



Does adding parent education and workforce training to Head Start promote or interfere with children's development?

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Abstract

This study explores the effects of the two-generation program *CareerAdvance*—which combines education and training for parents in healthcare with Head Start for children—on children's academic, language, mathematics, and inhibitory control followed for 3 years. The sample (collected in Tulsa, Oklahoma from 2011 to 2018) includes 147 children in the *CareerAdvance* group and 139 children in a matched comparison group ($n=286$; 40% Black, 17%, White, 10% Hispanic, 33% Mixed Race, or Other Race; $M=3.6$ years old; 47% female). Overall, the effect of *CareerAdvance* on child outcomes is neither greater nor less than Head Start alone. These findings suggest that children's developmental outcomes do not worsen or improve in the short term when their parents return to school.

Children's socioeconomic circumstances, defined by their parents' education, employment, and income, are one of the most consistent predictors of children's own opportunities over the life course. In particular, parents' level of education when children are young is a robust predictor of a host of developmental outcomes for children, including academic achievement (Bulotsky-Shearer et al., 2012), social-emotional skills (Carneiro et al., 2013; McDermott, 2018), and health (Currie & Moretti, 2003). These early developmental outcomes in turn relate to longer-term outcomes, including high

school completion, college enrollment and graduation, and labor market participation and wages (Sawhill & Reeves, 2016), playing a strong role in intergenerational mobility over the life course.

In the United States, half of all low-income parents of young children have attained no more than a high school degree (Koball & Jiang, 2018). Increasingly, low-income parents are highly motivated to improve their own education and career training (IWPR and Ascend at the Aspen Institute, 2019). As parents seek to advance (their own education, they often face a number of barriers,

Abbreviations: CAP Tulsa, Community Action Project of Tulsa County; CNA, Certified Nursing Assistant; ECE, early childhood education; ES, effect size; GED, general education diploma; HIT, Health Information Technology; IPSW, inverse propensity score weight; NEWS-COS, National Evaluation of Welfare-to-Work Strategies Child Outcomes Study; PPVT, Peabody Picture Vocabulary Test; WJ, Woodcock-Johnson.

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including lack of childcare, increased financial burdens, and balancing school, family, and often work (Gardner et al., 2017). Surprisingly, we know very little about what happens to children as parents work to improve their own education.

The current study seeks to better understand the effects of an intervention that targets parents' own education and explores the effects on children's development. The program under study, *CareerAdvance*, takes a two-generation approach, which represents an emerging whole-family approach that capitalizes on the connections between parents and children with the aim of promoting positive outcomes for both generations simultaneously. By targeting parents' own educational advancement, two-generation programs try to improve the very same factors that are predictive of improved opportunities for children from low-income backgrounds.

CareerAdvance was designed and delivered by the Community Action Project of Tulsa County (CAP Tulsa), a large antipoverty organization in Tulsa, Oklahoma. *CareerAdvance* was explicitly designed to address many of the barriers that parents may face as they advance their own education (Chase-Lansdale & Brooks-Gunn, 2014). For parents, *CareerAdvance* offered tuition-free workforce development training in the healthcare sector for cohorts of parents, as well as coaching support and peer partner meetings. *CareerAdvance* paired these adult services with CAP Tulsa's high-quality Head Start, which not only offered childcare for parents as they sought to improve their own education, but also provided high-quality, evidence-based programming for children (Gormley et al., 2008). Indeed, extant evidence has suggested that Head Start overall leads to positive and moderate effects on children's short-term outcomes, including language, literacy, math, and executive functioning skills (for reviews see Duncan & Magnuson, 2013; Gibbs et al., 2013). CAP Tulsa's Head Start program in particular has been associated with positive short-term outcomes for children (Gormley et al., 2008).

An untested question is whether adding intensive education training programs with parents *adds to* or *interferes with* the known positive effects of Head Start on young children's development. On one hand, as parents advance their own education, they may have better jobs and financial security, leading to reduced stress and better interactions with their children, and improved outcomes for children. On the other hand, it may be stressful for parents as they seek to juggle work, school, and family, which could lead to burdens on time, money, and psychological resources. In particular, parents could have less time with their children and heightened stress, all of which in turn could lead to null or even negative effects on children. Moreover, given that Head Start already produces positive effects for low-income children, it is unclear whether these gains can be made even greater by advances in parents' socioeconomic status.

Importantly, we do know what happened to parents after 3 years. Past work found that *CareerAdvance* was associated with increases in parent education, employment in the healthcare field, self-efficacy, and optimism, but no effects on income 3 years after the start of the program; there was also no effect on parents' stress (Chase-Lansdale et al., 2019; Chor et al., 2023). Below, we integrate these past findings on *CareerAdvance* parents with theories from development science to form hypotheses about what may have happened to children over the same time period (1–3 years after baseline). We then test the effects of *CareerAdvance* participation on children's academic, language, and inhibitory control skills 1, 2, and 3 years after the program starts.

Past evidence on pairing Head Start for children with *CareerAdvance* for parents

The education and training provided by *CareerAdvance* drew upon several recent innovations in the workforce development field that have proven benefits for adult outcomes and are explicitly designed to reduce the potential burden of parents' schooling on families. Specifically, *CareerAdvance* provided stackable, sector-based training in the healthcare sector, which was selected based on a local labor market analysis that highlighted the high need for jobs in this sector in Tulsa. In addition, *CareerAdvance* parents were supported by weekly peer partner meetings at the Head Start centers, led by trained career coaches who were employed by the CAP Tulsa (King et al., 2009). Developing a close relationship with a career coach, as well as with peers, has been found to help adults persist in their own education (Holzer, 2018; Strumbos et al., 2018). Lastly, *CareerAdvance* provided tuition coverage, incentives, and in-kind assistance such as after-school care or transportation (with incentive and in-kind assistance receipts at an average of \$2300 annually per parent participant; Chase-Lansdale et al., 2019) to encourage participation and attainment and to offset the reduced wages parents may incur while attending school (Deming & Dynarski, 2010; Huston et al., 2001).

Overall, past work has demonstrated that parents in *CareerAdvance* had greater educational attainment than the matched comparison group after the first year of the program, which was sustained 2 and 3 years after baseline (Chase-Lansdale et al., 2019; Chor et al., 2023; the previously published results for all parents' outcomes are summarized in Table S1 for the full sample and by parent education subgroup). After 1 year, 82% of treatment *CareerAdvance* parents obtained a new certificate, compared to 45% of comparison group parents. *CareerAdvance* parents continued to have higher certification rates through the end of year 3 (90% vs. 56%). In addition, the program was associated with higher rates of employment in the healthcare sector through the end of year 3. *CareerAdvance* parents

also reported psychological benefits, including greater self-efficacy and optimism, compared to the matched comparison group after 1 year; however, these findings were not sustained after 2 or 3 years in the full sample. In all three time points, *CareerAdvance* parents did not report higher levels of perceived stress or psychological distress.

Notably, there was no effect on parents' income or their perceptions of their financial circumstances across all 3 years in the full sample. However, important subgroup findings did emerge. Among parents with postsecondary credentials at baseline, there were decreases in material hardship and financial worry at all three time points (around a third of a standard deviation) and increased optimism. Parents without postsecondary education did not experience any changes in their material hardship, financial worry, or optimism (although they did experience greater increases in their educational advancement compared to parents with some postsecondary education at baseline; Chor et al., 2023).

Previous research has found that *CareerAdvance* children demonstrated higher rates of attendance and lower rates of absence and chronic absence (missing 10% or more of school days) in Head Start than matched comparison children after one semester (Sommer et al., 2020). However, the current study is the first to examine the effects of *CareerAdvance* on children's developmental outcomes. This study explores the extent to which parents' participation in an education and training program was associated with effects on young children in early childhood through early elementary school.

Theory behind why *CareerAdvance* may (or may not) affect children

CareerAdvance purposefully recruited families from Head Start, in which most children are 3 or 4 years old, given the considerable evidence from neuroscience, biology, and epigenetics that early childhood is a sensitive period for development with heightened developmental plasticity and a rapid consolidation of essential capabilities and skills (Brito & Noble, 2014; Knudsen, 2004). Early experiences foster neural connections and other biological systems that influence future cognitive, language, and behavioral development (Shonkoff & Phillips, 2000). Yet, it is an open question whether targeting parents' education while children are enrolled in Head Start and early elementary school will lead to a positive, negative, or null effect of children's short-term development given the known positive effects of Head Start. The sections below outline the rationale and theory behind why two-generation programs, specifically *CareerAdvance*, may or may not lead to developmental gains for children. To do so, we bridge developmental theory with our known effects of *CareerAdvance* on parents to form hypotheses about the potential effects on children.

Head Start has known positive impacts on children in the short term

CareerAdvance uses Head Start as a platform to support both parents and children. From its inception in 1965, the core mission of Head Start has been to promote the development of children from socioeconomically disadvantaged backgrounds through high-quality early childhood education (ECE) and family services. Results from the only nationally representative experimental study of Head Start found that the program had a positive effect on children's short-term learning, which equates to about 2 months of gains in school outcomes (Puma et al., 2010, 2012). Notably, as children progress through elementary school, these positive effects diminished, where there were often no differences by the end of kindergarten between children who attended Head Start and those who did not (Bailey et al., 2017). Despite these diminished effects in elementary school, Head Start and other well-known ECE programs (e.g., Perry Preschool and Abecedarian) found long-term positive effects in adulthood (Barnett, 2011; Heckman, 2006). As a result, one of the main questions troubling the field of developmental science is how to maintain or even boost the short-term positive effects of Head Start as children enter and progress through elementary school (Haskins & Brooks-Gunn, 2016). One hypothesis is to focus on parents' own skill development while children are enrolled in Head Start and early elementary school given the critical and sustained role that parents play in the lives of children in early childhood and afterward.

CareerAdvance was run by CAP Tulsa, which provided high-quality Head Start programming compared to average Head Start programs nationwide. For instance, all teachers had Bachelor's degrees (which is not required of Head Start teachers nationally) and were paid on a K-12 public school salary scale. Classroom sizes and child-to-staff ratios were lower than national averages for Head Start, and all CAP Tulsa Head Start programs were full-day (52% of Head Start programs nationwide are full-day). Gormley et al. (2008) used a regression discontinuity design based on age cutoffs to study the effects of CAP Tulsa Head Start, where they compared previous Head Start participants entering kindergarten to children entering Head Start at the same time. Participation in CAP Tulsa's Head Start program led to substantial increases in early reading (letter word identification; effect size [ES] = .51) and early math skills (applied problems; ES = .37) at kindergarten entry. More recent work has followed children into high school and found that students who attended Tulsa's Head Start and/or Tulsa prekindergarten missed less school were less likely to repeat a grade and were more likely to take an Advanced Placement or International Baccalaureate course, but did not have higher test scores or grades (Amadon et al., 2022). Importantly, all families in *CareerAdvance* were recruited from CAP Tulsa's Head Start programs.

In this way, it may be more challenging to observe positive effects of *CareerAdvance* since findings would need to be above and beyond these known positive effects of CAP Tulsa Head Start. At the same time, in the longer term, as the potential initial effects of Head Start may diminish, we may expect children to show some benefits.

Parents' and children's lives are linked

CareerAdvance adds to the business-as-usual Head Start with education and training for parents using an explicit two-generation approach, taking advantage of the known connections between parents and children to support both generations simultaneously. Ecological, transactional, and life course perspectives have emphasized the interconnectedness across generations. The dynamic interactions between children and parents have been seen as the “primary engine of development” and as one of the central ways that the environment influences young children (Bronfenbrenner & Morris, 2006). Collectively, these theories have emphasized “lives in motion,” suggesting that changes in parents' lives would lead to changes in children's lives (Elder, 1998).

Developmental theories also have emphasized the *dual development* of parents and children together, highlighting the ways in which each generation influences the other over time (Sabol et al., 2021; Sameroff, 2010). More specifically, while it is the case that parents strongly influence children, developmental systems theory also has highlighted the extent to which children influence their parents. For instance, parents who observe their children thriving in ECE programs may be more motivated to succeed in their own educational pursuits and career goals (Chase-Lansdale & Brooks-Gunn, 2014). Advanced educational outcomes for parents may be linked to better child outcomes, and as children's well-being is enhanced, parents may become even more invested in their own future, and so forth. Two-generation programs, and *CareerAdvance* specifically, offer high-quality and equally intensive services and programs for both parents and children to capitalize on the ways in which improvements in one generation are likely to lead to improvements in the other generation. Indeed, our past findings demonstrate that parents' participation in *CareerAdvance* was associated with improvements in children's Head Start attendance, suggesting possible positive benefits for children's developmental outcomes, even beyond Head Start business-as-usual effects on children (Sommer et al., 2020).

Parents' education has positive links to child wellbeing

Building on the connections between parent and child skill development, two-generation education programs

target low-income parents' education and training as a means of increasing parents' employment and household income, and in turn, boosting their children's wellbeing. Indeed, parents' level of education at their child's birth has been consistently associated with a range of child outcomes, including pre-literacy and math performance, language skills and executive functioning skills in early childhood, and academic and socioemotional outcomes in middle childhood and adolescence (Mistry et al., 2008; Sastry & Peibly, 2012).

Most of the past work on parent education has been correlational in nature. One exception is the work by Oreopoulos et al. (2006) that employed a more causal approach to explore the links between parents' education and child outcomes. They took advantage of changes in state compulsory schooling laws for parents (that occurred in different states at different times in the early and mid-20th century, requiring the completion of more than 9 years of school vs. less than seven) and examined the subsequent impact on their children in the 1960s–1980s. They found that an increase in parents' education of 1 year reduced the probability that a child repeated a grade by between 2 and 7 percentage points and lowered the likelihood that students would drop out of high school. This study provided information on the effects of adding additional years of education among parents who have less than a high school degree.

While there is a robust body of literature that examines the role of education on children's development, most of this evidence is based on studies that treat education as static. This research that relies on point-in-time measurement has provided critical information about whether parents' education matters for young children's development. Yet, it does not explicitly capture the effects on children while parents are in the *process* of advancing their own education, which often takes numerous years. Gennetian et al. (2008) explored the effect of *changes* in education among a sample of parents with a range of education levels (a third had less than a high school degree, half had a high school degree, and less than 10% had some postsecondary education). They found that random assignment to the National Evaluation of Welfare-to-Work Strategies Child Outcomes Study (NEWS-COS), which improved parents' education services through a welfare-to-work program, led to significant increases in children's basic numeracy and literacy skills. Notably, there are little to no studies that have examined the impact of changes in parent education on child outcomes in the context of children attending high-quality ECE.

Parent education affects children for numerous reasons (Conger & Donnellan, 2007; Harding, 2015; Yeung et al., 2002). The family investment model posits that families with higher levels of education have greater economic resources and in turn can purchase more materials and services that are directly beneficial for children (e.g., homes in safe, secure neighborhoods). In addition,



parents with higher levels of education may be better equipped to navigate children's schooling environments, including homework assistance, communication with teachers, and helping children gain access to enriching activities (Gardner et al., 2017; Guryan et al., 2008; Kalil et al., 2012). Indeed, higher maternal education has been related to mothers more frequently engaging in cognitively stimulating activities (Suizzo & Stapleton, 2007) and spending more time in developmentally salient activities with their children (Kalil et al., 2012; LeVine et al., 2011).

As found previously, *CareerAdvance* did lead to improvements in parents' educational advancement, represented primarily by obtaining a new certificate. There is limited research examining the effect of parents' certificates on children's development, but it is possible that certificate attainment could be the less impactful effect on children compared to obtaining a more finite degree (i.e., obtaining a high school or college degree). Moreover, *CareerAdvance* led to higher rates of employment, but these did not translate to improvements in income. Given the lack of past evidence on the role of certificates and the limited effect on income, we may hypothesize positive but potentially modest effects on children's learning above and beyond high-quality ECE programming.

Changes in parents' education may interfere with family dynamics in the short term

At the same time, despite theoretical and empirical support for the positive effect of changes in parents' education on child wellbeing (Duncan & Brooks-Gunn, 1997), it is also possible that parents' enrollment in an education and training program could lead to negative effects for children (Granger & Cytron, 1999; Hsueh & Farrell, 2012), at least in the short term. Family stress theory has highlighted the ways in which parental stress, household income, and child outcomes are related (Conger et al., 2007). For example, the family stress model posits that financial difficulties can activate parents' stress mechanisms and adversely affect their emotions and behaviors, which in turn can negatively affect the way parents interact with children. Parents may have increased day-to-day financial stress while they are enrolled in school because of the costs of school and potential loss of income from employment. Moreover, parents may have less time to interact with children as they take on the additional burden of school and in many cases juggle employment and parenting with training. Indeed, prior experimental workforce development interventions for low-income mothers found that the programs often led to increased parental stress (Granger & Cytron, 1999; Zaslow et al., 2002).

Importantly, our past findings on *CareerAdvance* found no effect on parents' level of stress (either perceived

stress or psychological distress), suggesting family stress theory may not be at play within our sample. There were positive effects on parents' optimism and self-efficacy but no effects on material hardship or financial worry (Chor et al., 2023). As a result, it may be the case that we do not observe negative effects of parents' participation in *CareerAdvance* or even observe positive effects because of the structure of the *CareerAdvance* and their increased psychological wellbeing (Chase-Lansdale et al., 2019; Chor et al., 2023).

Variation based on level of parent education at baseline

Our past evidence on *CareerAdvance* combined with theory paints an unclear picture of what we may expect in terms of whether *CareerAdvance* has differential effects on children's developmental outcomes based on parents' educational level at baseline. On one hand, parents without postsecondary education had greater increases in their educational advancement (as measured by certificate attainment) compared to parents with some postsecondary education at baseline (Chor et al., 2023). Similarly, developmental risk and resiliency theory suggests children with parents who are most at risk (e.g., low levels of education) may have the most to gain, suggesting potential positive effects within this subgroup (Masten, 2018). Indeed, past work has found that changes in parents' education were particularly important for children of mothers with low levels of education. More specifically, Magnuson (2007) used a nationally representative sample of children ages 6 to 12 and found that children of mothers with low levels of education had stronger academic skills when their mothers advanced their education, whereas changes in maternal education were not associated with any achievement differences for children with more educated mothers.

On the other hand, it may be the case that children whose parents start out with postsecondary education gain the most. Our past research on *CareerAdvance* found that parents with postsecondary credentials at baseline reported decreases in material hardship and financial worry at all three time points (Chor et al., 2023). Based on family stress theory, parents' perceptions of improved financial stability could translate to benefits for children. Given these competing theories and evidence, we were unsure a priori whether children from one subgroup may outperform the other.

Evidence on other two-generation programs on children

The evidence on two-generation education interventions that take an explicit, whole-family approach to supporting parent and child education together has

been sparse. One of the only studies on two-generation programs is the Enhanced Early Head Start, which provided “self-sufficiency” specialists to help support parents’ employment and education goals while infants and toddlers were enrolled in Early Head Start (Hsueh & Farrell, 2012). The study found no effects on parents or children at the 18- or 42-month follow-up (with the exception of improved self-regulation for children at 18 months). One reason for the lack of findings was that parents in the program were offered mainly a “light touch” option that focused on referrals to outside workforce and education agencies, which looked very similar to what the control group received through business-as-usual Early Head Start services.

Current study

This study explored the effect of the two-generation program *CareerAdvance* on children’s academic, language, mathematics, and inhibitory control followed for 3 years. Although it is an open question as to whether parents’ participation in an education and training program while children are young benefits or hinders child development, we ultimately did hypothesize positive outcomes based on prior theory and our previously found effects on *CareerAdvance* parents’ education and wellbeing (as well as improvements in children’s attendance). We hypothesized that the effect would be modest given the increases in parental education did not yet translate to improvements in income. We then explored whether the pattern of findings differed based on parents’ baseline level of education. Given the mixed pattern of parent outcomes by parent educational subgroup (low vs. higher education at baseline) found in past work (Chor et al., 2023), we were neutral in our hypotheses around the subgroup findings. It is important to note that all children at the start of the study were enrolled in CAP Tulsa’s high-quality Head Start programs—whether in the *CareerAdvance* group or the matched comparison group. Thus, all findings are above and beyond the known effects of CAP Tulsa’s Head Start.

METHOD

Participants

Families were recruited from CAP Tulsa’s Head Start programs into the *CareerAdvance* program through a range of approaches, including the distribution of flyers across all CAP Head Start programs, promotion through Head Start family support staff, and program information sessions held by career coaches at CAP Head Start programs across Tulsa. Parents were eligible for participation in the education and training

along the following: an interview led by *CareerAdvance* coaches, background checks, health status review, drug testing, absence of financial or academic hold at the local community college, and English proficiency. Based on this recruitment process, 317 families applied to the program, 221 were accepted, and 162 families enrolled in the program and consented to participate in the study.

Once selected, parents had the opportunity to participate in *CareerAdvance*, which offered sectoral career pathway training using a sequence of stackable education programs. Based on an analysis of the local labor market, *CareerAdvance* selected healthcare as a growing sector of the local economy (Smith & King, 2011). The stackable training was conducted in partnership with two local community colleges in three tracks—Nursing, Health Information Technology (HIT), and Medical Assisting—with varying levels and opportunities for attaining certificates. For example, in the Nursing track, participants began by attaining a Certified Nursing Assistant certificate (CNA; 8–10 weeks) and could continue to eventually become a Registered Nurse (3–4 years), with opportunities to attain certificates along the way (e.g., Geriatric Technician, Advanced Unlicensed Assistant, or Certified Medication Aid). Indeed, there were also significant salary differences based on the certificate (e.g., a CNA at the time in Tulsa would have made \$10–\$14 per hour versus a Registered Nurse at \$20–\$36 per hour in Tulsa; King et al., 2009).

Only a small number of families enrolled in each cohort of *CareerAdvance* (around 20–30 families in each of our seven cohorts), and there was not excess demand for those slots because the program was new. As a result, we could not implement a randomized controlled trial design for our study. Instead, matched comparison parent–child dyads were selected as each cohort was recruited for *CareerAdvance* from 2011 to 2014 (seven cohorts total). To form the matched comparison group, we selected parent–child dyads from the full pool of CAP Tulsa Head Start parents ($n = 3536$) drawing on administrative Head Start data. Matched comparison parent–child dyads were chosen based on their observed similarity to *CareerAdvance* parents, including the neighborhood of residence, parent race, relationship to child, household income, English proficiency, parent age, parental education, single parent status, and foster parent status. We also selected a few extra-matched comparison families because of concerns about attrition over time.

This process led to a sample of 338 parent–child dyads (162 *CareerAdvance* enrolled families and 176 matched comparison group families). Each parent’s oldest child enrolled in CAP Tulsa Head Start, for both the *CareerAdvance* and matched comparison groups, was then selected for participation in the study (in the case of twins and triplets, we randomly selected one child). Data

were collected among the *CareerAdvance* and matched comparison families at baseline, 1 year later (i.e., end of year 1), 2 years later (i.e., end of year 2), and 3 years later (i.e., end of year 3). Each wave of assessments took place either in the fall or the winter because of the staggered approach of enrollment (where cohorts could enter the program or study in either August or January of each year). The study protocol, procedures, and analysis were approved by The Northwestern Institutional Review Board (*CareerAdvance* Program's Effects on Children and Families: CAP Family Life Study; Study No. STU00044261). The treatment of all participants in the study was in accordance with established ethical guidelines from the Institutional Review Board. In terms of our analytic sample, 52 children were missing outcome data at the end of years 1, 2, and 3 or did not meet age requirements (see [Measures](#) section below on age restrictions per measure) and they were excluded from the analysis. Reasons for missing data included that the family moved out of the Tulsa area, the child was absent on the day that assessments were administered at the child's CAP Tulsa Head Start center, or parents were not available or did not consent to an in-home assessment.

This led to an analytic sample of 286 children for the current study, with 147 children in the *CareerAdvance* group and 139 children in the matched comparison group. Overall, the analytic sample ($n=286$) was similar to the original sample ($n=338$). The only exception is that children in the analytic sample had fewer adults in the household, were slightly more educated (lower rates of parents with a high school degree or less), and had higher proportions of children from Mixed Race or Other Race (including Asian or Pacific Islander, American Indian, Eskimo, Aleut, two or more races, or other). All other demographic characteristics were similar between the two samples, including child gender, age, household income, and English as the primary language.

Our sample did vary across assessments. In our main outcome analysis, we restricted the sample to children who had assessments at the end of years 1, 2, and 3 for the same assessment ($n=162$ for Peabody Picture Vocabulary Test [PPVT] at all three waves, $n=165$ for Woodcock-Johnson (WJ)-Applied Problems, $n=154$ for inhibitory control at all three waves). Notably, our sample rates for the Bracken at the end of year 3 were small given that children aged out so our sample across all 3 years is $n=68$ and as a result, we used the same sample for end of year 1 and 2 ($n=145$) and then restricted to children $n=68$ for the year 3 analysis.

Because of the eligibility requirements for *CareerAdvance* (and the fact that we selected the matched comparison group based on observable similarity to *CareerAdvance*), there are some differences between the study sample ($n=286$) and the broader population at CAP Tulsa ($n=3536$). Compared to all CAP Tulsa parents, the parents in our full sample were about 2 years older, had fewer children living in their households on

average, and a larger proportion were single parents (68% vs. 56%). Moreover, children in our sample were more likely to be Black and less likely to be Hispanic/Latine or White compared to other CAP Head Start children. Correspondingly, nearly all (93%) of the study parents spoke English as their primary language, as compared to only two-thirds (65%) of the rest of the CAP Head Start population. Sample parents also had higher levels of education on average, with 46% holding a high school degree, general education diploma (GED), or higher, compared to 19% among other CAP Head Start parents.

Sample

Table 1 presents the characteristics of the study's analytic sample ($n=286$). All families in the study were low-income because of Head Start income eligibility requirements. The average household income at baseline was \$14,667.24 ($SD=12,451.11$). Forty-seven percent of children were female, and the full sample of children had a mean age of 44.43 months ($SD=13.31$; $M=3.74$ years) at baseline. The children were racially and ethnically diverse, with the largest group being Black (39.9%), followed by White (17.1%), Hispanic/Latine (10.1%), and Mixed Race or Other Race group (32.9%) which included Asian/Pacific Islander (1.1%), American Indian, Eskimo, Aleut (7%), and Two or more races/Other (24.8%). Ninety-one percent of children spoke English as their primary language.

One-third of children (32%) had single parents, with two children living in the household on average ($SD=1.19$), and the average household size was four individuals ($SD=1.41$). Around one-half of children had parents with low levels of education at baseline, defined as parents with a high school degree (43%) or less than high school degree (8%). The remaining parents had a certificate or Associate's degree (45%) or Bachelors (4%). Parents with low levels of education had similar demographics compared to parents with higher levels of education (e.g., race, household size, age). The only exception was the parents had higher rates of English as a primary language in the higher parent education group compared to the low based on significant t -tests (see [Table S2](#)). Because of the fact that parents could enroll in either the fall or spring of the Head Start year (and the majority of children were in 4-year-old preschool classrooms at the program start), by the end of year 1, 27% were still enrolled in Head Start. By the end of year 2, only 5% were still enrolled in Head Start. At the end of year 3, 255 children had a reported school or program and they attended 115 different elementary schools across 30 different school districts (the highest proportion of children attend elementary school in Tulsa Public Schools, $n=132$ children). Moreover, at the end of year 3, 43.7% of parents (59 out of 135 families with available data) were still enrolled in *CareerAdvance*.

TABLE 1 Full sample descriptive statistics ($n=286$).

	<i>M (SD)/%</i>
Demographic characteristics at baseline	
Child gender (1 = female, 0 = male)	0.469
Child age (months)	44.427 (13.306)
Child race (y/n)	
Black	0.399
White	0.171
Hispanic/Latine	0.101
Mixed race/other	0.329
Parent age (years)	29.098 (6.067)
Single parent (y/n)	0.322
English is parent's primary language (y/n)	0.906
Highest level of parent education	0.510
Less than high school	0.080
High school diploma or general education diploma	0.430
Certificate or Associate's degree	0.451
Bachelor's degree or higher	0.038
Annual household income (\$)	14,667.240 (12,451.110)
Household size	4.234 (1.413)
Number of children in household	2.448 (1.189)

Note: Includes children with any end of year 1, 2, or 3 data, keeping only the sibling with the most data. Children with missing values on matching variables are omitted from the sample. Results are unweighted (i.e., prior to matching).

Data

The study used four sources of data: (1) Head Start administrative data from ChildPlus, part of the federal program's management information system; (2) a baseline questionnaire for all CAP Tulsa Head Start parents regarding their interest in educational and career advancement in the healthcare sector ("motivation questionnaire"); (3) baseline parent surveys; and (4) direct child assessments. Head Start administrative data from ChildPlus were collected by CAP Tulsa from all new applicants to CAP Tulsa's Head Start programs at the time of Head Start enrollment. The motivation questionnaire was administered to all CAP Tulsa Head Start parents by family support workers in the fall of each year. Parent surveys were administered in person by a research assistant. They took approximately 90 min to complete and included demographic, psychological, financial, education, employment, and parenting-related questions. The direct child assessments were administered in person by a research assistant and are detailed below.

Once parents consented to the study, their children were assessed at baseline by research staff at CAP Tulsa Head Start centers. The battery of assessments required approximately 40–45 min to complete and directly measured basic academic skills, language skills, mathematics skills, and inhibitory control. Children were assessed in Spanish if they were not English proficient. Each child was assessed again at the end of year 1 and the end of

year 2. Once the child left CAP Tulsa Head Start, research staff contacted and scheduled a time to conduct these assessments in a location that was mutually convenient for the family and staff member.

Measures

Our child assessment battery included measures of basic literacy and numeracy (Bracken), receptive language (PPVT), math skills (WJ-Applied Problems), and inhibitory control (Pencil Tap).

Basic literacy and numeracy skills

Children were individually administered the Bracken School Readiness Assessment (Bracken, 1984), a standardized test of children's basic skills. The Bracken consists of 88 items across five subtests assessing children's knowledge of colors, letters, numbers and counting, sizes and comparisons, and shapes. Items were presented in a multiple-choice format where children pointed to their choice from four or more response options. Raw scores (i.e., total number correct) were converted into standard scores based on age (with a mean of 100 and a standard deviation of 15). The Bracken demonstrates test–retest reliability of 0.91–0.95 as well as strong internal consistency of 0.98 (Bracken). The Bracken assessment

was conducted among children 7 and younger and therefore had higher rates of missingness in year 3.

Receptive language

The PPVT-3rd edition was used to measure children's receptive vocabulary skills (Dunn & Dunn, 1997). Children were asked to point to the picture that most closely represented the verbal stimulus presented. The PPVT demonstrates strong test–retest reliability (0.91–0.94) and internal consistency (0.94). Raw scores were converted into standardized scores ($M=100$, $SD=15$) that reflect each child's performance relative to the expected performance of children in the population who are the same age.

Math skills

The WJ-III Test of Achievement, Applied Problems subtest was used to measure children's emergent math skills, such as counting, numeracy, comparisons, and word problems (Woodcock et al., 2001). Items included basic mathematical operations, such as addition and subtraction, and basic applied skills, such as telling time and reading a thermometer. For this subtest, raw scores were converted to standardized scores ($M=100$, $SD=15$). This subtest has demonstrated strong psychometric properties, including test–retest reliability (0.92) and internal consistency (0.93; Woodcock et al., 2001).

Inhibitory control

Children's inhibitory control was measured using the Pencil Tap task. This assessment tested the child's ability to resist a dominant response in favor of a nondominant response in a situation activating little emotion. The assessor instructed the child to tap their pencil on the table once when the assessor taps her pencil twice and vice versa. The total number of correct out of 16 trials was recorded, and then the child's score was calculated as the percentage of items answered correctly as a proportion of the total number of items. High scores reflect high levels of inhibitory control. This measure has been shown to have good concurrent and construct validity (Smith-Donald et al., 2007), and internal consistency for the current sample was high (Cronbach's $\alpha=.93$).

Family background and demographic matching variables

The current study used a set of matching variables from the parent survey and ChildPlus administrative data to find similar families, which include child gender, age,

and race (indicators for Black, White, Hispanic/Latine, and other); whether English was the primary language spoken at home; number of individuals and number of children living in the home; household income (indicator for income above the mean) and an indicator for whether the household received public assistance; parental education (high school degree, GED, or lower vs. some post-secondary education or higher); parent gender, age, and relationship status (indicator for being a single parent); an indicator for whether the parent was a teenage parent; rating of parent's motivation to enroll in school or job training (scale from 1 to 5); neighborhood (indicators for each of four neighborhoods); year of study entry; and season of study entry (fall or spring semester).

Parent education subgroups

For the subgroup analysis, we categorized parents' level of education at baseline into two groups: (1) low parent education, which is defined by whether the parent has less than a high school degree, or a high school diploma or GED at baseline, and (2) higher parent education, which is defined whether a parent has a certificate, Associate's degree, Bachelor's degree, or higher.

Analytic approach

Given the sample size and design, as well as the limited evidence on this type of program, our study is exploratory in nature. In the absence of an experiment that could determine *CareerAdvance* participation, we addressed the concern of parents' nonrandom selection into the program—which would yield biased estimates of treatment effects—with propensity score matching, estimating the likelihood of a parent–child dyad enrolling in the *CareerAdvance* two-generation intervention rather than Head Start alone. Although matching strategies do not account for differences between the treatment and comparison groups along unobservable determinants of program participation (Murnane & Willett, 2010; Rubin, 2001), propensity score matching allowed us to compare *CareerAdvance* children to other CAP Tulsa Head Start children with similar observable characteristics.

We recruited CAP Tulsa families (i.e., parent–child dyads) into the matched comparison group based on an earlier stage of propensity score matching that drew on CAP Tulsa's administrative data. Therefore, the sample was well balanced at baseline (see Table S3 for matching variables' distributional information before and after matching). However, some imbalances remained after this first stage of matching (e.g., *CareerAdvance* children were slightly older than matched comparison children).

To achieve greater balance, we re-estimated propensity scores (i.e., the likelihood of a parent–child dyad

enrolling in *CareerAdvance* rather than CAP Tulsa Head Start only) using logistic regression and baseline parent survey data (which represent more current data compared to the Head Start administrative data used to select the matched comparison sample; matching variables included are described above in the [Measures](#) section). The propensity score model was as follows:

$$PS_i = \Pr(CA_i = 1 | X_i) = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}},$$

where PS is the probability that the i th parent would be enrolled in *CareerAdvance*, conditional on a vector of family-level covariates X (e.g., neighborhood of residence, parent race, parent education, child gender, and parent motivation score) measured at baseline. We created inverse propensity score weights (IPSW) based on these propensity scores, where the IPSW for a treatment group parent–child dyad was given by $1/PS_i$ and the IPSW for a matched comparison group pair was given by $1/(1 - PS_i)$. We then applied these weights to a basic ordinary least squares regression model in which we regressed children's outcomes at the end of year 1, year 2, or year 3 on a binary treatment indicator for *CareerAdvance* participation, controlling for child age at study entry, child gender, and child race. After applying the IPSWs, there were no significant differences between the *CareerAdvance* group and the matched comparison group based on observable characteristics at baseline (e.g., all standardized difference scores were less than .20; [Table S3](#)).

Subgroup analyses

In addition to measuring the full-sample treatment effects of *CareerAdvance* participation on children's skills, we sought to understand for which groups of children the program might be most—or least—effective. To verify the validity of subgroup analyses, we investigated treatment–comparison group balance in each of the four subgroups of interest (children with parents with higher vs. low levels of education at baseline in the treatment and comparison groups; [Table S4](#)). When we applied the inverse propensity score weighting, treatment–comparison group balance was achieved within nearly all groups. The only exception is that the treatment group had slightly higher rates of single parents and were marginally significantly older at the 10% level compared to the matched comparison group, among the higher parent education group. The low parent education subgroup was balanced between the treatment group and the matched comparison group.

To conduct our subgroup analysis, we first included an indicator for treatment status (1 = *CareerAdvance*; 0 = matched comparison), an indicator for subgroup membership (e.g., 1 = low parent education; 0 = high

parent education), and a binary interaction term between the two (i.e., treatment status and subgroup membership) as predictors in a regression model (controlling for child age at study entry, gender, and race), as well as interaction terms between each covariate and the indicator variable for the parent having a low level of baseline education. We then separately measured the effect of *CareerAdvance* restricting only to children who were in a particular subgroup (e.g., running separate OLS models with treatment status as the main predictor variable—first for children in the low parent education group and then for children in the higher parent education subgroup). This allowed us to determine whether *CareerAdvance* had an effect on a particular subgroup of children (e.g., children whose parents had low levels of education at baseline) and whether the magnitude of the effect was statistically different across subgroups.

Sensitivity checks

We ran several sensitivity checks of our main outcome analysis. As a sensitivity check, we allowed our sample to vary across assessment and year which did result in a larger sample across time points (e.g., range from $n=212$ – 222 for PPVT across all 3 years; range $n=209$ – 218 for inhibitory control across all 3 years). As a second robustness check, we restricted the sample to children in the study from parent–child dyads with propensity scores on the region of common support (i.e., between the minimum propensity score within the treatment group, 0.134, and the maximum propensity score within the comparison group, 0.849), which reduced the sample size by about 10% for each measure or wave of assessment. We also used a tobit regression model rather than ordinary least squares regression to test the effect of *CareerAdvance* on a child's level of inhibitory control. Inhibitory control was measured as the percentage of trials completed correctly, so scores could range from 0 (0% correct) to 1 (100% correct). The tobit model accounted for this natural censoring from both below and above. Finally, we conducted a placebo test, verifying that we did not detect a statistically significant association between a family's *CareerAdvance* participation and an outcome that should not have been affected by treatment: parent earnings during the year prior to *CareerAdvance* entry.

We initially aimed to explore whether our findings varied by child age (child aged 0–3 vs. child aged 4 or older at baseline) or exposure to CAP Tulsa Head Start (1 = participated in CAP Tulsa Head Start 1 year or more prior to *CareerAdvance* entry). However, this proved challenging given that child age and Head Start enrollment status are dependent on one another—with age as a key factor determining Head Start eligibility—thus making it difficult to disentangle the two. For example, if we found that the magnitude of the effect of *CareerAdvance* varied by child age, this difference could be explained

by CAP Tulsa Head Start exposure, and vice versa. As a result, we did not conduct these subgroup analyses.

RESULTS

Relation among CareerAdvance participation and child outcomes

We first tested the effect of CareerAdvance on children's academic, language, mathematics, and inhibitory control 1, 2, and 3 years after program entry. The individual measures of child outcomes represented distinct but related aspects of children's early functioning (correlations across measures ranged from 0.351 to 0.610, with the strongest correlation being between children's receptive language and math skills). All academic, language, and math scores were standardized and coefficient estimates were interpreted as ESs, and the mean difference in performance between children whose parents were enrolled in CareerAdvance and the matched comparison group, beyond the effects of CAP Tulsa's Head Start programs, was represented in standard deviation units (see Table 2). The effect on inhibitory control was presented as the difference in the percentage correct between children in the CareerAdvance group versus the matched comparison group.

TABLE 2 Effect of parent careeradvance participation on child academic, language, mathematics, and inhibitory control 1, 2, and 3 years after program entry.

	<i>n</i>	<i>B</i> (SE)
End of year 1		
Basic numeracy and literacy v2	145	-.067 (0.164)
Receptive language	162	.166 (0.168)
Math-applied problems	165	-.037 (0.162)
Inhibitory control	154	.077 (0.044)*
End of year 2		
Basic numeracy and literacy v2	145	.018 (0.181)
Receptive language	162	.003 (0.177)
Math-applied problems	165	-.003 (0.169)
Inhibitory control	154	.027 (0.029)
End of year 3		
Basic numeracy and literacy v2	68	-.261 (0.249)
Receptive language	162	-.162 (0.182)
Math-applied problems	165	.120 (0.167)
Inhibitory control	154	.014 (0.026)

Note: Results of inverse propensity score weighted regressions of end of year 1, 2, and 3 outcomes on parent treatment status and covariates (child age at baseline, child race, and child gender; time to end of year 1, 2, or 3 assessments; and an indicator for whether or not the assessment was administered in Spanish), restricting for each outcome to children who have end of year 1, 2, and 3 data available on that outcome.

* $p < .10$.

One year after CareerAdvance entry, we generally found no evidence of effects on children's basic numeracy and literacy (Bracken), receptive language (PPVT), or math skills (WJ-Applied Problems). The only exception was that we found a small but marginally significant positive relation among CareerAdvance participation and children's inhibitory control, such that children in the CareerAdvance group performed 7.7 percentage points higher ($SE = 4.4$) on the pencil tap compared to children in the matched comparison group at the end of year 1 ($t(145) = 1.74$, $p = .084$). Two and three years after CareerAdvance entry, there were no differences in performance between children whose parents were enrolled in CareerAdvance and those in the matched comparison group on any of the child outcome measures.

As a follow-up analysis, we compared the children in our sample to a nationally representative sample of Head Start children (from the Head Start Impact Study) using standard scores for receptive language (PPVT) and math skills (WJ-Applied Problems). As represented in Figure 1, the average standard score of Head Start children nationwide after 1 year in Head Start was 92.2 points on receptive language and 91.5 points on math. As a point of comparison, after year 1, children in the CareerAdvance group had a standard score of 100.3 and children in the matched comparison group had a standard score of 98.0 1 year after CareerAdvance entry for receptive language. Similarly, CareerAdvance children had an average standard score of 101.1 in mathematics at the end of year 1 and matched comparison children had an average of 99.8. More specifically, for receptive language, children in CareerAdvance performed more than one-half (0.54) of a standard deviation higher compared to Head Start children nationwide at year 1. Even the matched comparison group performed two-fifths of a standard deviation higher compared to the national averages of Head Start children. For mathematics, CareerAdvance children scored three-fifths of a standard deviation higher and even matched comparison children scored 0.1 standard deviations higher compared to national Head Start averages. These rates of performance for both CareerAdvance and matched comparison children continued through year 3.

We then compared how the children in our sample compared to nationally representative samples of children. The overall distributions of scores on the PPVT and WJ-Applied Problems tests among a nationally representative sample of children from diverse socioeconomic statuses and backgrounds have been normal with a mean score of 100 and a standard deviation of 15 (LaForte et al., 2014). For receptive language, children in CareerAdvance performed commensurate to the national average (0.03 SD above the mean) and the matched comparison group performed slightly under the overall national average (0.17 SD) at the end of year 1. By the end of year 3, children in the CareerAdvance and the matched comparison group performed commensurate

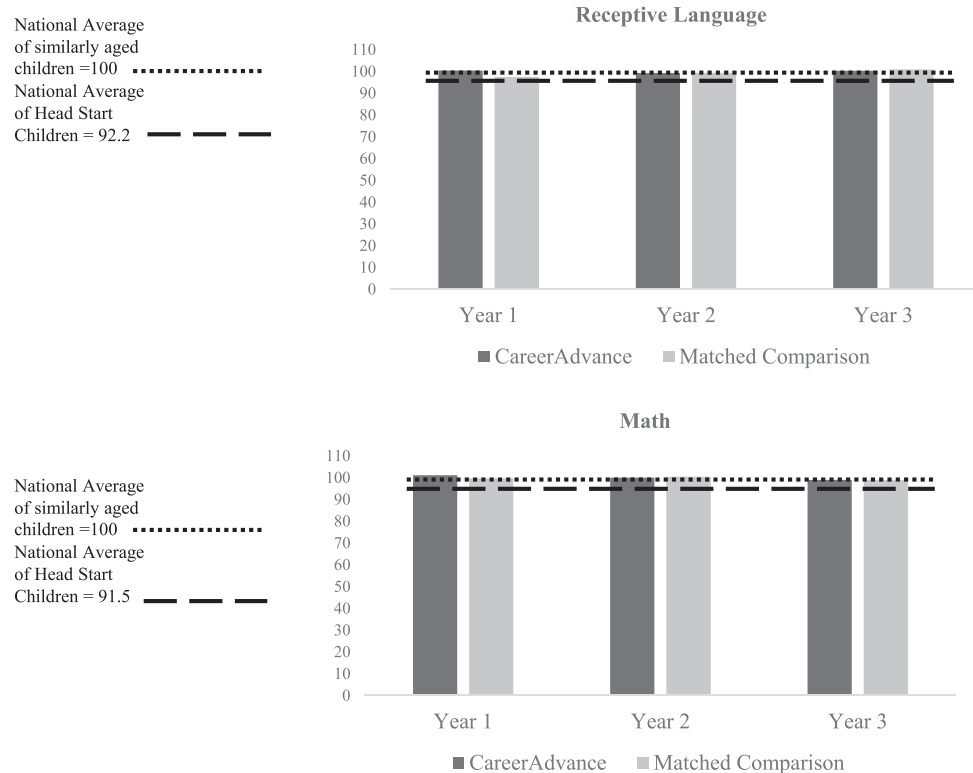


FIGURE 1 Effect of careeradvance on children's receptive language and math skills after 1, 2, and 3 years and comparison of performance to national averages.

to, and even slightly above, the national average. For math skills, the findings were similar, where by the end of year 1, children in the *CareerAdvance* performed slightly above national averages (0.07 SD) and matched comparison children were slightly below the mean (0.02 SD) and by year 3, they both performed just under national averages (0.07 SD and 0.08 SD, respectively).

Sensitivity checks

Overall, our largely null results, with a small effect on inhibitory control 1 year after baseline, were similar across our sensitivity checks, including when we (i) allowed the sample to vary across years and assessments (sample ranged from smallest the Bracken [$n=68$] to the largest n for WJ-Applied Problems [$n=165$]; see Table S5); (ii) restricted to children whose parents' propensity scores were on the region of common support (Table S6); and (iii) used a tobit model rather than ordinary least squares to measure the relationship between a family's *CareerAdvance* participation and a child's level of inhibitory control (Table S7). More specifically, when we allowed our sample to bounce on the outcome measure of interest at all time points, we continued to identify a marginally significant association between parents' *CareerAdvance* participation and children's level of inhibitory control at the end of year 1. All other outcomes continued to be null across years and assessments. After

restricting to children from families with propensity scores on the region of common support, the estimated association between *CareerAdvance* participation and a child's level of inhibitory control at the end of year 1 was no longer marginally significant although its magnitude was similar. When we used a tobit model rather than ordinary least squares for inhibitory control (Table S7), we found very similar estimates, with a slightly stronger association with inhibitory control at the end of year 1 ($\beta=.116$, $t(144)=1.1.97$, $p=.050$) and still no evidence of a statistically significant association at the end of year 2 or 3. Encouragingly, our placebo test was also null, finding no evidence of a statistically significant association between a family's *CareerAdvance* participation and parent earnings during the year prior to *CareerAdvance* entry ($\beta=-963.260$; $SE=1250.224$; $t(246)=-0.77$, $p=.442$).

Subgroup analysis

We next explored whether our findings differed as a function of parents' baseline level of education (Table 3). For receptive language, mathematics, and inhibitory control, there were no differential effects of *CareerAdvance* based on parent education at any time point through the end of year 3. For basic numeracy and literacy, we found no effect of *CareerAdvance* at the end of year 1 or 2. We did find a marginally significant differential effect on children's basic numeracy and literacy between

TABLE 3 Effect of parent careeradvance participation on child academic, language, mathematics, and inhibitory control 1, 2, and 3 years after program entry by baseline parent education.

	Full sample interaction		Subgroup analysis			
	<i>n</i>	Difference in treatment effect by parent education (<i>n</i> = 286)	<i>n</i>	Low parent education (<i>n</i> = 146)	<i>n</i>	High parent education (<i>n</i> = 140)
End of year 1						
Basic numeracy and literacy	145	0.111 (0.338)	66	−0.001 (0.208)	79	−0.112 (0.261)
Receptive language	162	−0.398 (0.340)	82	0.005 (0.225)	80	0.403 (0.256)
Math-applied problems	165	0.064 (0.334)	82	−0.009 (0.232)	83	−0.072 (0.241)
Inhibitory control	154	0.053 (0.090)	76	0.095 (0.060)	78	0.043 (0.068)
End of year 2						
Basic numeracy and literacy	145	0.298 (0.359)	66	0.178 (0.234)	79	−0.120 (0.264)
Receptive language	162	0.458 (0.355)	82	0.246 (0.272)	80	−0.213 (0.228)
Math-applied problems	165	−0.001 (0.343)	82	−0.018 (0.268)	83	−0.017 (0.217)
Inhibitory control	154	0.048 (0.057)	76	0.049 (0.037)	78	0.001 (0.043)
End of year 3						
Basic numeracy and literacy	68	0.958 (0.502)*	35	0.309 (0.387)	33	−0.649 (0.316)*
Receptive language	162	0.211 (0.325)	82	0.009 (0.223)	80	−0.202 (0.236)
Math-applied problems	165	0.486 (0.340)	82	0.376 (0.262)	83	−0.110 (0.218)
Inhibitory control	154	0.038 (0.042)	76	0.025 (0.028)	78	−0.013 (0.031)

Note: Results of inverse propensity score weighted regressions of end of year 1, 2, and 3 outcomes on parent treatment status and covariates (child age at baseline, child race, and child gender; time to end of year 1, 2, or 3 assessments; and an indicator for whether or not the assessment was administered in Spanish), restricting for each outcome to children who have end of year 1, 2, and 3 data available on that outcome. Separate regressions were run for the two subgroups, and a model that interacted each covariate with the indicator for having a lower level of education was used to measure the difference in the treatment effect by parent education.

* $p < .05$;

children whose parents had high versus low parent education at baseline at the end of year 3 (difference in treatment effect by parent education $\beta = -.958$, $SE = 0.502$, $t(52) = 1.91$, $p = .062$). Among children whose parents had higher levels of education, *CareerAdvance* children had about two-thirds of a standard deviation lower scores on basic numeracy and literacy ($\beta = -.649$, $SE = 0.316$; $t(25) = -2.05$, $p = .051$). The effect among the low parent education group was nonsignificant, albeit positive ($\beta = .309$, $SE = 0.387$; $t(27) = 0.80$, $p = .431$).

DISCUSSION

This study examined the effect of a two-generation education intervention, *CareerAdvance*, which pairs high-quality Head Start programming for children with education and training for their parents. All parents in our study were recruited from CAP Tulsa's Head Start programs. The difference was that the *CareerAdvance* group had a parent enrolled in an education and workforce training program in addition to their children receiving CAP Tulsa Head Start services, whereas matched

comparison group families had children enrolled only in CAP Tulsa Head Start at baseline. Although we originally hypothesized that we would find a positive, albeit small effect on children, we did not observe this. More specifically, we did not find an average effect of *CareerAdvance* on children's academic or language skills 1, 2, or 3 years after parents' enrollment in the program, with an exception for inhibitory control at the end of year 1. There were some slight differences in outcomes based on parent baseline education; however, no consistent pattern emerged across the 3 years. Given some past evidence suggesting that improvements in parents' education are linked with improved child outcomes (e.g., Gennetian et al., 2008; Magnuson, 2007), we reflect below on why we did not observe similar positive effects.

CareerAdvance and child outcomes

We hypothesize two main reasons for the lack of positive effects on children. First, all of the families were recruited from CAP Tulsa's Head Start programs, which already have proven benefits for children. In

particular, CAP Tulsa's Head Start programs are associated with relatively large short-term ESs on children's pre-reading and math skills (e.g., $ES = .369$ for WJ-Applied Problems; same math measure used in the current study), using a regression discontinuity design in which CAP Head Start children entering kindergarten were compared with children entering Head Start (who had not yet been exposed to Head Start) at the same point in time using age cutoffs (Gormley et al., 2008, 2010).

Encouragingly, children in our sample (both in the matched comparison and *CareerAdvance* groups) performed comparatively well to other low-income children in Head Start, as well as in terms of average performance nationwide across socioeconomic groups. In fact, in the context of the high-quality programming of CAP Tulsa, children in both the matched comparison and *CareerAdvance* groups performed above children in a nationally representative sample of Head Start programs after 3 years and performed on par with national averages of children from a range of socioeconomic backgrounds at each time point. In this context, we are left reflecting on whether expecting children to gain above and beyond already large effects of Head Start is a reasonable expectation.

Second, our past work on *CareerAdvance* found that the benefits of parent education had not yet translated to improvements in household income by the end of year 3. Family investment theory would suggest that one of the main pathways by which improved education affects children is through increased financial means, where parents can purchase materials or resources for children, such as tutors, after-school programs, or moving to more highly resourced neighborhoods. Previous findings suggest that sectoral job training, which is similar to the sectoral approach of *CareerAdvance* in the healthcare sector, does lead to labor market gains, but these often take more than 3 years to accrue (Maguire et al., 2010). Thus, it may be the case that we will not observe positive effects for children until parents and families experience significant increases in income. Indeed, just under half of our parents were still enrolled in *CareerAdvance* at the end of year 3. Given the fact that some families were still progressing in the program, it is possible that we could observe financial benefits after the end of year 3, and in turn, observe effects on children later through elementary school. But again, all findings would have to be above and beyond the effects of Head Start in the long term for children (Phillips et al., 2016).

Importantly, parents' enrollment in *CareerAdvance* was not related to negative effects on children. Past workforce development interventions for low-income mothers found that the programs often led to increased parental stress (Granger & Cytron, 1999; Zaslow et al., 2002), likely because of pressures inherent in the programs and parents' unrealistic expectations for success. Family

stress theory would suggest that increased parent stress would have negative effects for children. Our past research found that *CareerAdvance* was not associated with increased stress. Notably, we only had two measures of stress for parents: (1) perceived stress, which assessed the degree to which parents appraise situations in their lives as stressful and how unpredictable, uncontrollable, and overloaded respondents find their lives, and (2) psychological distress, which asks respondents to report on the frequency with which they experienced symptoms of nonspecific psychological distress. As a result, we cannot speak to the specific effects on stress from parenting, but rather general stress. However, our results do suggest that we did not observe heightened overall stress and that given the right supports, parents can improve their own education, and this does not come at a cost to children's development.

More specifically, *CareerAdvance* was explicitly designed to minimize financial and psychological distress. For example, to help parents make ends meet, *CareerAdvance* offers free tuition, books, and materials. Parents were also eligible to receive financial incentives for reaching certain milestones such as attaining a certificate or meeting attendance requirements. Correspondingly, past work did not find *CareerAdvance* to be associated with perceptions of increases in material hardship, suggesting household economic equilibrium continued during program participation (Chase-Lansdale et al., 2019). We hypothesize that it was because of the purposeful family focus of the intervention and its supportive components, which resulted in improved psychological wellbeing and no overall loss of household income, that parents' participation in *CareerAdvance* did not interfere with CAP Tulsa's effective Head Start programming while children were enrolled in Head Start and as they progressed in elementary school. In this way, our null findings are in some ways encouraging and suggest that the field of child development should continue to consider the significance and direction of effects in intervention work and what we can learn from null findings.

In terms of our subgroup findings, while previous studies found interesting patterns in parents' own outcomes based on their education level at baseline (Chor et al., 2023), we did not observe a consistent pattern in differences in children's outcomes across the same subgroups. In particular, past work found that parents with higher levels of education had decreases in material hardship and financial worry at all three time points. In accordance with family stress theory, we thus hypothesized that potentially children in this group would experience more gains. While we did observe that among children whose parents had higher levels of education, children whose parents were in *CareerAdvance* had greater gains in receptive language compared to the matched comparison group, these findings did not persist through the end of year 3 and

there were no other significant findings within this subgroup. As a result, we find no consistent evidence that children's development varied based on parents' baseline education. While speculative, it could be the case that parents simply did not experience sufficient levels of reductions in financial worry to translate to benefits for children.

Limitations and next steps

There are several notable limitations to our study. We did not conduct a randomized control trial because the program was not yet oversubscribed at the time that study families entered *CareerAdvance*. As a result, unobserved differences between *CareerAdvance* families versus those in the comparison groups may have biased our estimates. Results should not be interpreted as causal. In addition, the study may have limited generalizability. Since the study involved selected Head Start parents in both groups, the findings may not generalize to low-income families who did not enroll their children in Head Start or families across a range of education or income levels. In addition, results may not apply to other Head Start or ECE programs. CAP Tulsa was particularly well suited to support a two-generation approach given its strong administrative leadership and broader mission to support parents and children together. Not all ECE programs, or Head Start agencies, may be ready to support two-generation programs. An area of future work is to explore the extent to which two-generation education programs can be successfully implemented across a range of settings. Indeed, we also have a randomized control trial underway with a larger sample (recruited from an adult-oriented workforce training organization rather than Head Start) to better understand scale-up possibilities using different models on children.

Moreover, this study explored the average effect of *enrollment* in *CareerAdvance* on child outcomes. Our future work will more deeply explore the implementation of *CareerAdvance* and variation in families' experiences within *CareerAdvance*. We will also examine how effects on parents and children vary based on persistence in the program and participation rates as well as elements of the program that were most helpful from parents' perspectives based on qualitative interviews. In addition, this study examined shorter-term effects for academic, language, mathematics, and inhibitory control measures. In terms of outcomes, future work may want to explore the effects on children's behavior problems or social skills. For example, some past work found that parents' increases in education were related to increases in externalizing behavior problems (e.g., Harding, 2015).

Lastly, an examination of longer-term effects is needed and planned. Developmental theory strongly suggests that early childhood is a sensitive period of

development, where positive skill development for young children in the short term may lead to a cascading effect over time, resulting in improved outcomes later in life. Linked lives and dual development theory would suggest that as parents improve their education, employment, and income, children should benefit (Sabol et al., 2021; Sameroff, 2010). This is an empirical question and one that we will study in the future. One important caveat for long-term findings is that CAP Tulsa Head Start is associated with long-term outcomes for children (Amadon et al., 2022). As with our short-term findings, the benefits of *CareerAdvance* would need to be above and beyond these longer-term effects. Testing the complex relation between parents' changes in socioeconomic status and children's development is one that is likely worth testing over time to better understand the links between parent and child wellbeing over time.

CONCLUSION

Given that half of all low-income parents of young children have no more than a high school degree (Jiang et al., 2017), improving parent education may be a path forward for increasing labor market outcomes and income for parents as well as their positive outcomes for their children. Overall, we found no evidence that promoting parent education interferes with children's development, suggesting that this type of two-generation education intervention holds promise as a way to promote parent outcomes through a family-focused lens. Of course, an added benefit would have been if it had also simultaneously promoted children's outcomes above and beyond Head Start, which unfortunately we did not find. However, our findings do suggest that parents can advance their own education without a cost for children when their children are enrolled in high-quality ECE. Further research is necessary to understand the extent to which *CareerAdvance* is associated with longer-term effects for parents and children together.

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DATA AVAILABILITY STATEMENT

The data necessary to reproduce the analyses presented here are not publicly accessible. The analytic code and materials necessary to reproduce the analyses presented

in this study are not publicly accessible. The analyses presented here were not preregistered.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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