes of contemporaneous interventions in adolescence, such as motivational interviewing (effect size of 0.17 across all types of substances; Jensen et al., 2011) and family interventions (effect size of 0.25 for alcohol reduction; Smit et al., 2008).

Figure 3.7 shows the pooled effect sizes for the three outcome categories individually, as well as combined, and Table 3.9 lists the results. The black diamond in the figure shows the estimated effect size for outcomes pooled across all three of these outcome categories. This estimate is positive and statistically different from 0, but it is also very small at about 0.05. Estimating a pooled effect size for child health in general would require estimating effect sizes for all 679 child health outcomes recorded in our data. This is beyond the scope of the present study, so these effect size estimates represent the pooled effect sizes for their categories but do not represent the estimate for all child health outcomes. In sum, these estimates demonstrate that early childhood programs can improve child health outcomes but that the results vary by the particular outcome category examined. This can reflect the fact that some of the programs included in this analysis measured outcomes in the three outcome categories but might not have had these outcomes as their primary objectives, nor have curricula specifically designed to improve child health. Indeed, Pinquart and Teubert (2010)

Figure 3.7
Pooled Effect Sizes and Confidence Intervals, by Outcome Category and for All Three Health Outcome Categories Combined



SOURCE: Authors' calculations based on sources in the "Study" column of Table C.3 in Appendix C.
NOTE: The diamond and squares plot the estimated average effect size based on the meta-analysis. The horizontal bars show the 95-percent confidence intervals.
RAND *RR1993–3.7*

Table 3.9
Effect Size Estimates, by Outcome Category and for All Three Health Outcome Categories Combined

	Pooled Effect Size		95% Confidence Interval Bounds		
Outcome Category	Value	Standard Error	Lower	Higher	*p*-Value
Birth outcomes	0.034	0.014	0.007	0.061	0.013
BMI	–0.028	0.159	–0.340	0.283	0.859
Substance use	0.149	0.033	0.084	0.214	<0.001
All three categories combined	0.051	0.013	0.026	0.075	<0.001

and Camilli et al. (2010) document larger effect sizes for outcomes that are aligned with curricula and instruction.

Within the birth outcome and substance use categories, we also estimated pooled effect sizes for subcategories of outcomes. In the birth outcome category, these subcategories included low birth weight, gestational age, and postbirth complications. We did not find that the pooled effect size was different from 0 for low birth weight and postbirth complications, suggesting that, on average, the set of programs in this study had no effect on these two types of outcomes. However, we did find that the programs led to a statistically significant (albeit small) improvement in gestational age—the estimated pooled effect size was 0.051, with a *p*-value of less than 0.001. The substance use subcategories were the use of alcohol, tobacco, and other drugs and measures of combined substance use. Our results showed that the programs in our analyses were associated with reductions in the use of other drugs and measures of combined substance use, but we did not find an effect on the use of alcohol or tobacco. There were few studies in these subcategories, so these results should be treated as tentative until more studies are available. Appendix C reports the complete set of meta-analysis results for these subgroup analyses.

Do Effect Sizes Vary by Program Approach or Other Characteristics?

The findings regarding the effect sizes in these three categories of the child health outcome domain indicate small effects of early childhood programs on these outcomes. We now examine whether the effect sizes differ by program approach and whether the effect sizes have changed across the four decades during which the programs in our study commenced.

To assess whether the pooled effect size for these three health categories varied by program approach, we used the categorization of approach outlined earlier. We estimated the pooled effect size for all child outcomes measured for each approach, and these are reported in Table 3.10. The only approach that yields a statistically significant benefit on this set of overall child health measures is ECE, which has an effect size of 0.12.

Table 3.10
Mean Child Health Outcomes Effect Size Estimates, by Program Approach

	Effect Size		95% Confidence Interval Bounds		
Program Approach	Value	Standard Error	Lower	Higher	*p*-Value
ECE	0.12	0.04	0.04	0.20	<0.00
HV	0.07	0.07	−0.08	0.21	0.36
PE	0.02	0.04	−0.06	0.10	0.61
Transfers	0.02	0.01	−0.01	0.05	0.14
Programs using a combination of approaches	−0.12	0.27	−0.65	0.41	0.67

NOTE: This is the complete set of child health outcomes with effect size calculations. *N* = 44 studies, 86 outcomes.

We also examine whether our results vary by the decade in which the evaluated program commenced. This is important because, in the past 50 years, the comparison condition that the control groups receive has changed dramatically. For example, in studies of Head Start conducted in the 1960s, the control group children were unlikely to receive any type of ECE. However, more-recent Head Start study control group children are very likely to receive some other type of ECE (Promising Practices Network, undated). As a result, we would expect that the differences in outcomes between Head Start children and control group children would shrink during this time span. Evidence to support this is provided in Duncan and Magnuson (2013), which shows that preschool programs providing services prior to 1980 had a larger effect on cognitive outcomes than those after 1980 (0.33 compared with 0.16).

Our results are similar, though we measure child health outcomes rather than cognitive scores and include a spectrum of approaches rather than just preschool programs. Table 3.11 reports that the effect sizes for programs that commenced in the 1980s are smaller than for those that commenced in the 1970s (0.08 lower), and the effect sizes for

Table 3.11
Child Health Outcome Metaregression Estimates, by Decade

	Coefficient		95% Confidence Interval Bounds		
Decade	Value	Standard Error	Lower	Higher	*p*-Value
1970s (omitted comparison category)					
Intercept	0.061	0.019	0.023	0.094	0.002
1960s	0.111	0.197	−0.275	0.496	0.573
1980s	−0.089	0.031	−0.149	−0.028	0.004
1990s	−0.128	0.043	−0.212	−0.045	0.003
2000s	0.003	0.049	−0.099	0.094	0.956

NOTE: This is a complete set of child health outcomes with effect size calculations. *N* = 43 studies, 85 outcomes.

programs that commenced in the 1990s are smaller still (0.12 lower). We do not find a difference in the effect sizes of programs commencing in the 1960s or 2000s, but that might be due to small numbers of studies in these decades.

A final analysis we conducted was to assess whether the effect sizes varied when we excluded evaluation cohort studies (referred to as *studies* in the remainder of this report) that exhibited some weaknesses. Seven of the 44 studies exhibited weaknesses, and this was primarily due to attrition greater than 25 percent, which was statistically unaccounted for in the time between when the outcome was measured and when the study participants were enrolled. We found no differences between the effect sizes of these seven studies and the studies without these reservations. Moreover, the overall effect size did not change when we omitted the studies with reservations, suggesting that these studies do not bias the overall findings from this analysis.

We also attempted to examine whether the set of child health effect sizes varied by other study characteristics, such as whether the study was an RCT instead of a quasi-experimental or other design, whether the program developer was part of the evaluation team, and

whether the evaluation was conducted in a model program versus a real-world setting. In general, one would expect that weaker designs, having the developer involved in the evaluation, and studying a program under model conditions would lead to higher effect sizes. However, we could not test hypotheses about these aspects of the evaluations because these study characteristics tended to vary together, so their independent effects could not be distinguished. Specifically, we found that many studies exhibited two out of three of these characteristics, and some even exhibited all three. For example, of the 23 studies that were reported by authors who were also the program developers, all were also RCTs. Of these 23 studies, ten were also model demonstrations.

Summary of Improvements in Outcomes

Our data have characterized the outcomes captured by nearly half a century of early childhood program evaluations. We found that more than three-quarters of outcomes were in three domains: behavior and emotion (29 percent), cognitive achievement (26 percent), and child health (21 percent). We also found that programs with different approaches often measured different types of outcomes and that different types of outcomes can be measured throughout the life of the child.

Given that early childhood programs are often considered one of the great success stories of the evidence-based program movement, it might seem surprising that, across all of the outcomes, the majority of findings are null. However, about three in ten findings are favorable at a 0.05 significance level, indicating that many of the outcomes have been improved and that this could not be due to chance. Overall, we found that the early childhood programs in our analysis improved 923 of 3,183 outcomes measured. Furthermore, 102 out of our 115 programs had a favorable effect on at least one child outcome, indicating that it is relatively rare, among published evaluations, to find programs that have no demonstrable impacts on child outcomes.

Our examination of the magnitude of these improvements focused on three categories of outcomes in the child health domain.

The estimate of the pooled effect size for the entire set of outcomes from the three categories was statistically different from 0, but the size was very small (0.05). The effect size estimates for the individual categories found a modest effect size for substance use (0.15), a small effect size for birth outcomes (0.03), and a null effect for BMI. ECE programs had larger effects than other program approaches for the three health outcome categories we analyzed. The estimated effect size of 0.12 for the ECE programs was at the low end of the range of pooled effect sizes for other meta-analyses of early childhood programs for other domains that we summarized. The effect sizes declined over time, so evaluations in more-recent decades exhibit smaller effect sizes.

The emphasis of this effect size analysis was a set of child health outcomes, but program impacts on additional outcomes, as well as other considerations, will clearly figure into decisions about early childhood programs. In addition to the type and magnitude of outcomes from early childhood programs, another factor that plays a central role in decisionmaking is the costs of these programs and the monetary benefits due to changes in outcomes. Although effect sizes are used to provide a way to compare the magnitude of different types of outcomes, the monetary benefits associated with outcomes can provide an alternative way of describing the relative importance of outcomes and effect of programs. In fact, large changes in some outcomes can be associated with small economic returns, while small changes in other outcomes can be linked to large economic returns. In Chapter Four, we turn to an analysis of the monetary costs and benefits.

CHAPTER FOUR

What Are the Economic Returns of the Programs?

The ever-expanding body of evaluation research examining early childhood interventions has been accompanied, in some cases, by economic evaluations in order to understand the value of the resources required to implement a given program (a cost analysis), the cost to obtain a given outcome from the program (a CEA), or the net economic value of the program's effects relative to the program cost (a BCA). In this chapter, we extend our assessment of the short- and longer-term impacts that early childhood interventions can have to examine evidence of the economic investment required for program implementation and the associated economic returns.

We begin by providing an overview of economic evaluation methods: what can be learned and the methodological approach and challenges in application, particularly those most salient to early childhood interventions. We then review evidence, in turn, from cost analyses, CEAs, and BCAs. Of necessity, the discussion in this chapter centers on a subset of the programs examined in Chapters Two and Three. Nevertheless, the available economic evaluations allow us to identify several findings that we expect will extend to the broader set of program models we have examined in this study.

Overview of Economic Evaluation Methods

Cost analysis, CEA, BCA, and related economic evaluation methods are examples of the general class of cost and outcome analyses.[1] With the growing interest in evidence-based policy and result-based accountability, these methods have gained traction, with the expectation that economic evaluation methods would be employed as part of an overall program evaluation. In fact, cost analysis can contribute to a process or implementation evaluation, while CEA and BCA build on and extend impact (or outcome) evaluation. A recent report by the National Academy of Sciences focuses on the application of economic evaluation methods to investments in children, youth, and families and delineated a set of guidelines for best practices (National Academies of Sciences, Engineering, and Medicine, 2016). Box 4.1 provides a summary of the economic evaluation methods discussed in this chapter, as well as relevant concepts involved with the application of these methods.

The application of economic evaluation methods, especially BCA, stems from the possibility that the improved outcomes from effective early childhood programs—those demonstrated from impact evaluations, as summarized in Chapter Three—will produce benefits to

Box 4.1
Key Methods and Concepts for Economic Evaluation

In this chapter, we focus on three main types of economic evaluation methods (see National Academies of Sciences, Engineering, and Medicine, 2016, for further discussion):

- A **cost analysis** produces a comprehensive measure of the value of all resources required to implement a program or intervention relative to the baseline or alternative.
- A **CEA** calculates the cost required for a program or intervention to produce a given unit of output (e.g., cost per standard deviation test score gain or cost per high school graduate). Alternatively, a CEA can report the amount of an outcome obtained for each dollar invested. The estimate of program cost should be based on a cost analysis.
- A **BCA** (also sometimes referred to as a cost–benefit analysis) produces a comprehensive measure of the value of the outcomes from a program or intervention to compare with the estimate of program cost from a cost analysis. Metrics from the analysis include **net benefits** (benefits minus costs) or the **benefit–cost ratio** (benefits divided by cost).

[1] This section draws on Karoly (2008), Karoly (2012), and Kilburn (2011).

Box 4.1—Continued

For all three methods, the program of interest is compared with a **baseline** or alternative condition, which can be the status quo or "business as usual" or it can be an alternative program group.

For a CEA or BCA, the measures of program impact should be based on **causal estimates**. For a CEA, the measures of program impact are expressed in their natural units (e.g., achievement test scores, high school graduation rate). For a BCA, program impacts are expressed in monetary units to capture their economic value. The economic values should measure society's willingness to pay for that outcome. The economic values attached to outcomes that are not already measured in monetary units are often referred to as **shadow prices**.

In all three analyses, when streams of costs or benefits accrue over time, monetary values can be expressed as a **present discounted value** (PDV). The PDV is calculated by applying a **discount rate**, which recognizes that a dollar in the future is worth less than a dollar in the present. For example, with a 3-percent discount rate, $100 to be received or expended one year from now would be valued at $97 today ($100 divided by 1.03).

When an economic evaluation is conducted, the perspective for the analysis should be explicitly defined. The most comprehensive perspective is the **societal perspective**. Using the societal perspective, different parties or **stakeholders** can bear costs and benefits. A standard disaggregation is to consider three types of stakeholders: program participants, the government (i.e., individuals as taxpayers), and the rest of society (i.e., individuals as private consumers). A BCA can be performed from the perspective of the government (i.e., public sector), in which case it is referred to as a **cost–savings analysis**.

The National Academies of Sciences, Engineering, and Medicine (2016) recommends some best practices in applying economic evaluation to programs serving children, youth, and families. These include the following:

- Provide estimates of the **deadweight loss** (DWL) (also known as excess burden) from taxation if new revenue is required to implement a program or if there are savings to the government. The DWL parameter recognizes that every dollar of revenue raised costs society more than a dollar because of the changes in behavior induced by taxes (e.g., reduced work effort). It is usually expressed as a percentage of the tax revenue raised. A parameter of 50 percent, for example, means that every $1.00 raised costs an additional $0.50 because of the distortionary effect of taxes.
- Perform **sensitivity analyses** to account for the robustness of estimates of cost, cost-effectiveness, or benefit–cost to assumptions about economic values, program impacts, discount rates, and other parameters used in the analysis.

society that can pay for the cost of the up-front investment. Table 4.1 illustrates an array of the potential outcomes that an effective early childhood program can realize and the potential spillover benefits (or costs) that would follow. This exercise shows that some of the spillover benefits (and sometimes costs) would accrue from changes in outcomes for the participating parents, and others from changes in outcomes

Table 4.1
Potential Benefits (Positive or Negative) of Improved Outcomes from Early Childhood Programs

Outcome	Parent's Age When Outcome Is Monetized	Child's Age When Outcome Is Monetized	Stakeholders Who Incur a Monetizable Effect		
			Program Participants	Taxpayers	Rest of Society
Improved pregnancy outcomes → lower medical costs	Birth	n/a		+	
Increased child care → value of care for parents and increase in lifetime earnings if increased work effort	Childhood	n/a	+	+	
Reduced child accidents and injuries → lower cost for ED visits and other health care	n/a	Childhood		+	
Reduced child abuse and neglect → lower cost for child welfare system and abuse victims	n/a	Childhood	+	+	
Improved school readiness (cognitive, social, or emotional) → higher educational performance and lifetime earnings	n/a	Adulthood	(+)	(+)	
Reduced special education use → lower education system costs	n/a	K–12		+	
Reduced grade retention → fewer years in K–12 education	n/a	K–12		+	

Table 4.1—Continued

Outcome	Parent's Age When Outcome Is Monetized	Child's Age When Outcome Is Monetized	Stakeholders Who Incur a Monetizable Effect		
			Program Participants	Taxpayers	Rest of Society
Higher achievement tests → higher educational performance and lifetime earnings	n/a	Adulthood	(+)	(+)	
Increased high school graduation → increased lifetime earnings (net of taxes) and increased tax revenue to government	Childhood	Adulthood	(+)	(+)	
Increased postsecondary education → increased education costs	Childhood	Adulthood	–	–	
Increased postsecondary education → increased lifetime earnings (net of taxes) and increased tax revenue to government	Childhood	Adulthood	(+)	(+)	
Reduced contact with criminal justice system → lower costs for criminal justice systems and lower crime victim costs	Childhood	Adolescence to adulthood		+	+
Reduced smoking and substance use → lower costs for the public health care system and from premature death	Childhood	Adolescence to adulthood		+	
Improved health and other health behaviors[a] → lower costs for the public health care system and from premature death	Childhood	Adolescence to adulthood	+	+	

Table 4.1—Continued

Outcome	Parent's Age When Outcome Is Monetized	Child's Age When Outcome Is Monetized	Stakeholders Who Incur a Monetizable Effect		
			Program Participants	Taxpayers	Rest of Society
Reduced welfare use → reduced administrative costs for social welfare programs and reduced welfare program transfer payments	Childhood	Adolescence to adulthood	–	+	

NOTE: n/a = not applicable. + = favorable effect. – = unfavorable effect. (+) = The monetizable effect is indirect (i.e., through linkages to later outcomes). References to the timing of monetizable outcomes refer to the stage of the focal child in the intervention.

[a] Examples include depression, smoking, substance abuse, mortality, and teen pregnancy.

for the participating child.[2] Some of the gains can be realized at the time of the child's birth, others in early childhood, and still others later in childhood or in adolescence. These benefits can accrue to the participants themselves or to other parties, specifically the government sector (i.e., taxpayers) and private citizens who did not participate in the program.

For example, if an early childhood program leads to improved pregnancy outcomes, medical costs can be reduced, which would represent a savings to the public sector if Medicaid or other public insurance covers the mothers. Likewise, reduced accidents and injuries would be a benefit realized for the child in the childhood years and would reduce public health care costs. If an early childhood program reduces a child's special education use, that would generate savings to the public education system that could accrue over the K–12 schooling years. Some outcomes, such as reduced crime, can be evident for both the mother when her child is young and later for the child himself or herself upon reaching adolescence or adulthood. The benefits from reducing crime accrue not only to the public sector but also to the rest of society, who are less likely to be crime victims. Thus, although the nature and magnitude of the impacts of an early childhood program, such as those summarized in Chapter Three, can provide sufficient justification for some decisionmakers to devote resources to such programs, other decisionmakers are persuaded by evidence that the upfront investment in an effective program produces economic benefits

[2] Table 4.1 is not meant to be exhaustive in covering all of the potential impacts of an early childhood program and all of the associated spillover consequences. For example, increased educational attainment can improve other social and nonmarket outcomes beyond effects on earnings (Wolfe and Haveman, 2002; Moretti, 2006). These broader benefits include higher educational attainment for the next generation (i.e., the children of preschool participants); improved health status for preschool participants when they are adults and for their family members (e.g., children); better consumer choices by preschool participants in adulthood, which raise well-being through more-efficient consumption; improved fertility choices by preschool participants (e.g., timing and spacing of births); and improved outcomes for peers of preschool participants through effects on classrooms or neighborhoods. The intergenerational effects can extend to the fourth generation and beyond. Likewise, there can be value associated with other outcomes, such as improved parenting (e.g., intrinsic gains that parents can realize from better parenting).

in the short and longer terms that can help recover the cost of the program.

Economic evaluation methods, such as BCA, can account for the time profile of costs and benefits, as well as the multiple stakeholders that can potentially gain (or lose) from effective programs. At the same time, as noted in Karoly (2012) and Kilburn (2011), there are challenges in the application of economic evaluation methods—particularly BCA—to early childhood programs. First, because early childhood programs often affect more than one outcome, it can be more challenging to apply CEA to such programs than to apply BCA. This is because CEA considers cost-effectiveness in terms of one outcome at a time. Thus, a CEA could compare early childhood programs in terms of the cost to achieve having one fewer child in special education services and rank programs from the lowest to highest cost to achieve that outcome. However, the same programs can also increase high school graduation, and the ranking of programs from least to most costly to achieve that outcome might not necessarily match the ranking when considering the cost-effectiveness with respect to special education use. BCA, by comparison, can potentially aggregate benefits across all domains of impact for a more comprehensive assessment of benefits and costs.

With the application of BCA, challenges can arise in valuing the outcomes affected by early childhood programs and in capturing the potential longer-term benefits from programs. Although early childhood programs can affect outcomes that are already valued in monetary terms (e.g., health care costs), other outcomes must be converted to dollar values. This can be more challenging for some outcomes, such as measures of child development, student achievement, or parenting behavior, than others. Some outcomes, such as achievement scores or educational attainment, can be linked—through estimates available in the literature—to other outcomes that can be valued in monetary terms, such as future earnings or future use of social welfare programs. In some cases, estimates from longitudinal studies can provide the basis for projecting outcomes measured at one point in time into the future, such as linking earnings in young adulthood to a profile of future earnings until retirement age. Such linkages and projections allow ana-

lysts to capture the full range of potential benefits from effective early childhood programs. At the same time, such methods introduce additional uncertainty into the estimates of economic returns that should be accounted for through Monte Carlo simulation methods or other sensitivity analyses (National Academies of Sciences, Engineering, and Medicine, 2016).

Other challenges arise in the comparison of economic evaluation studies across different early childhood programs because they do not always follow the same methodology. Differences can arise because of the nature of the associated impact evaluation, such as having a different baseline or comparison condition, measuring different outcomes, and following program participants for different lengths of time. Cost analyses can differ in their comprehensiveness. BCAs can vary in terms of which outcomes are valued, the shadow prices that are applied, and which outcomes are linked to other outcomes or projected to the future. The discount rate applied and whether to account for DWL are two other sources of potential variation across BCA studies. In the review of the available economic evaluations later in this chapter, we describe such differences in methods.

Despite these challenges, economic evaluations of early childhood programs contribute valuable information for practitioners and policymakers. Retrospective analyses of a program as implemented extend what can be learned from an impact evaluation by identifying the value of the resources required to implement the program as part of a cost analysis and the return for that investment, either in terms of a given outcome (CEA) or in terms of the value of multiple outcomes (BCA). These methods can also be applied prospectively to estimate the expected resources required to implement a program in the future—either in the same setting or a new setting (e.g., a different locality or state)—along with the expected return in terms of a given outcome or the value of multiple outcomes. These methods can be applied to a single early childhood program to determine whether the resources required for implementation are justified in terms of the outcomes achieved. The methods can also be used to compare programs in terms of the magnitude of the up-front investment and the resulting returns. Such comparisons are most useful when the cost analysis

is comprehensive and when CEA or BCA is applied to programs that measure a common set of outcomes, follow participants for the same length of time, apply comparable economic values for the resources deployed and the outcomes realized, and utilize other parameters in common (e.g., discount rate, DWL). Given the differences in methods noted earlier, such apples-to-apples comparisons are not usually possible, but that does not detract from the value of a retrospective or prospective analysis of a given program.

Early Childhood Programs with Economic Evaluations

As summarized in Table 4.2, our literature review identified formal economic evaluations—cost analysis, CEA, or BCA—for 25 of the 115 individual programs we analyzed in Chapters Two and Three. (See Appendix A for a discussion of the methods we used to identify the economic evaluations.[3]) Among the programs with economic evaluations, at least one program is represented from six of the eight approaches we defined in Chapter Two (the exceptions are transfers and ECE combined with home visiting and non–home-based parent education). Thus, the economic evaluations cover nearly the full range of early childhood intervention approaches we have examined.

At the same time, it is important to note that economic evaluations have not been performed for the full set of 115 programs we review. As noted earlier, many of the outcomes measured in evaluations of early childhood programs are not readily valued in economic terms. Programs without an economic evaluation might not have

[3] We excluded from consideration informal or "back of the envelope"–type economic evaluations of programs. For example, Ludwig and Miller (2007) exploits variation in Head Start funding, when the program first began, to estimate Head Start's effects on educational attainment and health. The authors performed additional calculations, documented in a footnote, to suggest that the value to society provided by the higher earnings from the impact on schooling would be more than enough to pay the program cost. Likewise, Bitler and Currie (2005) performs a rough calculation to indicate that the value of WIC's impact on hospitalizations that, the authors estimate in their analysis, would be enough to cover the program's cost. Where there were multiple economic evaluations (e.g., for Chicago, CPC and Perry Preschool), we feature the most current analysis, sometimes based on a working paper.

Table 4.2
Early Childhood Programs with Economic Evaluation

Program	Citation	Type of Economic Evaluation			Aligned with Outcome Analysis
		Cost Analysis	CEA	BCA	
ECE					
Breakthrough to Literacy	Layzer et al. (2009)		Yes		Yes
Carolina Abecedarian Project[a]	Barnett and Masse (2007)			Yes	Yes
Foundations of Learning	Morris, Lloyd, et al. (2013)	Yes			Yes
Head Start	WSIPP (2016a)			Yes	No[b]
Oklahoma Pre-K	Bartik, Gormley, and Adelstein (2012)			Yes	Yes
PATHS	WSIPP (2016a)			Yes	No[c]
Ready, Set, Leap!	Layzer et al. (2009)		Yes		Yes
HV					
Durham Connects	Dodge, Goodman, Murphy, O'Donnell, Sato, and Guptill (2014)			Yes	Yes
HFNY	DuMont, Kirkland, et al. (2010)			Yes	Yes
Healthy Families Oregon	Green, Tarte, Sanders, et al. (2016)			Yes	Yes

Table 4.2—Continued

Program	Citation	Type of Economic Evaluation			Aligned with Outcome Analysis
		Cost Analysis	CEA	BCA	
NFP[a]	WSIPP (2016a)			Yes	No[b]
Parent–Child Home Program	WSIPP (2016a)			Yes	No[c]
PE					
COPE	Melnyk and Feinstein (2009)			Yes	Yes
Family Foundations	Jones, Feinberg, and Hostetler (2014)	Yes			Yes
Helping the Noncompliant Child	WSIPP (2016a)			Yes	No[d]
Incredible Years for parents	WSIPP (2016a)			Yes	No[b]
Legacy for Children to age 3	Corso et al. (2015)		Yes		Yes
Legacy for Children to age 5	Corso et al. (2015)		Yes		Yes
PCIT	WSIPP (2016a)			Yes	No[c]
ECE + HV					
CCDP[a]	Aos et al. (2004)			Yes	Yes
Early Head Start national study, all approaches	WSIPP (2016a)			Yes	Yes

Table 4.2—Continued

Program	Citation	Type of Economic Evaluation			Aligned with Outcome Analysis
		Cost Analysis	CEA	BCA	
Perry Preschool Project[a]	Heckman, Moon, et al. (2010)			Yes	Yes
ECE + PE					
Chicago CPC[a]	Reynolds, Temple, White, et al. (2011)			Yes	No[d]
HIPPY[a]	Aos et al. (2004)			Yes	No[b]
PAT[a]	WSIPP (2016a)			Yes	No[d]

NOTE: WSIPP = Washington State Institute for Public Policy.

[a] A program with a BCA that Karoly, Kilburn, and Cannon (2005) includes.

[b] Meta-analysis includes studies that we did not abstract because they did not meet our methodological criteria (e.g., valid experimental or quasi-experimental designs).

[c] Meta-analysis includes studies that we did not abstract because they did not meet our method or other criteria (e.g., evaluated in another country or for older children).

[d] Meta-analysis includes only studies that we did not abstract.

demonstrated impacts on outcomes that can be translated into dollar benefits. Whether or not they would eventually have an impact on outcomes that can be valued in monetary terms remains to be seen.

The economic evaluations listed in Table 4.2 derive from two sources: (1) stand-alone analyses of one or more programs by research teams, either the same team that implemented and evaluated the intervention or independent researchers who might also have been involved in the impact evaluation, or (2) analyses by WSIPP, which has developed a rigorous and complex BCA model that has then been applied to a wide array of programs serving children, youth, and families (WSIPP, 2016b). In most cases, we draw on the most recent set of results produced and published for the WSIPP model (WSIPP, 2016a). In addition, WSIPP last published findings in 2004 for several of the programs on our list of 115, so we rely on those findings as well (Aos et al., 2004).[4] It is important to note that WSIPP made many refinements to its model between 2004 and 2016. Thus, WSIPP results from the prior model and the most current model will not necessarily be comparable.

Among the 25 economic evaluations listed in Table 4.2, two are cost analyses, four are CEAs, and the remaining 19 are BCAs. Seven of the 25 programs were featured in Karoly, Kilburn, and Cannon (2005) with a BCA, although often an earlier version (for example, based on an earlier follow-up) than the analyses featured in Table 4.2.[5] This illustrates the growing application of economic evaluation methods to early childhood programs, including the growing inventory of early childhood programs that WSIPP analyzed. At the same time, the application of economic evaluation methods is still far from universal given that 90 of the 115 program models we reviewed were not associated with a formal economic evaluation, according to our literature search.[6]

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[4] One exception is that Aos et al. (2004) produced a BCA for IHDP, but it was based on the findings available at that time, which were only short-term impacts. There have been longer-term follow-up and impact estimates, but they have not yet been incorporated into the WSIPP estimates.

[5] As noted in Chapter One, our 1998 study produced BCA estimates for just two of the ten programs reviewed (Karoly, Greenwood, et al., 1998).

[6] A complete analysis of the factors associated with which program models have been subject to an economic evaluation is beyond the scope of our effort. However, we did examine

A final column in Table 4.2 indicates whether the economic evaluation findings covered in this chapter are aligned with the outcome evaluation findings we reported in Chapters Two and Three. Among the 25 programs with economic evaluations, 15 are based on the same impact findings analyzed earlier in this report, sometimes as part of the same journal article or report. We view such economic evaluations as being "aligned" with our earlier outcome analysis. In contrast, the other economic evaluations we identified in Table 4.2 are not in complete alignment. This can take one of three forms: (1) The economic evaluation was based on impact findings from studies that we included in our synthesis but also studies excluded from our synthesis because the study did not meet our standards for methodological rigor; (2) the economic evaluation was based on impact findings from studies that we included, along with other studies we excluded from our synthesis because they did not meet other criteria (e.g., an evaluation that reported only subsamples, an evaluation outside the United States, or an evaluation focused on children older than our oldest age cutoff); or (3) the economic evaluation was based on findings from studies excluded from our review altogether. In other words, the WSIPP model, because it relies primarily on impact estimates generated from meta-analyses, has a tendency to be more inclusive than the criteria used to select studies for the outcome analysis in Chapters Two and Three.

We now turn to our synthesis of the findings based on our assessment of economic evaluation evidence tallied in Table 4.2. We begin with cost analysis and then proceed with CEA and BCA findings.

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whether, among our 115 programs, those with longer follow-up periods were more likely to have BCAs than those with shorter follow-up periods were. Overall, of the 19 programs with BCAs, six are from programs with outcomes measured midway through the intervention or at the end of the intervention (i.e., with no longer-term follow-up), while another six programs had follow-up periods at least ten years after the intervention ended. The remaining seven programs with BCAs have follow-up periods beyond the end of the intervention but less than ten years after the intervention ended. Among the programs with ten years or more of follow-up data, 46 percent (six of 13 programs) have BCAs, compared with 13 percent of those programs with less than ten years of follow-up (13 of 102 programs). Thus, those with longer-term follow-up are more likely to have BCAs, but such BCAs are not universal for programs with longer-term follow-up. And BCAs have been conducted for programs with no follow-up beyond the end of the intervention.

Cost of Early Childhood Programs

As noted in Chapter Two, the 115 program models we identified for our review are extremely varied in their approaches, so there is wide variation in the resources they deploy and the value of the resources required per child or per family to implement the intervention. Thus, it is not surprising that we also see tremendous variation in costs across the 25 models for which we have estimates. There is also variation in how the cost analyses were performed. We point to some of these methodological differences in advance of covering the findings.

Cost Analysis Methods

We note first that the cost estimates for the programs listed in Table 4.3 derive from stand-alone cost analyses (two programs), from CEAs (four programs), or from BCAs (19 programs in total). As noted in National Academies of Sciences, Engineering, and Medicine (2016), a cost analysis is ideally performed concurrently with a program evaluation, with information collected on program cost at the same time that the program model is being implemented and evaluated for impact. However, as indicated in Table 4.3, this is often not the case for the

Table 4.3
Cost Analysis Methods for Early Childhood Programs with Economic Evaluation

Program	Concurrent Cost Data Collection	Perspective	Year for Reported Cost Estimate
ECE			
Breakthrough to Literacy	Unknown	Funder	2008
Carolina Abecedarian Project	No	Funder	2002
Foundations of Learning	Yes	Society	2010
Head Start	—	—	2015
Oklahoma Pre-K	No	Funder	2005

Table 4.3—Continued

Program	Concurrent Cost Data Collection	Perspective	Year for Reported Cost Estimate
PATHS	—	—	2015
Ready, Set, Leap!	Unknown	Funder	2008
HV			
Durham Connects	Yes	Funder	2013
HFNY	Yes	Funder	2000
Healthy Families Oregon	Yes	Funder	2015
NFP	—	—	2015
Parent–Child Home Program	—	—	2015
PE			
COPE	—	Funder	2008
Family Foundations	Yes	Funder	2008
Helping the Noncompliant Child	—	—	2015
Incredible Years for parents	—	—	2015
Legacy for Children to age 3	Yes	Funder	2008
Legacy for Children to age 5	Yes	Funder	2008
PCIT	—	—	2015
ECE + HV			
CCDP	—	—	2003
Early Head Start (national study, all approaches)	—	—	2015

Table 4.3—Continued

Program	Concurrent Cost Data Collection	Perspective	Year for Reported Cost Estimate
Perry Preschool Project	No	Funder	2006
ECE + PE			
Chicago CPC	No	—	2007
HV + non–home-based PE			
HIPPY	—	—	2003
PAT	—	—	2015

SOURCE: Studies cited in Table 4.2.

NOTE: — = not reported.

cost findings we reviewed, especially for program evaluations that took place more than ten years ago. In earlier studies, cost estimates were often reconstructed later—in many cases, years after the program was implemented, according to budget and expenditure data.

Another consideration for cost analyses that National Academies of Sciences, Engineering, and Medicine (2016) identifies is whether they are performed from the perspective of the funder (typically the government) or for society as a whole. For the former, the only consideration is the costs that would be borne by the funding agency. Costs to program participants, such as the value of their time, are not considered when the cost analysis is conducted from the agency perspective but would be included when the societal perspective is adopted. Table 4.3 indicates, where we could determine the perspective, that many analyses estimate costs from the funder perspective rather than the societal perspective. This means that the cost estimates are not a full accounting of the economic value of all of the resources required to implement the program.

Another issue for cost analyses, as part of an economic evaluation, is that costs should be measured relative to the baseline or comparison condition—the same "control" condition that is the reference point for the associated impact evaluation that would be used for CEA or

BCA (National Academies of Sciences, Engineering, and Medicine, 2016). Although this feature is not always explicitly acknowledged in the economic evaluation studies listed in Table 4.2, to the best of our knowledge, this is the approach followed for the studies with cost estimates listed in Table 4.3. For example, the BCA of Helping the Noncompliant Child performed for WSIPP (2016a) estimates that the baseline conditions involve a service cost of $1,000 in 2015 dollars. Thus, the cost of the program is the incremental cost beyond the baseline cost. In such cases, the cost estimate is not the same as the cost to implement the program in the absence of such baseline cost.

Finally, all cost estimates are local rather than national estimates. In the case of the WSIPP model, the cost estimates for any given program are based on estimates of the cost to implement the program model in the state of Washington. For the other studies, the costs are typically specific to the location where the program evaluation took place and will therefore reflect the local cost of the labor and other resources required to implement the program. In addition, as noted in Table 4.3, the reported cost estimates are nominal, and there is variation in the year that applies. Thus, we have converted all cost figures to 2016 values using the Consumer Price Index (CPI).

Cost Analysis Findings

Keeping in mind that the cost estimates are not strictly comparable because of the different perspectives applied (funder versus societal), the use of local rather than national prices, and other differences in cost analysis methodology, we now summarize the main implications of the cost estimates reported in Table 4.4. The table also shows the intensity of program services as designed, although the amount of services received by a participating child or family can be lower or higher than what is described. We highlight the following key findings that emerge:

- There is wide variation in the cost of the 25 early childhood programs with cost estimates. As measured in 2016 dollars, the cost estimates range from about $150 per family for the COPE parent education program to nearly $48,800 per family for CCDP,

Table 4.4
Cost Analysis Results for Early Childhood Programs with Economic Evaluation

Program	Intensity (as Designed)	PDV Cost per Child or per Family, in 2016 Dollars
ECE		
Breakthrough to Literacy	One-year pre-K curriculum	1,013
Carolina Abecedarian Project	Five-year, full-day (six to eight hours), full-year (50 weeks) education-based child care	47,847
Foundations of Learning	One-year pre-K curriculum with 36 hours of teacher training, weekly master teacher consultation, and one-on-one clinical services for selected children	1,926
Head Start	One- or two-year part- or full-day school- or full-year ECE program	8,947
Oklahoma Pre-K	One-year part- or full-day school- or full-year pre-K program	5,411[a]/10,822[a]
PATHS	One-year pre-K curriculum	360
Ready, Set, Leap!	One-year pre-K curriculum	614
HV		
Durham Connects	One to three postnatal nurse home visits delivered universally with targeted follow-on support based on needs assessment	721
HFNY	Biweekly visits prenatally, weekly through six months, then periodically thereafter up to age 5	5,716
Healthy Families Oregon	Weekly home visits for six months, then periodically thereafter up to age 2	3,815

Table 4.4—Continued

Program	Intensity (as Designed)	PDV Cost per Child or per Family, in 2016 Dollars
NFP	Biweekly visits prenatally, weekly for first month after birth, reduced frequency until 18–24 months, then every six weeks until age 2	10,176
Parent–Child Home Program	46 biweekly, half-hour home sessions spread over seven months in each of two years	5,860
PE		
COPE	A sequence of four educational audiotapes (ten to 20 minutes each) and associated skill-building activities for parents of a premature infant delivered during and after the time the infant is in the NICU	152
Family Foundations	Four prenatal and four postnatal group-based PE sessions	868
Helping the Noncompliant Child	Eight to ten clinic-based parent–child therapy sessions, plus additional practice time	698
Incredible Years for parents	12 to 14 weekly two-hour group-based PE sessions	1,321
Legacy for Children to age 3	Five hour-long group-based prenatal PE sessions, then 90 1.5-hour sessions until the child turns age 3	15,718
Legacy for Children to age 5	Group-based weekly 1.5-hour PE sessions until the child turns age 5	18,839
PCIT	Weekly hour-long therapy sessions that continue until parents demonstrate skill mastery	1,416

Table 4.4—Continued

Program	Intensity (as Designed)	PDV Cost per Child or per Family, in 2016 Dollars
ECE + HV		
CCDP	Multiple services provided for up to five years, including ECE, home visits, intensive case management, counseling, life skill training, and referrals	48,768
Early Head Start (national study, all approaches)	Weekly home visits or at least 20 hours per week of center-based child care over three years, or a combination of the two	11,134
Perry Preschool Project	One- or two-year part-day school-year ECE program	21,142
ECE + PE		
Chicago CPC	One- or two-year part-day school-year ECE program with approximately 18 hours of parent involvement per year	9,853
HV + non–home-based PE		
HIPPY	Home visits twice monthly and parent group–based sessions every two weeks for two years	6,381
PAT	Monthly home visits for up to two or three years, combined with developmental screenings of children, parent group meetings, and a resource network that links families with needed community resources	2,722

SOURCES: Studies cited in Table 4.2.

NOTE: Monetary values have been converted to 2016 dollars using the CPI. NICU = neonatal intensive care unit. A full year typically runs from August to July.

[a] The estimates are for part- and full-day programs, respectively.

which combined ECE with home visiting, among other comprehensive services.

- The variation in cost is also characteristic of early childhood programs within the same general approach. For example, among the seven programs we classify as ECE, the per-child cost ranges from $360 to almost $47,850 in 2016 dollars. The costs for the five home visiting programs range from about $720 per family to nearly $10,200 per family. Parent education program costs extend from about $150 per family to about $18,800 per family for the six programs we reviewed. Such cost differentials are also evident for the combination programs when we have at least two for comparison.
- Much of this variation reflects differences in the intensity of program services, the duration of services over time, and other aspects of the program model. For example, the Carolina Abecedarian Project provided full-day, year-round, educationally oriented child care services for five years, from soon after birth to kindergarten entry, hence the nearly $48,000-per-child total cost figure. Likewise, CCDP offered up to five years of subsidized ECE services, home visiting, intensive case management, and other services as part of its two-generation approach, which accounts for the total cost of nearly $49,000 per family served. In contrast, the four ECE programs that delivered a specific curriculum for one year—Breakthrough to Literacy; Foundations of Learning; PATHS; and Ready, Set, Leap!—have considerably lower costs per child: between $360 and $1,930. Such programs intervene at the level of an ECE program classroom, with supports for the teacher in implementing the curriculum. That means that costs are even lower when allocated across each child in the classroom. The costs for home visiting programs and parent education programs likewise relate to the intensity and duration of the services delivered, with higher costs the more frequently home visits are made or parent education sessions are delivered in a given period of time and the longer the duration of time over which the services are offered. Other aspects of program design also affect cost. For example, group-based parent education programs tend to be less

costly than those that provide one-on-one sessions. Home visiting models that rely on paraprofessionals tend to be less costly than those that rely on nurses because of salary differentials.

- These cost drivers do not always fully account for the estimated cost differentials. A full cost estimation model would be required to provide a more comprehensive assessment of all the factors that can account for cost differentials across the early intervention models in Table 4.4. In addition to local cost differentials, a consideration is the extent to which participating children and families receive the intended level of services. Many families might drop out of a program before the full treatment has been received, which will tend to lower costs on a per-family or per-child basis if resources can be redeployed to serve new program entrants who replace the dropouts.[7]
- Depending on the size of the population served, the relative cost differential between two programs based on total cost can be different from the differential based on cost per child or per family. This result can be illustrated with a universal versus targeted home visiting model. Durham Connects, for example, is a universal home visiting program that is estimated to cost about $720 per family served, through a combination of less intensive services for all families, followed by more-intensive services for a smaller number of families identified as needing ongoing supports. In contrast, each of the other home visiting models in Table 4.4 is a program that targets particular at-risk populations with more-intensive (and more-costly) services for those identified families. Depending on the size of the universal versus targeted populations, the universal program might cost more in total than the targeted program.[8] Effectively, the universal program includes the

[7] Another possible difference is whether costs are measured as marginal versus average cost for each study. The methodology used in each case is not always explicitly delineated.

[8] Consider a population with 1,000 families. A $700-per-family universal home visiting program would cost a total of $700,000. By comparison, a targeted home visiting program that costs $6,000 per family and is designed to reach 10 percent of the population would cost a total of $600,000. Thus, the universal program is less costly per child than the targeted program but more costly in terms of the total budget required.

cost for screening all families to identify those that are in need of the more-intensive services.

Cost-Effectiveness of Early Childhood Programs

As noted earlier in this chapter, CEA can be an informative tool, even when early childhood program effects are expected in multiple domains. As shown in Table 4.2, several of the programs we reviewed have been the subject of a CEA. Layzer et al. (2009) compares the cost-effectiveness of two pre-K curricula designed to promote children's language and literacy development: Breakthrough to Literacy and Ready, Set, Leap! The cost estimates for the two programs, shown in Table 4.4, indicate that the per-child cost for Ready, Set, Leap! was about 61 percent of the cost of Breakthrough to Literacy. Classroom costs for the latter program were higher for curricular materials and supplies, and Breakthrough to Literacy also required the purchase of computers to implement the intervention. The costs of mentors at the classroom level were similar across the two programs.

In terms of outcomes, the experimental evaluation showed that the two curricula produced similar-sized gains in several measures of emergent literacy, although some point estimates were larger for Ready, Set, Leap! while the opposite held for other outcome measures. Given the cost differential, the cost-effectiveness ratios consistently showed that Ready, Set, Leap! was more cost-effective in that it produced similar-sized gains in vocabulary for a lower cost. Another way to view the result is that the cost to produce a one–standard deviation change in emergent literacy was lower for Ready, Set, Leap! than for Breakthrough to Literacy.

Corso et al. (2015) provides another application of CEA for two variants of the Legacy for Children parent education program. One program variant was designed to offer parent education supports up to age 3 of the focal child, while another variant provided services up to age 5. The two models differed in their starting ages and the frequency of the parent course offerings. As would be expected, the cost per child was higher (by about 20 percent) for the program variant with the

longer duration, although not in direct proportion to the increased duration of the program (about a 40-percent increase in duration in moving from 3.5 to five years, assuming about six months of prenatal services for the first model variant). For one outcome—the risk of requiring a referral for severe behavior problems—the incremental impact relative to the control group was statistically significant only for the more intensive program. The reverse pattern was found for the risk of attention-deficit hyperactivity disorder. Given these mixed findings, the authors could not indicate that one program was uniformly more cost-effective than the other. The study concluded, however, that the cost per child to avoid having a child develop behavior problems or attention-deficit hyperactivity disorder, estimated to be in the range of $100,000 to $200,000 through the intervention, was lower than the lifetime cost associated with treating either health issue.

These examples illustrate that CEA can be an informative tool for evaluating the cost to achieve a given impact using alternative early intervention strategies. This tool is especially useful when there is a clear outcome of interest and alternative interventions are under consideration. Relevant outcomes could include health care utilization, school readiness indicators, special education use, grade retention, high school graduation, crime and delinquency, and health-related behaviors and outcomes. Comparisons between closely related interventions—such as different curricula or programs with different levels of key features (such as group size, teacher–child ratios, or teacher education)—are especially amenable to CEA. However, given that early childhood interventions can produce impacts in multiple domains, the relative rankings of programs in terms of cost-effectiveness can differ depending on the outcome being considered. Thus, the advantage of BCA as an economic evaluation tool is that multiple outcomes can be accounted for simultaneously, provided that the outcomes can be expressed in terms of monetary values that can be aggregated and compared with program cost. With this virtue in mind, we turn to findings from the application of BCA to early childhood interventions.

Public and Social Returns to Early Childhood Programs

We now focus on the approach and findings for the 19 BCAs summarized in Tables 4.5 to 4.10. Before discussing the findings, we begin with a description of the methodological features of the BCAs and the comparability of the methods across studies. Again, we have adjusted all dollar amounts to 2016 dollars using the CPI.

Benefit–Cost Analysis Methods

As Karoly (2012) notes based on a review of a smaller number of BCAs, the field has yet to converge on a standardized approach to the analysis of benefits and costs for early childhood intervention programs. Some of the differences stem from variation in the methods employed in the underlying impact evaluations (e.g., in the outcomes measured and the length of the follow-up period), while other differences involve choices made regarding the parameters and methods for the BCA itself. This lack of standardization is also evident for the set of BCAs reviewed in this study.

To start, it is important to note that the BCAs we reviewed, with one exception, provide estimates of the costs and benefits for each intervention from the societal perspective. On the cost side, we noted earlier that some cost estimates explicitly or implicitly adopt a funder perspective because they do not account for the costs that participating children and families bear (e.g., parents' time) (see Table 4.3). Nevertheless, on the benefit side, the BCAs seek to be comprehensive in accounting for private benefits to participants (e.g., higher lifetime earnings), as well as benefits to the public sector, and private benefits to other members of society. The one exception is the HFNY BCA, which explicitly adopted a government perspective in measuring both costs and benefits, thereby producing a cost-savings analysis.

A set of key methodological features of the BCA studies is reported in Table 4.5. Two important types of variation in BCA analysis across studies are the child's age at the start of the intervention and the age as of the last data collected. With our inclusion criteria, all programs start before kindergarten entry, some as early as the prenatal period. For some programs, the starting age is a range (e.g., participants in a

Table 4.5
Methods for Early Childhood Programs with Benefit–Cost Analyses

Program	Child Age		BCA Discount		BCA Has Stakeholder Disaggregation?	BCA Reports Standard Errors?	BCA Reports Sensitivity Analyses?
	At Intervention Start	At Last Follow-Up	Rate, as a Percentage	To Age. . .			
ECE							
Carolina Abecedarian Project	Six weeks to three months	21 years	0, 3, 5, 7, 10	0	No	No	To discount rate, outcomes valued
Head Start	Three to four years	21 years	3.5	3	Yes	Yes, Monte Carlo[a]	To outcomes valued
Oklahoma Pre-K	Four years	Five years	3	4	No	No	To discount rate, earnings projected
PATHS	Three to four years	Six years	3.5	3	Yes	Yes, Monte Carlo[a]	To outcomes valued
HV							
Durham Connects	Birth	Six months	n/a	n/a	No	No	No
HFNY	Birth	Seven years	3	0	No	No	To discount rate, cost assumptions

Table 4.5—Continued

Program	Child Age		BCA Discount		BCA Has Stakeholder Disaggregation?	BCA Reports Standard Errors?	BCA Reports Sensitivity Analyses?
	At Intervention Start	At Last Follow-Up	Rate, as a Percentage	To Age. . .			
Healthy Families Oregon	Birth	Two years	None used	n/a	No	No	To projected outcomes
NFP	Up to 30th week of gestation	19 years	3.5	0	Yes	Yes, Monte Carloa	To outcomes valued
Parent–Child Home Program	Two to three years	17 years	3.5	2	Yes	Yes, Monte Carloa	To outcomes valued
PE							
COPE	Two to four days after admission to NICU	Two months	n/a	n/a	No	No	No
Helping the Noncompliant Child	Three to four years	Four years	3.5	3	Yes	Yes, Monte Carlo[a]	To outcomes valued
Incredible Years for parents	Three to four years	Six years	3.5	3	Yes	Yes, Monte Carlo[a]	To outcomes valued
PCIT	18 months to four years	Six years	3.5	1.5	Yes	Yes, Monte Carlo[a]	To outcomes valued

Table 4.5—Continued

Program	Child Age		BCA Discount		BCA Has Stakeholder Disaggregation?	BCA Reports Standard Errors?	BCA Reports Sensitivity Analyses?
	At Intervention Start	At Last Follow-Up	Rate, as a Percentage	To Age. . .			
ECE + HV							
CCDP	Prenatal to one year	Five years	3	3	Yes	No	To outcomes valued
Early Head Start (national study, all approaches)	Six weeks to two years	Ten years	3.5	0	Yes	Yes, Monte Carlo[a]	To outcomes valued
Perry Preschool Project	Three to four years	40 years	0, 3, 5, 7	3	No	Yes, Monte Carlo	To discount rate, outcomes valued, cost of crime, projection method
ECE + PE							
Chicago CPC	Three to four years	26 years	3, 0–7	3	Yes	Yes, Monte Carlo	To discount rate, outcomes valued, projection method

Table 4.5—Continued

Program	Child Age		BCA Discount		BCA Has Stakeholder Disaggregation?	BCA Reports Standard Errors?	BCA Reports Sensitivity Analyses?
	At Intervention Start	At Last Follow-Up	Rate, as a Percentage	To Age. . .			
HV + non–home-based PE							
HIPPY	Three to four years	Six years	3	3	Yes	No	To outcomes valued
PAT	Birth to six months	Four years	3.5	0	Yes	Yes, Monte Carlo[a]	To outcomes valued

SOURCES: Studies cited in Table 4.2.

[a] Reports the probability of positive net benefits based on a Monte Carlo simulation.

one- or two-year preschool program can start at age 3 or 4). There is more variation in the age as of the last follow-up because that is a function of the extent to which the evaluation involves follow-up beyond the end of the intervention and how far into the future the follow-up can extend.

Among the studies we review, the shortest follow-up (two months) is for the COPE program, which has a primary focus on parent education provided when a premature infant is in the hospital NICU. The longest follow-up is for Perry Preschool, which last published results for treatment and control group differences based on data collected when study participants were age 40. A handful of other interventions have also followed study participants into adulthood (age 19 or older): Carolina Abecedarian, Head Start, NFP, and Chicago CPC. These economic evaluations with long-term follow-up are exceptional, however, because the vast majority of the intervention BCAs listed in Table 4.5 (13 of the 19) are based on follow-up that does not extend past the early childhood years or only into the first few years of the elementary grades (up through age 7). Two other programs with BCAs (Early Head Start and Parent–Child Home Program) last collected data from participants later in the school-age years: ages 10 and 17, respectively. As we discuss later, the length of the follow-up has implications for the outcomes that can be measured and the feasibility of placing an economic value on those outcomes.

For most early interventions, with the possibility of impacts and associated economic costs or benefits beyond a single year, there is a need to apply a discount rate to account for the lower value of dollars in the future than in the present. Table 4.5 shows that most of the BCAs we identified use a preferred discount rate equal to 3 or 3.5 percent (the latter being the rate used in the WSIPP model). Several studies assess the sensitivity of results to alternative rates ranging in discrete increments from 0 percent to 7 percent or to 10 percent. Three BCAs did not apply a discount rate (Durham Connects, Healthy Families Oregon, and COPE). For two of these programs, outcomes were measured within one year of the program implementation, so all dollar values based on observed outcomes would not require discounting. When discounting was applied, the discounting was typically applied

back to the earliest age at which the intervention could start, which means that some BCAs discounted to age 0, while others used up to age 4. These differences in the age to which the analyses discounted will not affect the benefit–cost ratio, but it will affect the level of benefits and net benefits.

Several other best-practice features, recommended by National Academies of Sciences, Engineering, and Medicine (2016) include presenting BCA results disaggregated by stakeholder, reporting standard errors or some other parameter to indicate the degree of uncertainty in the benefit–cost results, and conducting sensitivity analyses. As shown in Table 4.5, the first two of these practices are not yet routinely in place for BCAs of early childhood programs. However, because the WSIPP model follows all three practices, the prevalence of these practices is higher than it might otherwise be. For the WSIPP model, for instance, BCA results are reported separately for the public sector as a stakeholder, along with program participants and the rest of society. Monte Carlo simulation is used in the WSIPP BCA tool to model the implications of various sources of uncertainty, with the uncertainty expressed by the percentage of the Monte Carlo simulations where net benefits were greater than 0 (i.e., benefits exceed costs). In terms of sensitivity analyses, the WSIPP results show the sources of benefits and the associated contribution to the total, thereby allowing for sensitivity analyses based on which outcomes are or are not valued. A few other studies also disaggregate results by stakeholder, use Monte Carlo simulation to estimate standard errors, or perform sensitivity analyses in terms of the discount rate and assumptions used in the valuation of outcomes (e.g., the value of reductions in crime or the assumptions used in projecting future earnings).

Arguably the bigger sources of methodological variation across BCA studies of early childhood programs, with implications for comparability, are the outcomes measured and their assigned economic values: whose outcomes are valued, which outcomes are observed and valued, which outcomes are observed but not valued, and which outcomes are projected beyond the last follow-up. Additional issues related to valuation of resources used and program impacts include whether the study accounts for DWL from the distortionary effects of government taxes

and transfers, whether it values parent (or child) time, and whether the value of crime avoidance includes the intangible costs (e.g., pain and suffering). Table 4.6 summarizes the resolution of these issues related to outcome analysis methods for each of the 19 studies.

First, this comparison shows that most economic evaluations measure and value outcomes for both the child and the parent(s), although a few capture child outcomes only. This is largely a function of whether the evaluation collects outcomes for the child only or for parents, as well. The measurement of parental outcomes, especially when the program is focused on changing parental behavior, adds to the potential economic benefits from the intervention.

Second, there is no consistent pattern in which outcomes are observed and valued, those outcomes that are not included in the analysis, and the outcomes projected through time. Most common for valuation include K–12 net savings (e.g., from reduced grade retention or reduced special education use), achievement tests, educational attainment, use of the social safety net, and health care utilization. Outcomes that are measured but less likely to be valued include child social and emotional outcomes, child or adult mental health, and parenting practices. Outcomes that are projected as economic values beyond the point of last observation include those that are linked to later outcomes (such as achievement tests or educational attainment) that are linked to later increases in earnings. Other outcomes are projected from the last observed value to the same outcome at future ages, and these include earnings, welfare use, and criminal activity.

Third, aside from the analyses based on the WSIPP model, few studies account for DWL or test the sensitivity of findings with respect to the assumed DWL parameter. Almost no studies value parent time, including home visiting and parent education programs in which parental time is a major resource utilized in the intervention. In contrast, where applicable, studies uniformly include the intangible cost of crime (e.g., pain and suffering), even though the valuation of such intangibles is subject to more uncertainty than the tangible costs of crime (e.g., in the form of property damage and medical costs related to personal injury).

Table 4.6
Methods for Valuing Outcomes for Early Childhood Programs with Benefit–Cost Analyses

	Outcomes					Valuation	
Program	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time	DWL Included?	Parent Time?	Intangible Crime Benefits?
ECE							
Carolina Abecedarian Project	Child and parents	K–12 net savings; educational attainment; smoking; welfare use; earnings (mother)	None	College costs; earnings (and taxes); mortality; welfare use; earnings (mother)	No	Values child care benefit for parents	n/a
Head Start	Child and mother	Achievement tests; K–12 net savings; high school graduation; crime; teen birth (mother and child)	Child social and emotional behavior; health care (child); postsecondary net savings (child)	High school graduation (child); crime (child); teen birth (mother and child)	Yes	No	Yes
Oklahoma Pre-K	Child	Prereading, prewriting, and premath skills	None	Earnings (and taxes)	No	No	n/a
PATHS	Child	Social and emotional behavior; achievement tests	None	Social and emotional behavior; achievement tests	Yes	No	n/a

Table 4.6—Continued

Program	Outcomes				DWL Included?	Valuation	
	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time		Parent Time?	Intangible Crime Benefits?
HV							
Durham Connects	Child	ED visits	Parent behaviors; child development knowledge; home environment; maternal mental health	None	No	No	n/a
HFNY	Child and parent	Low birth weight; child welfare system (including foster care); preventive services; welfare use; earnings (and taxes)	None	No	No	No	n/a
Healthy Families Oregon	Child and parent	Welfare use; child welfare system (including foster care); preventive services; low birth weight; educational attainment	None	Yes	No	No	n/a

Table 4.6—Continued

	Outcomes					Valuation	
Program	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time	DWL Included?	Parent Time?	Intangible Crime Benefits?
NFP	Child and mother	Child abuse and neglect; social and emotional behavior; achievement tests; K–12 net savings; crime (mother and child); welfare use (mother); substance abuse (mother); employment (mother); high school graduation (mother)	Mortality (child); health care (mother and child); high school graduation (child)	Child abuse and neglect; social and emotional behavior; achievement tests; K–12 net savings; high school graduation; crime (mother and child); welfare use (mother); substance abuse (mother); employment (mother); postsecondary net savings (mother)	Yes	No	Yes
Parent–Child Home Program	Child	Achievement tests; K–12 net savings	Social and emotional behavior; high school graduation	Achievement tests; K–12 net savings	Yes	No	n/a

Table 4.6—Continued

Program	Outcomes				DWL Included?	Valuation	
	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time		Parent Time?	Intangible Crime Benefits?
PE							
COPE	Child	Days in hospital NICU	Stress, depression, anxiety (parents); parent–infant interactions	None	No	No	n/a
Helping the Noncompliant Child	Child and parent	Social and emotional behavior; mental health (parent)	None	Social and emotional behavior; mental health (parent)	Yes	No	Yes
Incredible Years for parents	Child and parent	Social and emotional behavior; mental health (parent); depression (parent)	None	Social and emotional behavior; mental health (parent); depression (parent)	Yes	No	Yes
PCIT	Child and parent	Social and emotional behavior; mental health (parent)	None	Social and emotional behavior; mental health (parent)	Yes	No	Yes

Table 4.6—Continued

Program	Outcomes				DWL Included?	Valuation	
	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time		Parent Time?	Intangible Crime Benefits?
ECE + HV							
CCDP	Child and parent	Achievement tests; welfare use (mother)	None	None	No	No	n/a
Early Head Start (national study, all approaches)	Child and mother	Social and emotional behavior; achievement tests; K–12 net savings; crime; higher education (mother); welfare use (mother); substance abuse (mother); employment (mother); depression (mother)	Health care (child); child abuse and neglect	Social and emotional behavior; achievement tests; K–12 net savings; crime; postsecondary net savings (mother); welfare use (mother); substance abuse (mother); depression (mother)	Yes	No	Yes
Perry Preschool Project	Child	K–12, college, and adult education net savings; earnings (and taxes); crime; welfare use	Academic success; mortality (intrinsic value of loss of life)	Earnings (and taxes); crime; welfare use	0%, 50%	No	Yes

Table 4.6—Continued

Program	Outcomes				DWL Included?	Valuation	
	Whose Are Valued	Observed and Valued	Observed but Not Valued	Linked or Projected in Time		Parent Time?	Intangible Crime Benefits?
ECE + PE							
Chicago CPC	Child	Child abuse and neglect; K–12 and college net savings; crime; depression; substance use; smoking	None	Child abuse and neglect (intangible victim costs); earnings (and taxes); crime; depression; substance use; smoking	No	Requires parent time in centers and a child care benefit for parents	Yes
HV + non–home-based PE							
HIPPY	Child	K–12 net savings	None	Earnings (and taxes)	No	No	n/a
PAT	Child and parent	Achievement tests; child abuse and neglect; teen birth	Child social and emotional behavior; health care (child)	Child abuse and neglect; achievement tests; high school graduation (mother); teen birth (mother)	Yes	No	Yes

SOURCES: Studies cited in Table 4.2.

[a] Report probability of positive net benefits based on a Monte Carlo simulation.

Benefit–Cost Analysis Findings

The assessment of the methods behind the BCAs reviewed in this chapter serves to underscore the lack of strict comparability from one BCA to another, which limits the ability to use the results to reach conclusions, such as which intervention has the highest net benefits per child or the highest benefit–cost ratio. In addition, the WSIPP BCA results are best viewed as prospective estimates of the expected return for a given program model if implemented in the future in Washington State. The non-WSIPP BCAs are generally designed to serve as retrospective analyses, with the aim of estimating the economic return for the program as implemented and evaluated with a particular population, in a specific place, and during a specific time period. Thus, the BCA results are best viewed in the context of each separate early childhood program as an indication that the program either produced a favorable economic return or could produce a favorable return in the future.

Another consideration, documented in the first column of Table 4.7, is that the WSIPP model applies several "rules" that attenuate (i.e., discount or shrink) the magnitude of the program impacts estimated from their meta-analyses based on such factors as evaluations with weaker designs or those that are based on small-scale implementation (e.g., a demonstration program). These discounts, when they are applied, will shrink the estimate of (gross and net) benefits because the attenuation factors do not apply to the cost side of the equation. Such assumptions tend to be conservative and will magnify any differences across BCA studies based on the WSIPP model and others, which tend not to attenuate results based on these factors. For example, the estimated net benefits for the NFP program produced by the WSIPP model are based on attenuating program impacts, on average, to 36 percent of their value based on the WSIPP meta-analysis. The attenuation is even larger (i.e., a smaller percentage in Table 4.7) for the Parent–Child Home Program and the HIPPY program, but smaller for PCIT, Helping the Noncompliant Child, the Incredible Years, and PATHS. Some programs in Table 4.7 with BCAs based on the WSIPP model—namely, Head Start, Healthy Families, Early Head Start, and PAT—do not have effects attenuated.

Table 4.7
Results for Early Childhood Programs with Economic Benefit–Cost Analyses

Program	Attenuation, as a Percentage[a]	PDV Amounts per Child or Family, in 2016 Dollars			Benefit–Cost Ratio	Years to Break Even	Percentage of Simulations in Which Benefit > Cost
		Cost	Benefits	Net Benefits			
ECE							
Carolina Abecedarian Project	0	47,847	174,323	126,477	3.64	—	—
Head Start	0	8,947	26,604	17,656	2.97	28	82
Oklahoma Pre–K							
Full day—free lunch	0	10,822	33,478	22,656	3.09	—	—
Full day—reduced-price lunch	0	10,822	37,364	26,542	3.45	—	—
Full day—full-price lunch	0	10,822	30,556	19,734	2.82	—	—
Part day—free lunch	0	5,411	22,065	16,654	4.08	—	—
Part day—reduced-price lunch	0	5,411	16,181	10,770	2.99	—	—

Table 4.7—Continued

Program	Attenuation, as a Percentage[a]	PDV Amounts per Child or Family, in 2016 Dollars			Benefit–Cost Ratio	Years to Break Even	Percentage of Simulations in Which Benefit > Cost
		Cost	Benefits	Net Benefits			
Part day—full-price lunch	0	5,411	18,602	13,191	3.44	—	—
PATHS	117	360	7,655	7,295	21.24	18	63
HV							
Durham Connects	0	721	2,178	1,457	3.02	1	—
HFNY	0	5,716	875[b]	–4,841	–0.15	—	—
Healthy Families Oregon	0	3,815	–659	–4,474	–0.17	—	—
NFP	36	10,176	16,412	6,237	1.61	25	58
Parent–Child Home Program	28	5,860	2,951	–2,909	0.50	42	43
PE							
COPE	0	152	5,295	5,143	34.93	1	—
Helping the Noncompliant Child	59	698	1,579	881	2.26	26	66
Incredible Years for parents	67	1,321	2,180	858	1.65	22	54

Table 4.7—Continued

Program	Attenuation, as a Percentage[a]	PDV Amounts per Child or Family, in 2016 Dollars			Benefit–Cost Ratio	Years to Break Even	Percentage of Simulations in Which Benefit > Cost
		Cost	Benefits	Net Benefits			
PCIT	58	1,416	3,247	1,831	2.29	25	79
ECE + HV							
CCDP	50	48,768	–12	–48,780	0.00	—	—
Early Head Start	0	11,134	–1,535	–12,669	–0.14	>50	24
Perry Preschool Project	0	21,142	181,926	160,783	8.60	—	—
ECE + PE							
Chicago CPC	0	9,853	106,748	96,895	10.83	—	—
HV + non–home-based PE							
HIPPY	21	6,381	14,308	7,927	2.24	—	—
PAT	0	2,722	8,955	6,234	3.29	23	67

SOURCES: Studies cited in Table 4.2.

NOTE: Monetary values have been converted to 2016 dollars using the CPI. — = not reported.

[a] Percentage attenuation of evaluation effect size used for the BCA, averaged across all effect sizes.

[b] Savings to government only.

With these issues in mind, we summarize key conclusions that can be drawn based on the results presented in Table 4.7, which show the PDV of cost per child (or family) (previously presented in Table 4.4), PDV benefits per child, PDV net benefits per child, and the benefit–cost ratio. The WSIPP model is generally the only one that also reports the number of years it will take to break even (i.e., the period when cumulative benefits first exceeds cumulative costs) and the percentage of Monte Carlo simulations in which benefits exceed cost:

- Most, but not all, of the early childhood programs that have been the subject of BCAs produce positive economic returns. In other words, PDV net benefits are positive and the benefit–cost ratio is greater than 1. The few exceptions include HFNY (based on the cost-savings analysis), Healthy Families Oregon, the Parent–Child Home Program, CCDP, and Early Head Start. In each of these cases, based on the available follow-up data, the programs were estimated to have small or null effects on the outcomes that could be monetized, which translates into few monetary benefits to offset the program costs. For example, the WSIPP analysis of Early Head Start, based on the national RCT, produced impact estimates on 11 outcomes for either the child or the child's parent. But all of the effect sizes were less than 0.1, so the associated dollar benefits were small and not enough to offset the cost of about $11,100 per child. It is possible that a more comprehensive BCA based on longer-term follow-up or measurement and monetization of other outcomes would show positive net benefits for these programs.
- There is a wide range in the estimated net benefits per child (or family) and the benefit–cost ratio. For those programs that are estimated to have positive economic returns, the net benefits per child range from about $900 for the Incredible Years and Helping the Noncompliant Child to about $100,000 or higher for Chicago CPC, Abecedarian, and Perry Preschool. The programs with the highest net benefits do not necessarily have the highest benefit–cost ratios. Among the programs in Table 4.7, the highest benefit–cost ratio is about 35 to 1 for the COPE parent education

program. This is a relatively low-cost program—with costs of about $150 per family—and generates health care savings from reduced length of NICU stay equal to about $5,300 per child. Likewise, the PATHS pre-K curriculum requires an investment of only about $360 per child but is estimated to produce benefits nearly 20 times as large (about $7,700), primarily through improvements in achievement scores that are linked to higher lifetime earnings. These high benefit–cost ratios are the exception, however. Among the other programs in Table 4.7 with positive returns, benefit–cost ratios typically fall in the range of $2 to $4 per $1 invested. The three more-intensive ECE programs with positive returns—Abecedarian, Perry Preschool, and CPC—have benefit–cost ratios of about 4 to 1, 9 to 1, and 11 to 1, respectively. These higher returns can be attributed, in part, to the long-term follow-up associated with these interventions, which allows the inclusion of observed impacts on adult outcomes that have large economic consequences, such as earnings and crime.[9]

- A variety of program approaches realize positive economic returns. Positive economic returns can be realized for less intensive and more-intensive interventions and for programs that use different approaches. As just noted, low-cost interventions, such as the COPE parent education program, Durham Connects, and the PATHS curriculum, can produce positive returns. But the same is also true for very resource-intensive programs, such as the Abecedarian, Oklahoma Pre-K, NFP, Perry Preschool, and Chicago CPC, each of which requires an investment of $10,000 or more per child or family. Positive economic returns are also found for at least one of the programs in each of the seven approaches represented. In other words, benefits can outweigh costs for well-designed programs that provide ECE, home visiting, parent education, or a combination of approaches.

[9] For Perry Preschool and Chicago CPC, earlier BCAs based on shorter follow-up periods found lower benefit–cost ratios, despite projecting outcomes into the future, such as earning gains and crime reduction. It appears that the future projection based on follow-up in early adulthood tended to underpredict the actual benefits later observed with subsequent follow-up. See Karoly (2012) for a discussion.

- Positive economic returns can be achieved for universal, as well as targeted, programs. Most of the programs with BCAs listed in Table 4.7 are targeted in some way, either to serve children and families with low resources (e.g., families with incomes below the federal poverty threshold) or children and families facing other risks (e.g., parents with premature newborns). Thus, there is strong evidence that early intervention programs can produce favorable economic returns when they target vulnerable children and families. However, the positive net benefits and benefit–cost ratio for the universal Oklahoma Pre-K program and the universal Durham Connects home visiting program demonstrate that positive returns are also possible when programs are available to all children and families. The BCA results for Oklahoma Pre-K, disaggregated by eligibility for free or reduced-price lunch, indicate that returns per child are likely to be higher for the more–economically disadvantaged groups than for those that are more advantaged but that the economic returns are positive on average for children across the income spectrum. Universal provision has the advantage of eliminating costs for determining eligibility and potentially removing the stigma that can be associated with targeted programs, thereby boosting participation rates, especially for the most at-risk families. The Durham Connects program demonstrates that universal access does not have to mean uniform service provision. Rather, universal intake allows for the use of a screening process to determine which children and families would benefit from which services, thereby tailoring service provision according to family needs.
- The benefits of early childhood investments unfold over time and can take years to reach the point at which cumulative benefits exceed the up-front costs. The BCAs in Table 4.7 that the WSIPP model produces include estimates of the number of years until the programs break even—in other words, the point at which the cumulative benefits exceed cumulative costs (using undiscounted cash flows). In two other cases—for Durham Connects and the COPE program—we had sufficient information to estimate the time to break even. For the WSIPP-based BCAs, the break-even

point is estimated to occur 18 to 40 years after the program began. This reflects the fact that participant earnings are often a major source of benefits (as discussed later) and that such benefits do not begin to accumulate until the participating child reaches adulthood 15 to 20 years after the program began. Durham Connects and the COPE program are exceptional in that they begin at birth or soon thereafter, they have modest per-family up-front costs, and those costs are paid back within the first year of the child's life through reduced use of medical services.

- There is considerable uncertainty in the estimates of economic returns. It is important to emphasize that the estimates of program costs, impacts, and dollar benefits summarized in Table 4.7 are all estimates with at least some degree of uncertainty. That uncertainty can be expressed in a standard error around the estimated impact of an intervention, as evaluated using an RCT or quasi-experimental design, or it can be reflected in a low to high range of likely economic values for a given outcome. The WSIPP model—consistently with the recommended best practice of accounting for multiple sources of uncertainty (National Academies of Sciences, Engineering, and Medicine, 2016)—conveys the uncertainty associated with its BCA model in the reported percentage of Monte Carlo simulations in which the estimated benefits exceed the estimated cost. Those simulations account for multiple sources of parameter and benefit–cost model uncertainty. As shown in Table 4.7, there is greater confidence that the Head Start program will provide a positive return (because 82 percent of the simulations resulted in a positive net benefit) than that Early Head Start will, where that rate is 24 percent. It is important to keep these sources of uncertainty in mind, especially when comparing the estimated net benefits or benefit–cost ratio across two or more early childhood interventions.

Table 4.8 shows the findings from the stakeholder disaggregation associated with each BCA, when it was reported (for 13 of the 19 BCAs). These additional results demonstrate the following:

- Program participants often have the largest benefits, and the rest of society the smallest benefits. As we see in Tables 4.9 and 4.10, one of the largest sources of benefits is participant earnings (parent or child). Although some of those gains in earnings flow to the public sector in the form of higher tax payments, the bulk of the gains in earnings remain with the program participant.
- The benefits to the government (federal, state, and local), albeit positive in many cases, are not always large enough to offset the program cost. A comparison of the cost column (first data column in Table 4.8) and the government benefit column (fourth data column) shows that the estimated benefits for government fall below the program cost in 11 out of the 13 of the BCAs with this breakdown. In other words, although a program can generate positive social net benefits, it will not necessarily generate savings for the public sector that can cover the program investment. It is possible that, with longer-term follow-up, programs would generate further savings to government that could help to cover the program cost.
- The inclusion of DWL estimates in the WSIPP BCA model does not have a large effect on the estimated benefit–cost ratio. The final column of Table 4.8 shows the benefit–cost ratio when the indirect benefits, estimated from the WSIPP model to account for the DWL—is set to 0. Because the indirect benefits are always negative, this serves to increase the benefit–cost ratio, but only modestly so.

To further explore the sources of benefits, Tables 4.9 and 4.10 disaggregate the estimated benefits for selected early childhood programs based on the reported sources of impact either for the parent (typically the mother) or the child. We make this comparison for a subset of the BCAs, particularly those with longer-term follow-up and valuation of

Table 4.8
Stakeholder Disaggregation for Early Childhood Programs with Benefit–Cost Analyses

Program	PDV Cost per Child or per Family, in 2016 Dollars	PDV Benefits per Child or per Family, in 2016 Dollars					Benefit–Cost Ratio	Benefit–Cost Ratio with 0% DWL
		Total	Participants	Government	Rest of Society	Indirect[a]		
ECE								
Carolina Abecedarian Project	47,847	174,323	—	—	—	—	3.64	3.64
Head Start	8,947	26,604	14,316	8,806	7,082	–3,600	2.97	3.38
Oklahoma Pre-K	[b]	[b]	—	—	—	—	[b]	[b]
PATHS	360	7,655	4,156	1,866	1,841	–207	21.24	21.81
HV								
Durham Connects	721	2,178	—	—	—	—	3.02	3.02
HFNY	5,716	—	—	875	—	—	–0.15	–0.15
Healthy Families Oregon	3,815	–659	—	—	—	—	–0.17	–0.17
NFP	10,176	16,412	8,857	6,600	4,531	–3,576	1.61	1.96

Table 4.8—Continued

Program	PDV Cost per Child or per Family, in 2016 Dollars	PDV Benefits per Child or per Family, in 2016 Dollars					Benefit–Cost Ratio	Benefit–Cost Ratio with 0% DWL
		Total	Participants	Government	Rest of Society	Indirect[a]		
Parent–Child Home Program	5,860	2,951	1,962	2,387	788	–2,186	0.50	0.88
PE								
COPE	152	5,295	—	—	—	—	34.93	34.93
Helping the Noncompliant Child	698	1,579	622	554	525	–123	2.26	2.44
Incredible Years for parents	1,321	2,180	1,312	860	465	–457	1.65	2.00
PCIT	1,416	3,247	1,287	1,135	1,061	–237	2.29	2.46
ECE + HV								
CCDP	48,768	–12	119	-48,900	0	—	0.00	0.00
Early Head Start	11,134	–1,535	708	2,161	354	-4,758	–0.14	0.29
Perry Preschool Project	21,142	181,926	—	—	—	—	8.60	8.60

Table 4.8—Continued

Program	PDV Cost per Child or per Family, in 2016 Dollars	PDV Benefits per Child or per Family, in 2016 Dollars					Benefit–Cost Ratio	Benefit–Cost Ratio with 0% DWL
		Total	Participants	Government	Rest of Society	Indirect[a]		
ECE + PE								
Chicago CPC	9,853	106,748	35,854	70,895		—	10.83	10.83
HV + non–home-based PE								
HIPPY	6,381	14,308	8,079	–4,014	3,861	—	2.24	2.24
PAT	2,722	8,955	5,964	3,052	694	–754	3.29	3.57

SOURCES: Studies cited in Table 4.2.

NOTE: Monetary values have been converted to 2016 dollars using the CPI. — = not reported.

[a] This category captures the estimated value of DWL from taxation.

[b] See Table 4.7.

Table 4.9
Sources of Benefits for Selected Early Childhood Programs with Economic Evaluation: Benefits in 2016 Dollars

	ECE Approach		HV Approach		Combination Approaches		
Source of Benefits	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Parent outcomes							
Child care	—	—	—	—	—	—	5,078
Maternal earnings	91,691	194	7,233	—	760	—	—
Maternal crime	—	—	719	—	—	—	—
Maternal welfare use (cash, food, medical)	—	—	998	—	1,036	—	—
College tuition	—	–17	–696	—	—	—	—
Other (e.g., health care cost)	—	26	—	—	230	—	—

Table 4.9—Continued

Source of Benefits	ECE Approach		HV Approach		Combination Approaches		
	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Child outcomes							
Child abuse and neglect	—	—	1,846			—	8,485
Education	945	–2,848	–981	2,020	915	5,149	6,833
Grade retention	11,788	131	–70	125	56	—	1,019
Special education	—	—	–251	2,013	893	—	6,155
College tuition	–10,844	–2,979	–660	–117	–33	—	–340
Earnings or compensation	50,071	34,868	7,444	3,834	1,101	92,872	33,388
Criminal behavior	—	4,012	4,858	—	2	79,502	49,152
Welfare	261	10	—	—	—	4,403	—
Health	23,722	280	41	10	19	—	3,813
Depression	—	—	—	—	—	—	572

Table 4.9—Continued

Source of Benefits	ECE Approach		HV Approach		Combination Approaches		
	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Substance misuse	—	—	—	—	—	—	3,241
Future generations	7,634	—	—	—	—	—	—

SOURCES: Studies cited in Table 4.2.

NOTE: Monetary values have been converted to 2016 dollars using the CPI. We set DWL to 0 percent for all BCA estimates. — = not included as a source of benefits.

Table 4.10
Sources of Benefits for Selected Early Childhood Programs with Economic Evaluation: Percentage Distribution of Benefits

	ECE Approach		HV Approach		Combination Approaches		
Source of Benefits	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Parent outcomes							
Child care	—	—	—	—	—	—	4.8
Maternal earnings	52.6	0.5	33.7	—	18.7	—	—
Maternal crime	—	—	3.4	—	—	—	—
Maternal welfare use (cash, food, medical)	—	—	4.7	—	25.5	—	—
College tuition	—	0.0	–3.2	—	—	—	—
Other (health care cost)	—	0.1	—	—	5.7	—	—

Table 4.10—Continued

Source of Benefits	ECE Approach		HV Approach		Combination Approaches		
	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Child outcomes							
Child abuse and neglect	—	—	8.6	—	—	—	7.9
Education	0.5	–7.8	–4.6	34.5	22.5	2.8	6.4
Grade retention	6.8	0.4	–0.3	2.1	1.4	—	1.0
Special education	—	—	–1.2	34.3	22.0	—	5.8
College tuition	–6.2	–8.2	–3.1	–2.0	–0.8	—	–0.3
Earnings or compensation	28.7	95.5	34.7	65.4	27.1	51.0	31.3
Criminal behavior	—	11.0	22.6	—	0.0	43.7	46.0
Welfare	0.2	0.0	—	—	—	2.4	—
Health	13.6	0.8	0.2	0.2	0.5	—	3.6
Depression	—	—	—	—	—	—	0.5

Table 4.10—Continued

Source of Benefits	ECE Approach		HV Approach		Combination Approaches		
	Carolina Abecedarian Project	Head Start	NFP	Parent–Child Home Program	Early Head Start	Perry Preschool	Chicago CPC
Substance misuse	—	—	—	—	—	—	3.0
Future generation	4.4	—	—	—	—	—	—

SOURCES: Studies cited in Table 4.2.

NOTE: Monetary values have been converted to 2016 dollars using the CPI. We set DWL to 0 percent for all BCA estimates. — = not included as a source of benefits.

multiple outcomes.[10] Table 4.9 shows how benefits are disaggregated by source as measured in 2016 dollars. Table 4.10 shows the percentage of total benefits accruing from a given source, where the percentages sum to 100 percent across all benefit categories. These results for the selected programs support the following conclusions:

- The monetary benefits from early childhood program derive from multiple outcome domains, and they can be due to improved outcomes for the children, the parents, or both. This supports the argument made earlier that BCA is more applicable than CEA for looking at the economic impact of early childhood programs because multiple outcomes can be affected, which then become sources of benefits.
- Earnings of the parent or the child are often the single-largest absolute source of benefits. This is especially true for programs with long-term follow-up when gains in earnings can be measured and valued, rather than projected. Benefits from reduced crime are a close second when the outcome is measured, usually as part of a longer-term follow-up. The share of benefits linked to crime impacts is about 45 percent for both Perry Preschool and Chicago CPC, two studies with relatively large effects on crime. The next-highest crime share is NFP (22 percent), for which crime reductions were found for both the participating mother and later for her child. Such large dollar benefits might not be replicated with other early childhood programs, especially when the population served has a relatively low baseline rate of criminal activity.
- Higher education costs generally factor in as a negative benefit, but those costs are offset implicitly in the projected gains in earnings. The negative benefits reflect the outlays for tuition and fees that occur up front as a result of increased attendance

[10] This analysis is less interesting for the BCAs in which all benefits derive from a single source, such as the Oklahoma Pre-K benefit estimate (which derives from the program's effect on school readiness measures, which are then converted to future earnings) or the returns for the COPE program (which are exclusively from the reduction in hospital days). Our disaggregation does not consider DWL as another outcome category given that we did not estimate it for all the programs in the table.

at postsecondary institutions. This is an example of how improving outcomes through early childhood interventions can produce outcomes that generate costs, along with improved outcomes for which the consequence is realized as benefits.

- Health-related impacts have generally not been a major source of benefit in the available BCAs for early childhood programs. For the selected early childhood interventions in Tables 4.9 and 4.10, health-related outcomes contribute to a maximum of 14 percent of the benefits for the Carolina Abecedarian Project, a project that reduced smoking rates, which was then monetized in the BCA. The next-highest share for health is the 4-percent contribution to benefits for Chicago CPC, for which favorable effects on depression and substance use were monetized. In the other BCAs listed in Tables 4.9 and 4.10, the small contribution reflects the fact that few studies measure health-related outcomes, and, when they do, the impacts tend to be small or to have relatively low monetary value. Two exceptions, not included in Tables 4.9 and 4.10, are the COPE program and Durham Connects, both of which (as noted earlier) generate benefits from reduced health care loss to more offset the cost of the program.

Summary

This chapter has assembled the economic evaluations available for 25 of the 115 early childhood programs that we reviewed in Chapters Two and Three and synthesized the associated findings. This report includes more than twice as many economic evaluations as our 2005 review (Karoly, Kilburn, and Cannon, 2005) did. Some form of economic evaluation, such as a cost analysis, remains the exception rather than the rule, however. The growth over time in such analyses reflects the growing demand for economic evaluation evidence. But the demand is undermined by the challenges in applying economic evaluation tools to early childhood programs, especially in the case of BCA, with the need to value many outcomes in early childhood for which ready economic values do not always exist.

Cost analysis is the most straightforward to implement, of interest in its own right but also the foundation for a CEA or BCA. Of the cost analyses we identified, more-recent analyses are based on concurrent cost data collection and are comprehensive in capturing as many resources as possible, but many still adopt a funder perspective and therefore do not capture all societal resources used to implement the intervention. Across the 25 early childhood cost analyses, we find tremendous variation in the per-child or per-family costs. Much of this variation can be traced to key program features, such as the intensity and duration of the services delivered. Such cost analyses provide valuable information about the resources required to replicate an evidence-based program. However, a CEA or BCA is required to determine whether program benefits outweigh program costs.

Of the two outcome-based methods, CEA has had more-limited use when applied to early childhood interventions, given that many interventions can have impacts in multiple outcome domains. Nevertheless, CEA can be useful when there is just one outcome or only a few outcomes of interest or when alternative program variants have been evaluated. When multiple outcomes are of interest, however, the rankings of early childhood program based on a cost-effectiveness ratio might not always produce consistent rankings. In other words, one program can be more cost-effective in producing improvements in outcome A, but a different program is more cost-effective in producing improvements in outcome B.

Among economic evaluation methods, BCA has the advantage that it provides a comprehensive accounting of all potential domains of impact and the associated economic value. Yet, challenges with its application to early childhood programs need to be kept in mind—notably, the lack of comparability across most estimates available to date. This is because of different methods, but also the fact that interventions vary in the outcomes measured and the length of follow-up. Thus, programs with low net benefit estimates can, in fact, produce lower returns, or the estimate of net benefits can be lower because the programs have neglected to measure key outcomes for which benefits accrue or they have not had the time or resources for longer-time

follow-up. Hence, for the BCAs reviewed in this chapter, comparing BCA estimates across programs is not advised.

Rather, results from 19 BCAs reviewed in this chapter demonstrate the proof of the principle that early childhood programs can generate economic benefits that outweigh program costs, but not all programs achieve this result. Among the programs that are estimated to generate positive net benefits to society, the favorable economic returns are found for both inexpensive interventions and more-costly ones, using a range of intervention approaches. Some programs are estimated to generate very high ratios of benefits to cost, but this usually occurs when costs are very small (e.g., PATHS and COPE). For more-costly interventions, the typical economic return is in the $2-to-$4 range per $1 invested, although the level of net benefits can be as high or higher as those of less costly programs (e.g., compare Abecedarian with Chicago CPC). The benefit–cost ratio also tends to be higher for more-targeted programs, especially those for which there is an opportunity for a meaningful reduction in criminal behavior, which is associated with large cost savings (e.g., Perry Preschool, Chicago CPC). Universal programs, which decisionmakers can favor for other reasons, such as those discussed earlier (e.g., no cost for eligibility determination, lower stigma), can also produce positive economic returns (e.g., Oklahoma Pre-K).

This chapter also demonstrates that there is scope for improving the application of economic evaluation methods to early childhood interventions, along the lines of the best practices recommended in National Academies of Sciences, Engineering, and Medicine (2016) or the suggested approaches for standardization offered in Karoly (2012). Improvements in the quality of the economic evaluations of early childhood interventions will allow more-direct comparisons across early childhood programs and provide greater usefulness for decisionmakers.

CHAPTER FIVE

Conclusions and Policy Implications

In our 2005 report (Karoly, Kilburn, and Cannon, 2005), we summarized the state of evidence on early childhood programs as providing proof of the concept that these programs could improve child outcomes and generate benefits that more than outweighed the costs. The present analysis includes more than five times as many programs and evaluation studies and three times as many BCAs. The additional data provide more certainty on some aspects of the evidence on early childhood programs. As a whole, the larger body of research available today strengthens the conclusion that a spectrum of early childhood programs can improve child outcomes. This research base includes an increasingly diverse set of approaches and demonstrates that no single approach emerges as the only effective strategy or most effective approach. In addition, the growing research base demonstrates that early childhood programs improve a range of outcomes, both soon after the intervention ends and in the long run. No single outcome domain emerges as the primary impact of early childhood programs.

Instead of narrowing the set of effective programs and improved outcomes that early childhood programs can claim, the additional research highlights the unifying child development processes underlying this diverse set of programs and outcomes. As we discussed in Chapter Two, these programs improve child outcomes by enhancing child development inputs either directly or by promoting parenting capacity (see Figure 2.1 in that chapter). Furthermore, the programs enhance child development by engaging in development-promoting experiences, increasing children's access to goods that enhance

development, or both. Given these commonalities in the underlying process by which early childhood programs improve child outcomes—increase experiences and goods that promote development—it is not surprising that most programs we reviewed improved one or more child outcomes despite differences in program characteristics. Whether programs were provided in the home, ECE center, or health care setting; whether the programs interacted with only the child or the parent or both; and whether the child was an infant or a preschooler, the programs were generally informed by the same underlying theories and knowledge about how to promote child development (such as Center on the Developing Child, 2007).

We now summarize key findings from the previous chapters and then outline the implications of these findings for policy and practices, as well as research.

Key Findings

We organize our discussion of findings around our primary study questions:

- What program approaches to providing services for families and children from the prenatal period to school entry have been rigorously evaluated?
- What outcomes did these programs improve in the short or long term?
- What are the costs and benefits of effective programs and returns to government or society?

The State of the Evidence Base Regarding Early Childhood Programs

Our review of the literature uncovered a broad range of rigorous early childhood program evaluations that measured one or more child outcomes. At the same time, many programs lacked a research base that met our screening criteria, and we did not include these in our review. We ultimately analyzed 115 programs. Of these programs, 25 also had economic evaluations available for review.

The 115 programs are representative of all four program approaches we describe as part of our conceptual framework for characterizing programs—ECE, home visiting, parent education, and transfers. However, the great majority (78 percent) of programs include either an ECE or home visiting approach alone or in combination with another approach.

Additionally, we observed variation across this set of early childhood programs in key dimensions of the program approach. For example, among program dimensions, relatively few programs focus on universal implementation, instead using such criteria as low-income status to target the participants to receive services. The starting age for child participants also varies, with programs most often beginning with infants or preschoolers rather than in the prenatal period or with toddlers. And although programs most commonly provided services for less than a year, several programs provided services for more than three years.

Furthermore, evaluation characteristics varied, although we found clustering among programs with certain common evaluation characteristics. Almost all programs we reviewed had at least one evaluation conducted as an RCT. Often, however, evaluations were local model demonstrations with relatively small samples, with fewer large-sample, multisite studies examining program effects. Programs commonly had been evaluated in the short term, often not long past services for participants concluded, rather than observing longer-term effects by following children after the program ended. Another factor related to lack of long-term follow-up is the recency of programs, with many programs starting intervention evaluations in the 1990s or 2000s, limiting how many adult outcomes of the participating children are yet available to observe and assess.

The Outcomes That Early Childhood Programs Improve

We summarized findings from nearly half a century of early childhood program evaluations. The three most-common outcome domains that these evaluations reported were behavior and emotion (29 percent), cognitive achievement (26 percent), and child health (21 percent). Different program approaches tended to measure different

outcome domains, often reflecting the program approach goals. We also observed that, across the life cycle, the evaluations measured different types of outcomes as study participants aged.

The early childhood programs in our analysis improved 923 of 3,183 outcomes measured. The majority of findings were null, and 34 of the measured outcomes were negative. However, 102 out of our 115 programs had positive effects on at least one child outcome, indicating that it is the exception, among published evaluations, to find programs that have no demonstrable impacts on child outcomes. Prior meta-analyses of early childhood programs have demonstrated that impacts from early childhood programs can be sizable. Our 2005 study found an average effect size for early cognitive skills measured near the beginning of elementary school of 0.33 for nine ECE programs in combination with other approaches (home visiting or parent education) and 0.21 for six programs that were either single-approach home visiting or parent education programs (Karoly, Kilburn, and Cannon, 2005). These magnitudes are consistent with other meta-analyses of early intervention programs, which suggest a range of significant impacts for various early intervention approaches on child outcomes of 0.1 to 0.4, where most syntheses have estimated effect sizes for the cognitive achievement or the behavior and emotion domain.

As part of our review, we estimated the magnitude of outcome changes for three categories of outcomes in the child health domain, one that has not been estimated as often in prior syntheses of early childhood programs. The meta-analytic effect sizes estimated for the individual categories found a modest effect size for substance use (0.15), a small effect size for birth outcomes (0.03), and a null effect for BMI. The pooled effect size estimate for the entire set of outcomes from the three categories was small (0.05), but this was statistically different from 0.

We also found that effect sizes for health outcomes declined over time, with program impacts from evaluations conducted in earlier decades having larger effect sizes, on average, than more-recent program evaluations. This is consistent with findings reported in Duncan and Magnuson (2013) which show that pre-K effects on cognitive and achievement outcomes declined in the previous half century, potentially

because of changes in the counterfactual for those who did not experience pre-K. Finally, our analysis showed that ECE programs had larger effects than other program approaches for the pooled outcomes in the three health outcome categories we analyzed.

The Costs and Benefits of Early Childhood Programs

For the 115 programs we reviewed, 25 had some form of economic evaluation: a cost analysis, CEA, or BCA. Although this represents an increase over the number of programs with economic evidence available for our 2005 review, the production of economic evaluations has not kept pace with the growth in the number of impact evaluations. This stems from several factors. The teams that conduct the outcome evaluations often do not include researchers who analyze costs. Consequently, information on program cost is often collected retrospectively rather than concurrently with the evaluation effort. Even once cost data are available, implementing a BCA can be challenging because many of the outcomes affected by early childhood programs, especially those measured in the short term, are not readily expressed in monetary values so that they can be aggregated and compared with program cost.

The estimates of program cost available for the subset of the programs reviewed in this study reveal that early childhood programs have a considerable range in the resources required for implementation, from a few hundred dollars per child or family to nearly $50,000 per child or family. That variation, from very modest investments to very substantial ones, is largely attributable to differences in the intensity and duration of program services, although other factors contribute as well.

CEA and BCA go beyond cost analysis to incorporate program impacts into the economic evaluation. CEA tends to be less useful for analyzing early childhood programs when multiple outcomes are affected. In such cases, BCA is appropriate, but it requires assigning economic values to all affected outcomes, which, as noted earlier, might not be feasible for all outcomes.

The early childhood programs with BCAs reviewed in this study demonstrate that positive economic returns are possible but not guaranteed. Positive returns can be realized for both less and more

resource-intensive programs, for varied program approaches, and for both targeted and universal programs. At the same time, the underlying variation in program evaluations and the current state of the art in the application of BCA methods to early childhood programs means that it is usually not possible to use the available BCA findings to identify the programs with the largest "bang for the buck." Improvements in the quality and comparability of economic evaluations can only strengthen the usefulness of these methods for decisionmakers seeking to make efficient use of available resources.

Implications

We close this final chapter by discussing the implications of the findings in this report in two areas. The first area is implications for policy and practice, and the second is implications for research.

Implications for Policy and Practice

Research on early childhood program effectiveness and economic returns is intended to inform how decisionmakers in the public and private sectors set policy with respect to such programs and how practitioners implement them. Our findings have implications for both policy and practice.

Policymakers can be highly confident that well-designed and implemented early childhood programs can improve the lives of children and their families. This report features dozens of programs that have been rigorously demonstrated in the past several decades to improve child outcomes, and some of those also have evidence that they generate returns that more than pay for their costs. Although not every early childhood program improves every outcome, evidence that most of the early childhood programs we identified improve at least some child outcomes is robust across time, locations, and program models.

With a robust base of early childhood programs that have been proven to be effective based on rigorous evaluation, decisionmakers should integrate other criteria when selecting programs to implement. Now that there are multiple proven programs from which

to choose, decisionmakers can go beyond considering only whether a program is "evidence-based" to incorporate other criteria when determining which interventions to implement. These criteria include such aspects as whether the program targets the community's greatest needs and whether the workforce needed to implement the program is available. For example, stakeholders can identify the outcomes they would like to improve and the population that should be served to achieve the desired outcomes. Another important consideration is the assets and resources that the community can deploy. For example, a half-day preschool program can be a good fit for a high-density urban area where families can walk to a center, but the same program might not be a good fit for a rural area, where children live an average of 30 miles from the proposed preschool center. Some communities might have greater access to a trained workforce than others.

Numerous resources can assist communities in the process of identifying the best programmatic fit. An example of this is the needs–assets–best practices framework employed in Kilburn and Maloney (2010). The report illustrates how one community selected early childhood interventions that had evidence of effectiveness and that were at the intersection of the community's needs and assets. Another framework that helps guide communities through the process of choosing evidence-based interventions and is itself evidence-based is Getting to Outcomes (Chinman, Imm, and Wandersman, 2004). This ten-step program planning and implementation tool includes steps that involve needs assessment, asset identification, collecting evidence on relevant effective programs, and assessing program fit with the setting. Notably, a Getting to Outcomes toolkit for home visiting has already been developed (Mattox et al., 2013).

Program implementers adopting or expanding evidence-based models should pay attention to quality of replication and effects of scale-up. Exploration and adoption of an evidence-based program are only the first two stages of successful implementation, as outlined by the National Implementation Research Network (NIRN) (NIRN, undated; Fixsen, Naoom, et al., 2005). The final two stages are initial implementation, when program implementation is ramping up and staff are learning to deliver the program with fidelity, and

full implementation, which is achieved when more than half of the staff are executing the new program with fidelity (NIRN, undated). Fidelity of implementation is important because most of the program evaluations we have reviewed tell us that an early childhood program works but not which features were responsible for the demonstrated outcomes (the so-called black box). Thus, there is no guarantee that an evidence-based early childhood program will be as effective if modified, for example, with less intensive services or by deploying staff with different qualifications.

In other words, selecting evidence-based programs helps increase the chances of achieving desired outcomes for children, but it does not guarantee the same outcomes that were demonstrated in prior evaluations. Achieving desired results also requires good implementation of the programs as they were originally evaluated. Implementation researchers (Fixsen, Blase, et al., 2013) use this "formula" to describe this phenomenon:

evidence-based programs × effective implementation = improved outcomes.

The growing field of implementation science (Halle, Metz, and Martinez-Beck, 2013) and increasing technical assistance from funders, such as the Maternal, Infant, and Early Childhood Home Visiting Program and Head Start, provide support for effective implementation.

Further, given that many of the effective programs documented in this report were undertaken as smaller-scale demonstration projects, it is important to address fidelity and program quality in the context of program scale-up. Indeed, some experience suggests that adapting programs on a larger scale results in smaller improvements in outcomes than at the demonstration stage. For example, the impacts that full-scale pre-K programs have on school readiness tend to be not as large, but still substantial, as those demonstrated for smaller-scale demonstration programs (Karoly and Auger, 2016). Similarly, retention in NFP replication sites has been lower than in the original NFP efficacy trials (Maternal, Infant, and Early Childhood Home Visiting Technical Assistance Coordinating Center, 2015). Paying particular attention to implementation of the programs with fidelity when scaling up can support the realization of gains as close as possible to those achieved at

demonstration sites. As we note later in this section, when programs are implemented with modifications at a small or larger scale, further evaluation should be performed to determine whether the program variant is at least as effective as the original model.

New approaches to universal programs raise the possibility that such programs can complement rather than substitute for targeted programs. Traditionally, a debate in early childhood programming has been whether a program should be targeted to families with greater needs or provided universally to all families (Karoly, 2009). Arguments in favor of the targeted approach, especially when resources are limited, include the expectation of larger gains for high-needs families and, consequently, a higher ratio of benefits to costs. Indeed, some of the BCA findings discussed in Chapter Four support this expectation. Arguments for a universal approach note that targeting criteria can be imperfect, missing some families who could also benefit from the program, and that serving everyone would minimize any stigma associated with program participation. Other BCA evidence, also covered in Chapter Four, demonstrates that universal programs can also produce positive economic returns. Further, the aggregate net benefits can be larger in a universal program than in a targeted one (Karoly, 2009).

A new generation of universal programs demonstrates that the choice does not have to be either targeted or universal: Both approaches can be employed together. Rather than providing the same program to a broader population, such programs as Durham Connects have developed curricula and other program components that provide a low-intensity service to all families tailored to their needs, while also identifying those children and families that might benefit from additional specialized and more-intensive services. These follow-on interventions—whether home visiting, parent education, or other interventions—are necessarily targeted based on particular needs. In this way, universal programs can partner with targeted services for families of young children, taking advantage of the strengths of both approaches.

It can be tempting to view low-intensity universal programs as being a lower-cost option than more-intensive targeted programs. How-

ever, the total costs to deliver a universal program could be considerably more than a targeted one. For example, a universal program that serves 10,000 families at $500 per family would have total costs of $5 million; compare this with a targeted program serving 1,000 families at $4,000 per family for total costs of $4 million. The key is whether the universal program, by reaching all families, can more effectively target the intensive services to the families that can benefit most, rather than relying on the eligibility determination rules typically used by targeted programs.

Benefits can take decades to exceed costs, posing challenges for funding mechanisms that require short-term payoffs. The burgeoning research findings demonstrating positive rates of return to effective early childhood programs have encouraged the use of social impact bonds and other pay-for-performance mechanisms as a strategy for attracting private financing for the expansion of early childhood programs (Liebman, 2011; Dugger and Litan, 2012). Such contracts are already in place or in the planning stages for home visiting programs and ECE programs in multiple communities in the United States (Urban Institute, undated). These mechanisms are premised on the expectation of shorter-term impacts on program participants that are associated with public-sector savings that can be used to pay back the private investors' up-front financing.

As noted in Chapter Four, although BCAs for varied early childhood programs demonstrate positive returns to society, depending on which outcomes are improved and when the benefits occur over the child's lifetime, it can take a decade or longer until cumulative benefits exceed the up-front costs. Furthermore, many of the benefits from early childhood programs accrue to program participants themselves, and the returns to government might not be positive, especially in the short run. Programs that generate improvements in parents' outcomes that, in turn, increase government revenues or reduce government costs in the short term (e.g., effects on earnings, health care costs, use of other social welfare benefits, or crime) can be more amenable to these financing mechanisms than programs are that have primarily short-term effects on children's developmental outcomes, for which the effects on outcomes that can be monetized can take longer to realize.

Implications for Research

Our synthesis of research evidence for the set of programs we reviewed also points to opportunities and challenges for the research community to further advance our understanding of early childhood program effectiveness and economic impact. Our findings also have implications for ongoing dissemination of the research evidence.

Comparative effectiveness research can add value to early childhood program decisions. The focus of our review was on early childhood programs that were evaluated relative to "usual care," in part to standardize on the counterfactual condition of a "no-program" group. As evaluation research advances for early childhood programs, comparative effectiveness research will have greater currency than in the past for two key reasons. First, for many program models, it is becoming increasingly challenging to establish a no-program control group. This is especially the case for evaluations of pre-K programs and other early learning programs, given the high rates of participation in such programs. As the implementation of home visiting models expands, this issue will also confront program evaluators of this early intervention strategy. Second, because there are more evidence-based early childhood programs from which to choose, decisionmakers would benefit from explicit head-to-head comparisons between program alternatives. This could be achieved by presenting evaluation results in ways that facilitate comparison or by undertaking research studies that compare a given program with one or more other programs, rather than to the "usual care services" condition (see Effective Health Care Program, undated, for a discussion of comparative effectiveness).

The next generation of research needs to get inside the black box of effective programs. This was a recommendation in our 2005 report as well (Karoly, Kilburn, and Cannon, 2005). Although the past decade has seen growth in the number of effectiveness and efficacy studies, we still have few studies that examine which specific program components drive effectiveness. To target limited resources and innovate, we need to know more about which program components improve outcomes. Key design features include the age of the child when a program commences, the program intensity (e.g., the number of years for which services are provided, the number of hours per day,

the number of visits per year), the education and training background of providers, and specific curricular components. Such research can lead to better program design and program design that is based on evidence of cost-effectiveness. Conducting comparative effectiveness studies would help to address this need.

One barrier to expanding the knowledge base regarding the features that make early childhood programs effective is the high cost of conducting rigorous evaluations. An experimental design, for example, is not always feasible and can be expensive to execute. However, the growing rigor of quasi-experimental methods, such as the regression discontinuity design, provides an opportunity to come close to replicating experimental conditions. Although concerns about bias can remain, evidence from careful quasi-experimental designs would be better than having no evaluation evidence at all. Quasi-experimental designs can be particularly well suited for carrying out numerous studies to compare short-term impacts for alternative program designs with variation in the program features enumerated above. Fewer experimental studies could be used to confirm the most-robust findings from quasi-experimental studies.

Early childhood programs improve a range of outcomes, so evaluations should collect outcomes across a range of domains. This report has highlighted health outcomes for children who had participated in early childhood programs, but we also presented information about outcomes in numerous other outcome domains. Furthermore, we documented that the returns shown in BCA derived from many outcomes and not just one domain. Together, these findings demonstrate that programs that promote child development enhance individual well-being, a multifaceted concept. Building children's skills, knowledge, and health expresses itself in many outcomes and behaviors. Measuring only a subset of these facets of well-being is likely to miss some of the potential dividends that early childhood programs can pay across a lifetime.

Outcomes for two generations should be captured in early childhood program research. This review focused on children's outcomes, but many studies also measured outcomes for parents. As outlined in the early childhood framework presented in Chapter Two, par-

ents can also benefit from early childhood programs, especially when parents are the focus of the intervention, such as in parent education programs and many home visiting program models. Parents can also benefit in terms of greater labor force participation and higher earnings from ECE programs when the hours of care and early learning are sufficient to allow parents to increase their work hours, work experience, or education and training. Indeed, Chapter Four highlights that, in the available BCAs, many programs monetized parent outcomes, and this contributed to the favorable benefit–cost ratio. In some cases, accounting for parent outcomes ensures a shorter time interval until a program breaks even because the monetary benefits of improved parental outcomes are often realized sooner than the benefits associated with improved child outcomes. Adopting a two-generation perspective for early childhood programs will ensure that a more comprehensive accounting of potential benefits is captured. Furthermore, including outcomes for both generations will enable a more standardized comparison across program alternatives and will improve the comparability of BCAs.

There is a need for more studies that conduct longer-term follow-up to determine whether early program impacts are sustained. Growth in early childhood evaluations with long-term follow-up lags behind growth in early childhood program evaluations overall. This review includes many more studies than our 2005 report did, including many more BCAs. However, the bulk of the growth in studies has been from those that follow study participants for short increments after program services end. For example, all of the BCA studies in Chapter Four with long-term follow-up into adulthood (Abecedarian, Chicago CPC, Head Start, NFP, and Perry Preschool) were included in our 2005 review. Given the value of BCA for understanding the economic consequences of investing in early childhood programs and the greater likelihood of positive returns when longer-term outcomes are accounted for, conducting more long-term studies should be a research priority. Making greater use of administrative data from the criminal justice system, social welfare programs, child welfare system, and unemployment insurance system is one lower-cost strategy for measuring longer-term outcomes for evaluation cohorts.

To facilitate this strategy, researchers should routinely seek permission from study participants (children and parents) to link their evaluation data to administrative records in the future.

There is also a need to extend our understanding of the relationship between early-life outcomes and later-life outcomes. Longitudinal studies provide an opportunity to study such linkages, but the available evidence remains limited, especially for some early childhood outcomes, such as social and emotional development (Jones, Karoly, et al., 2015). Research that establishes the causal relationship between outcomes in early childhood and outcomes in adulthood can be used to forecast the longer-term effects of early childhood programs, in advance of having the long-term follow-up findings. Further, such linkages will facilitate greater use of BCA because the causal estimates can link outcomes in early childhood to outcomes later in childhood or adulthood that can be more readily expressed in monetary terms. For example, estimates of the causal effect of improved kindergarten performance and high school graduation in Chetty et al. (2011) provide the basis for forecasting longer-term economic benefits from such programs as Oklahoma Pre-K (Bartik, Gormley, and Adelstein, 2012). The forecasts can eventually be replaced by direct evidence of longer-term impacts. But until that time, the causal linkages can provide a data-driven basis for anticipating future benefits.

Incentivizing cost data collection, as well as standardization of BCA methods, would also facilitate comparisons across programs. The ability to compare BCA findings across early childhood programs is limited because of differences in the outcomes measured and the length of follow-up conducted for the program evaluation, the lack of cost data, and methodological differences in economic evaluation methods. Establishing a set of core outcomes to be measured in early childhood program evaluations (e.g., within any given domain in which a program is designed to produce impacts),[1] encouraging the

[1] In seeking to standardize the outcomes collected across evaluations of early childhood programs, measures could be specified within each domain in which programs would be expected to product impacts (e.g., cognitive development, social and emotional development, physical development). Then, for any given program model, the evaluation would measure the core outcomes consistent with the domain that that program is expected to affect.

routine collection of cost data, and incentivizing the use of standardized methods, such as those recommended in National Academies of Sciences, Engineering, and Medicine (2016), could boost the degree of comparability across economic evaluations of early childhood programs. This will also provide policymakers with relevant, high-quality information to guide their decisionmaking in the years ahead.

As we look beyond these direct implications of our study for policy, practice, and research, it is also important to place our findings regarding early childhood interventions in the context of the broader literature around supports for healthy child development at any age. A range of researchers, including economists and psychologists, have argued that investing early can provide the highest payoff because skill development is cumulative (Heckman, 2008). Furthermore, we have shown that the benefits of early childhood programs can be realized decades after the program ends. However, although these factors underscore the salience of early childhood programs from both short- and long-run perspectives, they do not imply that later investments in children's health and human capital are unproductive. Without experiences and goods that support development in middle childhood and adolescence, the developmental foundation laid in early childhood is less likely to be fully leveraged. For example, in considering the longer-term effects of high-quality preschool programs, research now points to the importance of the quality of the experience children have in the early elementary grades, as well as the alignment of the school-age services with those delivered in the preschool period (Zellman and Kilburn, 2015; Karoly and Auger, 2016). Furthermore, once children enter the school-age years, many will encounter risks to their healthy development that had not been present in the early childhood years. Thus, whether targeted or universal, early childhood programs are just the foundational component of a continuum of effective supports for healthy development throughout childhood.

The core outcomes would not necessarily require measurement of the same indicator (e.g., Peabody Picture Vocabulary Test) but the same construct (e.g., receptive vocabulary).

APPENDIX A

Methods

This appendix provides additional details on the methods we used for this study. We begin with a description of our search strategy to identify programs and rigorous evaluations and an overview of the abstraction process. Next, we discuss the methods employed for the outcome analyses presented in Chapter Three. We conclude with a discussion of the methods used for the economic evaluations presented in Chapter Four.

Program Selection

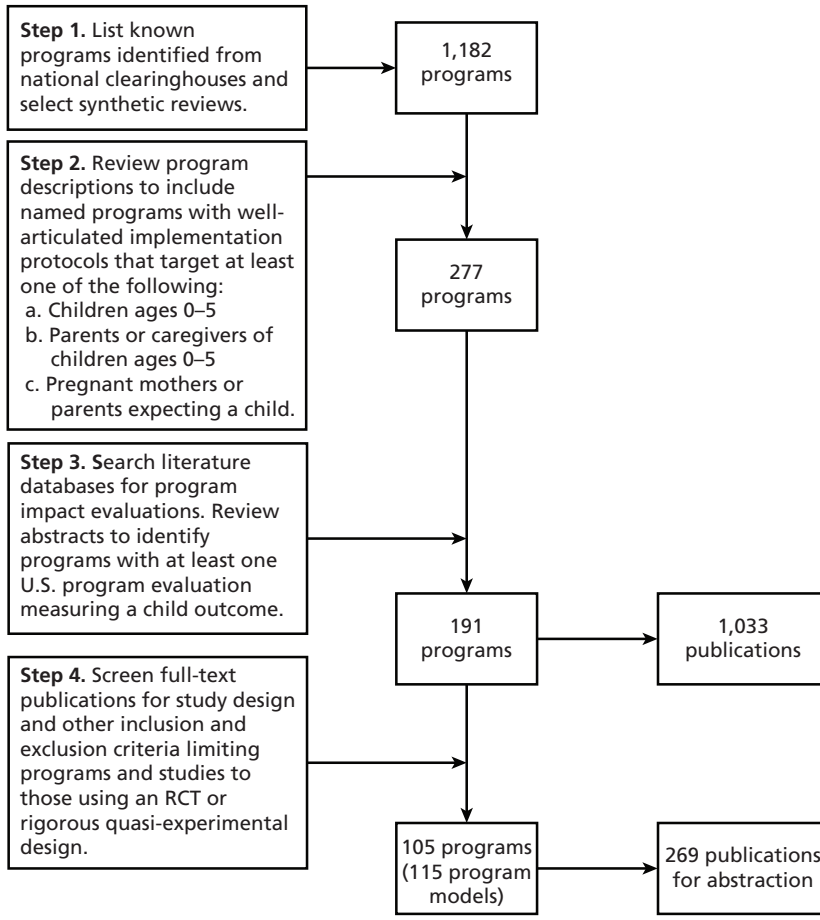
Our search strategy for programs to include in our analysis—and the associated evaluation studies—consisted of four steps, as illustrated in Figure A.1.

Step 1

We began building a master list of known social services or programs, starting with the full list of interventions included in the Pew Results First Clearinghouse Database, compiled from eight national research clearinghouses.[1] We supplemented this list with services and programs

[1] The eight national clearinghouses were Blueprints for Healthy Youth Development; California Evidence-Based Clearinghouse for Child Welfare; Coalition for Evidence-Based Policy; National Institute of Justice Office of Justice Programs Crime Solutions; Substance Abuse and Mental Health Services Administration's National Registry of Evidence-Based Programs and Practices; Promising Practices Network; U.S. Department of Education's What Works Clearinghouse; and What Works in Reentry Clearinghouse.

Figure A.1
Flow Diagram of Program and Evaluation Study Selection



RAND *RR1993-A.1*

listed on five additional sites, as well as synthetic research pieces discussing cash transfer, parenting, or early childhood programs.[2] This initial step yielded 1,182 programs.

[2] The five additional sites were U.S. Department of Health and Human Services' Home Visiting Evidence of Effectiveness; Collaborative for Academic, Social, and Emotional

Step 2

We reviewed descriptions of the 1,182 programs identified in step 1 to include only programs targeting at least one of the following:

- a child age 0–5
- a parent or caregiver of a child age 0–5
- a pregnant mother or parent expecting a child.

We excluded programs that lacked clear program design, such as information on the treatment, dosage, and implementation setting. We also excluded programs that were not "named" programs. That is, a program had to be an identifiable named program with a description of the intended design and targeted participants. When we began reviewing in more detail the programs in our master list from step 1, we determined that some of these were not actual programs but could better be characterized as generic approaches or loose descriptions of services that were not distinguishable from other programs. As examples, these include such approaches as cognitive behavioral therapy or interpersonal therapy that a psychotherapist might use in the course of traditional practice, a home-based parenting intervention that was not well-defined, or a dance activity offered in a preschool.

We found 277 programs that met these requirements. To keep the list tractable, we did not accept any additional programs into our review after November 15, 2015.

Step 3

We performed a structured bibliographic database search and program website scan to narrow the 277 programs identified in step 2 to those with published empirical measures of child outcomes in the United States. We searched 11 bibliographic databases and performed full-text searches (where the database allowed) of English-language articles, reports, and conference proceedings published between January 1, 1980, and September 30, 2015, or the date the bibliographic search

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Learning; Child Trends; WSIPP; and ChildServ. We referenced Bitler and Karoly (2015) to build our list of transfer programs.

occurred.[3] We also included any publication identified after the bibliographic search dates that met the requirements for admission—this process was more ad hoc and not a structured bibliographic search. In addition, we included publications that predated this January 1, 1980, date that were included in Karoly, Kilburn, and Cannon (2005) or, in one identified program's case, were the only evaluations available. Search terms included the program name and the following: outcome*, longitudinal study*, impact*, intervention*, effectiveness, control*, causal, experiment*, statistically significant*, parent*, and program study*.[4] We adjusted our search strategy for 12 transfer programs identified in step 2 because of the extremely high volume of references citing those program names. We used Google Scholar and searched on the program name and the search terms listed above. For all programs, we also scanned program websites for cited evaluation references.

We imported the publication references identified in this two-pronged search into the reference-managing software EndNote. We reviewed abstracts to identify programs with at least one U.S. impact evaluation measuring a child outcome. This step narrowed our list to 191 programs and 1,033 publications.

Step 4

Study team members retrieved and screened the 1,033 full-text evaluation-related publications for the 191 programs identified in step 3 to assess the strength of the evidence and whether other criteria were met. A key screening criterion at this step was the research design. To meet our criterion for inclusion, an evaluation needed to use an RCT or strong quasi-experimental design. RCTs are studies in which participants are randomly assigned to an intervention group that receives or is eligible to receive the intervention and a control group that does not receive the intervention. This is considered the strongest research

[3] The 11 databases searched were Academic Search Complete; Education Abstracts, Education Resources Information Center (ERIC), JSTOR, PsycARTICLES, PsycINFO, Scopus, Social Science Abstracts, Sociological Abstracts, Web of Science, and WorldCat. The bibliographic searches took place between September 2015 and April 2016.

[4] An asterisk after a term means that we included in the search all terms that begin with that root.

design when well implemented. When randomization is not feasible, some quasi-experimental designs can offer the next best strategy to infer causality for an intervention. Some quasi-experimental designs create comparable treatment and comparison groups and can attribute differences in outcomes for the two groups to the intervention rather than some other explanation (Shadish, Cook, and Campbell, 2002). Not all quasi-experimental designs create observationally equivalent treatment and comparison groups (e.g., race and ethnicity, socioeconomic status, siblings, preschool before kindergarten), as well as groups that are equivalent on unobservable characteristics, such as motivation, exposure to other interventions, or preexisting knowledge. We included the following strong quasi-experimental study designs:

- regression discontinuity
- instrumental variables or two-stage least squares
- difference in differences
- interrupted time series
- propensity score matching.

We excluded from our analysis single-case studies, simple multivariate regression studies with no additional controls for selection bias, designs with nonequated comparison groups and no attempt to control for differences, and publications that did not provide enough research design information to determine whether criteria were met.[5] Additional exclusion criteria at this step included publications that did any of the following:

- bundled program effects with other interventions such that we could not disentangle the effects of the program of interest

[5] Multivariate regressions that do not attempt to control for selection include cases in which the outcome variable is estimated in a multivariate regression as a function of an indicator for participating in the intervention and other observable control variables (e.g., child's gender, mother's education, family background). This approach does not control for unobserved differences in study members (a type of selection), such as motivation to support education or mother's knowledge of child development. Nonequated comparison group designs compare outcomes for children in a treatment group with means or other summary statistics available for a large group in the same catchment or service area or in the same group.

- focused exclusively on special-needs populations (e.g., children with an autism spectrum disorder or children who are deaf or blind)
- reported results for only a subset of the full evaluation cohort population
- did not report on or provide sufficient data to determine the statistical significance of their findings
- reported duplicative results that were already reported in another publication in our set.

We note that, in the scope of this study, we did not endeavor to judge the merits of the research design, as implemented in any given evaluation, that met one of the eligible design criteria. If the design was well-enough described to determine the approach used, we included it. We did take note during the abstraction phase of any specific methodological concerns we might have had (e.g., very high attrition) to allow the potential for sensitivity analyses later. In addition, we did not apply a sample size criterion like we did in our prior RAND studies noted in Chapter One; we included studies with fewer than 20 treatment and 20 control children, although very few evaluation cohorts in our final set had this characteristic. Our analyses thus reflect the pool of published studies and do not weight whether they are stronger or weaker designs.

This step ultimately identified 105 programs (representing 115 program models in our analysis set) and 269 publications that met our requirements for abstraction.

Data Abstraction

We conducted full data abstraction for the 269 publications across the 115 program models we discuss in Chapter Two. We developed a protocol for data abstraction, and a team of three policy analysts reviewed the publications and completed the common data abstraction protocol for each of the 269 publications. Each data abstractor was assigned a list of programs and was responsible for all studies associated with that

program. This was intended to ensure that we captured and understood any related and follow-up studies for each program. An abstraction consisted of all information for a single evaluation cohort, so a single publication could be abstracted more than once if it included more than one evaluation cohort meeting our criteria. This ultimately resulted in 312 individual abstractions across the 269 publications. Data abstractors worked from common decision rules and met weekly with doctoral-level reviewers to cross-check data abstracted from more-complicated studies. A doctoral-level reviewer also cross-checked select publication abstractions to ensure consistency.

Table A.1 summarizes the data abstracted from these publications. We abstracted information related to the publication details, general program characteristics, evaluation study and evaluation cohort characteristics, outcome timing, and results.

Table A.1
Information Collected in the Data Abstraction Phase

Data Abstracted	Description
Publication information	
Program edition	Original program or modified in some way
Follow-up study	Follow-up of earlier work evaluating the same evaluation cohort exposed to the same intervention
Multiple studies	The publication reports on more than one evaluation cohort.
Multiple intervention arms	The publication reports on a study with multiple intervention arms.
Evaluator	Were the authors of the publication also involved in developing the program?
Cost data availability	Does the publication include any information about the cost of the program (e.g., cost to run the program, CEA, BCA)?
Program information	
Target population	Intended participant of the program (e.g., child, parent, teacher or child care provider, health care provider)
Implementation setting	Setting in which the program is delivered (e.g., residence, preschool or child care setting, hospital, doctor's office, government agency)
Implementation level	Services provided at the individual or group level
Program type	General focus of the program (e.g., PE, child care or early learning, physical health promotion)
Program length	Duration of the intervention
Program dosage	Intended and actual dosage of the intervention (e.g., number of sessions, visits)
Research design	
Study arms	Type of arms reported in the publication (e.g., control group, control group receiving alternative intervention, treatment group, treatment group receiving modified or different intervention)
Study design	Design of the evaluation cohort study (e.g., RCT, regression discontinuity, propensity score matching)

Table A.1—Continued

Data Abstracted	Description
Study details	
Initial sample size	Starting sample size of children in each intervention arm
Final sample size	Final sample size for each measurement time point in each intervention arm
Child age	Age of children at beginning of intervention
Child race and ethnicity	Races and ethnicities of children
Targeted delivery	Is the program, as it is delivered, designed to target a specific population (e.g., low-income families, certain racial or ethnic groups, English-language learners, children with low birth weight)?
Year	In what year was the intervention delivered; what was the starting year for participant enrollment in intervention?
Scale of study	At what level was the intervention implemented (e.g., national, regional, state, local community)?
Number of participating sites	How many sites participated in the trial?
Urban or rural setting	Type of locale where the trail was conducted (e.g., urban, suburban or small city, rural)
Evaluation findings	
Measured outcomes	What child outcomes are measured in this publication (e.g., name of measure, domain, age at measurement, timing in relation to program completion)?
Source of outcome data	What is the source of the program outcome data (e.g., teacher report, parent report, child report, school records, medical records, administrative data)?
Results	Was the outcome significant at $p < 0.05$, and, if so, was the treatment effect favorable or unfavorable (i.e., null, significant favorable, or significant unfavorable)?

Effect Sizes and Meta-Analysis

We calculated effect sizes for programs in three of the 45 outcome categories: birth outcomes, BMI, and substance use. We began with the set of outcomes abstracted as described in previous sections of this appendix. Here, we describe the process we used to select the outcome data we abstracted for the effect size calculation for each outcome category. Following guidelines for meta-analysis methods in Cooper (1998) and Lipsey and Wilson (2001), we established a coding protocol for the outcomes reported in these three categories. The three categories included several different constructs—for example, the birth outcome category included measures of birth weight, gestational age, and NICU admission. For birth outcomes and substance use, the outcomes were clustered in several types of measures, so we extracted data for measures in each of the subcategories. Because studies often collected several measures for similar constructs (e.g., low birth weight and birth weight), we specified that the most common measure be collected and which measures to collect if that was not available. The subcategories within the three outcome categories and the measure instructions were

- birth outcomes
  - low birth weight (collect birth weight if low birth weight is not available)
  - preterm birth (collect gestational age if preterm birth is not available)
  - postbirth complications (newborn hospital stay or NICU admission, child hospital readmission, fetal demise, or other, prioritized in this order)
- BMI
  - BMI z-score, BMI percentile (if no position in the distribution, then use BMI)
- substance use
  - alcohol use (excessive drinking measure; other measure of alcohol use if there is no excessive drinking measure)
  - tobacco use (daily, weekly, or regular use; only one per study)

  - marijuana and other drug use (if no marijuana use, then include measure of other drug use)
  - composite measure, such as alcohol and other drug use.

General principles that we used to select which outcomes were abstracted in the effect size calculations were as follows:

- Each evaluation cohort would contribute only one data point in each outcome subcategory (e.g., cigarette smoking) at a particular data collection time point, but an evaluation cohort could contribute multiple measures within a category because it is represented in more than one subcategory. If the outcome was reported for multiple evaluation cohorts of the same program, a program can be represented more than one time in the effect size.
- For each outcome in a publication, we used the estimates that that authors reported as being from the "preferred" or final statistical model.
- When abstracting information from publications, we included "adjusted" estimates when available (see discussion in Nieminen et al., 2013). This refers to estimates generated while controlling for other factors, such as additional covariates in a regression. If estimates from an adjusted model were not available, we included unadjusted estimates.
- Sometimes, we calculated statistics needed as inputs for computing the effect size using statistics reported in the publication. For example, we calculated standard deviations from standard errors and sample sizes, and we calculated treatment and control group sample sizes from total sample size and the proportion in the treatment group.
- When there was not enough information in a publication to allow us to calculate an effect size, we contacted authors of the publications to see whether we could obtain the information needed.
- In cases in which a regression coefficient was reported, we used the online Campbell effect size calculator (Wilson, undated) to calculate Cohen's d and the 95-percent confidence intervals.

- We were also interested in conducting analysis to assess whether effect sizes varied by characteristics, such as intervention approach, decade, and study design (RCT versus other). When we abstracted data from articles as described earlier, we included these variables: approach (e.g., ECE, home visiting), RCT or other study design, decade in which the evaluated program commenced, whether the program developer was an author on the evaluation studies, the age of the child when the outcome was measured, whether it was a model demonstration program or a scaled-up version, and whether there were some weaknesses in the evaluation (such as high attrition between waves of data collection).

We used CMA software, version 3.3.070 (Borenstein et al., undated) to calculate standard errors for each program, pooled standard errors for each of the three outcome categories, and the pooled standard error for outcomes in all three outcome categories combined. In each case, we calculated Cohen's d as the effect size because standard methods are available for calculating Cohen's d (rather than other measures of effect size, such as Hedge's g) for all the different types of statistical methods used in the publications from which we abstracted—e.g., odds ratios, regression coefficients, differences in means (Nieminen et al., 2013). We entered all statistics such that improvements in the outcomes were positive and worsening outcomes were negative. For example, we would enter declines in drug use and reductions in low birth weight so that the statistics were positive. CMA uses the inverse of variance of the within-study and between-study variance as the study weights in the random-effect model (see Borenstein et al., undated, and CMA, undated, for more information on CMA methods).

For each evaluation cohort of a program, we estimated Cohen's d, the 95-percent confidence interval, and a *p*-value for the outcome based on the estimate that met the criteria outlined earlier. As we indicate in Table A.2, out of the 95 outcomes that met our inclusion criteria for effect size estimates, 85 had enough data reported (or available from contacted authors) that enabled us to calculate effect sizes. Table C.3 in Appendix C reports the effect size from each study included in

Table A.2
Availability of Statistics for Estimating Effect Sizes, by Outcome Category and Subcategory

Outcome Category	Number of Outcomes Identified for Effect Size Abstraction	Number of Outcomes with Enough Data to Calculate Effect Size
Birth outcomes	49	45
Gestational age	15	15
Low birth weight	22	20
Postbirth complications	12	10
BMI	18	15
Substance use	28	25
Alcohol use	6	6
Tobacco use	8	7
Other drug use	9	7
Combination drug use	5	5
Total	95	85

the analysis and indicates the subcategory in which the outcome was classified.

Using a random-effect estimator, we estimated pooled effect sizes for each of the outcome categories and subcategories and the total set. We include in the pooled estimates for the outcome category all of the observations for each subcategory. Given that some evaluation cohort studies contributed multiple observations within the set of pooled estimates, we used the mean of the outcomes for each study that contributed more than one outcome to the pooled effect size estimates. Documentation about the details of these calculations is available from CMA, undated. Table C.2 in Appendix C reports the estimated pooled effect size, 95-percent confidence intervals, and *p*-value for each of the outcome categories and subcategories.

We also tested whether pooled effect sizes for the three main outcome categories and the entire set of outcomes varied by the character-

istics we abstracted, as listed earlier. We did not conduct these tests for subcategories because of the small numbers of studies in most subcategories. As reported in Chapter Three, we found differences in outcomes by approach, with ECE programs having larger effect sizes, on average. We also reported in Chapter Three that effect sizes generally declined over the decades. We did not find that effect sizes varied according to whether studies exhibited some weaknesses or not. We were not able to test age at measurement of the outcomes because this was highly collinear with approach. We also found that the three additional characteristics were so highly correlated that we could not distinguish between them in statistical tests, and these characteristics were RCT or other study design, whether the program developer was an author on the evaluation studies, and whether it was a model demonstration program or a scaled-up version. We found that a large number of studies were model demonstration programs evaluated by the program developer using an RCT.

Economic Evaluations

For the 115 programs that met the rigor and outcome requirements screened for in the data abstraction phase described earlier in this appendix, we undertook a two-step process to identify those programs that also had one or more formal cost analyses, CEAs, or BCAs. In step 1, for each program, we compiled an initial list of publications that referenced a cost analysis, CEA, or BCA based on a search of the following six sources:

- *data abstraction forms:* Reviewers screened for reference to an economic evaluation and flagged those publications that included references to a cost analysis, CEA, or BCA of any kind. This search found 43 publications with cost information.
- *EndNote libraries:* Reviewers screened the references collected in step 3 of the program selection phase; coded them to indicate whether the publication was a cost analysis, CEA, or BCA; and identified 37 publications.

- *program websites:* We scanned the program websites for the subset of programs with external web pages and found 11 publications with reference to an economic evaluation.
- *RAND 2005 report:* We included six BCAs referenced in the 2005 RAND report but not captured in the first three sources.
- *WSIPP benefit–cost results:* WSIPP performs comprehensive BCAs of a wide range of public programs. We scanned its benefit–cost results and found 24 publications related to the 115 programs with data abstracted.
- *Columbia University Center for Benefit–Cost Studies of Education:* This center performs economic analyses of educational programs and interventions. We reviewed its analyses of early childhood programs and identified two publications.

We identified a total of 123 publications in this initial scan and found an additional eight in the references to these publications, resulting in 131 publications.

Step 2 included a full-text review of these 131 publications to identify formal economic evaluations for the 115 potential named programs and classify each as a cost analysis, CEA, or BCA. At this stage, we required that the economic evaluation have a formal cost analysis, ideally using the ingredient method (or other microcosting approach) (National Academies of Sciences, Engineering, and Medicine, 2016). This meant that we excluded studies that based their cost estimates on program spending (e.g., the amount of government appropriation divided by the number of people served) or some other rough cost estimate without details on its derivation.[6] For BCAs, we excluded "back-of-the-envelope" calculations of program benefits that were intended to illustrate potential returns, without undertaking a formal BCA. Typically, such estimates were provided as part of a concluding discussion in a report or journal article. Other exclusions occurred because the economic evaluation was conducted for a subset of the evaluation

[6] For some publications, especially for the transfer programs, the study referenced total spending for the program or the amount of spending per recipient. Thus, it did not meet the criteria for a formal cost analysis.

cohort (e.g., males only) or the only available economic evaluation had not been updated to reflect the most-recent follow-up findings, had a narrow focus on one outcome (e.g., earnings) when others were available, or was performed from the government perspective rather than the societal perspective. Several of the identified publications were not associated with any of our 115 programs.

The resulting 32 publications that we identified as formal economic evaluations meeting our criteria were typically either standalone publications (including the online program reports provided by the WSIPP BCA model) or a separate chapter in a larger evaluation report with well-documented methods for the cost analysis and, where relevant, the methods for the associated CEA or BCA. These publications covered 25 of the 115 programs we reviewed. (The results in Chapter Four focus on the most recent analysis for the handful of programs that had multiple economic evaluations.)

APPENDIX B

Program Descriptions and Citations

Table B.1 provides a brief summary of the program features for each of the programs we studied. We also list relevant citations on which we relied for the results presented in the report. We count several programs as more than one program model, which we indicate in the program description and citations listed. We describe the program as implemented within the evaluation studies, drawing from published studies and Karoly, Kilburn, and Cannon (2005), and some programs can encompass other features not noted here. We also include the web address for those programs with websites that provide additional information.

Table B.1
Descriptions and Citations for Early Childhood Programs Included in the Study

Program	Description	Citations
Active Parenting	Active Parenting was an obesity prevention home visiting (HV) program that was piloted with 20 mother–child pairs in the St. Regis Mohawk community in northern New York State and Canada. Forty-three mothers whose children ranged from age 14 months to 30 months participated in a 16-week HV intervention delivered by an indigenous peer educator. Mothers received an average of 16 total hours of the intervention. The emphasis of the program was child psychological and behavioral goals, encouragement techniques, logical and natural consequences, and mutual respect. The pilot was conducted prior to 2003.	Harvey-Bernino and Rourke (2003)
Attachment and Biobehavioral Catch-Up (ABC)	The ABC program is an HV intervention that targets caregivers of infants and young children from birth up to 24 months old, including caregivers of children in foster care, kinship care (such as a grandparent raising a grandchild), and adoptive care families, as well as high-risk birth parents. Parent-coaches deliver ten weekly sessions lasting approximately 60 minutes each in the family's home and provide immediate feedback (called "in-the-moment" comments) about parental behaviors and how they affect the child. The ABC intervention is designed to help parents provide nurturance, mutually responsive interactions, and care that is not frightening. The program was evaluated in a large mid-Atlantic city in the 2000s and 2010s. ABC is being implemented in Delaware, Hawaii, Kansas, Maryland, Minnesota, New York, North Carolina, Philadelphia, Australia, and the United Kingdom (UK). www.infantcaregiverproject.com/about_us	Infant Caregiver Project (undated) Dozier et al. (2008) Bernard, Dozier, Bick, Lewis-Morrarty, et al. (2012) Lewis-Morrarty et al. (2012) Bernard, Dozier, Bick, and Gordon (2015) Lind et al. (2014) Bernard, Hostinar, and Dozier (2015)

Table B.1—Continued

Program	Description	Citations
Breakthrough to Literacy	Breakthrough to Literacy is a widely used early language and literacy curriculum for preschool through third grade. Breakthrough to Literacy introduces children to one book per week for the duration of the school year. The curriculum includes classroom and independent learning activities focusing on the book of the week. Classroom activities include independent learning activities, teacher-led whole-group instruction, and teacher-led small-group instruction. The program aims to teach children phonemic awareness, vocabulary, concepts of print, and oral language skills. Breakthrough to Literacy also includes professional development activities for teachers to improve classroom management skills and assist teachers to incorporate the curriculum into day-to-day activities. Breakthrough to Literacy was evaluated in Miami–Dade County, Florida, in 2003–2009, but no other information on the current scope of operations is available.	Layzer et al. (2009)
Building Blocks	Building Blocks is a mathematics curriculum developed through National Science Foundation funding. The curriculum targets students between pre-K and grade 2 and is designed to comprehensively address mathematics education through the use of computers, print materials, and manipulatives. The pre-K materials are a complete curriculum, and the K–2 materials are designed to enrich existing school curricula. Building Blocks pre-K activities include small- and whole-group games; ideas for integrating math into other parts of the day, such as story time; computer software; free-choice learning centers; and manipulatives. In the 2000s, a multisite randomized control trial (RCT) in school districts tested the program's generalizability in different settings. The Building Blocks curriculum has gone through many iterations, and the final iteration of Building Blocks was developed in 2007. www.buildingblocksmath.org/	Building Blocks (undated) Clements and Sarama (2007) Clements and Sarama (2008) Clements, Sarama, Spitler, et al. (2011)

Table B.1—Continued

Program	Description	Citations
Building Early Language and Literacy (BELL)	The BELL program is a school-based literacy curriculum. The program targets preschool children and aims to improve phonological awareness, print awareness, and language proficiency. The curriculum includes twice-daily 15- to 20-minute-long lessons, which consist of a variety of activities, such as shared reading of oversized books, songs, and poetry. BELL was evaluated in a large-scale RCT in Miami–Dade County, Florida, in 2003–2009.	Layzer et al. (2009)
Carolina Abecedarian Project	The Carolina Abecedarian Project was a comprehensive early education program for young children ages six weeks to five years who were at risk for developmental delays and school failure. The program operated in a single site in North Carolina between 1972 and 1985, and it involved both a preschool component and a school-age component. Children entered the program from infancy up to six months of age. The preschool program offered a full-day, year-round, center-based stimulating and structured environment, along with nutritional supplements, pediatric care, and social work services. abc.fpg.unc.edu/	Carolina Abecedarian Project (undated) Ramey and Campbell (1984) Horacek et al. (1987) Martin, Ramey, and Ramey (1990) Campbell and Ramey (1994) Campbell and Ramey (1995) Clarke and Campbell (1998) Campbell, Ramey, Pungello, et al. (2002) Barnett and Masse (2007) McLaughlin et al. (2007) Muennig et al. (2011) Campbell, Pungello, et al. (2012) Englund et al. (2014)

Table B.1—Continued

Program	Description	Citations
CenteringPregnancy	CenteringPregnancy is a model for prenatal care in group settings that emphasizes health education, support, and assessment. The program is delivered in health care settings and includes a recommended schedule of ten prenatal visits, 90 minutes to two hours long. The program aims to reduce rates of negative birth outcomes. The theory behind the program is that groups are effective in providing support and assisting mothers in reaching their goals. As part of the program, mothers also engage in their care by taking their own blood pressure and weight and recording their own health data. Sharon Schindler Rising piloted the program in the 1990s, and it continues to be used today. The program has been implemented and evaluated in sites across the country, including five sites in Tennessee, two military communities in the Pacific Northwest and Atlantic Coast regions, and two university-affiliated hospital prenatal clinics in the Northeast and Southeast regions. www.centeringhealthcare.org/	Centering Healthcare Institute (undated) Ickovics et al. (2007) Kennedy et al. (2011) Tanner-Smith, Steinka-Fry, and Lipsey (2014)
Chicago Child–Parent Center (CPC)	The Chicago CPC program has been providing center-based preschool education to disadvantaged children in high-poverty Chicago neighborhoods since 1967. The centers operate during the school year through the Chicago public school system and are located in public elementary schools. The preschool provides a structured part-day program for children ages 3 and 4 that emphasizes a child-centered, individualized approach to social and cognitive development. The centers also require regular parental participation. Related program services continue after kindergarten entry and through grade 1, 2, or 3. www.waisman.wisc.edu/cls/Program.htm	Chicago Longitudinal Study (2004) Reynolds, Temple, Ou, et al. (2011) Reynolds, Temple, White, et al. (2011) Arteaga et al. (2014)

Table B.1—Continued

Program	Description	Citations
Chicago Doula Project	HealthConnect One's community-based doula program, also referred to as Chicago Doula Project in evaluation, helps to connect underserved women to doulas from their community, based on the idea that doulas from the community will be best able to provide culturally attuned support. Doulas provide HV services during the prenatal period through three months postpartum and are present to support women during labor and delivery. The model demonstration of the program took place in two prenatal clinics in Chicago in the 2000s. The program has been replicated in underserved areas nationwide. www.healthconnectone.org/our-work/program_development/community_based_doula_program/	HealthConnect One (undated) Hans et al. (2013)
Chicago Parent Program (CPP)	The CPP is a community-based parent education (PE) program designed to promote parenting competence and prevent child behavior problems. The CPP model demonstration began operating in Chicago in 2002 in 15 preschools serving low-income urban families and targeted two- to four-year-old black and Latino children. The 12-session program offered 11 two-hour weekly group sessions plus a booster session two months after during which video vignettes are shown to parents and used to stimulate discussion and problem-solving related to child behavior and parenting skills. The focus of the first four weeks is on building parents' positive relationships with their children, while the second four weeks address child behavior management skills. The final four weeks focus on stress management, problem-solving skills, and skill maintenance. www.chicagoparentprogram.org/	CPP (undated) Breitenstein et al. (2012)

Table B.1—Continued

Program	Description	Citations
Chicago School Readiness Project (CSRP)	The primary aim of CSRP is to improve teachers' emotionally supportive classroom practices in Head Start–funded preschool settings. This early care and education (ECE) program was implemented with two cohorts of three- to four-year-old children in 35 Head Start classrooms located in high-poverty neighborhoods in Chicago from 2004 to 2006. The program involved 30 hours of teacher training, mental health consultation, class visits to provide coaching and stress-reduction strategies, and targeted individual and group mental health consultation services to some children in each class. steinhardt.nyu.edu/ihdsc/csrp/	CSRP (undated) Raver, Jones, Li-Grining, Zhai, Metz, et al. (2009) Raver, Jones, Li-Grining, Zhai, Bub, et al. (2011)
Child and Adult Care Food Program (CACFP)	CACFP and its predecessors, operating since the late 1960s, are federal programs that serve children in child care by reimbursing child care providers for meals and snacks served to children in child care centers, preschools, day care homes, after-school programs, and homeless shelters. CACFP reimburses centers on a per-meal, per-child basis. Four criteria determine eligibility: type of care (center versus home, for-profit versus nonprofit, licensed versus unlicensed), neighborhood income, provider income, and the child's family's income. The child's family's income determines the reimbursement level: full (for incomes below 130 percent of the federal poverty threshold), reduced (for incomes between 130 and 185 percent of poverty), or paid (for incomes above 185 percent of poverty).	Korenman et al. (2013)

Table B.1—Continued

Program	Description	Citations
Child Care and Development Fund (CCDF)	CCDF is the primary national funding stream devoted to child care assistance in the United States. It was created with the passage of welfare reform in 1996 and provides states with an annual base amount, as well as matching funds, to provide child care subsidies to eligible low-income families so they can work or attend training or education. Families must have at least one child between ages 0 and 12, must be engaged in a state-defined acceptable work activity (e.g., employment, education, or job training), and have incomes below 85 percent of the state median income. Reimbursement rate depends on income, the type of provider used, and the age of the child, with reimbursements going directly to the child care provider or the family in order to pay some or all of the family's child care costs.	Herbst and Tekin (2010) Herbst and Tekin (2012)
Child Development Accounts (CDAs) through SEED for Oklahoma Kids (SEED OK)	CDAs are savings accounts designed to encourage children and families to build lifelong assets by providing financial access, information, and incentives. Assets accumulated through CDAs are used for qualified purposes, such as education, homeownership, and other developmental purposes. In the SEED OK program, the Oklahoma treasurer's office opened state-owned college-savings plan (Oklahoma 529 College Savings Plan, or OK529) accounts for infant participants; participants' mothers were also financially incentivized to open personal college-savings plan (OK529) accounts. Furthermore, savings into personal accounts were matched up to a certain amount, depending on household income. The program was evaluated via a statewide RCT in the 2000s. Children were roughly one month to nine months old when baseline outcomes were measured and age 4 when follow-up outcomes were measured in the sole evaluation to date.	Huang et al. (2014)

Table B.1—Continued

Program	Description	Citations
Child First	Child First is a comprehensive, home-based, therapeutic intervention targeting multirisk young children and families in order to prevent or diminish serious emotional disturbance, developmental and learning disabilities, and abuse and neglect. The intervention is delivered to children from the prenatal period to age 6 evidencing emotional, behavioral, developmental, or learning problems or living within a family experiencing significant psychosocial risk and provides psychotherapeutic parent–child treatment and collaborative "system-of-care" services for the identified child, siblings, and parents. A clinical team consisting of a master's-level developmental or mental health clinician and an associate's- or bachelor's-level care coordinator or case manager visited the family weekly for about 45–90 minutes over the duration of intervention. The program began operation in Bridgeport, Connecticut, in 2001 and has been replicated in North Carolina with a goal of further expansion to more states. www.childfirst.org/	Child First (undated) Lowell et al. (2011)
Child Health Supervision	The Child Health Supervision was a comprehensive HV program targeting unmarried pregnant teenagers. The intervention, which began from seven months of pregnancy to three years postdelivery, was delivered by a pediatrician and public health nurse during one- to 1.5-hour routine visits in a mobile coach parked in front of the participant's home. Between mobile coach health care visits, the same nurse would conduct additional home visits. The intervention consisted of baby-preparation counseling, well-baby care postdelivery, and infant-stimulation counseling. For the first few families enrolled in the study, group sessions were also held in the first year of intervention postdelivery to provide social support to the mothers. The model demonstration took place in the 1960s in Washington, D.C.	Gutelius, Kirsch, MacDonald, Brooks, McErlean, and Newcomb (1972) Gutelius, Kirsch, MacDonald, Brooks, and McErlean (1977)

Table B.1—Continued

Program	Description	Citations
Child Parent Enrichment Project (CPEP)	CPEP was an HV intervention targeting pregnant mothers identified as being at risk of engaging in child abuse. Trained paraprofessionals, called parenting consultants, delivered CPEP services over six months using a task-centered approach in which parents identified and completed tasks to achieve their goals. These tasks were discussed with consultants during home visits, thus providing consultants with a focal point for their work to reduce the risk of parenting problems. Tasks were recorded on sheets for clients and paraprofessionals to use as prompts and for accountability. Tasks completed could be parent-focused, consultant-focused, or shared. The model demonstration took place in Contra Costa County, California, in the 1980s.	Barth (1991)
Childhaven Therapeutic Child Care	Childhaven Therapeutic Child Care is an early child care program that aims to mitigate the harmful effects of maltreatment among abused, neglected, or at-risk children between ages one month and five years by addressing parent, child, and family risk factors for abuse within a protective, nurturing, and therapeutic environment. Parent participation, however, is voluntary. Program staff transports the children to and from the five-day-per-week ECE program for the duration of the intervention. First initiated in 1977, the program continues operation in Seattle, Washington. The model demonstration took place in the 1980s. childhaven.org/	Childhaven (undated) Moore, Armsden, and Gogerty (1998)

Table B.1—Continued

Program	Description	Citations
Childhood Asthma Prevention Study (CAPS)	CAPS is a secondary prevention study aimed at decreasing allergens in the home, reducing environmental tobacco smoke exposure, and improving quality of maternal caregiving and illness management among low-income (Medicaid-eligible) families with children between nine and 24 months of age with medical record documentation of at least three separate episodes in which wheezing was observed. The intervention is delivered over one year and consists of 18 home visits by nurse home visitors with bachelor of science degrees in nursing and experience in community outreach. The model demonstration took place in Denver, Colorado, in the 2000s. It has been implemented in the United States and other countries, such as Australia and Canada.	Klinnert et al. (2005)
Children Get a Head Start on the Road to Good Nutrition	This was a school-based program designed to encourage the development of Head Start children's nutrition knowledge, attitudes, and behaviors. Teachers who had undergone three-hour preparatory sessions taught the curriculum over six weeks to four- and five-year-old children enrolled in Head Start. The model demonstration took place in 65 Head Start classrooms across the United States in the 1990s.	Byrd-Bredbenner, Marecic, and Bernstein (1993)

Table B.1—Continued

Program	Description	Citations
Circle of Security	Circle of Security is an HV attachment-based intervention intended to increase infant–mother attachment security for irritable infants from economically stressed families. The intervention consisted of three one-hour home visits that occurred approximately every three weeks when infants were between 6.5 and nine months of age and a brief fourth visit two weeks later, when the home visitor reviewed the program and responded to potential concerns of the parent. The home visitor worked to enhance maternal sensitivity by helping mothers to better understand and observe their infants' needs and to implement sensitive responses. The model demonstration took place in an urban setting in the 2000s. www.circleofsecurityinternational.com/	Circle of Security International (undated) Cassidy et al. (2011)
Comprehensive Child Development Program (CCDP)	CCDP aimed to enhance child development and help low-income families to achieve economic self-sufficiency. The program initially began in 1988 with 22 sites that operated for five years; two more sites started in 1990. The program was designed to serve families from as early as the prenatal period through age 5, although, in practice, wide variation in implementation length was observed between sites. CCDP projects were designed to build on existing service delivery networks and relied on case managers to coordinate the service needs of a group of families. Case managers provided some services directly (e.g., counseling, life skills training) and provided access to other services, such as immunizations, child care, and prenatal care through referrals and brokered arrangements. www.acf.hhs.gov/opre/research/project/comprehensive-child-development-program-ccdp-1990-1996	Office of Planning, Research and Evaluation (undated) St. Pierre, Layzer, et al. (1997) Goodson et al. (2000) Aos et al. (2004)

Table B.1—Continued

Program	Description	Citations
Creating Opportunities for Parent Empowerment (COPE)	COPE is a parent educational–behavioral intervention program aimed at enhancing coping in parents of low–birth weight, premature infants. The intervention is delivered from two to four days postbirth and continued through one week after discharge from the neonatal intensive care unit (NICU). The education component provides information to parents on infant behavior and parent roles, while the behavioral component engages parents in activities that assist them in implementing the experimental information. The model demonstration took place in two NICUs in New York in the 1990s and 2000s. Program outcomes were measured at two to six months of age. www.copeforhope.com/nicu.php	COPE for HOPE (undated) Melnyk, Alpert-Gillis, et al. (2001) Melnyk, Feinstein, Alpert-Gillis, et al. (2006) Melnyk and Feinstein (2009)
Curiosity Corner	Curiosity Corner is a preschool language and literacy curriculum. The curriculum consists of two sets of 38 weekly theme-based units (one set of units for three-year-olds and a separate set of units for four-year-olds). Daily activities include Rhyme Time, Story Tree, Clues and Questions, Learning Labs, Motor Play, and Snack Time. In-classroom activities, take-home materials (e.g., lending library, videos), and a home component encourage parent participation. Curiosity Corner was piloted in 1999 and launched in 2002. Curiosity Corner currently operates in 29 states, at more than 300 sites. www.successforall.org/our-approach/schoolwide-programs/curiosity-corner/	Success for All Foundation (undated) Preschool Curriculum Evaluation Research Consortium (2008)

Table B.1—Continued

Program	Description	Citations
DaisyQuest	DaisyQuest is a software bundle for phonological instruction that targets children ages 3–7 and is designed for use in classrooms. Children learn skills, such as how to recognize rhyming words through fairy tale–themed activities. DaisyQuest was developed in 1992, and the model demonstration for preschoolers took place at one Head Start site in Tallahassee, Florida, in the 1990s. www.adventurelearningsoftware.com/daisyquest/	Adventure Learning Software (undated) Lonigan et al. (2003)
DARE (Decision-Making, Assertiveness, Responsibility, Esteem) to Be You (DTBY)	DTBY is a parenting program aimed at high-risk families with children ages 2–5, designed to be delivered in a community setting. By improving parenting and child resiliency, the program aims to lower the likelihood that children will engage in substance abuse and other high-risk activities later in life. The program includes components for children, parents, child care providers, and social service agency workers: joint parent–child workshops, classes for parents, age-appropriate children's activities, and training for child care providers and social workers. The model demonstration took place in the 1990s. The program has been implemented with diverse populations in Colorado, New Mexico, Arizona, Utah, and California. dtby.colostate.edu/	DTBY (undated) Miller-Heyl, MacPhee, and Fritz (1998)
Doors to Discovery	Doors to Discovery is a literacy curriculum for preschool classrooms that consists of activities to teach children fundamental literacy skills, such as phonological awareness, alphabet knowledge, and vocabulary development. These activities are grouped into eight thematic units (e.g., Our Water Wonderland, Backyard Detectives, Tabby Tiger's Diner). The model demonstration took place in a Houston school district in the 2000s. www.mheducation.com/prek-12/program/MKTSP-O01M0.html	McGraw Hill Education (undated) Assel et al. (2007)

Table B.1—Continued

Program	Description	Citations
Durham Connects	Durham Connects is an HV program that provides no-cost nurse visits to families with newborns between two and 12 weeks old, living within a defined service area. Durham Connects is available to families living in Durham County, North Carolina, and it has been replicated under the name Family Connects, which is available in four rural North Carolina counties: Bertie, Beaufort, Chowan, and Hyde. Families are screened for risk factors during their nurse visits, and those with identified risks receive additional visits, supports, and linkages to services. The program aims to help parents enhance their children's health and well-being, reduce child abuse and neglect rates, improve family connections to community resources, prevent infant hospital readmissions and unnecessary emergency care visits, improve the quality and safety of the home environment, encourage positive parenting behaviors, and reduce parental anxiety and depression. Durham Connects is a program of the Center for Child and Family Health in partnership with the Center for Child and Family Policy at Duke University, the Durham County Department of Social Services, and the Durham County Health Department. The Center for Child and Family Health is supporting the program's replication under the program name Family Connects. Durham Connects has been operating since 2008. www.durhamconnects.org/	Durham Connects (undated) Dodge, Goodman, Murphy, O'Donnell, and Sato (2013) Dodge, Goodman, Murphy, O'Donnell, Sato, and Guptill (2014)

Table B.1—Continued

Program	Description	Citations
Early Childhood Education and Assistance Program (ECEAP)	ECEAP offers part- and full-day preschool services for eligible three- and four-year-olds and their families in Washington State. ECEAP also provides family support and health and nutrition services. A child is eligible for ECEAP if he or she has special needs, the family has certain risk factors, or the family income is equal to or less than 110 percent of the federal poverty threshold. ECEAP aims to help children develop the skills they need to be ready for school and foster a passion for lifelong learning. The Washington State legislature established ECEAP in 1985. del.wa.gov/parents-family/eceap-and-head-start	Washington State Department of Early Learning (undated) Bania et al. (2014)
Early Childhood Friendship Project	This is a school-based preventive intervention designed to reduce physical and relational aggression and peer victimization and increase prosocial behavior among preschool children ages 3–5. A classroom teacher facilitates the intervention over a period of six weeks. Each week is devoted to a relevant theme: physical aggression (week 1), exclusion and relational aggression (week 2), relational inclusion and prosocial behavior (week 3), friendship withdrawal threats and relational aggression (week 4), friendship formation skills and prosocial behavior (week 5), and lesson review and graduation ceremony (week 6). Each weekly theme is explored using a series of activities—namely, puppet shows, participatory activities, and concept rehearsal activities—and reinforcement sessions. Two program evaluations took place in the 2000s and 2010s in settings that included ECE centers, universal pre-K, and National Association for the Education of Young Children–accredited centers.	Ostrov, Massetti, et al. (2009) Ostrov, Godleski, et al. (2015)

Table B.1—Continued

Program	Description	Citations
Early Head Start: four program models	Early Head Start is a federally funded community-based program that provides child and family development services to low-income pregnant women and families with infants and toddlers up to age 3. The program uses multiple strategies, including HV, case management, child development, PE, nutrition education, child care, health care and referrals, and family support. Early Head Start was first implemented in 1994 and has been operated in hundreds of sites across the United States. No single program model exists, and each site selects delivery options that will best meet the needs of the families and communities it serves. The three primary program delivery models are a home-based option in which families receive a set number of home visits, a center-based option in which families get center-based ECE experiences, and a combination of home-based and center-based delivery. eclkc.ohs.acf.hhs.gov/about-us/article/early-head-start-programs	Early Childhood Learning and Knowledge Center (undated) National study, all approaches: Love et al., 2002a Love et al., 2002b Peterson et al. (2004) Chapin and Altenhofen (2010) Raikes et al. (2010) Vogel, Xue, et al. (2010) Vogel, Brooks-Gunn, et al. (2013) Green, Ayoub, et al. (2014) Center-based only: Love et al. (2002a) Love et al. (2002b) Vogel, Xue, et al. (2010) Home-based only: Love et al. (2002a) Love et al. (2002b) Vogel, Xue, et al. (2010) Harden, Sandstrom, and Chazan-Cohen, 2012 Mixed home- and center-based: Love et al. (2002a) Love et al. (2002b) Vogel, Xue, et al. (2010) Cost study: WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
Early Intervention Program (EIP) for Adolescent Mothers	The EIP is an HV program extending from pregnancy through one year postpartum that targeted adolescent mothers in San Bernardino County, California, in the 1990s. Participants were exposed to approximately 17 prenatal and postnatal home visits, each lasting 1.5 to two hours. During these visits, public health nurses provided nursing case management, individualized life planning and counseling, health education, social support, and referrals for family planning, child care, and mental health services. Participants also received four preparation-for-motherhood classes focusing on behaviors to promote health during pregnancy, parent–child communication, and the transition to motherhood.	Koniak-Griffin, Anderson, Verzemnieks, et al. (2000) Koniak-Griffin, Anderson, Brecht, et al. (2002) Koniak-Griffin, Verzemnieks, et al. (2003)
Early Training Project	The Early Training Project was a demonstration project that served a cohort of children born in 1958. The program, implemented in Murfreesboro, Tennessee, was designed to improve the educability of young children ages 3–6 from low-income homes. The program consisted of a ten-week summer preschool program for the two or three summers prior to first grade and weekly home visits during the remainder of the year.	Gray, Ramsey, and Klaus (1982) Consortium for Longitudinal Studies (1983) Elango et al. (2015)
Earned-income tax credit (EITC)	The United States' federal EITC is a refundable tax credit offered to low-wage workers, particularly low-income mothers. The credit was originally enacted in 1975 and subsequently expanded. Certain states have enacted their own EITCs (some refundable and some nonrefundable), which are typically articulated as a percentage of the federal EITC.	Strully, Rehkopf, and Xuan (2010) Hoynes, Miller, and Simon (2015)

Table B.1—Continued

Program	Description	Citations
Even Start	Even Start was a federally funded family literacy initiative administered by the U.S. Department of Education from 1988 to 2010. The funding stream supported programmatic approaches that targeted low-income families with young children between birth and age 8 with parents eligible for basic education, secondary education, and English-language supports through the Adult Education and Family Literacy Act (Pub. L. 105-220, 1998). Although projects could vary by site, they were required to provide four components, including early childhood education, PE, adult literacy, and interactive learning activities. Some programs also provided HV. A two-year, multisite program evaluation drawn from a national sample of Even Start sites was conducted in the 2000s. www2.ed.gov/programs/evenstartformula/index.html	U.S. Department of Education (2014) St. Pierre, Ricciuti, and Rimdzius (2005)

Table B.1—Continued

Program	Description	Citations
Family Check-Up (FCU)	The FCU for children is a family-centered intervention that targets families with risk factors, including maternal depression, family and child risk factors for child conduct problems, socioeconomic disadvantage, and academic failure. The FCU for children is designed for families with children ages 2–5 and aims to reduce children's behavioral and academic problems, reduce maternal depression, increase parental involvement, and increase positive parenting. The FCU has two phases: (1) three home sessions that involve an interview, assessment, feedback, and referral to community resources as needed, and (2) providers delivering the Everyday Parenting family management training program in the home. Everyday Parenting aims to enhance parents' skills in positive behavior support, relationship-building, and healthy limit-setting. The FCU health maintenance model includes yearly checkups to track family and child behaviors over time and assist families in overcoming difficulties. Model demonstrations took place in three cities in three different states in the 2000s. The FCU operates in Arizona, Illinois, Nevada, Oregon, Pennsylvania, and South Carolina. The Research and Education Advancing Children's Health (REACH) Institute at Arizona State University offers training, implementation support, and resources to FCU service providers. The Center for Progress in Children's Mental Health also implemented the FCU in Sweden. reachinstitute.asu.edu/family-check-up	REACH Institute (undated) Shaw et al. (2009) Chang et al. (2014) Justin Smith, Dishion, et al. (2014) Chang et al. (2015) Sitnick et al. (2015) Justin Smith, Montaño, et al. (2015)

Table B.1—Continued

Program	Description	Citations
Family Foundations	Family Foundations is a series of eight interactive, psychoeducational classes for expectant couples who are cohabiting. Family Foundations was delivered through childbirth education departments at local hospitals. The program aims to enhance the coparenting relationship of parents of children prenatal to six months. The program's focus is to generate awareness of areas of coparental disagreement before parenthood and provide strategies to manage disagreements. Family Foundations provides material on parenting an infant (including information on infant sleep, nutrition, and promoting parent–child bonding), in the context of the coparenting relationship. Two RCTs to evaluate Family Foundations took place in Pennsylvania during the 2003–2005 time frame, but other information on the scope of implementation of Family Foundations is not available. Although, at the time the RCTs were conducted, Family Foundations consisted of classes delivered at local hospitals, the most recent iteration of Family Foundations consists of DVDs and workbooks that can be ordered online through the program website. These materials aim to help parents work together to promote their children's sleep, attention, social competence, and well-being. famfound.net/	Family Foundations (undated) Feinberg and Kan (2008) Feinberg, Kan, and Goslin (2009) Feinberg, Jones, Kan, et al. (2010) Feinberg, Jones, Roettger, Solmeyer, et al. (2014) Feinberg, Roettger, et al. (2015) Jones, Feinberg, and Hostetler (2014) Feinberg, Jones, Roettger, Hostetler, et al. (2016)

Table B.1—Continued

Program	Description	Citations
Family Spirit	Family Spirit is an HV program that targets Native American children from prenatal to age 3 and their mothers. Beginning during the mother's pregnancy, health educators visit families in their homes to deliver a behaviorally focused curriculum. The curriculum consists of 63 lessons in six domains: prenatal care, infant care, child development, toddler care, life skills, and healthy living. Home visitors refer families to community resources to address individual needs. Since 2006, Family Spirit has been implemented with more than 2,000 tribal communities in dozens of U.S. states. Two model demonstrations took place in tribal communities in the 2000s. www.jhsph.edu/research/affiliated-programs/family-spirit/	Johns Hopkins Bloomberg School of Public Health (undated) Walkup et al. (2009) Barlow, Mullany, Neault, Compton, et al. (2013) Barlow, Mullany, Neault, Goklish, et al. (2015)
Family Thriving Program	The Family Thriving Program is an enhancement to HV models (e.g., Healthy Start) that uses cognitive reframing to help parents of children from birth to age 1 become competent and independent problem solvers. Developers of the program propose that a skewed view of the parent–child relationship can contribute to child abuse and neglect. Family Thriving consists of a series of 20 home visits during the first year of a child's life. A parent participating in Family Thriving share recent parenting problems with the home visitor, and the home visitor assists the parent in formulating a strategy through a series of questions intended to identify the problem's cause. Family Thriving was tested in conjunction with the Healthy Start home visitation program in Santa Barbara County, California, in the 1990s and 2000s. labs.psych.ucsb.edu/bugental/daphne/	Bugental (date unknown) Bugental, Ellerson, et al. (2002) Bugental and Schwartz (2009) Bugental, Schwartz, and Lynch (2010)

Table B.1—Continued

Program	Description	Citations
FluText	FluText is a text-messaging program that sends automated influenza vaccination reminders to pregnant women and parents of young children and adolescents. The text-messaging system was linked with the immunization registry in order to send regular, customized reminders about upcoming influenza vaccination clinics at the child's pediatric clinic. FluText has currently been implemented in New York State. The model demonstration, which took place at four community-based clinics in New York City in the 2010s, included large samples of children between six and 59 months old. www.columbia.edu/cu/text4health/flutext_b.html	"FluText" (undated) Stockwell et al. (2012) Hofstetter et al. (2015)
Foundations of Learning	The Foundations of Learning project was a large-scale implementation of a classroom management curriculum adapted from the smaller-scale CSRP. The program, implemented in the 2000s in 91 preschool sites in Newark, New Jersey, and Chicago, Illinois, aimed to improve preschoolers' behavior by offering teachers training in classroom management strategies in concert with weekly in-classroom consultation in which teachers were mentored on the new strategies. Teachers also received training in stress management. Finally, consultants also offered one-on-one clinical services to those children who were not responsive to the teacher's improved classroom management. www.mdrc.org/project/foundations-learning-project	MDRC (undated) Morris, Raver, et al. (2010) Morris, Lloyd, et al. (2013)

Table B.1—Continued

Program	Description	Citations
Hawaii's Healthy Start	Hawaii's Healthy Start program, launched in 1975 on Oahu, is an HV program aimed at reducing child maltreatment. The program aims to identify families at risk for child maltreatment early and utilizes a strength-based approach to reduce risk factors. Mothers delivering children at a local hospital were screened for risk of child maltreatment during their stays using medical record data. Families identified to be at risk of child maltreatment were offered HV services by paraprofessionals for three to five years. Model demonstrations took place at several sites in Hawaii in the 1990s.	National Committee to Prevent Child Abuse (1996) Duggan, McFarlane, Windham, et al. (1999) Duggan, McFarlane, Fuddy, et al. (2004)
Head Start	Head Start is a federally funded community-based preschool program initiated in the 1960s with an overall goal of increasing the school readiness of eligible young children ages 3–5 in low-income families. Head Start preschools, operating either part or full day, provide a range of services, including early childhood education, nutrition and health services, PE, and parental involvement. There is no single Head Start program model, and programs exist in all 50 states. www.acf.hhs.gov/ohs	Office of Head Start (undated) Lee, Brooks-Gunn, and Schnur (1988) Abbott-Shim, Lambert, and McCarty (2003) Ludwig and Miller (2007) Puma, Bell, Cook, Heid, Shapiro, et al. (2010) Puma, Bell, Cook, Heid, Broene, et al. (2012) Carneiro and Ginja (2014) WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
Head Start REDI (Research Based, Developmentally Informed) Program	The Head Start REDI intervention is a Head Start enrichment program that aims to promote social–emotional skills and language development among children ages 3–5. The intervention includes a manualized classroom curriculum and teacher training and coaching in the new teaching strategies, as well as PE materials to help continue the learning at home. The program is implemented throughout the school year. The first Head Start REDI demonstration project was funded in 2002, and trials are ongoing. csc.psych.psu.edu/research/head-start-redi-project	Child Study Center (2016) Bierman, Domitrovich, et al. (2008) Nix et al. (2013) Bierman, Nix, et al. (2014)
Headsprout Early Reading	Headsprout Early Reading is a supplemental program consisting of 80 online lessons of 20 minutes each. The program was evaluated in a preschool setting using only 40 of the 80 lessons that were determined to be developmentally appropriate for preschoolers. In addition to receiving the 40 online lessons, children were given six sets of flashcards and 30 printed stories to read aloud with an adult. This technology-based program does not require extensive teacher training; it is designed largely for independent use by children. Model demonstrations took place at two Head Start centers in a Florida city in the 2000s. www.headsprout.com/main/ViewPage/name/headsprout-early-reading	Headsprout (undated) Huffstetter et al. (2010)
Healthy Families Alaska	Healthy Families Alaska, launched in 1995, was an HV model based on the Healthy Families America model established in 1992. The program ran statewide through 2005 and targeted those families identified prenatally or postnatally to be at particular risk of child maltreatment. The goal of the program was to reduce child abuse among children ages 0–5 by providing intensive home visitation for the first three to five years of a child's life.	Caldera et al. (2007) Duggan, Caldera, et al. (2007)

Table B.1—Continued

Program	Description	Citations
Healthy Families New York (HFNY)	HFNY is a five-year voluntary HV program established in 1995 and accredited by Healthy Families America. Program services begin prenatally or at birth and target families considered to be at high risk of child maltreatment. Home visitors provide families with support, education, and referrals to community services aimed at addressing the following goals: (1) promoting positive parenting skills and parent–child interaction, (2) preventing child abuse and neglect, (3) ensuring optimal prenatal care and child health and development, and (4) increasing parents' self-sufficiency. HFNY currently operates throughout New York State. www.healthyfamiliesnewyork.org/	HFNY (undated) DuMont, Mitchell-Herzfeld, et al. (2008) DuMont, Kirkland, et al. (2010)
Healthy Families Oregon	Healthy Families Oregon is an HV model that is currently the largest child abuse prevention initiative in the state of Oregon. Based on the Healthy Families America national model, Healthy Families Oregon aims to prevent child maltreatment and increase school readiness through HV. Families with two or more risk factors are identified prenatally or within 90 days of birth and enrolled for up to three years of home visits. Visits are weekly for the first six months and then reduced as families meet certain milestones. In 2014–2015, the statewide program provided HV services to 2,500 families. oregonearlylearning.com/health-families-oregon	Early Learning Division (undated) Green, Tarte, Harrison, et al. (2014) Green, Tarte, Sanders, et al. (2016)

Table B.1—Continued

Program	Description	Citations
Healthy Start	The Healthy Start initiative is a federal funding stream established in 1991 with the goal of improving maternal and infant health in communities with infant mortality rates more than 1.5 times the national average. Participating grantees are given flexibility in how they design the program within their communities, but each program must focus on reduction of infant mortality and a close collaboration with the community in planning and implementing the program. Healthy Start is a prenatal intervention. Model demonstrations took place Michigan and Florida in the 1990s and 2000s. mchb.hrsa.gov/maternal-child-health-initiatives/healthy-start	Maternal and Child Health Bureau (2016) Stabile and Graham (2000) Kothari et al. (2014)
Healthy Steps for Young Children	Healthy Steps for Young Children was established in 1995 with the goal of incorporating developmental and behavioral services into primary care pediatric visits and providing extended developmental services during home visits from birth to age 3. Healthy Steps was evaluated in the 1990s in six cities across the United States. The evaluated Healthy Steps program model required programs to abide by specific implementation protocols, including up to six home visits, provision of written materials, and access to a child development telephone line. Currently, sites are not required to abide by these protocols but have a much looser set of programmatic requirements. www.healthysteps.org/	HealthySteps (undated) Minkovitz, Strobino, Hughart, et al. (2001) Minkovitz, Hughart, et al. (2003) Minkovitz, Strobino, Mistry, et al. (2007)

Table B.1—Continued

Program	Description	Citations
Helping the Noncompliant Child	Helping the Noncompliant Child is an individualized, clinic-based treatment program delivered by therapists (clinical psychologists) for parents of children ages 3–5 exhibiting disruptive behavior. The program's two phases are a focus on differential attention followed by a focus on compliance training. Parents participated in a series of eight weekly, one-hour joint parent–child sessions to teach parents how to change their maladaptive interaction patterns with their children. Program components included modeling, parent role-play, and didactic instruction. Parents were also given home-based assignments and exercises to practice skills. The model demonstration was carried out on a small sample in a single city in the late 2000s. The program currently has a manual available for purchase.	Abikoff et al. (2015) WSIPP (2016a)
HighScope Perry Preschool Project	The HighScope Perry Preschool Project was a center-based early childhood education program designed to promote children's intellectual, social, and emotional learning and development. The program was conducted from 1962 to 1967 in Ypsilanti, Michigan, and targeted three- and four-year-old black children who were living in poverty and had low IQ scores. The school-year program emphasized learning through active and direct child-initiated experiences rather than through directed teaching. Teachers conducted part-day, daily classroom sessions for children and weekly home visits. highscope.org/	HighScope (undated) Heckman, Moon, et al. (2010)

Table B.1—Continued

Program	Description	Citations
Hip-Hop to Health Jr.	Hip-Hop to Health Jr. is a 14-week physical activity and nutrition promotion program for low-income minority preschool children. The program consists of 20-minute classroom lessons related to healthy behaviors, followed by a 20-minute fun physical activity period, and a parent newsletter with homework assignments. Parents are compensated $5 for each homework assignment completed. Parents are also given access to free 30-minute aerobic activity sessions twice a week. The model demonstration, which included several cohorts, took place at Head Start centers in Chicago in the 1990s and 2000s.	Fitzgibbon, Stolley, Schiffer, Van Horn, et al. (2005) Fitzgibbon, Stolley, Schiffer, Braunschweig, et al. (2011) Fitzgibbon, Stolley, Schiffer, Kong, et al. (2013) Fitzgibbon, Stolley, Schiffer, Van Horn, et al. (2006) Kong et al. (2016)
Home Instruction for Parents of Preschool Youngsters (HIPPY)	HIPPY is a two-year parent involvement program that offers home-based early childhood education for three-, four-, and five-year-old children. The program targets parents with limited formal education from economically disadvantaged families. HIPPY helps parents enhance their children's school readiness through the use of a structured curriculum and books and materials designed to strengthen children's cognitive skills, early literacy skills, social and emotional development, and physical development. The program is designed such that mothers deliver the HIPPY lessons to their children daily, with support in the form of biweekly home visits from a paraprofessional and biweekly group meetings with paraprofessionals and other parents. HIPPY is an international program that started in Israel in 1969 and has been in operation in the United States since 1984, with programs in 26 states. www.hippyusa.org/	HIPPY (undated) Baker, Piotrkowski, and Brooks-Gunn (1998) Aos et al. (2004)

Table B.1—Continued

Program	Description	Citations
I Can Problem Solve	I Can Problem Solve is a school-based intervention program for young children ages 4–7. The program is implemented classroom-wide and seeks to change children's problem-solving and thinking styles, enhance their social adjustment, and promote prosocial behavior. In preschool, I Can Problem Solve is a three-month program of daily 20-minute classroom problem-solving lessons. Teachers are also trained in "problems solving dialoguing," which continues throughout the school year. The first I Can Problem Solve trial was conducted in 1980; since then, the manualized program has been implemented nationwide. www.icanproblemsolve.info/	I Can Problem Solve (undated) Shure and Spivack (1980) Shure and Spivack (1982) Feis and Simons (1985)

Table B.1—Continued

Program	Description	Citations
Incredible Years, four models	The Incredible Years series is a set of comprehensive curricula for children ages 2–8 and their parents and teachers. Parent, teacher, and child curricula can be used separately or in combination. The Incredible Years targets high-risk children or children displaying behavior problems. The curricula are designed to work jointly to promote emotional and social competence and to prevent, reduce, and treat children's behavioral and emotional problems. The Incredible Years parent training involves 12 to 14 weekly sessions, emphasizing such parenting skills as how to set limits, how to play with children, and how to handle misbehavior and incorporates videotaped scenes to encourage group discussion and problem-solving. The child-training program uses a small-group curriculum for children exhibiting conduct problems and is offered in weekly sessions for 18 to 20 weeks. The Incredible Years has been in operation since 1980 in multiple sites in the United States, as well as sites in Canada, the UK, and Sweden. www.incredibleyears.com/	Incredible Years (undated) Parents only: Webster-Stratton (1982) Gross, Fogg, and Tucker (1995) Gross, Fogg, Webster-Stratton, et al. (2003) Helfenbaum-Kun and Ortiz (2007) Perrin et al. (2014) WSIPP (2016a) Parents and teachers: Webster-Stratton (1998) Webster-Stratton, Reid, and Hammond (2001) Gross, Fogg, Webster-Stratton, et al. (2003) Kratochwill et al. (2003) Williford and Shelton (2008) Teachers only: Gross, Fogg, Webster-Stratton, et al. (2003) Snyder et al. (2011) Parents augmented: Brotman, Klein, et al. (2003) Brotman, Gouley, Chesir-Teran, et al. (2005) Brotman, Gouley, Huang, Kamboukos, et al. (2007) Brotman, Gouley, Huang, Rosenfelt, et al. (2008)

Table B.1—Continued

Program	Description	Citations
Infant Health and Development Program (IHDP)	IHDP was a comprehensive intervention consisting of early child development programs and family support services tailored to reduce the prevalence of health and developmental problems among low–birth weight, premature infants. Targeting infants upon discharge from the neonatal nursery until 36 months of age, the program provided HV, parent group meetings, and a center-based child development program for children. The program operated in eight medical institutions throughout the United States from 1985 to 1988.	"Enhancing the Outcomes of Low-Birth-Weight, Premature Infants" (1990) McCormick, Brooks-Gunn, et al. (1991) Brooks-Gunn, Klebanov, et al. (1993) Brooks-Gunn, McCarton, et al. (1994) McCarton et al. (1997) Casey et al. (2009) McCormick, Buka, et al. (2012) Litt et al. (2015)
Interpersonal Skills Program	The Interpersonal Skills Program is an intervention aimed at improving the problem-solving skills of preschool children. The intervention is delivered in the classroom for ten weeks in daily 20-minute sessions. The model demonstration took place in the 1970s and 1980s in a city in the Southwest. It was offered to entire classrooms but specifically targeted at improving the behavior of preschool children displaying aggressive behaviors.	Ridley and Vaughn (1982) Vaughn, Ridley, and Bullock (1984)

Table B.1—Continued

Program	Description	Citations
Kids in Transition to School	The Kids in Transition to School program is a school readiness intervention aimed at helping young children in foster care at high risk for school difficulties cope with the transition to kindergarten. Children attend a school readiness group that is structured like a typical kindergarten twice per week in the eight weeks before beginning kindergarten and once per week after beginning kindergarten. The group focuses on early literacy and numeracy, self-regulation, and social skills. Parents also attend weekly workshops through the summer and twice-monthly workshops in the fall. The Oregon Social Learning Center established the program in 2005, and it has been implemented in at least 13 school districts in Oregon. www.kidsintransitiontoschool.org/	Kids in Transition to School (undated) Pears, Kim, and Fisher (2012) Pears, Fisher, et al. (2013)
Learning Language and Loving It: The Hanen Program for Early Childhood Educators	The Learning Language and Loving It program is a teacher education program aimed at providing educators with practical strategies for encouraging language and social skills among all children in their classes, including children with diverse needs. The program targets children ages 3–5. The program consists of five to eight group training sessions run by a trained speech–language pathologist of three to four hours each, as well as several one-on-one individualized feedback sessions in which a mentor provides feedback on videos of each teacher's classroom literacy activities. The model demonstration took place in 38 preschools in a mid-Atlantic state in the 2000s. The Learning Language and Loving it program is available worldwide. www.hanen.org/Programs/For-Educators/Learning-Language-Loving-It.aspx	Hanen Centre (undated) Cabell et al. (2011) Johanson, Justice, and Logan (2016)

Table B.1—Continued

Program	Description	Citations
Legacy for Children, two program models	Legacy for Children is a parent support and education program covering a wide range of child development topics, as well as specific parenting skills, focusing on fostering a safe and consistent mother–child bond. The program was implemented as a demonstration in Miami and Los Angeles between 2001 and 2009, and each site offered a different duration and dosage of program services. The Los Angeles program targeted children prenatal to age 3, and the Miami program targeted children ages 0–5. Both programs involved parent training sessions for two hours each, occasional one-on-one sessions, and group outings in the community. www.cdc.gov/ncbddd/childdevelopment/legacy.html	Centers for Disease Control and Prevention (2017) To age 3: Kaminski et al. (2013) To age 5: Kaminski et al. (2013) Cost study: Corso et al. (2015)
Let's Begin with the Letter People	Let's Begin with the Letter People is a preschool literacy curriculum that promotes print knowledge, phonological awareness, and general language ability through circle time and center activities and small- and large-group activities. The program offers a range of reading materials for students, as well as a manual for teachers. The program was developed in 2000, and model demonstrations took place in a Houston school district and several Head Start centers in New York State in the 2000s. The Letter People materials have been widely distributed. www.abramslearningtrends.com/products/lets-begin-letter-people	Abrams Learning Trends (undated) Assel et al. (2007) Fischel et al. (2007)
Literacy Express	The Literacy Express preschool curriculum is a supplemental preschool literacy curriculum for three- to five-year-old children delivered via whole-group activities, small-group dialogic reading sessions, and learning center activities. The curriculum includes a large variety of manipulatives and children's books. Initially developed in 2005, the curriculum is now widely available.	Farver, Lonigan, and Eppe (2009)

Table B.1—Continued

Program	Description	Citations
Making Choices and Strong Families	Making Choices and Strong Families programs are complementary interventions aimed at preventing aggressive behavior in preschool children between ages 3 and 4. The Making Choices intervention, designed to prevent aggressive behavior and promote social problem-solving skills, delivers lessons in a small-group format to preschool children. The Strong Families intervention provides families with information about child development and parenting and offers referrals to needed services to help families address basic needs. These two interventions were implemented and tested together in a demonstration project conducted in a large urban area in the South in the 2000s.	Conner and Fraser (2011)
Medicaid	Medicaid is a national health insurance program for low-income children and their families. It is available to certain categories of people, including young children and pregnant women living below or near the poverty threshold. Medicaid was enacted as federal legislation in 1965 providing matching funds to states choosing to participate; however, state participation is optional. www.medicaid.gov/	Medicaid (undated [a]) Epstein and Newhouse (1998) Card and Shore-Sheppard (2004) Levine and Schanzenbach (2009) Cohodes et al. (2016)
Minding the Baby	Minding the Baby is an intensive HV program designed to support medically underserved mothers from the last trimester of pregnancy through 24 months postpartum. The intervention aims to promote parent reflection on what the infant is communicating from a very early age. It also provides coordinated referrals in order to ensure that basic needs are met. The manualized program was developed in 2002 and has been rolled out more broadly since that time. medicine.yale.edu/childstudy/mtb/	Yale School of Medicine (2017) Sadler et al. (2013) Ordway et al. (2014)

Table B.1—Continued

Program	Description	Citations
MOM Program	The MOM Program is an HV program for mothers of healthy infants. The program targets children ages 0–3. The MOM Program is designed to increase the child's participation in primary health services, early intervention programs, and other services by encouraging mothers to obtain these services when they are called for. Brief home visits of about 15 minutes are offered through age 3, and the program incorporates telephone reminders of upcoming well-child visits. The program was implemented as a demonstration program in Philadelphia, Pennsylvania, from 2001 to 2006.	Schwarz et al. (2012)
Mother–Infant Transaction Program	The Mother–Infant Transaction Program aims to improve infant development and maternal adjustment by teaching mothers of low–birth weight infants to be more responsive to infants' social and physiological signals. The program begins with seven daily sessions prior to the infant's discharge from the hospital. A neonatal intensive care nurse who works with the mother and the infant implements these sessions at three, 14, 30, and 90 days after discharge. An RCT of the Mother–Infant Transaction Program was conducted on infants born at the Medical Center Hospital of Vermont between 1980 and 1981, and four-, seven-, and ten-year outcome follow-ups of the RCT were also conducted.	Nurcombe et al. (1984) Rauh et al. (1988) Achenbach, Phares, et al. (1990) Achenbach, Howell, et al. (1993)

Table B.1—Continued

Program	Description	Citations
My Baby U	My Baby U is an at-home, yearlong video and book course intended to educate parents about the basics of parenting and infant development at different stages in the first year of the child's life. The course has packages (one-hour video and short book) on the newborn and the one-, three-, five-, seven-, ten-, and 12-month-old baby. The package also comes with a video with instructions on infant massage. The course is intended to be broadly applicable to mothers from many different backgrounds and was initiated in 1990. The model demonstration took place in a New England city in the 1990s. Since its inception, it has become widely available for new mothers to download from the course website. www.mybabyu.com/	My Baby U (undated) Brown, Yando, and Rainforth (2000)
Newborn Individualized Developmental Care and Assessment Program (NIDCAP)	NIDCAP focuses on the needs of infants in NICUs. It is a relationship-based and family-centered program that relies on neurobehavioral observation throughout hospitalization to develop an in-depth behavioral developmental profile of preterm low–birth weight infants. NIDCAP encourages parents and other key family members to be constantly present in the NICU and to take charge of the development and nurturing of their infants. Training in developmental care is also provided to nursing staff, developmental specialists, nurse educators, and a multidisciplinary leadership support team. The model demonstrations took place in Boston, Massachusetts, and Palo Alto, California, in the 1980s and 1990s. NIDCAP is now widely available and has multiple training centers for the model. nidcap.org/en/	NIDCAP (undated) Als, Lawhon, et al. (1994) Ariagno et al. (1997) Als, Duffy, et al. (2004) McAnulty, Duffy, Butler, Parad, et al. (2009) McAnulty, Duffy, Butler, Bernstein, et al. (2010)

Table B.1—Continued

Program	Description	Citations
Nurse–Family Partnership (NFP)	NFP, formerly Prenatal/Early Infancy Home Visitation by Nurses, provides intensive and comprehensive HV by public health nurses to low-income first-time pregnant women and mothers of any age. The visits begin during pregnancy and continue through the child's second birthday and are intended to help women improve their prenatal health and the outcomes of pregnancy, improve the care provided to infants and toddlers, and improve women's own personal development. The NFP program has been evaluated over several decades in trials in Elmira, New York; Memphis, Tennessee; and Denver, Colorado. More recently, the program has been replicated in 23 states across the United States. www.nursefamilypartnership.org/	NFP (undated) Kitzman, Olds, Henderson, et al. (1997) Olds, Eckenrode, et al. (1997) Olds, Henderson, et al. (1998) Olds, Robinson, O'Brien, et al. (2002) Olds, Kitzman, Cole, et al. (2004) Olds, Robinson, Pettitt, et al. (2004) Olds, Kitzman, Hanks, et al. (2007) Eckenrode et al. (2010) Kitzman, Olds, Cole, et al. (2010) Olds, Holmberg, et al. (2014) Olds, Kitzman, Knudtson, et al. (2014) WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
Nutrition and Physical Activity Self-Assessment for Child Care (NAP-SACC)	NAP-SACC was developed in 2003 by a team of child obesity researchers at the University of Carolina at Chapel Hill in association with colleagues in the Nutrition Services branch at the North Carolina Division of Public Health as an approach to promote and enhance healthy nutrition and physical activity environments in preschool settings by improving the nutritional quality of food and beverages, the amount and quality of physical activity, staff–child interactions, and center nutrition and physical activity policies and practices. The NAP-SACC intervention consists of five steps: an environmental self-assessment, selection of areas for change, continuing education workshops, targeted technical assistance, and reevaluation. Implementation usually occurs over a six-month period. NAP-SACC has been adopted and implemented in multiple states. In 2010, the White House Task Force on Childhood Obesity named it one of three innovative early childhood programs to help combat childhood obesity. gonapsacc.org/	NAP-SACC (undated) Alkon et al. (2014) Bonis et al. (2014)
Oklahoma Pre-K	Since 1998, the state of Oklahoma has offered a voluntary, one-year, free pre-K program to all four-year-old students in participating school districts. Each pre-K teacher is required to hold a bachelor's degree, as well as early childhood certification. The program also imposes restrictions on class size (20 students) and child–teacher ratios (10 to 1).	Oklahoma State Department of Education (undated) Gormley and Gayer (2005) Gormley, Gayer, Phillips, et al. (2005) Wong et al. (2008) Gormley, Phillips, Adelstein, et al. (2010) Gormley, Phillips, Newmark, et al. (2011) Bartik, Gormley, and Adelstein (2012) Hill, Gormley, and Adelstein (2015)

Table B.1—Continued

Program	Description	Citations
Parent–Child Assistance Program	The Parent–Child Assistance Program is an HV, case management, and advocacy program for improving health and social outcomes of high-risk substance-abusing mothers and their children starting from the birth of the target child until the child is age 3. This intervention consists of HV, advocacy, and connection of clients with appropriate community services. The intervention is delivered by paraprofessional advocates who work to establish a trusting relationship with clients and act as positive role models with an experienced and realistic perspective. Advocates work with a caseload of 12 to 15 clients and conduct home visits weekly for the first six weeks, then biweekly or more frequently, depending on client needs. The Parent–Child Assistance Program was funded in 1996 by the Washington State legislature as a continuation of the Seattle Birth to 3 Program, which was initially developed in 1991. depts.washington.edu/pcapuw/	University of Washington (2017) Ernst et al. (1999) Kartin et al. (2002)

Table B.1—Continued

Program	Description	Citations
Parent Child Development Center (PCDC) Birmingham	The Birmingham PCDC was a center-based parent–child education program implemented from 1970 to 1978 and aimed at preventing school failure and behavior problems in young children of low-income families. Mothers entered the program when their children were three to five months old and remained until they were age 3, such that the program lasted for 31 to 33 months. During the first year, parenting and infant development were focal topics, and mother–infant dyads spent three half-days per week at the center. In the second year, they were in the center four half-days per week, now as understudies to the teaching mothers, and a fifth day in classes led by staff members and teaching mothers. Topics included health, social services, child development, adult growth, and planning activities for children. In the last months, mothers attended full time five days a week. They taught other mothers and took part in development-related activities in afternoons. Mothers were paid a small stipend of $5 to $14 per day for participation, with the amount paid increasing with length of participation and added responsibilities.	Bridgeman, Blumenthal, and Andrews (1981) Andrews et al. (1982) Johnson and Blumenthal (2004) Johnson (2006)
PCDC Detroit	The Detroit PCDC was a replication of the New Orleans PCDC model. It was a center-based parent–child education program implemented from 1975 to 1980 aimed at preventing school failure and behavior problems in young children. This program, which targeted urban and low-income black women, ran for 34 months, beginning when the children were two months old and ending when they reached age 3. Like in the New Orleans PCDC, participating mothers attended the program two mornings per week for three hours together with Parent Advisory Council meetings once a month for three hours. Weekly sessions focused on child development, parenting roles, and relationships within the family and the community at large.	Bridgeman, Blumenthal, and Andrews (1981)

Table B.1—Continued

Program	Description	Citations
PCDC Houston	The Houston PCDC, whose goal was preventing school failure and behavior problems in young children, was a two-year parent–child education program for children ages 1–3. The program was implemented from 1970 to 1978 and targeted low-income Mexican American families who lived in Houston barrios. The Houston families entered the program when the children were age 1. The first year of the program involved biweekly home visits to the mother and child by paraprofessional educators, several weekend sessions for entire families, English-language classes for the mothers, a medical examination of the child, and referrals to community resources. In the second year, mothers and children attended the project center where the child was in child care and the mother in classes on homemaking, child care, and cognitive stimulation for up to four mornings a week, along with evening sessions that included fathers, and a continuation of language classes and community services. Mothers were paid a small stipend of $5 per day for participation during the center program phase.	Johnson, Kahn, et al. (1976) Bridgeman, Blumenthal, and Andrews (1981) Andrews et al. (1982) Johnson and Breckenridge (1982) Walker and Johnson (1988) Johnson and Walker (1991) Johnson and Blumenthal (2004) Johnson (2006)

Table B.1—Continued

Program	Description	Citations
PCDC New Orleans	The New Orleans PCDC was a center-based parent–child education program implemented from 1970 to 1978 aimed at preventing school failure and behavior problems in young children. This program, which targeted urban and low-income black families, also featured a strong preventive health and health education component. The program ran for 34 months, beginning when the children were two months old and ending when they reached age 3. Participating mothers attended the program two mornings per week for three hours together with Parent Advisory Council meetings once a month for three hours. Weekly sessions focused on child development, parenting roles, and their relationships within the family and the community at large. The original New Orleans design included the comparison of two other treatment variations: a three-year home visit program and a two-year center program, which started when the children were age 1. These variations were eliminated because resources were not adequate to support the development of three complete programs. Mothers were a paid small stipend of $5 per day for participation.	Bridgeman, Blumenthal, and Andrews (1981) Andrews et al. (1982) Johnson and Blumenthal (2004) Johnson (2006)

Table B.1—Continued

Program	Description	Citations
Parent–Child Home Program	The Parent–Child Home Program, a replication of the Mother–Child Home program, is a play-filled, nondidactic home-based intervention promoting parent–toddler verbal interaction as a means of improving cognitive development among children of low-income, low-educated parents at high risk for educational disadvantage. Children in participating families entered the program as toddlers. The intervention consists of 46 biweekly, half-hour home sessions conducted by home visitors called Teaching Demonstrators spread over seven months in each of the two years of the intervention. Since 1965 when it was first implemented, it has operated in multiple sites across the United States. www.parent-child.org/	Parent–Child Home Program (undated) Slaughter, Earls, and Caldwell (1983) Madden, O'Hara, and Levenstein (1984) Levenstein et al. (1998) WSIPP (2016a)
Parent–Child Interaction Therapy (PCIT)	PCIT is a PE program for parents of children displaying signs of disruptive behavior or clinical behavioral issues, such as oppositional defiant disorder. The program involves weekly, hour-long therapy sessions that progress through two phases. The first, Child-Directed Interaction, is similar to traditional play therapy. The second phase, Parent-Directed Interaction, resembles clinical behavior therapy. Families remain in the program until parents demonstrate mastery of the skills and the child's behavior is within the normal range. The program was initially developed in the 1970s, and the model has been used both nationally and internationally since that time. www.pcit.org/	PCIT International (undated) Bagner, Sheinkopf, et al. (2010) Bagner, Coxe, et al. (2016) WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
ParentCorps	ParentCorps is a center-based, preventive, family-centered, school-based intervention aimed at improving effective parenting practices and reducing child behavior problems among ethnically diverse children attending pre-K programs in public schools in disadvantaged, urban communities. It includes a series of 13 two-hour weekly group sessions for parents and children held at the school during early evening hours and facilitated by teachers and mental health professionals. The model demonstration took place in New York City in the 2000s. med.nyu.edu/pophealth/divisions/cehd/parentcorps	New York University School of Medicine (undated) Brotman, Calzada, et al. (2011) Brotman, Dawson-McClure, et al. (2013)
Parents as Teachers (PAT)	PAT is a voluntary early childhood PE and family support program that begins at or before the birth of the child and continues until kindergarten entry. Program services include home visits to families, developmental screenings of children, parent group meetings, and a resource network that links families with needed community resources. The PAT program was created in 1981 and is a universal-access model adaptable for families from all types of communities. parentsasteachers.org/	PAT (undated) Wagner, Clayton, Gerlach-Downie, et al. (1999) Wagner and Clayton (1999) Wagner and Spiker (2001) WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
Play and Learning Strategies (PALS): three program models	PALS is an HV program geared toward increasing responsive parenting behaviors; strengthening parent–child bonding; and stimulating children's early language, cognitive, and social development. The PALS intervention was conducted in families' homes across two developmental periods, infancy (PALS I) and toddler–preschool (PALS II), and is made up of ten weekly and 11 weekly, one-hour home-based sessions, respectively. Each session involves using educational videos featuring mothers with similar backgrounds, facilitator coaching of parents' use of key behaviors during video-recorded interactions with their infants, supporting mothers to critique their video-recorded practiced behaviors, and planning for how to use the target behaviors across the week. The model demonstrations of PALS I and PALS II took place in Texas in the 1990s and 2000s. www.childrenslearninginstitute.org/programs/play-and-learning-strategies-pals	Children's Learning Institute (2017) Infancy only (PALS I): Landry, Smith, and Swank (2003) Landry, Smith, and Swank (2006) Landry, Smith, Swank, and Guttentag (2008) Landry, Smith, Swank, Zucker, et al. (2012) Toddler only (PALS II): Landry, Smith, Swank, and Guttentag (2008) Landry, Smith, Swank, Zucker, et al. (2012) Infancy and toddler (PALS I and II): Landry, Smith, Swank, and Guttentag (2008) Landry, Smith, Swank, Zucker, et al. (2012)

Table B.1—Continued

Program	Description	Citations
Pride in Parenting (PIP)	PIP is an HV and group intervention program designed to improve knowledge, influence attitudes, and promote life skills that would assist low-income black mothers with inadequate prenatal care in providing better health oversight and development for their infants. PIP targets children from birth to age 1. The model demonstration took place in Washington, D.C., in the 1990s. The PIP curriculum involved a total of 32 home visits and 16 parent–infant group sessions for one year after birth. Trained paraprofessional home visitors from the same racial and ethnic backgrounds as the participants implemented the home visit curriculum, while a master's-level early intervention specialist facilitated 1.5-hour group sessions in conjunction with home visitors.	Katz et al. (2011)
Project CARE (Carolina Approach to Responsive Education): two program models	Project CARE was a longitudinal early intervention study that targeted families whose infants were at elevated risk for delayed development. Participants were subject to either of two interventions or to a control group. The interventions consisted of either a family-focused HV program that provided general family support or home visits in addition to child attendance at an educational development center that utilized a structured curriculum. Home visits began in the month after the child's birth, and children assigned to the educational development center began attending at some point between six weeks and three months of age. Both interventions continued until age 5. Project CARE was implemented in North Carolina between 1978 and 1983.	No ECE: Ramey, Bryant, et al. (1985) Campbell, Wasik, et al. (2008) With ECE: Ramey, Bryant, et al. (1985) Wasik, Ramey, et al. (1990)

Table B.1—Continued

Program	Description	Citations
Project STAR (Sit Together and Read)	Project STAR is a school-based print referencing intervention designed to improve print knowledge and early literacy skills of preschool children ages 3–5. Trained teachers implemented a 30-week shared reading program in their classrooms using a set of 30 storybooks provided for the intervention. Each teacher read the week's assigned storybook over four sessions that week as a large-group activity involving all children in the classroom using a print referencing style. Model demonstrations took place in Ohio and Virginia in the 2000s, and the program is still operating in Ohio through the Ohio State University.	Justice et al. (2010) Piasta et al. (2012)
Promoting Alternative Thinking Strategies (PATHS) for preschool	The preschool PATHS is an early education school-based program designed for children ages 3–5 to improve their social competence and reduce problem behavior. The program uses the preschool PATHS curriculum, which consists of 30 lessons that a classroom teacher delivers once a week during circle time sessions over a period of nine months. The model demonstration took place in Pennsylvania in 20 Head Start classrooms in the 2000s. The curriculum has been used in most U.S. states and more than 20 countries. www.pathseducation.com/what-is-paths/paths-curriculum	PATHS Education Worldwide (undated) Domitrovich, Cortes, and Greenberg (2007) WSIPP (2016a)

Table B.1—Continued

Program	Description	Citations
Promoting First Relationships	Promoting First Relationships is a relationship-based intervention designed to improve sensitive, responsive, and predictable care by caregivers (foster, kin, and birth caregivers) of toddlers with recent child welfare–mandated placement changes. A mental health training program developed in the early 1990s in Washington State, it consists of ten weekly 60- to 75-minute in-home visits by providers from community mental health agencies. It uses video feedback together with reflective practice principles to focus on the deeper emotional feelings and needs underlying difficulties in the parent–child relationship and to help caregivers think about their children's developing minds. The model demonstration took place in one Washington county in the 2000s. pfrprogram.org/	Promoting First Relationships (undated) Spieker et al. (2012) Nelson and Spieker (2013)
Reach Out and Read	Reach Out and Read is a national program that promotes reading aloud to young at-risk children by using the pediatric office as a site for education and intervention. Doctors and nurses give new books to children at each well-child visit from six months old to age 5 and accompany these books with developmentally appropriate advice to parents about reading aloud with their children. First implemented in 1989, Reach Out and Read is available in all 50 states, the District of Columbia, Puerto Rico, and Guam. www.reachoutandread.org/	Reach Out and Read (undated) Golova et al. (1999) High et al. (2000)

Table B.1—Continued

Program	Description	Citations
Reaching Educators, Children, and Parents (RECAP)	RECAP is semistructured, classroom-based, cognitive–behavioral skill training program that aims to address emotional and behavioral problems and promote prosocial skill development in preschool-age children. The program is delivered over an academic year and involves an adapted classroom-based curriculum and behavior management system taught two to three times per week, four to six hours weekly of site-based teacher training and consultation on implementation, and 16 biweekly parent group sessions. The model demonstration took place in six preschools in the 2000s.	Han et al. (2005)
Ready, Set, Leap!	Ready, Set, Leap! is a classroom-based curriculum program designed by LeapFrog Schoolhouse for building oral language, phonological awareness, print awareness, and a language-rich environment among preschool-age children. The intervention is delivered through whole-group, small-group, and individualized instruction and incorporates the use of interactive technology tools. Ready, Set, Leap! was evaluated in a large-scale RCT in Miami–Dade County, Florida, in 2003–2009.	Layzer et al. (2009)
Ready to Learn	Ready to Learn is a center-based early child education program that focuses on teaching children ages 4–5 a combination of learning skills and social skills in the regular classroom by the regular classroom teacher over a period of seven months. It integrates these skills into the regular curriculum through the use of stories and five teacher strategies: modeling-coaching, positive peer reporting, student storytelling, student story retelling, and the encouragement council. The model demonstration took place in ten classrooms in a large city in the 1990s.	Brigman et al. (1999)

Table B.1—Continued

Program	Description	Citations
REST (Reassurance, Empathy, Support, and Time-Out) Routine	REST Routine is a home-based nursing intervention program designed for managing infant irritability and unexplained crying through the use of infant behavior assessment, pattern recognition, individualized infant schedules, specific management strategies, and parent education and support. The intervention targets families who have healthy, full-term infants who have excessive and unexplained irritability and is guided by four principles (regulation, entrainment, structure, and touch) and four concepts (reassurance, empathy, support, and time-out). The intervention is delivered over one month in four weekly visits by pediatric nurse specialists who apply the program principles and concepts to the needs and unique features of each family. Model demonstrations took place in Charleston, South Carolina, and Denver, Colorado, in the 2000s. Infants were two to eight weeks old during enrollment, and four weekly home visits occurred after enrollment.	Keefe et al. (2005)
Safe Environment for Every Kid (SEEK)	SEEK is an enhanced pediatric primary care–based program that aims to identify and help address prevalent psychosocial problems that are risk factors for child maltreatment among children ages 0–5. The intervention was initiated in 2002 and consists of training health professionals to address targeted risk factors for maltreatment, such as maternal depression, alcohol and substance abuse, intimate-partner violence, harsh punishment, and major stress; providing resources for the doctors and parents (handouts); offering the brief Parent Screening Questionnaire to identify targeted risk factors; and addressing the identified risk factor by the health professional–social worker team. The model demonstration took place in the Baltimore area at multiple pediatric practices in the 2000s. theinstitute.umaryland.edu/frames/seek.cfm	Institute for Innovation and Implementation (undated) Dubowitz, Feigelman, et al. (2009) Dubowitz, Lane, et al. (2012)

Table B.1—Continued

Program	Description	Citations
SafeCare Augmented	SafeCare Augmented (sometimes written as SafeCare+) is a home-based model for child maltreatment prevention in high-risk families with children age 5 or younger. It utilizes a skill-based approach to change those parenting behaviors most proximal to child maltreatment, such as behavior related to child health, home safety and cleanliness, and parent–child bonding. Home visitors are trained to identify and respond to imminent child maltreatment and risk factors of substance abuse, depression, and intimate-partner violence. The trained home visitors conduct 60- to 90-minute weekly or biweekly home visits over 18 to 22 weeks focusing on three modules: parent–child interactions, infant and child health, and home safety. In addition, the program could be augmented with motivational interviewing to motivate behavior change in caregivers. The model demonstration took place in a county in the Southwest in the 2000s.	Silovsky et al. (2011)

Table B.1—Continued

Program	Description	Citations
Smart Start	Smart Start is a nationally recognized early child care program in North Carolina that began as a demonstration project in 1993 with the goal of ensuring that all the state's children between ages 0 and 5 and their families have access to high-quality child care and education services that would prepare them for school. Starting initially with 13 counties, it was gradually expanded to all counties by 1999. The initiative combined a top-down comprehensive system approach and a bottom-up implementation approach in order to address a broad set of challenges and to maximize local ownership and commitment, respectively. It was decentralized such that the state provided funding to broadly constituted county-level (and, in some cases, multicounty) partnerships set up specifically to implement the initiative. The local communities could use the provided funding for a variety of services benefiting young children. www.smartstart.org/about-smart-start/	Smart Start (undated) Ladd, Muschkin, and Dodge (2014) Muschkin, Ladd, and Dodge (2015) Dodge, Bai, et al. (2017)
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	WIC provides federal grants to states for health care referrals, supplemental foods, and nutrition education for low-income pregnant, breastfeeding, and nonbreastfeeding postpartum women and to infants and children up to age 5 who are at nutritional risk. WIC was piloted in 1972 and currently operates through 1,900 local agencies in 10,000 clinic sites, in 50 state health departments, 34 Indian tribal organizations, the District of Columbia, and five territories (Northern Mariana, American Samoa, Guam, Puerto Rico, and the Virgin Islands). www.fns.usda.gov/wic/about-wic-wic-glance	Food and Nutrition Service (2015) Bitler and Currie (2005) Joyce, Gibson, and Colman (2005) Joyce, Racine, and Yunzal-Butler (2008) Figlio, Hamersma, and Roth (2009) Hoynes, Page, and Stevens (2011) Rossin-Slater (2013) Currie and Rajani (2015)

Table B.1—Continued

Program	Description	Citations
State Children's Health Insurance Program (SCHIP)	SCHIP was established by the Balanced Budget Act of 1997 (Pub. L. 105-33) and provides matching federal funds to states in order to make health insurance available to children under age 19 in near-poor families who are ineligible for Medicaid. Substantial flexibility is provided to states in designing or modifying their SCHIPs. Hence, although the federal government provides general guidelines for the administration of SCHIP, individual states determine the type and scope of services provided. www.medicaid.gov/chip/index.html	Medicaid (undated [b]) Joyce and Racine (2005) H. Wang, Norton, and Rozier (2007) Lurie (2009) Li and Baughman (2010)
STAR (Stop, Think, Ask, and Respond) Parenting Program	STAR is a psychoeducational parenting program with parents of young children ages 1–5 who use excessive verbal and corporal punishment and are of low-income status. The intervention is delivered via four segments represented by the acronym STAR (stop, think, ask, and respond) as an approach to help parents thoughtfully respond rather than emotionally react to their young children's challenging behavior. The STAR program is delivered to parents in ten weekly 1.5-hour sessions facilitated in small groups with a maximum of four parents in each group. The model demonstration took place in a Midwestern city in the 1990s.	Nicholson et al. (2002)
Story Talk: Interactive Book Reading	This is a school-based program designed to improve language development and literary skills among children ages 3–4 from low-income families. The intervention was delivered over 15 weeks by classroom teachers who were first trained in interactive book reading for the first four weeks and then delivered the intervention by themselves in the remaining weeks. Intervention involved reading and discussing age-appropriate trade books related to a topic or theme, as well as extension activities for reinforcing the book vocabulary in another context. The model demonstration took place at a Title I learning center in Baltimore in the 1990s.	Wasik and Bond (2001)

Table B.1—Continued

Program	Description	Citations
Toddler–Parent Psychotherapy	Toddler–Parent Psychotherapy is a preventive intervention for promoting secure attachment in the offspring of depressed mothers. Toddlers and their mothers were seen in joint therapy sessions, beginning when the toddlers were, on average, 20 months old and continuing until they reached age 3. Through joint observation of the mother and the child, the therapist strives to alter the relationship between mother and toddler by increasing maternal understanding regarding the effects of prior relationships on current feelings and interactions. The model demonstration took place in the 1990s.	Cicchetti, Toth, and Rogosch (1999) Cicchetti, Rogosch, and Toth (2000) Toth et al. (2006)
Tools of the Mind	The Tools of the Mind is a preschool curriculum based on the work of psychologist Lev Vygotsky that focuses on the development of self-regulation at the same time as teaching literacy and mathematics skills in a way that is socially mediated by peers and teachers and with a focus on play. The curriculum incorporates 40 Vygotsky-inspired activities designed to promote mature dramatic play, encourage the use of self-regulatory private speech, and teach the use of external aids to facilitate attention and memory. First developed in 1996, the curriculum has been implemented in multiple states in the United States and helps to guide teachers' daily practices to support children's learning. toolsofthemind.org/	Tools of the Mind (undated) Diamond et al. (2007) Barnett, Jung, et al. (2008)

Table B.1—Continued

Program	Description	Citations
University of California, Los Angeles (UCLA) Family Development Project	UCLA Family Development Project was a two-year HV intervention targeted at mothers in the third trimesters of their first pregnancies who were identified as being at risk for inadequate parenting because of poverty and a lack of support. The primary goal of the intervention was to offer the mother the experience of a stable, trustworthy relationship that conveys understanding of her situation and that promotes her sense of self-efficacy. Mental health professionals with experience in child development and family system approaches carried out home visits once a week, lasting for 60 minutes in late pregnancy and in the first year and every other week in the second year. The intervention included home visits, developmental assessments, possible referral to community resources, and a weekly mother–infant group from infants three to 15 months old. The model demonstration took place in Los Angeles, California, in the 1990s. www.semel.ucla.edu/fdp	Jane and Terry Semel Institute for Neuroscience and Human Behavior (undated) Heinicke, Fineman, Ruth, et al. (1999) Heinicke, Fineman, Ponce, et al. (2001)

Table B.1—Continued

Program	Description	Citations
Video Interaction Project	Video Interaction Project is a pediatric PE program developed at the New York University School of Medicine and Bellevue Hospital Center aimed at supporting the parent–child relationship among low-income families. Child development specialists use video-recorded interactions to promote cognitive, language, and social–emotional development. Starting when the infant is about two weeks old until age 3 in a pediatric primary setting, the program is made up of 12 sessions lasting for 30 to 45 minutes during well-child visits. The program was first implemented in 1999 among low-income Latino mother–newborn dyads who delivered at an inner-city public hospital. Each session includes a discussion of child developmental progress; receipt of a developmentally appropriate learning material (e.g., toy or book) that promotes parent–child engagement; and a five- to ten-minute video recording of the parent and child engaging in activities of the parent's choice, which the child development specialist then reviews with the parent to highlight the parent's strengths and suggest activities to practice at home. The model demonstration took place in New York City in the 1990s. www.videointeractionproject.org/	Video Interaction Project (undated) Mendelsohn, Dreyer, et al. (2005) Mendelsohn, Valdez, et al. (2007)

Table B.1—Continued

Program	Description	Citations
Waterford Early Reading Level One	Waterford Early Reading Level One is an integrated learning system that connects teacher-led instruction and self-guided learning by providing 15 minutes daily of one-to-one learning time for each child and includes a wide range of early literacy skills (e.g., letter knowledge, concepts of print, vocabulary, and story structure). It employs the Waterford software, which provides individualized instruction to each child. There are also teacher guides for each letter of the alphabet that provide additional activities allowing teachers to reinforce or expand on the core of basic skills taught interactively through the software. The program is conducted across an academic year and has been developed for children from pre-K to grade 3. The model demonstration took place in New York in the 2000s. www.waterford.org/	Waterford (undated) Fischel et al. (2007)

APPENDIX C

Supplementary Tables for Chapter Three

Table C.1
Distribution of Outcomes, by Outcome Category

Outcome Domain	Outcome Category	Number of Outcomes	Percentage of Total
Behavior and emotion			
	General behavior or emotion	356	11.2
	Social skills or attachment	270	8.5
	Externalizing behaviors	199	6.3
	Internalizing behaviors	108	3.4
Cognitive achievement			
	Assessments: language or literacy assessments	413	13.0
	Executive function or self-regulation	151	4.7
	Assessments: general, IQ, and general cognitive assessments	144	4.5
	Assessments: math	118	3.7
	Other cognitive measures	4	0.1
	Assessments: other subjects, not general	3	0.1
Child health			
	Birth outcomes	106	3.3

Table C.1—Continued

Outcome Domain	Outcome Category	Number of Outcomes	Percentage of Total
	Other health outcomes	94	2.9
	Nutrition and physical activity	89	2.8
	ED visits and hospitalizations	67	2.1
	BMI or weight gain	62	2.0
	Child access to health care	45	1.4
	Timely immunizations	44	1.4
	General health status or rating	42	1.3
	Injury or safety	40	1.3
	Substance use	35	1.1
	Well-child visits	25	0.8
	Dental care	15	0.5
	Sexual health and pregnancy	13	0.4
	Physical health in adulthood	2	0.1
Crime			
	Justice system involvement	80	2.5
	Self-reported criminal activity	9	0.3
Child welfare			
	Parent or child self-reported abuse or neglect	88	2.8
	Official reports of child maltreatment	42	1.3
	Other child welfare outcome	2	0.1
Developmental delay			
	Developmental delay	237	7.5
Educational attainment			
	School performance	49	1.5
	Special education	49	1.5

Table C.1—Continued

Outcome Domain	Outcome Category	Number of Outcomes	Percentage of Total
	Grade retention	43	1.4
	High school graduation	18	0.6
	College enrollment	11	0.4
	School engagement	10	0.3
	Not otherwise specified	10	0.3
	Attendance	9	0.3
	Years of completed schooling	9	0.3
	College graduation	3	0.1
Adult outcomes			
	Employment and earnings in adulthood	30	0.9
	Family formation in adulthood	14	0.4
	Use of social services in adulthood	13	0.4
Composite measures			
	Composite measures	12	0.4

Table C.2
Effect Size Estimated for Each Outcome Category and Subcategory

Outcome Category	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
		Lower	Higher	
Birth outcomes	0.034	0.007	0.061	0.013
Gestational age	0.040	0.008	0.071	0.014
Low birth weight	–0.016	–0.094	0.063	0.695
Postbirth complications	0.061	–0.023	0.145	0.156
BMI	–0.028	–0.340	0.283	0.859
Substance use	0.149	0.084	0.214	<0.001
Alcohol use	0.021	–0.118	0.161	0.762
Tobacco use	0.096	–0.008	0.200	0.070
Other drug use	0.168	0.036	0.301	0.013
Combination drug use	0.167	0.091	0.243	<0.001

Table C.3
Pooled Effect Size Estimates for Each Included Study

Study	Program	Outcome Subcategory	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
				Lower	Higher	
Alkon et al. (2014)	NAP-SACC	BMI	0.325	0.051	0.598	0.020
Barth (1991)	CPEP	Low birth weight; postbirth complications	0.272	–0.013	0.557	0.062
Bitler and Currie (2005)	WIC	Gestational age; low birth weight; postbirth complications	0.033	0.007	0.059	0.014
Bonis et al. (2014)	NAP-SACC	BMI	0.000	–0.272	0.272	1.000
Brown, Yando, and Rainforth (2000)	My Baby U	Postbirth complications	–0.148	–0.435	0.139	0.313
Campbell, Pungello, et al. (2012)	Abecedarian	Alcohol use; tobacco use; other drug use	0.018	–0.372	0.409	0.927
Campbell, Ramey, Pungello, et al. (2002)	Abecedarian	Alcohol use; tobacco use; other drug use	0.200	–0.200	0.600	0.327
Campbell, Wasik, et al. (2008)	Project CARE, no ECE	Tobacco use; other drug use	–0.041	–0.690	0.609	0.902
Casey et al. (2009)	IHDP	BMI	–1.040	–1.191	–0.890	0.000
Currie and Rajani (2015)	WIC	Gestational age; low birth weight; postbirth complications	–0.006	–0.010	–0.003	0.001

Table C.3—Continued

Study	Program	Outcome Subcategory	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
				Lower	Higher	
Eckenrode et al. (2010)	NFP	Alcohol use; other drug use	0.080	−0.225	0.385	0.608
Englund et al. (2014)	Abecedarian	Alcohol use; tobacco use; other drug use; combination drug use	0.025	−0.367	0.418	0.900
Epstein and Newhouse (1998)	Medicaid California	Gestational age; low birth weight	0.004	−0.001	0.008	0.084
Epstein and Newhouse (1998)	Medicaid South Carolina	Gestational age; low birth weight	−0.002	−0.014	0.009	0.677
Feinberg, Jones, Roettger, Solmeyer, et al. (2014)	Family Foundations	Gestational age; low birth weight; postbirth complications	−0.020	−0.342	0.302	0.902
Feinberg, Roettger, et al. (2015)	Family Foundations	Low birth weight; postbirth complications	−0.154	−0.398	0.089	0.215
Figlio, Hamersma, and Roth (2009)	WIC	Gestational age; low birth weight	0.187	0.125	0.248	0.000
Fitzgibbon, Stolley, Schiffer, Braunschweig, et al. (2011)	Hip-Hop to Health Jr.	BMI	0.071	−0.091	0.233	0.390

Table C.3—Continued

Study	Program	Outcome Subcategory	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
				Lower	Higher	
Fitzgibbon, Stolley, Schiffer, Kong, et al. (2013)	Hip-Hop to Health Jr.	BMI	0.142	–0.187	0.471	0.398
Fitzgibbon, Stolley, Schiffer, Van Horn, et al. (2005)	Hip-Hop to Health Jr.	BMI	0.194	–0.028	0.416	0.087
Fitzgibbon, Stolley, Schiffer, Van Horn, et al. (2006)	Hip-Hop to Health Jr.	BMI	0.050	–0.160	0.260	0.642
Harvey-Bernino and Rourke (2003)	Active Parenting	BMI	0.527	–0.103	1.158	0.101
Heckman, Moon, et al. (2010)	Perry Preschool	Tobacco use	0.171	–0.200	0.543	0.366
Herbst and Tekin (2012)	CCDF	BMI	–0.295	–0.391	–0.199	0.000
Ickovics et al. (2007)	CenteringPregnancy	Low birth weight; postbirth complications	0.071	–0.054	0.195	0.267
Joyce, Gibson, and Colman (2005)	WIC	Gestational age; low birth weight	0.029	0.021	0.037	0.000
Joyce, Racine, and Yunzal-Butler (2008)	WIC	Gestational age; low birth weight	0.098	0.095	0.101	0.000

Table C.3—Continued

Study	Program	Outcome Subcategory	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
				Lower	Higher	
Kennedy et al. (2011)	CenteringPregnancy	Gestational age; low birth weight; postbirth complications	–0.103	–0.530	0.324	0.636
Kitzman, Olds, Cole, et al. (2010)	NFP	Combination drug use	0.179	0.008	0.351	0.040
Koniak-Griffin, Anderson, Verzemnieks, et al. (2000)	EIP	Low birth weight; postbirth complications	–0.009	–0.318	0.299	0.952
Kothari et al. (2014)	Healthy Start	Gestational age; low birth weight	0.048	–0.187	0.283	0.688
Melnyk, Feinstein, Alpert-Gillis, et al. (2006)	COPE	Postbirth complications	0.013	–0.249	0.276	0.920
Moore, Armsden, and Gogerty (1998)	Childhaven	Combination drug use	0.782	0.059	1.506	0.034
Muennig et al. (2011)	Abecedarian	Alcohol use; tobacco use; other drug use	0.172	–0.205	0.549	0.372
Olds, Henderson, et al. (1998)	NFP	Alcohol use; tobacco use; other drug use	0.081	–0.175	0.337	0.536
Reynolds, Temple, Ou, et al. (2011)	Chicago CPC	Combination drug use	0.153	0.049	0.258	0.004

Table C.3—Continued

Study	Program	Outcome Subcategory	Pooled Effect Size	95% Confidence Interval Bounds		*p*-Value
				Lower	Higher	
Reynolds, Temple, White, et al. (2011)	Chicago CPC	Tobacco use; combination drug use	0.163	0.011	0.315	0.035
Rossin-Slater (2013)	WIC	Gestational age; low birth weight	0.018	0.013	0.023	0.000
Sadler et al. (2013)	Minding the Baby	Gestational age; low birth weight	–0.083	–0.470	0.303	0.673
Stabile and Graham (2000)	Healthy Start	Gestational age; low birth weight	–0.633	–1.094	–0.172	0.007
Strully, Rehkopf, and Xuan (2010)	EITC	Low birth weight	0.026	0.023	0.028	0.000
Tanner-Smith, Steinka-Fry, and Lipsey (2014)	CenteringPregnancy	Gestational age; low birth weight	0.113	–0.063	0.289	0.208

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The past two decades have been characterized by a growing body of research from diverse disciplines—child development, psychology, neuroscience, and economics, among others—demonstrating the importance of establishing a strong foundation in the early years of life. The research evidence has served to document the range of early childhood services that can successfully put children and families on the path toward lifelong health and well-being, especially those at greatest risk of poor outcomes. As early childhood interventions have proliferated, researchers have evaluated whether the programs improve children's outcomes and, when they do, whether the improved outcomes generate benefits that can outweigh the program costs. This report examines a set of evaluations that meet criteria for scientific rigor and synthesizes their results to better understand the outcomes, costs, and benefits of early childhood programs. The authors focus on evaluations of 115 early childhood programs serving children or parents of children from the prenatal period to age 5. Although preschool is perhaps the best-known early childhood intervention, the study also reviewed such programs as home visiting, parent education, government transfers providing cash and in-kind benefits, and those that use a combination of approaches. The findings demonstrate that most of the reviewed programs have favorable effects on at least one child outcome and those with an economic evaluation tend to show positive economic returns. With this expanded evidence base, policymakers can be highly confident that well-designed and -implemented early childhood programs can improve the lives of children and their families.

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