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The Role of Early Head Start in School Readiness

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THE ROLE OF EARLY HEAD START IN SCHOOL READINESS

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in
Economics

By
Meron Ayalew Habtu
August 2012

Accepted by:
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Dr Howard Bodenhorn
Dr Robert Tamura

ABSTRACT

This thesis considers the relationship between participation in Early Head Start programs and school readiness for children from low-income families. The work uses longitudinal data from the Early Childhood Research and Evaluation (EHSRE) project that followed 3001 families in 17 Early Head Start Centers from 1996-2010. In the project, data was collected about children's school readiness in three phases: 0-3 years, Pre-K and fifth grade.

In the sample data set, families were randomly assigned to either a treatment group of Early Head Start participants or a control group. Empirical analysis was conducted that compares the test scores of the treatment group with those of the control group for all three phases. The results indicate that children in the treatment group score higher on tests in the early phase of 0-3 years. As children enter Pre-K and fifth grade, the effects of Early Head Start fade out and the scores of the two groups do not show statistically significant differences. The services that showed the greatest impact for children's school readiness are center care and parents reading to children.

DEDICATION

I dedicate this to my parents, Shewaye Nurye and Ayalew Habtu.

ACKNOWLEDGMENTS

I would like to thank my advisor Dr. Tomas Cvrcek, for his guidance and encouragement. I would also like to thank my committee members, Dr. Bodenhorn and Dr. Tamura, for agreeing to serve on my committee and for providing useful comments on the work.

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CHAPTER I

INTRODUCTION

Investing in human capital is an important part of sound economic policy. A nation's economic strength is directly related to the skill set of its people and educational attainment is an important predictor of future labor force participation and earning. Society at large benefits from a highly productive and educated populace. Many of the policies through which governments seek to build human capital are targeted towards improving the education level of the public. Programs that are focused on early childhood education are a major feature of these policies.

Early childhood programs aim to improve preschoolers' cognitive and intellectual performance (Anderson, et al., 2003). Most of the research work done on the topic finds that there is a positive relationship between enrollment in these programs and school achievement. Anderson finds that "consistent improvement was found in the measures of intellectual ability such as standardized tests, and promotion into the next grade level". Policies that are geared toward developing skills early on show the most promise in closing the achievement gap. Heckman writes "early investments in learning are the most effective policies" when it comes to improving the skills of the public (Heckman, 2000).

One of the foremost early intervention programs for low income families is Head Start. Head Start was launched in 1965 as part of President Johnson's War on Poverty legislation. According to the Administration for Children and Families, Head Start "promotes school readiness by enhancing the social and cognitive development of

children through the provision of educational, health, nutritional, social and other services to enrolled children and families”. The government offers grants to private and public agencies in order to provide child development services to disadvantaged children and their families. The department of Health and Human Services estimates that the program has enrolled more than 25 million children since its launch. In 1995, Early Head Start was initiated to expand the program and include pregnant women and children from birth to three years old in the face of increasing evidence that the early years of a child’s life are important for later development (Currie 2000).

Head Start – and Early Head Start – are popular programs that attempt to help low income children and their families. However, the academic records of children in Head Start and Early Head Start show that the programs are lacking when it comes to preparing children for school. Despite the growing body of evidence that Head Start does not have long term benefits, the combined budget for the two programs reached almost \$8 billion in fiscal year 2012. Early Head Start is relatively new and while it has been deemed beneficial in the short term, its long term impact is still being studied.

The purpose of this thesis is to determine whether participation in Early Head Start improves the educational achievements of low income children in the US. Specifically, we will attempt to answer two questions: whether the particular services provided in Early Head Start, such as center care, home visits and parenting education, have a direct impact on children’s performance on standardized tests, and whether any academic gains last through elementary school. We will be using longitudinal data from the Early Head Start Research and Evaluation Project (EHSRE) conducted from 1996-

2010¹. The project followed families of infants and toddlers enrolled in Early Head Start (EHS) from birth of the child until they were ready to enter 5th grade. It sought to examine key family and child outcomes such as cognitive, socio emotional and physical development. Our focus will be on the role of EHS on cognitive development of children. The children and their parents in the EHS programs received care in centers and through home visits. The short term effects of EHS will be assessed using Bayley assessment scores administered when the children were 14, 24 and 36 months old. Children entering Pre-K were given the Peabody Picture Vocabulary Test (PPVT) and Woodcock-Johnson Applied Problems test. The final sets of tests are the PPVT and the ECLS-K math routing test administered prior to 5th grade entry.

The rest of thesis is organized in to four chapters. Chapter 2 will review the existing literature on the outcomes of Head Start and Early Head Start. In Chapter 3, we will discuss data and analysis methodology adopted for this thesis. Chapter 4 presents and discusses the results of the study from the perspectives of both short run and long run impacts of the programs. Finally, Chapter 5 summarizes the conclusions of the work and discusses other programs that have shown success when it comes to early childhood education.

¹ Administration for Children and Families, Office of Planning, Research and Evaluation

CHAPTER II

LITERATURE REVIEW

The aim of this chapter is to provide a review of what past and current research has found on the relationship between early intervention and school readiness for low income children. The major goal of early intervention is to help children be ‘successful’ adults. Success can take many forms such as succeeding in school, better earnings and welfare independence.

The focus of this thesis is looking at future academic success from early intervention programs. The first part of this review will, therefore, summarize what has been documented about the importance of early intervention for school readiness and future academic success. The second part of the review discusses what is known about Head Start and its contribution to the short term and long term cognitive abilities of its participants. The last section will discuss what has been found so far about Early Head Start.

2.1 Early Childhood Education and School Readiness

School readiness measures how equipped a child is to succeed in school, cognitively, socially and emotionally. Disadvantaged children and those from poor families often face a gap in school readiness when compared to their better off peers. There is a large body of evidence that supports the importance of early education programs in raising the academic performance of poor children (Ramey and Ramey, 2004). Children who had

performed poorly early in school are highly associated with dropping out, teen pregnancy and dependence on social welfare programs (Shonkoff and Phillips, 2000).

Participation in center-based care is associated with improved scores in reading and math (Fram et al 2011, Loeb et al 2005). Both studies used data from Early Childhood Longitudinal Study – Kindergarten cohort (ECLS-K) and analyzed test assessments and parent interviews to reach their conclusion. Loeb et al (2005) also found that children who start center care between the ages of two and three see greater gains than those who start centers earlier or later. Magnuson et al (2004) found that the effect of pre kindergarten and preschool on academic outcomes are slightly larger – and last longer – for disadvantaged children than the general public (Magnuson et al, 2004).

The amount of time children spent in center care is directly related to higher levels of cognitive performance demonstrated by a sample of low income (measured by free lunch eligibility) kindergarten children in the Southeastern US (Connell and Prinz 2002). Center based programs were found to enhance children’s development of language, problem solving skills and other social and emotional skills (Barnett and Belfield 2006). Further evidence is found in a 15 year follow up study of low income youth in Chicago born in 1980. Children who participated in early childhood programs had a higher rate of high school completion and more years of education (Reynolds et al, 2001).

In addition to center care, early intervention programs have components such as home visits and parental involvement. Parents are visited at home to be given education on raising their children and also encouraged to participate in the education of their children. Studies find when parents are active in their children’s learning (for example by reading

to them), their efforts are correlated with higher school readiness in children. Early care programs that fostered literacy skills in parents were also found to benefit children (Arnold and Doctoroff, 2003). Early intervention that was delivered in home visits was found to have somewhat ineffective results (Brooks-Gunn and Markman, 2005; Grolnick and Slowiaczek, 1994). This is because very few of these home visits are intensive enough to produce significant cognitive benefits for children (Barnett and Belfield 2006).

2.2 Outcomes of Head Start

Head Start is a comprehensive child development and school readiness program that serves pre-school children (ages 3-5). Head Start's primary goal is promoting the school readiness of low-income children by enhancing their cognitive, social and emotional development in a learning environment that supports children's growth in language, literacy, mathematics, science, social and other approaches to learning (Head Start Act, amended 2007). The program has been successful in achieving that goal in the short term. Comparisons of participants and non-participants of Head Start showed that Head Start children had higher language and literacy skills, and improved cognitive and social skills (Lee, 2010; Currie, 2000).

National evaluations of Head Start, like the Head Start Impact Study in 2005², were conducted across 84 nationally representative agencies. 5000 children were randomly assigned to a Head Start group or a control group and followed through their 1st grade year. The study found small to moderate positive impacts for 3 and 4 year olds that

² U.S. Department of Health and Human Services, Administration for Children and Families (May 2005). Head Start Impact Study: First Year Findings. Washington, DC

participated in Head Start on cognitive skills such as pre-reading, pre-writing and vocabulary. The same results were observed for a large sample (N=2803) of urban children in 18 cities. Head Start attendance was found to be closely associated with enhanced cognitive ability and social competence and reduced attention problems by age 5 (Zhai et al 2011).

Results for the long term effects of Head start are mixed. Barnett and Hustedt find substantial long term positive benefits on educational achievement, employment and social behavior (Barnett & Hustedt, 2005). Another study also supports this finding. Using data from the National Longitudinal Mother-Child supplement, outcomes for children who were enrolled in Head Start between 1984 and 1990 and their siblings who did not participate were evaluated (Deming 2009). The study concluded that there was an initial test score gain by ages 5-6 that fades out by ages 11-14. Using the same longitudinal data, Currie compared the cognitive gains made by Head Start children to the national norm and finds that initial gains in vocabulary and reading test scores faded out while the children were still in elementary school (Currie, 2001). Currie maintains that the gains of Head Start were only short term and there was no evidence of lasting benefits.

2.3 What Do We Know About Early Head Start So Far?

Early Head Start was established as an expansion of Head Start in 1994. Early Head Start primarily serves children from pre-natal to age 3, pregnant women and their families. Its goal is to increase the school readiness of infants and toddlers through a

variety of services aimed at helping children and their families. Early Head Start programs primarily have three options of providing service to participants: a home based option where families receive weekly home visits, a center based option and a combined option where families receive both home visits and center care.

Since Early Head Start is relatively new, studies are still being conducted on its success in preparing children for school. One study project that is being conducted to measure the impact of the program is the Early Head Start Research and Evaluation Study (EHSRE). It is a large scale, random assignment evaluation of Early Head Start that followed infants and their families from birth until elementary school.

Past research on this data set found short term benefits in infants cognitive and social development at age 3 (Bradley et al, 2009; Fenichel and Mann, 2001). The same study also established that ‘mixed’ approaches (center and home based care) may have increased advantages for children and their families and engagement in home visits through Early Head Start resulted in better parenting.

Missing from the research are Early Head Start’s long term benefits and the ability of its programs to help maintain the cognitive success of their participants through elementary school. This thesis contributes to the field by following the same group of children through fifth grade and documenting their academic progress via assessment scores.

CHAPTER III

RESEARCH DESIGN AND DATA SELECTION

3.1 Data Overview

The data used in this paper comes from the Early Head Start Research and Evaluation Study (EHSRE), designed to provide a comprehensive evaluation of the role Early Head Start programs play in the lives of low income children and families. The study followed 3001 families enrolled in 17 Early Head Start (EHS) programs from 1996 – 2010. The EHS programs evaluated in this study were sites that were able to recruit twice as many families as they could serve and also could provide a national geographic distribution that represented the diverse characteristics of EHS families in the nation³.

Only low income families with children up to 12 months old at the time of enrollment were qualified for evaluation. Pregnant women were enrolled at some locations and about one fourth of the families signed up while pregnant with the focus child. After initial selection and into the EHS program in their region, families were randomly assigned into a research group (1513) or a control group (1488). Families in the control group were not allowed to receive EHS services until the focus child reached the age of three. They were, however, eligible to participate in other community services. Thus, the only difference between the two groups was that the research group was offered EHS services and the

³ Russellville, Arkansas; Venice, California; Denver, Colorado (two programs); Marshalltown, Iowa; Kansas City, Kansas; Jackson, Michigan; New York City; Kansas City, Missouri; Pittsburgh, Pennsylvania; Sumter, South Carolina; McKenzie, Tennessee; Logan, Utah; Alexandria, Virginia; Kent, Washington; Sunnyside, Washington; and Brattleboro, Vermont.

control group was not. The EHS services received include home visits, childcare, case management, parenting education and health care.

3.2 Sample Characteristics

The primary goal of this thesis is assessing the impact of EHS services on children's school readiness. Specifically, we are interested in analyzing whether receiving home visits, case management or care in early head start centers will enhance children's cognitive skills. To this end, we will compare various assessment scores of children that started receiving EHS early with those that only enrolled in child care programs after age 3. The data to be analyzed was collected at three different stages of the child's life – birth to three months, Pre-K (from age 3 until scheduled kindergarten entry) and at 5th grade entry.

Descriptive statistics for the sample at the beginning of the study is provided next (Table 1). There were three types of early intervention given to the applicants: center based, at home case management or a combination of the two. The majority of applicants received home visits (46%), and 34% of participants received a combination of home visits and center care, the remaining participants attended early head start through a center-based approach. The racial makeup of the sample is proportionally distributed among White and Black. About 36% of the participants were white, 34% African American and 23% Hispanic.

Around 40% of the applicants were teen moms and in only 38% of the households was there an adult male. The average age in months for the children enrolled for

observation was five months. Other variables included measures of level of poverty and education attainment of the applicants. Only 28% of the applicants had completed high school. The majority (46%) had completed less than 12 years of schooling. At baseline half of the participants were receiving some form of welfare and only 11% of the sample had income right at the poverty line or higher.

3.3 Data Collection Phases

The first stage of data collection is the birth to three (0-3) phase. The data collected was a mix of child assessments and parent interviews. Direct child assessments were conducted when the children were 14, 24 and 36 months old. The assessments were the Bayley Scales of Infant Development (BSID-II) at 14 and 24 months and Peabody Picture Vocabulary Test (PPVT) at 36 months.⁴ The assessments given to the children here and in the next two data collection phases are described in detail in section 3.4 below.

In the second phase of the focus child's life (Pre-K), data were collected as the child prepared for kindergarten entry i.e. at age five or six (depending on state requirements). Tracking interviews were ongoing during the three year interval (36 month data collection and Pre-K) to maintain contact with the families and collect information on type of child care and continued participation in some form of Head Start program.⁵ The focus of this round was parent and family functioning, children's readiness for kindergarten, parent-child interactions and observations from early care providers. For

⁴ EHSRE Study user guide: Birth to three

⁵ EHSRE Study user guide: Pre-K

the purposes of this thesis, we shall focus on evaluating children's school readiness. The tests given to the children cover pre literacy skills such as recognizing letters and words, emerging numeracy and vocabulary risks. The measures used to assess these skills are the Peabody Picture Vocabulary Test (PPVT) and the Woodcock-Johnson Applied Problems (WJAP) test.

The third and final phase of data collection occurred in the spring of 5th grade. Similar to the previous two phases of study, children were given standardized tests to measure their language, literacy and math skills. The tests were the PPVT, the ECLS-K⁶ fifth grade reading and the ECLS-K math routing test. We will be using data from this phase (as well as Pre-K) to measure the long term effects of EHS in terms of preparing children for academic success.

3.4 Child Assessments

In this section, the assessments used to measure outcomes in this study will be discussed in detail. The Bayley Scales of Infant Development (BSID) is a standardized assessment technique commonly used to determine the cognitive level of children. The BSID was first developed by Psychologist Nancy Bayley in 1969 with revisions in 1993 (BSID-II) and 2005 (BSID-III). The BSID consist of three scales: the Mental Scale, Motor Scale and Behavior rating scale (Bayley 1993). The Mental and Motor scales assess the child's current level of cognitive, language, personal-social, and motor development. The Behavior scale assesses the child's behavior when the test is being

⁶ Early Childhood Longitudinal Study-Kindergarten class of 1998-99

administered. The measure we are concerned with in this thesis is the Mental Development Index (MDI) of the BSID II which is derived from the mental scale.

The mental scale of the BSID-II is composed of 178 items of increasing difficulty (Gauthier 1999). The items measure performance in the areas of sensory perception, knowledge, memory, problem solving and early language. In the BSID-II suggested starting points are provided for infants of different ages. From these starting points, there are “basal” and “ceiling” rules that the child must pass. An infant attains a basal provided he or she successfully passes at least five items within the item he or she is being tested in. A ceiling is attained when he or she fails a minimum of three items within the same item. The infant’s MDI score is based on the raw score obtained on the set in which both basal and ceiling criteria are met (Gauthier 1999, Glenn 2001). A normal MDI has a mean of 100 and a standard deviation of 15.

Here, we note that the BSID has not been without criticism. Some have issues with the use of standardized procedures used in the test. Vance points out that these procedures are foreign to most children including interaction with unfamiliar test giver and a question and answer format with which the child may have minimal experience (Vance 1999). In addition, the tests may be biased against children with disabilities as they require language and motor skills that these children may not have at the time the tests are given. Despite the criticism, the BSID remains one of the most used tools of assessing child development.

The second assessment given to the children in this data set is the Peabody Picture Vocabulary Test (PPVT-III). The test is used to measure receptive vocabulary and verbal

ability. The examiner orally presents a stimulus word with a set of pictures and the test taker is asked to select the picture that best represents the word's meaning. The examiner administers the item sets until the child's basal and ceiling sets are found (usually takes five item sets). The basal set is the item set in which the child makes one or no errors and the ceiling set is the item set in which the child makes eight or more errors. The established standard PPVT score has a mean of 100 and SD of 11 (Washington 1999). The PPVT was administered to the children at all three phases of the study and will be instrumental in comparing children's vocabulary level at different ages.

Another assessment given to the children in this sample is the Woodcock-Johnson Applied Problems test. A component of the Woodcock-Johnson Psycho-educational battery, this test is designed to measure children's skill in analyzing and solving practical problems in mathematics. Children must recognize the procedure to be followed and then solve simple counting, addition or subtraction problems. Many of the problems include unrelated information and the child must also decide which data to include while solving the problems he/she are presented with. Children in this sample were given this test at the Pre-K stage of the study.

The final assessment we look at is the ECLS-K tests administered in fifth grade. The ECLS-K was designed to evaluate the relationship between a child's academic and social development and a wide range of family, school, and community variables (Pollack et al 2005). The fifth grade assessments consist of direct and indirect cognitive measures and socio emotional evaluations. The direct cognitive measures are based on children's test scores in math, reading and science. Teachers' ratings of children's social skills and

approaches to learning make up the indirect assessment. The direct assessments we will be looking for this thesis are the children’s math (ECLS-K) and language (PPVT) scores. The PPVT assesses children’s knowledge of the meaning of words by asking them to say or indicate which of four pictures best shows the meaning of a word said aloud by the test administrator⁷. For the math assessment, children are read all questions and responses and also complete math workbooks. The assessment included questions in the following areas: number sense, properties, geometry and spatial sense, statistics, algebra, and probability among others. Summary statistics of the test scores given to the sample are provided in Table 1 below.

Table 1: Summary Statistics of Standardized Tests Given to Study Participants

Description	Phase	Obs	Mean	Std. Dev.	Min	Max
14m Bayley MDI score	0-3 months	1881	98.3	11.1	49	130
24m Bayley MDI score		1780	89.1	13.7	49	134
36m Bayley MDI score		1658	90.6	12.6	49	134
36m PPVT standard score		1424	83.0	15.6	40	125
PPVT-III standard score	Pre-K	1674	91.5	15.2	40	152
WJ Applied problems standard score		1755	88.3	20.1	0	136
C5-PPVT standard score	5th grade	1544	94.0	15.7	40	138
ECLS-K math routing score		1552	8.4	4.7	0	18

⁷ EHSRE Used Guide :5th grade

3.5 Empirical Methodology

3.5.1 Early Phase: 0-3

The first model we estimate determines the effects of early intervention services on the Bayley MDI score and the Peabody Picture Vocabulary Test (PPVT) during the first 36 months of the child's life. This is done via a simple OLS regression, which can be written as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where, Y stands for the Bayley MDI score for the participant at 14, 24 and 36 months. The independent variables represent the type of intervention the focus child (FC) and parent received i.e. center care, home visits, parenting education, parents reading daily to children and an interaction variable that combine center care and parent reading daily. We are interested in our finding whether any of these EHS services results in higher Bayley scores for children. In addition, I expect children whose parents received education services on parenting to score higher on the BSID compared to the control group. The longer the FC participates in early head start, and given the same risk factors (low income and education, no father in household and so on), one can expect the children in EHS to perform better than control group children that did not participate.

The variables we controlled in this estimate for the three Bayley assessments (at 14, 24 and 36 months) and the PPVT will essentially remain the same throughout the three periods. After the first estimation, we were interested in seeing whether the type of care received made a difference in the Bayley assessment scores. Therefore, we estimated

two different regressions: one showing the effect of child development services in home visits and the second measuring the benefits of center-based care.

Next, we looked into whether direct parental involvement in the focus child's learning combined with the early head start services increases the Bayley assessment scores. The variables we chose to measure this effect are whether the parent received education on parenting and whether the parent read to the child daily. Last, we created a variable that measured participation in center-based care in addition to parents reading to the FC and compared the result with the other independent variables.

The control variables aim to reduce the correlation of exogenous factors with outcomes of the assessments. As stated above, I controlled for the family characteristics and risks faced by the children at the same levels. I controlled for mother's age at the time of birth of the FC, poverty level of the family, the presence of an adult male in the household, whether the mother/applicant participated in previous head start programs, risks (environmental or medical) faced by the focus child and education level of the mother. Description and summary statistics of explanatory and control variables are provided in Table 2 below.

Table 2: Summary Statistics for Phase 0-3

Description	Obs	Mean	Std. Dev.	Min	Max
Control variables					
Program or control group	672	0.54	0.49	0	1
Adult male in household	671	0.37	0.48	0	1
Previously in a headstart or child dev. Prgm	645	0.13	0.34	0	1
Child has established risks	643	0.12	0.33	0	1
Birth mother was<20 when FC was born	669	0.41	0.49	0	1
Highest grade completed <12	672	0.38	0.49	0	1
Highest grade completed =12	672	0.31	0.46	0	1
Income is 100% of poverty or higher	672	0.12	0.33	0	1
Explanatory variables					
By 6 months					
Respondent/Focus child engaged in any activity*	663	0.81	0.38	0	1
FC in any center child care	641	0.35	0.47	0	1
Received child development services in home visits	672	0.52	0.50	0	1
Received parenting education services	639	0.71	0.46	0	1
Parent read daily to FC	664	0.53	0.50	0	1
Child in EHS center care and read to by parent daily	635	0.17	0.37	0	1
By 14 months					
Respondent/Focus child engaged in any activity	667	0.87	0.33	0	1
FC in any center child care	647	0.42	0.49	0	1
Received child development services in home visits	672	0.42	0.49	0	1
Received parenting education services	648	0.78	0.43	0	1
Parent read daily to FC	617	0.59	0.49	0	1
Child in EHS center care and read to by parent daily	593	0.26	0.44	0	1
By 26 months					
Respondent/Focus child engaged in any activity	661	0.91	0.28	0	1
FC in any center child care	629	0.52	0.50	0	1
Received child development services in home visits	672	0.60	0.49	0	1
Received parenting education services	654	0.81	0.39	0	1
Parent read daily to FC	662	0.59	0.49	0	1
Child in EHS center care and read to by parent daily	619	0.31	0.46	0	1

3.5.2 Pre – K and Fifth Grade

In these two phases of the child's life, we are interested in finding out whether there are observable long term effects on receiving EHS services and whether the gains from early intervention last through fifth grade. Children in the control group were allowed to participate in Head Start programs (at age 3) and we controlled for this effect when running the regression for the Pre-K stage. We will compare PPVT and Woodcock-Johnson applied problems scores of EHS children with those in the control group.

At the fifth grade, the academic performance measures we will discuss are the ECLS-K math routing scores and the Peabody Picture Vocabulary test. The regression reported controlled for the scores of children who have any learning disability. I followed the same model as the initial 0-3 phase and the explanatory variables remain the same, i.e. children in the program group were involved in early head start programs for the first 26 months of their lives. Summary statistics are provided in Table 3.

Table 3: Summary Statistics for Pre-K Phase

Variable	Obs	Mean	Std. Dev.	Min	Max
Program participation	2977	0.50	0.50	0	1
Male in household	2969	0.39	0.49	0	1
Parent previously in Head Start or child dev. Program	2864	0.13	0.34	0	1
Child has established risks	2081	0.11	0.31	0	1
Birth mother was <20 when FC was born	2971	0.38	0.49	0	1
Highest grade completed was <12	2977	0.46	0.50	0	1
Highest grade completed was >12	2977	0.28	0.45	0	1
Income is 100% of poverty or higher	2977	0.11	0.32	0	1
Child has learning disability	2047	0.08	0.27	0	1
Child ever in Head Start	2129	0.51	0.50	0	1
Respondent/Focus child engaged in any activity	2051	0.89	0.31	0	1
FC in any center child care	1948	0.41	0.49	0	1
Received child development services in home visits	2084	0.60	0.49	0	1
Received parenting education services	2028	0.80	0.40	0	1
Parent read daily to FC	2072	0.54	0.50	0	1
Child in EHS center care and read to by parent daily	1688	0.24	0.43	0	1

CHAPTER IV

RESULTS AND DISCUSSION

In this chapter, the results of the analysis will be reported in two parts: the effects of Early Head Start programs in the short term and the long term. First, we will discuss the short-term results as observed by the Bayley assessments taken at 14, 24 and 36 months and Peabody Picture Vocabulary Tests at 36 months. Then, we will present the long-term results for the assessments at the Pre-K and fifth grade.

4.1 Early Head Start in the Short Term

At a first glance, the children that received early intervention services score higher than the control group at all three points of assessment. Most of the dependent variables used showed a positive, but not significant relationship to the independent variable. To calculate the Bayley scores for each group it was assumed that both groups of children have the same family and income characteristics and the only difference came from enrollment in Early Head Start. For both groups, there was no male in the household (father or any adult male that lives with the mother), the mother was not previously involved in Head Start and was not a teen mom at the time of birth of the focus child. The child did not have any established risks (environmental, developmental or biological) and the income of the family was below the poverty line for the year that that the data was collected.

Given these similarities, children in the program group (at all age levels) showed higher Bayley MDI scores at 14 months. The score as a whole for the entire group

(control and treatment) is within the standard Bayley score ($M=100$, $SD=15$). Table A-1 included in the Appendix provides regression outputs for each of the treatment types chosen to be discussed in this study.

At 14 months, participation in any activity, such as center care, home visits, case management and group parenting activities (Column 1) had a higher effect on the FC's development (See Figure 1). A second regression was run to differentiate between specific types of care and it's found that a center environment where children and parents attend classes (Column 2) captures most of the positive effect on the Bayley MDI. Child development services delivered at home have no effect on the child's mental development (Column 3) i.e. there is no noticeable difference in the Bayley scores of the two groups.

Early Head Start programs are designed to involve parents as well as children in achieving outcomes. To this end, children of parents that were given general education on parenting (Column 4) scored higher on the Bayley Mental Development index than those who did not. Children whose parents read to them daily (Column 5) scored higher on the assessment. The last estimation in this section is observing the effect of EHS center care and parents reading to their children daily. This variable has a greater effect on the child's MDI scores than other variables in showing the greatest difference in Bayley scores between the program group and the control group. The graph below supports my findings - enrollment in early head start centers and parents' direct involvement in the mental development of their children show the greater difference between the control group and the treatment group.

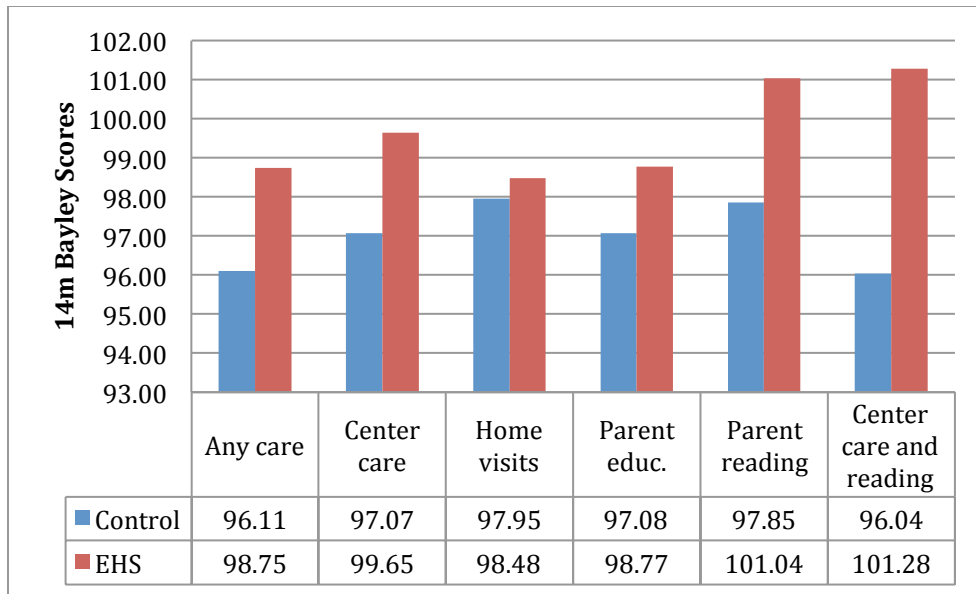


Figure 1: Bayley MDI Scores at 14 Months

At 24 months, the overall Bayley MDI scores for the group fell from what is observed at 14 months (See Figure 2). However, the positive effect of early head start is better observed in this age group. EHS children had similar scores with control group children in the first regression testing the effects of any type of EHS care (Table A-2, Column 1). But the scores improve when the child was involved in center care compared to home visits. Giving families parenting instruction does not improve the MDI scores by much. We notice here that, as with the 14 month assessments, the effect of parents reading to their children daily is considerably larger than the rest of the explanatory variables (including center care) and it was statistically significant. Lastly, if the FC is in center care and is being read to daily, its assessment score significantly improved as well. The changes described above can be seen in the graph below that compares the assessment scores of children in Early Head Start to those in the control group.

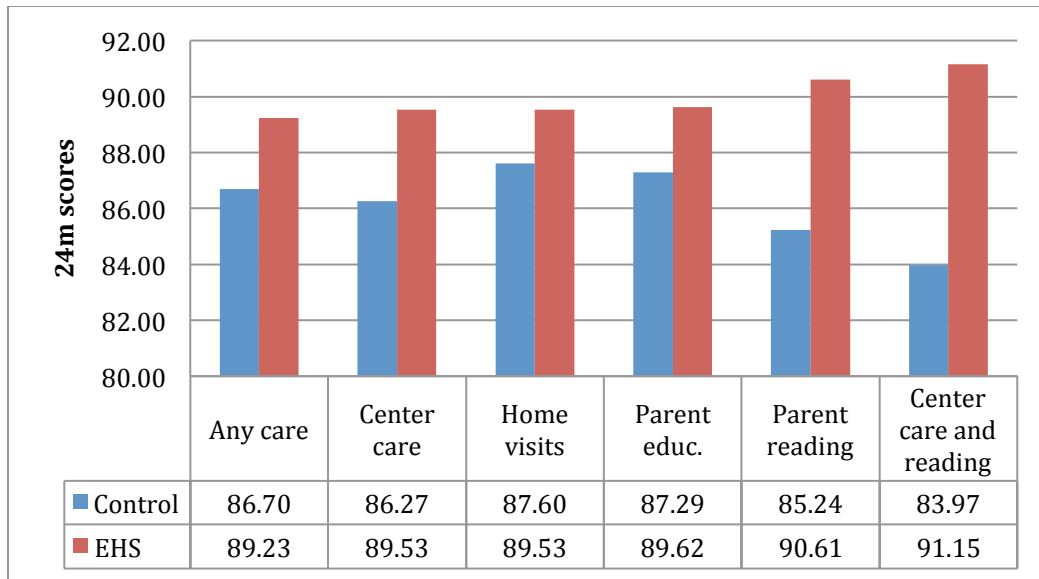


Figure 2: Bayley MDI Scores at 24 Months

The last assessment for the Bayley MDI scores was taken when the FC was 36 months old (See Figure 3). I find a similar pattern as the 24 months Bayley scores; EHS participants scored higher than the control group. Regressions to find the specific effects of different types of EHS care (Table A-3) reveal that those who received center care and home visits alone do not show a statistically significant score. The most important determinants of high scores are parents reading to their children or a combination of center care and parents reading to their children daily. These children score the highest in the sample group tested and the results are statistically significant as well.

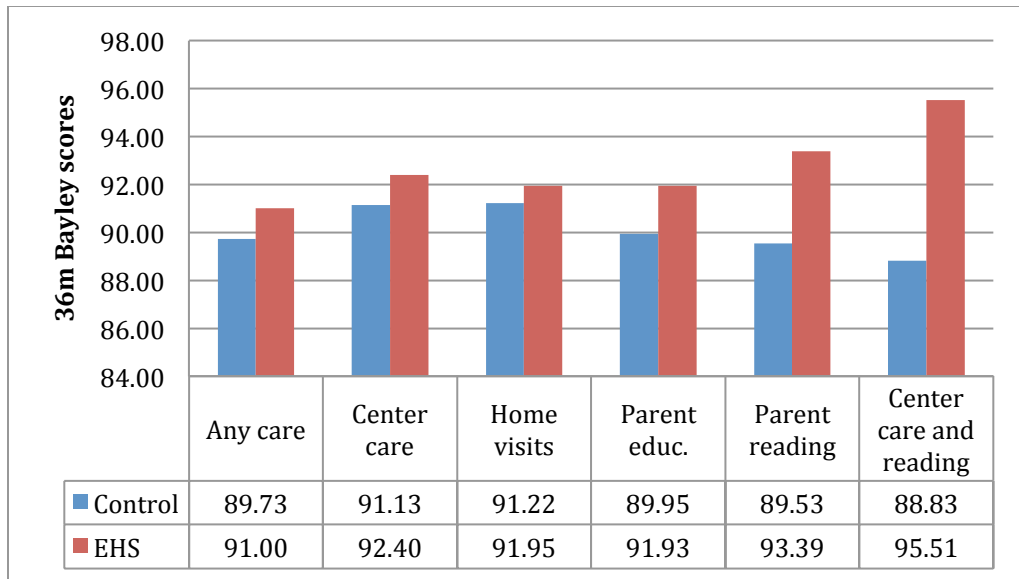


Figure 3: Bayley MDI Scores at 36 Months

It can be seen that involvement in Early Head Start results in improved cognitive abilities for children. EHS children scored at or above the average Bayley MDI scores (for the sample) at all age levels and also consistently score higher than those in the control group. However, when I distinguish between the types of care that children receive, it appears that the most important contribution to a child’s development comes from EHS services that involve parents.

For this sample, center care and group parenting activities show significant improvement in the child’s performance only at the earliest point of assessment. At 14 months, receiving child development services in home visits does not improve the child’s mental development. Receiving parenting education alone also does not seem to help children achieve higher Bayley MDI scores. At 24 and 36 months, the effects of these treatments are reduced and lose their statistical significance altogether. The children who have consistently shown higher scores in the Bayley assessment are those whose parents

read to them daily and children who participated in center care in addition to being read to daily.

The other measure of cognitive skills given to the children in the study is the Peabody Picture Vocabulary Test (PPVT)⁸ (See Figure 4). First, the sample as a whole had a low PPVT score (Mean=83), which is to be expected as they come from disadvantaged homes and circumstances in addition to mothers who only have a high school education. We found that while positive, participation in center care, home visits or receiving parenting education do not yield significant results when it comes to the vocabulary skills of the children. EHS children score about average when they have parents reading to them daily. More importantly, a combination of center care and parent reading to child daily push the PPVT scores above average.

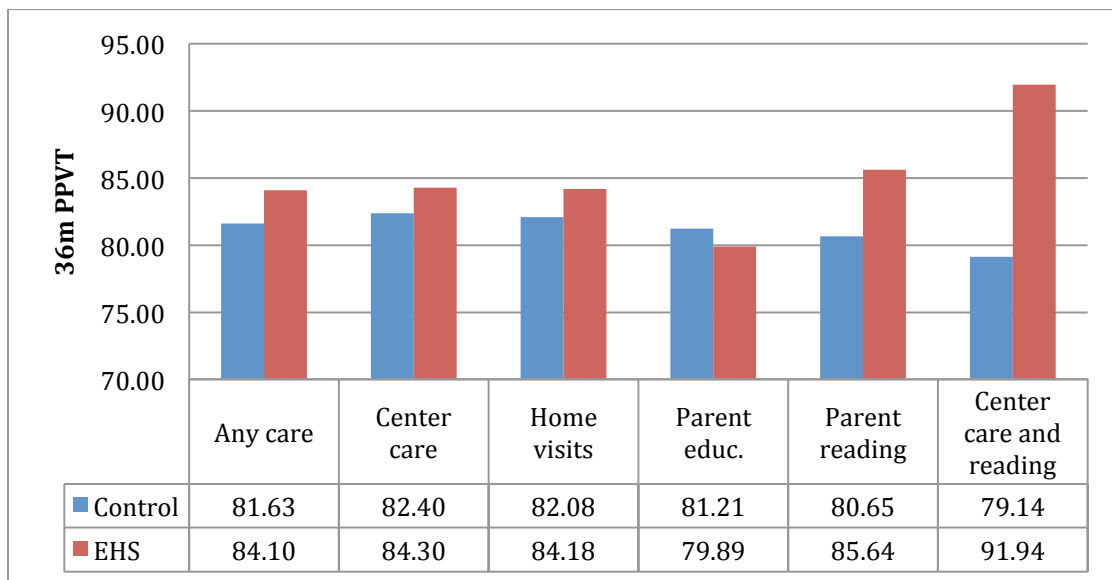


Figure 4: Peabody Picture Vocabulary Scores at 36 Months

⁸ Regression output reported in table A-4 in appendix

4.2 Long Term Effects of Early Head Start

4.2.1 Pre-Kindergarten

The next set of results look at how EHS children perform at the start of Pre-Kindergarten i.e. whether the gains that EHS involvement brought at infancy stay with them as they start school. The first test of school readiness is the PPVT and Figure 5 summarizes these scores. We find that EHS children who received any type of care had a higher score over the control group. All of the EHS services received helped the program group children achieve scores that were equal to or higher than the sample's average PPVT score. As with the 0-3 phase, EHS children whose parents read to them showed the highest difference from the control group. For this test, involvement in center care does not show the same effect as the earlier phases.

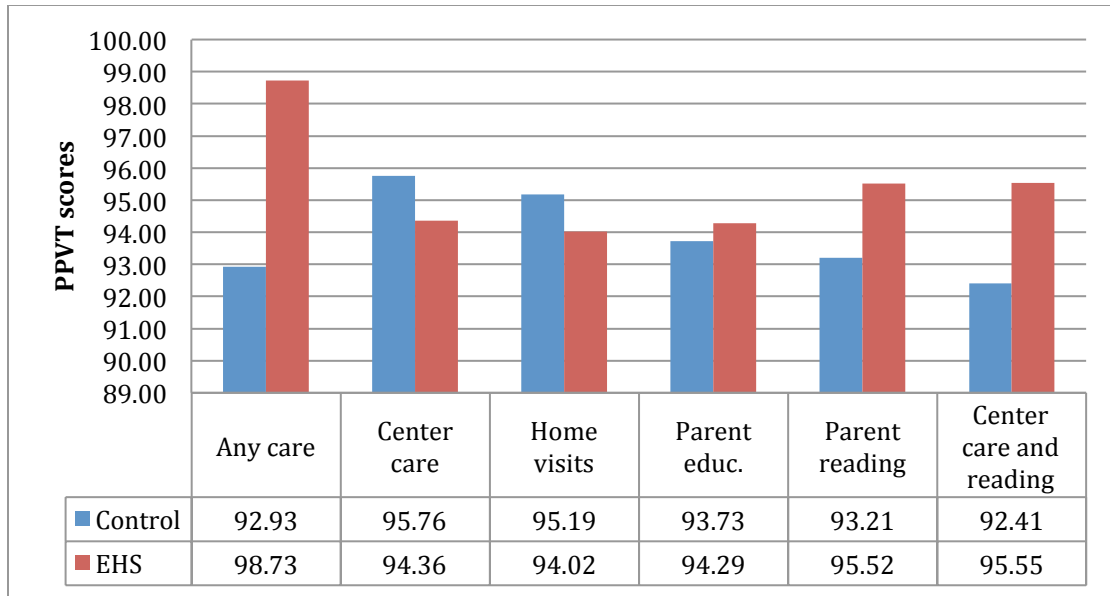


Figure 5: Pre-K PPVT Scores

The second test chosen to be included in this paper is the Woodcock-Johnson Applied Problems test (WJAP). The results, which are summarized in Figure 6, are somewhat similar to the PPVT tests. The score differences between the treatment and control groups are minimal for the first four types of EHS care but increase significantly when parents' reading is involved. Center care does not make much difference but when it is combined with reading, it led to higher scores on the math skills test. We also see that participation in any EHS service leads to higher scores in the treatment group.

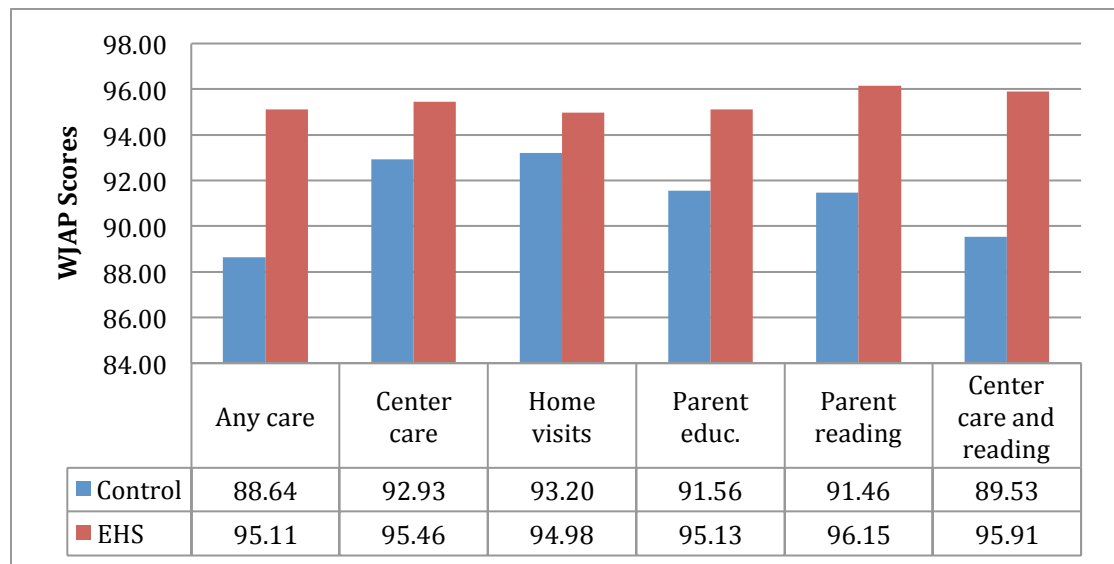


Figure 6: Pre-K WJ Applied Problems Scores

The Pre-K results tell us that EHS services that encourage parents to read to their kids play a role in helping disadvantaged kids' develop math and language skills. For both tests, center care, home visits and parenting education received don't seem to help EHS children score better than those who are in the control group. This is not completely unexpected. Parents were involved in EHS until their children were 26 months old and

they may have failed to routinely apply the skills learned until the child is old enough for kindergarten.

Overall, I can say that some of the effects of early head start help children until kindergarten entry when it comes to school readiness. EHS does not necessarily level the playing field (by bringing up scores to standard levels) but it plays a role in improving the academic outlook of at risk children.

4.2.2 Fifth Grade

So far, I have shown that EHS children generally performed better than the control group in the 0-3 and Pre Kindergarten phase. The last point of assessment is the fifth grade. The tests we will discuss are the PPVT and the ECLS-K math routing test.

The PPVT scores of all the children in the sample are very close to the standard level and there is no real difference between students who were in Early Head Start programs and those that were not. Care received in a center environment, home visits or education on parenting did not help raise test scores. To the contrary, control group children score better than EHS children who only received center care. As with the above results, parents' reading to their children has a significant effect in this phase (Table A-6) but not enough to show a real difference in scores. Figure 7 shows the score differences between the two groups.

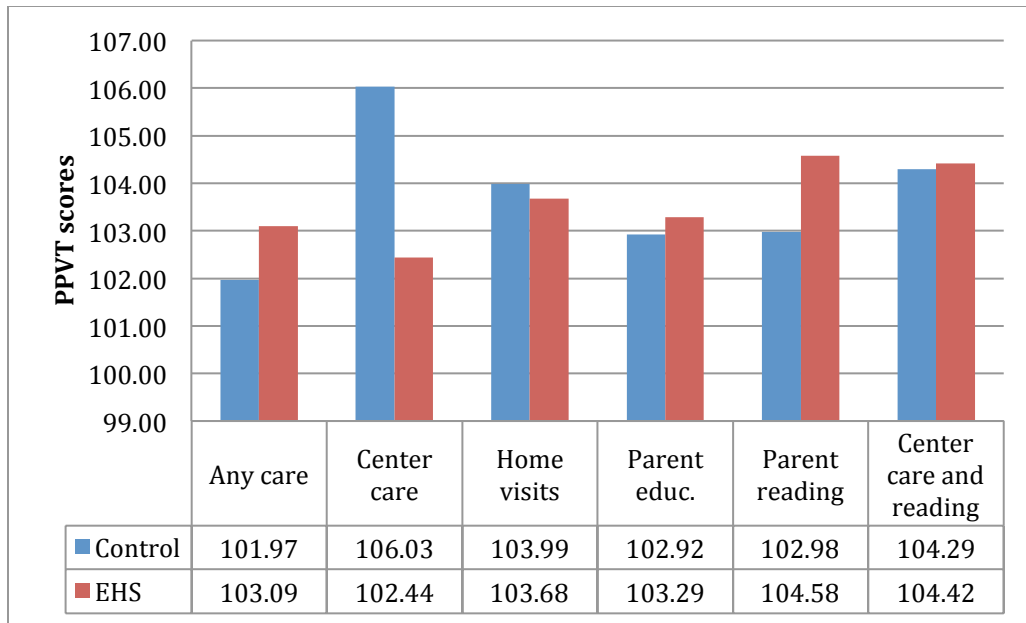


Figure 7: 5th Grade PPVT Scores

We observe similar results in the math assessments. The math scores (Figure 8) show that, by 5th grade, EHS children and control group children were at the same skill level. None of the services received in childhood helped in bringing up the scores of EHS children compared to the comparison group. We can see that any positive effects in the earlier phases brought on by center care and parents reading to their children are lost when the child enters fifth grade. As we can see from the graph, children who received home visits and whose parents were given parenting education actually scored less than the control group.

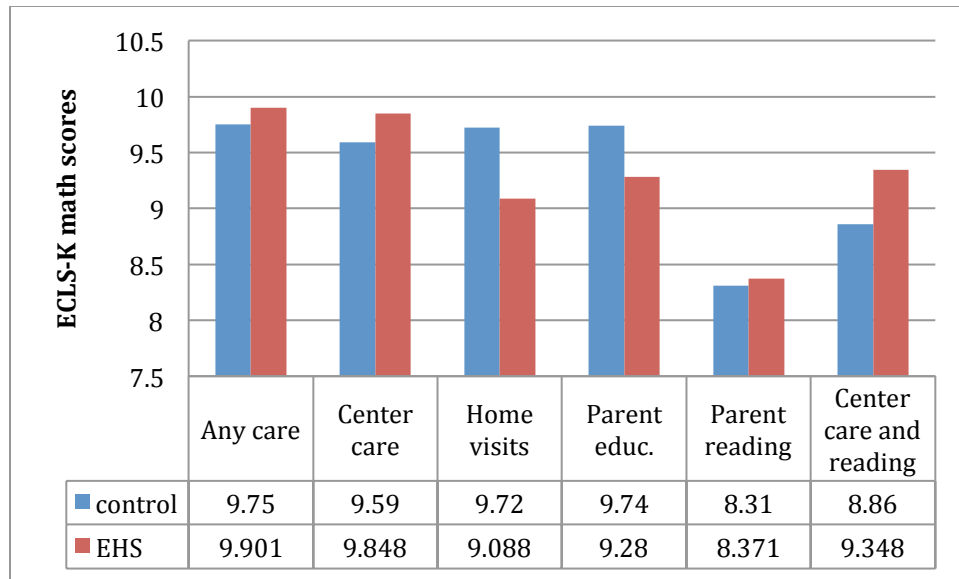


Figure 8: 5th Grade ECLS-K math Scores

I conclude from these results that like Head Start, Early Head Start’s effects fade out when it comes to school readiness. The services received by children and their parents are important in the first few years – but participation alone does not give low income children an improved chance at academic success.

We can attribute the fade out to the quality of schools attended by children after they left EHS. The decision to attend better schools depends on parents’ economic status among other things. Children from low income families and neighborhoods tend to attend poor quality schools and thus lose the edge they had over their peers that were not in EHS.

CHAPTER V

SUMMARY AND CONCLUSION

The purpose of this study was to discover the role of Early Head Start on children's academic success, particularly those from low-income families. The results are consistent with existing evidence discussed in chapter 2 of this thesis. Early Head Start (EHS) services such as center care are successful at increasing cognitive scores at the early ages. Services that promote parents reading to their children also improve cognitive development of children in the first three years of their lives. Home visits, group parenting activities and receiving parenting education do not show a significant impact. As the participants got older (by 36 months), only center care and parents reading kept scores higher than control group children.

EHS has not delivered promising results in the long term. At the Pre-K level, EHS children showed higher math and vocabulary scores than the control group only when parents were reading to them daily while they were in the EHS program. Parents reading showed statistically significant results for both PPVT and Woodcock-Johnson Applied Problems tests for Pre-K children. Center care, home visits and parenting education have very little impact on improving test scores. At the fifth grade level, PPVT and ECLS-K test scores show that EHS participants have the same scores as control group children. None of the services given in EHS services maintained their effects long enough to last through elementary school.

The 2009 American Recovery and Reinvestment Act appropriated \$1.1 Billion⁹ to the EHS program; out of which \$982 million is slated to help increase the number of children participating in Early Head Start. The use of multiple outcomes at multiple time points helps us choose EHS services that show a more productive pattern when it comes to academic success and school readiness. EHS services need to be re-assessed in light of these findings. Early Head Start plays an important role in helping low-income children and families achieve better health and cognitive outcomes in the short run when compared to their peers. However, it still lags when it comes to raising the school readiness of its participants to a level that can compete with those from better circumstances.

EHS should not be adapted as a short-term fix, especially when it is an important part of public policy. The long-term benefits of EHS and school readiness require us to take a closer look at the overall effectiveness of the program. Home visits and parenting education do not help children's cognitive development at all three phases of this study. And those that do show gains before preschool (center-based, and that encourage parents to read to their children daily) lose their advantage by elementary school. The focus of the EHS expansion should be singling out and reinforcing services that help children achieve academic success in both the long and short run.

⁹ Department of Health and Human Services-Early Head Start American Recovery and Reinvestment Plan

APPENDIX: REGRESSION OUTPUTS

Table A-1	Regression output for 14 month Bayley scores					
	1	2	3	4	5	6
Program participation	0.098 (.757)	0.278 (.728)	1.302 (.847)	0.054 (.831)	1.037 (.693)	0.417 (.718)
Male in household	1.089 (.715)	1.440 (.735)	1.184 (.709)	1.151 (.726)	1.237 (.710)	1.468 (.736)
Previous enrollment in Head Start	-0.219 (1.151)	0.051 (1.062)	-0.218 (1.040)	-0.255 (1.057)	-0.185 (1.046)	-0.103 (1.068)
Established risks	-2.969 (1.151)	-2.945 (1.184)	-2.835 (1.144)	-3.421 (1.166)	-2.393 (1.151)	-2.388 (1.195)
Teen mom	0.206 (0.791)	0.135 (.811)	0.222 (.785)	0.561 (.802)	-0.205 (0.793)	-0.155 (.818)
Mother's education <12	-1.587 (0.944)	-1.721 (.973)	-1.978 (.933)	-2.141 (.958)	-1.636 (.941)	-1.659 (.975)
Mother's education =12	-0.180 (.945)	-0.315 (.971)	-0.305 (.939)	-0.351 (.957)	-0.262 (.939)	-0.179 (.972)
Family income at poverty line	2.452 (1.085)	2.522 (1.117)	2.374 (1.077)	2.018 (0.959)	2.138 (1.075)	2.257 (1.115)
Participation in any activity	2.542* (0.938)					
Child in center care by 6 months		2.296** (.794)				2.344* (1.095)
Rec'd child dev services in home visits			-0.775 (.847)			
Parent received parenting education				1.638* (.887)		
Parent read to child daily					1.890* (.624)	2.025* (0.866)
Child in center care and read to daily						0.278 (1.550)
Constant	96.288	97.389	98.259	97.43	98.114	96.218
Observations	998	955	1014	965	993	936
Adjusted R-Squared	0.0215	0.025	0.017	0.0207	0.0208	0.0312
P value of regression	0.0004	0.0001	0.0018	0.0006	0.0003	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-2	Regression output for 24 month Bayley scores					
	1	2	3	4	5	6
Program participation	1.471 (1.01)	1.074 (1.018)	1.485 (1.051)	1.102 (.972)	1.509 (.789)	1.017 (.901)
Male in household	2.484 (1.00)	2.764 (1.039)	2.353 (.894)	2.239 (.911)	2.248 (.812)	2.460 (.930)
Previous enrollment in Head Start	1.457 (1.554)	1.429 (1.59)	.887 (1.384)	.854 (1.401)	1.235 (1.208)	.976 (1.412)
Established risks	-3.034 (1.65)	-3.077 (1.708)	-2.935 (1.656)	-4.531 (1.517)	-4.442 (1.346)	-5.302 (1.552)
Teen mom	0.638 (1.123)	0.665 (1.169)	1.467 (.993)	1.427 (1.008)	1.463 (.897)	1.025 (1.027)
Mother's education <12	-7.520 (1.311)	-7.157 (1.353)	-7.786 (1.305)	-8.554 (1.172)	-7.767 (1.071)	-8.018 (1.211)
Mother's education =12	-3.237 (1.304)	-3.441 (1.352)	-3.207 (1.301)	-2.920 (1.177)	-3.160 (1.062)	-3.053 (1.196)
Family income at poverty line	3.211 (1.501)	3.281 (1.538)	3.368 (1.493)	3.258 (1.374)	3.258 (1.234)	2.557 (1.417)
Participation in any activity	1.064 (1.557)					
Child in center care by 6 months		2.681 (1.031)				3.446 (1.505)
Rec'd child dev services in home visits			0.442 (1.438)			
Parent received parenting education				1.231 (1.337)		
Parent read to child daily					3.863*** (.800)	4.342*** (1.306)
Child in center care and read to daily						-1.625 (2.053)
Constant	89.934	89.71	90.805	90.209	88.40	87.02
Observations	782	755	790	766.00	773.00	738.00
Adjusted R-Squared	0.0664	0.0734	0.0688	0.0693	0.0896	0.0903
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-3	Regression output for 36 month Bayley scores					
	1	2	3	4	5	6
Program participation	0.175 (.937)	0.377 (.948)	0.284 (1.112)	0.428 (.902)	0.474 (.908)	0.874 (.857)
Male in household	2.604 (.849)	2.569 (.883)	2.428 (.843)	2.519 (.855)	2.007 (.785)	2.728 (.891)
Previous enrollment in Head Start	-1.652 (1.240)	-1.642 (1.265)	-1.535 (1.232)	-1.538 (1.251)	-1.351 (1.113)	-1.380 (1.275)
Established risks	-1.026 (1.391)	-0.525 (1.431)	-0.920 (1.387)	-0.821 (1.413)	-0.911 (1.264)	-0.485 (1.449)
Teen mom	-0.199 (.926)	-0.297 (0.959)	0.800 (.919)	0.085 (.935)	-0.186 (.861)	-0.468 (.975)
Mother's education <12	-7.237 (1.104)	-7.112 (1.146)	-7.552 (1.093)	-7.635 (1.107)	-6.091 (1.033)	-6.922 (1.156)
Mother's education =12	-2.682 (1.243)	-2.475 (1.284)	-2.902 (1.236)	-2.975 (1.129)	-2.677 (1.037)	-3.095 (1.185)
Family income at poverty line	-1.237 (1.267)	-0.783 (1.301)	-1.091 (1.268)	-1.181 (1.281)	-1.873 (1.196)	-1.178 (1.317)
Participation in any activity	2.178 (1.59)					
Child in center care by 6 months		0.892 (.868)				0.598 (1.443)
Rec'd child dev services in home visits			0.447 (1.136)			
Parent received parenting education				1.559 (1.125)		
Parent read to child daily					3.390*** (.932)	3.008 (1.339)
Child in center care and read to daily						-0.025 (1.915)
Constant	92.409	93.609	94.119	92.921	92.204	91.927
Observations	745	707	758	738	744	700
Adjusted R-Squared	0.0557	0.0512	0.0531	0.0582	0.0705	0.0621
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-4	PPVT 36 months					
	1	2	3	4	5	6
Program participation	0.387 (1.198)	0.217 (1.121)	-0.810 (1.267)	-0.406 (1.279)	0.527 (1.155)	0.878 (1.104)
Male in household	3.243 (1.132)	3.526 (1.182)	3.154 (1.118)	2.952 (1.128)	1.941 (1.038)	3.062 (1.167)
Previous enrollment in Head Start	-2.369 (1.544)	-1.967 (1.584)	-2.464 (1.528)	-2.440 (1.538)	-2.237 (1.368)	-1.873 (1.563)
Established risks	-3.269 (1.737)	-2.897 (1.786)	-3.304 (1.723)	-3.382 (1.744)	-2.608 (1.574)	-2.759 (1.777)
Teen mom	0.157 (1.243)	0.709 (1.304)	0.490 (1.233)	0.397 (1.247)	0.096 (1.147)	0.173 (1.299)
Mother's education <12	-9.556 (1.506)	-9.572 (1.574)	-9.533 (1.487)	-9.486 (1.498)	-9.482 (1.385)	-9.258 (1.565)
Mother's education =12	-4.855 (1.526)	-4.778 (1.577)	-5.047 (1.378)	-4.495 (1.385)	-4.903 (1.513)	-6.565 (1.451)
Family income at poverty line	0.929 (1.629)	1.249 (1.688)	0.937 (1.621)	0.983 (1.618)	0.646 (1.536)	0.623 (1.681)
Participation in any activity	2.082 (2.161)					
Child in center care by 6 months		1.684 (1.225)				0.533 (1.909)
Rec'd child dev services in home visits			2.909 (1.420)			
Parent received parenting education				3.577 (1.637)		
Parent read to child daily					4.455*** (1.181)	2.979* (1.795)
Child in center care and read to daily						1.843 (2.467)
Constant	86.482	87.174	87.125	85.705	85.557	85.709
Observations	608	577	618	601	611	570
Adjusted R-Squared	0.0686	0.0683	0.0718	0.0721	0.087	0.0829
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10% respec.						
Standard errors in parenthesis						

Table A-5	Pre K PPVT					
	1	2	3	4	5	6
Program participation	-2.222	-1.762	-2.614	-2.591	-2.022	-1.926
	(1.285)	(1.017)	(1.482)	(1.071)	(1.231)	(1.281)
Male in household	3.081	3.574	3.225	2.947	3.102	3.474
	(1.044)	(1.063)	(1.038)	(1.056)	(0.991)	(1.111)
Previous enrollment in Head Start	-0.650	-0.906	-0.277	-0.553	0.073	-0.576
	(1.430)	(1.438)	(1.418)	(1.441)	(1.306)	(1.500)
Established risks	-1.339	-1.122	-1.195	-1.058	-0.965	-1.100
	(1.659)	(1.666)	(1.659)	(1.682)	(1.591)	(1.762)
Teen mom	0.307	0.211	0.274	0.321	-0.858	-0.358
	(1.126)	(1.145)	(1.119)	(1.142)	(1.078)	(1.213)
Mother's education <12	-9.829	-9.996	-10.123	-10.421	-8.373	-9.591
	(1.368)	(1.399)	(1.356)	(1.373)	(1.322)	(1.470)
Mother's education =12	-4.569	-4.240	-4.824	-4.504	-4.834	-4.3573
	(1.622)	(1.355)	(1.607)	(1.621)	(1.605)	(1.655)
Family income at poverty line	0.723	1.158	0.883	0.639	-0.498	0.196
	(1.498)	(1.536)	(1.505)	(1.505)	(1.444)	(1.596)
Child has learning disability	-7.907	-7.282	-7.959	-8.00	-8.284	-7.271
	(1.892)	(1.910)	(1.898)	(1.914)	(1.764)	(2.057)
Child ever in Head Start	-2.260	-2.042	-2.164	-2.198	-1.869	-2.145
	(1.016)	(1.032)	(1.011)	(1.028)	(0.963)	(1.078)
Participation in any activity	3.452					
	(2.331)					
Child in center care by 26 months		0.365				1.722
		(1.287)				(2.031)
Rec'd child dev services in home visits			1.442			
			(1.517)			
Parent received parenting education				3.149*		
				(1.779)		
Parent read to child daily					4.335***	5.742**
					(1.266)	(1.902)
Child in center care and read to daily						-2.399
						(2.600)
Constant	97.499	100.001	100.013	98.232	98.039	96.764
Observations	492	470	498	484	492	464
Adjusted R-Squared	0.1013	0.1024	0.0990	0.1032	0.1219	0.1266
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-6	Pre K WJ Applied Problems Test					
	1	2	3	4	5	6
Program participation	1.162	1.418	1.242	1.07	1.339	1.305
	(1.56)	(1.574)	(1.802)	(1.36)	(1.518)	(1.58)
Male in household	4.56	5.29	4.18	3.82	3.76	5.28
	(1.30)	(1.33)	(1.31)	(1.33)	(1.26)	(1.39)
Previous enrollment in Head Start	0.333	0.91	0.95	0.46	0.48	0.36
	(1.82)	(1.85)	(1.83)	(1.85)	(1.69)	(1.92)
Established risks	-1.65	-1.64	-1.45	-1.41	-1.63	-2.02
	(2.12)	(2.14)	(2.14)	(2.17)	(2.06)	(2.26)
Teen mom	4.05	4.26	4.23	4.11	3.62	3.78
	(1.41)	(1.43)	(1.41)	(1.44)	(1.36)	(1.51)
Mother's education <12	-13.20	-13.08	-14.02	-14.07	-12.68	-12.58
	(1.71)	(1.76)	(1.71)	(1.73)	(1.68)	(1.84)
Mother's education =12	-5.021	-5.002	-5.474	-5.542	-5.357	-6.59
	(1.972)	(2.028)	(1.962)	(1.71)	(1.977)	(1.81)
Family income at poverty line	0.47	1.72	0.59	0.49	0.004	1.39
	(1.92)	(1.98)	(1.95)	(1.96)	(1.88)	(2.06)
Child has learning disability	-13.95	-11.18	-13.78	-13.80	-15.54	-11.16
	(2.38)	(2.45)	(2.42)	(2.44)	(2.29)	(2.64)
Child ever in Head Start	0.29	0.12	0.31	0.31	-0.60	-0.57
	(1.27)	(1.30)	(1.27)	(1.30)	(1.22)	(1.35)
Participation in any activity	5.302*					
	(2.816)					
Child in center care by 6 months		1.117				3.387
		(1.583)				(2.516)
Rec'd child dev services in home visits			0.539			
			(1.847)			
Parent received parenting education				2.497		
				(2.185)		
Parent read to child daily					3.352*	5.795*
					(1.559)	(2.363)
Child in center care and read to daily						-4.108
						(3.225)
Constant	88.643	92.925	93.202	91.559	91.459	89.534
Observations	498	475	504	490	497	468
Adjusted R-Squared	0.0781	0.0777	0.0946	0.0752	0.0832	0.0875
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-7	5th grade PPVT					
	1	2	3	4	5	6
Program participation	-2.63 (1.10)	-1.68 (1.13)	-4.28 (1.29)	-3.14 (1.17)	-2.17 (1.04)	-1.684 (1.18)
Male in household	2.01 (1.10)	1.98 (1.16)	2.03 (1.09)	1.56 (1.11)	1.87 (1.07)	2.14 (1.21)
Previous enrollment in Head Start	-1.36 (1.60)	-1.29 (1.67)	-1.00 (1.59)	-1.14 (1.61)	-1.01 (1.50)	-1.40 (1.74)
Established risks	-1.34 (1.84)	-1.13 (1.91)	-1.31 (1.84)	-1.27 (1.87)	-0.68 (1.78)	-1.11 (2.00)
Teen mom	2.87 (1.20)	3.16 (1.26)	3.23 (1.19)	2.89 (1.21)	1.73 (1.17)	2.94 (1.32)
Mother's education <12	-11.77 (1.42)	-11.94 (1.48)	-12.53 (1.40)	-12.30 (1.41)	-10.63 (1.40)	-11.65 (1.55)
Mother's education =12	5.134 (1.45)	-5.48 (1.53)	-6.15 (1.45)	-5.65 (1.46)	-5.53 (1.41)	-5.35 (1.61)
Family income at poverty line	-1.02 (1.60)	-0.71 (1.67)	-0.92 (1.61)	-1.2 (1.61)	-0.97 (1.56)	-0.86 (1.74)
Child ever in Head Start	-3.92 (1.09)	-3.99 (1.14)	-3.86 (1.08)	-3.58 (1.10)	-3.21 (1.06)	-3.93 (1.18)
Child has learning disability	-10.95 (1.56)	-10.59 (1.66)	-11.04 (1.56)	-10.83 (1.59)	-10.46 (1.45)	-10.58 (1.74)
Participation in any activity	3.752 (1.82)					
Child in center care by 6 months		-1.907 (1.16)				-2.429 (2.361)
Rec'd child dev services in home visits			3.965 (1.713)			
Parent received parenting education				3.507 (2.067)		
Parent read to child daily					3.766* (1.43)	3.225 (2.199)
Child in center care and read to daily						1.016 (1.35)
Constant	101.97	106.03	103.99	102.92	102.98	104.29
Observations	401	377	407	397	401	371
Adjusted R-Squared	0.1583	0.1467	0.1674	0.1872	0.1671	0.1816
P value of regression	0	0	0	0	0	0
***,**, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

Table A-8	5th grade ECLS-K Math					
	1	2	3	4	5	6
Program participation	-0.192 (0.45)	-0.177 (.462)	0.165 (.517)	-0.13 (.49)	-0.287 (.43)	-0.207 (.466)
Male in household	1.25 (0.32)	1.23 (0.33)	1.19 (.32)	1.19 (.33)	1.03 (.31)	1.24 (.35)
Previous enrollment in Head Start	-0.56 (.47)	-0.56 (.49)	-0.48 (.47)	-0.44 (.48)	-0.56 (.44)	-0.53 (.51)
Established risks	-0.24 (0.54)	-0.29 (0.55)	-0.21 (.53)	-0.29 (.55)	-0.02 (.52)	-0.13 (.58)
Teen mom	0.49 (0.35)	0.44 (0.36)	0.55 (.35)	0.47 (.35)	0.31 (.34)	0.48 (.39)
Mother's education <12	-1.69 (0.42)	-1.49 (0.43)	-1.82 (.41)	-1.86 (.41)	-1.77 (.41)	-1.54 (.45)
Mother's education =12	-0.61 (0.43)	-0.39 (.45)	-0.65 (.42)	-0.64 (.43)	-1.77 (.41)	-0.48 (.46)
Family income at poverty line	-0.09 (0.46)	-0.04 (.48)	-0.04 (0.47)	-0.08 (.47)	-0.14 (.46)	-0.06 (.50)
Child ever in Head Start	-0.67 (0.32)	-0.58 (.33)	-0.60 (0.32)	-0.51 (.32)	-0.63 (.31)	-0.59 (.35)
Child has learning disability	-3.93 (0.46)	-3.95 (.48)	-3.95 (.46)	-3.85 (.47)	-4.22 (.76)	-4.07 (.51)
Participation in any activity	-0.267 (.82)					
Child in center care by 6 months		0.045 (.46)				0.943 (.724)
Rec'd child dev services in home visits			-0.797 (.532)			
Parent received parenting education				-0.33 (.64)		
Parent read to child daily					0.348 (.45)	1.192 (.673)
Child in center care and read to daily						-1.44 (.92)
Constant	10.36	9.98	10.37	10.38	10.08	9.34
Observations	402	378	408	398	402	372
Adjusted R-Squared	0.1201	0.1037	0.1297	0.1248	0.1306	0.1108
P value of regression	0	0	0	0	0	0
***, **, * Significant at 1%, 5%, 10%						
Standard errors in parenthesis						

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