INVESTING IN HEALTH:
THE LONG-TERM IMPACT OF HEAD START

by

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ABSTRACT

Head Start is a comprehensive, early childhood development program designed to augment the human capital and health capital levels of disadvantaged children. Grossman's (1972) health capital model suggests that early investments of this type should have lasting effects on health outcomes. This research evaluates the impact of Head Start on long-term health by comparing health outcome and behavioral indicators of adults who attended Head Start with those of siblings who did not. The results suggest that there are long-term health benefits from participation in Head Start and that these benefits result from lifestyle changes.

JEL Classification: I12, I38, I21, H51

Keywords: early childhood education; Head Start; human capital; health; health capital; health disparities; program evaluation

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I. Introduction

There is mounting evidence that early childhood socioeconomic conditions have long-term health consequences, reinforcing and sustaining health disparities over the life course (e.g. Hayward and Gorman, 2004). The health capital theory (Grossman, 1972) suggests that early investments in human capital and health capital have lasting effects on health outcomes later in life. This possible link between early childhood investments in education and health and later health conditions and outcomes, if established, could help explain the remarkable extent and persistence of socioeconomic disparities in health.

Head Start is a comprehensive, national, federally-funded program designed to augment the human and health capital of disadvantaged children to better prepare them for subsequent educational experiences. The program began in 1965 as part of President Johnson's "War on Poverty" and has provided services to over 22 million children since its inception (Head Start Bureau, 2004). Federal guidelines state that at least 90 percent of the children enrolled in each of the Head Start centers must be from families with income levels below the poverty line and at least 10 percent of the participants must be children with disabilities (Head Start Bureau, 2002). There were 19,200 centers located throughout the country that enrolled 909,608 children at an average cost of $7,092 per child in the 2003 fiscal year. Fifty three percent of these children were 4 years old and 34 percent were 3 years old. Thirty two percent of Head Start participants in 2003 were black, 31 percent were Hispanic, and 28 percent were white (Head Start Bureau, 2004).

Head Start seeks to enhance cognitive skills by developing age-appropriate literacy, numeracy, reasoning, problem-solving, and decision-making skills. Head Start also helps parents provide adequate nutrition for participating children and ensures that children receive

proper immunizations and other preventive health measures, as well as continuous access to pediatric health care.

This emphasis on education, nutrition, and health care has an immediate effect on the health of preschoolers. We also expect to see a positive impact of Head Start participation on adult health for two reasons. First, the health component of Head Start is designed to increase children's health, which is predicted to increase adult health. Second, the cognitive goals of the program are intended to increase the education of participants, and education has been strongly linked to adult health (Grossman and Kaestner, 1997). If this program affects the long-term health of participants, then Head Start may be one way to reduce the health disparities that are correlated with inequality in childhood socioeconomic conditions.

Although a major component of the Head Start curriculum is aimed at improving the health of its participants, most evaluations of this program focus on cognitive outcomes. The limited numbers of studies that investigate the health outcomes of program participants concentrate on short-term outcomes or specific benefits such as immunization; these studies demonstrate a positive effect of participation.

This research evaluates the impact of Head Start on long-term health using the Panel Study of Income Dynamics. We follow the methodology of Currie and Thomas (1995) and Garces, Thomas, and Currie (2002) and control for unobservable family characteristics that may affect health or the decision to participate in Head Start. The effect of Head Start participation is determined by comparing the health outcomes of individuals who attended Head Start with those of siblings who did not participate. Because Head Start began in 1965, even its earliest participants have not yet reached old age and many chronic diseases that plague older individuals are not yet evident in former Head Start participants; therefore, to assess the impact of Head Start

on long-term health we focus on intermediary behaviors and measures of health that are related to health throughout an individual's life. Measures of health outcomes include self-reported health status, obesity, incidence of high blood pressure, and whether or not an individual smokes or exercises. Additionally, the relationship between Head Start participation and health insurance coverage is estimated because insurance can be related to the likelihood that an individual utilizes medical care.

Head Start participation is shown to reduce the likelihood that an individual smokes cigarettes. Given that tobacco use is the leading cause of mortality in the United States (Mokdad *et al*., 2004) and is associated with cancer, heart disease, chronic obstructive pulmonary disease, and stroke (National Center for Health Statistics, 2001), the reduction in smoking from Head Start participation can result in a substantial improvement in health. Benefits to younger siblings include increased exercise and health insurance coverage for blacks and a decrease in obesity for whites. Poor diet and physical inactivity together forms the second leading cause of mortality (Mokdad *et al*., 2004). These results suggest that there are long-term health benefits from participation in Head Start and these benefits result primarily from lifestyle changes.

II. The Benefits of Early Childhood Investment and Head Start Participation

a. *Early Childhood Investment and Adult Health*

Grossman's (1972) fundamental theory of the demand for health identifies the key roles that human capital and health capital play in the production of good health. Within a utility maximizing framework, health is demanded as a source of utility and is produced by individuals because health determines the number of illness-free days available for labor and leisure activities. Individuals inherit an initial stock of health capital that depreciates over time and can

be increased or decreased each period through an individual's health investment. Investment is determined according to a health production function, which associates changes in health capital with health inputs such as medical care utilization, diet, exercise, and the consumption of cigarettes.

The efficiency of the production function is determined by the individual's human capital. Education, as a component of human capital, can affect health directly by increasing the productivity of the health inputs or indirectly by providing knowledge of how to efficiently combine inputs to produce better health.

One implication of this conceptual model is that, for a given level of education, increased medical care and nutrition can result in improved health and early childhood investment can increase health capital in all future periods. Additionally, if preschool education leads to an increase in the level of education, an improvement in health can result from changes in health-related behaviors that are encouraged through education.

b. *Early Childhood Investment and Health Disparities*

Disparities in mortality are reflected through differences in socioeconomic status (Pappas *et al*., 1993). Recent evidence on health over the life course seems to support the underlying hypothesis that adult health is dependent upon childhood conditions and that disparities in adult health result from differences in the initial levels of human and health capital among young children. Socioeconomic status during childhood is negatively related to adult body mass index (Blane *et al*., 1996), the incidence of Type 2 diabetes for women (Maty *et al*., 2002), and mortality (Davey Smith *et al*., 1998; Hayward and Gorman, 2004). Hayward and Gorman (2004) find that the impact of socioeconomic status during childhood on adult mortality results, in part, because of the relationships between childhood socioeconomic status and educational

attainment and adult body mass index. Consequently if early childhood investments in children from low socioeconomic status backgrounds can overcome the relationships between a disadvantaged child background and low educational attainment and adult obesity, these investments have the potential to reduce socioeconomic disparities in mortality.

c. *Educational Outcomes of Head Start Participation*

Although Head Start participation may have substantial health benefits, most evaluations of the program have focused solely on cognitive outcomes. Head Start participation is generally believed to be associated with short-term cognitive benefits; however a few years after program completion, these benefits fade (McKey *et al.*, 1985; Lee, Brooks-Gunn, and Schnur, 1988; Lee *et al.*, 1990; Barnett, 1995; Currie and Thomas, 1995; Aughinbaugh, 2001). This decrease in the effect of Head Start participation may result because of the lesser quality of the subsequent schools that Head Start participants attend (Lee and Loeb, 1995).

Currie and Thomas (1995) demonstrate that the benefits of Head Start participation are not uniform across all races. The increase in cognitive ability – measured by the Picture Peabody Vocabulary Test (PPVT) score – that results from participation in the program is erased by age 10 for black children, but not for white children. There is also a decrease in the likelihood of grade repetition for white Head Start participants, relative to not attending preschool or attending other preschools. In a later paper, Currie and Thomas (2000) offer evidence that this fade in test score gains may result because, after completion of the Head Start program, black participants attend lower quality primary schools than other black children. However, this is not the case for white participants.

In addition to lower rates of grade retention, long-term effects on school success are found for whites through an increased probability of completing high school and attending

college (Garces, Thomas, and Currie, 2002). No statistically significant effect of Head Start participation is found on high school graduation rates or college attendance for blacks.

The result that Head Start participation confers short-term cognitive benefits and improves educational attainment lends further credibility to the hypothesis that Head Start participation may have long-term health benefits. Extensive research has shown that increases in education result in improved health (Grossman and Kaestner, 1997). Education has a causal influence on self-reported health status (Grossman, 1975; Gilleskie and Harrison, 1998); disability, functional limitation, and blood pressure (Berger and Leigh, 1989); disease (Behrman and Wolfe, 1989); and mortality (Lleras-Muney, 2002).

Education also has an effect on adult health through the positive impact of schooling on nutrition (Behrman and Wolfe, 1989; Variyam et al., 1999), exercise (Kenkel, 1991; Gilleskie and Harrison, 1998), and the frequency of preventive physician visits (Gilleskie and Harrison, 1998). Additionally, schooling has a negative impact on smoking (Kenkel, 1991; Sander, 1995a; Gilleskie and Harrison, 1998) and increases the probability that an adult who smokes will quit (Sander, 1995b).

d. *The Health Components of Head Start*

In 1965, the planning committee for Head Start developed a program targeting nutrition, physical and mental health, parent involvement, social services for families, and early childhood education. "The goal the planners envisioned was to enhance children's overall social competence through the provision of comprehensive services" (Zigler, Styfco, and Gilman, 1993, p. 3-4). The overall goals of Head Start have continued throughout the program's existence. Head Start is a comprehensive child development program that, in 2001, had an overall goal of "increasing the social competence of young children in low-income families…

Social competence takes into account the interrelatedness of social, emotional, cognitive, and physical development. Head Start services are also family-centered, following the tenets that children develop in the context of their family and culture and that parents are respected as the primary educators and nurturers of their children" (Head Start Bureau, 2002, p.1).

The physical development goals of Head Start target nutrition, pediatric health care, and health education (Head Start Bureau, 2002). Head Start staff members, with the cooperation of the child's family members, determine each child's nutritional needs, as well as design and implement a nutritional plan for each child. Children who have not received breakfast prior to their arrival at a Head Start center at the beginning of each day are provided a nutritious breakfast. Children in a full-day program receive meals and snacks that provide one-half to two-thirds of the child's daily nutritional needs. Parents are educated in preparation and nutritional skills.

Head Start centers determine if the child has an adequate source of ongoing, continuous, and assessable pediatric health care. If the child does not have an appropriate source of pediatric health care, then program administrators assist parents in finding one. Head Start staff members also assist children and families in developing an age-appropriate schedule of preventive and primary health care that includes child immunizations. The provision of health care services is monitored throughout the duration of the program. Children are screened for developmental problems upon program enrollment and parents are notified of any concerns. Parents are familiarized with pediatric health care and developmental screening procedures and the importance of these procedures.

e. *Health Outcomes of Head Start Participation*

Although health services are a major component of the Head Start program, little research has addressed the impact of Head Start participation on health. Early qualitative and quantitative research on this subject concluded that Head Start participation results in positive short-term health benefits for children in terms of general physical health, motor skills, and nutrition (McKey *et al*., 1985). Hale, Seitz, and Zigler (1990) determine that Head Start participants are more likely than children on the Head Start waiting list or middle-class children to receive age-appropriate health screenings or dental examinations.

Currie and Thomas (1995) investigate the impact of Head Start on two health measures: the probability of measles immunization and child height–for-age, a long-run measure of health and nutrition. Head Start participation is not shown to have an effect on child height-for-age; however, participation improves the probability of being immunized for the measles, relative to not attending preschool. This benefit of Head Start is not limited to the participant, as there is evidence that the younger siblings of Head Start participants are more likely to receive the immunization as well. Increased vaccination coverage has short-term and lasting health benefits as a result of the prevention of specific diseases; however immunizations are only one component of the health services provided in Head Start.

While existing research concentrates mainly on educational outcomes or short-term health effects of Head Start participation, little is known about the long-term health effects. Head Start is a comprehensive development program, which is designed to provide a wide array of benefits for participants. This research seeks to highlight an outcome that is often ignored: the long-term health benefits of Head Start participation.

III. Estimation Strategy

In this paper, we estimate the effect of attending Head Start on adult health. In an ideal setting, children would be randomly assigned to attend Head Start or would not attend any form of preschool. Then, the health of these individuals would be monitored as they aged. The difference in the health outcomes between Head Start participants and individuals who did not attend Head Start would be the impact of attendance in Head Start. However, this ideal setting is not available.[2] In the analysis of existing secondary data, several deviations from this ideal setting lead to complications which are addressed in turn.

First, children who do not attend Head Start may attend other forms of preschool. As a result of the beneficial impacts of other forms of preschool, the difference of health outcomes between Head Start participants and non-Head Start participants would underestimate the effects of Head Start participation in comparison to individuals who did not attend any form of preschool. To allow for the options that individuals attend Head Start, other forms of preschool, or no preschool, the relationship between Head Start and adult health is modeled as:

$$H_i = \alpha_0 + \alpha_1 HS_i + \alpha_2 PS_i + \varepsilon_i , \qquad (1)$$

where H is a measure of health of individual i, HS and PS are indicator variables for participation in Head Start or other preschool programs, and ε is random error. α_k (k=1,2) is the marginal impact of Head Start and other preschool programs.

Second, observable characteristics of families are associated with selection of participants into Head Start and the development of long-run health. Head Start participants are from disadvantaged families. Eligibility for Head Start participation is primarily determined by family income (Head Start Bureau, 2002). At least 90 percent of the children enrolled in Head Start

[2] In the fall of 2002, as part of the congressionally-mandated evaluation of Head Start, Head Start eligible children were randomly assigned into Head Start or a non-Head Start control group. These children will be evaluated until the spring of 2006. The Head Start Impact Study will allow for the estimation of the short-term benefits of Head Start participation in a randomized setting, but not the long-term benefits.

must be from families whose total annual income before taxes is less than or equal to the poverty line. For the purposes of eligibility, income is defined as gross cash income, which includes unemployment compensation and other sources of transfer income. Additionally, at least ten percent of Head Start enrollees must be children with disabilities and a child must be at least three years old to be eligible for Head Start participation. Because Head Start participation is correlated with childhood socioeconomic status, which is correlated with adult health, estimation of equation (1) would lead to a biased estimate of the impact of Head Start participation. To overcome this problem, equation (1) is modified to include family background characteristics during the preschool years:

$$H_i = \beta_0 + \beta_1 HS_i + \beta_2 PS_i + \boldsymbol{\beta}_3 \boldsymbol{X}_i + \eta_i , \qquad (2)$$

where $\boldsymbol{X}$ is a vector of exogenous family background characteristics and η is random error. β_k (k=1,2,3) is the marginal impact of Head Start, other preschool programs, and childhood conditions on health. The characteristics in $\boldsymbol{X}$ include family income, disability status of the child, and other demographic characteristics.

Third, unobservable characteristics of families that influence health outcomes may be correlated with the decision to enroll children in Head Start. Over 880,000 parents volunteer in Head Start (Head Start Bureau, 2004); these parents may choose to make other investments in their child that could positively influence health outcomes. Following established methodology by Currie and Thomas (1995) and Garces, Thomas, and Currie (2002), we compare sibling outcomes to determine the effects of Head Start participation. We restrict the sample to individuals with at least one sibling and include a family-specific fixed effect in the health models. The fixed effect controls for fixed unobservable family characteristics that affect health

and are correlated with the decision to participate in Head Start. The health of an individual in early adulthood is estimated as:

$$H_{if} = \delta_0 + \delta_1 HS_{if} + \delta_2 PS_{if} + \boldsymbol{\delta}_3 \boldsymbol{X}_{if} + \phi_f + \nu_{if}, \quad (3)$$

where H is now a measure of health of individual i in family f, ϕ is the family-specific fixed effect, and ν is random error. δ_k (k=1,2,3) is the marginal impact of Head Start, other preschool programs, and childhood conditions on health.

If the unobserved household characteristics that are related to selection into Head Start are constant across siblings, then the impact of Head Start could be measured by comparing the health of siblings who attended Head Start to the health of siblings who did not attend any form of preschool (δ_1). However, as noted by Currie and Thomas (1995) and Garces, Thomas, and Currie (2002) if parental favoritism results in differential investments among siblings, then δ_1 is a biased estimate of the impact of Head Start. To eliminate this bias, we compare the effects of participation in Head Start to participation in other preschools ($\delta_1 - \delta_2$). This is a consistent estimator of the effect of Head Start if parents view Head Start and other preschool of comparable quality. This is a lower bound estimate of the effect of Head Start if parents view other preschool as higher quality than Head Start and send their favorite children to other preschools (Currie and Thomas, 1995).[3]

The benefits of Head Start participation may not be confined to the participants in the program. Spillover effects of Head Start are likely to exist and result in an underestimate of the effect of the program ($\delta_1 - \delta_2$) because children who do not attend the program receive benefits from the sibling who does attend. Spillover effects could result from the family-centered emphasis of Head Start. Parents of participants learn about family nutrition and increase their

health knowledge, which benefits other family members including siblings. Children in disadvantaged households may be more likely to benefit from spillover effects. To examine if spillover effects occur, we interact the Head Start and other preschools variables with birth order and oldest child variables and add these interactions to the fixed effects model.

IV. Data

This research evaluates the impact of Head Start on long-term health using data from the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal study of U.S. households and individuals that began in 1968 with a national sample of approximately 4,800 households. Members of these households, their offspring, and current co-residents have been interviewed on an annual or biennial basis since the inception of the PSID. The information collected focuses on economic and demographic characteristics, but also includes sociological and psychological traits.

Supplements to the PSID occasionally expand the information collected. In 1995, additional questions were asked of interviewees that related to early childhood education. All household members between the ages of 5 and 49 were asked about whether they had ever enrolled in Head Start or any other preschool or daycare program, the length of attendance, and their age of initial attendance. Collecting information retrospectively about early childhood education experiences leads to the possibility of recall error. After comparing reported enrollment rates, racial composition, and family income to the national Head Start data, Garces, Thomas, and Currie (2002) validate the quality of the data from the 1966 birth cohort onward. Data from the 1964-1965 birth cohorts are not as reliable because participation rates in the PSID

[3] There is empirical evidence from sibling comparisons that other preschool children may be the beneficiaries of favoritism relative to their siblings than Head Start children are to their siblings (Currie and Thomas, 1995).

are significantly lower than the national rates. However, their results (based on data from the 1966-1977 birth cohorts) are robust to the inclusion of the 1964-1965 birth cohorts (personal communication with Eliana Garces).

In the 1999 supplement, an extensive set of health-related questions was included. Information regarding height, weight, health behaviors, health conditions including disease prevalence, and self-reported health status was obtained for adult members of the household. The exclusion of children limits the ability to examine the short-term, but not the long-term, effects of Head Start on health. Gouskova and Schoeni (2002) report that the response rates, prevalence estimates, and parameter estimates in multivariate models of the health measures in the PSID are similar to the health measures in the National Health Interview Survey (NHIS).

The key advantage of using PSID data is the panel nature of the data set, which allows for the coordination of data from the 1995 supplement regarding Head Start participation, the 1999 health supplement, and the respondent's childhood. This enables the estimation of the effect of early childhood education programs, such as Head Start, on health outcomes, while controlling for the childhood environment. The data sample used will examine the health of individuals in 1999. The data from the 1995 supplement are used to determine which individuals experienced Head Start or other preschool programs. Data from the 1999 wave of the PSID and years for which the individual was between the ages of 3 through 6 provide control variables. Controlling for family background throughout the period of early childhood education (ages 3 through 6), as opposed to capturing a snapshot of the family environment at the most common age of preschool attendance (age 4), minimizes measurement error, reduces missing data, and provides a more accurate description of the family environment during the early childhood years. Because the

PSID began in 1968, individuals who were older than 4 years old in 1968 were excluded from this analysis. The resulting sample includes individuals between the ages of 18 and 35 in 1999.

The measures of health that are the focus of this research consist of health-related behaviors and overall indicators of health that have previously been shown to be related to education. The specific health behaviors are whether or not the individual currently smokes cigarettes or ever smoked and whether or not the individual participates in the recommended amounts of light or heavy exercise[4] per week. The overall indicators of health are whether or not an individual is overweight,[5] reports fair or poor health,[6] and has ever had high blood pressure or hypertension. Because health insurance can affect the likelihood that an individual seeks medical care, whether or not an individual has health insurance is an additional dependent variable.

The individual and family characteristics include demographic characteristics and childhood conditions. The demographic characteristics are age, gender, race, marital status, whether the individual lives in an urban or rural community, birth order, and whether the individual is the oldest child. Variables that measure early childhood conditions include the average total family income between ages 3 through 6[7], the mother's and father's average years

[4] Light exercise is light physical activity such as walking, dancing, gardening, golfing, bowling, etc. Light exercise activities are recommended at least 5 times per week. Heavy exercise is vigorous physical activity or sports, such as heavy housework, aerobics, running, swimming, or bicycling. Heavy exercise activities are recommended at least 3 times per week. The goals for Healthy People 2000 were based on these baselines (National Center for Health Statistics, 2001).

[5] This dichotomous measure is derived from an individual's body mass index (BMI). The formula for BMI is: BMI = weight in kilograms / [height in meters] ^{2}. This binary variable equals one when an individual's BMI is at least 25.0. Although this measure includes the overweight and obese ranges of BMI, for the sake of brevity this variable will be referred to as measuring if an individual is overweight.

[6] This variable is constructed from a survey question that asks individuals to rate their health as excellent, very good, good, fair, or poor.

[7] Total family income includes the taxable income and transfer income, which includes public assistance, of all household members. Taxable income includes labor, asset, rental, interest, and dividend income. The reported estimates in the next section are robust to the inclusion of taxable income and a dummy variable that captures receipt of public assistance in place of total family income. Income is converted into 1999 prices using the Consumer Price Index.

of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, and whether the father was present between ages 3 through 6. As a measure of initial health status, whether the individual was a low-birth-weight baby[8] is included. In addition to family income, eligibility for Head Start is determined by disability status. Therefore a dichotomous variable that captures whether or not an individual is disabled during childhood is included.[9] We also include dummy variables that reflect participation in Head Start or other preschool for individuals born prior to 1966.[10]

Missing values for race were assigned the race of any siblings; this affected less than one half of a percent of the sample. After filling in these missing values, the sample is limited to black and white respondents to facilitate comparisons of the impact of Head Start across racial groups. Missing values for other demographics or family background characteristics were assigned the mean value of the sample and indicator variables to reflect that the values were missing were included in the regressions (e.g. Lillard and Willis, 1994; Garces, Thomas, and Currie, 2002). In the sample of respondents with at least one sibling in the sample, less than five percent of the respondents had missing values for the variables that reflect early childhood conditions. Approximately ten percent of these respondents had missing values for whether the individual was a low-birth-weight baby and approximately one quarter of this sample had missing values for urbanicity. Approximately one percent of this sample had missing values for

[8] Low birth weight is defined as a weight of less than 5.5 pounds (88 ounces).

[9] Whether an individual is disabled or requires extra care is only assessed from 1969 to 1972 and 1976 to 1978 in the PSID. Additionally, in 1999, individuals were asked to provide a self-assessment of their health during childhood. An individual is considered disabled during childhood if they report a disability or requiring extra care during the ages of 3 through 6 or if they report their health status as poor during childhood.

[10] These two variables are included to allow for the possibility that recall error influenced the responses of individuals born prior to 1966. The influence of early childhood experiences on health does not vary according to whether an individual was born before or after 1966. Individuals born before 1966 are more likely to have ever smoked cigarettes and are more likely to report their health as fair or poor, although both of these relationships are significant only at the ten percent level.

birth order and less than one percent had missing values for marital status and whether the individual is the oldest child.

Descriptive statistics for the data are provided in Table 1. The descriptive statistics provide the means and standard errors for the early childhood education experiences, health outcomes, and individual and family background characteristics of PSID respondents.[11] The entire sample is the sample of black and white individuals ages 18 through 35 who were interviewed in 1995 and 1999 in the PSID and provided information about their early childhood education experience and at least one measure of health. The sibling sample is the subset of individuals within the entire sample who have at least one sibling in the sample. The Head Start, Preschool, and Neither samples include subsets of individuals within the entire sample and the sibling sample who participated in Head Start; nursery school, a preschool program, or day care center besides Head Start; or none of the above, respectively.

The descriptive statistics demonstrate that adults who previously participated in Head Start, in comparison to individuals who attended other forms of preschool or did not attend any form of preschool, are, on average, more likely to report themselves in fair or poor health and more likely to be obese or overweight. Adults who formerly attended Head Start report similar health-related behaviors as other adults, with the exception that Head Start participants are more likely to have ever smoked cigarettes than other adults. Former Head Start participants are also less likely than other adults to have health insurance.

While Head Start participants tend to display worse adult health than other individuals, these descriptive statistics, as well as the targeted nature of the Head Start program, highlight the

[11] The means and standard errors are weighted by the PSID sample weights to be representative of the national population. These weights account for the initial oversampling of low-income households, changes in family composition, and differential attrition. These weights also reflect the addition of a nationally representative sample

importance of controlling for the home environment in the empirical model to discern the independent effect of Head Start participation. Former Head Start participants are more likely to have been raised in larger families with less income. These families are also less likely to have had a father present in the home, and parents have less education on average.[12] Additionally, Head Start participants are more likely to be black, less likely to be married, and more likely to be a younger sibling. The descriptive statistics for the sibling sample demonstrate that restricting the analysis to individuals with at least one sibling does not change the overall characteristics of the sample.

V. Estimates of the Relationship between Head Start participation and Health

a. *Health Behaviors and Overall Indicators of Health*

Tables 2 and 3 display the estimation results that explain the relationship between Head Start participation and health behaviors and overall indicators of health.[13] Estimates of the impact of Head Start and other preschools on these dichotomous measures are obtained from linear probability models.[14] Heteroskedasticity-robust standard errors that allow for family clustering are reported. Columns 1 and 2 are based on the sample of black and white PSID respondents aged 18 to 35 years old who report early childhood education experiences and health. Column 1 does not control for the observable or unobservable characteristics of individuals. Column 2

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of post-1968 immigrant households in the PSID and the poststratification adjustments of the weights to the Current Population Survey by race, metropolitan status, and Census region (Heeringa and Connor, 1999).

[12] This description of Head Start families is similar to previous demographic studies of the characteristics of Head Start families (McKey *et al*., 1985).

[13] See tables A1 through A8 in the appendix for complete estimation results of the specifications in Tables 2 and 3.

[14] These estimates are substantively similar to logit and conditional logit estimates and are reported for the ease of the interpretation of the coefficient estimates. The disadvantage of the linear probability model is that the probability that the outcome equals one is not constrained to be in the interval [0,1], while the disadvantage of the conditional logit model is that the estimates drop siblings with the same outcome measure from the sample and do not use the information contained in the explanatory variables for these siblings. Although there are disadvantages

includes control variables that reflect the demographic characteristics and the observable family background measures. Columns 3 and 4 restrict the sample to respondents with at least one sibling. Column 3 is the same specification as column 2, but with the sibling sample. Column 4 includes a family-specific fixed effect that controls for the unobserved family characteristics that are constant across siblings.

Estimates of the relationship between Head Start participation and the probability that an individual smokes cigarettes as an adult demonstrate no statistically significant relationship when control variables are excluded from the model. After including observable characteristics in the model, the point estimates for Head Start and other forms of preschool remain negative and the difference between the estimated coefficient for Head Start and other preschools changes from positive to negative but all estimates are statistically insignificant. Including a family-specific fixed effect, which controls for the unobservable family characteristics that are constant across siblings, increases the absolute value of the estimate of the effect of Head Start, but increases the standard error as well. This estimate suggests that Head Start participants are 12.4 percent less likely to smoke than individuals who did not attend preschool; however, this estimate is only statistically significant at the ten percent level. On the other hand, the estimate of the effect of other preschools on smoking becomes positive but remains statistically insignificant. Because the unobservable household characteristics that determine the selection decisions associated with early childhood education may not be fixed across siblings, the difference in smoking between Head Start participants and their siblings is compared to the difference in smoking between other preschool participants and their siblings. This reveals a negative and statistically significant effect of Head Start participation on the probability that an individual will smoke cigarettes as an

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to each estimation method, the similarity of the results for each method provides assurance that the conclusions presented are robust to the choice of estimation technique.

adult. Head Start participants are 17.4 percent less likely to smoke cigarettes than individuals who attended other forms of preschool. Additional models that estimated the relationship between early childhood educational experiences and the probability that an individual has ever smoked revealed no statistically significant relationship.

Head Start participants are less likely to engage in the recommended level of light exercise than individuals who attended other forms of preschool or did not attend preschool if control variables or fixed effects are excluded. The negative estimate for the Head Start coefficient remains statistically significant after adding control variables to the model but is not statistically significant after the sample is restricted to individuals with at least one sibling in the sample. After adding a family-specific fixed effect to the model, both the Head Start estimate and the difference estimate remain statistically insignificant, but the difference estimate, which represents the lower bound of the benefits to Head Start participation, becomes positive. There is also no statistically significant effect of Head Start on the probability that an individual participates in heavy exercise.

The results at the top of Table 3 describe the relationship between Head Start participation and being overweight. Head Start participants are more likely to be overweight, while other preschool participants are less likely to be overweight in comparison to individuals who did not attend preschool; the difference between these two estimates is positive and statistically significant. After controlling for individuals' demographics and childhood family background, only the difference estimate is statistically significant at the ten percent level for the entire sample. The addition of a family-specific fixed effect reveals no statistically significant relationship between Head Start attendance and being overweight.

Although the point estimates for Head Start and the difference estimate are consistently positive across all model specifications, the effect of Head Start participation on the probability that an individual has or has had high blood pressure is not statistically significant in any model.

In the model without control variables or fixed effects, preschool participants in programs besides Head Start are less likely to report their health as fair or poor than individuals who did not attend preschool, while Head Start participants, in comparison to other preschool participants, are more likely to view their health as fair or poor. Other preschool participants remain less likely to report poor or fair health than individuals that did not attend preschool once control variables are included, but this relationship becomes statistically insignificant with the addition of a family-specific fixed effect. There is no relationship between Head Start participation and the probability that individuals report themselves in fair or poor health once the family background and demographics of individuals are included in the model.[15]

Without controlling for observable characteristics, Head Start participants are less likely to have health insurance as a young adult. However, columns 2 and 3 demonstrate that this relationship can be explained by family background and individual demographics. Including a family-specific fixed effect, Head Start does not affect the probability that a young adult has health insurance.[16,17,18]

[15] Examining each category of self-reported health separately, Head Start participants are more likely to report good health and less likely to report very good health than individuals who did not attend any form of preschool. While self-reported health may be related to objective measures of health such as mortality (Mossey and Shapiro, 1982), because of the potential biases in this measure (Bound, 1991), the implications of individuals reporting their health as good compared to very good are unclear. Given the family backgrounds of Head Start participants and the relationship between low socioeconomic status and poor health, we focus on whether or not an individual reports their health in the lower two categories (fair and poor) of the self-reported scale.

[16] Head Start does affect the type of insurance that individuals obtain. Head Start participants are 11.8 percent less likely to have Medicaid insurance than individuals who did not attend preschool and 14.9 percent less likely than individuals who attended other forms of preschool. White Head Start participants are 20.1 percent and 21.9 percent less likely to have Medicaid insurance than other white individuals who did not attend preschool or who attended other forms of preschool, respectively. Black Head Start participants are 20.4 percent less likely to have Medicaid insurance than other black individuals who attended other forms of preschool; however this result is only statistically significant at the ten percent level. Black Head Start participants are also 20.5 percent more likely to

b. *Differential Effects According to the Year of Enrollment*

Although the broad goals for Head Start participants have remained consistent over time, the benefits of Head Start participation may vary across the life of the program. To evaluate the possibility that the effects of Head Start participation vary according to the year of enrollment, we include two additional variables in the fixed effects model: an interaction between Head Start participation and current age and an interaction between participation in other preschools and current age. The results are summarized in Table 4.

The relationship between Head Start participation and health does not vary according to an individual's age; however the relationship between participation in other preschools and health does. Individuals who attended other forms of preschool are more likely to engage in light exercise than individuals who did not attend preschool, although this benefit of early childhood education is smaller for individuals who attended preschool further in the past. Older individuals who attended other preschools are more likely to exercise heavily and less likely to be overweight than individuals who attended other preschools more recently, although both of these relationships are only significant at the 10 percent level.

c. *Differential Effects According to the Length of Participation*

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have employer-provided health insurance than other black individuals who did not attend preschool; this result is also only statistically significant at the ten percent level. There is no statistically significant relationship between Head Start participation and the likelihood that an individual has privately purchased health insurance or health insurance funded by government sources other than Medicaid. The decrease in Medicaid participation is driven by whites. However, there is not a corresponding increase in other forms of insurance for whites and white Head Start participants are not less likely to have health insurance. An explanation for these relationships between Head Start and insurance categories remains to be determined. These results are available from the authors upon request.

[17] The reported estimates in this section are robust to conditioning on the sample of individuals who were not disabled during childhood and, to capture the impact of any Head Start standards that vary by state, including a set of dummy variables that control for the state of residence at age 4.

[18] While not estimated as a measure of health, there is also the possibility of mortality benefits from Head Start participation that arise because of the associated increased immunization rates (Currie and Thomas, 1995) and reduction in crime (Garces, Thomas, and Currie, 2002). In the data sample, a comparison of mortality rates is not feasible because Head Start participation data are not collected until 1995, while health data are collected in 1999. This results in a sample size that is not large enough to analyze mortality. However, the potential that Head Start

Once children enroll in Head Start, they can remain in the program until kindergarten or first-grade, depending on the availability of these programs in their community, provided that the child continues to meet the Head Start eligibility criteria. The length of participation in Head Start can differ for children, and the difference in exposure to the program can affect the benefits received. For the entire sample of individuals who participated in Head Start, 7.5 percent attended the program for less than three months, 56.9 percent attended the program for three to eleven months, 24.7 percent attended the program for 12 to 23 months, and 10.9 percent attended the program for 24 or more months. For the sibling sample, these numbers change to 11.1 percent, 54.0 percent, 27.4 percent, and 7.5 percent, respectively.[19]

To determine if the variation in program exposure has an effect on the health outcomes of Head Start participation, we include a set of dummy variables in the fixed effects model that controls for the length of attendance in Head Start. Variables that measure participation for less than 3 months, from 12 to 23 months, and for 24 or more months are included; participation from 3 to 11 months is the reference category. These results are reported in Table 5. Similar variables that reflect the length of participation in other preschools are not available in the PSID.

The length of attendance in Head Start impacts the probability that an individual smokes cigarettes or has ever smoked cigarettes, but does not affect the probability that an individual engages in light or heavy exercise. An individual who attended Head Start for two years or more is 33.3 percent less likely to smoke cigarettes than an individual who was in the program for 3 to 11 months and 41 percent less likely to smoke than an individual who did not attend any form of preschool. A similar pattern is displayed for the probability that an individual has ever smoked cigarettes. An individual who attended Head Start for two years or more is 52.2 percent less

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participation reduced mortality provides further credibility that our estimates provide a lower bound of the true effect of Head Start on long-term health.

likely to have ever smoked cigarettes than an individual who was in the program for 3 to 11 months and 53.7 percent less likely to have ever smoked cigarettes than an individual who did not attend preschool.

Head Start participants who attended the program for two years or more are 32.7 percent more likely than participants enrolled in Head Start for 3 to 11 months to be overweight as young adults, although this relationship is significant only at the ten percent level. No other statistically significant effects are estimated for body composition, high blood pressure, self-reported health, or health insurance.

d. *Differential Effects Across Race*

Based on the results reported by Currie and Thomas (1995) and Garces, Thomas, and Currie (2002) that demonstrate a differential impact of Head Start participation for blacks and whites on educational and social outcomes, it is important to examine if the health benefits from Head Start participation differ by race. To estimate if there is a racial difference in the health effect of Head Start participation, we first include interaction terms in the fixed effects model between Head Start, other preschools, and a dummy variable that equals one if the individual is black. Second, we estimate the fixed effects model for each race separately. While the latter method estimates the potentially differential impact of Head Start participation by race with greater flexibility, the decrease in sample size reduces the precision of the estimates. The results of each method are reported in Table 6.

The relationship between Head Start participation and smoking does not vary according to race. Black participants in other preschools are 25.1 percent less likely to have ever smoked and 20.1 percent less likely to currently smoke than white participants in other preschools, although the latter relationship is only significant at the ten percent level. Further, white

[19] These figures are weighted by the PSID sample weights.

participants in other preschools are more likely to currently smoke than individuals who did not attend preschool, at the ten percent significance level. Examining the relationship between Head Start participation and smoking for blacks and whites separately, there is no statistically significant impact of early childhood education for either race. However, this may be the result of the decrease in sample size that accompanied the stratification of the sample by race.

The relationships between Head Start participation and the probability that an individual exercises (light or heavy), the probability that an individual is overweight, the probability that an individual has or has had high blood pressure, and the probability that an individual has health insurance do not vary by race, regardless of whether interaction terms are included in the model or separate models are estimated for each race. Whites who attended preschool other than Head Start are less likely to be overweight and more likely to have health insurance than whites who did not attend any preschool.

Black Head Start participants are 16.9 percent less likely than white Head Start participants to describe their health as fair or poor. Stratifying the sibling sample by race, there is no statistically significant relationship between Head Start participation and the probability that an individual reports fair or poor health for blacks. White Head Start participants are 11.4 percent more likely to report fair or poor health than whites who attended other forms of preschool, although this relationship is significant only at the ten percent level.

e. *The Benefits to Siblings of Early Childhood Education*

The benefits of Head Start participation may not be confined to the participants in the program. To examine if spillover effects occur, we interact the Head Start and other preschools variables with birth order and oldest child variables and add these interactions to the fixed effects model.

The results of these estimates for each health measure for both races together and separately are reported in Table 7.

Older siblings who attended Head Start are 22.9 percent more likely to smoke than their younger siblings and older, white siblings who attended Head Start are 64 percent less likely to have ever smoked cigarettes than their younger siblings, although both of these relationships are significant only at the ten percent level.

Younger siblings who participated in Head Start are six percent more likely than their older siblings to engage in the recommend amount of light exercise. This relationship is found for blacks but not whites and is significant only at the ten percent level. Similar relationships hold for the probability that an individual participates in heavy exercise, although these relationships are statistically significant at the five percent level.[20] As older siblings who attend Head Start interact socially with their peers and become for likely to play and exercise, younger siblings may become more active as they imitate and learn from their older siblings. Increased activity at a younger age is likely to encourage children to remain active and exercise as they age.

When the eldest sibling in a black family attended Head Start, these siblings are 76.5 percent more likely than their younger siblings to be overweight.[21] This suggests that the benefits of Head Start spill over from older siblings to younger siblings for body composition.[22] This spillover could result from increased parental education about child nutrition in the Head Start program. After the oldest child attends Head Start, this knowledge of nutrition provides a

[20] For blacks, this relationship is robust to a model specification with interactions between early childhood experiences and birth order only.

[21] This result also holds when only interactions between early childhood experiences and the oldest sibling variable are included.

[22] To further verify that this result is a spillover effect benefiting younger siblings, we estimate a model for overweight that includes interaction terms between early childhood education and a dummy variable indicating that

greater benefit to the younger siblings, who are the beneficiaries of the greater parental knowledge at an earlier stage in development. The lasting impact of improved child nutrition is a decrease in the likelihood of being overweight. All younger siblings benefit equally from this spillover since the coefficient on birth order is not statistically significant. This spillover effect explains why no statistically significant effect of Head Start participation is found when comparing sibling outcomes, even though nutrition is a large part of the health component of Head Start.

No spillover effects exist for the relationship between early childhood education and high blood pressure. In white families, the eldest child who attended Head Start is 27.9 percent less likely to report their health as fair or poor; however, this result is only significant at the ten percent level.

In black families, the eldest child who attended Head Start is 36.3 less likely to have health insurance.[23] No relationship exists for whites. Head Start programs work to ensure that a source of health care and funding is available for the participants. Staff members assist families in determining if the Head Start child is eligible for Medicaid, aid families in understanding the guidelines of the Medicaid program, and refer families to health professionals who accept Medicaid patients (Head Start Bureau, 2002). As parents learn about the available health insurance options and the benefits of health insurance, the children are likely to profit from this knowledge and the youngest child benefits the most.

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the individual is the youngest child. These interactions are negative and statistically significant at the ten percent level suggesting that older siblings do not benefit from the Head Start attendance of the youngest child.

[23] This result also holds when only interactions between early childhood experiences and the oldest sibling variable are included. Additional estimates demonstrate that older siblings in black families are more likely to have health insurance than the youngest sibling who attended Head Start, although this result is only significant at the 10 percent level. This suggests that this spillover benefit does flow from older siblings to younger siblings.

VI. Conclusion

The early childhood investment program Head Start affects the education and health of children who participate in the program. Prior research determined that the cognitive focus of the program resulted in sustained educational benefits. The predicted relationship between educational attainment and adult health, as well as the empirical literature that substantiates this claim, suggest that the cognitive investments of Head Start will translate into lasting health benefits for program participants. Prior research has found evidence that immunizations and physician visits increased among Head Start participants. If the investments in the health and nutrition of the child participants have a lasting effect on health, then the Head Start program can lead to sustained health benefits for program participants. As a result of the focus of Head Start on children from low-income families, health benefits from Head Start participation can reduce persistent socioeconomic health disparities.

To determine the long-term impact of Head Start participation, we estimated a fixed effects model of health outcomes and health practices. Our results demonstrated that Head Start changed health behavior. Participants are less likely to smoke cigarettes as adults than participants in other preschools but are not less likely to smoke than children who did not attend preschool. One explanation for this result is that the focus of Head Start on parental education mediates the effect of Head Start participation on smoking; parents learn about the risks of smoking and in turn influence the smoking behavior of all of their children. The comparison between a sibling who attended Head Start and one who did not would be biased downward if these parental spillovers are important. However, the spillover effect through parental education would not bias the comparison of a sibling who attended another preschool program and one who did not attend preschool if other preschool programs did not include parental education.

Therefore, the difference in behavior of a sibling who attended Head Start in comparison to one who did not attend and a sibling who attended another preschool program in comparison to one who did not attend provides a lower bound estimate of the true benefit of Head Start participation. The lower bound of the effect of Head Start participation on smoking is a large 17.4 percent reduction.

In 2000, smoking was the cause of 435,000 deaths, including mortality due to second hand smoking and maternal smoking (Mokdad *et al*., 2004). Cancer, cardiovascular disease, respiratory disease, and perinatal conditions contribute to smoking-attributable mortality (Center for Disease Control and Prevention, 2002). The estimated annual costs per smoker between 1995 and 1999 amounted to $3,391, which included excess medical expenditures and lost productivity (Center for Disease Control and Prevention, 2002). To demonstrate the importance of a 17.4 percent reduction in smoking, the present value of this effect of Head Start participation, assuming a 3 percent real discount rate, is $11,704 per each Head Start participant entering the program at four years of age in 2003.[24] Using a 7 percent real discount rate, the present value becomes $3,756. For 2003, the average cost of each Head Start participant was $7,092. The value of the reduction in smoking alone represents 53 to 165 percent of the costs per child.

Participation in Head Start benefits younger siblings, as well as participants in Head Start on other dimensions of health. Younger siblings of Head Start participants in black families are more likely to exercise heavily than older siblings who attended Head Start. Younger siblings of Head Start participants in white families are less likely to be overweight than the oldest sibling

[24] The economic costs are converted into 2003 dollars using the Consumer Price Index of all items for all urban consumers (current series). This assumes that the reduction in smoking begins at age 18 and lasts until death at age 70. This excludes any benefits associated with an increase in the length of life.

who attended Head Start. Poor diet and physical inactivity combine to form the second leading cause of mortality and were responsible for 400,000 deaths in 2000 (Mokdad *et al*., 2004).

Younger siblings of Head Start participants in black families are more likely to have health insurance than the oldest sibling who attended Head Start. Sixteen percent of individuals in the United States in 2003 were uninsured and 24 percent of people in households with an annual income of less than $25,000 were uninsured (DeNavas-Walt, Proctor, and Mills, 2004). Because low income individuals are less likely to have health insurance and Head Start targets children from low income families, Head Start provides a pathway for reducing socioeconomic disparities in health insurance coverage. Health insurance encourages individuals to seek medical care by lowering the associated cost of preventive and curative care and can lead to improved health by increasing the consumption of an important input in health production.

Head Start is associated with health benefits that are likely to persist throughout the participants' life. As the participants age into their later years, information will become available about adult health conditions, including the development of various diseases and mortality. In the future, we will be able to better understand if attending a comprehensive early childhood development program, such as Head Start, can reduce the socioeconomic disparities in health.

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Table 1: Descriptive Statistics: Sample Means and Standard Errors

Variable	Entire Sample	Head Start	Preschool	Neither	Sibling Sample	Head Start	Preschool	Neither
Program Participation								
Head Start	0.070	1.000	0.034	0.000	0.074	1.000	0.037	0.000
	(0.007)		(0.009)		(0.010)		(0.014)	
Other Preschool	0.293	0.144	1.000	0.000	0.279	0.141	1.000	0.000
	(0.014)	(0.035)			(0.018)	(0.049)		
Overall Indicators of Health								
Fair or Poor Health	0.048	0.104	0.018	0.056	0.039	0.078	0.015	0.044
	(0.006)	(0.032)	(0.007)	(0.009)	(0.007)	(0.030)	(0.010)	(0.010)
Overweight	0.489	0.614	0.380	0.525	0.487	0.593	0.396	0.515
	(0.015)	(0.050)	(0.028)	(0.019)	(0.020)	(0.067)	(0.038)	(0.025)
High Blood Pressure	0.076	0.128	0.081	0.071	0.077	0.158	0.084	0.069
	(0.008)	(0.038)	(0.016)	(0.009)	(0.011)	(0.057)	(0.022)	(0.012)
Health Insurance	0.864	0.773	0.890	0.861	0.866	0.780	0.907	0.856
	(0.010)	(0.046)	(0.018)	(0.013)	(0.013)	(0.060)	(0.021)	(0.017)
Adult Health Behaviors								
Smoke Cigarettes	0.251	0.245	0.227	0.263	0.249	0.239	0.218	0.262
	(0.013)	(0.040)	(0.024)	(0.016)	(0.017)	(0.053)	(0.032)	(0.021)
Ever Smoked Cigarettes	0.444	0.471	0.390	0.464	0.427	0.497	0.377	0.439
	(0.015)	(0.052)	(0.028)	(0.019)	(0.020)	(0.070)	(0.038)	(0.024)
Light Exercise	0.547	0.442	0.532	0.563	0.545	0.500	0.499	0.566
	(0.015)	(0.052)	(0.029)	(0.019)	(0.020)	(0.071)	(0.039)	(0.024)
Heavy Exercise	0.403	0.359	0.421	0.398	0.403	0.359	0.432	0.395
	(0.015)	(0.049)	(0.028)	(0.018)	(0.020)	(0.064)	(0.038)	(0.024)
Demographics								
Age	28.609	27.744	27.716	29.090	28.625	27.569	28.255	28.911
	(0.124)	(0.521)	(0.211)	(0.155)	(0.153)	(0.695)	(0.268)	(0.187)
Female	0.531	0.599	0.560	0.512	0.522	0.607	0.525	0.511
	(0.015)	(0.052)	(0.028)	(0.019)	(0.020)	(0.069)	(0.039)	(0.024)
Black	0.120	0.657	0.114	0.072	0.101	0.570	0.097	0.057
	(0.008)	(0.050)	(0.016)	(0.007)	(0.010)	(0.069)	(0.022)	(0.007)
Married	0.549	0.316	0.475	0.603	0.552	0.351	0.474	0.605
	(0.015)	(0.047)	(0.029)	(0.018)	(0.020)	(0.064)	(0.039)	(0.024)
Urban	0.550	0.506	0.589	0.537	0.544	0.572	0.568	0.532
	(0.013)	(0.047)	(0.023)	(0.016)	(0.017)	(0.064)	(0.032)	(0.021)
Rural	0.022	0.005	0.021	0.025	0.026	0.004	0.028	0.028
	(0.003)	(0.001)	(0.006)	(0.005)	(0.005)	(0.001)	(0.010)	(0.006)
Birth Order	2.456	4.021	2.073	2.478	2.511	4.604	2.180	2.449
	(0.057)	(0.426)	(0.085)	(0.062)	(0.076)	(0.571)	(0.125)	(0.074)
Oldest	0.324	0.209	0.390	0.307	0.276	0.130	0.306	0.278
	(0.014)	(0.036)	(0.027)	(0.017)	(0.018)	(0.037)	(0.035)	(0.022)
Family Background								
Family Income (000s)	50.819	28.232	59.668	48.990	51.082	29.953	62.912	48.111
	(0.948)	(1.642)	(2.177)	(1.013)	(1.312)	(1.924)	(3.492)	(1.217)
Family Size	4.797	6.247	4.367	4.852	5.030	6.971	4.567	5.036
	(0.051)	(0.402)	(0.081)	(0.054)	(0.070)	(0.565)	(0.116)	(0.063)
Father Not Present	0.159	0.434	0.167	0.130	0.138	0.372	0.151	0.112
	(0.011)	(0.051)	(0.021)	(0.012)	(0.013)	(0.063)	(0.027)	(0.015)
Mother's Education	12.150	10.598	13.102	11.874	12.238	10.627	13.188	11.997
	(0.065)	(0.225)	(0.120)	(0.074)	(0.084)	(0.291)	(0.167)	(0.092)
Father's Education	12.659	11.573	13.883	12.222	12.740	11.459	14.090	12.312
	(0.081)	(0.162)	(0.144)	(0.099)	(0.105)	(0.234)	(0.201)	(0.123)
Childhood Health								
Low Birth-weight Baby	0.076	0.080	0.068	0.078	0.072	0.071	0.065	0.074
	(0.008)	(0.030)	(0.013)	(0.010)	(0.010)	(0.031)	(0.017)	(0.012)
Disabled	0.045	0.033	0.036	0.050	0.043	0.013	0.043	0.046
	(0.006)	(0.014)	(0.011)	(0.009)	(0.008)	(0.008)	(0.016)	(0.011)
Sample Size	2397	325	572	1542	984	135	252	615

Notes: Standard errors in parentheses. The means and standard errors are weighted by the PSID sample weights to be representative of the national population. The entire sample is the sample of black and white individuals ages 18 through 35 who were interviewed in 1995 and 1999 in the PSID that provided information about their early childhood education experience and at least one measure of health. The sibling sample is the subset of individuals within the entire sample who have at least one sibling in the sample. The Head Start, preschool, and neither samples subsets of individuals within the entire sample and the sibling sample who participated in Head Start; nursery school, a preschool program, or day care center besides Head Start; or none of the above, respectively.

Table 2: The Relationship between Head Start Participation and Health Behaviors

	(1)	(2)	(3)	(4)
SMOKE CIGARETTES				
Head Start	-0.010	-0.024	-0.081	-0.124*
	(0.026)	(0.032)	(0.050)	(0.075)
Other Preschool	-0.027	-0.011	-0.029	0.049
	(0.021)	(0.022)	(0.033)	(0.051)
Difference (HS-PS)	0.017	-0.013	-0.053	-0.174**
	(0.031)	(0.037)	(0.058)	(0.088)
Sample Size	2397	2397	984	984
EVER SMOKED CIGARETTES				
Head Start	-0.061**	-0.025	-0.061	-0.096
	(0.028)	(0.034)	(0.053)	(0.085)
Other Preschool	-0.034	-0.020	-0.057	-0.006
	(0.025)	(0.027)	(0.040)	(0.057)
Difference (HS-PS)	-0.027	-0.006	-0.004	-0.090
	(0.036)	(0.042)	(0.066)	(0.100)
Sample Size	2396	2396	984	984
LIGHT EXERCISE				
Head Start	-0.071**	-0.101***	-0.058	-0.039
	(0.030)	(0.037)	(0.057)	(0.098)
Other Preschool	-0.010	-0.039	-0.055	-0.056
	(0.024)	(0.027)	(0.039)	(0.066)
Difference (HS-PS)	-0.062*	-0.062	-0.003	0.017
	(0.037)	(0.045)	(0.068)	(0.115)
Sample Size	2390	2390	980	980
HEAVY EXERCISE				
Head Start	-0.048	-0.009	0.022	0.068
	(0.030)	(0.037)	(0.059)	(0.091)
Other Preschool	0.043*	0.015	0.008	0.038
	(0.025)	(0.028)	(0.041)	(0.062)
Difference (HS-PS)	-0.091**	-0.024	0.014	0.031
	(0.037)	(0.045)	(0.069)	(0.107)
Sample Size	2384	2384	979	979
Control Variables	No	Yes	Yes	Yes
Fixed Effects	No	No	No	Yes
Sample	Entire Sample		Sibling Sample	

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. Control variables include age, gender, race, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to 1966.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 3: The Relationship between Head Start Participation and Overall Indicators of Health

	(1)	(2)	(3)	(4)
OVERWEIGHT				
Head Start	0.103***	0.041	0.017	-0.045
	(0.029)	(0.035)	(0.055)	(0.083)
Other Preschool	-0.079***	-0.034	-0.053	-0.089
	(0.025)	(0.028)	(0.042)	(0.056)
Difference (HS-PS)	0.186***	0.075*	0.070	0.045
	(0.036)	(0.042)	(0.067)	(0.097)
Sample Size	2362	2362	972	972
HIGH BLOOD PRESSURE				
Head Start	0.020	0.013	0.048	0.062
	(0.018)	(0.022)	(0.041)	(0.052)
Other Preschool	-0.010	0.004	0.017	0.049
	(0.013)	(0.015)	(0.025)	(0.035)
Difference (HS-PS)	0.030	0.010	0.031	0.013
	(0.021)	(0.025)	(0.043)	(0.061)
Sample Size	2397	2397	984	984
FAIR OR POOR SELF-REPORTED HEALTH				
Head Start	0.022	-0.009	-0.008	-0.003
	(0.016)	(0.018)	(0.028)	(0.043)
Other Preschool	-0.028***	-0.020*	-0.043***	-0.045
	(0.010)	(0.011)	(0.013)	(0.029)
Difference (HS-PS)	0 .050***	0.011	0.036	0.041
	(0.017)	(0.021)	(0.032)	(0.050)
Sample Size	2397	2397	984	984
HEALTH INSURANCE				
Head Start	-0.101***	-0.001	0.073	0.026
	(0.027)	(0.032)	(0.047)	(0.064)
Other Preschool	0.027	0.015	0.019	0.079*
	(0.017)	(0.018)	(0.029)	(0.043)
Difference (HS-PS)	-0.129***	-0.016	0.054	-0.054
	(0.030)	(0.036)	(0.055)	(0.075)
Sample Size	2397	2397	984	984
Control Variables	No	Yes	Yes	Yes
Fixed Effects	No	No	No	Yes
Sample	Entire Sample		Sibling Sample	

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. Control variables include age, gender, race, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to 1966.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 4: The Importance of the Year of Enrollment in the Relationship between Head Start Participation and Health

	SMOKE CIGARETTES	EVER SMOKED CIGARETTES	LIGHT EXERCISE	HEAVY EXERCISE	OVERWEIGHT	HIGH BLOOD PRESSURE	FAIR OR POOR SELF-REPORTED HEALTH	HEALTH INSURANCE
Head Start	-0.028	-0.076	-0.309	-0.171	-0.347	0.005	0.126	-0.004
	(0.455)	(0.516)	(0.591)	(0.550)	(0.496)	(0.315)	(0.257)	(0.385)
Head Start x Age	-0.003	-0.001	0.010	0.009	0.011	0.002	-0.005	0.001
	(0.017)	(0.019)	(0.022)	(0.020)	(0.018)	(0.011)	(0.009)	(0.014)
Other Preschool	0.519	-0.011	1.240***	-0.698	0.634*	0.089	0.184	-0.237
	(0.345)	(0.392)	(0.448)	(0.424)	(0.384)	(0.239)	(0.195)	(0.292)
Other Preschool x Age	-0.017	0.000	-0.047***	0.027*	-0.026*	-0.001	-0.008	0.012
	(0.013)	(0.014)	(0.016)	(0.015)	(0.014)	(0.009)	(0.007)	(0.011)
Sample Size	984	984	980	979	972	984	984	984

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. Estimates include a mother-specific fixed effect and control variables that include age, gender, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to 1966.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 5: The Importance of Length of Attendance in the Relationship between Head Start Participation and Health

	SMOKE CIGARETTES	EVER SMOKED CIGARETTES	LIGHT EXERCISE	HEAVY EXERCISE	OVERWEIGHT	HIGH BLOOD PRESSURE	FAIR OR POOR SELF-REPORTED HEALTH	HEALTH INSURANCE
Head Start	-0.077	-0.015	-0.036	-0.015	-0.153	0.069	0.000	0.008
	(0.090)	(0.102)	(0.120)	(0.110)	(0.099)	(0.062)	(0.052)	(0.076)
Time in Head Start: 0-3 months	-0.120	-0.426	0.282	0.184	0.386	0.173	-0.011	0.116
	(0.250)	(0.283)	(0.332)	(0.306)	(0.274)	(0.174)	(0.144)	(0.212)
Time in Head Start: 12-23 months	0.014	-0.018	-0.061	0.134	0.203	0.088	0.001	0.01
	(0.121)	(0.138)	(0.164)	(0.149)	(0.133)	(0.084)	(0.070)	(0.103)
Time in Head Start: 24+ months	-0.333**	-0.522***	0.184	0.098	0.327*	0.022	-0.067	-0.129
	(0.165)	(0.187)	(0.220)	(0.203)	(0.181)	(0.115)	(0.095)	(0.140)
Other Preschool	0.052	0.004	-0.062	0.032	-0.096*	0.037	-0.044	0.078*
	(0.050)	(0.057)	(0.067)	(0.062)	(0.056)	(0.035)	(0.029)	(0.043)
Sample Size	974	974	970	969	962	974	974	974

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. The reference category for time in Head Start is 3 to 11 months. Estimates include a mother-specific fixed effect and control variables that include age, gender, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 6: Racial Differences in the Relationship between Head Start Participation and Health

HEALTH BEHAVIORS

	SMOKE CIGARETTES			EVER SMOKED			LIGHT EXERCISE			HEAVY EXERCISE		
	Interaction	Black	White	Interaction	Black	White	Interaction	Black	White	Interaction	Black	White
Head Start	-0.171	-0.012	-0.138	-0.045	-0.036	-0.029	0.000	-0.065	-0.050	0.11	0.111	0.078
	(0.122)	(0.095)	(0.133)	(0.138)	(0.106)	(0.155)	(0.160)	(0.125)	(0.178)	(0.148)	(0.110)	(0.168)
Head Start x Black	0.059			-0.090			-0.062			-0.066		
	(0.144)			(0.163)			(0.189)			(0.175)		
Other Preschool	0.108*	0.017	0.081	0.065	-0.071	0.054	-0.043	-0.053	-0.069	0.050	0.044	0.024
	(0.059)	(0.098)	(0.060)	(0.067)	(0.109)	(0.070)	(0.078)	(0.129)	(0.080)	(0.072)	(0.118)	(0.076)
Other Preschool x Black	-0.201*			-0.251**			-0.049			-0.050		
	(0.109)			(0.124)			(0.145)			(0.138)		
Difference (HS-PS)		-0.029	-0.219		0.035	-0.083		-0.012	0.019		0.067	0.053
		(0.126)	(0.146)		(0.140)	(0.170)		(0.165)	(0.195)		(0.147)	(0.183)
Sample Size	984	282	702	984	282	702	980	280	700	979	279	700

OVERALL INDICATORS OF HEALTH

	OVERWEIGHT			HIGH BLOOD PRESSURE			FAIR OR POOR SELF-REPORTED HEALTH			HEALTH INSURANCE		
	Interaction	Black	White	Interaction	Black	White	Interaction	Black	White	Interaction	Black	White
Head Start	0.062	-0.188	0.052	0.104	0.006	0.133	0.108	-0.074	0.091	0.074	0.05	0.027
	(0.133)	(0.114)	(0.141)	(0.085)	(0.070)	(0.091)	(0.069)	(0.077)	(0.062)	(0.103)	(0.096)	(0.104)
Head Start x Black	-0.153			-0.064			-0.169**			-0.077		
	(0.157)			(0.099)			(0.081)			(0.122)		
Other Preschool	-0.129*	-0.064	-0.134**	0.059	0.036	0.062	-0.035	-0.125	-0.023	0.106**	0.021	0.099**
	(0.066)	(0.124)	(0.065)	(0.041)	(0.072)	(0.041)	(0.034)	(0.080)	(0.028)	(0.050)	(0.100)	(0.047)
Other Preschool x Black	0.135			-0.036			-0.041			-0.096		
	(0.124)			(0.076)			(0.062)			(0.093)		
Difference (HS-PS)		-0.124	0.185		-0.030	0.071		0.051	0.114*		0.029	-0.071
		(0.155)	(0.155)		(0.093)	(0.099)		(0.103)	(0.068)		(0.128)	(0.114)
Sample Size	972	279	693	984	282	702	984	282	702	984	282	702

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. Estimates include a mother-specific fixed effect and control variables that include age, gender, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to 1966.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table 7: Sibling Spillovers in the Relationship between Head Start Participation and Health

HEALTH BEHAVIORS

	SMOKE CIGARETTES			EVER SMOKED			LIGHT EXERCISE			HEAVY EXERCISE		
	Both Races	Black	White	Both Races	Black	White	Both Races	Black	White	Both Races	Black	White
Head Start	-0.213*	-0.097	0.021	-0.064	-0.086	0.550	-0.304*	-0.378*	-0.097	-0.224	-0.260	-0.368
	(0.128)	(0.158)	(0.311)	(0.146)	(0.177)	(0.363)	(0.169)	(0.209)	(0.417)	(0.155)	(0.175)	(0.392)
Head Start x Birth Order	0.016	0.013	-0.022	-0.017	0.003	-0.156	0.065*	0.067*	0.021	0.070**	0.085**	0.131
	(0.026)	(0.030)	(0.084)	(0.030)	(0.034)	(0.098)	(0.035)	(0.039)	(0.113)	(0.032)	(0.033)	(0.106)
Head Start x Oldest	0.229*	0.293	-0.419	0.131	0.234	-0.640*	0.263	0.369	0.036	0.169	0.269	0.267
	(0.137)	(0.178)	(0.331)	(0.156)	(0.200)	(0.386)	(0.183)	(0.235)	(0.445)	(0.166)	(0.199)	(0.417)
Other Preschool	0.066	-0.111	0.127	0.036	-0.020	-0.056	-0.117	-0.012	-0.258	0.127	0.358*	0.065
	(0.104)	(0.175)	(0.164)	(0.119)	(0.198)	(0.191)	(0.137)	(0.231)	(0.220)	(0.126)	(0.198)	(0.207)
Other Preschool x Birth Order	-0.004	0.023	-0.002	-0.020	-0.023	0.044	0.023	-0.010	0.080	-0.038	-0.064	-0.029
	(0.031)	(0.039)	(0.058)	(0.036)	(0.044)	(0.067)	(0.041)	(0.052)	(0.078)	(0.038)	(0.044)	(0.073)
Other Preschool x Oldest	-0.050	0.298	-0.140	0.009	0.119	0.058	0.023	0.007	0.044	0.036	-0.600**	0.096
	(0.095)	(0.217)	(0.124)	(0.108)	(0.244)	(0.144)	(0.124)	(0.285)	(0.166)	(0.115)	(0.245)	(0.156)
Sample Size	984	282	702	984	282	702	980	280	700	979	279	700

OVERALL INDICATORS OF HEALTH

	OVERWEIGHT			HIGH BLOOD PRESSURE			FAIR OR POOR SELF-REPORTED HEALTH			HEALTH INSURANCE		
	Both Races	Black	White	Both Races	Black	White	Both Races	Black	White	Both Races	Black	White
Head Start	-0.007	-0.168	-0.202	0.057	-0.059	0.316	0.003	-0.126	0.272*	0.073	0.127	0.195
	(0.141)	(0.192)	(0.329)	(0.089)	(0.117)	(0.212)	(0.073)	(0.130)	(0.145)	(0.109)	(0.160)	(0.243)
Head Start x Birth Order	-0.018	-0.011	0.040	0.005	0.018	-0.053	-0.002	0.009	-0.043	-0.012	-0.006	-0.069
	(0.029)	(0.037)	(0.090)	(0.018)	(0.022)	(0.058)	(0.015)	(0.025)	(0.039)	(0.022)	(0.030)	(0.066)
Head Start x Oldest	0.135	0.156	0.765**	-0.042	-0.023	-0.140	-0.052	0.035	-0.279*	0.004	-0.363**	0.161
	(0.151)	(0.217)	(0.350)	(0.095)	(0.133)	(0.226)	(0.078)	(0.147)	(0.154)	(0.117)	(0.180)	(0.259)
Other Preschool	-0.128	-0.196	-0.176	0.078	0.019	0.129	0.026	-0.015	-0.047	0.037	-0.096	0.058
	(0.115)	(0.221)	(0.176)	(0.072)	(0.131)	(0.112)	(0.059)	(0.145)	(0.076)	(0.089)	(0.178)	(0.128)
Other Preschool x Birth Order	0.013	0.019	0.019	-0.002	0.009	-0.016	-0.026	-0.034	0.011	0.014	0.036	0.014
	(0.035)	(0.048)	(0.063)	(0.022)	(0.029)	(0.039)	(0.018)	(0.032)	(0.027)	(0.027)	(0.040)	(0.045)
Other Preschool x Oldest	0.005	0.397	-0.028	-0.095	-0.041	-0.118	-0.025	0.022	0.008	0.02	0.038	0.016
	(0.105)	(0.269)	(0.133)	(0.065)	(0.162)	(0.084)	(0.054)	(0.179)	(0.057)	(0.080)	(0.220)	(0.096)
Sample Size	972	279	693	984	282	702	984	282	702	984	282	702

Notes: Standard errors (in parentheses) allow for household clustering and heteroskedasticity in ordinary least squares regressions. Estimates include a mother-specific fixed effect and control variables that include age, gender, marital status, whether the individual lives in an urban or rural community, birth order, whether the individual is the oldest child, average total family income between ages 3 through 6, the mother's and father's average years of formal schooling completed between ages 3 through 6, the average family size between ages 3 through 6, whether the father was present between ages 3 through 6, whether the individual was a low-birth-weight baby, disability status, whether a Head Start participant was born prior to 1966, and whether a participant of other preschool was born prior to 1966.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

APPENDIX

Table A1: Smoke Cigarettes

Complete Results of the Specifications in Table 2

	(1)	(2)	(3)	(4)
Head Start	-0.010	-0.024	-0.081	-0.124*
	(0.026)	(0.032)	(0.050)	(0.075)
Other Preschool	-0.027	-0.011	-0.029	0.049
	(0.021)	(0.022)	(0.033)	(0.051)
Head Start Before 1996		0.065	0.009	0.113
		(0.065)	(0.096)	(0.123)
Other Preschool Before 1996		-0.013	0.081	0.057
		(0.051)	(0.091)	(0.121)
Age		0.001	0.003	0.001
		(0.003)	(0.004)	(0.013)
Female		-0.032*	-0.059**	-0.033
		(0.017)	(0.028)	(0.036)
Black		-0.114***	-0.099**	
		(0.027)	(0.046)	
Married		-0.136***	-0.148***	-0.078**
		(0.020)	(0.028)	(0.037)
Urban		-0.062***	-0.044	-0.014
		(0.023)	(0.036)	(0.056)
Rural		-0.009	0.057	0.138
		(0.070)	(0.130)	(0.159)
Birth Order		0.008	-0.001	0.001
		(0.008)	(0.012)	(0.035)
Oldest		-0.012	-0.054	-0.064
		(0.025)	(0.034)	(0.042)
Family Income (ln)		-0.037	-0.031	-0.045
		(0.023)	(0.035)	(0.080)
Family Size		-0.005	-0.008	-0.036
		(0.009)	(0.015)	(0.035)
Father Not Present		-0.004	-0.055	-0.032
		(0.036)	(0.044)	(0.083)
Mother's Education		-0.011*	-0.011	-0.019
		(0.006)	(0.009)	(0.031)
Father's Education		-0.007	-0.020**	-0.034
		(0.005)	(0.008)	(0.024)
Low Birth-weight Baby		-0.021	-0.106**	-0.001
		(0.040)	(0.049)	(0.074)
Disabled		0.013	-0.067	-0.123
		(0.052)	(0.079)	(0.090)
Constant	0.254***	0.734***	0.911***	1.246
	(0.012)	(0.121)	(0.174)	(0.804)
Difference (HS-PS)	0.017	-0.013	-0.052	-0.174
	(0.031)	(0.037)	(0.058)	(0.088)
N	2397	2397	984	984
R-squared	0.00	0.05	0.10	0.06

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A2: Ever Smoke Cigarettes

Complete Results of the Specifications in Table 2

	(1)	(2)	(3)	(4)
Head Start	-0.061**	-0.025	-0.061	-0.096
	(0.028)	(0.034)	(0.053)	(0.085)
Other Preschool	-0.034	-0.020	-0.058	-0.006
	(0.025)	(0.027)	(0.040)	(0.057)
Head Start Before 1996		0.101	0.112	0.272*
		(0.071)	(0.109)	(0.140)
Other Preschool Before 1996		-0.016	0.104	0.055
		(0.064)	(0.105)	(0.137)
Age		0.002	0.002	0.000
		(0.003)	(0.005)	(0.015)
Female		-0.026	-0.035	-0.059
		(0.019)	(0.031)	(0.041)
Black		-0.208***	-0.198***	
		(0.030)	(0.050)	
Married		-0.154***	-0.143***	-0.072*
		(0.022)	(0.032)	(0.042)
Urban		-0.053**	-0.03	0.016
		(0.025)	(0.038)	(0.063)
Rural		-0.063	0.051	0.217
		(0.074)	(0.122)	(0.181)
Birth Order		0.013	-0.006	0.002
		(0.009)	(0.014)	(0.039)
Oldest		-0.026	-0.103***	-0.091*
		(0.028)	(0.039)	(0.048)
Family Income (ln)		-0.001	0.002	-0.091
		(0.026)	(0.038)	(0.091)
Family Size		-0.013	-0.006	-0.007
		(0.010)	(0.017)	(0.040)
Father Not Present		-0.071*	-0.098*	-0.076
		(0.040)	(0.052)	(0.095)
Mother's Education		-0.016**	-0.012	-0.001
		(0.007)	(0.010)	(0.036)
Father's Education		-0.013**	-0.025***	-0.045*
		(0.006)	(0.008)	(0.027)
Low Birth-weight Baby		-0.087*	-0.102*	0.014
		(0.044)	(0.061)	(0.084)
Disabled		-0.006	0.005	-0.020
		(0.055)	(0.085)	(0.102)
Constant	0.416***	0.932***	1.052***	1.417
	(0.014)	(0.132)	(0.183)	(0.912)
Difference (HS-PS)	-0.027	-0.005	-0.003	-0.090
	(0.036)	(0.042)	(0.066)	(0.100)
N	2396	2396	984	984
R-squared	0.00	0.07	0.09	0.06

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A3: Light Exercise

Complete Results of the Specifications in Table 2

	(1)	(2)	(3)	(4)
Head Start	-0.071**	-0.101***	-0.058	-0.039
	(0.030)	(0.037)	(0.057)	(0.098)
Other Preschool	-0.010	-0.040	-0.056	-0.056
	(0.024)	(0.027)	(0.039)	(0.066)
Head Start Before 1996		0.071	-0.033	-0.039
		(0.068)	(0.121)	(0.163)
Other Preschool Before 1996		0.134**	0.027	-0.022
		(0.065)	(0.118)	(0.161)
Age		-0.008***	-0.002	-0.003
		(0.003)	(0.004)	(0.017)
Female		-0.012	-0.032	0.015
		(0.019)	(0.032)	(0.048)
Black		-0.042	-0.060	
		(0.031)	(0.051)	
Married		-0.077***	-0.096***	-0.069
		(0.024)	(0.033)	(0.049)
Urban		0.009	-0.003	0.078
		(0.025)	(0.036)	(0.073)
Rural		0.118	0.126	-0.017
		(0.084)	(0.106)	(0.208)
Birth Order		0.000	-0.007	-0.030
		(0.010)	(0.014)	(0.045)
Oldest		-0.055*	-0.051	-0.069
		(0.030)	(0.043)	(0.055)
Family Income (ln)		-0.016	-0.041	-0.038
		(0.027)	(0.036)	(0.106)
Family Size		-0.008	-0.004	-0.013
		(0.010)	(0.016)	(0.046)
Father Not Present		-0.029	0.011	0.098
		(0.040)	(0.054)	(0.111)
Mother's Education		-0.007	-0.001	0.054
		(0.007)	(0.009)	(0.041)
Father's Education		-0.003	-0.006	-0.039
		(0.006)	(0.008)	(0.032)
Low Birth-weight Baby		0.019	0.038	-0.012
		(0.051)	(0.070)	(0.097)
Disabled		0.047	0.099	0.12
		(0.057)	(0.084)	(0.118)
Constant	0.546***	1.056***	0.967***	0.656
	(0.014)	(0.127)	(0.185)	(1.055)
Difference (HS-PS)	-0.062*	-0.061	-0.002	0.017
	(0.037)	(0.045)	(0.068)	(0.115)
N	2390	2390	980	980
R-squared	0.00	0.02	0.04	0.04

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A4: Heavy Exercise

Complete Results of the Specifications in Table 2

	(1)	(2)	(3)	(4)
Head Start	-0.048	-0.009	0.022	0.068
	(0.030)	(0.037)	(0.059)	(0.091)
Other Preschool	0.043*	0.015	0.008	0.038
	(0.025)	(0.028)	(0.041)	(0.062)
Head Start Before 1996		-0.032	0.051	0.145
		(0.066)	(0.122)	(0.151)
Other Preschool Before 1996		0.065	-0.02	-0.012
		(0.066)	(0.110)	(0.149)
Age		-0.001	0.002	0.007
		(0.003)	(0.004)	(0.016)
Female		-0.098***	-0.111***	-0.115***
		(0.021)	(0.033)	(0.044)
Black		-0.047	-0.038	
		(0.030)	(0.052)	
Married		-0.060***	-0.088**	-0.055
		(0.022)	(0.035)	(0.045)
Urban		-0.007	-0.027	0.094
		(0.025)	(0.039)	(0.067)
Rural		0.083	0.087	-0.148
		(0.091)	(0.113)	(0.200)
Birth Order		0.003	-0.004	-0.022
		(0.010)	(0.014)	(0.042)
Oldest		0.027	0.009	-0.023
		(0.029)	(0.041)	(0.051)
Family Income (ln)		-0.020	-0.007	0.152
		(0.027)	(0.040)	(0.099)
Family Size		0.007	0.003	0.010
		(0.010)	(0.016)	(0.043)
Father Not Present		-0.010	0.048	-0.034
		(0.039)	(0.056)	(0.102)
Mother's Education		0.015**	0.017*	0.028
		(0.007)	(0.010)	(0.038)
Father's Education		0.003	-0.001	-0.048
		(0.006)	(0.008)	(0.030)
Low Birth-weight Baby		0.024	0.028	0.004
		(0.049)	(0.072)	(0.090)
Disabled		-0.087	-0.099	0.038
		(0.053)	(0.077)	(0.109)
Constant	0.373***	0.336**	0.289	-0.058
	(0.013)	(0.143)	(0.212)	(0.983)
Difference (HS-PS)	-0.091**	-0.024	0.014	0.031
	(0.037)	(0.045)	(0.069)	(0.107)
N	2384	2384	979	979
R-squared	0.00	0.03	0.04	0.05

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A5: Overweight

Complete Results of the Specifications in Table 3

	(1)	(2)	(3)	(4)
Head Start	0.103***	0.041	0.016	-0.045
	(0.029)	(0.035)	(0.055)	(0.083)
Other Preschool	-0.079***	-0.034	-0.053	-0.089
	(0.025)	(0.028)	(0.042)	(0.056)
Head Start Before 1996		-0.083	-0.237**	-0.152
		(0.073)	(0.108)	(0.137)
Other Preschool Before 1996		0.074	0.132	-0.039
		(0.061)	(0.092)	(0.139)
Age		0.006**	0.010**	0.018
		(0.003)	(0.005)	(0.014)
Female		-0.190***	-0.172***	-0.190***
		(0.021)	(0.034)	(0.040)
Black		0.154***	0.145***	
		(0.031)	(0.051)	
Married		0.049**	0.055	0.018
		(0.023)	(0.034)	(0.041)
Urban		-0.014	-0.012	-0.068
		(0.024)	(0.038)	(0.061)
Rural		0.023	-0.080	0.019
		(0.066)	(0.102)	(0.174)
Birth Order		-0.013	-0.015	0.037
		(0.010)	(0.014)	(0.039)
Oldest		0.022	0.023	0.039
		(0.029)	(0.038)	(0.046)
Family Income (ln)		-0.058**	-0.085**	-0.032
		(0.028)	(0.042)	(0.089)
Family Size		0.017*	0.012	-0.060
		(0.010)	(0.015)	(0.039)
Father Not Present		-0.053	-0.082	-0.052
		(0.041)	(0.057)	(0.092)
Mother's Education		-0.010	-0.018	-0.002
		(0.007)	(0.011)	(0.034)
Father's Education		-0.003	-0.002	0.024
		(0.006)	(0.009)	(0.026)
Low Birth-weight Baby		-0.046	-0.033	0.010
		(0.048)	(0.059)	(0.081)
Disabled		0.056	0.027	0.173*
		(0.056)	(0.075)	(0.101)
Constant	0.521	0.709***	0.816***	0.260
	(0.013)	(0.139)	(0.212)	(0.888)
Difference (HS-PS)	0.186***	0.075*	0.069	0.045
	(0.036)	(0.042)	(0.067)	(0.097)
N	2362	2362	972	972
R-squared	0.01	0.08	0.10	0.11

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A6: High Blood Pressure

Complete Results of the Specifications in Table 3

	(1)	(2)	(3)	(4)
Head Start	0.020	0.013	0.048	0.062
	(0.018)	(0.022)	(0.041)	(0.052)
Other Preschool	-0.010	0.004	0.017	0.049
	(0.013)	(0.015)	(0.025)	(0.035)
Head Start Before 1996		-0.023	-0.054	-0.043
		(0.044)	(0.073)	(0.085)
Other Preschool Before 1996		-0.054**	-0.071	-0.081
		(0.025)	(0.056)	(0.084)
Age		0.003	0.005*	0.005
		(0.002)	(0.003)	(0.009)
Female		-0.012	0.001	-0.016
		(0.012)	(0.018)	(0.025)
Black		0.020	0.002	
		(0.017)	(0.031)	
Married		-0.012	-0.023	-0.022
		(0.012)	(0.017)	(0.026)
Urban		-0.009	-0.007	0.046
		(0.014)	(0.022)	(0.038)
Rural		-0.063***	-0.034	-0.102
		(0.023)	(0.044)	(0.110)
Birth Order		0.003	0.000	0.013
		(0.006)	(0.008)	(0.024)
Oldest		0.026	0.010	0.049*
		(0.017)	(0.025)	(0.029)
Family Income (ln)		0.030**	0.027	0.010
		(0.015)	(0.022)	(0.055)
Family Size		-0.003	-0.005	-0.009
		(0.005)	(0.007)	(0.024)
Father Not Present		0.038	0.024	0.077
		(0.025)	(0.034)	(0.058)
Mother's Education		-0.004	-0.002	0.022
		(0.004)	(0.005)	(0.022)
Father's Education		-0.005*	-0.007*	-0.021
		(0.003)	(0.004)	(0.017)
Low Birth-weight Baby		0.004	0.023	0.074
		(0.028)	(0.041)	(0.051)
Disabled		0.081*	0.097	0.093
		(0.043)	(0.065)	(0.062)
Constant	0.077***	0.000	-0.023	-0.126
	(0.007)	(0.074)	(0.110)	(0.556)
Difference (HS-PS)	0.030	0.010	0.031	0.013
	(0.021)	(0.025)	(0.043)	(0.061)
N	2397	2397	984	984
R-squared	0.00	0.02	0.03	0.05

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A7: Fair or Poor Health

Complete Results of the Specifications in Table 3

	(1)	(2)	(3)	(4)
Head Start	0.022	-0.009	-0.008	-0.003
	(0.016)	(0.018)	(0.028)	(0.043)
Other Preschool	-0.028***	-0.020*	-0.044***	-0.045
	(0.010)	(0.011)	(0.013)	(0.029)
Head Start Before 1996		0.011	0.024	0.123*
		(0.041)	(0.077)	(0.070)
Other Preschool Before 1996		0.012	0.031	-0.02
		(0.026)	(0.047)	(0.069)
Age		-0.001	0.001	-0.004
		(0.001)	(0.002)	(0.007)
Female		0.012	0.018	0.016
		(0.010)	(0.013)	(0.020)
Black		0.019	0.023	
		(0.014)	(0.023)	
Married		-0.029***	-0.021	-0.002
		(0.011)	(0.015)	(0.021)
Urban		-0.017	0.015	-0.018
		(0.011)	(0.015)	(0.031)
Rural		-0.053**	-0.041***	0.028
		(0.024)	(0.014)	(0.090)
Birth Order		0.004	-0.019**	-0.018
		(0.007)	(0.009)	(0.020)
Oldest		0.005	-0.014	-0.015
		(0.014)	(0.019)	(0.024)
Family Income (ln)		-0.016	-0.015	-0.008
		(0.013)	(0.016)	(0.045)
Family Size		0.001	0.017*	-0.011
		(0.007)	(0.009)	(0.020)
Father Not Present		0.026	0.019	-0.017
		(0.020)	(0.026)	(0.047)
Mother's Education		0.001	0.001	0.018
		(0.003)	(0.003)	(0.018)
Father's Education		-0.005**	-0.002	0.011
		(0.002)	(0.003)	(0.014)
Low Birth-weight Baby		-0.039**	-0.020	-0.010
		(0.018)	(0.025)	(0.042)
Disabled		0.109**	0.085	0.079
		(0.043)	(0.059)	(0.051)
Constant	0.064***	0.180***	0.051	-0.013
	(0.006)	(0.069)	(0.082)	(0.455)
Difference (HS-PS)	0.050***	0.011	0.036	0.041
	(0.017)	(0.021)	(0.032)	(0.050)
N	2397	2397	984	984
R-squared	0.00	0.03	0.06	0.04

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A8: Health Insurance

Complete Results of the Specifications in Table 3

	(1)	(2)	(3)	(4)
Head Start	-0.101***	-0.001	0.073	0.026
	(0.027)	(0.032)	(0.047)	(0.064)
Other Preschool	0.027	0.015	0.019	0.079*
	(0.017)	(0.018)	(0.029)	(0.043)
Head Start Before 1996		-0.075	-0.094	0.093
		(0.058)	(0.090)	(0.104)
Other Preschool Before 1996		-0.009	0.016	-0.063
		(0.034)	(0.050)	(0.103)
Age		0.006***	0.006*	-0.015
		(0.002)	(0.003)	(0.011)
Female		0.045***	0.036	0.033
		(0.014)	(0.023)	(0.031)
Black		-0.045*	-0.016	
		(0.025)	(0.044)	
Married		0.115***	0.106***	0.137***
		(0.017)	(0.024)	(0.031)
Urban		0.023	0.013	0.011
		(0.019)	(0.029)	(0.047)
Rural		-0.09	-0.199*	0.126
		(0.069)	(0.104)	(0.135)
Birth Order		-0.007	-0.015	-0.062**
		(0.008)	(0.011)	(0.029)
Oldest		0.021	0.014	0.038
		(0.022)	(0.028)	(0.035)
Family Income (ln)		0.078***	0.096***	0.079
		(0.023)	(0.034)	(0.068)
Family Size		0.001	0	-0.001
		(0.008)	(0.011)	(0.030)
Father Not Present		-0.039	-0.048	0.096
		(0.033)	(0.044)	(0.071)
Mother's Education		0.008	0.009	0.046*
		(0.006)	(0.008)	(0.027)
Father's Education		0.003	0.002	-0.021
		(0.004)	(0.006)	(0.021)
Low Birth-weight Baby		-0.008	0.024	0.081
		(0.034)	(0.044)	(0.062)
Disabled		0.009	0.031	0.032
		(0.044)	(0.059)	(0.076)
Constant	0.858***	0.178	0.14	0.645
	(0.010)	(0.113)	(0.167)	(0.681)
Difference (HS-PS)	-0.129***	-0.016	0.054	-0.054
	(0.030)	(0.036)	(0.055)	(0.075)
N	2397	2397	984	984
R-squared	0.01	0.10	0.11	0.09

* significant at 10%; ** significant at 5%; *** significant at 1%