The Influence of Low-Income Children's Participation in Head Start on Their Parents' Education and Employment

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Abstract

Head Start is the oldest and largest federally funded preschool program in the United States. From its inception in 1965, Head Start not only provided early childhood education, care, and services for children, but also sought to promote parents' success. However, almost all evaluation studies of Head Start have focused solely on children's cognitive and social outcomes rather than on parents' outcomes. The present study examines whether children's participation in Head Start promotes parents' educational advancement and employment. We use data from the Head Start Impact Study (HSIS), a randomized trial of over 4,000 newly entering three- and four-year-old children. We find that parents of children in the three-year-old cohort (but not the four-year-old cohort), who were randomly assigned to and participated in Head Start, had steeper increases in their own educational attainment by child age six years compared to parents of children in the control group. This pattern is especially strong for parents who had at least some college experience at baseline, as well as for African-American parents. We do not find evidence that Head Start helped parents enter or return to the workforce over time. Results are discussed in the context of using high-quality early childhood education as a platform for improving both child and parent outcomes. © *2014 by the Association for Public Policy Analysis and Management.*

INTRODUCTION

Head Start is the oldest and largest federally funded preschool program in the United States, currently serving more than 1 million children with almost $8 billion appropriated annually. Established in 1965 during the Civil rights era and President Lyndon B. Johnson's War on Poverty, Head Start was designed to promote low-income, preschool-aged children's early school success in the hopes of reducing social disparities over time. The current program provides comprehensive services to economically disadvantaged families, including early childhood education; medical, dental, and mental health care; nutrition counseling; and family support services (Vinovskis, 2008; Zigler & Valentine, 1979).

From its inception, Head Start not only provided early childhood education, care, and services for children, but also sought to promote parents' engagement in their children's schooling, foster their childrearing skills, and improve their own educational progress (Zigler & Styfco, 2004; Zigler & Valentine, 1979). However, almost all evaluation studies of Head Start have focused solely on children's cognitive and social outcomes rather than on parent outcomes (for an exception see Gelber & Isen, 2013). The present study examines whether children's participation in Head

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Start promotes parent well-being, in particular, parents' educational advancement and employment.

We capitalize on the Head Start Impact Study (HSIS), a randomized trial of over 4,000 newly entering three- and four-year-old children that followed them through the third grade. This study was mandated by Congress in 1998 and has resulted in the most ambitious evaluation of the program to date. We examine the effect of being offered access to Head Start as well as the effect of receipt of Head Start services on parents' education and employment. We also examine whether the strength of the findings varies for certain subgroups, defined by parent age, race and ethnicity, income, and household structure.

Our results indicate that among the three-year-old cohort, parents whose children were randomly assigned to and participated in Head Start had steeper increases in their own educational attainment by child age six years compared to parents of children in the control group. This pattern is especially strong for parents who had at least some college experience at baseline, as well as for African-American parents. Access to or participation in Head Start did not lead to changes in parents' employment status.

BACKGROUND

Low-income parents with young children have markedly low levels of education in the United States, with over 70 percent having no more than a high school degree (Addy & Wight, 2012). Over the past several decades, parents have demonstrated an increased interest in pursuing postsecondary education, with the proportion of undergraduates who are parents rising from 20 to 27 percent (Horn & Carroll, 1996; National Center for Education Statistics [NCES], 2002). At the same time, 68 percent of student parents who were admitted to higher education institutions delayed their enrollment (compared to 47.9 percent for nonparent students) and 64 percent attended college part-time (compared to 47.9 percent), both of which reduce the chances that student parents will persist and attain postsecondary degrees (NCES, 2002). In addition, there has been a dramatic rise in low-income maternal employment in recent decades due in large part to welfare reform and to the work requirements through the expansion of the Earned Income Tax Credits (EITCs; Haskins, 2006). However, many of these mothers struggle with balancing employment and family responsibilities, given barriers, such as nonstandard work hours, low wages, and inadequate care arrangements, for their children (Dunifon, Kalil, & Bajracharya, 2005).

Promoting low-income parents' education and employment is an important outcome in and of itself for improving the financial well-being of economically disadvantaged families. However, advances in parents' education and employment may also foster children's learning over the long-term. Parents' level of education is strongly and consistently related to children's development (Davis-Kean, 2005; Hart & Risley, 1995; Magnuson, 2007). For example, a study by Sastry and Pebley (2012) found that mothers' schooling and literacy skills were the strongest predictors of inequality in achievement among children ages 3 to 17, controlling for family income and neighborhood factors. Parents with higher levels of education tend to spend more time interacting with their children and better tailoring this time to suit the developmental needs of their children, especially when compared to parents with lower levels of education (Guryan, Hurst, & Kearney, 2008; Kalil, Ryan, & Corey, 2012). Results from the National Longitudinal Study of Youth (NLSY) suggest additional schooling completed by mothers with low-levels of education was associated with an increase in the cognitive stimulation in the home environment and improved academic achievement among young children (Magnuson, 2007).

In addition, low-income parents' employment when children are of preschool age has few negative associations with children's development and can also be positive for low-income children if family income increases substantially (Chase-Lansdale et al., 2003; Coley & Lombardi, 2013; Duncan, Huston, & Weisner, 2007; Goldberg et al., 2008). Mothers' employment during infancy, particularly in middle-income families, has been linked to children's negative cognitive and social development (Brooks-Gunn, Han, & Waldfogel, 2010). However, Coley and Lombardi (2013) found that maternal employment within two years of a child's birth was associated with positive academic and socio-emotional development in elementary school among urban, low-income, predominately African-American and Hispanic families.

Additional education and better employment opportunities may lead to improved financial stability over the long-term (Yoshikawa, Aber, & Beardslee, 2012). Increases in family income early in children's lives plays an important role in their later well-being (Duncan & Brooks-Gunn, 1997; Duncan et al., 1998). Yet, low-income parents typically face strong barriers to advancing their educational levels or staying in or entering the workforce. These may include difficult prior experiences in school, low levels of school success, challenges in balancing work, family and school demands, and lack of access to affordable, quality child care and education (Waldfogel, 2006).

Head Start programs may provide the ideal context for supporting parents' education and employment (Chase-Lansdale & Brooks-Gunn, 2014; Crosnoe & Kalil, 2010; Domina & Roksa, 2012; Sommer et al., 2012). We propose the following three theories to support this idea. The first is resource allocation theory that addresses how families change their allocation of time in response to resources and investments (Becker, 1991; Foster, 2002). Head Start, a publicly supported preschool, provides subsidized child care for low-income families. This form of public investment could allow parents to reallocate their time in a number of ways, including staying at home with other children, increasing their leisure time, or entering or returning to school or the workforce. Head Start also may help parents manage their work–school–family balance by providing an affordable, safe place to send their children while they go to work or school (Waldfogel, 2006).

A second key theory is social capital theory that posits that the social, informational, and material resources that families receive through their social networks may be critical components in helping them reach their education and employment goals (Coleman, 1988; Sommer et al., 2012). In early childhood education settings, parents who work together on shared goals can experience reduced economic hardship and increased mental health (Small, 2009). In the 1960s, founders of Head Start incorporated this perspective into the original design of the program by creating a "community action program" that fostered parents' social and human capital in order to promote children's life success (Vinovskis, 2008). Currently, Head Start takes a whole family approach that (1) offers leadership opportunities to parents, families, and whole communities; (2) promotes parent engagement in their children's school; (3) provides opportunities for parents to meet each other and participate in activities together; (4) strengthens parent–child relationships through parenting classes and workshops; and (5) provides information and access to postsecondary educational opportunities (Zigler & Styfco, 2004). By experiencing these opportunities within a trusted community of teachers, support staff, and other parents, parents may become more motivated to persist in their own education and employment goals (Chase-Lansdale & Brooks-Gunn, 2014).

The third framework—which draws from ecological and transactional theories from developmental science—hypothesizes more complex, bidirectional processes among families whose children attend Head Start (Bronfenbrenner & Morris, 1998; Sameroff & Rosenblum, 2006). These theories emphasize the interconnectedness between parents' and children's learning, where children's participation in Head

Start may inspire parents to heighten opportunities at home and to raise their educational expectations for themselves. Parents who observe their children thriving in Head Start may also be more motivated to succeed in their own educational pursuits and career goals. Fostering children's learning in early education contexts may encourage parents to strengthen their role-modeling to support their children's learning. This in turn may raise parents' educational expectations for themselves and advance their own education and employment (Chase-Lansdale & Brooks-Gunn, 2014; Sommer et al., 2012).

These three theories suggest that Head Start may promote parents' education as well as allow parents to remain or enter into the workforce, and there is some supportive evidence along these lines. In terms of resource allocation, time use diary studies suggest that access to child care increases parents' time to earn income or return to school (Folbre, 2006). Child-care subsidies and availability of public schooling have been associated with increases in maternal employment. Using a sophisticated quasi-experimental design-based children's date of birth and age cutoffs for school entry, Gelbach (2002) found an association between children's enrollment in public kindergarten and mothers' increases in employment. Thus, Head Start may provide the key work support to allow parents to enter or remain in school or the workforce.

Head Start may help parents reallocate their time in more child-oriented ways. Gelber and Isen (2013) found that randomized access to Head Start led to increased parental investment in their own children's education, such as reading to children more often, or participating in joint math activities. These results suggest that Head Start does not substitute for parental inputs, but actually helps parents redistribute their time to help support their children's development.

In terms of social capital theory, Head Start programs may provide key opportunities for parents to develop social ties. Small (2009) conducted a study of Head Start programs in New York City and found that early childhood education centers provided parents with a trusting and safe environment to develop connections and relationships with other parents. These relationships allowed parents to share key resources with one another, such as information on health care or employment opportunities. The postsecondary development literature also suggests that informal peer support helps parents persist in education and training programs. For example, the National Study of Student Support Services conducted at two- and four-year colleges found that students who participated in more hours of peer counselling were more likely to persist in school and attained higher grade point averages (Bettinger & Baker, 2011; Brock, 2010; Muraskin, 1997; Purnell & Blank, 2004). Therefore, parents' connections with their peers may help them meet their educational goals.

There is extensive evidence on the developmental systems framework demonstrating the many ways that children affect their parents' behavior (Bronfenbrenner & Morris, 1998; Dworsky & Courtney, 2007; Olson & Pavetti, 1996). For instance, children's mental health problems or behavioral issues can act as a barrier to parents' employment, particularly among economically disadvantaged families (Coley, Ribar, & Votruba-Drzal, 2011; Corman, Noonan, & Reichman, 2005; Dworsky & Courtney, 2007). There has been very little evidence on the positive impacts of children's learning on parents' learning. However, a recent qualitative study of 51 parents of children in three high-quality early childhood education centers demonstrated that the majority of parents believed that postsecondary education was essential in today's economy and wanted to improve their own human capital in order to be better role models for their children (Sommer et al., 2012).

An opposing hypothesis is that low-income parents experiencing material hardship may have high levels of stress that could interfere with their educational advancement. Parents' psychological distress is linked to prolonged welfare receipt, intermittent or low levels of employment, and inadequate parenting, and may also

put parents at-risk for not achieving their educational goals (Linver, Brooks-Gunn, & Kohen, 2002). As a result, Head Start's supportive elements may not be enough to help parents advance their human capital.

In addition, Head Start often only provides half-day care and education, with the majority of children spending fewer than 35 hours per week in Head Start. The hours that children are in Head Start may not be enough to offset the demands of attending school or entering the workforce while raising young children, especially if parents' school or work schedules do not align with children's school schedules. The short school day offered by Head Start may make it particularly difficult for parents to enter the workforce given the nonstandard or inflexible work hours of many low-wage jobs (Johnson, Kalil, & Dunifon, 2012).

The short duration of Head Start, particularly for newly entering four-year-olds who only receive one year of services, may not be sufficient to help parents meet their school or employment goals. In the present study, we examine the effect of Head Start among newly entering three-year-olds separately from newly entering four-year-olds to test the hypothesis that parents may need more years to reap the benefits of the supportive elements in Head Start.

In addition, the support services offered by Head Start may be better tailored to promote parents' education than employment. Head Start has historically focused on the importance of both parent and child learning. Center staff, including family support services, often provide services that directly help parents become better education-oriented role models for their children, such as helping parents gain access to literacy classes or GED prep work. We hypothesize that the combination of services provided at Head Start may be especially effective at helping parents advance their own education, more so than their employment.

Overall, there is very little understanding as to whether Head Start supports parents' human capital development. Past evaluations have almost exclusively focused on Head Start's impact on child outcomes, with mostly positive effects (e.g., Currie & Thomas, 1995; Deming, 2009; Ludwig & Phillips, 2007; U.S. Department of Health and Human Services [HHS], 2010a; Zhai, Brooks-Gunn, & Waldfogel, 2013). Results from a recent meta-analysis of Head Start, including the HSIS as well as numerous other experimental and quasi-experimental studies, suggest that Head Start is moderately effective in improving children's short-term, with mixed evidence on longer-term outcomes (Nathan, 2007; Shager et al., 2013). However, by not examining Head Start's impact on parent outcomes, researchers and policymakers may have missed a key adult outcome and a promising factor for children's long-term success.

One of the main reasons this topic may have not been studied before is the difficulty in actually testing a causal relationship between children's participation in early childhood education programs and parent outcomes. When studying the effectiveness of early childhood education on child outcomes, researchers must address a number of selection issues. For example, parents with more education and higher motivation may send their children to higher quality early education programs than do peers with lower levels of education and motivation. The same issues apply when examining the effect of early childhood education participation on parental education. Children's participation in Head Start may be related to numerous factors, including genetic predispositions shared with parents, stimulating home environments, and school quality, all of which could be linked with both children's participation in Head Start and parents' educational levels.

The proposed study employs data from the HSIS, which randomly assigned children to Head Start or to a control group. A unique aspect of the current study's design is that it uses the exogenous variation generated by random assignment as an instrument to examine the influence of children's learning on parents' increases in education up to three years after children are enrolled in the study. This instrumental variable strategy has demonstrated promise in advancing

developmental science and identifying the pathways by which intervention effects occur (Duncan, Ziol-Guest, & Kalil, 2010; Gennetian, Magnuson, & Morris, 2008). The present study will provide insight into the influence between children's and parents' education and employment.

METHOD

Data

The HSIS, funded by the U.S. Department of HHS, used a multistage sampling process to construct the nationally representative sample of oversubscribed Head Start programs. The study first randomly selected 84 agencies and then randomly selected 383 Head Start centers within the agencies.[1] At each of the selected centers, first-time Head Start applicants who were determined to be eligible for Head Start services were randomly assigned either to the Head Start group or to a control group for the 2002 to 2003 school year.[2] The Head Start treatment group was allowed to enroll in Head Start, while the control group was not granted access to Head Start in those centers for one year. The study examined two separate cohorts of children—newly entering three- and four-year-olds—to test the hypothesis that program impacts may differ by age of entry into Head Start. Both cohorts started in the fall of 2002. The three-year-old cohort had the opportunity to attend Head Start for two years, whereas the four-year-old cohort only attended Head Start for one year. Data were collected in fall 2002 (baseline) and each spring until the child was in first grade (2006 for the three-year-old cohort; 2005 for the four-year-old cohort; see Appendix Table A1).[3]

The original HSIS sample included 4,442 children, with 2,449 in the three-year-old cohort and 1,993 children in the four-year-old cohort. In the present study, our analytic sample only includes families in which the biological or adoptive mother or father completed a parent/primary caregiver survey at baseline (fall 2002). In fall 2002, 865 (19 percent) children were missing a parent/caregiver survey. In addition, 141 parent/caregiver surveys were filled out by someone other than the adoptive or biological parent (with the largest proportion being grandparents or

[1] The HSIS used a multistage sampling process. In the first stage, the study randomly selected a sample from the 1,715 grantee agencies nationwide, stratified by region of the country, urban or rural location, race or ethnicity of children served, and variation in state prekindergarten and child-care policies. The study then randomly selected Head Start centers within each agency based on the same characteristics used to select the grantees or agencies. Children were only eligible for the HSIS if they were eligible for Head Start services. As a result, the study only includes Head Start eligible children (and noneligible children and parents were not interviewed or assessed). The study does not represent Head Start programs serving special populations, such as tribal Head Start programs, programs serving migrant and seasonal farm workers, or Early Head Start.

[2] At each of the selected Head Start centers, children were randomly selected to have access to Head Start versus randomly selected to not have access to Head Start using a lottery-like process. Only oversubscribed centers were included in this process. Therefore, the study does not represent the 15 percent of Head Start programs in which the pool of applicants for Head Start slots was too small to allow for an adequate control group. A report on the first year findings on the HSIS (U.S. Department Health and Human Services, 2005) indicated that there were differences between agencies and centers that were oversubscribed and agencies/centers that were not. Undersubscribed grantee agencies were smaller, more likely to be school-based, and had fewer Hispanic children attending their programs. Undersubscribed centers were smaller, had fewer Hispanic children, and had a larger percentage of first year three-year-olds compared to oversubscribed centers.

[3] All appendices are available at the end of this article as it appears in JPAM online. Go to the publisher's Web site and use the search engine to locate the article at http://www3.interscience.wiley.com/cgi-bin/jhome/34787.

great-grandparents; $n = 80$) and were excluded from the study. Therefore, our analytic sample is comprised 3,436 children.[4]

Among the 3,436 children in the analytic sample, 1,203 children were randomly selected to have access to Head Start and 701 were in the control group (total = 1,904) in the three-year-old cohort. In the four-year-old cohort, 958 children were selected for the Head Start group and 574 children were in the control group (total = 1,532).[5] The three-year-old cohort control group was allowed to enroll in Head Start the following year. In our analytic sample, 47 percent of the three-year-old control group attended Head Start when they were four-years-old. Two-thirds of the children in the treatment group of the three-year-old cohort attended Head Start for two years. As such, the comparison between the treatment and control, in some sense, captures both age of entry impacts, as well as effect of attending two years of Head Start versus one. Further detail on the study can be found in the Head Start Final Report (Puma et al., 2012; U.S. Department of HHS, 2010a, 2010b).

Measures

The HSIS conducted in-person parent interviews in the home with the primary caregiver, who was almost always the mother, at every wave. In some cases, the respondent changed in subsequent waves from the baseline respondent. The new respondent was asked to respond to a set of questions about the biological or adoptive mother and father, which we used for the analysis.[6]

Primary Outcome Measures

The primary outcome for the present study was parents' change in education. Parents were asked about the highest grade or year of school that they had completed with response values ranging from 1 to 14. The 14 response options were: (1) up to eighth grade, (2) 9th to 11th grade, (3) 12th grade no diploma, (4) high school diploma, (5) GED, (6) vocational/technical program but no diploma, (7) vocational/technical diploma, (8) some college but no degree, (9) associate's degree, (10) bachelor's degree, (11) graduate or professional school but no degree, (12) master's degree, (13) doctorate degree, and (14) professional degree (e.g., MD/JD). We subtracted time 1 (fall 2002) from later time points (i.e., spring 2003, spring 2004, spring 2005, and spring 2006) to determine how parents increased their education over time. We also created a binary variable for whether the participants increased the level of education they had at baseline (fall 2002) at a later point in time, which is our main variable of interest. We also created an indicator to determine whether a parent attained a degree or certificate over time based on four distinct education

[4] Children in the analytic sample ($n = 3,436$) differed from excluded children ($n = 221$) on several child-level characteristics. *t*-Test comparisons indicated that there were fewer African-American children (34 percent vs. 30 percent), more Latino children (39 percent vs. 33 percent), more children who spoke Spanish at home (32 percent vs. 25 percent), and fewer children with special needs (12 percent vs. 15 percent) in the analytic sample compared to the excluded sample. The samples did not differ based on age, gender, or achievement at baseline. We control for all of these characteristics in our analyses. We could not compare parent-level characteristics because they were missing for most of the children in the excluded group.

[5] The imbalance in the numbers of children in the treatment and control groups was an intentional aspect of the study design in order to decrease the cost of data collection. This method only reduces the precision of the impact estimates by less than 2 percent (compared to a balanced design) while decreasing cost of data collection (U.S. Department of Health and Human Services, 2010a).

[6] The percentage of cases with a different respondent ranged from 9.7 percent (fall 2002 to spring 2003) to 20.2 percent (fall 2002 to spring 2006 for the three-year-old cohort).

degree levels: "No degree," "High school diploma or GED," "Technical certificate or Associates degree," and "Bachelor's degree and above." We then created a binary variable for whether the participant attained a new degree over time.

For each baseline education subgroup, we created a variable to indicate whether parents attained a new degree/certificate attainment over time. The education subgroup variables were determined if parents moved from (1) less than a high school degree/GED at baseline to receiving a high school degree; (2) high school degree/GED at baseline to attaining a technical certificate, associate's degree, bachelor's degree, or above; and (3) some college at baseline to attaining a technical certificate, associate's degree, bachelor's degree, or above at a later time point.

A subset of responses across time demonstrated measurement error indicating that parents' educational attainment decreased over time. About 9 percent of cases decreased in the level of education from fall 2002 to spring 2005, and about 15 percent of the cases decreased from fall 2002 to spring 2006. We followed the procedures from the NLSY to address this type of error and created a revised set of degree attainment variables.[7] The revised level of educational attainment is used in all of the analyses.

Parents' employment status was also treated as an outcome. At each wave, parents were asked about how they spent their time in the last week with the following response options: (1) working full-time (35 hours or more per week), (2) working part-time, (3) looking for work, (4) laid off from work, (5) in school/training, (6) jail or prison, (7) military, (8) keeping house, or (9) something else. Parents were coded as "employed" if they were working full-time, part-time, or in the military. Parents were coded as "not employed" if they were looking for work, laid off from work, in jail/prison, or keeping house. It was unclear if the parent had a job if he or she responded *being in school or training* ($n = 250$; 7 percent of sample), *something else* ($n = 66$; 2 percent), or if employment status was missing ($n = 14$; <1 percent). For our main analysis, we treated all of these cases as missing ($n = 330$). At baseline, 1,413 parents were not working (756 in the three-year-old cohort and 657 in the four-year-old cohort). We created a binary variable indicating whether the parent moved from not working at baseline to working at a later time point (yes = 1). For example, if a parent was not working in fall 2002 and was working in spring 2003, they would be coded as 1 (yes).

Background Characteristics and Covariates

All covariates were measured at baseline and included parent age, number of adults who contributed to household income, number of children under age 18 living in the household, whether the family lived in an urban or nonurban area, whether the family spoke Spanish in the home, whether both biological parents lived in the home, parents' relationship to the child (e.g., 1 = father, 0 = mother), race/ethnicity (e.g., Latino = 1, non-Latino = 0), country of birth (USA = 1, non-USA = 0), marital status (1 = married; 0 = not married), whether the mother gave birth to child as a teenager (≤19 = 1, >19 = 0), and number of weeks elapsed between baseline (fall 2002) and the parent interview at each wave of data collection. Children's

[7] For the most part, cases with grade reversals were coded as the highest grade previously reported by the respondent. The only exception was that if one year of education was followed by two or more consecutive years of education that were lower, then we changed the first year to equal the following two years. For all levels of education, there was no more than a 2 percent difference between the original education values and the re-coded values. For example, originally 33 percent of parents had less than a high school degree at baseline. After recoding, 35 percent of parents had less than a high school degree at baseline.

characteristics included age, gender, and language they were tested in at baseline (1 = Spanish or other language, 0 = English). We also created a set of variables to indicate if the respondent of parents' education and employment changed across waves.

We also created a set of binary variables based on parent and family characteristics for our subgroup analysis. These included whether the parent was in (1) the top age quartile (>32 years old), (2) had three or more children, (3) two or more adults contributed to the household income, or (4) the bottom income quartile (≤$700 per month).

Sample Characteristics

Table 1 displays the baseline descriptive statistics for the main variables and baseline education levels and employment status. Due to Head Start eligibility requirements, all of the families had incomes below the poverty line or received public assistance, such as temporary assistance for needy families (TANF) or supplemental security income (SSI). Over half of the families in our study received food stamps. Almost all of the parents were mothers; only 4 percent of our sample were fathers. Parents were approximately 29-years-old at baseline (SD = 6). Our sample was evenly split across three racial or ethnic groups (i.e., white/other, African American, Latino). Around one-fourth of the families spoke Spanish in the home and one fourth of the parents were not born in the United States. On average, each household had two adults (SD = 1) and approximately three children (SD = 1) under 18 living in the home. Approximately 45 percent of parents were not working at baseline. Similar to the original HSIS ($n = 4,442$), our analytic sample ($n = 3,436$) was balanced between the control group and the treatment group by child age cohort on all baseline parent and child characteristics presented in Table 1.

There were notable differences between parents in the three- and four-year-old cohorts. Parents in the three-year-old cohort had higher levels of educational attainment at baseline than parents in the four-year-old cohort, primarily in the first three subgroups: less than a high school degree (33 percent vs. 41 percent), high school or GED completion (36 percent vs. 32 percent), and some college but no degree (21 percent vs. 15 percent). The two cohorts were similar in the technical certification (7 percent vs. 7 percent) and bachelor's degrees (3 percent vs. 5 percent). In addition, there were more African-American parents (34 percent vs. 25 percent) and fewer Latino parents (32 percent vs. 40 percent) in the three-year-old cohort compared to the four-year-old cohort. Families in the three-year-old cohort had also lower income compared to the four-year-old cohort (monthly income $1363 vs. $1488).

Analytic Method

To examine the effect of Head Start on parent education and employment, we closely replicated the analytic strategies used in the HSIS Final Report, which focused on child outcomes, led by the U.S. Department of HHS (2010a). We estimate our analysis using two different approaches, intent-to-treat (ITT) and treatment-on-the-treated (TOT), which mirrors the HSIS analytic approach. We also conduct all analyses for the three- and four-year-old cohorts separately. Our main difference from the HSIS approach is that we examine parent education and employment instead of gains in child outcomes. Accordingly, our sample only includes families in which the biological or adoptive mother or father completed a parent/primary caregiver survey at baseline ($n = 3,436$), which is slightly less than the HSIS ($n = 4,442$).

We capitalize on the randomization in the HSIS to investigate the impact of Head Start on parents' educational advances and employment status. The randomized

Table 1. Descriptive statistics for children in the HSIS at baseline (fall 2002), by age cohort.

	Three-year-old cohort			Four-year-old cohort		
Baseline variable	*N*	Unweighted M(SD)	Weighted M(SD)	*N*	Unweighted M(SD)	Weighted M(SD)
Treatment assignment						
Assigned to Head Start (pct)	1,904	63.183	51.667	1,532	62.532	51.312
Parent characteristics						
Relationship to child	1,904			1,532		
Mother (pct)		95.641	95.649		95.497	95.732
Father (pct)		4.359	4.351		4.503	4.268
Age	1,896	28.613 (6.168)	28.694 (6.010)	1,522	29.494 (6.285)	29.561 (6.203)
Race	1,904			1,532		
White (pct)		31.775	33.985		36.366	34.874
African American (pct)		35.714	34.194		21.671	25.062
Latino (pct)		32.511	31.820		41.971	40.064
Not born in USA (pct)	1,904	25.892	26.471	1,532	37.924	36.806
Education degree (pct)	1,904			1,532		
Less than high school		35.242	33.480		42.754	40.429
High school or GED		36.029	35.642		31.397	32.596
Some college no degree		18.382	20.692		15.201	15.497
Technical certificate or Associate's degree		6.995	7.076		6.403	6.822
Bachelors or more		3.352	3.110		4.245	4.656
Not employed (pct)	1,713	44.134	43.471	1,393	47.165	45.567
Family and household characteristics						
Speak Spanish in home (pct)	1,904	27.521	28.003	1,532	35.906	35.297
Bio parents live in home (pct)	1,904	50.840	52.783	1,532	52.937	53.589
Married (pct)	1,904	43.697	46.222	1,532	47.127	46.163
Mother gave birth as teenager (pct)	1,904	14.915	14.243	1,532	17.03	15.777
Number of children	1,895	2.622 (1.298)	2.612 (1.262)	1,525	2.670 (1.291)	2.658 (1.274)
Number of adults	1,894	2.061 (0.996)	2.078 (0.976)	1,525	2.149 (1.037)	2.173 (1.058)
Number of adults contribute to income	1,875	1.620 (0.778)	1.652 (0.82)	1,510	1.611 (0.769)	1.641 (0.822)
Income per month	1,703	1,329.787 (942.744)	1,363.314 (936.111)	1,370	1,433.826 (974.651)	1,488.155 (1,056.162)
Income subsidies						
TANF (pct)	1,885	9.389	9.572	1,525	11.606	11.484
SSI (pct)	1,887	11.711	11.122	1,524	9.777	10.359
Food stamps (pct)	1,892	50.951	47.443	1,525	44.393	42.695
Lives in urban area		82.615	80.298		85.509	83.730
Child characteristics						
Female (pct)	1,904	51.365	52.074	1,532	49.151	49.587
Age	1,899	3.526 (0.331)	3.513 (0.325)	1,531	4.414 (0.354)	4.407 (0.360)
Race	1,904			1,532		
White (pct)		29.831	31.975		33.746	32.682
African American (pct)		35.924	34.068		21.606	24.839
Latino (pct)		34.244	33.956		44.647	42.478

Table 1. Continued.

Baseline variable	Three-year-old cohort			Four-year-old cohort		
	N	Unweighted M(SD)	Weighted M(SD)	*N*	Unweighted M(SD)	Weighted M(SD)
Special needs (pct)	1,904	11.40	11.606	1,532	13.381	11.795
Type of child care	1,904			1,532		
Center (pct)		11.171	14.282		19.712	20.409
Home based (pct)		7.563	9.359		5.221	5.944
Parent care (pct)		18.750	20.897		17.820	22.019
Head Start (pct)		57.668	51.516		52.937	46.320

Notes: Cell entries are unimputed mean values at baseline (fall 2002) by cohort with standard deviations listed in parentheses below the mean when appropriate. The child-level fall 2002 weight was used for the weighted values.

design ensures that families in the treatment group and control group are similar on all observed and unobserved characteristics saved for the fact that the treatment group was allowed to participate in Head Start and the control group was not.

We first compare individuals according to whether they were offered treatment, also known as ITT. The ITT estimates only tell us about the effect of offering treatment, not of Head Start participation per se. Yet, the random assignment to Head Start treatment did not result in complete compliance. Ten percent of the three-year-olds ($n = 124$) and 14 percent of the four-year-olds ($n = 137$) were assigned to the Head Start group but did not participate in Head Start. Similarly, 14 percent of three-year-olds ($n = 100$) and 12 percent of the four-year-olds ($n = 71$) who were assigned to the control group actually attended Head Start. The most common reason for noncompliance in the control group was that parents applied and received admittance to another nearby Head Start program that was not oversubscribed and thus were not participating in the HSIS.

Similar to the HSIS, we employ an instrumental variable approach to address the compliance problem and estimate a TOT effect. The instrumental variable method estimates the local average treatment effect of Head Start by comparing the effect on parents whose children were randomly assigned to treatment and attended Head Start to those who were randomly assigned to the control group and did not attend Head Start. The TOT estimate is calculated by dividing the ITT coefficient by the first stage estimate of assignment on Head Start participation from the two-stage instrumental variable analysis, or in other words, the difference in compliance rates between treatment and control groups based upon their treatment assignment (Angrist & Pischke, 2008; Gennetian, Magnuson, & Morris, 2008).[8]

[8] The TOT rescales the original ITT estimate by the difference in noncompliance (no-shows and crossovers) between the treatment and the control group. This method is built on the assumption that no impact occurs for parents whose children did not attend Head Start even though they were assigned (no-shows) since they were never exposed to the intervention, which typically is a valid assumption (see Bloom, 1984, 2005). The instrumental variable method further assumes that Head Start's impact on families who crossover is similar to the program's impact on the corresponding families in the treatment group. In order for the TOT to characterize all Head Start participants, crossover children in the treatment group need to experience the same impact on average as other Head Start participants in the treatment group. Therefore, the instrumental variable approach produces an unbiased estimate of Head Start only among compliers (Angrist, Imbins, & Rubin, 1996). Further detail on the ITT and TOT approach used in the HSIS is described in the study's technical report (U.S. Department of Health and Human Services, 2010b).

In the first equation of our main specification, we predict Head Start participation (X; dummy code in which 1 = child attended Head Start; 0 = child did not attend Head Start):

$$X_{ip} = \alpha_0 + \alpha_1 Z_{ip} + \mathrm{V}_{ip}\alpha + \zeta_i + \upsilon_{ip}, \tag{1}$$

for individual child i in program p as a function of treatment assignment (Z; 1 = child assigned treatment; 0 = child assigned to control group), a vector of baseline covariates (V), Head Start center-level fixed effects (ζ_i), and an error term (υ_{ip}). The second stage of the model is as follows:

$$Y_{ipt} = \beta_0 + \beta_1 X_{ip} + \mathrm{V}_{ip}\beta + \zeta_i + \varepsilon_{ip}. \tag{2}$$

This second equation regresses parents' educational advances (Y) at time t on the predicted Head Start participation (X) and the same vector of baseline controls (V) used in the first stage equation, Head Start center-fixed effects (ζ), and an error term (ε). In this second equation, β_1 identifies the local average treatment effect of Head Start participation on parent education.

We also change the outcome in our second stage and test the effect of Head Start (X) on educational advances within certain baseline parent education subgroups (i.e., less than high school, high school or GED, or some college), as well as the effect of Head Start on parent employment (Y). In addition, we examine the effect of Head Start on increases in parent education within demographic subgroups (such as age of parent, race and ethnicity, and number of children in the home). We use the same instrumental variable approach described above.

All of our models are conducted with controls to reduce some of the variability in our outcomes and more precisely estimate our coefficients even if there is no association between the instrument and exogenous covariates (Angrist & Pishke, 2008). We attempted to match closely the covariates included in the HSIS (see Exhibit 2.1 in the HSIS Final Report; U.S. Department of Health and Human, 2010a). These consisted of: child gender, child age in fall 2002, child primary language at baseline, primary language spoken in the home, parent age in fall 2002, whether both biological parents live with child, country of birth, parent's marital status, whether the mother gave birth to the child as a teenager, and number of weeks elapsed between baseline (fall 2002) and parent interview at each wave of data collection. In addition, we added several covariates that were not included in the HSIS child outcomes analysis, but that we hypothesized may be related to parents' educational advancement or employment. These covariates included parent's relationship to child (mother or father), race of parent, number of children in the home, number of adults who contribute to income, whether the family lived in an urban or nonurban area, and whether the respondent of parent education and employment differed across waves of data collection.

In addition, all models include center-level fixed effects since randomization of children occurred at the family level within Head Start centers. These fixed effects models control for all the time-invariant characteristics of centers, including observed and nonobserved characteristics. They do not control for unobserved time-varying characteristics that may vary over time, yet due to the randomized design our results should be relatively bias free, assuming that the unmeasured time-varying characteristics do not differ between the treatment and the control group within each center.

Weights are used to adjust for the probability of selection into the study sample, including all stages of sampling. This is particularly important given that the study is undersampled for the control group. Table 1 demonstrates that after the weights are added, the average percentage of the children in the treatment and control is

Table 2. Impact of Head Start participation on parents' educational advancements, three- and four-year-old cohort.

		Parent increased education (y/n)	
	N	ITT (1)	TOT (2)
Three-year-old cohort			
Child age three to four	1,778	0.025	0.036
		(0.027)	(0.034)
Child age three to five	1,727	0.033	0.046
		(0.041)	(0.05)
Child age three to six	1,699	0.064*	0.090**
		(0.036)	(0.045)
Child age three to seven	1,664	0.038	0.053
		(0.039)	(0.045)
Four-year-old cohort			
Child age four to five	1,442	0.020	0.027
		(0.03)	(0.041)
Child age four to six	1,353	0.001	0.001
		(0.035)	(0.043)
Child age four to seven	1,362	0.022	0.030
		(0.041)	(0.049)

Notes: Columns 1 presents the differences in parents' educational advancement based on whether children were offered access to Head Start (intent-to-treat; ITT). Column 2 presents the differences in parents' educational advancement using random assignment as an instrument for Head Start attendance (treatment-on-the-treated; TOT). All models are weighted based on the posttreatment outcome. For example, the change in degree from child age three to six used the age six weight. The change in degree from child age three to child age seven was weighted with the child age seven weight. "Parent increased education" indicates whether or not parent increased their education since baseline. All models include center-fixed effects and controls. Controls include parent gender, age, race/ethnicity, parents' relationship to the child, country of origin, whether Spanish is spoken in the home, marriage status, whether both biological parents lived in the home, whether the mother gave birth to child as a teenager, number of children in home, number of adults contributing to income, urbanicity, whether the reporter of parents' level of education changed across time points, and number of weeks elapsed between baseline and parent interview at each wave of data collection; and child age, gender, and English proficiency. $^{*}p < 0.10$; $^{**}p < 0.05$.

roughly equivalent. In addition, weights were recalculated each year to compensate for nonresponse. We use different weights depending on the outcome of interest. For example, we use a weight for spring 2005 outcomes, and a different weight for spring 2006 to account for different attrition patterns at each time point. As such, our sample varies depending on the outcome.

Although the weights account for participant attrition, missing data occurred for a number of individual variables in the analytic sample ($n = 3{,}436$). In order to avoid further reduction of the sample and maintain adequate power to detect effects, missing variables were imputed using multiple imputation through chained equations (ICE) in Stata 13 (StataCorp, 2013). We created 50 complete data sets that included all variables of interest. Table 1 presents the unimputed data (unweighted and weighted) for the analytic sample.

RESULTS

Impact of Head Start on Parents' Education Attainment

Table 2 presents the impact of Head Start participation on parents' educational advancement. We examined whether parents increased their level of education from

baseline (when child first enrolled in Head Start) through age seven. Column 1 provides ITT estimates and column 2 provides estimates using a TOT approach. All models include controls, appropriate weights, and center-fixed effects.

For the three-year-old cohort, an overarching pattern of findings suggested that children's Head Start participation led to increases in their parents' education. The coefficients ranged from 0.025 to 0.090 across ITT and TOT models, and they increased each year up until the children were six. When children were age six, a significantly higher percentage (9 percent) of parents whose children attended Head Start increased their education compared to parents whose children did not attend Head Start. The coefficient is slightly smaller for the TOT approach (column 1; $\beta = 0.064$), but still statistically significant. By child age seven, the effect of Head Start is still positive but no longer statistically significant. Unlike the three-year-old cohort, there were no significant impacts on parents' change in education through first grade among the four-year-old cohort. The coefficients on the effect of Head Start on parent education ranged from 0.001 to 0.030 and were all nonsignificant.

We also examined the effect of Head Start on whether the parent attained an advanced degree (presented in Appendix Table A2).[9] We found that counter to the main analysis on educational advancement, there was no effect of Head Start on whether or not the parent attained a new degree or certificate over time among the three- and four-year-old cohorts.

Subgroup Findings: Parents' Baseline Level of Education

Next, we examined whether Head Start had differential impacts within subgroups defined by parents' initial levels of education among the three- and four-year-old cohorts. Table 3 presents the association among children's Head Start participation and change in parents' educational attainment for three separate subgroups at baseline: (1) less than high school degree/GED, (2) high school degree or GED, and (3) some college but no degree.[10] We then explored whether parents attained the next level of certification within each of these subgroups. More specifically, we examined whether (1) the less than high school degree baseline group attained a high school degree, (2) the high school diploma or GED group attained a postsecondary degree, and (3) the group with some college but no degree attained a postsecondary degree (e.g., technical certificate or bachelor's degree) at a later time.

Head Start had strong impacts on parents who started with some college but had no postsecondary degree at baseline. Head Start effects on the other subgroups—less than high school or high school diploma or GED—were not evident. For the subgroup with some college but no degree at baseline, coefficients were larger than those found in the main analysis, ranging from 0.081 to 0.232 from the end of preschool through first grade. By the end of kindergarten, 23.2 percent more parents attained a postsecondary degree whose children attended Head Start compared to parents whose children did not attend Head Start and by the end of first grade, 16.5 percent more Head Start parents received a degree. We did not observe education subgroup findings for the four-year-old cohort.

[9] All appendices are available at the end of this article as it appears in JPAM online. Go to the publisher's Web site and use the search engine to locate the article at http://www3.interscience.wiley.com/cgi-bin/jhome/34787.

[10] Parents who had a technical certificate or above at baseline were not included in the analysis because the subgroup was relatively small (<10 percent of the sample) and almost half of the parents within this subgroup already had attained the highest degree (bachelor's degree or above).

Table 3. Association of children's Head Start participation and parents' degree attainment, by parents' education subgroups at baseline for the three- and four-year-old cohort.

	Change in education by parents' baseline education subgroup								
	Less than high school to high school/GED			High school/GED to technical or BA			Some college to technical or BA		
	n	ITT (1)	TOT (2)	*n*	ITT (3)	TOT (4)	*n*	ITT (5)	TOT (6)
Three-year-old cohort									
Child age three to four	622	−0.001	0	641	0.004	0.005	333	0.081*	0.100**
		(0.049)	(0.051)		(0.042)	(0.047)		(0.047)	(0.037)
Child age three to five	606	0.027	0.033	623	0.029	0.040	318	0.137	0.165**
		(0.057)	(0.056)		(0.042)	(0.044)		(0.087)	(0.065)
Child age three to six	592	0.011	0.014	614	0.032	0.043	315	0.182**	0.232***
		(0.057)	(0.057)		(0.032)	(0.033)		(0.086)	(0.065)
Child age three to seven	573	0.026	0.034	606	0.028	0.039	311	0.133	0.162**
		(0.064)	(0.063)		(0.040)	(0.043)		(0.089)	(0.069)
Four-year-old cohort									
Child age four to five	617	0.020	0.025	449	−0.001	−0.002	219	−0.008	−0.014
		(0.051)	(0.052)		(0.017)	(0.017)		(0.046)	(0.048)
Child age four to six	573	−0.050	−0.062	423	−0.035	−0.046	205	0	0
		(0.069)	(0.068)		(0.038)	(0.036)		(0.152)	(0.144)
Child age four to seven	580	0.027	0.034	419	−0.027	−0.035	215	−0.165	−0.283
		(0.082)	(0.081)		(0.049)	(0.046)		(0.168)	(0.182)

Notes: Odd numbered columns (columns 1, 3, and 5) present the differences in parents' degree/certification attainment based on whether children were offered access to Head Start (intent-to-treat; ITT). Even columns (columns 2, 4, and 6) present the differences in parents' degree/certification attainment using random assignment as an instrument for Head Start attendance (treatment-on-the-treated; TOT). All models are weighted based on the posttreatment outcome. Parents who had a technical certification or higher at baseline were excluded from the subgroup analysis because they already achieved the highest level. Each subgroup and time point (e.g., parents' change in education from child age three to four for parents who start with less than a high school education at children's Head Start entrance) was run in a separate model. All models include center-fixed effects and controls. Controls include parent gender, age, race/ethnicity, parents' relationship to the child, country of origin, whether Spanish is spoken in the home, marriage status, whether both biological parents lived in the home, whether the mother gave birth to child as a teenager, number of children in home, number of adults contributing to income, urbanicity, whether the reporter of parents' level of education changed across time points, and number of weeks elapsed between baseline and parent interview at each wave of data collection; and child age, gender, and English proficiency. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

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Subgroup Findings: Parents' Baseline Demographic Characteristics

We also examined whether Head Start had differential impacts based on parents' baseline demographic characteristics—parent age, race or ethnicity, and country of origin—as well as household and family dynamics, including marital status, number of children in the household, number of adults contributing to household income, household income, and location of home (urban or nonurban location). In the three-year-old cohort (see Table 4), Head Start participation had the largest impact among African-American parents, with coefficients ranging from 0.135 to 0.152 by the end of kindergarten and first grade, respectively. There was no significant effect of Head Start among white and Latino parents. In addition, parents who were younger (32 years old or younger) made significant advances in their own education by child age six and seven. Yet, there were no effects among parents in the older age group (>32 years old). There were also no effects of Head Start based on country of origin.

Systematic patterns also emerged based on household and family dynamics among the three-year-old cohort. Parents who were married made significant advances in their education as a function of Head Start compared to a nonsignificant effect of Head Start participation among unmarried parents by the end of the first preschool year. Smaller household size was also important, with households of two or fewer children living in the house leading to increased parental education ($\beta = 0.131$), compared to a nonsignificant association in households with three or more children ($\beta = 0.008$) by child age six. Urban parents also benefited from Head Start in terms of their own education, and Head Start was not associated with gains in parents' education among families living in nonurban or more rural areas. There were no differential effects of Head Start by income level or number of adults contributing to income.

Although we did not find main effects of Head Start on parents' educational advancement among the four-year-old cohort, interesting subgroup findings emerged (see Table 5). Findings from the subgroup analysis on parent and family characteristics for the four-year-old cohort generally followed a similar pattern to the three-year-old cohort. Parents who were older (>32 years) made significantly fewer advances in their education from the child's preschool to first grade (range −0.112 to −0.084), whereas the effect was generally positive among parents who were younger (<32; range 0.021 to 0.071). In addition, African-American parents especially appeared to benefit from Head Start by the end of preschool. At child age five, Head Start led to a 20.3 percent increase in educational advancement compared to the control group among African-American parents. Head Start was associated with fewer gains in parents' education among families living in nonurban or more rural areas compared to more urban areas. The effect of Head Start was generally positive but not significant among families living in urban areas.

The four-year-old cohort also demonstrated interesting subgroup patterns that were not found among the three-year-old cohort. Parents who were born in the United States whose children attended Head Start advanced their education more than parents whose children did not attend Head Start. There were no differences in educational advances among parents who were not born in the United States. In addition, parents who had at least two adults contributing to the household income made significant gains in their education. Parents who only had one adult contributing to the income did not make any differential educational advances as a result of Head Start participation. There were also no differences in educational advances based on number of children or marriage status.

Table 4. Association of children's Head Start participation and parents' educational attainment, by parents' baseline characteristics for three-year-old cohort.

Parents' characteristics at children's entrance to Head Start		Percentage of sample	Three-year-old cohort Change in parents' education from: Child age three to four $n = 1{,}778$	Child age three to five $n = 1{,}727$	Child age three to six $n = 1{,}699$	Child age three to seven $n = 1{,}664$
(1) Parent age	(a) ≤32	74.97%	0.030	0.072	0.129**	0.103**
			(0.039)	(0.057)	(0.051)	(0.052)
	(b) >32	25.03%	0.022	−0.020	−0.018	−0.097
			(0.089)	(0.100)	(0.125)	(0.132)
(2) Parent race/ethnicity	(a) African American	34.19%	0	0.063	0.152**,b	0.135*,b
			(0.057)	(0.094)	(0.068)	(0.078)
	(b) Latino	31.82%	0.002	−0.021	−0.034	−0.075
			(0.073)	(0.085)	(0.081)	(0.072)
	(c) White	33.99%	0.001	0.023	0.014	0.012
			(0.039)	(0.062)	(0.064)	(0.064)
(3) Country of origin	(a) USA	73.53%	−0.015	0.032	0.085	0.050
			(0.033)	(0.051)	(0.046)	(0.046)
	(b) Non United States	26.47%	0.113	0.038	0.019	−0.030
			(0.086)	(0.104)	(0.100)	(0.101)
(4) Marriage status	(a) Married	46.22%	0.135**	0.094	0.086	0.056
			(0.053)	(0.068)	(0.068)	(0.069)
	(b) Not married	53.78%	−0.038	0.035	0.063	0.075
			(0.050)	(0.067)	(0.054)	(0.054)
(5) Number of children	(a) Less than and equal to two	53.54%	0.059	0.049	0.131**	0.102
			(0.051)	(0.067)	(0.063)	(0.067)
	(b) More than two	46.46%	0.006	−0.011	0.008	−0.033
			(0.051)	(0.063)	(0.059)	(0.063)

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Table 4. Continued.

Parents' characteristics at children's entrance to Head Start		Percentage of sample	Three-year-old cohort: Change in parents' education from: Child age three to four $n = 1{,}778$	Child age three to five $n = 1{,}727$	Child age three to six $n = 1{,}699$	Child age three to seven $n = 1{,}664$
(6) Number of adults contribute to income	(a) One	48.84%	−0.001	0.074	0.083	0.048
			(0.080)	(0.072)	(0.062)	(0.069)
	(b) More than and equal to two	51.16%	0.046	−0.012	0.089	0.077
			(0.042)	(0.051)	(0.055)	(0.054)
(7) Household income	(a) ≤$700	23.21%	−0.067	0.032	0.042	0.109
			(0.062)	(0.095)	(0.115)	(0.117)
	(b) >$700	76.79%	0.068	0.053	0.076	−0.003
			(0.043)	(0.056)	(0.056)	(0.056)
(8) Urbanicity	(a) Urban	80.29%	0.065[b]	0.070	0.121**	0.074
			(0.040)	(0.054)	(0.046)	(0.047)
	(b) Nonurban	19.71%	−0.080*	−0.052	−0.061	0
			(0.041)	(0.090)	(0.089)	(0.073)

Notes: Coefficients were estimated using an instrumental variable approach using a treatment-on-the-treated framework with standard errors listed below each coefficient. All models include the full set of controls and weights. Sample percentages based on unimputed sample. Letter superscripts identify significant contrasts at $p < 0.05$ for the specified subgroup comparison (e.g., for parent race/ethnicity, superscript "b" indicates a significant contrast with Latino parents). *$p < 0.10$; **$p < 0.05$.

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Table 5. Association of children's Head Start participation and parents' educational attainment, by parents' baseline characteristics for four-year-old cohort.

Parents' characteristics at children's entrance to Head Start		Percentage of sample	Four-year-old cohort: Change in parents' education from: Child age four to five, $n = 1{,}442$	Child age four to six, $n = 1{,}353$	Child age four to seven, $n = 1{,}362$
(1) Parent age	(a) ≤32	69.79%	0.071	0.021	0.045
			(0.051)	(0.054)	(0.061)
	(b) >32	30.21%	−0.084	−0.090	−0.112*
			(0.051)	(0.074)	(0.068)
(2) Parent race/ethnicity	(a) African American	25.06%	0.203**,b	0.014	−0.003
			(0.089)	(0.088)	(0.08)
	(b) Latino	40.06%	−0.084	−0.063	0.024
			(0.091)	(0.087)	(0.092)
	(c) White	34.87%	0.088	0.076	0.055
			(0.038)	(0.063)	(0.070)
(3) Country of origin	(a) United States	63.19%	0.086**	0.001	0.015
			(0.042)	(0.051)	(0.053)
	(b) Non United States	36.81%	−0.044	0.028	0.073
			(0.095)	(0.103)	(0.104)
(4) Marriage status	(a) Married	46.16%	0.026	0.093b	0.121*
			(0.063)	(0.060)	(0.068)
	(b) Not married	53.84%	0.032	−0.074	−0.089
			(0.052)	(0.061)	(0.064)
(5) Number of children	(a) Less than and equal to two	52.55%	−0.043	−0.036	0.015
			(0.054)	(0.061)	(0.069)
	(b) More than two	47.45%	0.044	0	0.055
			(0.058)	(0.062)	(0.063)
(6) Number of adults contribute to income	(a) One	48.84%	0.058	−0.030	−0.069
			(0.073)	(0.051)	(0.065)
	(b) More than and equal two	51.16%	0.019	0.076	0.126**
			(0.038)	(0.048)	(0.065)
(7) Household income	(a) ≤$700	17.16%	0.109	0.113	0
			(0.089)	(0.111)	(0.147)
	(b) >$700	82.84%	0.012	0.020	0.050
			(0.045)	(0.051)	(0.055)
(8) Urbanicity	(a) Urban	80.29%	0.018	0.034b	0.063b
			(0.049)	(0.051)	(0.055)
	(b) Nonurban	19.71%	0.072	−0.119*	−0.114
			(0.063)	(0.067)	(0.083)

Notes: Standardized coefficients were estimated using an instrumental variable approach using a treatment-on-the-treated framework with standard errors listed below each coefficient. All models include the full set of controls and weights. Sample percentages based on unimputed sample. Letter superscripts identify significant contrasts at $p < 0.05$ for the specified subgroup comparison (e.g., for parent race/ethnicity, superscript "b" indicates a significant contrast with Latino parents). *$p < 0.10$; **$p < 0.05$.

Table 6. Impact of Head Start participation on parents' employment, three- and four-year-old cohort.

		Not employed to employed	
	N	ITT	TOT
Three-year-old cohort			
Child age three to four	649	−0.042	−0.057
		(0.063)	(0.068)
Child age three to five	622	0.070	0.090
		(0.069)	(0.068)
Child age three to six	599	0.053	0.067
		(0.072)	(0.068)
Child age three to seven	566	0.070	0.090
		(0.100)	(0.095)
Four-year-old cohort			
Child age four to five	578	−0.007	−0.008
		(0.055)	(0.051)
Child age four to six	535	0.090	0.105
		(0.067)	(0.060)
Child age four to seven	544	−0.021	−0.025
		(0.086)	(0.078)

Notes: Column 1 presents the differences in parents' employment status based on whether children were offered access to Head Start (intent-to-treat; ITT). Column 2 presents the differences in parents' employment status using random assignment as an instrument for Head Start attendance (treatment-on-the-treated; TOT). All models are weighted based on the posttreatment outcome. The "Not employed to employed" outcome variable only includes parents who were not working at baseline (fall 2002) and examines whether or not parents were employed at a later time point. Parents who indicated they were in school were coded as missing. All models include center-fixed effects and the full set of controls.

Impact of Head Start on Parents' Employment Status

We also estimated the effect of Head Start on parents' employment status using the ITT and TOT approach. We examined whether Head Start helped parents move from not working at baseline to employment, either full-time or part-time, at a later point in time. As demonstrated in Table 6, in all specifications, Head Start participation did not lead to changes in parents' employment during preschool or kindergarten among the three- or the four-year-old cohort.

We also tested whether the effect of Head Start on employment varied as a function of whether the parent had postsecondary education experience (some college or above) at baseline. Interactions between Head Start participation and baseline level of education were nonsignificant, suggesting that the effect of Head Start on employment was not affected by parents' baseline level of education.

Lastly, we determined whether our employment findings varied depending on how we characterized parents who reported being in school or in training. The item in the parent interview on employment did not allow parents to select multiple options for how they spend their time. As a result, it was unclear whether or not parents were working if they indicated that they were in school or in training. In the main analysis, we treated parents in school or training as missing ($n = 250$). However, we also ran several checks to examine relations to employment if we (1) re-coded parents who reported being in school or training as "employed" or (2) re-coded parents who reported being in school or training as "unemployed."

Appendix Table A3 suggests that findings do vary if we code all parents who were in school or training as unemployed. Among the three-year-old cohort, Head

Start led to an increase in employment by child age six (ITT, $\beta = 0.110$; TOT, $\beta = 0.142$).[11] There was no impact of Head Start on employment among the four-year-old cohort. In addition, Head Start did not lead to increased rates of employment when in school or training is coded as employed. This suggests that we may be underestimating the effect of Head Start on employment in the main analysis. Yet, given the difficulty in knowing parents' true employment status if they responded that they were in school (due to measurement constraints), we prefer the more conservative estimates presented in Table 6.

CONCLUSION

This paper takes advantage of the randomization of children into Head Start to examine the effect of children's participation in early childhood education on their parents' educational and employment trajectories. Parents whose three-year-old children entered Head Start made more significant advances in their own education from baseline to kindergarten compared to parents whose children did not attend Head Start. Head Start participation did not lead to higher rates of parents' employment. Subgroup analyses suggest that education effects were stronger among parents who had some postsecondary education experience before their children entered Head Start. Head Start also strongly promoted African-American parents' education.

Head Start may provide the ideal platform to promote low-income parents' education. Drawing from three theoretical frameworks—resource allocation, social capital, and ecological and transactional theories—we posit that Head Start provides critical support for parent outcomes by providing: (1) high-quality care for children that allows parents to pursue their own academic or career interests, (2) a network of parents and staff to support their success, and (3) information and access to postsecondary educational opportunities. Moreover, children's early learning in Head Start may encourage parents to heighten educational opportunities at home and their role-modeling, which may raise parents' educational expectations for themselves to advance their own education and employment (Chase-Lansdale & Brooks-Gunn, 2014; Sommer et al., 2012).

Our findings provide some support for these theories. A positive effect of Head Start on parents' education is consistent with the hypothesis that Head Start allowed parents to reallocate their time to attend school. However, the effect of Head Start on parents' educational advances may not be explained solely by resource allocation theory. If Head Start were simply a work support, we would have found that all parents benefited equally from Head Start. Instead, we found that in the three-year-old cohort, parents who had some college but no degree were particularly likely to increase their own education due to their children's participation in Head Start. Many of these parents attained technical certificates, or even higher, by the time their children were in kindergarten. These findings suggest that families who have the motivation to improve their education may benefit the most from the support offered by Head Start.

From a social capital perspective, the informational resources available in the community network may also help to explain some of our subgroup findings. Results suggested that Head Start had a large effect upon African-American parents' education, even more so than for white and Latino parents. Descriptive findings

[11] All appendices are available at the end of this article as it appears in JPAM online. Go to the publisher's Web site and use the search engine to locate the article at http://www3.interscience.wiley.com/cgi-bin/jhome/34787.

suggest that African-American families were much more likely to live in urban areas compared to white families, potentially having more access to greater educational opportunities. It may also be the case that the community offered by Head Start programs is particularly supportive to African-American parents, providing support for our social capital theory hypothesis. Since the inception of Head Start, the program has had the goal of mitigating poverty with the possible consequence of empowering African-American families, particularly given the high value that African-American families place on education (Vinovskis, 2008). Head Start's social support and leadership opportunities—which provide ways for parents to meet other parents and develop social ties within the Head Start community—could have led to the pattern of increased education among African-American parents (Dominguez & Watkins, 2003).

The effect of Head Start on parents' education was also stronger among parents who had fewer children, were married, and had other adults contributing to the household income. Although we are unable to test specific mechanisms of these findings, they could indicate a pattern of psychological and financial resources that may have promoted educational advancement. Often, parents of young children who are balancing multiple demands on their time may have higher rates of distress if there is no marital partner or other adult helping financially or socially in a household (Linver, Brooks-Gunn, & Kohen, 2002). Financial and social support from other adults in the home may help to alleviate parents' stress and provide the necessary levers to help them to achieve their educational goals while also providing strong examples of educational success for their children.

An interesting question is why we find effects of Head Start on parents' educational advancement among the three-year-old cohort, but not the four-year-old cohort. One explanation may be due to the fact that parents in the three-year-old cohort had an additional year to make gains in their own education. This may suggest that parents need more time to make significant educational advances and reap the benefits from the support services offered by Head Start. In addition, the three- and four-year-old cohort had different compositional patterns, including varying baseline levels of education, suggesting that parents who chose to enter their children earlier in Head Start differ in important observed and more than likely unobserved ways. Parents make their decisions to send their children to school based on a number of factors, including advice from friends or family members, financial circumstances, or local norms in their community (Helburn & Howes, 1996). These informational resources and social ties may be the same factors that led parents to enter school themselves. The evidence that there are more parents with some college but no degree in the three-year-old cohort may indicate that parents may choose to enroll their children earlier in Head Start to meet their own educational goals.

In general, Head Start did not lead to changes in employment while children were in preschool. It may be the case that the part-time early childhood programs offered by Head Start—on average children in the treatment group attended Head Start 25 hours per week—do not provide a sufficient amount of time in child care to support parents' employment. Moreover, if there is a younger child in the family who does not qualify for Head Start (which is unfortunately not reported in the HSIS), a parent may need to find child care for that younger child, making it difficult for parents to stay or enter the workforce. In addition, our employment findings may also be limited by inadequate measurement of employment in the HSIS, which did not include direct questions on the number of work hours or employment status. Future longitudinal reports studying children would benefit from more careful measures of parents' employment across time, such as the number of hours worked per week and nonstandard work experiences, in order to shed more light on this issue.

The policy implications of this paper's findings suggest that early childhood education programs may provide an important context for improving parent education,

but not employment. Although we only test the effect among low-income children attending Head Start, results may extend to other high-quality early childhood education programs, including state-funded prekindergarten programs that provide intensive learning opportunities for young children with a support staff for parents (Chase-Lansdale & Brooks-Gunn, 2014). Future studies may explore the potential for early childhood education programs, including universal prekindergarten programs that serve children from a range of different backgrounds, to promote parents' human capital.

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Appendix

Table A1. Children's year in school and wave of data collection, by age cohort.

Cohort	Fall 2002	Spring 2003	Spring 2004	Spring 2005	Spring 2006
Three-year-old	HS	HS	HS	K	First grade
Four-year-old	HS	HS	K	First grade	—

Table A2. Impact of Head Start participation on parents' educational advancements and degree attainment, three-year-old and four-year-old cohort.

		Attained a degree or certificate (y/n)	
	N	ITT (1)	TOT (2)
Three-year-old cohort			
Child age three to four	1,778	0.012	0.017
		(0.024)	(0.031)
Child age three to five	1,727	0.041	0.056
		(0.032)	(0.041)
Child age three to six	1,699	0.044	0.061
		(0.031)	(0.038)
Child age three to seven	1,664	0.030	0.041
		(0.034)	(0.042)
Four-year-old cohort			
Child age four to five	1,442	0.023	0.032
		(0.023)	(0.028)
Child age four to six	1,353	−0.019	−0.026
		(0.023)	(0.027)
Child age four to seven	1,362	−0.006	−0.010
		(0.032)	(0.040)

Notes: Column 1 presents the differences in parents' educational advancement or degree advancement based on whether children were offered access to Head Start (intent-to-treat; ITT). Columns 2 presents the differences in parents' educational advancement or degree attainment using random assignment as an instrument for Head Start attendance (treatment-on-the-treated; TOT). All models are weighted based on the posttreatment outcome. "Attained a degree or certificate" indicates whether the parent attained an advanced degree or certificate after baseline (yes/no). All models include center-fixed effects and controls.

Table A3. Impact of Head Start participation on parents' employment, four-year-old cohort.

	No work -> work (school as employed [= 1])			No work -> work (school as unemployed = [= 0])		
	N	ITT (1)	TOT (2)	*N*	ITT (3)	TOT (4)
Three-year-old cohort						
Child age three to four	673	−0.001	−0.002	803	−0.050	−0.067
		(0.062)	(0.068)		(0.055)	(0.059)
Child age three to five	647	0.071	0.091	767	0.026	0.033
		(0.067)	(0.067)		(0.061)	(0.060)
Child age three to six	621	0.080	0.102	740	0.027	0.034
		(0.070)	(0.068)		(0.069)	(0.070)
Child age three to seven	594	0.093	0.128	714	0.110*	0.142**
		(0.092)	(0.096)		(0.068)	(0.068)
Four-year-old cohort						
Child age four to five	600	0.012	0.014	703	0.007	0.008
		(0.055)	(0.052)		(0.047)	(0.046)
Child age four to six	550	0.090	0.105*	640	0.045	0.055
		(0.069)	(0.06)		(0.067)	(0.066)
Child age four to seven	553	−0.019	−0.022	645	0.011	0.014
		(0.085)	(0.078)		(0.068)	(0.067)

Notes: Columns 1 and 3 present the differences in parents' employment status based on whether children were offered access to Head Start (intent-to-treat; ITT). Columns 2 and 4 present the differences in parents' employment status using random assignment as an instrument for Head Start attendance (treatment-on-the-treated; TOT). In all four columns, the outcome variable only includes parents who were not working at baseline (fall 2002) and examines whether or not parents were employed at a later time point. All models are weighted based on the posttreatment outcome. Columns 1 and 2 code all parents who were in school as 1 (i.e., working). Columns 3 and 4 include the same set of parents, but recode all parents who were in school as 0 (not working). All models include center-fixed effects, weights, and controls. *$p < 0.10$; **$p < 0.05$.