



Closing Achievement Gaps Through Preschool-to-Third-Grade Programs

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Achievement gaps by family income, race, and ethnicity have persisted for decades. Yet only in recent years has this major social problem become a national priority in the United States and many other countries as concern rises over growing economic inequalities. In this article, we document gaps in school readiness and achievement in the United States and how they adversely affect the life course development of children and families from underrepresented groups. We emphasize the promising role of preschool-to-3rd grade (P-3) programs to reduce a variety of achievement gaps through comprehensive strategies that enrich educational and family experiences during most of the first decade of life. Implementation of the core elements of effective learning experiences, collaborative leadership, aligned curriculum, parent involvement and engagement, professional development, and continuity and stability in the Child-Parent Center (CPC) Program have shown relatively strong and sustained effects on school achievement, especially for Black children growing up in urban poverty. This evidence from the Chicago Longitudinal Study (CLS) and other projects suggests that broader scale up of truly comprehensive approaches that begin early, continue through most of the first decade, and are multilevel in scope can make a bigger difference than many existing strategies in reducing achievement gaps and their persistence.

Keywords: achievement gap, school readiness, poverty, child development, evaluation

INTRODUCTION

Gaps in various measures of academic performance exist at school entry, whether researchers are measuring differences in student outcomes across racial or ethnic groups or comparing students with different levels of family income. In the United States, evidence from nationally representative analyses indicate that Black and Hispanic students have lower scores than white students in reading and math at school entry, and lower-income students from all races on average are less prepared for school compared to students from families with higher incomes. While much public attention has been paid to the existence and persistence of racial gaps in school readiness, the gaps between lower- and higher-income children may be even twice as large as racial gaps (Reardon and Portilla, 2016). A major report from the National Academies of Sciences, Engineering and Medicine in the

United States highlighted the existence of these gaps as indicative of significant societal inequities. The authors of the report called for more research to both track the inequities in outcomes and in access to opportunities for those most affected by the gaps (National Academies of Sciences, Engineering, and Medicine, 2019).

Differences in school performance by family income are found across the world. One strand of the intergenerational mobility literature has focused on how the magnitude of test score gaps for a given amount of income inequality varies across countries. Bradbury et al. (2019) compare differences in cognitive development occurring as early as age 5 by income across the United Kingdom, Australia, and the United States and report that for a given income difference, early test scores exhibit significantly larger gaps by income in the United States. Compared to these other countries, the same degree of inequality in incomes in the United States translates into larger inequities in child development outcomes at early ages.

In the past two decades, recognition of the importance of early childhood education has led governments in many countries including the United States and England to increase spending for preschool. In the United States, state governments have expanded access to preschool, mostly for 4 year olds but also for 3 year olds in some cases Friedman-Krauss et al. (2021). While in England the Childcare Act of 2006 requires local authorities to provide preschool to all children free of charge, in the United States the federally funded program Head Start is offered to children from low-income families. States and local governments also can choose to fund preschool, and where these programs exist, may be targeted (available to only those children from low-income families) or universal, depending on where a child resides. In this article, we focus primarily on the United States experience.

Political and economic constraints restrict full access to high-quality early education. In the United States, the National Institute for Early Education (NIEER) has presented a plan for a gradual roll-out eventually resulting in full access to state-funded preschool expansion by the year 2050 (National Institute for Early Educational Research, 2021). While school readiness gaps are large and persist over time, observers have noted that the modest reduction in the gaps by income or race that has occurred in recent years may be due in part to the expansion of publicly funded preschool (Reardon and Portilla, 2016; Bassok and Latham, 2017; Kuhfeld et al., 2020). But in their examination of early test score data by race and income over time, Reardon and Portillo's calculations suggest that closing the school readiness gap might take 100 years to achieve.

While the effects of preschool programs have been well studied (e.g., Cascio, 2022) and access to good-quality programs has expanded, some researchers and educators have turned to examining the topic of dosage. One question is whether publicly funded preschool should be offered for 1 vs. 2 years (Arteaga et al., 2014; Wasik and Snell, 2019). Other researchers and practitioners have focused on another question of duration. Should we consider the importance of incorporating the early years of formal schooling through a preschool through third grade model of education programming? In this article we focus on the potential for a more extended program of early

intervention to have an impact on both school success in the shorter term in terms of reading scores and describe the potential for an extended early intervention to positively affect important long-term outcomes such as educational attainment and earnings.

NATIONAL EVIDENCE FROM UNITED STATES ON ACHIEVEMENT GAPS IN ELEMENTARY SCHOOL

While gaps in kindergarten readiness have remained significant for decades between children of different races and between children living in lower- and middle-income families, an examination of national data in the middle years of elementary school suggest that formal schooling in the early years has not reduced these gaps. As children make their way through elementary school, the existence of later gaps in achievement can be examined by looking at scores from the National Assessment of Educational Progress (NAEP). Sometimes called the Nation's Report Card, NAEP is a nationally representative assessment of reading, mathematics and science that public and private school students in the United States take starting in 4th grade (National Center for Education Statistics, 2019). While each state may have its own assessment tools for evaluating its public school students, the United States Congress has mandated since the 1960s that the United States Department of Education use a standard assessment nationwide to provide information on how well students in individual states as well as the nation are doing. The tests are administered to students in randomly selected schools in grades 4, 8, and 12. A common way of reporting results to show the percent of students in a particular grade who reach a proficiency threshold in reading, science or mathematics.

Figure 1 below reports the percent of United States students who have achieved a score in reading that is considered by the NAEP to represent proficiency. For comparison, the numbers are shown for students who are living in low-income families versus all other students. As school districts in the United States do not commonly collect detailed information on family income, the student's eligibility for a federal lunch subsidy (Free or Reduced Price Lunch or FRPL) is used as a proxy for low-income. According to the United States Digest of Education, the most recent data from 2016 to 2019 indicate that approximately 52% of public school students are eligible for the lunch subsidy (National Center for Education Statistics, 2020, Table 204.10).

In **Figure 1** it is clear that there are significant and persistent gaps in the percentage of children who are considered proficient in reading as of fourth grade. While the earlier discussion suggested that gaps at school entry might be modestly smaller in recent years (perhaps due in part to the expansion of publicly funded preschool education), here we see over the years 2005–2019 that the gap in fourth grade does not appear to have diminished and in every time period the share of children from lower-income families whose scores exceed the proficiency threshold is less than half of the proficiency rate of children from middle- and higher-income families. Importantly, the gap appears to have widened over time. While the proficiency rate

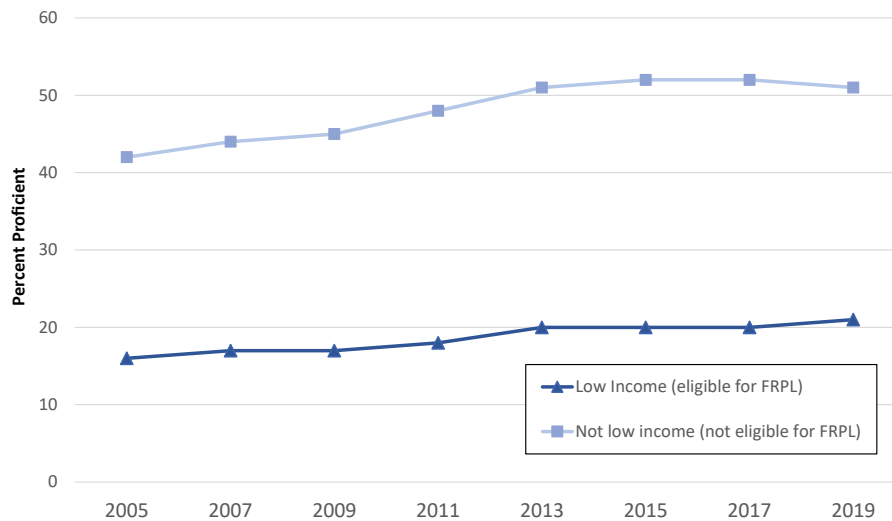


FIGURE 1 | Reading proficiency of United States 4th graders by year and family income status. Percent proficient refers to students who met or exceed the reading proficiency threshold in the National Assessment of Educational Progress (NAEP) by eligibility for free or reduced price lunch subsidy, an indicator of low-income status.

for students from families not eligible for a federal lunch subsidy increased from 42 to 51%, the improvement for students from low-income families improved from 16 to 21%. Although not shown here, these gaps across income groups also exist in the NAEP for mathematics and science.

In the remainder of the paper, we discuss the educational model of preschool to 3rd grade programming, a form of early intervention that provides enriched educational services beyond preschool into the early elementary grades (Reynolds, 2019). Preschool-to-3rd grade programs have been discussed in education practitioner and policy circles for several decades. One primary example of such a program is the Child-Parent Center (CPC) program offered in the Chicago Public Schools serving children and parents in high-poverty neighborhoods.

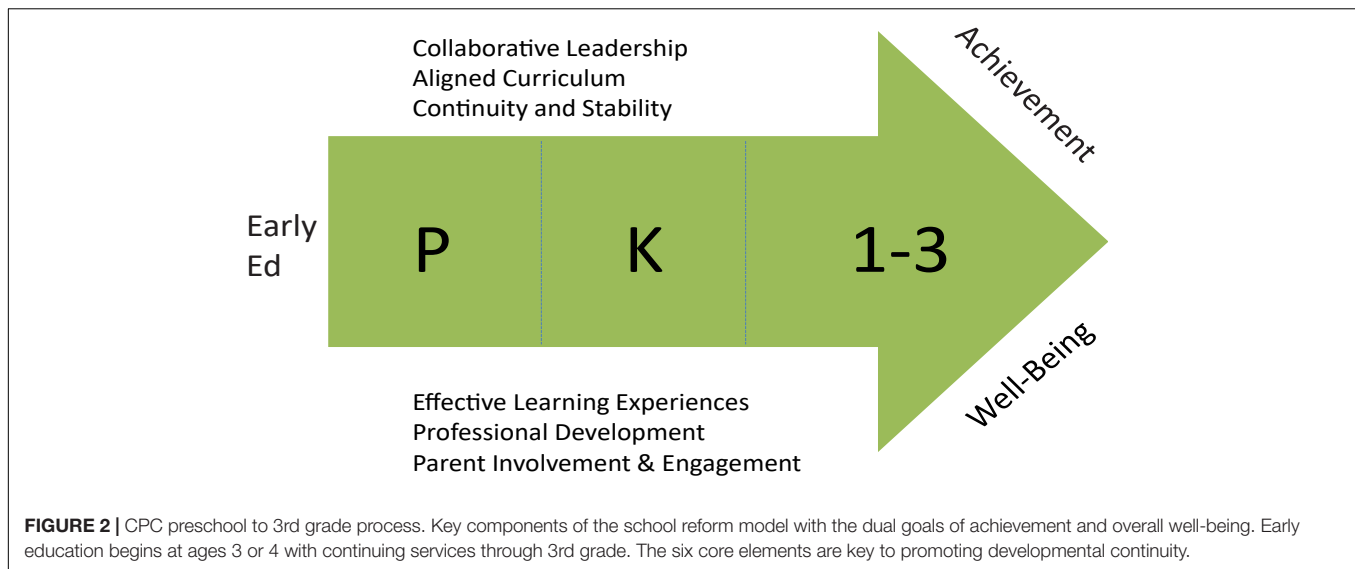
CHILD-PARENT CENTER PreK-3rd GRADE PROGRAM

The CPC are a preschool-to-3rd grade (P-3) program. Ideas for P-3 as a service continuum evolved during the early years of the War on Poverty/Great Society era of the mid 1960s (Zigler et al., 2006). Fundamental to P-3 is developmental continuity. This is the extent to which learning environments are consistent and predictable over time in promoting well-being, especially during transitions. This continuity provides a P-3 advantage, which is the added benefit of continued services above and beyond earlier experiences. Many studies show such an advantage (Reynolds, 1994; Ou and Reynolds, 2006; Zellman and Kilburn, 2015; Manship et al., 2016; Takanishi, 2016) and they demonstrate that P-3 can close achievement gaps and strengthen learning gains. Unique to the CPC model, however, is that the P-3 early education program model is a comprehensive model with key requirements on site

leadership, class size, and parent involvement. Researchers have examined long-term effects into adulthood (Reynolds et al., 2017).

The CPC opened in 1967 in Chicago through funding from Title I of the Elementary and Secondary School Act of 1965, a key component of the War on Poverty. While the federal preschool program Head Start was just starting to roll out, many areas remained unserved, and the Chicago Public Schools chose to make use of a different federal funding stream to implement this program. Although the CPC program began as a comprehensive preschool program, children received continuing services in kindergarten and the early grades the following year, leading to the current configuration. Under the direction of a leadership team at each site and in collaboration with the Principal, CPC-P3 enhances school readiness skills, increases early school achievement, and promotes parent involvement (Ou and Reynolds, 2006; Reynolds et al., 2011a, 2016). The main criterion for CPC program enrollment is residence in a low-income neighborhood eligible for federal Title 1 funding (Kainz, 2019). Other enrollment criteria include family income, parent education, and previous experience in early childhood programs, with priority given to those with greater disadvantage (Reynolds, 2000). Over 90% of CPC and comparison group members resided in families with incomes below 185% of the federal poverty line (Reynolds et al., 2018).

Figure 2 shows the continuity inherent in the CPC preschool to third grade model in its equal emphasis on preschool, kindergarten, and the early grades. Early education provides the foundation and the next few grades build on this to promote achievement and well-being. Some dimensions of adult well-being investigated in a longitudinal study following a large cohort of CPC participants as well as a matched comparison group include income, employment, justice system involvement, and physical and mental health (e.g., Reynolds et al., 2019;



Varshney et al., 2022). The figure also illustrates the inherent tension between the early timing of intervention versus duration of services. Early participation in programs is a frequent focus of impact efforts but usually does not address later stages of development. Longer duration programs rarely begin early enough in childhood. The CPC's preschool – third grade approach represent both dimensions, but a major focus of dissemination is promoting continuity in learning to realistically narrow achievement gaps.

The six elements noted in **Figure 1** are as follows:

1. *Collaborative leadership team* run by the Head Teacher in partnership with the Principal, Parent Resource Teacher, and School-Community Representative.
2. *Effective learning experiences* through small classes (17 or fewer), engaging instruction, and increased instructional time (e.g., full-day preschool).
3. *Aligned curriculum* is an organized and documented sequence of evidence-based instructional practices that build on prior learning and are supported by teacher collaboration across grades.
4. *Parent involvement and engagement* is a menu-based set of services led by the PRT and SCR and utilize a parent resource room. An involvement plan explicates the key elements.
5. *Professional development system* that combines on-site facilitation and on-line professional learning modules (e.g., STEM, thinking skills).
6. *Continuity and stability* includes co-located or close-by centers that provide year-to-year consistency in implementation.

Beginning at ages 3 and 4, children participate in small classes through 3rd grade and each class has an assistant for at least half of the day. The learning environment created by the principal and team provides an integrated context for improved achievement and sustained gains. Transitions from year to year

are supported by the parent involvement team, site mentors, and school staff, who share instructional approaches and teaching practices across grades. Teachers are state-licensed and follow an instructional plan with a nearly equal mix of teacher-directed and child-initiated activities supported further by classroom assistants. Curriculum alignment and parent involvement plans are reviewed and updated annually. Professional development includes on-line teaching modules and on-site coaching of instructional practices to support a balance of teacher- and child-initiated instruction. Outreach services, including home visits and workshops, use a menu-based system informed by needs assessments conducted with the parents.

CHILD-PARENT CENTER PROGRAM BENEFITS

The positive effects of CPC are well documented in the Chicago Longitudinal Study (CLS), which tracks well-being over the life course of an early childhood cohort of 1,539 children growing up in high poverty neighborhoods (Reynolds, 2000; Reynolds et al., 2011a). They were born in 1979–1980 and entered kindergarten in 25 schools in the fall of 1985. In this matched-group, quasi-experimental design, 989 3- and 4-year-olds from in 20 CPCs were compared to 550 children of the same age who enrolled in the usual early childhood programs in five randomly selected schools also eligible for federal financial assistance due to high rates of neighborhood poverty. A broad range of measures of well-being have been collected for over three decades with over 90% of the original sample remaining in the study.

Child-Parent Center participants show consistent performance advantages in school achievement, need for remediation, delinquent behavior, and educational attainment through high school and college (Reynolds and Ou, 2011; Reynolds et al., 2018). Some evidence on reading achievement over time is presented in **Figure 3**. In this figure, developmental standard scores in reading achievement on the Iowa Test of

Basic Skills for CPC participants who participated in at least the preschool component of the intervention are compared to evidence on national norms as well as the reading scores from the no-preschool comparison group. For the CPC treatment and control groups, scores shown are adjusted for adjusted for child and family demographic attributions (e.g., family education, income, child gender and race; see Reynolds and Temple, 1998). While CPC participant and controls were well matched on many socio-economic characteristics, by kindergarten the CPC participants have an advantage over students in the comparison group. Participation in the CPC preschool program helps close the gap in test scores in the early years of schooling, although the evidence suggests that this gap then widens somewhat between the national average and the CPC students and non-CPC controls by age 15.

Although both the CPC participants and comparison group students came from low-income families residing in some of the city's poorest neighborhoods, the CPC participants are able to maintain their advantage over the comparison group members and are able to close half of the achievement gap between non-CPC preschool students and national norms during elementary school before the gap between the program participants and national norms start to diverge. While participation in the CPC program into the early grades helps sustain the initial gains from participation in a strong preschool program, compared to national norms the program participants continue to live in economically disadvantaged neighborhoods often with fewer available parental and school resources. **Figure 3** also includes estimates of the effect sizes associated with participation in CPC preschool. Students who had at least some CPC preschool

perform better than the similar no-CPC preschool comparison group members after controlling for a rich set of family, neighborhood and child characteristics measured at the time of the child's birth. These effect sizes ranged from 0.62 to 0.25 as children progressed through school.

What if early interventions lasted longer, perhaps into third grade? **Figure 4** shows the growth in reading achievement from kindergarten entry (age 5) to 4th grade (age 10) for the CPC group participating in the entire program for 4–6 years (P-3) compared to the group without continuing services (P + K only). The comparison group from **Figures 2, 3** is not included here. As in **Figure 3**, reading scores from the Iowa Tests of Basic Skills are shown and are adjusted for child and family demographic characteristics.

While as previously mentioned students in the United States from low-income households start kindergarten well below national norms, all the CPC students shown in **Figure 4** participated in the intervention in preschool and kindergarten. As a result, their scores resemble the national averages at the end of kindergarten. This figure also shows that participation in preschool through third grade portion of the CPC program cuts the test score gap in half by age 10 compared to students who participated in preschool and kindergarten only. The national norm scores shown have means of 60, 78, and 108, respectively, for kindergarten, first grade, and third grades. As shown, although growth during kindergarten was similar between groups and at/above national norms, the CPC-P3 group experienced greater growth between 1st and 4th grades. This translates to about a 6-month gain above and beyond earlier participation. This advantage in performance reduced the

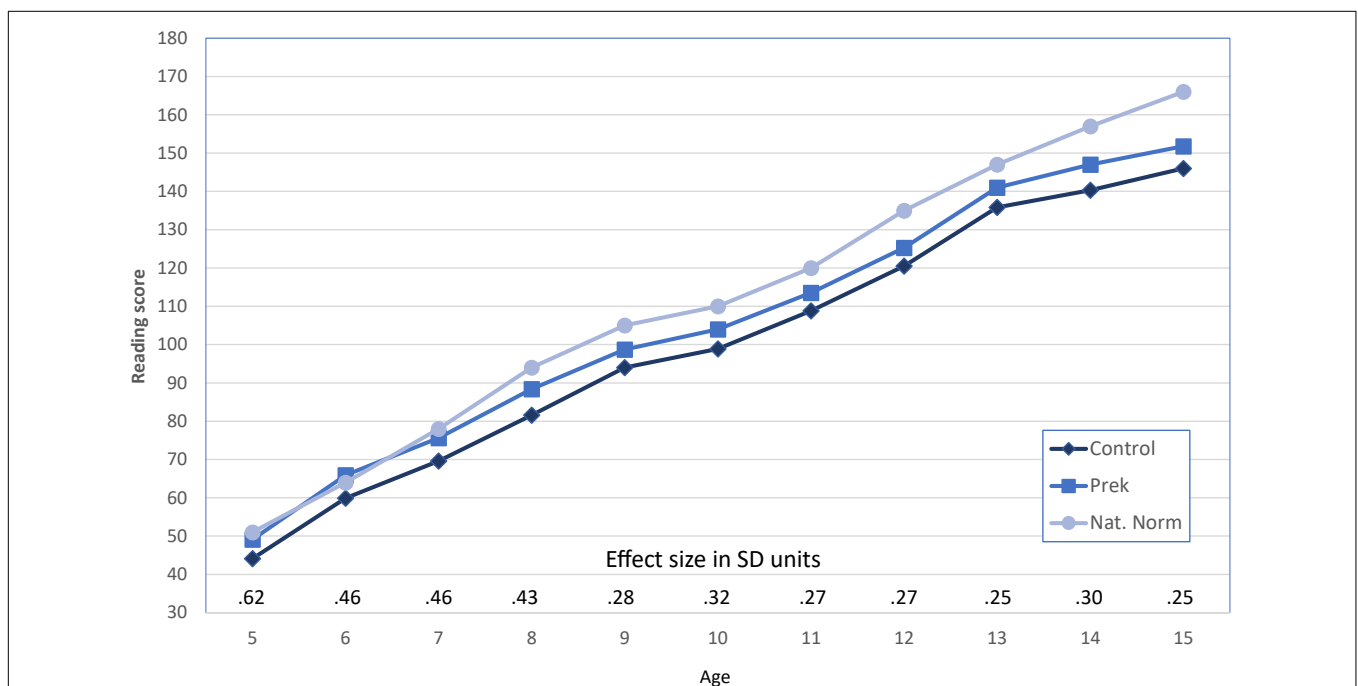
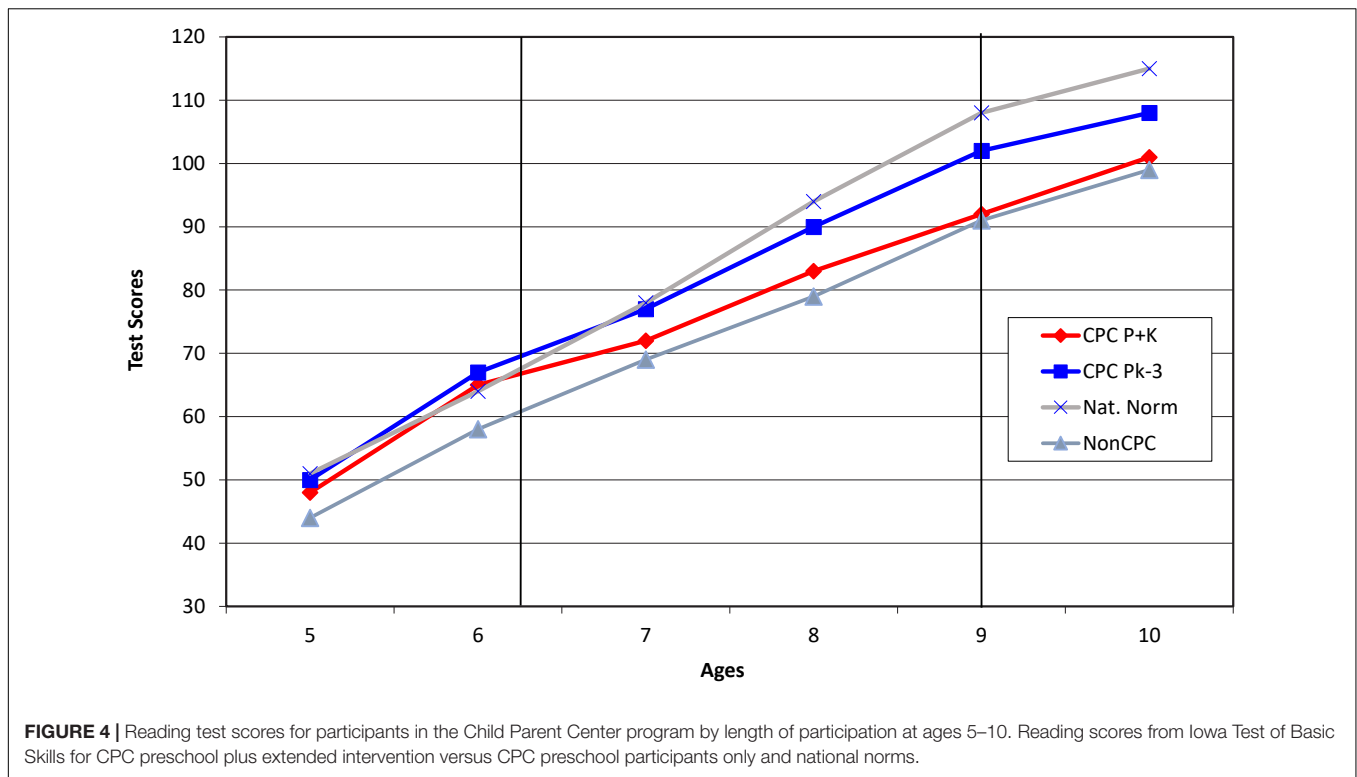


FIGURE 3 | Reading achievement for Child Parent Center (CPC) participants (with at least preschool) and others at ages 5–15. Reading test scores from Iowa Test of Basic Skills for CPC preschool program participants, non-CPC participants serving as controls, and national norms.



gap with the national average by about 75% even though the average performance of the CPC-P3 group was not quite at the national average. The pattern of sustained effects in reading for CPC preschool is also evident. Students in the CLS who did not participate in the CPC program performed below all other groups after controlling for child and family demographic characteristics.

Paths through which gains are sustained over time has been documented in the Five-Hypothesis Model (Reynolds and Ou, 2011), including paths of cognitive advantage, motivational advantage, school quality and support, family support behavior, and socio-emotional adjustment. A distinctive feature of the CLS is the long history of investigating the validity and generalizability of findings. This includes analyses that account for participants lost to follow-up and differences in school experiences. For example, the original analyses of P-3 not only modeled growth in achievement due to the participation in the extended intervention with two pretests, but also assessed the impact of unobserved influences.

EVIDENCE ON LONGER-TERM OUTCOMES FOR EDUCATIONAL ATTAINMENT AND INCOME

The differential impacts of participation in extended preschool-to-third grade education programs versus participation in preschool and kindergarten only have been investigated in the CLS for educational attainment outcomes up to age 35 (Reynolds et al., 2018). The empirical analysis controlled for

gender, race, and socio-economic characteristics observed from birth certificate records and early school administrative records. The use of inverse propensity score weighting resulted in some observations being weighted more heavily than others so that the analysis better resembled a randomized experiment. Similar corrections were also made to account for non-random attrition although sample retention remained high at over 80%. Overall, however, this reweighting had only a modest effect on estimation of effects due to the low attrition and the similarity of CPC participants to comparison group members on a rich set of background covariates including some measured at the time of birth. Some findings are reported in **Table 1** below where outcomes for CPC participants who participated in the preschool-to-third program for 4–6 years are compared to those who participated in CPC preschool and kindergarten only.

Overall, in this urban sample of minority students residing in high-poverty neighborhoods, high school graduation rates were low. But participation in the extended program of preschool into the early grades for 4–6 years seems to have made a difference above and beyond the effect of preschool and kindergarten by themselves. The adjusted rates of graduation (controlling for covariates and use of inverse propensity score weighting) indicate that almost 60% of students who participated in the CPC extended program graduated compared to 51% in both the preschool or no preschool comparison groups. In the United States, students are allowed to take the General Educational Development diploma (GED) at any time throughout their lives and in this sample many of those who did not formally graduate from high school

TABLE 1 | Predicted rates of educational attainment at age 35 in the Chicago Longitudinal Study.

	Preschool-to-third grade (4–6 years of intervention)	Preschool plus kindergarten only	Comparison group (0 years of participation in CPC program)
Educational outcomes by age 35%			
High school graduation %	59.1*#	50.7	50.6
Four-year high school graduation %	54.6*#	45.4	44.3
High school completion %	85.9#	84.5	81.4
Years of education (range 7–22)	12.9#	12.5	12.4
Any college attendance %	61.8#	57.3	54.1
Bachelors' degree or higher %	13.9*#	8.4	8.3

*Denotes statistical significance at 5% level for CPC enrollment for 4–6 years comparison to CPC preschool and kindergarten only. #Denotes significance at 5% level for CPC enrollment for 4–6 years comparison to students with 0 years of CPC enrollment. Rates shown are adjusted for gender, race and sociodemographic covariates. IPW is used to address non-random program assignment and attrition. GED holders are included in high school completion but not included in the high school graduation outcome. See Table 11 in Reynolds et al. (2018) for more detail.

later acquired this credential. As a result, the high school completion rate, which includes the GED, is more similar for all groups although there was a statistically significance difference in the completion rate between the extended versus 0 years groups. A similar finding occurred for the outcome of “any college” attendance. In fact, a sizeable number of students entered the city college system, but persistence was an issue (Reynolds et al., 2011b). Importantly, however, the percentage of preschool-to-third grade participants who received a bachelors’ degree was significantly higher than those with CPC preschool and kindergarten and those who did not participate in the intervention.

DISCUSSION AND CONCLUSION

Gaps in test scores and educational attainment are significant in large part because they help determine economic success throughout the life course. For students born into low-income families, education is the major opportunity for a child’s upward mobility. Evidence on income mobility across generations indicates that many current young people in many countries may not attain their own parents’ standard of living (Chetty et al., 2017; Manduca et al., 2020). Children born advantaged retain a large advantage at the end of early childhood, and the pattern persists in subsequent stages (Sawhill and Reeves, 2016). Evidence also indicates that the gaps in levels of educational attainment by parental income grow in the early years, through K-12, and into higher education (Duncan and Murnane, 2016).

Black and economically disadvantaged populations stand out in the vulnerable populations because of the large and persistent gap in economic status between Blacks and Whites in the United States (Mazumder, 2014; Reardon and Portilla, 2016). Studies found that almost 50 percent of Black children born into the bottom 20 percent of the income distribution were in the same position as adults, but that only 23 percent of White children born in that quintile were (Timothy, 2016).

Research indicates that early cognitive and achievement advantages carry over to social and emotional competencies in middle childhood and adolescence, culminating in greater educational, economic, and social well-being in adulthood (Reynolds, 2000; Schweinhart, 2005; Karoly et al., 2006). A recent study (Ricciardi et al., 2021), for example, indicates that school readiness skills, both pre-academic readiness and socioemotional readiness, at age 4 have a long-term influence on academic performance through fifth grade and socioemotional readiness skills are an important component of school readiness. Improving school readiness skills at preschool can be an effective way to optimize students’ chances of academic success although the positive effects on academic performance are not consistently found by late elementary grades.

While increasing access to high-quality preschool program is of great interest to educators and policymakers around the world, the current article explains and provides evidence relating to participation in an extended program of early intervention that provides continuity and alignment from preschool into the middle of elementary school. The test score trajectories shown in **Figures 3, 4** suggest that early sustained intervention can help reduce the achievement gap between children living in poverty and the national average. Complete closing of the gap, no matter how good the intervention, is unlikely given the contributing role of poverty to children’s daily experiences. Evidence suggests that post-preschool school quality can make a difference in sustaining early gains (Ansari and Pianta, 2018; Reynolds and Temple, 2019). The potential for school-based preschool programs to facilitate both collaborative leadership and curricula aligned vertically from preschool to kindergarten and beyond has been discussed in more detail by a number of authors including Bogard and Takanishi (2005); Kagan et al. (2006); Little (2020); and Justice et al. (2021). Evidence presented in this article suggests that preschool-to-third grade programs that intentionally combine the features of a collaborative leadership team, effective learning experiences, an aligned curriculum, parent involvement and engagement as well as an emphasis on a vibrant professional development system can make a difference in reducing achievement gains and helping to sustain gains from early interventions beginning in the preschool years.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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