



## **Cuyahoga County’s Universal Pre-Kindergarten Program: Evaluating its Effects on Kindergarten Readiness and Third Grade Reading Proficiency**

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### KEY FINDINGS

A recent evaluation using six cohorts of children attending kindergarten in urban and inner-ring public school districts in Cuyahoga County from 2011-2016 found the following benefits of participation in Cuyahoga County’s Universal Pre-Kindergarten (UPK) program compared to high quality, non-UPK preschool:

- Among the sample of children who attended preschool at a UPK site at any point in the two years before kindergarten, 41% of them received a high dose of 18 or more months. Among the sample of children who attended preschool at a high quality, non-UPK site, 22% received a high dose.
- Sixty-six percent of children who received a high dose of UPK were ‘On-track’ for Language and Literacy at kindergarten entry, compared to 47% of similar children who received a high dose of preschool in a high quality, non-UPK site.
- Children who received a high dose of UPK scored 7 points higher on Social Foundations for learning at kindergarten entry compared to similar children in high quality, non-UPK sites.
- Children who received a high dose of UPK scored nearly  $\frac{1}{3}$  standard deviation units higher on the Third Grade Reading Guarantee than similar children in high quality, non-UPK sites.
- Overall, boys tended to have lower scores on the Social Foundations subscale than girls. However, the gender gap was 7.2 points smaller among children in UPK compared to children in high quality, non-UPK settings.

### BACKGROUND

Today, children entering kindergarten need a variety of pre-literacy, pre-numeracy and social-emotional skills to be ready for kindergarten-level instruction and self-regulation expectations. This comprehensive skill set is not only foundational to kindergarten, but also longer-term wellbeing in academic, employment and relationship domains (Jones & Doolittle, 2017; Lehl, Kluczniok, & Rossbach, 2016). Research evidence indicates that the odds of experiencing educational achievement and academic success are stacked against low-income and minority children from the moment they enter kindergarten (Isaacs, 2012). In fact, some studies suggest the achievement gap between wealthy and low-income students has surpassed entrenched racial

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disparities in educational outcomes between African American and White students and that these disparities can be seen as young as age six when children typically begin their formal educational experience (Reardon, 2011; Reardon & Portilla, 2016).

The competency and ease with which elementary school children navigate academics and social situations has been found to be closely tied to their experiences prior to kindergarten entry (Blair & Raver, 2016). A considerable body of evidence has accumulated demonstrating positive outcomes—particularly in the areas of literacy and math proficiency, reduced need for remedial support services, and on-time grade matriculation—associated with receipt of a high quality preschool education (Gormley, Gayer, Phillips, & Dawson, 2005; Hattie, 2008; Mashburn, 2014; Reynolds, Temple, & Ou, 2010). Although racial and socioeconomic gaps in school readiness have narrowed in recent years, studies show that gaps remain (Bassok & Latham, 2017; Reardon & Portilla, 2016). These findings suggest low-income and minority children display greater need for high-quality preschool and early interventions designed to prepare them for kindergarten level instruction. Fortunately, studies show that children most in need of early interventions for kindergarten make the greatest gains in school readiness (Gormley & Gayer, 2005). Thus, if low-income and minority children receive a high quality preschool experience, they will be better positioned to succeed in the long-term (Barnett, 2008; Henry, Gordon, Mashburn & Ponder, 2001; Gilliam & Zigler, 2004; Bull & Lee, 2014; Yoshikawa, Weiland, & Brooks-Gunn, 2016).

In addition to preschool quality, the dose or amount of high quality preschool a child receives also matters a great deal in terms of realizing benefits. Conventional wisdom holds that preschool starts at age 4 and children receive one year before going to kindergarten. This bears out in national survey data captured by the National Center for Education Statistics. According to nearly two decades of data published in their 2019 indicators report, approximately 70% of 4-year olds attend preschool. However, more recent evidence indicates that receiving two full years of preschool, as opposed to one, prior to kindergarten entry is associated with better outcomes in elementary school (Barnett & Lamy, 2006; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Wen, Leow, Hans-Vaughn, Kormacher, & Marcus, 2012). Yet, only 40% of 3-year-olds are typically enrolled in preschool (National Center for Educational Statistics, 2019).

Experiences in early childhood, both positive and negative, are vitally important to predict wellbeing in later life, but research into this topic has been limited by the absence of integrated and longitudinal data. In January 2017, the Cuyahoga County Office of Early Childhood/Invest In Children was awarded a grant from the US Department of Education that facilitated a rigorous evaluation of the UPK Program. The evaluation considered both quality and dose of UPK, and asked, “What is the effect of a high dose of UPK participation on kindergarten readiness and third grade reading proficiency?” This document presents an overview of the main findings from that evaluation.

#### THE UNIVERSAL PRE-KINDERGARTEN MODEL

In 2007, Invest In Children launched a Universal Pre-Kindergarten (UPK) program. The UPK program was created through a year-long community planning process that involved over 100 stakeholders from school districts, business, child care, philanthropy, state and local government. The process was informed by national experts who served as consultants on program design, evaluation, and child care financing. In 2016, Cuyahoga County Executive Armond Budish, with

support from County Council, put an additional \$10 million into the county budget to expand UPK, and challenged the private funding community to match the public investment. Private funders responded with over \$12 million in support. This public/private partnership of UPK funding allowed for the doubling of the number of UPK seats from 2,000 to 4,000 through 2020.

UPK employs a mixed delivery system built upon high-quality preschool programs<sup>2</sup> in a variety of settings: public preschool, Head Start sites, private childcare centers and in-home family childcare. The goal of UPK is to further enhance these high-quality preschool programs and help them deliver a gold standard of early childhood education that is affordable for Cuyahoga County families. This includes quality enhancement funding, in which programs are given flexibility to spend in ways that are most useful and efficient. Programs have used the funding to improve teacher salaries and benefits, purchase new equipment and materials, pay for field trips, or bring in specialized programs. Another way UPK helps preschools deliver a gold standard of quality is through regular visits from technical assistance specialists, who work with administrators and teachers to enhance classroom quality, maintain and improve ratings through Ohio's Step Up To Quality (SUTQ) program, reinforce partnerships with families, and assist with child assessments, among other topics. Quality enhancement funding and technical assistance complement standards all UPK sites are required to meet when they join UPK, and which are proven through research to be the hallmarks of quality that result in improved school readiness. These standards include increased teacher qualifications, lower staff to child ratios, use of approved curricula and child assessments, engagement of families, and family linkages to necessary supportive services.

In addition to quality enhancement funding and technical assistance, Invest In Children also provides scholarship assistance to low- and moderate-income families to help offset the cost of high-quality early education. Families with incomes below 200% of the Federal Poverty Level (FPL; \$49,200 for a family of four in 2019) are eligible for a 50% reduction in tuition, and families with incomes between 200-400% FPL can receive a discount of up to 33%.

Early data from the Cuyahoga County UPK program demonstrates that high quality preschool in Cuyahoga County has a positive effect on development and school readiness and can successfully address the needs of low-income children. A study of children who attended UPK during its first year (2007-08) showed that they made meaningful developmental gains in cognitive skills while in UPK and had higher levels of kindergarten readiness compared to their peers. Similarly, a second study of children who attended kindergarten in Cleveland Municipal School District (CMSD) from 2008-09 to 2012-13 showed that the children who attended preschool in a UPK site had higher scores on the State of Ohio mandated Kindergarten Readiness Assessment (KRA) than their non-UPK peers. Both studies showed promising results, but were limited to a narrow subset of children attending UPK and did not control for children's individual, family, or neighborhood characteristics. The study described below builds on this early research by: 1) providing a broader look at the impact of UPK for children attending kindergarten in CMSD and eleven inner-ring public suburban school districts and 2) accounting for factors that are known to influence kindergarten readiness.

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<sup>2</sup> Rated at 3, 4, or 5 stars in Ohio's Step Up To Quality rating system

## THE CHILDHOOD INTEGRATED LONGITUDINAL DATA SYSTEM

Researchers selected a sample of six kindergarten cohorts (2011-2012 to 2016-2017) using data maintained in the ChildHood Integrated Longitudinal Data (CHILD) System housed at the Center on Urban Poverty and Community Development at Case Western Reserve University. This analysis used the following types of records<sup>3</sup>:

- birth certificates and lead testing records from the Ohio Department of Health<sup>4</sup>;
- child abuse and neglect reports from Cuyahoga County Division of Children and Family Services;
- monthly food assistance receipt from Cuyahoga County Job and Family Services;
- homeless services receipt from Cuyahoga County Office of Homeless Services;
- participation in Welcome Home, the county-funded newborn home visiting program;
- enrollment, test scores and attendance from the following public urban and inner ring suburban school districts in the county: Berea, Brooklyn, Bedford Heights, Cleveland, Cleveland Heights, East Cleveland, Garfield Heights, Lakewood, Maple Heights, Richmond Heights, South Euclid/Lyndhurst, and Warrensville Heights
- preschool exposure from the above school districts, UPK program records, and childcare subsidy records from Cuyahoga County Job and Family Services.

Individual-level kindergarten records were linked with preschool attendance data holdings to identify kindergarteners' preschool experiences in the two years before kindergarten entry and subsequently categorize children into treatment (UPK) and comparison (high quality, non-UPK) conditions. The comparison group was selected from children who attended high quality, non-UPK preschool for two main reasons. First, ample research evidence exists documenting the benefits of high quality preschool compared to lower-quality preschool. That is, we know that children will be better prepared for kindergarten if they receive a high quality preschool education as opposed to a lower quality one. Second, UPK is a quality enhancement model. Existing high quality preschool providers in the county apply, through a request for proposal process, to become UPK sites. Thus, the most appropriate test of the model is to isolate the effect of enhancement on already high quality providers thereby testing whether UPK does in fact raise quality above SUTQ standards. Similarly, existing research demonstrates that kindergarten readiness benefits are greater for children who receive a high dose of high quality preschool as opposed to a low dose. Because of this, in this analysis we only included children who received 18 or more months of UPK or high quality, non-UPK preschool. Among children who attended preschool at a UPK site at any point in the two years before kindergarten, 41% received a high dose. Among children who attended preschool at a high quality, non-UPK site, 22% received a high dose in the two years before kindergarten.

## CREATING A MATCHED COMPARISON GROUP

Far from random, the decision about where to send one's child to preschool is influenced by a variety of factors from cost, proximity to home/work/public transit, hours of operation, pedagogical approach, and teacher qualifications, to name just a few. Thus, to isolate the effect

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<sup>3</sup> Data use agreements (DUA) with all data providing agencies allow for the legal transfer of individually identifiable data on children and families to the CHILD System. Each DUA outlines the pertinent legal standards (e.g., FERPA, HIPAA, Ohio Revised Code) governing confidentiality, privacy, and acceptable uses of the data for research purposes. The data acquisition process is also fully governed by the authority vested in CWRU's Institutional Review Board.

<sup>4</sup> The birth and lead data used in this report come from the Ohio Department of Health. This should not be considered an endorsement of this study or these conclusions by the Ohio Department of Health.

of UPK, we needed to identify a group of children who were similar to those who attended UPK in all respects except for their exposure to UPK. Propensity score matching techniques (1:1 nearest neighbor matching with replacement) were used to create a comparison group of children who did not attend UPK, but were similar to children who did on a number of individual, family and neighborhood level covariates.<sup>5</sup>

Table 1 below presents descriptive characteristics for treatment (children who received 18 or more months of UPK) and comparison (children who received 18 or more months of high quality, non-UPK) conditions after propensity score matching.<sup>6</sup> As shown, there was only one statistically significant difference between conditions after matching; children in the high quality, non-UPK condition were older on average at the start of kindergarten than children in the UPK condition. As age at kindergarten entry and kindergarten readiness are positively correlated, the average older age of the comparison condition is actually a more rigorous test of the UPK treatment effect. All other statistically significant differences in pretreatment characteristics prior to matching were no longer significant in the matched samples. The percentage of children with prolonged exposure to poverty as well as the racial and ethnic diversity represented in the sample is reflective of the larger UPK population.

**Table 1. Individual, family, and neighborhood-level descriptive characteristics of children who received 18 or more months of UPK or high-quality, non-UPK preschool after propensity score matching**

	UPK	High quality, non-UPK
CHILD-LEVEL		
Age at kindergarten entry, M in months (SD)	<b>66.1 (3.5)</b>	<b>66.9 (4.0)</b>
Gender, % female	45.5	42.2
Race/ethnicity		
Hispanic, %	6.4	5.9
Black/African American, %	59.7	57.8
Non-Hispanic, White, %	26.6	29.7
Other or unknown, %	7.3	6.5

<sup>5</sup> Covariate factors used to create propensity score matched sample: child gender, race, ethnicity, low birth weight, premature birth, experienced child maltreatment, elevated blood lead level, home visiting receipt, food assistance receipt, child care subsidy receipt, maternal age and education level at child's birth, residential mobility, concentrated neighborhood disadvantage.

<sup>6</sup> All variables in Table 1 were used to create propensity score match. Prior to assessing covariate balance, researchers explored the degree to which distributions of propensity score estimates overlapped between groups (Lanza, Moore, & Butera, 2013). Researchers found substantial overlap in propensity score distributions between treatment conditions for both models (i.e., predicting treatment assignment in the 9-month sample and predicting treatment assignment in the 18-month sample) indicating that children in the comparison condition were similar to children in the treatment condition in terms of their propensity to receive UPK, conditional on a set of covariates (see Table 1 for a list of all variables used to estimate propensity scores).

Low birth weight, %	11.6	16.2
Born premature, %	15.9	18.4
Experienced substantiated child maltreatment before preschool entry, %	2.1	2.2
Confirmed elevated blood lead test result $\geq 5\mu\text{g/dL}$ before preschool entry, %	10.7	10.3
Received Welcome Newborn Home visit, %	23.6	23.8
<b>FAMILY-LEVEL</b>		
Food assistance receipt, more than half of child's life from birth to preschool entry, %	44.2	49.2
Child care subsidy receipt, more than half of child's life from birth to preschool entry, %	16.3	18.9
Born to teen mother, %	12.8	15.1
Born to mother with a high school diploma, %	88.4	84.3
Residential mobility, moved at least once from birth to preschool entry, %	57.1	58.4
<b>NEIGHBORHOOD-LEVEL</b>		
Concentrated disadvantage factor score, M birth to preschool (SD) <sup>a</sup>	0.32 (0.9)	0.33 (1.0)

Note. Bolded figures represent a statistically significant difference between treatment and comparison conditions,  $p < .05$ .

<sup>a</sup> Researchers created a standardized continuous concentrated disadvantage factor score (Sampson, Raudenbush, & Earls, 1997; Coulton, Richter, Kim, Fischer, & Cho, 2016) comprised of six US Census variables: percent of residents with incomes below the federal poverty line, percent of female-headed households, percent of residents who are unemployed, percent of residents identifying as African American, percent of residents receiving public assistance, and percent of residents under age 18. Using an exploratory factor analysis, researchers included data on the US Census variables for all census tracts in Cuyahoga County. Higher positive scores indicate greater concentrated neighborhood disadvantage whereas higher negative scores indicate greater neighborhood affluence. Researchers included the average concentrated neighborhood disadvantage score from birth to preschool entry for children who moved at least once during this observation period.

## WHAT IS THE EFFECT OF A HIGH DOSE OF UPK ON KINDERGARTEN READINESS?

In this study, kindergarten readiness was measured using the State of Ohio mandated assessment,<sup>7</sup> which includes subscales assessing children's language and literacy abilities and social emotional foundations for learning. Raw scores on the Language and Literacy Subscale are dichotomized into 'On-track' and 'Not On-track' categories that are predictive of a child's

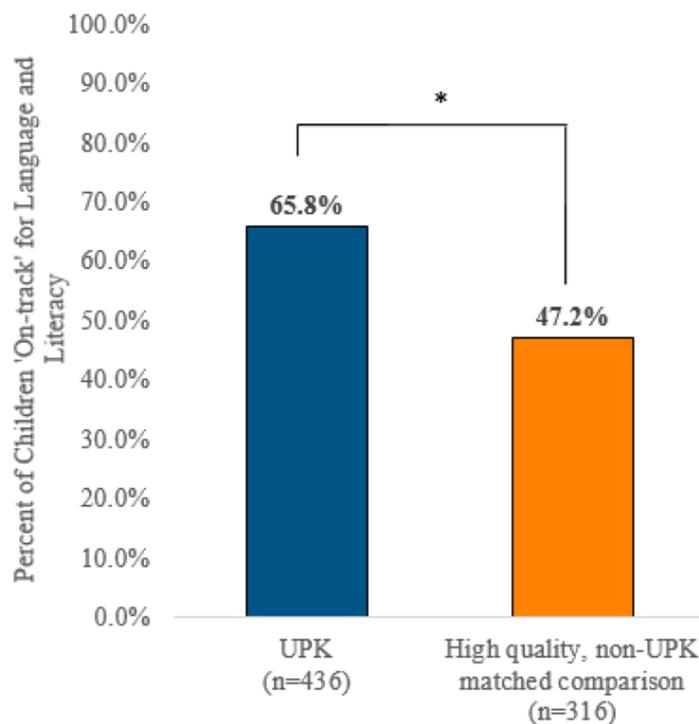
<sup>7</sup> The assessment was revised midway through the study period. From 2011-2012 to 2013-2014, the state assessment, known as the Kindergarten Readiness Assessment – Literacy (KRA-L), exclusively measured children's language and literacy abilities. Beginning with the 2014-2015 school year, the state implemented a revised, more comprehensive kindergarten readiness assessment that measures four areas of early learning aligned with Ohio's Early Learning and Development Standards. The revised Kindergarten Readiness Assessment (KRA) retained the language and literacy component and added three additional subscales, one of which is the Social Foundations subscale.

likelihood of passing a reading diagnostic assessment requirement at third grade. Examples of areas assessed via the Social Foundations subscale include planning, coordination and cooperation with peers in pretend play, sharing, coping with separation from family, following rules and directions, task persistence, seeking out adults for help, and independence. Raw scores on the Social Foundations subscale of the KRA range from 202-298, but are not dichotomized into ‘On track’ and ‘Not on track’ categories. This outcome is a continuous score with higher scores demonstrating greater teacher reported proficiency in social and emotional development.

Statistically significant propensity score adjusted estimates describing the effect of 18 or more months of UPK on kindergarten readiness are presented in Figures 1 and 2.<sup>8</sup> As shown in Figure 1, a significantly greater proportion of children who attended UPK scored ‘On-track’ for Language and Literacy at kindergarten entry. Thus, if all children who received a high dose of high quality, non-UPK preschool had instead received UPK, we would expect 65.8% of children to be ‘On-track’ instead of 47.2%, an 18.6 percentage point increase in the number of children ‘On-track’ for Language and Literacy.

UPK children also outperformed comparison children on the KRA Social Foundations subscale. As shown in Figure 2, UPK children scored an average of 6.8 points higher than comparison children on the Social Foundations subscale.

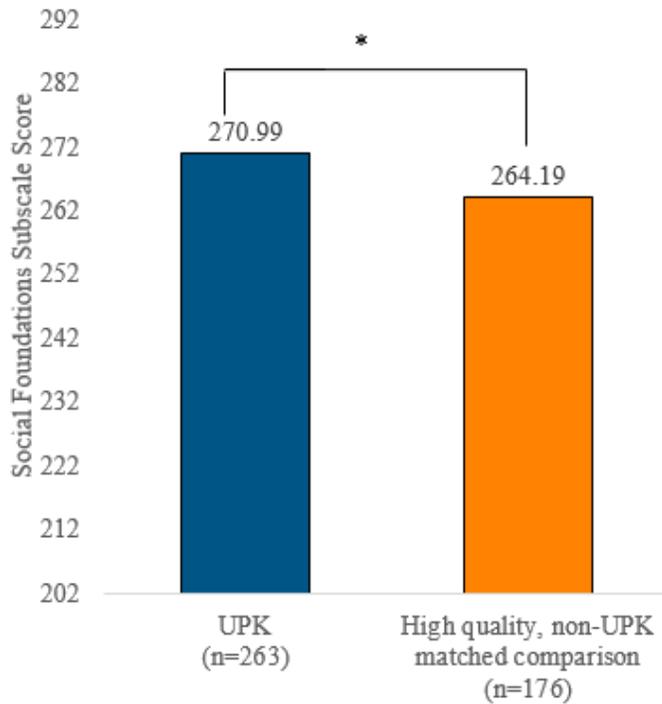
**Figure 1. Percent ‘On-Track’ for Language and Literacy at Kindergarten by Treatment Condition**



\* indicates statistically significant difference,  $p < .05$ .

<sup>8</sup> Analyses used listwise deletion. Sample size is smaller for Social Foundations outcome because the subscale was introduced by the state midway through selected kindergarten cohorts. Thus, only three of six cohorts have data available on this outcome.

**Figure 2. Average Score on KRA Social Foundations Subscale at Kindergarten by Treatment Condition**



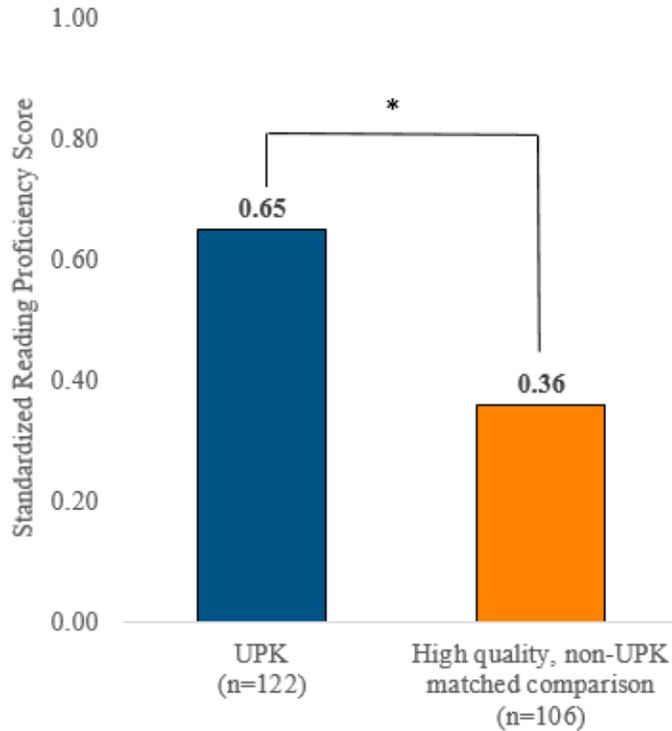
\* indicates statistically significant difference,  $p < .05$ .

### WHAT IS THE EFFECT OF A HIGH DOSE OF UPK ON THIRD GRADE READING PROFICIENCY?

Due to changes in the State of Ohio mandated assessment used to measure third grade reading proficiency over the kindergarten cohorts included in this analysis,<sup>9</sup> raw third grade reading proficiency scores were converted to standardized scores for this analysis. As with kindergarten readiness outcomes, comparisons between conditions were statistically significant and favored the UPK condition. As shown in Figure 3, children who received a high dose of UPK outperformed children who received a high dose of high quality, non-UPK preschool by 0.29 standard deviation units on the assessment.

<sup>9</sup> Not all kindergarten cohorts had matriculated to third grade at the time of this analysis. Thus, sample sizes reflect children who attended kindergarten in 2011-2012, 2012-2013, or 2013-2014 and had taken the third grade reading assessment.

**Figure 3. Average Standardized Score on Third Grade Reading Proficiency Assessment by Treatment Condition**



\* indicates statistically significant difference,  $p < .05$ .

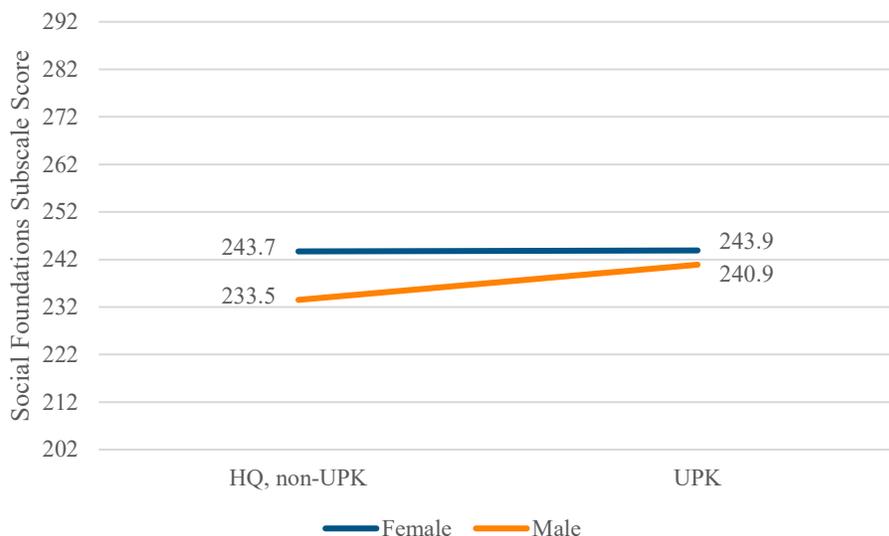
### IS THE IMPACT OF UPK DIFFERENT FOR BOYS AND GIRLS?

Researchers used OLS regression models<sup>10</sup> to examine interaction effects between treatment condition (UPK vs. high quality, non-UPK preschool) and child gender to determine whether UPK had a differential effect on boys or girls. There were no significant interactions between treatment and gender when predicting whether children were ‘On-track’ for Language and Literacy or the Third Grade Reading Proficiency score, meaning that boys and girls benefitted equally from UPK. However, researchers did identify a statistically significant interaction effect on the Social Foundations subscale among children attending preschool for 18 months or more in the two years before kindergarten. This interaction is illustrated in Figure 4 below.

The graph shows that, among children attending high quality, non-UPK preschools, girls outperformed boys by 10.2 points, on average. In UPK settings, the gap was smaller, with boys scoring an average of three points lower than girls. These results suggest that the higher Social Foundations scores shown in Figure 2 (above) are driven by the boost that UPK gives boys in this domain. Regardless of preschool setting, girls appear to perform equally well on the Social Foundations assessment. Although UPK boys still score lower than UPK girls, the narrowing of the gap in UPK settings suggests that the enhancements provided to preschools by the UPK program may equip teachers to be better attuned to the social and emotional needs of boys in their classrooms.

<sup>10</sup> The sample used in this analysis was not subject to propensity score matching, but instead relied on all children who received a high dose of either preschool type in the two years before kindergarten entry.

**Figure 4. Average Score on KRA Social Foundations Subscale by Treatment Condition and Gender**



## CONCLUSION AND IMPLICATIONS

This study builds on earlier evaluations of UPK<sup>11</sup> and is the first rigorous assessment of the program’s impact on children’s kindergarten readiness and third grade reading proficiency. In this comparison, we found that children who received a high dose of UPK—18 months or more in the two years before kindergarten—performed significantly better on the Kindergarten Readiness Assessment and the Third Grade Reading Guarantee than their counterparts who attended high quality, non-UPK preschools for the same period of time. The comparison to preschools that are already high quality is intentional, as UPK builds on the existing system of high quality preschool in Cuyahoga County. Thus, the findings reported here likely represent a conservative estimate of the benefits of UPK; it is possible that the impact is even larger when compared to children who attend lower-quality preschools (1- and 2-SUTQ star-rated sites), unrated preschools, or have no preschool experience at all.

The higher Language and Literacy, Social Foundations and Third Grade Reading Proficiency performance of children who attended UPK is net of several relevant factors known to predict school readiness. By using propensity score matching techniques, researchers were able to examine the program effect using a comparison group of children who were otherwise similar to treatment children (UPK) in regard to a number of individual, family and neighborhood characteristics such as age, gender, race, maternal education level, socioeconomic status, and neighborhood disadvantage. Additionally, the findings of this study highlight the benefits of getting two full years of preschool, as effect sizes were smaller or non-significant for children who received one year of high quality preschool.<sup>12</sup>

<sup>11</sup> Available at: <http://investinchildren.cuyahogacounty.us/en-US/evaluation.aspx>

<sup>12</sup> Results not shown here, but available upon request. These analyses compared children in UPK and high-quality non-UPK settings who attended for at least 9 months in the year before kindergarten.

The overarching goal of UPK is twofold: 1) further enhance high quality preschool programs, and 2) make high quality preschool education available, accessible, and affordable to all Cuyahoga County families. The positive effects realized for children who attended UPK are consistent with findings from Ohio's SUTQ Validation Study,<sup>13</sup> which concluded that even 5-star sites could improve their quality beyond the 5-star standards. Thus, the attainment of 5-star status does not represent the ceiling for quality in early childhood education. The continued innovation of Invest In Children to identify new avenues to improve quality and provide a "gold standard" appears to hold benefit for children attending UPK preschools. Findings like the ones reported here help to identify those services and educational programs offered in early childhood that are associated with better outcomes from kindergarten to third grade. Improving access to affordable high quality preschool is an obvious and critical step to ensuring children are getting a high dose of preschool and are ready to start school the first day they enter kindergarten. Demographic characteristics of the study sample illustrate that the UPK program is reaching a high need population.

The ability to demonstrate the impact of UPK would have been made more challenging and likely narrow in scope in the absence of longitudinal, integrated data. The individual, family, and neighborhood characteristics used to create matched groups for this analysis as well as the public school data needed to assess outcomes came from integrated, administrative records maintained in the CHILD System. This project and its use of integrated data illustrates the value of the CHILD System for our community to evaluate the impact of its social service programs and direct funds to programs that are improving the lives of children and families.

The findings using propensity score matched samples demonstrate the average positive impact of UPK on children across the program. The subgroup analysis examining whether there are specific groups for whom the impact is even larger reveals the particular benefit of UPK to boys' social-emotional development. The interaction effect between the treatment condition and child gender indicates that UPK is helping to close the gender gap in children's social emotional readiness for kindergarten, a testament to UPK's focus on supporting boys' social and emotional development. Having identified a group of children who benefit more from UPK can facilitate targeting of resources and encourage further innovation within the program to refine and improve the UPK model. This kind of data-driven programming enables IIC to efficiently target donors' and taxpayers' investments in Cuyahoga County's young children.

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<sup>13</sup> <http://earlychildhoodohio.org/sutq/pdf/SUTQValidationStudy2017.pdf>

## REFERENCES

- Barnett, W. S. (2008). Preschool education and its lasting effects: Research and policy implications. Boulder and Tempe: Education and the Public Interest Center & Education Policy Research Unit. Retrieved from <http://epicpolicy.org/publication/preschooleducation>
- Barnett, W. S., & Lamy, C. E. (2006). Estimated impacts of number of years of preschool attendance on vocabulary, literacy and math skills at kindergarten entry. New Brunswick: National Institute for Early Education Research.
- Blair, C., & Raver, C. C. (2016). Poverty, stress, and brain development: New directions for prevention and intervention. *Academic pediatrics*, 16(3), S30-S36.
- Bassok, D., & Latham, S. (2017). Kids today: The rise in children's academic skills at kindergarten entry. *Educational Researcher*, 46(1) 7-20.
- Blair, C., & Raver, C. C. (2016). Poverty, stress, and brain development: New directions for prevention and intervention. *Acad Pediatr*, 16(3 Suppl), S30-S36.
- Bull, R., & Lee, K. (2014). Executive functioning and mathematics achievement. *Child Development Perspectives*, 8(1), 36-41.
- Coulton, C. J., Richter, F., Kim, S., Fischer, R., & Cho, Y. (2016). Temporal effects of distressed housing on early childhood risk factors and kindergarten readiness. *Children and Youth Services Review*, 68(C), 59-72.
- Gilliam, W. S., & Zigler, E. F. (2004). State efforts to evaluate the effects of prekindergarten: 1977 to 2003. Retrieved from [https://www.researchgate.net/publication/253316034\\_State\\_Efforts\\_to\\_Evaluate\\_the\\_Effects\\_of\\_Prekindergarten](https://www.researchgate.net/publication/253316034_State_Efforts_to_Evaluate_the_Effects_of_Prekindergarten)
- Gormley Jr., W. T., & Gayer, T. (2005). Promoting school readiness in Oklahoma: An evaluation of Tulsa's pre-k program. *The Journal of Human Resources*, 40(3), 533-558.
- Gormley Jr., W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). The effects of universal pre-k on cognitive development. *Developmental Psychology*, 41(6), 872-884.
- Hattie, J. A. C. (2008). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. New York, NY: Routledge.
- Henry, G. T., Gordon, C. S., Mashburn, A., & Ponder, B. D. (2001). Pre-k longitudinal study: Findings from the 1999-2000 school year. Educational Policy Group, Andrew Young School of Policy Studies, Georgia State University. Retrieved from <https://eric.ed.gov/?id=ED481257>
- Isaacs, J. B. (March 2012). *Starting school at a disadvantage: The school readiness of poor children*. Center on Children and Families at Brookings: The Social Genome Project. Retrieved from [https://www.brookings.edu/wp-content/uploads/2016/06/0319\\_school\\_disadvantage\\_isaacs.pdf](https://www.brookings.edu/wp-content/uploads/2016/06/0319_school_disadvantage_isaacs.pdf)
- Jones, S. M., & Doolittle, E. J. (2017). Social and emotional learning: Introducing the issue. *The Future of Children*, 27(1). [www.jstor.org/stable/44219018](http://www.jstor.org/stable/44219018)
- Lanza, S. T., Moore, J. E., & Butera, N. M. (2013). Drawing causal inference using propensity scores: A practical guide for community psychologists. *American Journal of Community Psychology*, 52, 380-392. doi: 10.1007/s10464-013-9604-4.
- Lehrl, S., Kluczniok, K., & Rossbach, H. (2016). Longer-term associations of preschool education: The predictive role of preschool quality for the development of mathematical skills through elementary school. *Early Childhood Research Quarterly*, 36, 475-488.
- Loeb, S., Bridges, M., Bassok, D., Fuller, B., Rumberger, R. W. (2007). How much is too much? The influence of preschool centers on children's social and cognitive development. *Economics of Education Review*, 26(1). 52-66.
- Mashburn, A. J. (2014). The importance of quality prekindergarten programs for promoting school readiness skills. In S. H. Landry & C. L. Cooper (Eds.), *Wellbeing in children and families*, Vol. 1. (pp. 271-296). Wiley-Blackwell. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip.shib&db=psyh&AN=2014-09704-013&site=ehost-live>
- National Center for Education Statistics. (2019). Preschool and kindergarten enrollment. Retrieved from [https://nces.ed.gov/programs/coe/indicator\\_cfa.asp](https://nces.ed.gov/programs/coe/indicator_cfa.asp).

Reardon, S. F. (2011). The widening academic achievement gap between the rich and the poor: New evidence and possible explanations. In R. Murnane & G. Duncan (Eds.), *Whither Opportunity? Rising Inequality and the Uncertain Life Chances of Low-Income Children*. New York: Russell Sage Foundation Press.

Reardon, S. F., & Portilla, X. (2016). Recent trends in socioeconomic and racial school readiness gaps at kindergarten entry. *AERA Open*, 2(3), 1-18.

Reynolds, A. J., Temple, J. A., & Ou, S. R. (2010). Preschool education, educational attainment, and crime prevention: Contributions of cognitive and non-cognitive skills. *Children and youth services review*, 32(8), 1054–1063.  
doi:10.1016/j.chilyouth.2009.10.019

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, 277(5328), 918-924.

Wen, X., Leow, C., Hans-Vaughn, D. L., Kormacher, J., Marcus, S. M. (2012). Are two years better than one year? A propensity score analysis of the impact of Head Start program duration on children's school performance in kindergarten. *Early Childhood Research Quarterly*.

Yoshikawa, H., Weiland, C., & Brooks-Gunn, J. (Fall 2016). When does preschool matter? *Future of Children*, 26(2), 21-35.