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Evaluation of Early Head Start: Income, Education, and Cognitive Development of Children Prior to Age Three

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Abstract

The present evaluation of Early Head Start concerns the effects of household income and mother's education on child cognitive development. A secondary data analysis is performed on the Early Head Start Research and Evaluation study public use file, in which cognitive development is measured using the Bayley Mental Development Index and the Peabody Picture Vocabulary Test. Household income is measured as a percentage of the federal poverty level, with households earning up to 100 percent of the poverty level annually considered low income. Mother's education is determined by possession of a high school diploma. Results of multiple and simultaneous linear regressions are presented. Early Head Start is found to positively affect cognitive development among children whose mothers have earned a high school diploma, while its effectiveness for low income households is less significant. Implications for early childhood interventions are discussed, as well as areas for future research.

Introduction

When we speak of early child development we speak broadly of both cognitive and social/behavioral development in the first three years of life. We are concerned presently with cognitive development, which is characterized primarily by the development of language and pattern recognition (Whitehurst & Lonigan, 1998). The extent to which these cognitive abilities are expressed at an early age has implications for cognitive development throughout elementary school and beyond. Children with more advanced cognitive functioning relative to their peers prior to elementary school go on to perform better in school (Blachman, 1984; Blatchford & Plewis, 1990).

Importantly, research suggests cognitive development is not achieved at the same rate or to the same extent equally among all children. Numerous studies (Duncan et al, 1994; Entwisle & Alexander, 1995; Korenman et al, 1995; Blau, 1999; Fazio et al, 1996; To et al, 2004; Phipps & Lethbridge 2006) have indicated that household income, or the income

earned by the child's primary caretaker, is one of, if not the most significant determinant in a child's cognitive development. Children in poverty or low income households exhibit poorer cognitive functioning prior to and during the first few years of elementary school, as compared to children from higher income households (Blatchford & Plewis, 1990; Entwisle & Alexander, 1995; Fazio et al, 1996; Brooks-Gunn & Duncan, 1997; To et al, 2004). A similar correlation exists between parents' education and cognitive development in children (Sharp et al, 1979; Evans et al 2000; Bacharach & Baumeister, 1998). This, again, has implications for later achievement in school. Consequently, the purpose of our evaluation is to consider both the effect of Early Head Start (EHS) participation on cognitive development among children from low income households, and also the effect of EHS participation on cognitive development with respect to mother's education.

Background

Interventions to improve cognitive functioning in children younger than three years of age such as EHS are necessarily two-generational. That is, the interventions involve both the mother and child. EHS developers observed that the program effect was weak among existing interventions that served families and very young children, but the program models themselves varied considerably in terms of the following: 1) the duration and intensity of services; 2) the timing of services; 3) their status as home- or center-based (or both); 4) the duration and intensity of the parenting component; 5) the extent of reliance on case management; and 6) the nature of self-sufficiency components (i.e. adult education and job training) (U.S. Department of Health and Human Services, 2001).

EHS was created in 1995. The intervention model involves intensive services that begin before the child is born through the first three years of the child's life. Services include child development and parenting services--during home visits or in program centers; case management; group parenting activities; child care and center-based developmental services; health services including immunization and dentistry for children and mental health services for parents; and employment services (U.S. Department of Health and Human Services, 2001).

Because EHS services, like traditional Head Start, are only available to households that meet its income guidelines, participants are over-representative of low income households. As it concerns cognitive

development, the sample demographics are advantageous to pinpointing the effectiveness of EHS because, as mentioned, children from low income households show lower measurements of cognitive development than do children from households with higher incomes.

Furthermore, to the extent EHS improves cognitive development among children from low income, low educated households it represents an effective poverty-fighting program. With this in mind, our present evaluation is interested in answering the following questions: 1) What is the effect of EHS participation on the cognitive development of children from low income households? 2) What is the effect of EHS participation on cognitive development with respect to mother's education?

The Administration of Children, Youth, and Families (ACYF) of the U.S. Department of Health and Human Services (HHS) conducted its own evaluation of EHS, the Early Head Start Research and Evaluation (EHSRE) study. This evaluation was much broader in scope than is ours; we utilize a secondary data analysis of the EHSRE data set to answer our research questions, and focus attention more specifically on income and education. We hypothesize that EHS participation will significantly affect cognitive development among children in low income and/or low educated households.

Methodology

The EHSRE evaluation method was as follows. An experimental design was used to measure the effectiveness of EHS. Beginning in 1995, seventeen sites were selected across the United States, and 2,997 participants¹ were recruited then randomly assigned either to receive EHS services (1,503 participants) or to a comparison group (1,474 participants) that did not receive EHS services. This controlled for the variables of greatest concern to our research interests, namely household income and mother's education. Indeed, 2,451 participants were within 100 percent of the federal poverty level, which in 1995 was \$15,569 per year for a household of four (U.S. Census, 2010). Of these, 1,248 were in the treatment group while 1,203 were in the comparison group. Similarly, of the 1,023 participants who had received their high school diploma 534 were in the treatment group and 489 were in the comparison group. The evaluation itself occurred from 1996 to 2001.

¹ Participants in the EHS group and the comparison group were mothers.

Because participants were recruited when they were prenatal, the baseline measurement of cognitive development was taken at fourteen months after birth. In the EHSRE study cognitive development was measured using the Bayley Mental Development Index (MDI; Bayley, 1993) at fourteen, twenty-four, and thirty-six month intervals after birth. The Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997) was also used at thirty-six months.

In terms of design, the EHSRE study was as follows:

R	X	O ₁	X	O ₂	X	O ₃
R		O ₁		O ₂		O ₃

The value of the Bayley MDI and PPVT for our purposes is that they are normative on age-adjusted scales, and were administered by the EHSRE evaluation team on the children themselves. As measures of cognitive development, the instruments have been evaluated for their validity and reliability and have been found to be comparable to similar measures (Campbell et al, 2001; Miller & Lee, 1993; Costello & Ali, 1971; Harris et al, 2005). The PPVT measures listening comprehension of spoken words in standard English for children and adults from age 2 1/2 and over. During the assessment the child is presented with four pictures and asked to point to the picture that matches the word spoken by the interviewer. As mentioned, the Bayley MDI is normed so that a value of 100 represents the age-adjusted mean, with a standard deviation of 15. An adjusted mean value below 85 thus indicates delayed performance. The same scoring is used for the PPVT.

We employ a multiple linear regression to measure the significance of EHS participation among children from low income households. Accordingly, the Bayley MDI and PPVT serve as dependent variables, while the effect of baseline knowledge (in the case of the MDI) and EHS participation are held constant. Household income as an independent variable is included up to 100 percent of the federal poverty level. The same method is used to measure the effect of EHS participation among children from low educated households, with possession of a high school diploma serving as the independent variable.

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 X_{1i} + \epsilon_i$$

Because income and education are often correlated (Burchinal et al, 1997; Bradley & Corwyn, 2002; Bacharach & Burmeister, 1998), we also employ a simultaneous linear regression, in which income and education

are held constant along with baseline knowledge and program participation.

Results

To begin with, the overall program effect on cognitive development at thirty-six months was not significant (see Table 1), absent either household income or mother’s education. This holds true when we perform the regression holding household income constant. We see in Table 1 that the program effect at thirty-six months was not significant ($p<0.05$) for children of low income households. The significance seen at baseline and at twenty-four months does not carry over. In this respect it is helpful there are two measures of cognitive development to draw from; Table 2 suggests the effect of EHS participation was significant ($p<0.05$) on cognitive development at thirty-six months on the PPVT. If one were to use the results from Table 2 alone he might conclude the program effect was more significant than it really is.

Table 1: Results of linear regressions for the following variables on the Bayley MDI, holding program assignment and baseline knowledge constant

	Baseline (14 Months)		24 Months		36 Months	
	Coefficient	<i>p</i>	Coefficient	<i>p</i>	Coefficient	<i>P</i>
Program	0.159	0.757	1.49	0.025*	1.21	0.07
Poverty	0.555	0.046*	0.99	0.006**	0.35	0.325
HS	1.400	0.014*	4.33	0.000***	4.08	0.000***
Diploma						

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 2: Results of linear regressions for the following variables on the PPVT at 36 months, holding program assignment constant

	Coefficient	<i>p</i>
Program	1.26	0.12
Poverty	1.03	0.02*
HS Diploma	4.68	0.000***

* $p<0.05$; *** $p<0.001$

The same cannot be said for education. Table 1 shows the program effect on cognitive development remains very significant ($p<0.001$) from baseline to thirty-six months among children whose mothers have earned a high school diploma, an effect which is seen as well in Table 2. That is to

say, children from within the program group whose mothers had earned a high school diploma scored 4.08 points higher on the Bayley MDI than similar children in the comparison group and 4.68 points higher on the PPVT, respectively.

In terms of correlation between income and education, there remains an observable program effect. Even while controlling for income, we can see a very significant ($p < 0.001$) program effect in Table 3 and in Table 4 among children whose mothers have earned a high school diploma. Again, this means that within the program group children whose mothers had earned a high school diploma yet remained low income scored 3.30 points higher on the Bayley MDI and 4.78 points higher on the PPVT than similar children in the comparison group. The program effect on household income is less significant when controlling for education.

Table 3: Results of a simultaneous linear regression for the following variables on the Bayley MDI, holding program assignment and baseline knowledge constant

	Baseline (14 Months)		24 Months		36 Months	
	Coefficient	<i>p</i>	Coefficient	<i>p</i>	Coefficient	<i>p</i>
Program	0.22	0.73	1.45	0.068	0.41	0.59
Poverty	0.66	0.03*	1.19	0.002**	0.29	0.43
HS Diploma	1.49	0.02*	3.49	0.000***	3.30	0.000***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 4: Results of a simultaneous linear regression for the following variables on the PPVT at 36 months, holding program assignment constant

	Coefficient	<i>p</i>
Program	0.53	0.59
Poverty	0.58	0.22
HS Diploma	4.78	0.000***

*** $p < 0.001$

Discussion

Since low income children are particularly vulnerable to delays in cognitive development (Blatchford & Plewis, 1990; Entwisle & Alexander, 1995; Fazio et al, 1996; Brooks-Gunn & Duncan, 1997; To et al, 2004), it is very important that early intervention programs attend to the specific challenges of serving low income households in their program models. What our results suggest is that Early Head Start is an effective intervention

for improving cognitive development among low income children. It is even more effective when the child's mother has earned a high school diploma. This is not altogether surprising, and it leaves us unable to answer one of our research questions, which concerns whether the program is effective for children whose mothers have not earned a diploma.

In any case, our results confirm the importance of education on child cognitive development found elsewhere (Duncan et al, 1994; Entwisle & Alexander, 1995; Korenman et al, 1995; Blau, 1999; Fazio et al, 1996; To et al, 2004; Phipps & Lethbridge 2006; Evans et al 2000; Sharp et al, 2005; Bacharach & Baumeister, 1998). Further evaluation of Early Head Start should consider the ways in which education operates to improve cognitive development in early childhood. Such evaluations might also consider which program interventions are most effective in terms of cognitive development: home-based, center-based, or a combination of the two.

There are limitations to our results that should be taken into consideration. First, there is a significant amount of missing information from the EHSRE data set. Of the 2,977 participants, 898 did not indicate whether or not they had earned their high school diploma. Furthermore, 1,197 results were missing on the twenty-four-month measure of the MDI; 1,319 from the thirty-six-month measure; and 1,553 from the PPVT. Information from these participants could significantly change the results of our analysis. Finally, because the intervention began while some participants were prenatal the baseline measure of cognitive development may not represent a true baseline.

Conclusion

Early Head Start has a very positive effect on cognitive development among children whose mothers have earned a high school diploma. The effect on children from low income households is less significant. To the extent possible, interventions like EHS should consider opportunities for participants to further their education.

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