Two policies to boost school readiness

Greg J. Duncan
University of California, Irvine

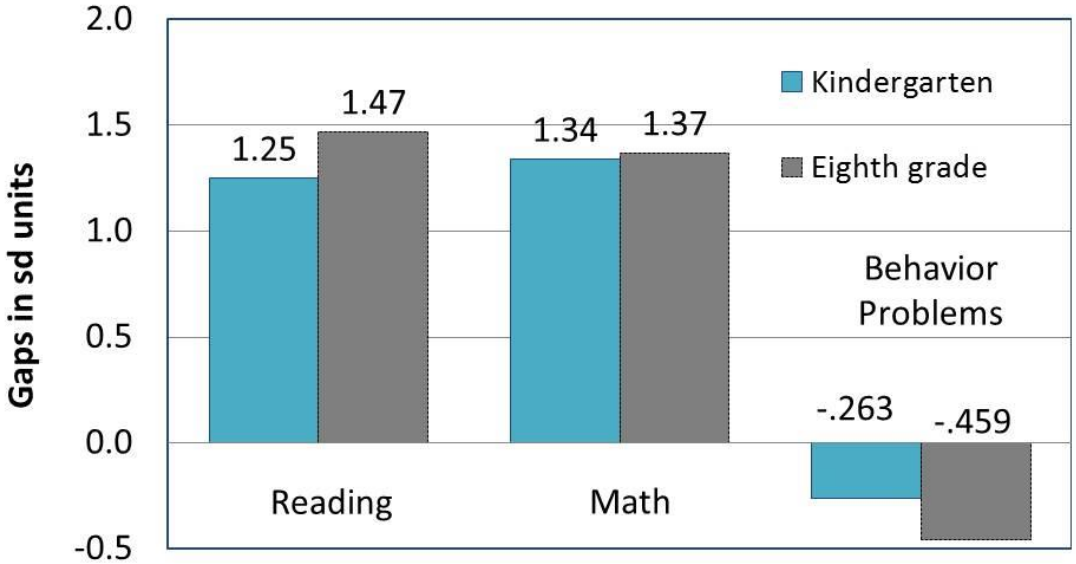
Ariel Kalil
University of Chicago

Katherine Magnuson
University of Wisconsin

Richard Murnane
Harvard University

Poor children begin school well behind their more affluent peers and regain little if any ground during the school years. Based on data presented in Duncan and Magnuson (2011), Figure 1 shows differences in reading and math scores and "externalizing" (anti-social) behavior problems across socioeconomic groups in both first and eighth grades. On average, students in the bottom socioeconomic status quintile (with average family income of about $15,500) scored well over one standard deviation – nearly a full year of learning – below children in the top SES quintile (average family income of $100,000) in both reading and math. SES gaps are roughly half as large for children *within* the same schools as for children overall, suggesting that SES-based family selection into schools accounts for some but by no means all of the achievement gaps. By eighth grade, children from low-SES families have fallen further behind high-SES children on both academic skills and social behaviors.

Figure 1: Reading, math and anti-social behavior gaps between low- and high-SES kindergarteners and 8th graders



Source: Authors' calculations based on data from the ECLS-K. Bars show differences between children in the top and bottom quintiles of socioeconomic status.

There are many reasons (reviewed below) for believing that preventative investments early in childhood targeting these school-entry achievement and behavior gaps may be more beneficial for promoting socioeconomic mobility among low-income children than remedial investments in adolescence or early adulthood. We consider two possible investment policies.

First: scale up the highly successful Boston Pre-K program. Although costing about two thousand dollars more than full-day Head Start, the Boston program combines proven math and literacy curricula, provides extensive professional development and coaching for teachers, and in other ways provide a much higher quality education experience for children than what is found in most early childhood education (ECE) programs.

Second: reallocate child tax credit and Earned Income Tax Credit (EITC) payments so that payments to families with children under age 6 are twice as large as payments to families with older children. Not only are the incomes of families with the youngest children substantially lower than the incomes of families with older children, but evidence indicates that income matters at least as much, if not more, in early childhood relative to later.

Why Focus on Early Childhood?

Emerging evidence from human and animal studies highlights the critical importance of early childhood for brain development and for setting in place the structures that will shape future cognitive, social, emotional, and health outcomes (Sapolsky, 2004; Shonkoff & Phillips, 2000). Studies in psychology and social epidemiology illustrate that both in-utero environments and early childhood experiences have long-run impacts on adult physical and mental health (Barker, Eriksson, Forsen, & Osmond, 2002; Danese, Pariante, Caspi, Taylor, & Poulton, 2007; Poulton & Caspi, 2005). Epidemiologists have suggested that early childhood stressors related to low income could alter or dysregulate biological systems, with adverse implications for future health (Godfrey & Barker, 2000). In animal models, optimal "mothering" behavior in critical periods of early development is associated with lifelong stress reactivity and cognitive strength (Sapolsky, 2004).

Cunha and Heckman (2007) posit a cumulative model of the production of human capital that allows for the possibility of differing childhood investment stages as well as roles for the past effects and future development of both cognitive and socio-emotional skills. Their model highlights the interactive nature of skill building and investments from families, preschools and schools, and other agents. It suggests that human capital accumulation results from "self-productivity" – skills developed in earlier stages bolster the development of skills in later stages – as well as the dynamic complementary process that results when skills acquired prior to a given investment increase the productivity of that investment. These two principles are combined in the hypothesis that "skill begets skill." This model predicts that poor-quality home environments and economic deprivation in early childhood creates disparities in school readiness and early academic success that widen over the course of childhood.

Early Childhood Interventions

Most early childhood interventions seek to improve the quality of the learning and social interactions that children experience. Some attempt to enhance the skills of parents in hopes that parents will better teach, nurture, or in other ways provide for their children and in so doing

enhance their children's well-being. Child-based interventions seek to provide enriching experiences to children directly, as with preschool education programs.

Early childhood interventions also differ in the types of children's skills and behavior they seek to influence. Some aim to improve children's early cognitive, literacy or numeracy skills. Others focus on development children socioemotional behaviors by, for example, reducing anti-social and other disruptive problem behaviors.

As is well-known, two intensive early childhood education programs – Perry Preschool and Abecedarian (described below) – generate long-term benefits well in excess of their costs. Scaling up more affordable versions of programs such as these has proven more difficult. Our first policy idea selects a program that has been scaled up across an entire urban school system and has shown considerable signs of success.

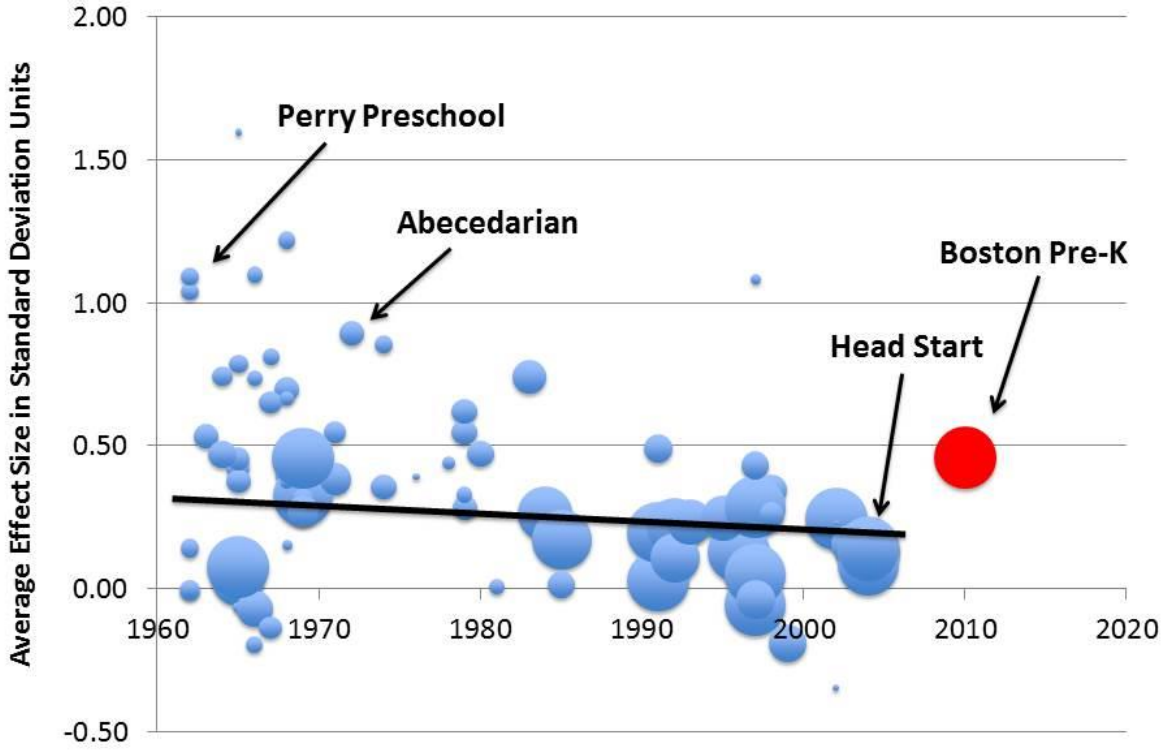
By and large, programs that attempt to enhance the skills and resources of parents in hopes that parents will do a better job teaching, nurturing, or in other ways providing for their children have a disappointing record (Furstenberg, 2011). There are two noteworthy exceptions, however. First is the nurse home-visitation program developed by David Olds, in which nurses pay repeated visits to high-risk first-time mothers in their homes (Duncan, Ludwig, and Magnuson 2010). Second, evidence from a number of experimental and quasi-experimental studies suggests that boosting the incomes of the poor, either through direct payments or by raising the effective earnings of the working poor, has positive, albeit modest, impacts on the achievement of younger children (Morris, Duncan, and Clark-Kauffman 2005).

Policy 1: Scale up the Boston pre-K system

Background

We begin our discussion of our Boston pre-K proposal by setting the stage for our preschool education policy. Focusing on evaluations of preschool programs that are based on strong experimental or quasi-experimental methods and provide impact estimates for cognitive or achievement-related outcomes,[1] Figure 2 shows the distribution of 75 program-average treatment effect sizes for cognitive and achievement outcomes measured at the end of each program's treatment by the calendar year in which the program began. Reflecting their approximate contributions to weighted results, "bubble" sizes are roughly proportional to the number of children in each evaluation study. The figure also includes a weighted regression line of effect size by calendar year.

Figure 2: Average Impact at the End of Treatment



Taken as a whole, ECE impacts on cognitive and achievement scores averaged .28 standard deviations at the time of program completion, an amount equal to nearly half of race differences in kindergarten achievement gap but only one-quarter of the size of the income gap. Programs beginning before 1980 had significantly larger average effect sizes (.37 sd) than those beginning after (.21 sd). Declining effect sizes over time are disappointing, as we might hope that lessons from prior evaluations and the science of child development would have led to an increase in program quality over time.

The likely reason for the decline is that counterfactual conditions for children in the control groups in these studies have improved substantially. Low-income children are much more likely to be attending some form of center-based care now relative to 40 years ago (Duncan and Magnuson, 2013). This matters because although children attend a mix of programs with varying degrees of educational focus, research suggests that general center-based care is associated with better cognitive and achievement outcomes for preschool age children (NICHD and Duncan, 2003).

Even more impressive are gains in the likely quality of the home environment provided by low income mothers, as indexed by their completed schooling. In 1970, some 71% of preschool age children in the bottom 20% of the income distribution had mothers with less than a high school degree, while only 5% of the mothers had attended at least some post-secondary schooling.[2] By 2000, the percent of children with mothers who had completed less than a high

school degree had dropped by nearly half (to 37%), while the percentage with mothers who had completed some post-secondary schooling increased five-fold (to just over 25%). Thus today, even when they are at home rather than in non-maternal care settings, children are benefiting from much higher quality home environments than was the case four decades ago.

Perry and Abecedarian

Despite the hundreds of ECE evaluation studies that have been published over the past 50 years, only a handful of programs have figured prominently in policy discussions about early childhood investments – in particular Perry Preschool, the Abecedarian program, Head Start, and more recently, some state pre-kindergarten programs. It can be seen in Figure 2 that average end-of-treatment effect sizes for Perry (1.1 standard deviations) and Abecediarn (.90 sd) are more than three times larger than the weighted mean effect size for all studies shown in Figure 2.

Perry provided one or two years of part-day educational services and weekly home visits to 58 low-income, low-IQ African American children aged three and four in Ypsilanti, Michigan, during the 1960s. Per pupil costs amounted to about $20,000 per child (in 2011 dollars). Perry's large impacts on cognitive ability at the point of school entry had all but disappeared by third grade (Schweinhart et al., 2005). Nevertheless, the program produced lasting improvements through age forty on employment rates and substantially reduced the chances that participants had been arrested. Heckman et al. (2010) estimate that the program generated a social rate of return between 7 and 10%.

The Abecedarian program, which served 57 low-income, mostly African American families from Chapel Hill, North Carolina, provided even more intensive services than Perry Preschool. Expressed in 2011 dollars, Abecedarian's five-year duration led to costs that totaled about $80,000 per child, and is estimated to have produced $160,000 in net present benefits for its participants and their parents (Barnett & Masse, 2007; Currie, 2001).

It is difficult to extract policy lessons from these model programs for ECE programs that states or the federal governments might offer today. Both were designed and evaluated by researchers and each served only several dozen children – conditions that scaled-up programs cannot match. Moreover, as mentioned above, counterfactual conditions three decades ago set a very low bar for these programs.

Head Start Impacts

Policy lessons might be gleaned more reliably from studies of Head Start, since it now provides services to almost a million three and four year olds. The Head Start Impact Study (HSIS) sampled Head Start centers nationally and used waitlist lotteries to randomly assign children to enrollment opportunities. Begun in 2002, it found that, after one academic year in the program, four-year old Head Start participants made significantly greater gains in six language and literacy areas than control children, with intent to treat effect sizes ranging from .09 to .31 standard deviations (US DHHS, 2005) and treatment on the treated effect sizes roughly 50 percent larger (Ludwig and Phillips, 2007).[3] In contrast, there were few program impacts on math skills or on children's attention, externalizing or mental health outcomes. By the end of first grade and continuing through third grade, both achievement levels and behavioral ratings of treatment group children were essentially similar to achievement levels of control-group children (US DHHS, 2010).

As with Perry and Abecedarian, disappearing test score impacts for recent cohorts of Head Start children appear to be at odds with long-term impacts on important young adult outcomes found in analyses of older Head Start cohorts. Some of these studies use strong quasi-experimental methods and find noteworthy long-run program impacts. Deming's (2009) sibling-based fixed effect analysis found that, compared with siblings who did not attend Head Start or other preschool programs, children who attended Head Start scored .23 sd higher on a composite of positive early adult outcomes (high school graduation, college attendance, idleness, crime, teen parenthood, and health status) produces an impact estimate of +.23 sd. Ludwig and Miller's (2007) regression discontinuity study of Head Start attendees in the late 1960s found that efforts to increase the likelihood that poor counties established Head Start programs by providing federal grant writing assistance yielded increases of 3-4 percentage points in high school graduation rates and post-secondary schooling in these counties in the 1990 census data, although such effects were attenuated by 2000. Taken together, these studies suggest that despite the decline in program impacts on achievement test scores as children progress through elementary school, there may be measureable important effects of Head Start on children's life chances. On the other hand, the confound between when the program started and the length of the follow-up period may just mean that the long-term effects found in these earlier studies will never happen in today's much better counterfactual conditions. The absence of detectable effects beyond kindergarten in the Head Start Impact Study hardly supports a prediction of longer-run success.

Pre-K Impacts

Some promising evaluations of pre-K programs were completed too recently to have been included in the data base used to produce Figure 2. The most comprehensive is Wong et al. (2008), who use regression discontinuity methods to examine five state-initiated pre-K programs. They find short-run effects on achievement test scores that are somewhat larger than those estimated in the National Head Start Impact Study, although the size of the impacts varies considerably across states and type of test. And in a head-to-head comparison of Head Start and pre-K programs in Tulsa, Gormley et al. (2008) found that pre-K students outperformed Head Start students on early reading and writing but not early math skills. The absence of longer-run results on pre-K programs suggests caution in drawing strong policy conclusions from these otherwise promising results.

Boston

We focus one of our policy recommendations on the Boston pre-K system. During the 2005–2006 school year, Boston pre-K was serving one-quarter of the four-year-olds whose parents applied for admission. At the same time Dr. Jason Sachs was recruited to head a newly-formed Department of Early Childhood (DEC).

Sachs and his colleagues chose the Opening the World of Learning (OWL) literacy curriculum and the Building Blocks mathematics curriculum (Weiland and Yoshikawa, 2013). The OWL focuses on developing children's early language and literacy skills and includes a social skills component within each study unit. The Building Blocks curriculum develops children's knowledge of simple arithmetic, geometry, measurement, and spatial relationships. Both curricula specify that children should spend considerable time at activity centers, playing in groups at activities designed to teach critical skills. The DEC team further enriched the

curriculum by adding a "Building Communities" component aimed at teaching children the negotiation skills essential for constructive play and learning.

Recognizing that implementing these curricula well would pose a substantial challenge for most Boston public school pre-K teachers and require significant preparation for each lesson, DEC embarked on a multiyear strategy to increase the quality and consistency of instruction in pre-K classrooms. This included providing teachers with manuals on how to prepare for and teach each of the many daily lessons in the curriculum and the staffing necessary to implement the curriculum appropriately. Key here was a full-time paraprofessional in each pre-K classroom to assist a licensed teacher as well as intense coaching and professional development aimed at providing all pre-K teachers and aides with the skills and knowledge to implement the demanding curricula. Part of the challenge was to convince teachers and aides that four-year-olds learn by doing, not by listening to teachers talk. Classroom management skills were also critical if children were to thrive in a cooperative learning setting. Yet another concern was to help teachers assess children's mastery of the skills and knowledge that provided the focus for the day's activities.

Weiland and Yoshikawa (2013) conducted a regression-discontinuity study of the impacts of the Boston pre-K system and found that the mathematics, literacy, and language skills of children who participated in the pre-K program were considerably more advanced than those of similarly-aged children who spent the year in other child care settings (Weiland and Yoshikawa, 2013; Figure 3). Moreover, the evaluation also found improvements in various components of executive functioning – working memory, inhibitory control and attention shifting (Figure 4). All in all, the sizes of the pre-K impacts were sufficient to close more than half of the gap at kindergarten entry between the academic skills of children from low-income families and those from relatively affluent ones.

Figure 3: Cognitive Impact of Boston pre-K
Weiland & Yoshikawa, 2013 *Child Development*

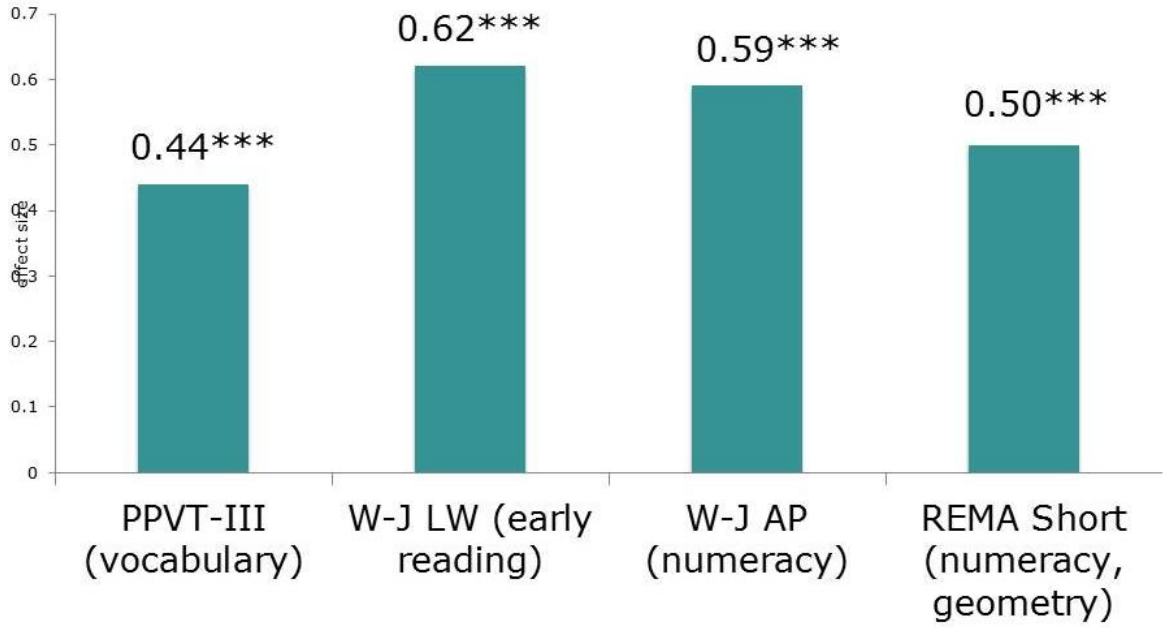
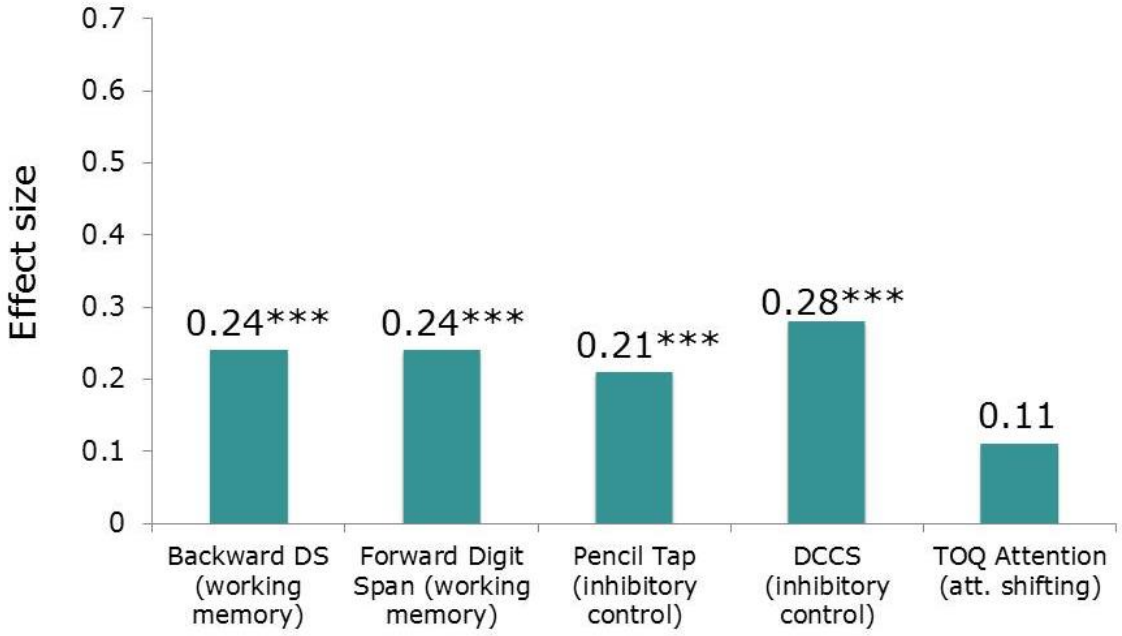


Figure 4: Executive Function Skill Impacts of Boston pre-K

Weiland & Yoshikawa, Nov / Dec 2013 issue, *Child Development*



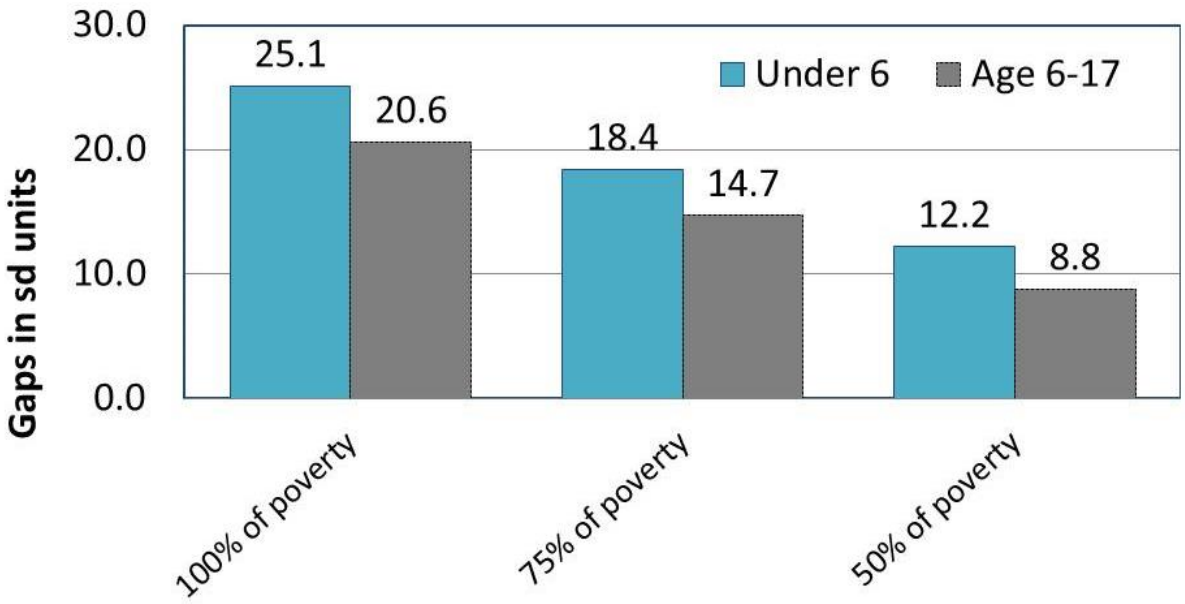
A huge unanswered question is whether these promising impacts of the Boston pre-K system will persist beyond the pre-K year. A regression discontinuity design such as the one used for the Boston evaluation cannot provide the needed evidence. The lack of evidence on longer-run outcomes suggests that the best strategy for scaling up the Boston pre-K system is a gradual one in which random-assignment evaluations (which can provide longer-run impacts) are embedded.

Reallocate child tax credit and EITC payments to families with younger children

Poverty is associated with a cluster of disadvantages that may be harmful to children, including low levels of parental education and living with a single parent. We argue below that evidence indicates that children's well-being would be helped by a policy that increased family incomes but did nothing else and that the income impacts are at least as large, if not larger, for families with young children.

At the same time, it is important to note how much lower income levels are for families with younger as opposed to older children. Using poverty data from the Current Population Survey, Figure 5 show rates of poverty for various poverty lines separately for preschool and older children. Rates are consistently 3 to 5 percentage points higher for families with young as opposed to older children. Using the convention (100% of) poverty line, it can be seen that more than one in four children under the age of 6 lived in poor families, while one in eight lived in families with income below 50 percent of the poverty line.

Figure 5: Poverty rates by age of child



Source: Authors' calculations based on data from the 2013 Current Population Survey.

The importance of income and the generally lower incomes for families with young children leads to our policy recommendation: **reallocate child tax credit and EITC payments so that payments to families with children under age 6 are twice as large as payments to families with older children.**

Background

What are the consequences of growing up in a poor household? Economists, sociologists, developmental psychologists, and neuroscientists emphasize different pathways by which poverty may influence children's development. The two main theoretical frameworks describing these processes are: family and environmental stress, on the one hand and resources and investment on the other.

Family and Environmental Stress Perspective. Economically disadvantaged families experience higher levels of stress in their everyday environments than more affluent families, and these disparities may affect children's development. The family stress model was first developed by Glen Elder to document the influence of economic loss during the Great Depression (Elder, 1974). According to this perspective, poor families face significant economic pressure as they struggle to pay bills and purchase important goods and services, and these economic pressures, coupled with other stressful life events that are more prevalent in the lives of poor families, creates high levels of psychological distress, including depressive and hostile feelings, in poor parents (Kessler and Cleary, 1980; McLeod and Kessler (1990).

This perspective has been broadened by recent behavioral economics work showing that conditions of poverty and scarcity not only create psychological distress, but also deplete important cognitive resources (Spears, 2011). Studies, most of which have been conducted in developing countries, find that making economic decisions under conditions of scarcity reduces adults' subsequent behavioral self-control and renders them less able to regulate their own behavior in order to pursue less immediate goals.

Psychological distress spills over into marital and co-parenting relationships. As couples struggle to make ends meet, their interactions tend to become more hostile and conflicted, and this leads them to withdraw from each other (Brody 1994; Conger and Elder, 1994). Parents' psychological distress and conflict, in turn, are linked with parenting practices that are on average more punitive, harsh, inconsistent, and detached, as well as less nurturing, stimulating, and responsive to children's needs. Such lower-quality parenting is likely to elevate children's physiological stress responses, and ultimately harms children's development (Conger et al., 2002; McLoyd (1990).

Although the biological links between low income and stress are compelling, no methodologically strong studies have linked poverty and elevated and prolonged stress reactions in children. Some strong studies have examined these connections in mothers. One of these linked expansions of the Earned Income Tax Credit to data from the National Health Examination and Nutrition Survey and found that when compared with mothers with just one child, low-income mothers with two or more children experienced larger reductions in risky biomarkers and self-reported better mental health (Evans and Garthwaite, 2010). A study of the impacts of increases in the Canadian Child Benefit also found improvements in maternal mental health. Studies of the impacts of other welfare and anti-poverty programs that increased both income and maternal employment did not show similar improvements in mental health (Milligan and Stabile, 2009; Duncan et al., 2009).

Resource and Investment Perspective. Household production theory has played a central role in how economists conceive of family influences on child development. Gary Becker's *A Treatise on the Family* (1991) posits that child development is "produced" from a combination of endowments and parental investments. Endowments include genetic predispositions and the values and preferences that parents instill in their children. Parents' preferences, such as the importance they place on education and their orientation toward the future, combined with their resources, shape parental investments.

Economists argue that time and money are the two basic resources that parents invest in their children. For example, investments in high-quality child care and education, housing in good neighborhoods, and rich learning experiences enhance children's development, as do investments of parents' time. Links among endowments, investments, and development appear to differ by the domain of development under consideration (e.g. achievement, behavior, health).

Household production theory suggests that children from poor families lag behind their economically advantaged counterparts in part because their parents have fewer resources to invest in them. Compared with more affluent parents, poor parents are less able to purchase inputs for their children, including books and educational materials at home, high-quality child care settings and schools, and safe neighborhoods. Economically disadvantaged parents may also have less time to invest in their children, owing to higher rates of single-parenthood, nonstandard work hours, and less flexible work schedules (Smolensky et al., 2003). This too may have

negative consequences for children. Evidence suggests that the amount of cognitive stimulation in the home environment varies with changes in family income (Votruba-Drzal, 2006).

Table 1 provides recent evidence, based on recent Consumer Expenditure Surveys, of the nature of child enrichment expenditures such as books, computers, high-quality child care, summer camps, and private school tuition. Shown are total expenditures per child, enrichment expenditures per child and per-child expenditures in selected categories for different income groups and for families with either only preschoolers or children age 6 or more. All amounts have been adjusted for family size and composition.[4]

Child enrichment expenditures are highly income elastic, constituting only 3 percent of total expenditures for families in the bottom expenditure quintile, and 9 percent of total expenditures for families in the top expenditure quintile. Trips and child care expenditures are most important for the high-income families, while expenditures are spread more evenly across categories for low-income families.

Since we focus our policy recommendation on the age of children, it is of interest to know whether it is normative for families to spend much more on older relative to younger children. Table 1 also shows expenditures separately for families with exclusively preschool children or exclusively school-aged children. Enrichment expenditures and expenditure shares are slightly higher for families with younger than older children. Child care expenditures are the dominant expenditure category for families with younger children, while no single expenditure category dominates for families with older children.

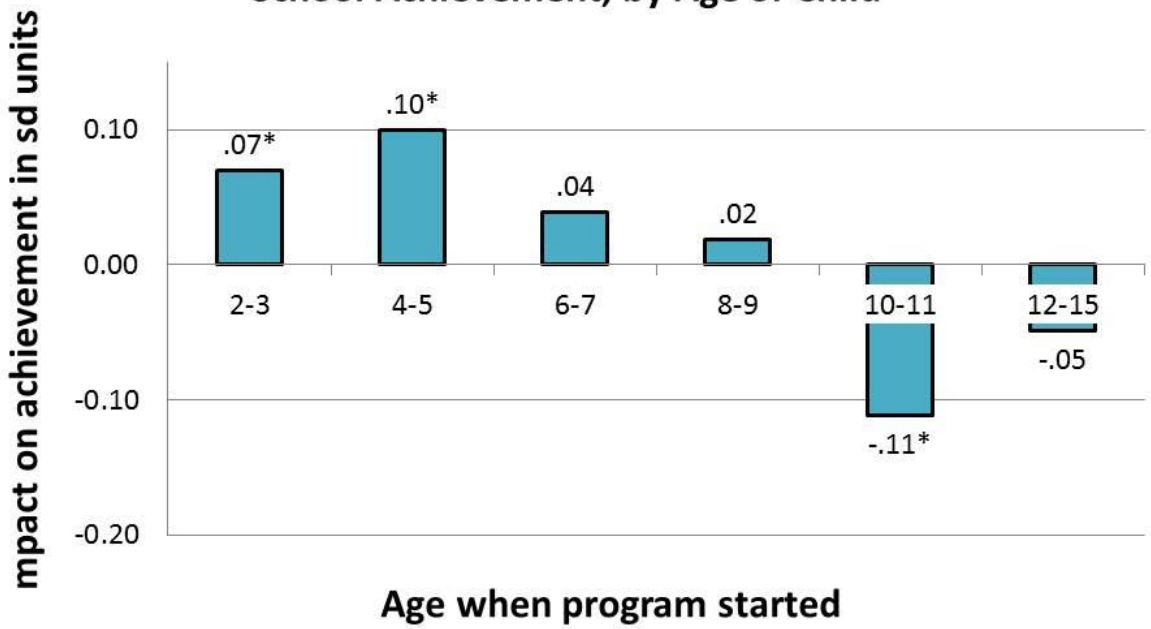
As to the causal impacts of income, the strongest evidence in the literature relates income increases to children's school achievement and attainment. The only large-scale randomized interventions to alter family income directly were the U.S. Negative Income Tax Experiments, which were conducted between 1968 and 1982 with the primary goal of identifying the influence of guaranteed income on parents' labor force participation. Three of the sites (Gary, Indiana, and rural areas in North Carolina and Iowa) measured impacts on achievement gains for children in elementary school; two of the three found significant impacts (Maynard and Murnane, 1979; Maynard, 1977). In contrast, no achievement differences were found for adolescents. Impacts on school enrollment and attainment for youth were more uniformly positive, with both the Gary and the New Jersey sites reporting increases in school enrollment, high school graduation rates, or years of completed schooling. Second- through eighth-grade teachers rated student "comportment" in the two rural sites; results showed income-inducted improvements in one of the sites but not the other.

Taken together, these studies appear to suggest that income is more important for the school achievement of pre-adolescents than adolescents but may also matter for the school attainment of adolescents. None of the results from the Negative Income Tax experiments bear on the "early is best" hypothesis, because none tracked the possible achievement impacts for children who had not yet entered school when the income "treatment" was being administered.

Experimental welfare reform evaluation studies undertaken during the 1990s incentivized parental employment by providing income supports to working-poor parents through wage supplements. Moreover, some measured the test scores of at least some children who had not yet entered school when the programs began. Morris et al. (2005) analyzed data from seven random-assignment welfare and antipoverty policies, all of which increased parental employment, while only some of them increased family income (Morris et al., 2005).

The combined impacts of higher income and more maternal work on children's school achievement varied markedly by the children's age (Figure 6). Treatment-group children between the ages of four and seven when the programs took effect, many of whom made the transition into elementary school during the programs, scored significantly higher on achievement tests than their control group counterparts. A sophisticated statistical analysis of the data on these younger children suggests that a $3,000 annual income boost is associated with a gain in achievement scores of about one-fifth of a standard deviation (Duncan et al., 2011). In contrast, there were no impacts on either teacher- or parent-reported behavior problems (Duncan et al., 2009).

Figure 6: Impacts of Earnings Supplement Programs on School Achievement, by Age of Child



Note: * p<.05; Source: Morris et al. (2005).

The achievement of children age eight to nine did not appear to be affected by the programs, and, if anything, the achievement of children who were 12 and older during the programs seemed to be hurt by the programs' efforts to increase family income and parental employment. Another study using these same data examined very young children and found positive impacts for some ages but not others (Hill and Morris, 2008).

Along the lines of the maternal stress study discussed above, another recent study took advantage of the increasing generosity of the U.S. EITC between 1993 and 1997 to compare children's test scores before and after it was expanded (Dahl and Lochner, 2012). Most of the children in this study were between the ages of 8 and 14 and none was younger than 5. The authors found improvements in low-income children's achievement in middle childhood that coincided with the EITC expansion.

A second study, conducted in Canada, took advantage of variations in the generosity of the National Child Benefit program across Canadian provinces to estimate income impacts on child achievement (Milligan and Stabile, 2009). Among children age 6 to 10 residing in low-income families, policy-related income increases had a positive and significant association with math scores and a negative link with the likelihood of a child receiving a diagnosis of a learning disability. For 4- to 6-year-olds, the income increases were associated with higher scores on a test of receptive vocabulary for boys, but not for girls. Turning to behavior, higher benefits led to less aggression among 4- to 10-year-olds, but did not appear to affect other behavioral dimensions assessed in the study.

Several lessons emerge from these experimental and quasi-experiment studies. First, achievement gains are selective and depend at least in part on the children's age when income gains were received. Children in their preschool years or making the transition to school and elementary school students generally enjoyed the most consistent achievement increases. For adolescents, the achievement changes were mixed, with various studies finding positive, null, and even negative impacts. Second, in the case of adolescents, income appears to affect educational attainments such as high school graduation and completed years of schooling rather than test scores. Given the high costs of post-secondary education, the effect of family income on completed schooling is not surprising. Third, we know far more about how poverty reduction affects achievement and schooling outcomes than we do about its effects on behavior problems including childbearing and criminal activity.

Virtually none of the experimental literature on income effects has been able to estimate the impacts of changes in family income during the very earliest years of a child's life – the time when children are developing rapidly and may be very sensitive to family and home conditions. Nor have these studies been able to examine the consequences of income changes during childhood for outcomes measured in adulthood. This is particularly unfortunate, since the goals of policies directed at children are often couched in terms of lifetime impacts – a middle-class standard of living or higher labor market earnings.

Two recent nonexperimental studies have linked early childhood income to adult outcomes (Duncan et al., 2011; Ziol-Giuest et al., 2012). Both use data from the Panel Study of Income Dynamics (PSID) on children born in the early years of the study, for whom adult outcomes were collected when these children were in their 30s. The PSID measures income in every year of a child's life from the prenatal period through age 15, making it possible to measure poverty experiences and family income early in life (prenatal through the fifth year of life in one study, prenatal through the first year in the other) as well as later in childhood and in adolescence. The study found that for families with average early childhood incomes below $25,000, an annual boost to family income during this time (birth to age 5) is associated with increased adult work hours and a rise in earnings, as well as with reductions in receipt of food stamps (but not AFDC/TANF for females). Family income in other childhood stages was never significantly related to the adult earnings and work hours outcomes. For the most part, behavior problems (arrests and incarcerations for males; nonmarital births for females) were not predicted by increments to low family income in any of the three childhood stages.

Reallocating Benefits by Age of Child

Given the high rates of poverty (including deep poverty) for very young children, the scope of child enrichment expenditures (particularly for child care) in the budgets of families

with preschoolers, and the research evidence pointing to consistent achievement gains for young children in response to poverty reduction, it makes sense to consider income transfer policies that provide more income to families with young children. In the case of work support programs like the Earned Income Tax Credit, this would mean extending more generous credits (or reallocating existing credits) to families with young children. In the case of refundable child tax credits, this would mean providing larger credits to families with young children.

Several European countries gear time-limited benefits to the age of children in their assistance programs. In Germany, a modest parental allowance is available to a mother working fewer than 20 hours per week until her child is 18 months old. France guarantees a modest minimum income to most of its citizens, including families with children of all ages. Supplementing this basic support is the Allocation de Parent Isolé (API) program for lone parents with children under age three. In effect, the API program acknowledges a special need for income support during this period, especially if a parent wishes to care for very young children and forgo income from employment. The state-funded child care system in France beginning at age three alleviates some of the child care problems associated with a parent's transition into the labor force.

Our specific proposal recognizes the importance of early childhood and the generally lower incomes of young families structuring child tax credit and EITC payments by specifying that payments to families with children under age 6 are twice as large as payments to families with older children. This could be done by supplementing existing programs with additional payments to families with children under the age of 6 or by reallocating existing funds in a way that established a 2-to-1 benefit ratio for families with younger vs. older children.

Acknowledgment

Portions of the chapter were drawn from a more general review of early childhood education programs (Duncan and Magnuson, 2013) and from a review chapter on socioeconomic status that the authors and Elizabeth Votriuba-Drzal wrote for the *Handbook of Child Psychology and Developmental Science* (Duncan, Magnuson, and Votruba-Drzal, forthcoming). We are grateful for support from the National Institute for Child Health and Human Development, through grant HD065704 to the University of California, Irvine (Greg Duncan, PI.) Other portions are drawn from the Duncan and Murnane book *Restoring Opportunity: The Crisis of Inequality and the Challenge for American Schools*, Cambridge, MA: Harvard Education Press and Russell Sage Foundation, 2013. We are grateful to the Russell Sage Foundation and the Spencer Foundation for supporting the production of that book.

Table 1: Annual Enrichment Expenditures (Equivalized), Families with Children, Consumer Expenditure Survey 1997-2006

	Total expenditures (equivalized)	Total enrichment expenditure	% of total expenditure	Books & magazines	Computer	Sport	Trips	Electronics	Non-college tuition & private bus	Child care	School supplies & books
Full sample	36065	2871	8	59	271	330	713	277	254	539	66
Quintile 1	13118	430	3	9	55	85	70	78	19	64	16
Quintile 2	21507	1134	5	26	139	179	214	163	68	201	32
Quintile 3	29372	2055	7	44	226	281	440	249	131	410	51
Quintile 4	40337	3527	9	78	361	407	845	348	246	753	78
Quintile 5	75994	7207	9	138	572	700	1998	546	806	1266	154
Preschool only	36201	3231	9	55	235	346	576	280	48	1438	25
School-age only	40026	3135	8	72	334	333	897	303	375	240	99

Source: Kaushal, Magnuson and Waldfogel (2011). Smaller expenditure categories have been omitted.

REFERENCES

Barker D., Eriksson J. Forsen T and Osmond C. (2002). Fetal origins of adult disease: Strength of effects and biological basis. *International Journal of Epidemiology*, 31, 1235-1239.

Barnett, W. Steven and Leonard N. Masse. 2007. Comparative cost-benefit analysis of the Abecedarian program and its policy implications. *Economics of Education Review 26* (1): 113-125.

Becker, G. S. (1991). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Brody. G. et al. (1994), "Financial Resources, Parent Psychological Functioning, Parent Co-caregiving, and Early Adolescent Competence in Rural Two-Parent African-American Families," *Child Development* 65 no. 2 (1994): 590 – 605;

Conger, R. and Elder, Jr. G. H. (1994), *Families in Troubled Times: Adapting to Change in Rural America* (New York: Aldine de Gruyter,).

Conger. R. et al. (2002), "Economic Pressure in African American Families: A Replication and Extension of the Family Stress Model," *Developmental Psychology* 38 no. 2: 179 – 193

Cunha, F. and Heckman, J. (2007). "The technology of skill formation," Working Paper 12840 (National Bureau of Economic Research)

Currie, Janet. 2001. Early Childhood Education Programs. *Journal of Economic Perspectives 15* (2): 213-238.

Dahl, G. and Lochner, L. (2012), "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit," *American Economic Review* 102: 1927-1956.

Danese, A., Pariante, C., Caspi, A., Taylor, A., & Poulton, R. (2007). Childhood maltreatment predicts adult inflammation in a life-course study. *Proceedings of the National Academy of Sciences, 104,* 1319-1324.

Deming, David. 2009. Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start. *American Economic Journal: Applied Economics, 1*(3): 111-34.

Duncan, G., Gennetian, L. and Morris, P. "Parental Pathways to Self-Sufficiency and the Well-Being of Younger Children," in *Making the Work-based Safety Net Work Better: Forward-looking Policies to Help Low-Income Families*, Carolyn Heinrich and John Karl Scholz (eds.) (New York: Russell Sage, 2009), 117-148.

Duncan, Greg, Jens Ludwig, and Katherine Magnuson. 2010. Child development. In *Targeting investments in children: Fighting poverty when resources are limited.*, eds. Phillip Levine, David Zimmerman. Chicago: University of Chicago Press.

Duncan, G. and Magnuson, K. (2011). The Nature and Impact of Early Achievement Skills, Attention and Behavior Problems. in Greg J. Duncan and Richard J. Murnane (eds.), *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, New York: Russell Sage, 2011, pp. 47-69.

Duncan, G., Morris, P. and Rodrigues, C. (2011), "Does money matter? Estimating impacts of family income on young children's achievement with data from random-assignment experiments," *Developmental Psychology* 47, no. 5 (2011): 1263–1279.

Duncan, G. and Magnuson, K. (2013) Investing in Early Childhood Education Programs, *Journal of Economic Perspectives*,

Duncan. G. and Murnane, R. (2014) *Restoring Opportunity: The Crisis and Inequality and the Challenge for American Education*, Cambridge, MA: Harvard Education Press.

Duncan, G., Ziol-Guest, K. and Kalil, A. (2010), "Early-Childhood Poverty and Adult Attainment, Behavior, and Health," *Child Development* 81: 306-325;

Evans, W. and Garthwaite, C. (2010) "Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health," Working Paper 16296 (National Bureau of Economic Research, Cambridge, MA).

Elder, G. H. (1974) *Children of the Great Depression*. Chicago: University of Chicago Press.

Elder, G. H., Nguyen, T. and Caspi, A. (1985). "Linking Family Hardship to Children's Lives," *Child Development* 56, no. 2: 361–375.

Furstenberg, F. (2011) The Challenges of Finding Causal Links between Family Educational Practices and Schooling Outcomes, in Greg J. Duncan and Richard J. Murnane (eds.), *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, New York: Russell Sage, 2011, pp.

Godfrey, K. M., & Barker, D. J. P. (2000). Fetal nutrition and adult disease. *American Journal of Clinical Nutrition*, 71, 1344S-1352S

Gormley, W., Gayer, T., Phillips, D.A., & Dawson, B. (2005). The Effects of Universal Pre-K on Cognitive Development," *Developmental Psychology, 41,* 872-84.

Gormley, W., Gayer, T., & Phillips, D.A. (2008). Preschool Programs Can Boost School Readiness. Science, 320, 1723-24.

Heckman, James J., Seong Hyeok Moon, Rodrigo Pinto, Peter Savelyev, Adam Yavitz. 2010. A New Cost-Benefit And Rate Of Return Analysis For The Perry Preschool Program: A Summary, NBER Working Paper 16180.

Hill, H. and Morris, P. (2008) "Welfare policies and very young children: Experimental data on stage-environment fit," *Developmental Psychology* 44, no. 6: 1557.

Kaushal, N., Magnuson, K., & Waldfogel, J. (2011) How is Family Income Related to Investments in Children's Learning? In G. J. Duncan & R. J. Murnane (Eds.), *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*(pp. 187-206). New York, NY: Russell Sage Foundation.

Kessler, R. and Cleary, P. (1980) "Social Class and Psychological Distress," *American Sociological Review* 45, no. 3: 463–478

Ludwig, Jens, and Miller, D. 2007. Does Head Start Improve Children's Life Chances: Evidence from a Regression Discontinuity Design. *Quarterly Journal of Economics, 122* (1): 159-208.

Ludwig, Jens, and Deborah Phillips. 2007. The Benefits and Costs of Head Start. *Social Policy*

Report, *21* (3): 3-20.

Maynard, R. and Murnane, R. (1979) "Effects of a Negative Income-Tax on School Performance - Results of an Experiment," *Journal of Human Resources* 14, no. 4: 463-476;

Maynard, R. (1977) "The effects of the Rural Income Maintenance Experiment on the school performance of children," *The American Economic Review* 67 no. 1: 370-375

McLeod, J. and Kessler, R. (1990) "Socioeconomic Status Differences in Vulnerability to Undesirable Life Events," *Journal of Health and Social Behavior* 31, no. 2: 162–172

McLoyd, V. (1990) "The Impact of Economic Hardship on Black Families and Children: Psychological Distress, Parenting, and Socioemotional Development," *Child Development* 61, no. 2: 311 - 346.

Milligan, K. and Stabile, M. (2009) "Child Benefits, Maternal Employment, and Children's Health: Evidence from Canadian Child Benefit Expansions," *The American Economic Review* 99, no. 2: 128-132;

Morris, P., Duncan, G. and Clark-Kauffman, E. (2005) "Child Well-Being in an Era of Welfare Reform: The Sensitivity of Transitions in Development to Policy Change," *Developmental Psychology* 41, no. 6: 919-932.

National Institute of Child Health and Human Development Early Childcare Research Network, and Greg J. Duncan. 2003. Modeling The Impacts of Child Care Quality on Children's Preschool Cognitive Development. *Child Development, 74* (5): 1454-1475.

Poulton, R. & Caspi, A. (2005). Commentary: How does socioeconomic disadvantage during childhood damage health in adulthood? Testing psychosocial pathways. *International Journal of Epidemiology, 34*, 344-345.

Sapolsky, R. (2004). Mothering style and methylation. *Nature Neuroscience, 7*, 791-792.

Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool study through age 40.* (Monographs of the High/Scope Educational Research Foundation, 14). Ypsilanti, MI: High/Scope Press.

Shonkoff, J. P., & Phillips, D. (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development.* Washington, DC: National Academy Press.

Smolensky, E. and Gootman, J. eds. (2003) *Working Families and Growing Kids: Caring for Children and Adolescents* (Washington, DC: National Academies Press).

Spears, D. (2011) "Economic Decision-Making in Poverty Depletes Behavioral Control," *B E Journal of Economic Analysis & Policy* 11 no. 1.

U.S. Department of Health and Human Services, Administration for Children and Families. (May 2005). *Head Start impact study: First year findings*. Washington, DC.

U.S. Department of Health and Human Services, Administration for Children and Families (January 2010). *Head Start impact study: Final report.* Washington, DC.

Weiland, Christina & Yoshikawa, Hirokazu (2012). *The impacts of an urban public prekindergarten program on children's mathematics, language, literacy, executive function, and emotional skills: Evidence from Boston.* Harvard Graduate School of Education.

Votruba-Drzal, E. (2006) "Economic Disparities in Middle Childhood: Does Income Matter?" *Developmental Psychology* 42 no. 6: 1154–1167.

Wong, Vivian, Cook, C., Barnett, S., & Jung, K. (2008). An Effectiveness-Based Evaluation Of Five State Pre-Kindergarten Programs. Journal of Policy Analysis & Management, 27, 122-154.

Ziol-Guest, K. M., Duncan, G. J., Kalil, A., & Boyce, W. T. (2012). Early childhood poverty, immune-mediated disease processes, and adult productivity. *Proceedings of the National*

[1] These data are drawn from a meta-analytic data base of studies published between1960 and 2007 and compiled by the National Forum on Early Childhood Programs and Policies. This is described at http://developingchild.harvard.edu/activities/forum/ Programs selected for our analysis had both treatment and control/comparison groups, included at least 10 participants in each condition, incurred less than 50% attrition and measured children's cognitive development close to end of their "treatment" programs. Studies had to have used random assignment or one of the following quasi-experimental designs: change models, fixed effects modes, regression discontinuity, difference in difference, propensity score matching, interrupted time series, instrumental variables and some other types of matching. Studies that used quasi-experimental designs must have had pre- and post-test information on the outcome or established baseline equivalence of groups on demographic characteristics determined by a joint-test. When a program evaluation reported more than one end-of-treatment impact on cognitive ability or achievement measures, we calculated a weighted average impact and pooled standard error, using the inverse of the squared sampling error as the weight. Cross-program averages reported in this article are also weighted by the inverse of the squared sampling error. Since results proved somewhat sensitive to large weight values, we truncated weight values from above at 100.

[2] The data in this paragraph are based on authors' calculation of the October Current Population Survey data.

[3] Because they failed to track families who declined to take up ECE program services, the vast majority of ECE evaluations provide only estimates of impacts on treated children.

[4] To take account of differences in family size and composition, Kurshal et al. (2011) adjust expenditures using an equivalence scale, which assigns a weight of 0.67 to the first adult, 0.33 to all other persons in the household over 17, and 0.2 to children 17 or under.