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RESEARCH ARTICLE

Three-Year Outcomes for Low-Income Parents of Young Children in a Two-Generation Education Program

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ABSTRACT

Increasingly, parents of young children need postsecondary credentials to compete in the labor market and meet basic family needs. This study uses a quasi-experimental design to examine the effects of Career*Advance*, a two-generation education intervention that offers postsecondary career training in healthcare for parents paired with Head Start for children. Overall, we find that Career*Advance* promotes low-income parents' educational advancement during the first three years after program entry, with weaker evidence of benefits to career progress and psychological wellbeing, and no evidence of economic gains. The two-generation program promotes greater educational and career advancement among parents without postsecondary credentials at baseline, than for parents who began the program with postsecondary credentials. In contrast, exploratory analyses suggest that parents entering the program with postsecondary credentials experienced benefits to some individual markers of economic and psychological wellbeing within three years.

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The likelihood of children earning more than their parents has declined from 90% among those born in 1940 to only 50% among those born in 1985 (Chetty et al., 2017; Solon, 1992). This pattern of economic immobility is linked to education – a key determinant of employment opportunities, career success, and income (e.g., Ashenfelter & Krueger, 1994; Becker & Chiswick, 1966). Although educational attainment has stagnated in recent decades (Fletcher & Han, 2019), parents' education remains a strong predictor of family success and wellbeing (e.g., Duncan et al., 2014; Gershoff et al., 2007; Heinrich, 2014; Magnuson, 2007). The 21st century global economy increasingly requires higher levels of education, including advanced certification and postsecondary

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degrees beyond high school, to compete in the labor market and to meet basic family economic needs (Haskins et al., 2014). Yet, more than half of low-income parents of young children in the United States have not advanced beyond a high school degree (Jiang et al., 2017). One in five college students is a parent (Cruse et al., 2018), but over 50% of parents leave college without earning a degree (U.S. Government Accountability Office, 2019). New approaches to family education are needed to foster multigenerational benefits to parents and children (Dahl & Lochner, 2012; Sabol et al., 2021).

Evidence has recently emerged demonstrating that sectoral training for low-income adults can promote educational and career advancement (Peck et al., 2019). It remains to be seen whether such programs can address the needs of low-income parents of young children (birth to age five), a special subgroup of policy interest. These parents bring challenges to schooling and work, such as the need for affordable childcare and the time demands of parenting, along with strengths, like motivation to succeed on behalf of their children (Gardner et al., 2017; Sommer et al., 2012). One innovative approach is to offer education to parents and young children in the same family at the same time and in a coordinated fashion, explicitly acknowledging the importance of working with the whole family, called two-generation programs (Chase-Lansdale & Brooks-Gunn, 2014; Sabol et al., 2021).

The Community Action Project of Tulsa County (CAP Tulsa) has designed such an intervention and recruits parents of children in its Head Start program into stackable postsecondary education and career training in healthcare at local community and technical colleges (King et al., 2009). In the short-term, Career*Advance* has been shown to promote low-income parents' educational attainment, healthcare employment, and psychological wellbeing after one year (Chase-Lansdale et al., 2019). In the current study, we examine whether Career*Advance* participation yields sustained benefits to parents' success and wellbeing over two and three years. We also consider who might benefit the most from Career*Advance*: those without any postsecondary credentials (i.e., no certificates or associate's, bachelor's, or higher degrees), or those who already hold postsecondary credentials.

Background

In addition to achieving short-term, Year 1 gains in education and employment in the healthcare sector, Career*Advance* participants reported increased psychological wellbeing as measured by optimism and self-efficacy (Chase-Lansdale et al., 2019). Yet, a singular focus on the short-term does not consider sustained improvements to family wellbeing, and evidence on the program's effects over time is needed to assess its potential.

Theoretical Perspectives. Two theoretical perspectives offer useful frameworks for understanding parents' outcomes after two and three years: (1) change and continuity theory, and (2) risk and resiliency theory. Buttressed by extensive empirical evidence, change and continuity theory posits that significant continuity persists over time within the person and within the environment (Rutter & Rutter, 1993). Most low-income environments stay the same because of the endemic nature of economic disadvantage as well as constrained opportunities (e.g., limited resources, substandard housing,

inadequate schools). Similarly, in terms of education and learning on the part of the individual parent, significant developmental continuity is the rule rather than the exception, especially in adulthood. For example, when parents have started down a path of poor performance in school, their lack of certain skills portends future difficulties (Caspi, 2000; Rutter & Rutter, 1993).

Risk and resiliency theory addresses how individuals adapt to chronic and acute stressors (Masten & Gewirtz, 2008) and how the accumulation of many risks hinders healthy development in all phases of life (Klebanov & Brooks-Gunn, 2006; Liaw & Brooks-Gunn, 1994). Resiliency – namely positive development in the face of challenges – implies that certain subgroups of parents may have a variety of strengths upon which they can draw, such as motivation to get their children into Head Start, a desire for more schooling, and other types of wellbeing such as determination and persistence. Such individual strengths are protective factors and can contribute to resiliency (Friedman & Chase-Lansdale, 2000). In addition, resiliency can occur in the face of adversity when parents participate in high-quality intervention programs (Chase-Lansdale & Votruba-Drzal, 2004; Masten & Gewirtz, 2008). In particular, a family systems intervention design may help promote resiliency by addressing the complexities of family life for low-income families. In addition, studies of resiliency in families have shown that some interventions may be most effective for the most disadvantaged (Brooks-Gunn et al., 1992; Harackiewicz & Priniski, 2018; Peisner-Feinberg et al., 2001).

Empirical Evidence. A limited set of evidence from past and current programs informs how best to support educational advancement among low-income parents of young children, and in turn, career success and economic and family wellbeing. Community and technical colleges like those serving Career*Advance* participants represent the most prevalent higher education resource for low-income adults. Stacking postsecondary credentials can increase employment and earnings for adults who already hold a community college credential (Meyer et al., 2022), but only 47% of community college students obtain any type of certificate or degree, and it takes six years (Nelson et al., 2013). Even for more highly educated adults, stackable credentialing is not always effective (Gaulke, 2021; Gaulke et al., 2019).

Over the past several decades, focus has shifted toward career pathway programs for low-income adults (connecting education, training, and supports) by targeting sectors of the economy like healthcare with high demand for workers and well-paying jobs. Findings are mixed. Four randomized control evaluations of sectoral workforce training programs (Project Quest, SEIS, WorkAdvance, and the Year Up healthcare training program) show evidence of increased earnings in the year or so after completion of training. Longer-term follow-up (3 years for Year Up, 6 years for WorkAdvance, and 9 years for Project Quest) shows persistence of early earnings gains by moving participants into higher-wage work rather than just by increasing rates of employment (Katz et al., 2020). In contrast, other studies of career pathway programs indicate smaller impacts on families' economic standing. Nine PACE healthcare training programs largely had impacts on credential receipt 18 months after enrollment, but only one – Year Up – increased earnings (Gardiner & Juras, 2019). Similarly, WorkAdvance had virtually no effect on employment or earnings over seven years (Kanengiser & Schaberg, 2022).

The most comparable study to ours to date is the experimental evaluation of the Health Profession Opportunity Act (HPOG) programs (HPOG 1.0 and HPOG 2.0), administered by the Administration for Children and Families in the Department of Health and Human Services and designed to train low-income adults for careers in healthcare. In fact, Career*Advance* was funded in part by HPOG grants, though the program was not included in the national, experimental evaluation. The second HPOG study (HPOG 2.0) began in 2015 and is ongoing with only short-term findings. That training promoted educational progress and increased healthcare employment in the first 15 months but did not promote general employment or earnings gains (Klerman et al., 2022). Interestingly, short-term (15-month) benefits to educational progress were larger for parents (with child age unspecified) than for those without children as well as for participants with postsecondary credentials at baseline, compared to those without such credentials.

HPOG 1.0 has been evaluated over a longer time frame than HPOG 2.0. After three years – the same time frame as the present study – the HPOG 1.0 programs increased educational attainment, postsecondary credentialing, and healthcare employment as intended, and decreased participants' levels of material hardship and perceived stress. However, HPOG 1.0 programs did not increase general employment or earnings after three years among the full sample. The HPOG 1.0 evaluation generally found the largest impacts on educational progress among those with lower levels of education at baseline, while it detected an impact on earnings in Year 3 among participants with postsecondary education experience (Juras & Buron, 2021; Peck et al., 2019). Separate analyses within the treatment group by length of time in HPOG 1.0 programs revealed that the largest benefits from healthcare training may be for participants who enrolled in a year or more of training, as evidenced by their greater likelihood to be employed (89% vs. 75%) and higher wages ($21/hour vs. $14.50/hour), compared to treatment group members with less than a year of training (Peck et al., 2019). Greater effectiveness of longer-term credentialling may be driven by increased take-up of support services compared to the control group among treatment group members who completed longer-term and multiple credentials (Litwok et al., 2023).

Most studies to date do not focus on parents of young children (e.g., Gardiner & Juras, 2019). An exception involved workforce training programs for low-income mothers of young children in the 1980s and 1990s (e.g., Project Redirection, New Chance, Teen Parent Demonstration, LEAP; Granger & Cytron, 1999), but these did little to boost GED attainment or employment. More recently, the Project Quest sectoral workforce training program had its largest earnings impacts nine years out among parents of children under the age of eighteen, again with child age unspecified (Roder & Elliott, 2019). Three-year HPOG 1.0 impacts on parents with children under age 18 were similar to those seen among the full sample, with an increase in healthcare employment but no effect on general employment; earnings; TANF, SNAP, or Medicaid receipt; or material hardship (Peck et al., 2019). In sum, the evidence regarding workforce training for low-income parents of young children is limited and not encouraging. However, virtually no recent research has examined the effects of two-generation education programs beyond one year.

Current Study and Hypotheses

The current study examines whether Career*Advance* had sustained benefits for parents. One-year findings were presented in previous work (Chase-Lansdale et al., 2019). While the current study focuses primarily on parents' outcomes two and three years after program entry, it reproduces one-year findings regarding individual markers of success and wellbeing and includes one-year outcomes not included in previous work. Moreover, the current study also includes subgroup analyses not presented with previous one-year findings.

To hypothesize about potential program effects, two considerations are key: the population and the counterfactual. In the current study, treatment and comparison group members all come from a population of parents of young children enrolled in a high-quality Head Start program in Tulsa, Oklahoma (Phillips et al., 2016), who were identified by program staff and the research team to be motivated for education and job training in healthcare. What distinguishes treatment group parents from the comparison group is that they have the support of the Career*Advance* program to help them achieve their educational and career goals with a two-generation approach: recruitment occurs within a child- and family-oriented program (Head Start); training schedules are aligned with Head Start hours; additional childcare is provided for younger siblings and during off-hours; coaching and other social and instrumental supports not only address succeeding in coursework but also managing family demands and organizing time; small peer group cohorts with fellow parents comprise the classes; and a family systems design highlights the trainees' roles as parents. These two-generation elements are on top of tuition, fees, and equipment coverage, financial incentives, and in-kind assistance (King et al., 2009). Thus, these multifaceted and generous aspects of the two-generation program are intentionally designed to: (1) address many of the barriers to educational success that are particularly challenging for parents of young children (e.g., financial hardship; juggling work, schooling, and childrearing); (2) provide supports within a trusted Head Start environment; and (3) draw upon parents' unique motivation to succeed on behalf of their children. We would generally expect treatment group parents to outperform comparison group parents across a range of outcomes, and for the program to be more effective at promoting parent success and family wellbeing than other healthcare training programs for low-income adults, including those participated in by comparison group parents.

Theory on change and continuity combined with empirical evidence on sectoral training suggest that Career*Advance* parents would maintain early Year 1 educational advancement during Years 2 and 3. Convergence between the program and comparison groups would be unlikely to occur, reflecting how difficult it is to make changes on one's own without the intensive financial, social, and professional supports available in Career*Advance*. Magnitudes of effects were hypothesized to stay more or less constant over time and compare favorably to those of other career pathways programs for low-income adults.

Empirical evidence on adult education and job training does not provide a strong base from which to hypothesize about low-income parents' career and economic advancement in a two-generation healthcare program over time. With regard to career advancement, we expected mixed results. We anticipated null effects on overall

employment, in line with the null findings after 15 months from the HPOG 2.0 study and the marginally significant and small (1 percentage point) impact after three years from the HPOG 1.0 study. However, we expected to identify other, sustained career benefits including higher rates of healthcare employment (for which parents expressed a desire), greater alignment between parents' jobs and their career goals, and strengthened ties to career (Florit & Lladosa, 2007; Schudde & Bernell, 2019). With regard to economic advancement, theory suggests that future earnings gains (and in turn reductions in public assistance receipt) could emerge over time, since Career*Advance* was designed to meet the unique needs and buttress the unique strengths of parents. However, empirical evidence counters that earnings effects were unlikely and would be *more* likely if Career*Advance* promotes longer-term credentialing beyond the first year rather than short-term certificates achieved in less than a year, as seen with other HPOG 1.0 programs. We further hypothesized that advances in education and career would be most evident among parents who had not previously attained a postsecondary credential, in line with HPOG 1.0 findings (Juras & Buron, 2021; Peck et al., 2019).

While workforce training programs consider long-term increases in earnings and economic advancement to be a key outcome, educational and career advancement and psychological wellbeing may occur independently of economic effects and benefit parents, children, and families (Gershoff et al., 2007; Greenhaus & Callanan, 2012). We expected that educational advancement and any benefits to career would come with lasting psychological benefits to parents, with Year 1 increases in self-efficacy and optimism persisting into Years 2 and 3 (Burger et al., 2020; Fenning & May, 2013; Grabowski et al., 2001; Zimmerman, 2000), in line with psychological benefits observed in the HPOG 1.0 study (Juras & Buron, 2021; Peck et al., 2019). At the same time, educational and career advancement may be associated with more stressful employment (Blustein, 2008; Fujishiro et al., 2010; Thompson et al., 2019). Evidence related to change and continuity theory, along with risk and resilience theory, generally suggests that early educational and career gains would be reflected in increases in wellbeing, such as reductions in financial worry, stress, and psychological distress.

Method

Data

CAP Family Life Study

The current study draws on data collected as part of the CAP Family Life Study to measure the effects of CAP Tulsa's Career*Advance* by comparing the outcomes of participant parents to those of a matched comparison group of similar parents not enrolled in the program; all parents had enrolled their children in CAP Tulsa's Head Start program. CAP Tulsa recruited parents into Career*Advance* by distributing flyers, holding information sessions, and promoting the program through its family support staff at Head Start centers. Eligibility was based on a background check, health status, drug testing, English language proficiency, and interviews conducted by Career*Advance* coaches. All 162 program parents in the study enrolled in Career*Advance* between the fall of 2011 and the fall of 2014.

The research team recruited 176 parents served by CAP Tulsa Head Start, but not enrolled in Career*Advance*, to form a comparison group similar to participant parents on a range of demographic characteristics and self-reported interest in educational and career advancement in the healthcare sector (see *Analytic Strategy: Propensity Score Estimation*). A randomized control trial was not possible at the launch of the study because the program was fairly new and not yet oversubscribed. Instead, as each cohort was recruited to the program, a new cohort of comparison group parents was also recruited to the study by the research team. All parents in Career*Advance* consented to participate in the CAP Family Life Study, as did the matched comparison parents (overall CAP Family Life Study $n = 338$).

Data Sources

The current study draws on five types of data collected as part of the CAP Family Life Study: (1) administrative data on family demographics from Head Start's ChildPlus data management system, collected by CAP Tulsa; (2) administrative data from the state of Oklahoma on parents' earnings income from immediately prior to study enrollment to up to several years after enrollment (depending on enrollment cohort, as data were not available across the entire span of the study); (3) a questionnaire administered by CAP Tulsa family support specialists on Head Start parents' interest in healthcare training; (4) Career*Advance* administrative data tracking participants' progress through the program, from interview through completion; and (5) in-person parent surveys administered by research team personnel at the time of study entry (i.e., baseline), with follow-up after one, two, and three years.

Sample

The current study included all parents from the full CAP Family Life Study sample with follow-up data available at the end of Years 1, 2, or 3 ($n = 314$). The sample size was allowed to vary by outcome as dictated by missingness, with a minimum sample size of 248. Sample parents' baseline demographic characteristics are presented in Table 1. Nearly all (98%) parents were female, and they had a mean age of approximately twenty-nine years ($M = 28.9$, $SD = 6.1$). The racial makeup of the sample was diverse, with 41 percent Black, nearly one-third White (28%), and less than ten percent Hispanic (9%). Since enrollment in Career*Advance* was contingent upon English-language proficiency, almost all parents spoke English as their primary language (90%). At baseline, most parents held a high school diploma or GED (44%) or a certificate or associate's degree (44%), while 8% were without a high school degree or GED and 4% had obtained a bachelor's degree or higher. Average household size was 4.3 residents ($SD = 1.4$) including 2.4 children ($SD = 1.2$), and nearly one-third (32%) of the sample were single parents. Given Head Start income eligibility requirements, all sample parents lived in low-income households, with an average annual household income of $14,594 ($SD$ = $12,493).

Members of the current study's sample ($n = 314$) generally did not differ substantially from the full CAP Family Life Study sample ($n = 338$). The only baseline demographic characteristic that was predictive of attrition was parents' education, with parents

Table 1. Baseline demographic characteristics of parents (M (SD) /%).

	Full Sample ($n = 314$)	Matched Comparison Group ($n = 156$)	Treatment Group ($n = 158$)	Standardized Treatment-Comparison Group Difference after Weighting (p-value)
Motivation score (1–5)	4.031 (0.685)	4.048 (0.795)	4.014 (0.558)	0.042 (0.726)
Gender is male (y/n)	0.019	0.019	0.019	−0.007 (0.946)
Race				
White	0.277	0.282	0.272	−0.027 (0.822)
Black	0.408	0.423	0.392	0.024 (0.840)
Hispanic	0.092	0.096	0.089	−0.024 (0.830)
Other	0.223	0.199	0.247	0.017 (0.896)
English is primary language (y/n)	0.901	0.891	0.911	0.003 (0.979)
Age (years)	28.936 (6.100)	28.224 (5.527)	29.639 (6.559)	0.035 (0.784)
Single parent (y/n)	0.322	0.327	0.316	−0.029 (0.801)
Household size	4.274 (1.406)	4.288 (1.441)	4.259 (1.374)	−0.040 (0.724)
Number of children in household	2.443 (1.171)	2.462 (1.188)	2.424 (1.158)	−0.037 (0.742)
Years of education	12.739 (1.254)	12.654 (1.283)	12.823 (1.224)	0.029 (0.824)
Education				
Less than high school (y/n)	0.076	0.141	0.013	−0.073 (0.653)
High school diploma or GED (y/n)	0.439	0.417	0.462	0.016 (0.896)
Certificate or associate's degree (y/n)	0.443	0.391	0.494	0.015 (0.900)
Bachelor's degree or higher (y/n)	0.041	0.051	0.032	0.017 (0.891)
Neighborhood of residence				
Neighborhood 1	0.424	0.404	0.443	−0.002 (0.988)
Neighborhood 2	0.417	0.436	0.399	0.004 (0.971)
Neighborhood 3	0.127	0.135	0.120	−0.011 (0.921)
Neighborhood 4	0.032	0.026	0.038	0.014 (0.904)
Semester of study entry is fall (y/n)	0.650	0.660	0.639	0.011 (0.928)
Year of study entry				
2011	0.306	0.288	0.323	−0.010 (0.929)
2012	0.287	0.282	0.291	0.031 (0.803)
2013	0.296	0.276	0.316	0.013 (0.916)
2014	0.111	0.154	0.070	−0.048 (0.665)
Annual household income ($)	14,594.210 (12,493.170)	15,288.440 (12,167.780)	13,908.770 (12,807.970)	−0.003 (0.982)
Earnings income in previous year ($)	6,369.777 (8,992.125)	6,286.082 (9,586.775)	6,439.522 (8,496.82)	0.030 (0.853)
Employed (y/n)	0.556	0.555	0.557	0.120 (0.349)

holding less than a high school education 11.1 percentage points more likely to attrite from the study sample prior to follow-up data collection, and parents holding certificates or associate's degrees 6.3 percentage points more likely to remain available for follow-up, compared to other parents (Appendix Table A3).

Among the 314 parents with follow-up data in the current study's sample, one-half were from the treatment group ($n = 158$, 50.3%) and one-half were from the matched comparison group ($n = 156$, 49.7%). Members of the comparison group were significantly more likely to attrite from the CAP FLS sample than those in the treatment group, with a difference in follow-up study participation of nine percentage points (89% in comparison group vs. 98% in treatment group). Holding less than a high school education was predictive of attrition only in the treatment group, among whom parents with less than a high school education were 48.7 percentage points less likely to remain in the sample compared to those with a high school education or higher, while among the comparison group, parents with less than a high school education were 0.7 percentage points less likely to remain in the sample, for a difference in attrition rates of 48 percentage points. We assess the impact of this difference on our findings with a robustness check (see online Supplementary Materials).

The treatment and comparison groups had similar characteristics at baseline, because comparison group parents had been identified for study recruitment based on the similarity of their observable characteristics to those of treatment group members. However, on average, treatment group parents were older than comparison group parents (standardized treatment-comparison difference of 0.233); less likely to hold less than a high school degree (standardized treatment-comparison difference of 0.495); and less likely to have entered the study in 2014 (standardized treatment-comparison difference of 0.269). After applying inverse probability weights there were no significant differences on observables between the treatment and matched comparison groups on average, indicating that the analytic strategy achieved its goal of accounting for observable treatment-comparison group imbalance (Table 1).

Measures

Following the convention of the HPOG evaluations, the current study focused on a small set of "confirmatory" outcomes as the primary markers of program success: indices of educational, career, and economic advancement and psychological wellbeing. The use of indices decreases the number of hypothesis tests conducted and provides information about whether the program has an overall or general effect on a domain of wellbeing (Anderson, 2008; Bloom & Michalopoulos, 2013). We also conducted exploratory analysis of individual indicators of success and wellbeing to provide a more nuanced understanding of participants' experiences.

Educational, Career, and Economic Advancement

Information about parents' educational advancement came from in-person parent surveys. The current study examines two markers of parents' educational advancement at the end of Years 1, 2, and 3: (1) receipt of new postsecondary credentials of any type since study entry (yes/no), and (2) enrollment in an education or job training program

(yes/no). These measures were considered to be important indicators of educational success which might be linked to future gains to career, as well as economic and psychological wellbeing. The mean of the two indicators was used to create an index of educational advancement, with the value of the index representing the likelihood of both having received new postsecondary credentials since program start and being enrolled in school, at each of the three timepoints.

Markers of career advancement included employment status (worked for pay at all in the last week, yes/no), working in the healthcare sector (yes/no), working a job related to personal career goals (yes/no), and strength of career identity. The parent survey asked parents to rate, for each job worked, how related the job was to the parent's career. A parent was considered to work a job related to their personal career goals if s/he rated any job as being somewhat or very related to his/her career, and a dummy variable was created accordingly, indicating working a job related to personal career goals. The strength of a parent's career identity was measured using a shortened version of the Work Role Salience Questionnaire (Chronbach's $\alpha = 0.81$; Greenhaus & Sklarew, 1981). The ten survey items were averaged, and the resulting value was standardized by subtracting the comparison group mean and dividing by the comparison group standard deviation. An indicator variable for having a strength of career identity above the sample median was also created, so that the mean could be taken of four dummy variables (employed, employed in healthcare, job aligned with career goals, and above the median on ties to career), creating an overall index of career advancement. The value of the index represents the proportion of the four career advancement characteristics held by the parent.

Economic advancement was gauged using four individual markers. Three markers represented objective measures of economic wellbeing. We calculated weekly earnings and created an indicator variable denoting whether a household received public assistance at each wave, both based on survey reports. We also measured material hardship using an eight-item scale adapted from the New Hope Project and based on items from the Survey on Income and Program Participation (Yoshikawa et al., 2008). The items asked parents whether their households had experienced any of eight types of material hardships in the previous six months. The survey items were averaged to find the proportion of the eight hardships experienced by the household, with a higher value indicating a greater level of material hardship. We also used a more subjective measure of economic wellbeing, representing a psychological stressor related to income and finances. Parents reported on their levels of financial worry at each wave of parent survey administration using a five-item scale adapted from the New Hope Project (Yoshikawa, 2009), for which individual items were averaged. Both material hardship and financial worry were standardized within the study sample using the comparison group's mean and standard deviation.

In addition, an indicator variable was created for earnings income, with a one representing having earnings above the sample median. We also constructed indicators signifying having levels of material hardship and financial worry below the sample median and created an indicator for *not* receiving public assistance. We were then able to take the mean of the four indicators (above the median on earnings, lack of public assistance receipt, below the median on material hardship, and below the median on financial

worry), creating an index of economic advancement that represents the proportion of the four economic advancement characteristics held by the parent.

Psychological Wellbeing

The study drew on parent self-reports of psychological wellbeing at the end of Years 1, 2, and 3 along four dimensions related to educational, career, and economic advancement: (1) self-efficacy, (2) optimism, (3) perceived stress, and (4) psychological distress. For each of the four measures, individual survey item responses were averaged within a scale, with a higher value indicating a greater level of the construct. The average scores were then standardized within the study sample using the comparison group's mean and standard deviation, such that study findings represent effects in standard deviation units.

Parents' levels of self-efficacy were measured using an adaptation of the six-item State Hope Scale ($\alpha = 0.82$; Snyder et al., 1996) used in the New Hope Project. The scale measures respondents' hope about achieving goals by asking them to indicate their levels of agreement with statements about how they are currently feeling about their lives (e.g., "At this time I am meeting the goals I set for myself") on a four-point scale. Optimism was measured using the Revised Life Orientation Test ($\alpha = 0.78$; Scheier et al., 1994), in which parents were asked to indicate their level of agreement with ten statements assessing differences in optimism versus pessimism (e.g., "In uncertain times, I usually expect the best") on a five-point scale.

Parents' levels of perceived stress were gauged using the 10-item Perceived Stress Scale ($\alpha = 0.78$; Cohen & Williamson, 1988), which assesses the degree to which individuals rate situations in their life as stressful and how unpredictable, uncontrollable, and overloaded they find their lives to be. Respondents rated on a five-point scale the frequency with which they felt or thought a certain way about events in their lives during the previous month (e.g., "How often have you felt difficulties were piling up so high that you could not overcome them?"). Psychological distress was measured using the Kessler 6 scale ($\alpha = 0.89$; Kessler et al., 2002), a six-item questionnaire asking respondents to report on the frequency with which they experienced symptoms of nonspecific psychological distress over the past thirty days (e.g., "Felt nervous") on a five-point scale.

Finally, to gauge the program's overall effect on psychological wellbeing, we created an index as a composite of the four individual measures of psychological wellbeing. We reverse-coded the perceived stress and psychological distress measures in order to align the valence across the four individual measures of psychological wellbeing, and then took the mean of the four standardized variables. A higher level of the index therefore indicates a higher level of psychological wellbeing, and in standard deviation units, i.e., effect sizes.

Analytic Strategy

Propensity Score Estimation

We employed a quasi-experimental design for the study with two stages of propensity score estimation: one for study recruitment and a second for measurement of program

effects. In the first stage of propensity score estimation, a group of parents was selected by the research team to recruit to a matched comparison group as part of the CAP Family Life Study from the full population of parents served by CAP Tulsa Head Start. At the time of each of seven cohorts' entries into Career*Advance* (fall 2011, spring 2012, through fall 2014), nearest-neighbor matching was conducted to identify non-participant Head Start parents with similar characteristics as participant parents as recorded in Head Start administrative data, who were then asked to participate in the study. Parents were matched based on a host of baseline characteristics, including parent gender, race, age, English language proficiency, education, relationship to child, single parent status, foster parent status, and motivation for healthcare training and employment.

After a second stage of propensity score estimation, inverse probability weighting was used to address selection into treatment on observable characteristics while comparing treatment and matched comparison group parents' outcomes over time. Logistic regression was used to estimate the likelihood that a parent participated in Career*Advance* as predicted by the selected matching variables. Appendix Table A1 reports odds ratios and marginal effects from the prediction of treatment status associated with each of the matching variables. Propensity scores π were used to create inverse probability weights, with treatment group members weighted by the reciprocal of the propensity score (i.e., $1/\pi$) and comparison group members weighted by the reciprocal of one minus the propensity score (i.e., $1/(1 - \pi)$). Estimation of second-stage propensity scores drew on baseline parent survey data collected as part of the CAP Family Life Study, which was not available at the time of matched comparison group recruitment and was likely more recent than Head Start administrative data. In addition, estimation of second-stage propensity scores drew on the full CAP Family Life Study sample rather than matching cohort by cohort, potentially allowing for more precise matching. Because we allowed the sample to vary across outcomes, we verified treatment-comparison group balance among each of the outcomes' individual samples after applying inverse probability weights (i.e., we conducted balance checks among the sample with nonmissing data on a given outcome, for all confirmatory outcomes; Appendix Table A4 reports the largest (and therefore most concerning) standardized treatment-comparison group difference, across all matching variables, for the sample of parents with data available on the given outcome).

Second-stage propensity scores used to create inverse probability weights ranged from a minimum of 0.038 to a maximum of 0.810, with a mean of 0.503 and a standard deviation of 0.159 (Figures 1–3; Appendix Table A2). We identified the region of common support as the range of propensity scores between the minimum propensity score among the treatment group (0.104) and the maximum propensity score among the comparison group (0.761). Twenty-one parents had propensity scores beyond the region of common support and were excluded from estimation of program effects (Figure 4).

Identification of causal effects of Career*Advance* among subgroups of interest (more and less highly educated parents) was limited by the fact that parents were neither randomly assigned to treatment across the full sample, nor randomly assigned to treatment within subgroups. Differences in trends in the outcome measures between these two groups could then drive subgroup differences. While data on such outcome measures as unemployment and earnings over time were not available for Tulsa, Oklahoma,

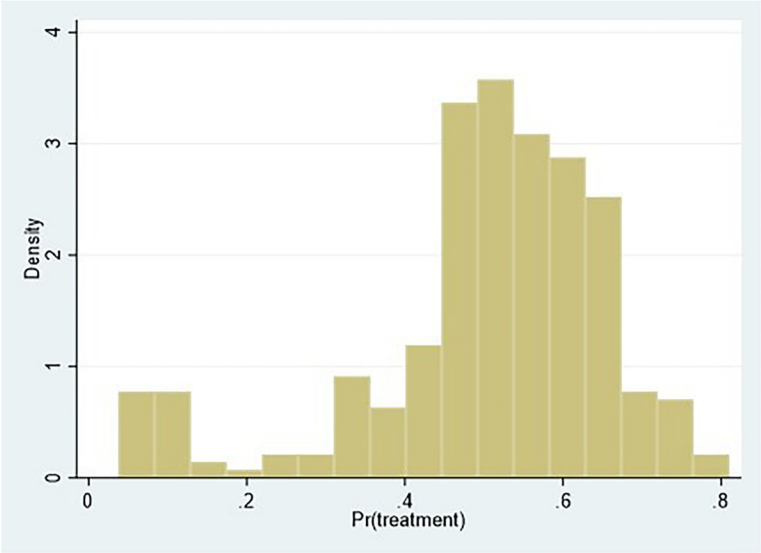

Figure 1. Histogram of estimated propensity scores.

separately for parents with and without postsecondary educational credentials, national statistics do not suggest differential trends by education. For example, between January 2010 and December 2017 (a bit before the study to a bit after the study), unemployment decreased by 59% among parents with high school degrees but no college and decreased by a similar 55% among parents with a bachelor's degree or higher (U.S. Bureau of Labor Statistics, 2022). Importantly, we did not detect any significant differences on observable baseline characteristics between the treatment and comparison groups within either of the subgroups of parents examined (i.e., parents with and without postsecondary credentials at baseline) at the 5% level after weighting.

Matching Variables

A comprehensive set of baseline demographic and family background characteristics was used in the second stage of propensity score estimation to estimate the probability of participating in Career*Advance* (Appendix Table A1), which was then used to create an inverse probability weight for weighted least squares regressions (see *Model*). With regard to individual characteristics, matching variables included: an indicator variable for gender (1 = male); age in years at study entry; a series of indicator variables denoting the parent's race being Black, White, Hispanic, or of another race; an indicator variable for English being the parent's primary language; and parent's highest level of educational attainment (indicator variables for having no high school degree; a high school degree (diploma or GED); a certificate or associate's degree; or a bachelor's degree or higher). Because of the importance of baseline education in the decision to pursue education and job training, we also included a more fine-grained measure as a matching variable, converting the parent's reported highest level of education into years of schooling (e.g., high school diploma or GED = 12 years; associate's degree or certificate = 14 years; bachelor's degree = 16 years; master's degree = 18 years). In terms of family

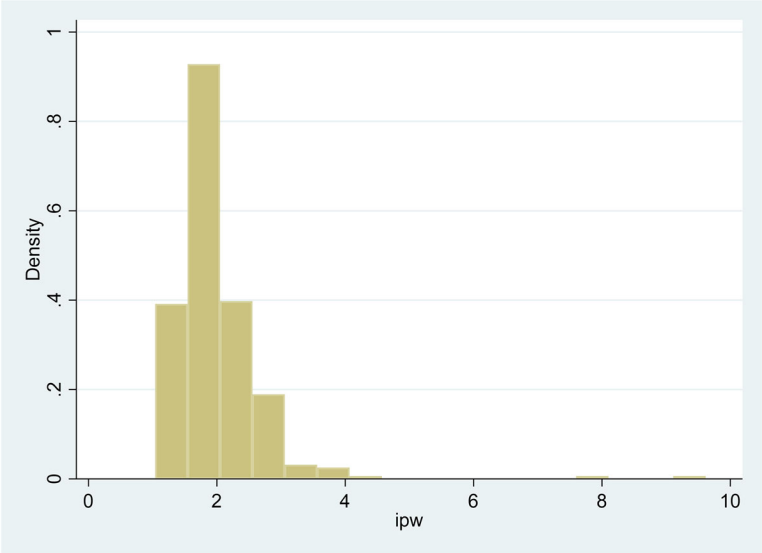

Figure 2. Histogram of estimated inverse probability weights.

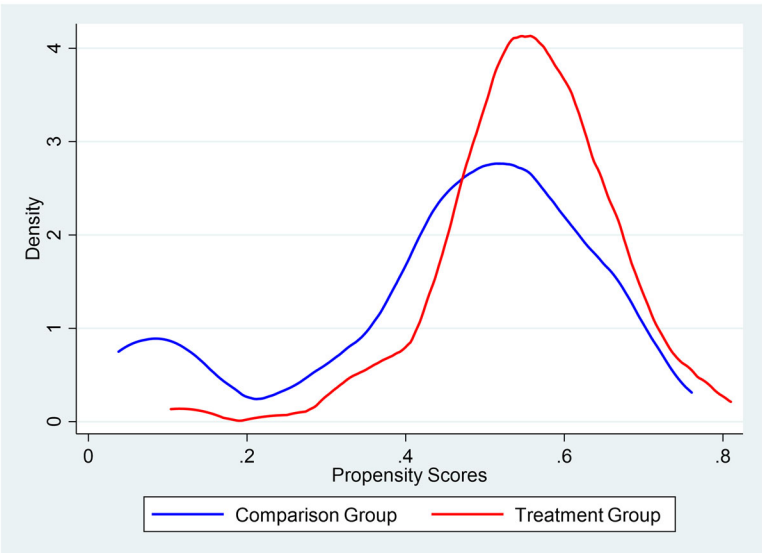

Figure 3. Kernel density plot of distribution of estimated propensity scores among the study's treatment and comparison groups.

characteristics, matching variables included: single parent status; number of individuals living in the parent's household; number of children living in the parent's household; neighborhood of residence (four different neighborhoods); and annual household income. To account for differences between program participants over time, as well as differences in the population of CAP Tulsa parents over time, we also matched on timing of program and study entry using indicator variables denoting that the parent enrolled in Career*Advance* or the CAP Family Life Study in a fall semester (versus a

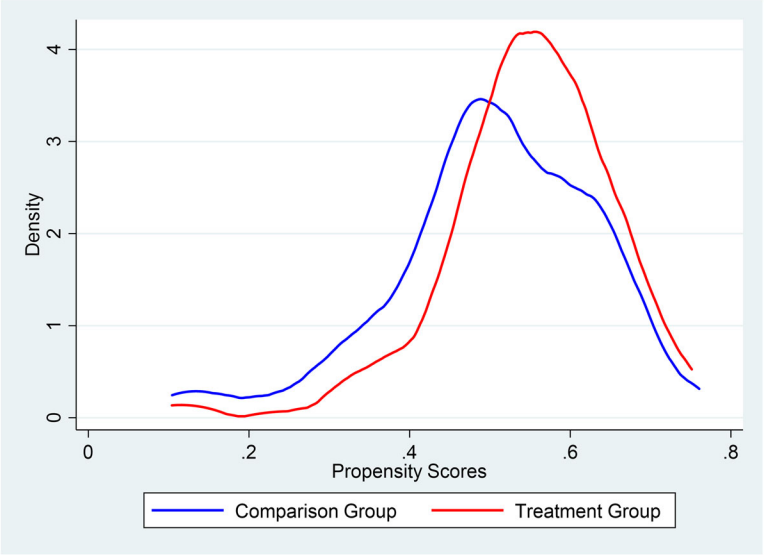

Figure 4. Kernel density plot of distribution of estimated propensity scores among the study's treatment and comparison groups after restricting to propensity scores on the region of common support.

spring semester) and indicator variables denoting the year in which the parent enrolled in Career*Advance* or the CAP Family Life Study (among each of years 2011 to 2014).

CAP Family Life Study parent survey data were generally more recent than Head Start ChildPlus data and therefore preferred. However, neighborhood of residence was not measured in the survey, and ChildPlus household income was used rather than study survey data out of concern that parents' incomes would have changed in response to acceptance in Career*Advance*, creating endogeneity if measured at the time of the baseline survey (rather than earlier).

To minimize selection into treatment on observable characteristics, we also matched on parents' observed motivation for healthcare training by including a "motivation score" based on self-reported interest in educational and career advancement in the healthcare sector as a matching variable. As part of their admission to the program, participant parents were ranked in terms of their motivation for healthcare training on a five-point scale by program personnel. Interest in healthcare training was assessed among non-participant CAP Tulsa Head Start parents to recruit the study's comparison group using a brief questionnaire administered by CAP Tulsa family support specialists. Responses to the questionnaire allowed for a comparable motivation score to be created, also on a five-point scale. All CAP Family Life Study parents were rated as highly motivated to attain healthcare training and employment, with an average motivation score of four points out of five ($SD = 0.68$; Chase-Lansdale et al., 2019), where higher values of the score indicate higher levels of motivation.

Propensity scores are often used to compare treated individuals to non-treated individuals with similar observable characteristics. However, they do not account for differences in unobservable characteristics that may be correlated with outcomes, except to the extent that these unobservable characteristics are predicted by those which are observable (Murnane & Willett, 2010; Rosenbaum & Rubin, 1983; Rubin, 2001).

Propensity score methods require conditional independence in order to produce valid estimates of program effects: that selection into treatment be independent of potential outcomes, after conditioning on observable characteristics. Generally, we would expect that low-income Head Start parents who select into an education and job training program in healthcare would differ from non-participant parents in ways that would affect identification of a causal effect of the program in the absence of randomized assignment.

The direction of selection is theoretically ambiguous. On the one hand, parents with the greatest need for educational, career, and economic advancement with lower levels of education, employment and income, might be the most likely to take advantage of the opportunity, biasing estimates downward because we would expect such parents to fare worse in terms of the study's markers of success and wellbeing. On the other hand, parents who are the most motivated to succeed in careers and have the most resources available to support their schooling (e.g., partner in the household, household income) might be the most likely to enroll in Career*Advance*.

We would generally expect estimates of program effects to be upward-biased, i.e., that there would be positive selection into treatment, meaning that program benefits might be overstated. However, the current study used a "motivation score" designed to gauge parents' motivation for educational and career advancement in the healthcare sector to recruit the comparison group to try to minimize this type of positive selection into treatment, in addition to using a broad set of indicators of parents' resources, which are likely strongly correlated with unobservable resources, as matching variables. The use of this motivation measure, not often available for similar studies, should reduce the magnitude of any upward bias, given that it is likely highly correlated with other, unobservable characteristics driving positive selection into treatment. Importantly, we also assessed the sensitivity of our results to deviation from conditional independence through a series of sensitivity analyses (see online Supplementary Materials).

Model

The current study measured the full-sample effects of Career*Advance* participation on parents' educational, career, and economic advancement and psychological wellbeing at the end of Years 1, 2, and 3 with ordinary least squares regressions of parent outcomes on treatment status (i.e., 1 = treatment, 0 = matched comparison). Regressions included all matching variables described above (see *Matching Variables*) as covariates and were weighted using inverse probability weights. We also conducted moderation analysis to test for differences in the magnitude of the effect of Career*Advance* by baseline education. An interacted model regressed a parent outcome on treatment status, baseline education (i.e., 1 = no postsecondary credentials, 0 = postsecondary credentials), and the interaction between the two, with the interaction term representing the difference in the magnitude of the effect of Career*Advance* by baseline education. The main effect of treatment status then provides an estimate of the effect of Career*Advance* among parents with higher levels of education, while the sum of the main effect of treatment status and the interaction term provides an estimate of the effect of Career*Advance* among parents with lower levels of education. All models also included the set of

covariates used for full-sample analysis (i.e., the matching variables), and regressions were weighted using the same inverse probability weights.

Results

Overall Effects on Parents' Educational, Career, and Economic Advancement and Psychological Wellbeing

In order to make generalizations about program effects on different domains of outcomes, and in recognition of issues of inference related to multiple hypothesis testing (Bloom & Michalopoulos, 2013), the study examined four overall indices of success and wellbeing as its confirmatory outcomes: composites of educational, career, and economic advancement and psychological wellbeing. We also performed the Holm-Bonferroni sequential correction for multiple hypothesis testing, and present p-values associated with estimates after conducting this adjustment, which controls the familywise error rate (Gaetano, 2013; Holm, 1979). In this section, we present treatment effect estimates under the assumption of conditional independence. We briefly discuss how sensitive our results are to deviation from this assumption in a later section (described in greater depth in the online Supplementary Materials).

Results using inverse probability weighting demonstrated that Career*Advance* participation promoted parents' educational and career advancement within the first year, and educational and career gains were sustained to the end of Year 3 (Table 2). However, we did not find evidence that Career*Advance* participation led to overall economic advancement during the first three years after program entry, and immediate benefits to parents' psychological wellbeing were not sustained beyond the end of Year 2. Moderation analysis suggested that education and career gains were larger for parents who entered Career*Advance* without postsecondary credentials (Table 3–5).

Educational Advancement

We found that Career*Advance* participation increased the index of educational advancement by approximately 0.3–0.4 in each of Years 1, 2, and 3, representing a 30 to 40 percentage point increase in the likelihood of holding both markers of educational advancement (postsecondary certification since program entry and enrollment in education or job training; Table 2). Parents' educational advancement indices doubled during Year 1 from a regression-adjusted mean of 38.8% among the comparison group to a mean of 78.1% in the treatment group (Table 6), a difference of 39.2 percentage points in the likelihood of both having received certification and being enrolled in school ($p < 0.001$). This effect was sustained to the end of Year 2, when treatment group members' educational advancement index had increased by 33.2 percentage points to 74.2%, compared to a base rate of 41.0% among the comparison group ($p < 0.001$). The magnitude of the effect on educational advancement remained highly significant at the end of Year 3 ($p < 0.001$), with an increase of 27.9 percentage points, from 41.2% to 69.0%, but the Year 3 effect was statistically significantly smaller compared to the end of Year 1 ($p = 0.002$) and the end of Year 2 ($p = 0.074$).

Table 2. Effect of Career*Advance* participation on indices of parents' educational, career, and economic advancement and psychological wellbeing at the end of years 1, 2, and 3, B (SE) ($n = 293$).

	End of Year 1	End of Year 2	End of Year 3
Educational advancement	0.392***[bc]	0.332***[ac]	0.279***[ab]
	(0.036)	(0.036)	(0.038)
Career advancement	0.065	0.088**	0.085**
	(0.039)	(0.039)	(0.038)
Economic advancement	−0.004	0.021	0.009
	(0.016)	(0.025)	(0.025)
Psychological wellbeing	0.223**[c]	0.183*[c]	0.039[ab]
	(0.091)	(0.092)	(0.092)

Notes: Results of inverse probability weighted regressions of outcomes one, two, and three years after program entry on parent treatment status and covariates (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry). Units for educational, career, and economic advancement indices is percentage of individual markers of advancement met. Units for psychological wellbeing index is standard deviations.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$ (After Holm-Bonferonni adjustment).
[a]Significantly different from Year 1 effect.
[b]Significantly different from Year 2 effect.
[c]Significantly different from Year 3 effect (each at $p < 0.10$).

Across all three time points, parents without postsecondary credentials benefited more from Career*Advance* in terms of educational advancement, compared to those with postsecondary credentials (Table 3). Career*Advance* parents without postsecondary credentials at baseline experienced educational advancement of approximately 0.6 on the education index in Year 1 ($\beta = 0.572$, $p = 0.001$), indicating a 57 percentage-point increase in the likelihood of achieving both markers of educational advancement, from a mean of 18.6% in the comparison group to a mean of 74.2% in the treatment group (Table 7). Treatment group parents without postsecondary credentials continued to outpace their comparison group counterparts by 45–50 percentage points at the end of Year 2 ($\beta = 0.502$, $p = 0.001$), when the comparison group had a mean of 24.3%, and the end of Year 3 ($\beta = 0.452$, $p < 0.001$), when the comparison group had a mean of 27.7%. Effects on parents who entered the program with postsecondary credentials were significantly smaller compared to treatment group parents with lower levels of baseline education at all three time points ($p = 0.001$).

Career Advancement

Career*Advance* participation increased the index of career advancement by a marginally significant 0.09 at the end of Years 2 and 3, corresponding to increases of about 9 percentage points in the likelihood of holding each of the four markers of career advancement (Table 2). At the end of Year 2, the treatment group had a mean of 41.5% compared to 32.7% among the comparison group, a difference of 8.8 percentage points ($p = 0.078$; Table 6). Outcomes were similar at the end of Year 3, when the treatment group had a mean of 40.9% compared to 32.4% among the comparison group, a difference of 8.5 percentage points ($p = 0.081$). Post hoc analysis showed that the magnitude of the program's effects on the index of career advancement did not differ over time, indicating that participant parents made immediate gains in Year 1, and though they did not make additional gains in later years, comparison group parents were not able to catch up over time either.

Table 3. Effect of Career*Advance* participation on indices of parents' educational, career, and economic advancement and psychological wellbeing at the end of years 1, 2, and 3, by baseline parent education, B (SE) ($n = 293$).

	End of Year 1			End of Year 2			End of Year 3		
	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education
Educational advancement	0.219***	−0.224	0.353***	0.167***	−0.088	0.336***	0.111	−0.092	0.341***
	(0.050)	(0.142)	(0.073)	(0.051)	(0.145)	(0.074)	(0.052)	(0.150)	(0.077)
Career advancement	0.044	0.063	0.042	0.069	0.020	0.043	0.021	0.215	0.136
	(0.057)	(0.156)	(0.083)	(0.055)	(0.157)	(0.085)	(0.054)	(0.153)	(0.081)
Economic advancement	−0.006	−0.032	0.004	0.033	−0.037	−0.026	0.021	−0.037	−0.024
	(0.024)	(0.065)	(0.035)	(0.036)	(0.103)	(0.054)	(0.036)	(0.103)	(0.053)
Psychological wellbeing	0.299	0.087	−0.152	0.207	−0.320	−0.053	0.111	−0.180	−0.154
	(0.132)	(0.363)	(0.193)	(0.129)	(0.368)	(0.198)	(0.131)	(0.373)	(0.197)

Notes: Results of inverse probability weighted regressions of outcomes one, two, and three years after program entry on parent treatment status, baseline education (indicator for not having postsecondary credentials), the interaction between treatment status and baseline education, and covariates (motivation score, gender, age, English as primary language, status as single parent, race, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry). Units for educational, career, and economic advancement indices is percentage of individual markers of advancement met. Units for psychological wellbeing index is standard deviations.

*$p < 0.10$.

**$p < 0.05$.

***$p < 0.01$ (After Holm-Bonferonni adjustment).

Table 4. Effect of Career*Advance* participation on individual markers of parents' educational, career, and economic advancement and psychological wellbeing at the end of years 1, 2, and 3, B (SE) ($n = 293$).

	End of Year 1	End of Year 2	End of Year 3
Educational Advancement			
Received postsecondary credentials since program start (y/n)	0.367***	0.408***	0.346***
	(0.044)	(0.042)	(0.043)
Enrolled in an education or job training program (y/n)	0.447***	0.255***	0.193**
	(0.054)	(0.059)	(0.057)
Career Advancement			
Employed (y/n)	0.023	0.046	0.049
	(0.057)	(0.060)	(0.059)
Employed in healthcare sector (y/n)	0.190**	0.193**	0.183**
	(0.058)	(0.059)	(0.056)
Works a job that is related to career goals (y/n)	0.051	0.107	0.107
	(0.060)	(0.060)	(0.061)
Strength of career identity (SD)	0.209	0.213	0.189
	(0.110)	(0.122)	(0.119)
Economic Advancement			
Weekly earnings ($)	−27.190	−1.618	25.242
	(33.438)	(34.617)	(38.854)
Household receives public assistance (y/n)	0.026	−0.042	−0.060
	(0.057)	(0.060)	(0.059)
Material hardship (SD)	−0.086	−0.276	−0.149
	(0.130)	(0.118)	(0.132)
Financial worry (SD)	−0.147	−0.293	−0.224
	(0.112)	(0.114)	(0.114)
Psychological Wellbeing			
Self-efficacy (SD)	0.286	0.184	0.085
	(0.124)	(0.125)	(0.133)
Optimism (SD)	0.305*	0.312*	0.195
	(0.114)	(0.112)	(0.112)
Perceived stress (SD)	−0.107	−0.203	0.077
	(0.115)	(0.129)	(0.122)
Psychological distress (SD)	−0.214	−0.037	0.035
	(0.108)	(0.117)	(0.125)

Notes: Results of inverse probability weighted regressions of outcomes one, two, and three years after program entry on parent treatment status and covariates (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry). One-year findings do not perfectly replicate previously presented findings due to differences in analytic strategies (Chase-Lansdale et al., 2019).
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$ (After Holm-Bonferonni adjustment).

Similar to educational attainment, moderation analysis suggested that parents who entered Career*Advance* without postsecondary credentials experienced the greatest benefits to career (Table 3). Program participation increased the index of career advancement by a marginally significant 0.16 during Year 3 ($\beta = 0.157$, $p = 0.068$) among parents without postsecondary credentials at baseline, from a mean of 26.4% in the comparison group to a mean of 45.0% in the treatment group, though the effect was not significantly larger for this group compared to more highly educated parents.

Economic Advancement

We did not find evidence that Career*Advance* participation led to overall economic advancement during the first three years after program entry (Table 2). Findings were similar across levels of baseline parent education (Table 3).

Table 5. Effect of Career*Advance* participation on individual markers of parents' educational, career, and economic advancement and psychological well-being at the end of years 1, 2, and 3, by baseline parent education, B (SE) ($n = 293$).

	End of Year 1			End of Year 2			End of Year 3		
	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education	Treatment Status	No Postsecondary Education	Treatment Status x No Postsecondary Education
Educational Advancement									
Received postsecondary credentials	0.057	−0.455***	0.628***	0.092*	−0.404***	0.643***	0.089	−0.330**	0.523***
since program start (y/n)	(0.058)	(0.165)	(0.085)	(0.054)	(0.154)	(0.079)	(0.058)	(0.165)	(0.085)
Enrolled in an education	0.439***	0.081	0.016	0.297***	0.415*	−0.092	0.174**	0.296	0.040
or job training program (y/n)	(0.078)	(0.213)	(0.114)	(0.083)	(0.235)	(0.127)	(0.082)	(0.232)	(0.123)
Career Advancement									
Employed (y/n)	0.025	0.161	−0.003	0.019	0.114	0.060	−0.053	0.225	0.216*
	(0.082)	(0.225)	(0.120)	(0.084)	(0.238)	(0.128)	(0.084)	(0.237)	(0.126)
Employed in healthcare	0.118	0.118	0.145	0.174**	−0.078	0.041	0.172**	0.370	0.025
sector (y/n)	(0.083)	(0.083)	(0.122)	(0.082)	(0.234)	(0.126)	(0.080)	(0.226)	0.120)
Works a job that	0.033	0.089	0.036	0.068	0.031	0.086	−0.035	0.264	0.302**
is related to career goals (y/n)	(0.086)	(0.237)	(0.127)	(0.084)	(0.240)	(0.130)	(0.086)	(0.242)	(0.128)
Strength of career identity (SD)	0.113	−0.120	0.196	0.083	−0.518	0.287	0.054	−0.759	0.289
	(0.159)	(0.438)	(0.234)	(0.170)	(0.492)	(0.261)	(0.168)	(0.486)	(0.254)
Economic Advancement									
Weekly earnings ($)	−52.889	40.418	52.483	−54.201	−4.413	114.041	−8.791	151.662	71.542
	(048.202)	(132.541)	(70.843)	(48.498)	(137.544)	(73.900)	(55.110)	(159.687)	(82.115)
Household receives public	0.017	0.045	0.017	−0.007	0.034	−0.076	−0.098	0.171	0.080
assistance (y/n)	(0.083)	(0.228)	(0.121)	(0.084)	(0.238)	(0.128)	(0.084)	(0.239)	(0.126)
Material hardship (SD)	−0.369**	0.090	0.577**	−0.465***	0.170	0.417*	−0.376**	−0.098	0.480*
	(0.186)	(0.499)	(0.273)	(0.163)	(0.451)	(0.249)	(0.186)	(0.558)	(0.277)
Financial worry (SD)	−0.368**	−0.817*	0.449*	−0.468***	−0.359	0.386	−0.457***	0.047	0.494**
	(0.162)	(0.444)	(0.237)	(0.158)	(0.450)	(0.243)	(0.161)	(0.457)	(0.242)
Psychological Wellbeing									
Self-efficacy (SD)	0.194	0.089	0.189	0.169	−0.273	0.033	0.026	0.200	0.128
	(0.179)	(0.492)	(0.263)	(0.174)	(0.497)	(0.268)	(0.188)	(0.534)	(0.284)
Optimism (SD)	0.348**	−0.183	−0.087	0.258*	−0.669	0.119	0.291*	−0.706	−0.204
	(0.164)	(0.453)	(0.241)	(0.156)	(0.445)	(0.240)	(0.159)	(0.453)	(0.240
Perceived stress (SD)	−0.321*	−0.515	0.434*	−0.346*	−0.068	0.314	−0.078	−0.086	0.329
	(0.165)	(0.454)	(0.242)	(0.179)	(0.509)	(0.275)	(0.172)	(0.490)	(0.259)
Psychological distress (SD)	−0.349**	0.112	0.273	−0.062	0.403	0.054	−0.049	0.321	0.179
	(0.156)	(0.429)	(0.228)	(0.164)	(0.468)	(0.253)	(0.177)	(0.503)	(0.266)

Notes: Results of inverse probability weighted regressions of outcomes one, two, and three years after program entry on parent treatment status, baseline education (indicator for not having postsecondary credentials), the interaction between treatment status and baseline education, and covariates (motivation score, gender, age, English as primary language, status as single parent, race, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry).
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table 6. Regression-adjusted means of indices of parents' educational, career, and economic advancement at the end of years 1, 2, and 3 ($n = 293$).

	End of Year 1		End of Year 2		End of Year 3	
	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group
Educational advancement (Scale: 0–1)	0.388	0.781	0.410	0.742	0.412	0.690
Career advancement (Scale: 0–1)	0.360	0.424	0.327	0.415	0.324	0.409
Economic advancement (Scale: 0–1)	0.597	0.592	0.571	0.591	0.574	0.583

Notes: Presents regression-adjusted means using the same set of covariates as used for estimation of program effects (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry) and same inverse probability weights. Index of psychological wellbeing not included in table because it is measured in standard deviation units.

Psychological Advancement

We found that Career*Advance* increased parents' psychological wellbeing by a statistically significant 0.22 standard deviations at the end of Year 1 ($ES = 0.223$, $p = 0.048$; Table 2). The program continued to benefit parents' psychological wellbeing at the end of Year 2 ($ES = 0.183$, $p = 0.098$). The magnitudes of the effects were not statistically significantly different between Years 1 and 2. However, we did not find a significant effect on overall psychological wellbeing at the end of Year 3, when the estimated effect was also significantly smaller than that estimated in Year 1 ($p = 0.030$) or Year 2 ($p = 0.068$). Moderation analysis did not reveal statistically significant differences in psychological effects by baseline education (Table 3).

Individual Markers of Parents' Educational, Career, and Economic Advancement and Psychological Wellbeing

The current study presents the effects of Career*Advance* on indices of parents' educational, career, and economic advancement and psychological wellbeing as its primary, confirmatory outcomes. In order to better understand the experiences of program parents though, we also conducted exploratory analysis of the program's effects on individual markers of success and wellbeing, accounting for issues of inference with multiple hypothesis testing by presenting adjusted p-values after performing the Holm-Bonferroni sequential correction. We found that Career*Advance* participation promoted sustained benefits to markers of parents' educational advancement and their healthcare employment through the end of Year 3 and promoted optimism through the end of Year 2 (Table 4). Effects on individual indicators of economic advancement and other markers of career advancement and psychological wellbeing were above the 10% threshold for marginal significance.

Educational Advancement

Our findings confirmed past work that found that parents in Career*Advance* had greater educational attainment than the matched comparison group after the first year of the program (Chase-Lansdale et al., 2019). Career*Advance* participation increased rates of new certification since program start. After one year, 81.8% of treatment group parents

Table 7. Regression-adjusted means of indices of parents' educational, career, and economic advancement at the end of years 1, 2, and 3, by baseline parent education ($n = 293$).

	No Postsecondary Education		Postsecondary Education	
	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group
End of Year 1				
Educational advancement (Scale: 0–1)	0.186	0.742	0.593	0.808
Career advancement (Scale: 0–1)	0.358	0.450	0.356	0.403
Economic advancement (Scale: 0–1)	0.608	0.603	0.583	0.584
End of Year 2				
Educational advancement (Scale: 0–1)	0.243	0.742	0.572	0.740
Career advancement (Scale: 0–1)	0.319	0.431	0.332	0.401
Economic advancement (Scale: 0–1)	0.578	0.592	0.557	0.597
End of Year 3				
Educational advancement (Scale: 0–1)	0.277	0.721	0.541	0.658
Career advancement (Scale: 0–1)	0.264	0.450	0.356	0.387
Economic advancement (Scale: 0–1)	0.578	0.586	0.560	0.590

Notes: Presents regression-adjusted means using the same set of covariates as used for estimation of program effects (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry) and same inverse probability weights, within subgroup. Index of psychological wellbeing not included in table because it is measured in standard deviation units.

had obtained new certificates, compared to 45.1% of comparison group parents, a difference of 37 percentage points ($\beta = 0.367$, $p = 0.001$; Table 8). Career*Advance* parents continued to outpace comparison group parents through the end of Year 3 ($\beta = 0.346$, $p = 0.001$), when 90.2% of treatment group parents had obtained a certificate since study entry, compared to 55.6% of matched comparison parents.

Not surprisingly, the biggest bump in enrollment in a career and education training program occurred by the end of Year 1, when Career*Advance* participation increased school enrollment by 45 percentage points ($\beta = 0.447$, $p = 0.001$). At the end of Year 1, three-quarters (74.9%) of Career*Advance* participants remained enrolled in the program, compared to the matched comparison group where less than one-third (30.1%) were enrolled in other educational programs. This effect continued to be statistically significant, but decreased in magnitude over time, falling to a 25.5 percentage point difference in Year 2 and a 19.3 percentage point difference in Year 3, largely due to the falling enrollment rates of Career*Advance* participants over time (from 74.9% at the end of Year 1 to 57.1% in Year 2 and 42.6% in Year 3) and the consistent rate of enrollment of matched comparison parents (25–30%) across the three years.

We conducted an exploratory, descriptive analysis of the types of certificates and degrees participants received over the first three years in order to better understand related effects on career and economic advancement and psychological wellbeing. We did not have access to detailed data on certification among the matched comparison group, so we were not able to compare results across the treatment and comparison groups. A total of 156 certificates were awarded to treatment group parents over the first three years. The vast majority of those certificates (78%) were awarded in Year 1. Most certificates awarded were short-term credentials achieved in less than a year, such as CNA, AUA, RMA, and Geriatric Tech. Nine longer-term LPN certificates were awarded over the first three years, and one participant completed RN credentialing after the three-year timeframe of the current study.

Table 8. Regression-adjusted means of individual markers of parents' educational, career, and economic advancement and psychological wellbeing at the end of years 1, 2, and 3 ($n = 293$).

	End of Year 1		End of Year 2		End of Year 3	
	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group
Educational Advancement						
Received postsecondary credentials since program start (y/n)	0.451	0.818	0.488	0.896	0.556	0.902
Enrolled in an education or job training program (y/n)	0.301	0.749	0.316	0.571	0.234	0.426
Career Advancement						
Employed (y/n)	0.634	0.657	0.609	0.654	0.610	0.658
Employed in healthcare sector (y/n)	0.301	0.491	0.246	0.439	0.238	0.421
Works a job that is related to career goals (y/n)	0.502	0.553	0.462	0.570	0.447	0.555
Strength of career identity (Scale: 1–5)	3.358	3.444	3.301	3.386	3.285	3.364
Economic Advancement						
Weekly earnings ($)	297.419	270.228	295.536	293.918	323.339	348.581
Household receives public assistance (y/n)	0.573	0.599	0.610	0.568	0.636	0.576
Material hardship (Scale: 0–1)	0.262	0.243	0.256	0.186	0.231	0.197
Financial worry (Scale: 1–5)	2.277	2.124	2.231	1.927	2.060	1.833
Psychological Wellbeing						
Self-efficacy (Scale: 1–4)	2.998	3.130	3.005	3.089	3.015	3.053
Optimism (Scale: 0–4)	2.589	2.792	2.642	2.834	2.699	2.806
Perceived stress (Scale: 0–4)	1.587	1.502	1.555	1.424	1.478	1.527
Psychological distress (Scale: 0–4)	1.084	0.917	0.975	0.946	0.915	0.939

Notes: Presents regression-adjusted means using the same set of covariates as used for estimation of program effects (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry) and same inverse probability weights.

Across all three time points (Year 1, 2, and 3), parents without postsecondary credentials benefited more from Career*Advance* in terms of receipt of new postsecondary credentials, compared to those with higher levels of baseline education (Table 5, Table 9). In contrast, treatment group parents in both the higher and lower education groups outpaced their comparison group counterparts in school and job training enrollment at each of the three time points, without significant differences in the magnitudes of effects by parent education.

Career Advancement

Program participation did not increase rates of general employment (across all sectors) among the full sample at any of the three time points, with employment rates staying fairly steady around 61–66% (Table 8). With regard to employment in the healthcare sector though, benefits were shown at the end of Year 1 and persisted over time. Parents' Career*Advance* participation increased the likelihood of being employed in the healthcare sector by a statistically significant 19 percentage points at the end of Year 1 ($\beta = 0.190$, $p = 0.012$) when 30.1% of the comparison group and 49.1% of the treatment group were employed in healthcare (Table 4, Table 8). This effect was then sustained to the end of Years 2 and 3, with an approximately 20 percentage point increase in the likelihood of being employed in the healthcare sector at both time points (end of Year 2: $\beta = 0.193$, $p = 0.012$; end of Year 3: $\beta = 0.183$, $p = 0.013$), compared to healthcare employment rates around 24–25% among the comparison group. Estimated benefits to

Table 9. Regression-adjusted means of individual markers of parents' educational, career, and economic advancement and psychological wellbeing at the end of years 1, 2, and 3, by baseline parent education ($n = 293$).

	End of Year 1				End of Year 2				End of Year 3			
	No Postsecondary Education		Postsecondary Education		No Postsecondary Education		Postsecondary Education		No Postsecondary Education		Postsecondary Education	
	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group	Matched Comparison Group	Treatment Group
Educational Advancement												
Received postsecondary credentials since program start (y/n)	0.087	0.773	0.801	0.862	0.179	0.889	0.803	0.884	0.318	0.902	0.803	0.884
Enrolled in an education or job training program (y/n)	0.328	0.736	0.308	0.732	0.345	0.593	0.257	0.583	0.233	0.491	0.198	0.399
Career Advancement												
Employed (y/n)	0.682	0.709	0.576	0.614	0.637	0.711	0.582	0.601	0.541	0.724	0.652	0.611
Employed in healthcare sector (y/n)	0.254	0.523	0.344	0.459	0.185	0.412	0.294	0.465	0.174	0.452	0.244	0.441
Works a job that is related to career goals (y/n)	0.492	0.576	0.502	0.539	0.452	0.602	0.468	0.540	0.341	0.625	0.528	0.497
Strength of career identity (Scale: 1–5)	3.344	3.464	3.392	3.404	3.260	3.397	3.345	3.363	3.222	3.387	3.326	3.353
Economic Advancement												
Weekly earnings ($)	279.664	294.613	297.213	261.322	273.041	341.141	302.892	255.993	286.961	364.789	340.828	346.773
Household receives public assistance (y/n)	0.529	0.569	0.625	0.620	0.601	0.515	0.637	0.603	0.637	0.649	0.623	0.516
Material hardship (Scale: 0–1)	0.231	0.267	0.299	0.212	0.217	0.223	0.272	0.159	0.195	0.266	0.247	0.143
Financial worry (Scale: 1–5)	2.038	2.120	2.547	2.089	2.017	2.055	2.319	1.869	1.869	1.897	2.274	1.723
Psychological Wellbeing												
Self-efficacy (Scale: 1–4)	2.993	3.131	3.028	3.106	2.979	3.048	3.041	3.114	3.007	3.092	3.010	3.026
Optimism (Scale: 0–4)	2.614	2.761	2.574	2.816	2.610	2.764	2.729	2.845	2.726	2.757	2.691	2.839
Perceived stress (Scale: 0–4)	1.407	1.568	1.705	1.482	1.445	1.472	1.614	1.400	1.414	1.620	1.500	1.468
Psychological distress (Scale: 0–4)	1.001	0.987	1.130	0.874	0.903	1.005	0.975	0.939	0.859	1.107	0.930	0.896

Notes: Presents regression-adjusted means using the same set of covariates as used for estimation of program effects (motivation score, gender, age, English as primary language, status as single parent, race, education, neighborhood of residence, household size, number of children in household, household income, fall semester study entry, year of study entry) and same inverse probability weights, within subgroup.

other markers of career advancement – working a job related to career goals and strength of career identity – were not statistically significant.

Estimated benefits were generally larger for parents without postsecondary credentials at the end of Years 1 and 2, but differences in the magnitude of the program's effect on parents by baseline parental education were not statistically significant (Table 5, Table 9). However, we did identify some subgroup differences in career advancement by the end of Year 3. Among parents without postsecondary credentials at program entry, Career*Advance* increased rates of employment by a marginally significant 16 percentage points ($\beta = 0.163$, $p = 0.068$), from a mean of 54.1% among the comparison group to a mean of 72.4% among the treatment group; increased the likelihood of working a job related to their career goals by 27 percentage points ($\beta = 0.267$, $p = 0.004$), from 34.1% to 62.5%; and strengthened career identity by 0.3 standard deviations ($\beta = 0.343$, $p = 0.059$) at the end of Year 3. Parents with postsecondary credentials did not experience significant effects on these outcomes, and the magnitudes of effect sizes were significantly larger for general employment and working a job related to career goals based on the interacted model.

Economic Advancement

We did not find evidence of full-sample economic benefits for individual markers of economic advancement (Table 4). Our study was limited in terms of statistical power, with standard errors on earnings estimates around $35 (per week). Extrapolating across 52 weeks, the estimated effect on annual earnings reached $1,313 in Year 3, which compares favorably to many education and job training programs for low-income adults, though it is not statistically significant. Administrative data on earnings income from the state of Oklahoma were available for Year 1. Using these administrative data did not yield evidence of an effect on earnings either, in line with parent survey data (*results available upon request*). Yet, even without experiencing statistically significant changes in earnings income or public assistance receipt, we did observe that some parents reported decreased material hardship and financial worry. Among parents with postsecondary credentials at baseline, we found statistically significant decreases in material hardship and financial worry at all three time points of between 0.35 and 0.47 standard deviations (Table 5).

Psychological Wellbeing

Turning to the individual markers of psychological wellbeing, we confirmed past findings, and observed an immediate (Year 1) increase in optimism ($ES = 0.305$, $p = 0.088$; Table 4). Career*Advance*'s positive (but marginally significant) effect on optimism was sustained to the end of Year 2 ($ES = 0.312$, $p = 0.066$). Encouragingly, at the end of Year 3, participant and comparison group parents had similar levels of perceived stress and psychological distress, so participant parents did not experience increases in stress or distress while juggling the competing demands of school, work, and family with limited resources, in line with Year 1 findings (Chase-Lansdale et al., 2019), though they did not have greater psychological wellbeing either.

The overall index of psychological wellbeing only increased among parents with postsecondary credentials, who saw a benefit during Year 1. Investigation of individual markers of psychological wellbeing revealed a more nuanced picture (Table 5). Only parents without postsecondary credentials experienced increased self-efficacy at the end of Year 1 ($ES = 0.382$, $p = 0.037$), though they did not have a significantly larger increase in self-efficacy compared to parents with postsecondary credentials. In contrast, increased optimism ($ES = 0.348$, $p = 0.035$) and reduced perceived stress ($ES = 0.321$, $p = 0.053$) and psychological distress ($ES = 0.349$, $p = 0.026$) were only observed among parents with postsecondary credentials at the end of Year 1, though only the magnitude of the effect on perceived stress was even marginally significantly different between subgroups. Both education groups had greater optimism at the end of Year 2 (parents without postsecondary credentials: $ES = 0.377$, $p = 0.030$; parents with postsecondary credentials: $ES = 0.258$, $p = 0.100$), when parents with postsecondary credentials also continued to experience reductions in perceived stress ($ES = 0.346$, $p = 0.055$). Parents with postsecondary credentials continued to experience increased optimism through the end of Year 3 ($ES = 0.291$, $p = 0.069$).

Robustness & Sensitivity

To lend greater confidence to study findings, we conducted a series of robustness checks in which we estimated program effects using different models: first, including parent employment status and earnings as matching variables, and second, dropping motivation score as a covariate. Other robustness checks changed the sample selection criteria: restricting the sample to parents with non-missing data on an outcome after one, two, and three years; restricting to parents with non-missing data on all outcomes after one, two, and three years; excluding two outlier observations from the treatment group with inverse probability weights far larger than other treatment group parents; or excluding parents without a high school degree at baseline. We found that coefficient estimates and conclusions about statistical significance were qualitatively consistent across different analytic decisions, compared to our preferred estimates.

However, these robustness checks did not confirm the assumption of conditional independence necessary to validity in matching estimation. Therefore, we also assessed the estimates' sensitivity to deviation from conditional independence to better understand whether and by how much our estimates might be biased upward, and the implications with regard to statistical significance of study findings. One sensitivity test measured the magnitude of the deviation from conditional independence which would yield a null (zero effect) finding (Masten & Poirier, 2018), while a second test determined the amount of positive selection into treatment that could be observed under which the true effect would remain at least marginally significant (Rosenbaum, 2005). Both tests showed that estimated effects on educational advancement were robust to substantial departure from conditional independence while estimated benefits to career advancement and psychological wellbeing were less robust. A third sensitivity test simulated unobserved confounders distributed like the matching variable found empirically to be the strongest predictor of treatment status (study entrance in 2013) or like a characteristic about which we had theoretical and empirical reason to be concerned: whether

a parent held less than a high school education at baseline (Ichino et al., 2006). Results indicated that only 4–7% of the estimated benefit to career advancement at the end of Year 3 was driven by positive selection of these types into treatment, while other estimated benefits were actually downward biased (see online Supplementary Materials for detail and results).

Discussion

The current study investigated the potential sustained benefits of participation in a two-generation education intervention – Career*Advance* – administered by a high-quality Head Start program and designed to meet the unique needs of low-income parents of young children through career pathway training. In line with other, similar education and job training programs for low-income parents, including the HPOG projects, we found overall that Career*Advance* participation led to immediate, Year 1 gains and sustained benefits for Head Start parents' educational advancement after two and three years; with weaker evidence of sustained benefits to career advancement and psychological wellbeing; and no evidence of economic advancement within three years. The continued positive effects show that the matched comparison group of parents were not able to "catch up" to the treatment group by advancing their education on their own. The program's effect on educational advancement was the most consistently robust across sensitivity tests.

Exploratory analysis suggested that educational benefits were indicated by both early receipt of new postsecondary credentials and enrollment in an education or job training program. Program participants' career advancement seemed to be driven primarily by increased healthcare employment, in line with the HPOG programs and the sectoral design of Career*Advance*. We found that educational and career benefits were generally largest for parents without postsecondary credentials at baseline (as seen in the HPOG 1.0 evaluation), who saw marginally significant gains in employment and a greater likelihood of working a job related to career within three years. A lack of observable impact on the composite measures of psychological wellbeing at the end of Year 3 or economic advancement at any time point, among the full sample, masked some indicators of benefits, with reductions in material hardship and financial worry and increased optimism at all three time points among parents with postsecondary credentials at baseline.

Additional patterns of findings raise interesting questions for further consideration. First, exploratory findings differ in interesting ways for the different measures of economic advancement. A lack of increased earnings is not altogether surprising given continuity in individuals and environments, and how difficult it is to make change. This is also reflected in many findings from other education and job training programs and continues to be a thorny issue in the field. The fact that we observed decreases in material hardship and financial worry among more highly educated parents with postsecondary credentials in the absence of such an effect is more surprising. Material hardship and financial worry may have decreased as a result of continued program participation into Years 2 and 3 because of the generous financial assistance that Career*Advance* provided (Chase-Lansdale et al., 2019). Moreover, an individual's worry over finances may not be directly linked to actual income but may relate to overall

perceived stability and security and could in fact be linked to the observed increase in optimism after one year among treatment group parents.

Second, we did not find strong evidence of lasting improvements in psychological wellbeing among program participants beyond Year 2. The fact that we did not observe an increase in perceived stress or psychological distress as parents took on new burdens in school and career, while managing family needs, is a positive sign. It is not altogether surprising that we would find null effects overall, as there are competing forces that could induce both improvements and new challenges to psychological wellbeing (Chase-Lansdale et al., 2019). For example, new career employment may lead to increased job satisfaction while also introducing new challenges to work-life balance. Moreover, change and continuity theory suggests that given the complications of educational and career advancement in low-income contexts, sustained improvement to psychological outcomes is unlikely without continued intervention. It may be difficult for former participants to continue to benefit from the program psychologically without continued program supports as they move out of schooling and into the labor market.

Interestingly, exploratory analysis suggests that parents who entered the program with postsecondary credentials may have experienced benefits in terms of some individual markers of economic advancement and psychological wellbeing, even though program effects on educational and career advancement were generally larger for less highly educated parents. Parents who had previously attained postsecondary credentials did so without Career*Advance*'s extensive supports, and likely experienced significant levels of economic and psychological stress as they pursued higher education. It is understandable then that enrolling in the two-generation program with such financial and social support would lead to decreased levels of stress. By comparison, the positive Year 1 effect on self-efficacy was driven by parents who entered the program without postsecondary credentials and benefited the most in terms of educational and career advancement.

Findings from our exploratory analyses also suggest that Career*Advance* compares favorably to other adult education programs not specifically focused on the potentially harder-to-serve population of low-income mothers of young children. For example, nearly all (96%) Career*Advance* participants achieved postsecondary credentialing by the end of Year 3, higher than HPOG 1.0 treatment group members, among whom 75% received postsecondary credentials in three years (Peck et al., 2019). By comparison, less than half (47%) of community college students (who are not all parents) attain a postsecondary certificate or degree of any type (the current study's primary outcome measure, postsecondary credentials) over an even longer, six-year time frame in national studies (Nelson et al., 2013). In addition, Career*Advance* successfully and continually promoted parents' enrollment in education and job training to the end of Year 3, in contrast to HPOG 1.0, which did not see treatment group parents outpace control group parents in rates of school enrollment at the end of Year 3 (Peck et al., 2019). These results are not entirely unexpected given Career*Advance*'s intensive supports and intentional two-generation design, which draws on the resiliency of motivated parents while also addressing the numerous challenges they face. However, they are exploratory findings and are more sensitive to deviation from conditional independence, so should be interpreted with caution.

In line with the literature, Career*Advance* did not have effects on general employment or earnings on average during the first three years. Longer-term findings beyond the scope of the current study can be used to inform predictions about Career*Advance*'s future benefits to participants. After six years, HPOG 1.0 programs did not increase longer-term credentialing requiring a year or more of training, though it increased receipt of *any* postsecondary credentials (of any length) by 8 percentage points. HPOG promoted healthcare employment, with the treatment group employed in the healthcare sector at rates exceeding the control group by 5 percentage points. Career advancement was not associated with earnings gains by the end of Year 6 (Peck, Litwok, & Walton, 2022).

However, the HPOG 1.0 study also found that, among the treatment group, participants who achieved longer-term training of a year or longer earned higher wages than parents with shorter-term training. While the HPOG 1.0 study did not find evidence that the program promoted achievement of additional, stackable certification beyond the first three years, it did not promote sustained enrollment in education and job training either, standing in contrast to Career*Advance*, which exploratory analysis suggests increased school enrollment by a statistically significant 20 percentage points at the end of Year 3. Moreover, parents without postsecondary credentials at baseline did in fact experience higher rates of employment in the same three-year timeframe as observed in Project Quest (Roder & Elliott, 2019). Generally, whether the program continues to benefit families over time remains an open question, which will be informed by longer-term data collection on CAP Family Life Study families.

Evidence of effects on children will also inform assessment of the program's potential to promote family wellbeing. Previous work has found that parents' educational and career advancement has substantial benefits to children's development and adult outcomes, and potential earnings increases in the future could also be accompanied by important intergenerational spillover effects (Dahl & Lochner, 2012; Sabol et al., 2021). The experimental HPOG 1.0 study did not find an effect on children's development (e.g., educational aspirations, socioeconomic development, academic skills) over a broad age range within three (Peck et al., 2019) or six years (Peck, Litwok, & Walton, 2022), but Career*Advance*'s parent- and family-focused design stands in contrast to the other HPOG 1.0 programs. Pairing intensive supports in a well-designed education and job training program for parents with high-quality Head Start, in addition to providing other family supports like connection to social services, through an intentional two-generation design has the potential to yield lasting and intergenerational benefits, though impacts on children are beyond the scope of the current study.

This study has several important limitations. In contrast to several well-known experimental evaluations of sectoral training programs for low-income adults, including the HPOG 1.0 and 2.0 studies, the CAP Family Life Study research team was unable to conduct a randomized control trial and therefore relied on quasi-experimental matching methods for analysis. As such, there may be selection bias in our estimates as parents who chose to enroll in Career*Advance* likely differ in unobservable ways from nonparticipants, which may not be addressed through inverse probability weighting. However, our findings stood up to a host of sensitivity tests, and the estimated effects on educational advancement are robust to substantial deviation from conditional independence,

though estimated effects on career advancement and psychological wellbeing are less robust. Generalizability of study findings may also be limited because all parents had enrolled their children in Head Start, and thus may not be similar to parents whose children are not in Head Start. Career*Advance* is also an expensive, model program run by a high-quality Head Start provider, so an extension of study findings to a more scaled-up version may be challenging.

Despite these limitations, the study adds to a very limited literature on the sustained effects of postsecondary education and job training for low-income parents of young children, focusing specifically on healthcare career pathway training using a two-generation approach, a promising avenue for future policy investment. Low-income parents face high barriers to school success, including logistical, financial, psychological, and social constraints. However, they are also motivated to succeed on behalf of their children (Chase-Lansdale & Brooks-Gunn, 2014). By meeting the needs of parents and their children in strategic ways, policymakers and practitioners have an opportunity to strengthen families' futures.

Supplementary Materials

Robustness Checks

We conducted a series of seven robustness checks focused on our analytic strategy (e.g., selection of matching variables and covariates) and our sample selection criteria to verify that our results were not sensitive to associated analytic decisions. The robustness checks all demonstrated consistency in the study's findings under alternative analytic decisions, compared to our preferred estimates.

First, we excluded parent employment status as reported on the parent survey as a matching variable in all analyses out of concerns about endogeneity. In addition, our preferred estimates excluded pre-enrollment employment status from the Head Start ChildPlus system and earnings income in the quarter prior to study entry from state of Oklahoma administrative data. We considered both to be potentially important factors in the decision to enroll in the program but were concerned about substantial missingness (employment: $n = 286$; earnings: $n = 275$; study sample: $n = 314$). Moreover, state administrative data only captures reported earnings and employment. However, we included pre-enrollment employment status and earnings income data as matching variables in our first robustness check (Supplementary Table 1). Second, we ran our regression models without the motivation score as a covariate because of concern that its inclusion would lead to over-controlling (Supplementary Table 2).

Third, we wanted to ensure that patterns of findings over time were not driven by sample attrition, or the fact that different parents had data available at different waves of data collection. So, we conducted a robustness check whereby we measured the effect of Career*Advance* participation on a given outcome while restricting to parents with non-missing data on the outcome after one, two, and three years (Supplementary Table 3). Similarly, we conducted a fourth robustness check restricting the sample to parents with non-missing data on all outcomes after one, two, and three years, such that the sample was the same for all estimates (Supplementary Table 4).

Next, we dropped two outlier observations from the treatment group with inverse probability weights far larger than other treatment group parents (Supplementary Table 5). We did not drop these two outliers from the study sample for our main analyses because they were the only parents in the treatment group not to hold a high school degree so their exclusion would have had a negative effect on balance. Moreover, their inclusion would only bias estimates downward. Finally, we dropped parents without a high school degree at baseline from the sample (Supplementary Table 6), because we observed significant treatment-comparison group imbalance on this measure prior to weighting and wanted to ensure that these parents did not drive overall study findings. As our final robustness check, we used Stata's "teffects" package to conduct inverse probability weighting, rather than directly applying our own estimated weights in regressions (Supplementary Table 7).

Sensitivity Tests

Our main analyses, including the robustness checks described above, used inverse probability weighting to adjust for observable differences between the treatment and control group and relied on the assumption of conditional independence: that selection into treatment was driven only by the observed matching variables. This assumption cannot be tested directly, but we conducted a series of three sensitivity analyses designed to assess the implications of deviation from conditional independence. We found that, among statistically significant treatment effects, benefits to educational advancement were most robust to the failure of conditional independence and positive selection into treatment. We also found evidence that some forms of deviation from conditional independence of theoretical and empirical concern for the study would lead to substantial *downward* bias, particularly with regard to career advancement and psychological wellbeing.

Our final robustness check allowed us to conduct the first of the three sensitivity tests. After running "teffects," we used Stata's supplemental "tesensitivity" package, which can be used to conduct sensitivity analysis using the approach of Masten and Poirier (2018) (see also Masten et al., 2023). The Masten and Poirier approach relaxes the assumption of conditional independence nonparametrically, indexed by a scalar sensitivity parameter c representing the largest difference between the propensity score and treatment probability conditional on covariates and an unobserved confounder, i.e., the magnitude of deviation from conditional independence in terms of probability units. For example, under conditional independence, $c = 0$, and under no assumptions on selection, $c = 1$. The package calculates "breakdown points" associated with each estimate: the maximum value of c such that the treatment effect estimate remains nonnegative. A larger breakdown point indicates that an estimate is less sensitive to deviation from conditional independence (Masten & Poirier, 2018). We found that the estimated effects on educational advancement were most robust (Supplementary Table 8), with breakdown points of more than 0.2 (0.280 at the end of Year 1; 0.272 at the end of Year 2; and 0.213 at the end of Year 3). Estimated effects on career advancement and psychological wellbeing were more sensitive to deviation from conditional independence according to this test, with breakdown points below 0.1.

To determine an appropriate reference point against which to compare observed breakdown points, we assessed the magnitude of the influence potentially important confounders might have on predicted propensity scores: year of study entrance (the matching variable found empirically to be the strongest predictor of treatment status, in line with the Rosenbaum (2005) approach) and parent education at baseline (a characteristic about which we had theoretical and empirical reason to be concerned). We compared the distribution of propensity scores with and without inclusion of these matching variables. We found that the average propensity score would decrease from 0.5267 to 0.5080 when excluding the categorical measure of baseline parent education (a decrease of 3.6%) and would be largely unchanged when excluding year of study entry (a decrease of .02%). By comparison, the estimated breakdown points were all at least 0.035 (i.e., a similar or greater magnitude compared to the influence of covariates of concern), suggesting that results regarding career advancement and psychological well-being were in fact robust to deviation from conditional independence, along with effects on educational advancement (Masten et al., 2023).

A second set of analyses followed the general strategy proposed by Rosenbaum (2005) and confirmed the finding that estimated effects on educational advancement were robust to substantial deviation from conditional independence, while estimated benefits to career advancement and psychological wellbeing were less robust. The Rosenbaum approach to sensitivity analysis asks what an unmeasured characteristic would need to look like to change the study's conclusions. It considers by how much the relative odds of treatment for treatment group members compared to comparison group members can increase based on an unobservable characteristic, i.e., by how much hidden bias can increase, before the study's conclusions are changed qualitatively. Gamma is a measure of the degree to which a study experiences selection bias. A value of $\Gamma = 1$ represents treatment assignment without selection bias (i.e., as good as randomized), while $\Gamma = 3$ indicates that, for a matched pair, the treatment group member is three times as likely to receive treatment because of unobserved characteristics positively correlated with the outcome. A larger value of gamma represents a greater departure from conditional independence.

Supplementary Table 9 presents our main findings based on inverse probability weighting in the left-hand column for comparison, along with treatment effect estimates based on the "psmatch2" package using 1-to-1 nearest-neighbor matching with replacement and with a caliper of 0.1, for each estimate from our preferred results that was categorized as at least marginally significant at the 10% level. The table then presents upper-bound (i.e., those least likely to point to statistical significance) p-values under different levels of positive selection bias ($\Gamma = 1, 2, 3$) based on Stata's "rbounds" package (implemented in conjunction with "psmatch2"). We also identified the amount of positive selection into treatment that could be observed (i.e., the value of gamma) such that the true effect would have an upper-bound p-value of 0.10, i.e., there would be a marginally significant finding.

Consistent with the Masten & Poirier sensitivity analysis, we found that estimated effects on educational advancement were robust to substantial departure from conditional independence. For example, a treatment group member would need to be 3.63 times as likely to receive treatment because of unobserved characteristics positively

correlated with educational advancement compared to their matched comparison group counterpart in order for the true effect on educational advancement at the end of Year 1 to fall below marginal significance. Year 2 effects on career advancement and psychological wellbeing were also fairly robust, with values of approximately $\Gamma = 1.35$ identified as the point at which the effects would no longer be significant. However, effects on career advancement at the ends of Year 1 and Year 3 were not found to be statistically significant using nearest-neighbor matching, and the effect on psychological wellbeing at the end of Year 1 was not robust to deviation from conditional independence, with $\Gamma = 1.03$. Supplementary Table 10 focuses on the individual markers of advancement and wellbeing that were identified as having at least marginally significant effects using inverse probability weighting. Estimated effects on markers of educational advancement were robust to substantial deviation from conditional independence at all three timepoints, as were estimated effects on optimism at the end of Year 2 and on healthcare employment at the ends of Years 2 and 3.

We also gauged how robust the estimated treatment effects were to deviation from conditional independence using the general approach suggested by Ichino et al. (2006), which builds on Rosenbaum and Rubin (1983) and Rosenbaum (1987) and is implemented with the "sensatt" Stata package (Nannicini, 2007). Under this approach, we assumed that conditional independence would be satisfied if an additional binary variable, currently unobserved, could be observed. (Note that Ichino, Mealli, & Nannicini show that the assumption that the confounder is binary does not have a significant impact on the sensitivity analysis; Nannicini, 2007.) We used our data to simulate the unobserved confounder, and then used the simulated confounder as a matching variable for nearest-neighbor matching. We compared the average estimates across 1,000 iterations of matching conducted with and without the simulated confounder, to assess the impact different types of selection bias would have on our estimates and determine to what extent our preferred estimates are robust to this type of failure of conditional independence.

We modeled the distribution of the unobserved confounder in two ways. First, we assumed the distribution of the matching variable found empirically to be the strongest predictor of treatment status (in line with the Rosenbaum approach): study entrance in 2013. Second, we assumed the distribution of a characteristic about which we had theoretical and empirical reason to be concerned: whether a parent held less than a high school education at baseline. The sensitivity analysis indicated that between 4% and 7% of the estimated benefit to career advancement at the end of Year 3 was driven by positive selection into treatment (Supplementary Table 11). In contrast, the analysis indicated that the other estimated benefits were actually *downward* biased. For example, the effect on educational advancement at the end of Year 1 would be 10.7% larger after accounting for an unobserved confounder distributed like 2013 study entrance, and 8.4% larger after accounting for an unobserved confounder with the distribution of the indicator for having less than a high school education. With regard to individual markers, upward bias was indicated in the estimated effects on healthcare employment, with up to 22.6% of the benefit to healthcare employment (Year 3, with a confounder distributed like whether a parent held less than a high school education at baseline) explained by positive selection into treatment (Supplementary Table 12).

Open Research Statements

Study and Analysis Plan Registration

- There is no study and analysis plan registration associated with this manuscript.

Data, Code, and Materials Transparency

- The materials used to collect the data underlying the results reported in this manuscript are available from the Open Science Framework: https://doi.org/10.17605/OSF.IO/5NVM3. The data and code are not publicly available.

Design and Analysis Reporting Guidelines

- Not applicable.

Transparency Declaration

- The lead author (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Replication Statement

- This manuscript reports an original study.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Open Scholarship

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Appendix

Table A1. Logistic regression predicting likelihood of treatment ($n = 314$).

	Odds Ratio (SE)	B (SE)
Motivation score	0.879 (0.159)	−0.129 (0.181)
Gender is male (y/n)	1.027 (0.938)	0.027 (0.913)
Race		
White	0.595 (0.224)	−0.518 (0.376)
Black	0.662 (0.225)	−0.412 (0.340)
Hispanic	0.911 (0.583)	−0.093 (0.640)
English is primary language (y/n)	1.342 (0.833)	0.294 (0.621)
Age (years)	1.046** (0.023)	0.045** (0.022)
Single parent (y/n)	0.886 (0.253)	−0.122 (0.285)
Household size	1.048 (0.187)	0.047 (0.179)
Number of children in household	0.903 (0.188)	−0.101 (0.208)
Years of education	0.958 (0.160)	−0.042 (0.167)
Education		
Less than high school (y/n)	0.155 (0.206)	−1.863 (1.326)
High school diploma or GED (y/n)	1.763 (1.700)	0.567 (0.964)
Certificate or associates degree (y/n)	2.137 (1.797)	0.759 (0.841)
Neighborhood of residence		
Neighborhood 1	0.909 (0.651)	−0.096 (0.716)
Neighborhood 2	0.784 (0.565)	−0.243 (0.720)
Neighborhood 3	0.718 (0.557)	−0.331 (0.775)
Semester of study entry is fall (y/n)	1.180 (0.320)	0.166 (0.271)
Year of study entry		
2011	2.196* (1.042)	0.787* (0.474)
2012	2.130 (1.017)	0.756 (0.478)
2013	2.464* (1.148)	0.902* (0.466)
Annual household income ($)	0.999 (0.00001)	−0.000007 (0.00001)

Notes: Excluded category for race is of another race. Excluded category for education is bachelors degree or higher. Excluded category for neighborhood is Neighborhood 4. Excluded category for year of study entry is 2014.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table A2. Descriptive Statistics of Estimated Propensity Scores.

	Full Sample ($n = 314$)		Sample on with Propensity Scores on the Region of Common Support, Used to Estimate Treatment Effects ($n = 293$)	
	Mean (SD)	Range [Min, Max]	Mean (SD)	Range [Min, Max]
Full Sample (n = 314)				
Propensity scores	0.503 (0.159)	[0.038, 0.810]	0.527 (0.119)	[0.104, 0.761]
Inverse probability weights	1.980 (0.759)	[1.039, 9.615]	2.046 (0.747)	[1.116, 9.615]
Treatment Group (n = 158)				
Propensity scores	0.554 (0.110)	[0.104, 0.810]	0.548 (0.105)	[0.104, 0.751]
Inverse probability weights	1.943 (0.870)	[1.235, 9.615]	2.146 (0.560)	[1.116, 4.177]
Matched Comparison Group (n = 156)				
Propensity scores	0.453 (0.184)	[0.038, 0.761]	0.503 (0.129)	[0.104, 0.761]
Inverse probability weights	2.023 (0.628)	[1.039, 4.177]	1.956 (0.873)	[1.331, 9.615]

Table A3. Attrition analysis ($n = 338$).

	Difference in Likelihood of Remaining in Sample (Versus Attrition) by Baseline Demographic Characteristics, B (SE)	Difference in Difference in Likelihood of Remaining in Sample (Versus Attrition) by Baseline Demographic Characteristics by Treatment Status (Treatment vs. Comparison Group), B (SE)
Motivation score	0.003 (0.021)	0.001 (0.044)
Gender is male (y/n)	0.072 (0.106)	−0.090 (0.209)
Race		
White	−0.005 (0.031)	−0.043 (0.062)
Black	−0.014 (0.028)	0.046 (0.056)
Hispanic	−0.025 (0.048)	0.086 (0.095)
Other	0.038 (0.034)	−0.066 (0.067)
English is primary language (y/n)	−0.011 (0.047)	−0.018 (0.094)
Age (years)	0.000 (0.002)	0.004 (0.005)
Single parent (y/n)	0.022 (0.030)	0.023 (0.060)
Household size	0.011 (0.010)	0.003 (0.020)
Number of children in household	0.017 (0.012)	−0.010 (0.024)
Years of education	0.023** (0.011)	0.002 (0.022)
Education		
Less than high school (y/n)	−0.111** (0.026)	−0.480*** (0.137)
High school diploma or GED (y/n)	−0.038 (0.028)	0.071 (0.055)
Certificate or associates degree (y/n)	0.063** (0.028)	−0.013 (0.056)
Bachelors degree or higher (y/n)	0.074 (0.073)	−0.094 (0.147)
Neighborhood of residence		
Neighborhood 1	0.002 (0.028)	−0.007 (0.056)
Neighborhood 2	−0.011 (0.028)	0.041 (0.056)
Neighborhood 3	0.001 (0.042)	−0.060 (0.083)
Neighborhood 4	0.073 (0.083)	−0.091 (0.166)
Semester of study entry is fall (y/n)	−0.017 (0.029)	0.006 (0.058)
Year of study entry		
2011	−0.047 (0.030)	0.057 (0.059)
2012	0.012 (0.031)	−0.066 (0.061)
2013	0.015 (0.031)	0.048 (0.061)
2014	0.048 (0.045)	−0.059 (0.096)
Annual household income ($)	0.000002 (0.000001)	−0.000002 (0.00002)

Notes: Results of individual, unweighted regressions of an indicator variable for being part of the study analytic sample (1 = yes, in sample) on a baseline demographic characteristic in middle column, showing the difference in the likelihood of remaining in the sample by a given characteristic. Results of individual, unweighted regressions of an indicator variable for being part of the study analytic sample, treatment status, and the interaction between sample and treatment statuses in right-hand column, with coefficient on the interaction term (presented) representing differential likelihood of attrition by treatment status across different demographic characteristics.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table A4. Largest treatment-comparison standardized difference (*p*-value) associated with a matching variable for sample with non-missing data on an outcome index.

	End of Year 1		End of Year 2		End of Year 3	
Educational advancement	$n = 293$	0.295 (0.287)	$n = 293$	0.295 (0.287)	$n = 293$	0.295 (0.287)
Career advancement	$n = 271$	0.342 (0.255)	$n = 257$	0.271 (0.320)	$n = 259$	0.163 (0.261)
Economic advancement	$n = 271$	0.342 (0.255)	$n = 287$	0.293 (0.291)	$n = 293$	0.295 (0.287)
Psychological wellbeing	$n = 271$	0.342 (0.255)	$n = 257$	0.271 (0.320)	$n = 259$	0.163 (0.261)

Presents largest (and therefore most concerning) standardized difference/smallest *p*-value associated with a treatment-comparison group difference, across all matching variables, for the sample of parents with data available on the given outcome.