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Pre-K in Texas: A Critical Component for Academic Success

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Pre-K in Texas: A Critical Component for Academic Success

Acknowledgements

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This report was made possible through the generous support of the Meadows Foundation and Miles Foundation. Additionally, this report builds off the most recent CHILDREN AT RISK 2014 Texas Pre-K study supported by the Meadows Foundation and the Texas Education Grantmakers Advocacy Consortium. We appreciate their commitment to quality early education and better outcomes for families in Texas.

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PRE-K IN TEXAS: A CRITICAL COMPONENT FOR ACADEMIC SUCCESS

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EXECUTIVE SUMMARY, KEY FINDINGS, AND POLICY RECOMMENDATIONS

Purpose

With funding from the Meadows Foundation and the Miles Foundation, researchers at CHILDREN AT RISK engaged in a study to examine how participation in Texas public Pre-Kindergarten Pre-K¹ is associated with performance on the 3rd Grade State of Texas Assessment of Academic Readiness (STAAR) Reading assessment.

CHILDREN AT RISK tracked approximately 47,000 students from the 2010-2011 school year to the 2014-2015 school year.² These students began public Pre-K in 2010 and completed 3rd grade in 2015. The study focused on five major independent school districts (ISD) in Texas (Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD, and San Antonio ISD) and 12 additional school districts surrounding these major metropolitan areas.³

The purpose of this report is twofold. The first purpose is to educate parents, policy makers, and the public about the association between Texas public Pre-K and 3rd grade STAAR Reading outcomes. Across campuses and students, this study examines the relationship between varying levels of public Pre-K participation and STAAR Reading scores by comparing 3rd grade STAAR Reading means among multiple sub-groups of economically disadvantaged students. The second purpose is to offer policy recommendations that will increase access to and improve the quality of the Texas public Pre-K program on behalf of parents, taxpayers, and—most importantly—children.

Background

This report is the most recent large-scale Pre-K Texas study since 2012, and supports findings from two previous studies from the University of Texas at Dallas and the University of Texas at Austin Lyndon Baines Johnson School of Public Affairs. Similar to our findings, these two studies suggest positive relationships between Texas public Pre-K attendance and 3rd grade standardized reading outcomes.

This report also builds off the most recent CHILDREN AT RISK 2014 Texas Pre-K study supported by the Meadows Foundation and the Texas Education Grantmakers Advocacy Consortium (TEGAC), which found a majority of districts indicating inadequate funding as a key barrier to expanding full-day Texas public Pre-K.

This report is noteworthy given the Texas Legislature's recent focus in 2015 on public Pre-K quality during the 84th Legislative Session as this study connects Pre-K quality indicators (e.g. class size, funding, and Pre-K program length) with 2010-2011 and 2014-2015 anonymized student level data from the Texas Education Agency (TEA).

Methodology

CHILDREN AT RISK, a nonpartisan research organization and advocacy non-profit organization utilized quantitative and qualitative methods to complete this study: (1) a literature review of past national and Texas-specific Pre-K studies; (2) analysis of multiple data sources including anonymized student-level data from the TEA (including demographic and socio-economic characteristics), financial data from the Texas Public Education Information Resource (TPEIR), school rankings data from CHILDREN AT RISK, and campus level data from the TEA's Academic Excellence Indicator System (AEIS); and (3) phone interviews with select "Gold Ribbon" schools (those that are high performing and have a high percentage of economically disadvantaged students).

Key Findings

Overall, this study finds that, on average, economically disadvantaged students who attended high-quality public Pre-K in 2010 scored higher on the 2015 3rd Grade STAAR Reading assessment than economically disadvantaged students who did not attend public Pre-K or those who attended lower quality public Pre-K.

1. Full-Day Pre-K Works:

For the overwhelming majority of economically disadvantaged students, the data suggests that students who attend full-day public Pre-K score higher on the 3rd Grade STAAR Reading assessment than economically disadvantaged students who do not attend public Pre-K or attend half-day public Pre-K.⁴ For economically disadvantaged students, the odds of reading at a college-ready pace⁵ are 40% higher if they attended full-day public Pre-K.⁶

2. Investment in Higher Quality Pre-K Produces Results:

Districts that provided full-day or quality Pre-K spent more per student on Pre-K than the 2015-2016 state average. In these districts, there was a stronger positive relationship between Pre-K enrollment and 3rd Grade STAAR Reading scores.⁷

3. Quality K-3 Matters:

For the overwhelming majority of economically disadvantaged students, the data suggests a quality Pre-K education and a quality Kindergarten through 3rd grade education makes the biggest impact.⁸

Policy Recommendations

The research makes it apparent that in order to maintain a strong workforce, the State of Texas needs to move towards ensuring all low-income children have access to full-day quality Pre-K. The following policy recommendations will move Texas in that direction:

1. Sustain the high-quality Pre-K Grant at \$236 million for the biennium.
2. Create sustainable funding for high-quality Pre-K through formula funding.
3. Limit Pre-K classrooms to a maximum of 22 students, allowing no more than 11 students for each teacher or aide in Pre-K classes with more than 15 students.
4. Create an Early Childhood through 3rd Grade teaching certificate to provide an option for teachers to gain in-depth expertise in early elementary grades.

Given the research showing a quality early childhood education is critical to long-term success, CHILDREN AT RISK also recommends the following policy changes that would strengthen the quality of educational services children under the age of five receive:

5. Increase inter-agency coordination of child care and Pre-K data systems through the Early Childhood Database System to improve outcomes for children and maximize efficiency of taxpayer dollars.
6. Increase local coordination of early education programs by supporting public/private partnerships between school districts and high-quality child care centers.

Methodology

The structure of this report moves from the highest level of Pre-K analysis (large national and Texas-specific Pre-K studies) to the smallest level of Pre-K analysis (student-level analysis).

The purpose of this study is to analyze how varying levels of Texas public Pre-K are associated with 3rd grade reading scores as measured by the Texas STAAR assessment.

Literature Review and Texas Pre-K

We begin with a literature review exploring the strengths and gaps of previous national and Texas-specific studies on Pre-K's effect on long-term academic outcomes. The study then moves into a high level "snapshot" of Texas Pre-K as it exists today.

Quantitative Analysis: Pre-K Enrollment and Third Grade Reading

We then move to a more granular level of Pre-K by analyzing student-level 2010-2011 Pre-K enrollment and 2014-2015 STAAR Reading data across five major urban school districts: Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD and San Antonio ISD.

To broaden this statewide analysis and further explore the association between Pre-K spending and 3rd grade STAAR Reading outcomes, we incorporate several other data-sets into the analysis for 12 additional school districts: Texas per student Pre-K funding from the TPEIR, 2016 CHILDREN AT RISK school ranking data, and class size information from the 2011 AEIS.

Qualitative Analysis: “Gold Ribbon” Principal Interviews

To increase our understanding even further of the ways in which Pre-K does or does not make a noticeable difference in Texas elementary schools, we conducted a set of in-depth, semi-structured interviews with principals of “Gold Ribbon” schools.

Gold Ribbon is a performance indicator designed by CHILDREN AT RISK to signify schools that are high performing and high poverty. To obtain Gold Ribbon status, a school must be more than 75% economically disadvantaged and must receive an CHILDREN AT RISK A or B school ranking. Schools with a CHILDREN AT RISK A or B school ranking are top performing schools in the state due to student growth and academic achievement in math and reading.

Additionally, these five schools were selected because they are the top five performing Gold Ribbon schools in Texas. All principals at these schools agreed to participate in a semi-structured interviews where we explored the role Pre-K plays at their campuses.

Limits of the Study

This study operates under the assumption that economically disadvantaged students have the most to gain from Pre-K. Our main sample consisted of 19,323 students across 509 schools encompassing five major ISD’s in Texas: Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD and San Antonio ISD. We looked at Spanish and English test takers separately and removed all alternative test takers.

We test mean differences across all comparison groups for statistical significance using the Welch two sample t-test, a test used to gain confidence in the probability that differences actually existed across samples. Similarly, we use a Chi-Square test to assess the odds-ratio of enrolling in 2010-2011 full-day Texas Pre-K and reaching the Level II Satisfactory metric on the 2014-2015 STAAR Reading assessment.

This study is not intended to be a causal analysis of Pre-K effects, but rather a study on the association between 2010-2011 Pre-K enrollment and 2014-2015 3rd grade STAAR Reading outcomes. Studies in the past, both in Texas and nationally, have attempted to use either quasi-experimental designs or random control trials to understand the cognitive and behavioral benefits for students that enroll in Pre-K. Contrary to these studies, this analysis simply seeks to find associations between Pre-K enrollment and average 3rd Grade STAAR Reading scores.

Above all, this study highlights associations amongst observational panel data for a set of districts. We do not attempt to disentangle countervailing effects such as changes over time or

within districts using fixed effects, difference in differences, or regression discontinuity. While advanced quasi-experimental models approximate causal relationships better than simple differences in means and Chi-Square tests, the purpose of this analysis is to give an intuitive analysis of associations with Pre-K using available data. While positive associations between high quality Pre-K enrollment and higher 3rd STAAR Reading scores may suggest a possible causal relationship, it is outside the scope of this study to strongly suggest causality.

Another limit of this analysis is that any finding reflects only the districts we studied. This study focuses on students that attended Pre-K within a district and then stayed in the district until 3rd grade. If a student attended Pre-K outside of a study district and then entered the study district after Pre-K, then that student would be counted as not attending Pre-K. Similarly, students who attend Head Start or private Pre-K under this study would not be counted as attending Pre-K. While this is problematic, it most likely causes our estimated Pre-K association to be conservative as some students not counted as attending Pre-K may have attended another form of formal early education such as Head Start or private Pre-K.

LITERATURE REVIEW

This section provides a review of literature on quality Pre-K access and previous national and Texas-specific studies. We focused on the impact of poverty on children, the benefits of high-quality Pre-K for economically disadvantaged students, the accessibility of high-quality Pre-K, the strengths and limitations of previous national and Texas-specific Pre-K studies.

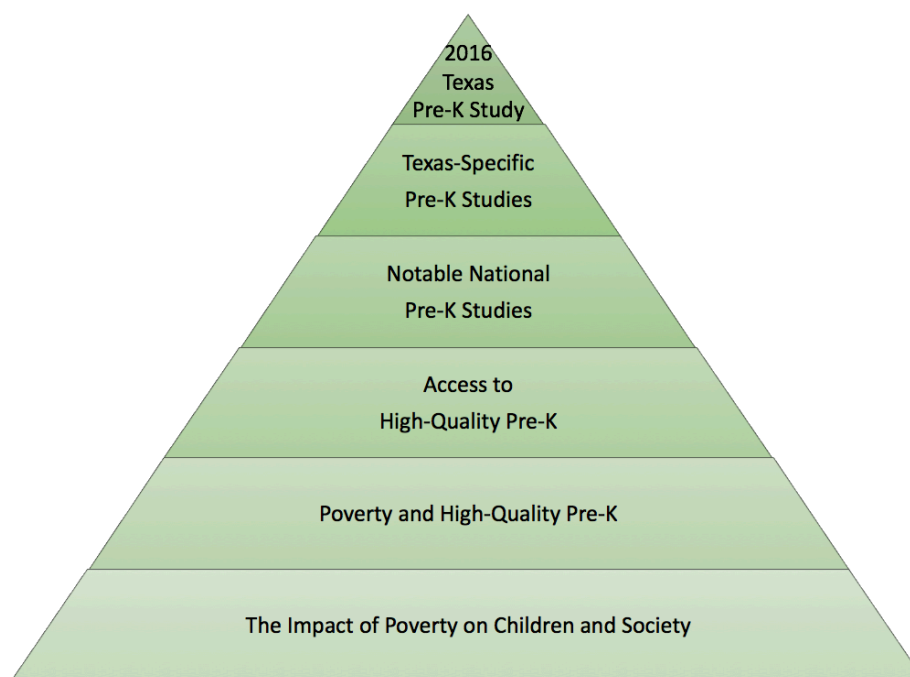


Figure 1. Structure and approach of literature review for current study.

The Impact of Poverty on Children and Society

According to the National Center for Children in Poverty, **47 percent of children in the United States under the age of three live in low-income households** in 2014 (Jiang, Ekono, & Skinner, 2016).

Children from low-income households experience a level of stress that can have long-lasting and adverse effects on academic and behavioral development (Duncan, Magnuson, & Votruba-Drzal, 2014). **In fact, children in households from the lowest income quintile begin Kindergarten with academic skills that are 20 months behind those of children from the top income quintile** (Nores & Barnett, 2014). These gaps eventually lead to higher high school dropout rates, decreased college attendance, and lower wages for low-income adults (Aud, Fox, & Kewal Ramani, 2010).

These achievement gaps are not individual problems, but rather a societal problem. An uneducated and under-productive labor force will result in higher societal costs and a less productive economy.

Poverty and High-Quality Pre-K: Limited Access and Limited Availability

One way America addresses achievement gaps exacerbated by poverty is by providing Pre-K programs to children, especially those who are economically disadvantaged – an intervention researchers have studied for decades.

Many states attempt to address these achievement gaps through statewide Pre-K programs; however, it is difficult for states to provide students with Pre-K programs that are as resource-intensive (Andrews, Jargowsky, & Khune, 2012). In fact, state Pre-K programs that focus on at-risk children are often of lower quality (Nores & Barnett, 2014).

To estimate the amount of quality early education available across states, researchers used nationally representative data from the Early Childhood Longitudinal Study's Birth Cohort (ECLS-B) and Kindergarten Cohort (ECLS-K). **This study estimates that one-third of all four-year-old children are enrolled in high-quality early childhood education; this number drops to 10 percent of all four-year-olds when limited to full-day high quality programs** (Friedman-Krauss, Barnett, & Nores, 2016).

In short, it appears that many four-year-olds are in low quality early education programs and very few have access to a full-day quality education.

Why Increase Access to High-Quality Pre-K?

In the first few years of life, a child's brain creates 700 new neural connections per second. Rapid learning gaps seem to appear just as quickly. Differences in vocabulary between children from high-income households and low-income households first appear at 18 months of age.

Similarly, by age three, children with college-educated parents demonstrate vocabularies that are two to three times larger than children's with parents who did not complete high school (Center on the Developing Child, 2009).

To help these economically disadvantaged children catch up, a structured or "formal" early education environment such as Pre-K seems to best prepare them for elementary school and beyond.

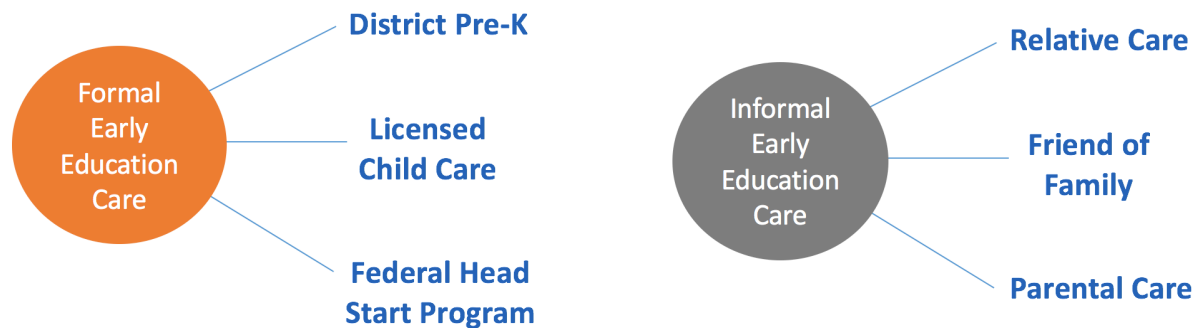


Figure 2. Difference between formal and informal care in early education.

Above all, the research suggests that quality child care exists at a higher rate in formal settings. Using nationally representative data from the ECLS-B, Bassok, Fitzpatrick, Greenberg, and Loeb (2016) found that quality is "systematically higher" in formal care settings than informal care settings using both structural and observational measures (Bassok et al., 2016). Likewise, Dowsett, Huston, Imes, and Gennetian (2008) found that children in formal care settings experience increased cognitive stimulation and sensitive care (Dowsett et al., 2008). This formal care advantage may be a result of strict regulations and access to a wider array of resources (Gormley, Phillips, Adelstein, & Shaw, 2010; Zhai, Waldfogel, & Brooks-Gunn, 2013).

Similarly, Ansari and Winsler (2013) found that children who attended formal early childhood education had moderate gains in pre-academic and social skills; however, **of all the formal early childhood education programs, children in public Pre-K showed the strongest Kindergarten readiness and scored above national averages in both language and cognition assessments** (Ansari & Winsler, 2013). This finding is corroborated by Barnett's (2011) meta-study which found that the most positive cognitive impact occurs when "direct instruction" is intentional and sometimes scripted (Barnett, 2011).

To maximize cognitive benefits during this period of rapid brain development, students need high-quality Pre-K. High-quality Pre-K happens when both Pre-K and Kindergarten teachers communicate, when teachers share curriculum, and when teachers are better paid and educated. Finally, Pre-K works best when the instruction aligns with rigorous state educational demands (Magnuson, Ruhm, & Waldfogel, 2007).

A History of National Pre-K Evaluations

This section provides an overview of various notable national research studies that have evaluated the effects of Pre-K through randomized early education interventions. These programs have become known as “model” programs that are often cited as evidence for Pre-K’s impact on long-term academic success. The most prominent studies are the Carolina Abecedarian Project, the Perry Preschool Project, the Vanderbilt Study, and the Duke Study.

The Carolina Abecedarian Project

In 1972, the Frank Porter Graham Child Development Institute selected 111 infants born between 1972 and 1977 to participate in an experiment that would observe the effects of a high-quality intervention from infancy through age five.

The participants were selected according to a “High-Risk Index” rating and were randomly placed into treatment and control groups (Ramsey, 1974). The goal was to observe if early education interventions could help at-risk children overcome developmental delays and academic failure.

The Abecedarian Project provided a comprehensive array of services to families in the treatment group such as social work services, nutritional supplements, medical care, transportation, payment for participation, and diapers. Meanwhile, families in the treatment group received a daily curriculum focused on development and learning activities for children from birth to three years of age, as well as early education care through age five (Ramsey, 1974). Short-term, the treatment group showed substantial increases in academic, social, and health benefits. However, what sets the Abecedarian Project apart are the documented long-term benefits children from the treatment group exhibited throughout their adult years.

As researchers from Abecedarian Project tracked the trajectory of the treatment group from age three through 30, they observed the treatment individuals attained both significantly higher levels of education and higher levels of economic benefits (Campbell et al., 2012).

Although the economic benefits were reported as inconclusive in the research paper, the authors noted that the odds of full-time employment were twice as high for the treatment group than the control group. Furthermore, the earned income, job prestige, and head of household status was higher for the treatment group in comparison to the control group (Campbell et al., 2012).

In a second follow-up, (Campbell et al., 2014) determined that the long-term benefits extended to persistent health benefits. The researchers found that individuals randomly assigned to the treatment group had a considerably lower prevalence of risk factors associated with cardiovascular and metabolic diseases, most significantly among males. They also found that 25% of the control group was affected by metabolic syndrome, which puts individuals at risk for

heart disease, while not a single participant in the treatment group was affected by this condition (Campbell et al., 2014).

HighScope Perry Preschool Study

In the early 1960's, the Perry Preschool Project – one of the most notable preschool research experiments to date – began tracking 123 low-income young children. Of the 123 children, 58 children accessed a high-quality preschool program (treatment group) while the remaining 65 children did not (Schweinhart et al., 2005).

The treatment group consisted of African-American children in poverty and at-risk of failing school. Starting at age three, this group of children received access to a free preschool education in very small classes led by qualified teachers with bachelor's degrees. The intervention also consisted of substantial parent outreach: Teachers working with the treatment group visited their homes at least once every two weeks (Schweinhart et al., 2005).

These students were tracked across their adult lives. For the children who received the high-quality preschool intervention, Heckman, Moon, Pinto, Savelyev, & Yavitz (2010) found the rate of return for the program was approximately 7 to 12 dollars for every dollar invested. This return on investment came from reductions in crime, higher earnings, more schooling, lower out-of-wedlock births and other positive life outcomes for students and society. This promising project has piqued the interest of states across the country for years (Heckman et al., 2010).

Many states, similar to the Perry Preschool project, attempt to address achievement gaps through statewide Pre-K programs, **however it's difficult for states to create public Pre-K programs at scale that invest at levels similar to "model" programs like the Perry Pre-School project** (Andrews, Jargowsky, and Khune, 2012).

The Vanderbilt Study

In 2005, Tennessee allocated \$213 million dollars towards the expansion of its Pre-K program, which created 786 new seats for 15,000 preschoolers.

To evaluate the expanded program, Vanderbilt's Peabody Research Institute used the oversubscription of Pre-K at participating schools that had too many students who wanted to attend Pre-K. Capitalizing on this oversubscription, researchers created a random control trial where they randomly assigned students to Pre-K or no Pre-K. The researchers evaluated Kindergarten readiness and persistence of cognitive benefits for both groups of students through 3rd grade.

Researchers found that students attending Pre-K initially outperformed students who did not attend Pre-K in Kindergarten; however, by 2nd grade, the control group had surpassed the Pre-K group by most measures (Lipsey, Farran, & Hofer, 2016).

While this Pre-K study provides an alternative narrative of Pre-K's effectiveness on long-term academic outcomes, one may point out that of the initial 3,000 students in the study, only 1,076 parents allowed students to be tracked through formative tests and teacher evaluations. This means that a substantial number of students were not able to be evaluated yet. Finally, this study did not use state standardized assessments to evaluate outcomes; instead, it relied on study-specific measures of student performance (Lipsey et al., 2016).

Duke Study on Pre-K: Quality Beats Fade Out

The most recent study on Pre-K effectiveness published in November of 2016 tracked over a million students over 13 consecutive years within North Carolina's high quality Pre-K system (Dodge, K. A., Bai, Y., Ladd, H. F., & Muschkin, C. G., 2016).

This Duke study evaluated the impact of county level funding for two early education programs: Smart Start and More at Four for 100 counties over 13 consecutive years. The outcome variables they explored were 3rd, 4th, and 5th grade reading and math standardized test scores, special education placement, and grade retention. The overall sample of 1,004,571 consisted of a relatively even mix of girls and boys, with an ethnicity breakdown of 61% non-Latino White, 30% African American, 4% Latino, and 5% other.

Unlike previous Pre-K studies, this evaluation tracked all Pre-K students in the entire state system over 13 consecutive years within an early education system that is considered high quality.

The study found that state Pre-K investment was associated with higher standardized reading and math test scores from third through fifth grade with no evidence of fade out, for all income groups and ethnicities. The authors suggested that fade out was not present because of strategic saturation across income groups: "...the sustained effects suggest that it may be more beneficial to saturate a community with an early childhood program than to distribute limited resources across many communities at a level that is below a threshold of enduring impact" (Dodge et. al, 2016, p. 35). The results from this study also counters the findings from the Vanderbilt study while using a more comprehensive sample and standardized reading and math scores.

A History of Texas-Specific Pre-K Evaluations

This section provides an overview of two recent notable Texas-Specific research studies that were released in 2012 which evaluate the association between attendance in Texas public Pre-K and 3rd grade reading outcomes measured by the State's standardized reading assessments used from 1991-2012. One study analyzed the association between participation in Texas' public Pre-K program and 3rd grade reading scores measured by the (TAAS) assessment while the other study used 3rd grade reading scores from the Texas Assessment of Knowledge and Skills (TAKS) assessment.

Study Using the Texas Assessment of Academic Skills (TAAS)

Andrews, Jargowsky, and Kuhne (2012) evaluated the association between Texas' targeted Pre-K program and 3rd grade standardized reading scores measured by the TAAS assessment, which was administered by Texas between 1990 and 2002. In addition to TAAS reading scores, researchers also evaluated the association between Texas Pre-K and the likelihood of grade retention and the probability of receiving special education (Andrews et al., 2012).

The study examined 682,749 students from 1994 through 2002, which found that students who participated in Texas' targeted Pre-K program had higher reading and math scores on the TAAS, a lower likelihood of being retained, and a decreased probability of receiving special education services (Andrews et al., 2012).

This study showed Texas' Pre-K program's effect on 3rd grade reading and math scores for students who were economically disadvantaged and/or with limited English proficiency was statistically significant: "...economically disadvantaged students who participated in public Pre-K scores about 0.06 standard deviations higher on their third grade reading test than students who did not attend the program" (Andrews et al., 2012, p. 10). Students who were both economically disadvantaged and with limited English proficiency experienced the greatest statistically significant effect at 0.1107; "...the fact that the program's effect was largest for students with two forms of disadvantage is also an encouraging result...these effects are substantively meaningful, particularly for an intervention that occurred four years prior to the outcome measure" (p. 10).

The benefits of Texas' Pre-K program were not limited to 3rd grade TAAS reading and math scores: Students who participated in the Texas Pre-K program also demonstrated a diminished probability of retention and special education assignment: the "...odds of retention [were] 24 percent lower for those who attended public Pre-K. The odds of retention for students who qualify for the program due to limited English proficiency [were] 40 percent lower for those who did not attend public Pre-K than for those who do not" (Andrews et al., 2012, p. 12). Additionally, students who attended Texas public Pre-K showed they "...were less likely to be assigned to special education in third grade; the odds of assignment were 13 percent lower for those who attended public Pre-K other things equal" (Andrews et al., 2012, p. 13).

Study Using the Texas Assessment of Academic Skills (TAKS)

Another major Texas-specific Pre-K study prepared by the University of Texas at Austin LBJ School of Public Affairs and the Ray Marshall Center for the Study of Human Resources also studied the relationship between Texas public Pre-K attendance in and 3rd grade TAKS reading scores. The study examined 237,279 students who attended Pre-K in 1998-1999 and took the TAKS Reading assessment in 2002-2003.

Overall, this study found that the most disadvantaged children, especially those who qualified for Pre-K services due to both their economically disadvantaged and limited English proficiency

status, benefited the most from Texas public Pre-K evidenced by higher third-grade TAAS reading and math scores.

Results by ethnic group also showed Hispanic children and black children benefited from Texas' public Pre-K program: "...For reading, scores of Hispanic children who attended Pre-K exceeded those who did not by 11.6 points...similarly, for math, the difference was 11.5 points...the advantages associated with Pre-K were especially marked for Hispanic children who took the test in Spanish" (Huston, Gupta, & Schexnayder, 2012, p.19). Black children who attended Pre-K also performed better on the 3rd math TAKS assessment.

In general, Huston et al. (2012) study found that disadvantaged children who attended Texas' public Pre-K program showed increased differences in both 3rd grade reading and math scores than children who did not attend Pre-K.

Texas Public Pre-K: High Access, Low Quality

The results from both the Andrews et al. (2012) and Huston et al. (2012) studies were promising, especially since Texas' Pre-K program has historically not been considered high-quality. Texas' Pre-K program only meets two of the ten quality benchmarks the National Institute for Early Education Research (NIEER) uses to evaluate state Pre-K program quality across the United States. Given the low quality of Texas' public Pre-K, both the Andrews et al. (2012) and Huston et al. (2012) studies showed that "...even a mediocre program implemented state-wide, can have a positive impact on a number of academic outcomes even if they lack the resources or intensiveness of [other] model programs..." (Andrews et al., 2012, p. 15).

This is not to say that individual district Pre-K programs across Texas do not meet NIEER's high quality standards, but rather the law in Texas is not as rigorous as it could be. Furthermore, in 2015 NIEER ranked Texas as 10th in Pre-K access to 4-year olds yet 30th in state spending. With a substantial number of 4-year olds accessing Pre-K in Texas, there is an opportunity for Texas to provide school districts with the sustainable funding they need to create quality public Pre-K for the students already accessing Texas public Pre-K.

Meadows CHILDREN AT RISK 2016 STAAR Study

Although the Andrews et al. (2012) and Huston et al. (2012) studies were useful in determining the effect of the Texas' public Pre-K program, they are not pertinent to the state of Pre-K today since students now take STAAR Reading in 3rd Grade, the State's new standardized reading assessment. The Meadows CHILDREN AT RISK 2016 study builds on these previous evaluations by further exploring the efficacy of the Texas Pre-K program using 3rd grade STAAR Reading standardized scores. This study is the third recent large-scale evaluation since 2010 that has found positive associations between participation in Texas public Pre-K and standardized reading test scores.

While the methodology used by the Meadows CHILDREN AT RISK study is not as complex as the

ones employed by the Andrews et al. (2012) and Huston et al. (2012) studies, the Meadows CHILDREN AT RISK study enhances the current dialogue centered on Texas Pre-K quality by focusing on how several quality measures (e.g. funding, length of day, classroom size, and the quality of Kindergarten through 3rd education) impact student outcomes as measured by the relatively new STAAR Reading assessment, a focus that makes this report especially timely.

STATE OF PRE-K IN TEXAS

A Brief History and Background of Pre-K Eligibility

Since 1985, Texas has provided funding to school districts throughout the state for the provision of half-day Pre-K services. The program is offered to three and four-year-old at-risk children who meet at least one of the following conditions or “at-risk” factors:

- They receive free or reduced-priced lunch.
- They are homeless.
- They are in foster care.
- Their parent is on active military duty.
- Their parent was killed or injured during active military duty.
- They are unable to speak or comprehend English.

School districts that have at least 15 children that are four years old and meet the eligibility criteria are required by law to create a public Pre-K system⁹ under the auspice of the TEA (Texas Education Agency, 2014) [TEA].

The TEA oversees Pre-K administration and funds through the Foundation School Program, which provides school districts with Pre-K funding through the Average Daily Attendance (ADA) formula that takes into account numerous factors including student attendance. In 2014-2015, Texas spent approximately \$3,600 per pupil on state Pre-K programs,¹⁰ causing Texas to be ranked 30th (of 43) in the nation in Pre-K spending (Barnett et al., 2016). Texas Pre-K spending per pupil is below the national Pre-K spending per pupil average of \$4,521 (Barnett et al., 2016).

Texas Public Pre-K Access

As a whole, per student Pre-K funding is low in Texas compared to other states and overall program quality is poor. Despite this fact, Texas is ranked in the 90th percentile for Pre-K access due to a steady increase in four-year-old attendance. In 2014-2015, 48% of the state’s four-year-old children attended public Pre-K in Texas (Barnett et al., 2016).

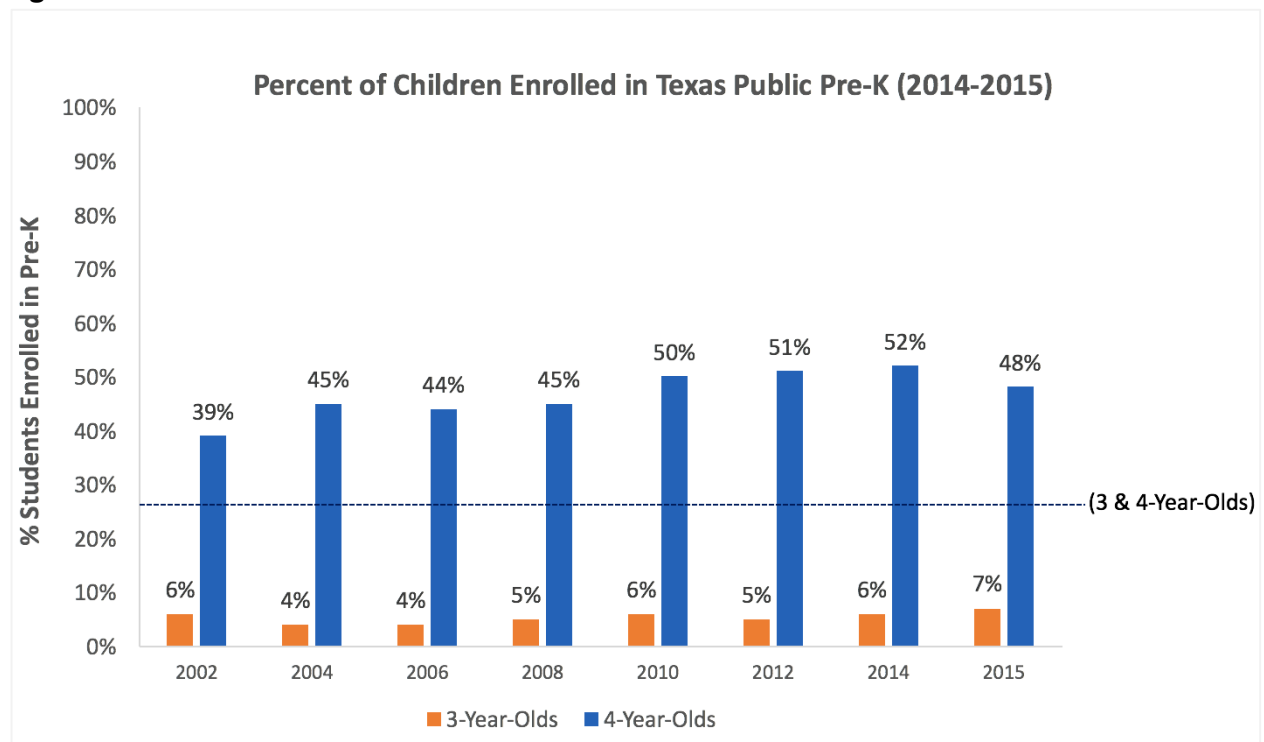
Figure 3

Figure 3. Modified from Barnett, W. S., Friedman-Krauss, A. H., Gomez, R. E., Horowitz, M., Weisenfeld, G. G., Clark Brown, K., & Squires, J. H. (2016). The state of preschool 2015: State preschool yearbook. Retrieved from the National Institute for Early Education Research: http://nieer.org/wp-content/uploads/2016/05/Yearbook_2015_rev1.pdf

Who Attends Pre-K?

TPEIR is organized by the TEA and the Higher Education Coordinating board to provide data reports to researchers and policy makers. The most recent 2014-2015 statewide Pre-K data reveals several key points regarding the landscape of the existing Pre-K program in Texas.

First, the 2014-2015 data revealed that the overwhelming majority of students receiving Pre-K services are eligible because of their status as “economically disadvantaged” – a status which is obtained through eligibility for free or reduced lunch.

Table 1*Public Pre-K Enrollment* by Student Eligibility*

Eligibility	Number of Students Enrolled By Eligibility			
	2011-12	2012-13	2013-14	2014-15
Economically Disadvantaged	197,561	197,114	197,047	188,772
Limited English Proficiency	90,724	90,714	90,674	88,383
Homeless	**	**	5,582	5,494
In Foster Care	**	**	1,812	1,832
Military Children	6,018	5,987	6,288	6,445
Special Education	8,903	8,817	8,621	8,146

Table 1. Adapted from Texas Public Education Information Resource (2011-2015). Texas Education Reports [Data file]. Available from <http://www.texaseducationinfo.org/>

Note. *The numbers in this table include three and four-year-old children in the Pre-K program

**For school years 2011-12 and 2012-13, homeless and foster care data are not available.

Source: 2014-2015 Texas Public Prekindergarten Programs and Enrollment Ages 3 and 4 Report

Second, a majority of the public Pre-K population in Texas is comprised of four-year-old children. Furthermore, approximately 50% of three and four-year-old Pre-K students attend full-day programs (4+ hours) as opposed to half-day programs (2-3 hours).

Table 2*Public Pre-K Enrollment by Program Type and Age for the 2014-2015 School Year*

Age	Program Type	Students Enrolled	Percent Enrolled
Age 3	Full-day	11,175	46%
	Half-day	13,144	54%
	Total	24,319	100%
Age 4	Full-day	100,459	51%
	Half-day	94,890	49%
	Total	195,349	100%
Grand Total		219,668	100%

Table 2. Adapted from Texas Public Education Information Resource (2011-2015). Texas Education Reports [Data file]. Available from <http://www.texaseducationinfo.org/>

Third, as shown in the figure below, the majority of students in Texas Pre-K programs are of the Hispanic/Latino ethnicity.

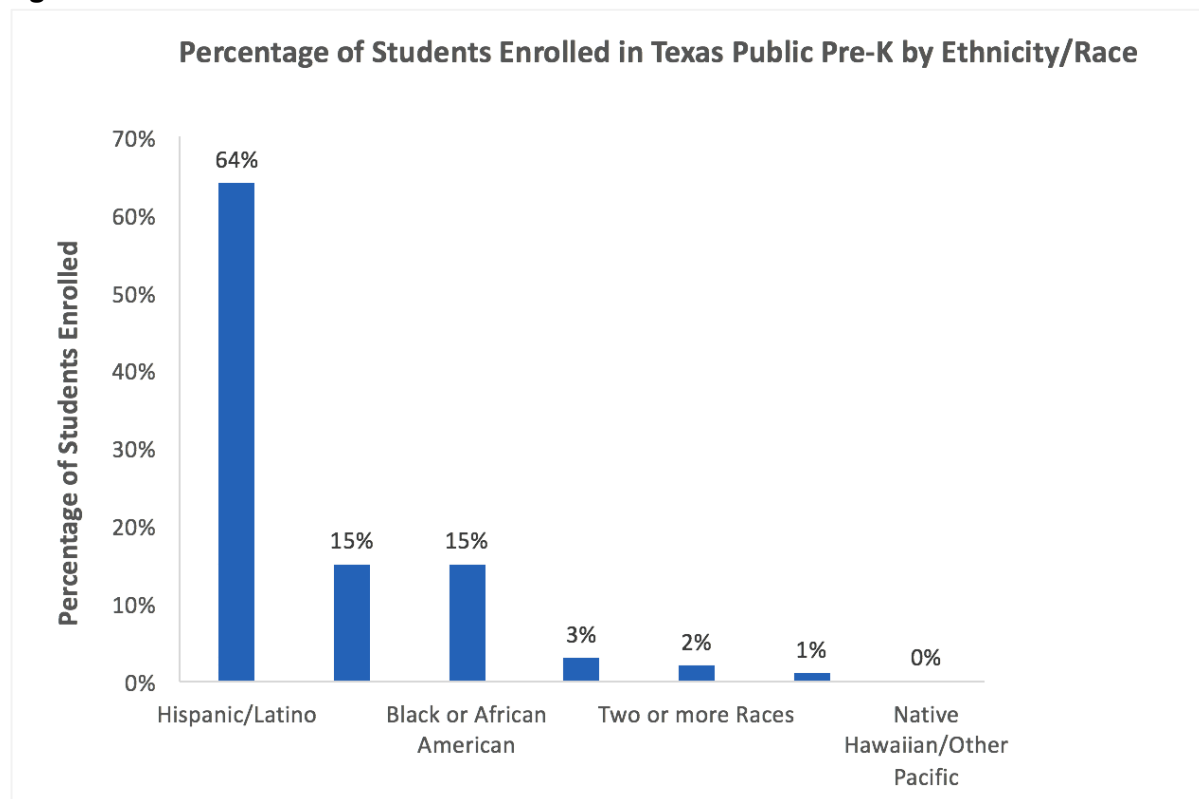
Figure 4

Figure 4. Public Pre-K Enrollment by Ethnicity for 2014-2015 School Year. Adapted from Texas Public Education Information Resource (2011-2015). Texas Education Reports [Data file]. Available from <http://www.texaseducationinfo.org/>

Fourth, the table below reveals that 43% of four-year-olds in Texas are not in public Pre-K or Head Start programs. However, they might be in an alternative type of formal or informal care which includes non-educational environments.

Table 3

Public Pre-K Enrollment by Age for the 2014-2015 School Year

3-Year-Olds		4-Year-Olds	
Program Type	Enrollment	Program Type	Enrollment
Public Pre-K	7%	Public Pre-K	48%
Head Start	8%	Head Start	9%
Special Education	1%	Other/None	43%
Other/None	84%		

Table 3. Adapted from Texas Public Education Information Resource (2011-2015). Texas Education Reports [Data file]. Available from <http://www.texaseducationinfo.org/>.

History and Background of Pre-K Funding

According to NIEER, in 2015, Texas ranked 30th across the nation in per pupil Pre-K spending as seen in the graph below (Barnett et al., 2016):

Figure 5

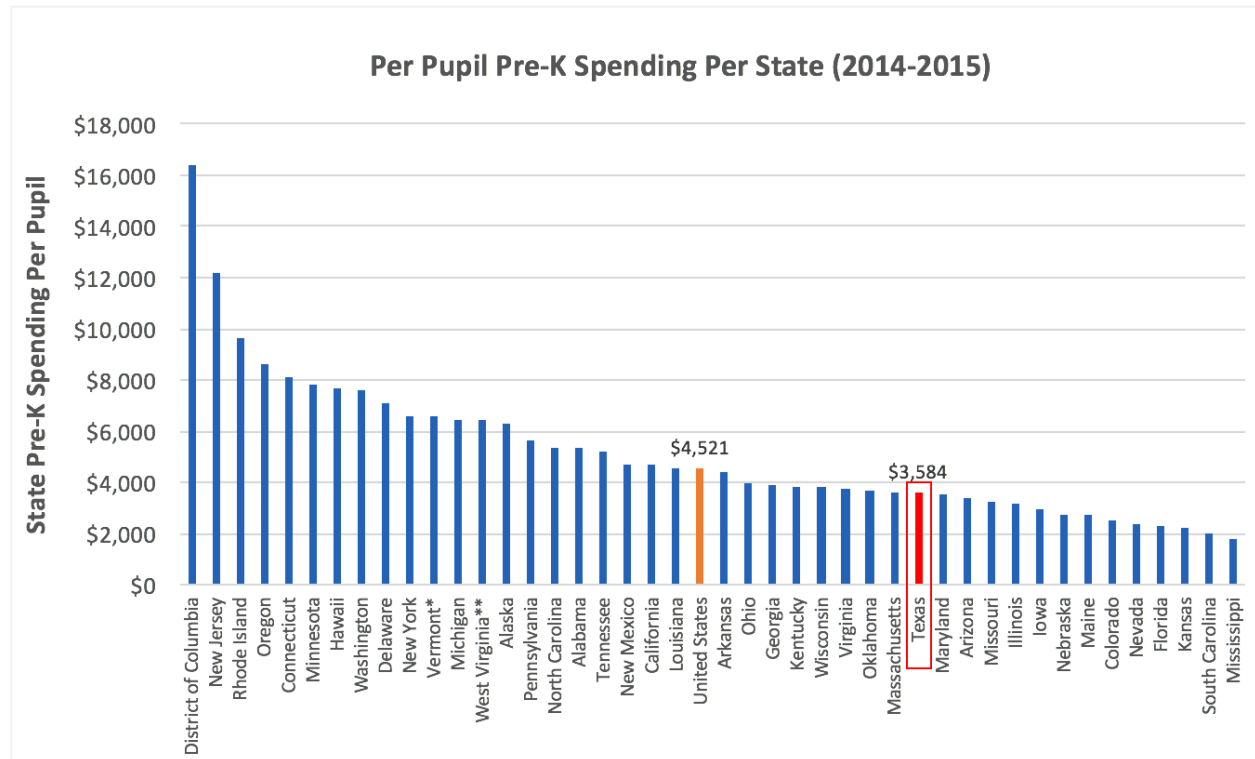


Figure 5. 2014-2015 Per Pupil Pre-K Spending by State. Modified from Barnett, W. S., Friedman-Krauss, A. H., Gomez, R. E., Horowitz, M., Weisenfeld, G. G., Clark Brown, K., & Squires, J. H. (2016). The state of preschool 2015: State preschool yearbook. Retrieved from the National Institute for Early Education Research: http://nieer.org/wp-content/uploads/2016/05/Yearbook_2015_rev1.pdf

Note. No Pre-K programs in Idaho, Indiana***, Montana, New Hampshire, North Dakota, South Dakota, Utah, and Wyoming.

*Vermont could not break out the state, local, and federal spending from the total amount reported. Vermont also provided updated spending information for the 2013-2014 school year, which is reflected in the calculations of change in spending.

**1366 3-year-old children were served in WV's Universal Pre-K program but were funded by sources not reported by the state. They were removed from the per-child spending calculations. A similar adjustment was made for 2013-2014.

*** Indiana funded a pilot state pre-K program during the 2014-2015 year. It spent about \$1.1 million to enroll 415 4-year-olds. It is not included in the rankings because the program served fewer than 1% of 4-year-olds.

In 2011, the 82nd Texas legislature cut approximately \$300 million in Pre-K funding, including \$208 million from the *Pre-K Early Start Grant Program*. This reduction in Pre-K funding was part of the larger \$5.4 billion that was cut from the public education state budget.

In 2012-2013, CHILDREN AT RISK conducted a yearlong assessment to evaluate the impact of the \$5.4 billion budget cut on students and classrooms in Texas. In the yearlong assessment supported by the Meadows Foundation and TEGAC, CHILDREN AT RISK surveyed districts across the state, ultimately releasing the study's findings in a report titled *Doing More with Less?*

Public Education in a New Fiscal Reality. Through the study, CHILDREN AT RISK learned that districts in Texas had been forced to make one of two choices regarding their Pre-K programs: either reduce Pre-K access or reallocate limited funding to keep the Pre-K programs alive.

CHILDREN AT RISK surveyed 631 traditional independent school districts out of 1,013 (62% response rate). The 631 districts that responded accounted for approximately 73% of students enrolled in Texas' public education system. The demographics of school district survey respondents generally matched the overall demographics of school districts in the state.

Analysis of survey data and supplementary research yielded several key findings. Overall, local school districts wanted full-day Pre-K to better prepare students for success in elementary school, but adequate funding was a challenge:

1. 78% of responding districts offered some type of expanded Pre-K program using general operating funds.
2. 50% reported districts reported that they would prefer to allocate funding to expand their existing half-day programs to full-day programs.
3. 73% reported districts reported inadequate funding as a barrier to Pre-K expansion.

As seen in the graph below, cuts in the state Pre-K budget (\$300 million) were *partially* restored in 2015 when the 84th Texas Legislature passed House Bill 4 [HB4] (Smith, 2015). HB4 created the High Quality Pre-K Grant Program, which allocated \$118 million of additional funding to support high quality Pre-K programs in eligible school districts throughout Texas. Participating school districts received this additional funding in the current 2016-2017 school year.

Figure 6

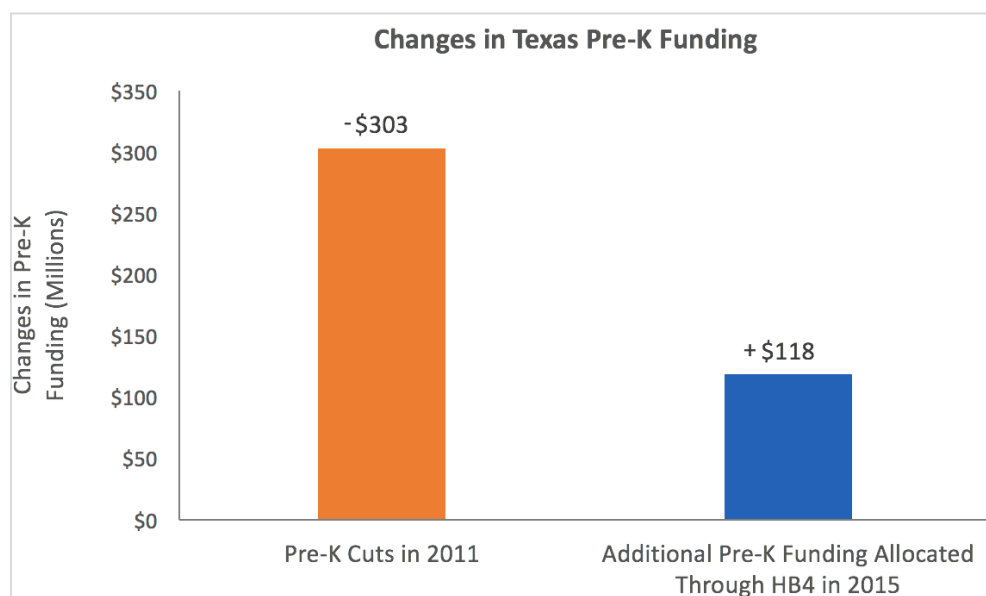


Figure 6. Changes in Texas Pre-K Funding from 2011 to 2015. Adapted from Smith, M. (2015, February 26). House takes the lead on Abbott's pre-k change. Retrieved November 30, 2016, from <https://www.texastribune.org/2015/02/26/huberty-prek/>

Texas Pre-K Quality

The National Institute for Early Education Research (NIEER) at Rutgers University ranks state Pre-K programs across the nation utilizing 10 research-based Pre-K quality benchmark standards. In 2014-2015, Texas' Pre-K program only met two of the 10 NIEER quality Pre-K benchmarks.

Table 4

Number of Quality Benchmarks Texas' Pre-K Program Met in 2014-2015

Policy / Quality Benchmark	Status
Early learning standards	Met
Teacher degree	Not Met
Teacher specialized training	Not Met
Assistant teacher degree	Not Met
Teacher in-service	Met
Minimum class size	Not Met
Staff-child ratio	Not Met
Screening/referral and support services	Not Met
Meals	Not Met
Monitoring	Not Met

Table 4. Adapted from Barnett, W. S., Friedman-Krauss, A. H., Gomez, R. E., Horowitz, M., Weisenfeld, G. G., Clark Brown, K., & Squires, J. H. (2016). The state of preschool 2015: State preschool yearbook. Retrieved from the National Institute for Early Education Research: http://nieer.org/wp-content/uploads/2016/05/Yearbook_2015_rev1.pdf.

Of course, these “inputs” alone do not create high-quality Pre-K. However, without them, Texas will likely continue to provide inconsistent access to a quality early education and not maximize the positive outcomes made possible by high quality Pre-K. Neighboring states with similar challenges have begun to address Pre-K quality. Lawmakers in Louisiana, Alabama, Mississippi, Oklahoma, and New Mexico recently legislated at least eight out of the 10 NIEER quality standards (Barnett et al., 2016).

Addressing Texas Pre-K Quality through House Bill 4

In 2015, the 84th Texas Legislature passed House Bill 4 (HB4), which created the High Quality Pre-K Grant Program that allocated \$118 million of additional funding for the 2016-2017 school year towards the expansion of Pre-K programs in eligible school districts. In order to qualify, school districts were required to meet Pre-K quality standards outlined by the Legislature in HB 4.

Under the High Quality Pre-K Grant Program, participating school districts could receive up to \$1,500 per student in additional Pre-K funding. However, given the large number of school

districts that both applied (600/1,200) and qualified for the additional Pre-K funding, the High Quality Pre-K Grant Program was only able to offer each district \$367 per student (Collier, 2016).

Because of the lower per student funding level, 21 of the districts that applied ultimately chose not to receive the extra funding. The additional \$367 per student was not sufficient to fully cover the costs of a quality pre-K program. Consequently, these 21 districts (mostly in rural areas), exited the program before it began. In an interview with the *Texas Tribune*, Mike Kelley – Superintendent of Springtown ISD, explained why his district chose to opt out of the High Quality Pre-K Grant Program:

“We had hoped to benefit from significantly more per-student funding through the grant...Upon receiving notification of award and reviewing the proposed allotment, it was determined that the resource allocations (human, fiscal, and physical) required to meet the enhanced standards and curricular requirements were too significant. ... We simply could not afford to implement the program” (Collier, 2016).

Eligible school districts that choose to implement the High Quality Pre-K Grant Program must meet the following requirements outlined in HB4:

Table 5

Requirements for Districts Implementing the High-Quality Pre-K Grant Program

Area	Description
Pre-K Services	Provide Pre-K to eligible students
Curriculum	Implement a high-quality Pre-K curriculum that includes all of the Pre-K guidelines established by the TEA
Progress Monitoring	Use an approved progress monitoring tool to measure the progress of students
Kindergarten Readiness	Use a kindergarten readiness assessment and report the results
Teacher Certification	Provide certified teachers that meet one additional qualification
Family Engagement	Implement and implement a family engagement plan
Data Reporting	Report the required Pre-K data into the PEIMS
Student Teacher Ratio	Attempt to maintain a teacher student ratio 11:1

Table 5. Adapted from Tex. H.B. 4, 84th Leg., R.S. (2015).

QUANTITATIVE FINDINGS

Background of the 2015 STAAR Reading Assessment

The STAAR English Reading assessment administered in 2015 consisted of 40 multiple choice questions. The raw scores from the assessment have corresponding “scale scores.” These scores standardize performance by adjusting for test difficulty and allowing for comparison across multiple tests. The 2015 assessment resulted in a scale score range of 765-1908.

Students taking the assessment placed in one of three levels of performance based on their raw score: Level I (Unsatisfactory), Level II (Satisfactory), and Level III (Advanced). In the 2015 STAAR English Reading assessment, students who answered 21 of 40 questions correctly (52.5%) met the Level II (Satisfactory) passing standard consisting of a scale score of 1337.

The STAAR Spanish Reading assessment administered in 2015 also consisted of 40 multiple choice questions. For the STAAR Spanish Reading assessment, the scale score range was 620-1990, and similar to the English version, there were three levels of performance students placed in based on their raw score: Level I (Unsatisfactory), Level II (Satisfactory), and Level III (Advanced). In the 2015 STAAR Spanish Reading assessment, students who answered 21 of 40 questions correctly (52.5%) met the Level II passing standard consisting of a scale score of 1318.

The TEA determines the minimum scale score a student needs to reach in order to be considered passing. The TEA increases the minimum scale score for passing every year with the goal of eventually increasing the minimum required scale score to 1468 in 2022. A scale score of 1468 for Level II performance will require students to answer 30 of 40 (75%) questions correctly (TEA, 2016b).

The following table outlines how the minimum scale score for passing will progressively increase each year from 2015-2022.

Table 6

English: 3rd Grade STAAR Reading Performance Standard

Year	STAAR Scale Score for Passing
2015	1331
2016	1345
2017	1365
2018	1386
2019	1406
2020	1427
2021	1447
2022	1468
Recommended Level III	1555

Table 6. Adapted from Texas Education Agency. (2016b). STAAR Performance Standards. Retrieved November 23, 2016, from <http://tea.texas.gov/student.assessment/staar/performance-standards/>

Segmentation of Student Groups

This study examined the relationship between public Pre-K attendance in the 2010-2011 school year and average 3rd grade reading scale scores in the 2014-2015 STAAR Reading assessment in English and Spanish. The sample consisted of 19,323 students across 509 schools encompassing

five major ISD's in Texas: Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD and San Antonio ISD.

This study controlled for socio-economic status; only students who were considered “economically disadvantaged” in the TEA Public Education Information Management System (PEIMS) system were included in the analysis. Students who are eligible for free or reduced-price meals under the National School Lunch and Child Nutrition Program are considered “economically disadvantaged” by the TEA (2011b).

The study segmented economically disadvantaged students into the following groups to observe the association between varying levels of 2010-2011 Pre-K participation and 2014-2015 3rd grade STAAR Reading outcomes:

1. **No Pre-K:** Students classified as “No Pre-K” were not found attending public Pre-K in one of the study’s school districts. These students could have been in informal child care, formal child care, Head Start, or another district Pre-K program outside the study group.
2. **Half-Day Pre-K:** Students classified as “Half-Day Pre-K” were found attending half-day Pre-K in the study’s school districts. Half-day Pre-K in the 2010-2011 school year consisted of approximately three hours of activities and instruction.
3. **Half-Day Pre-K and A or B School:** Students classified as “Half-Day and A or B School” were found attending half-day Pre-K in the study’s school districts. Half-day Pre-K in the 2010-2011 school year consisted of approximately three hours of activities and instruction. Additionally, these students took the 3rd grade STAAR Reading English or Spanish assessment in 2015 at a school with a CHILDREN AT RISK A or B school ranking. Schools with a CHILDREN AT RISK A or B school ranking are top performing schools in the state due to student growth and academic achievement in math and reading.
4. **Full-Day Pre-K:** Students classified as “Full-Day” were found attending full-day public Pre-K in the study’s school districts.
5. **Full-Day and A or B School:** Students classified as “Full-Day and A or B School” were found attending full-day public Pre-K in the study’s school districts. Additionally, these students took the 3rd grade STAAR Reading English or Spanish assessment in 2016 at a school with a 2016 CHILDREN AT RISK A or B school ranking. Schools with a CHILDREN AT RISK A or B school ranking are top performing schools in the state due to student growth and academic achievement in math and reading.
6. **Quality Pre-K:** Students classified as “Quality Pre-K” were found attending public Pre-K in one of the aforementioned independent school districts where the following quality controls were used: 2010-2011 full-day public Pre-K program offered at the district level, an average Kindergarten class size of 20 at the campus level (cutoff based on the

classroom size quality standard set by NIEER), and district Pre-K spending at or above the 2011-2012 State average (2010-2011 Pre-K spending data unavailable).

7. **Quality Pre-K and A or B School.** Students classified as “Quality Pre-K and A or B School” were found attending public Pre-K in one of the aforementioned ISD’s where the following quality controls were used: 2010-2011 full-day public Pre-K program offered at the district level, an average Kindergarten class size of 20 at the campus level (cutoff based on the classroom size quality standard set by NIEER), and district Pre-K spending at or above the 2011-2012 State average (2010-2011 Pre-K spending data unavailable). Additionally, these students also took the 3rd grade STAAR Reading English or Spanish assessment in 2015 at a school with a 2016 CHILDREN AT RISK A or B school ranking. Schools with a CHILDREN AT RISK A or B school ranking are top performing schools in the state due to student growth and academic achievement in math and reading.

Key Findings

Overall, this study finds that, on average, economically disadvantaged students who attended high-quality public Pre-K in 2010 scored higher on the 2015 3rd Grade STAAR Reading assessment than economically disadvantaged students who did not attend public Pre-K or those who attended lower quality public Pre-K.

1. Full-Day Pre-K Works:

For the overwhelmingly majority of economically disadvantaged students, the data suggests that students who attend full-day public Pre-K score higher on the 3rd grade STAAR Reading assessment than economically disadvantaged students who do not attend public Pre-K or attend half-day public Pre-K. For economically disadvantaged students, the odds of reading at a college-ready pace¹¹ are 40% higher if they attended full-day public Pre-K.¹²

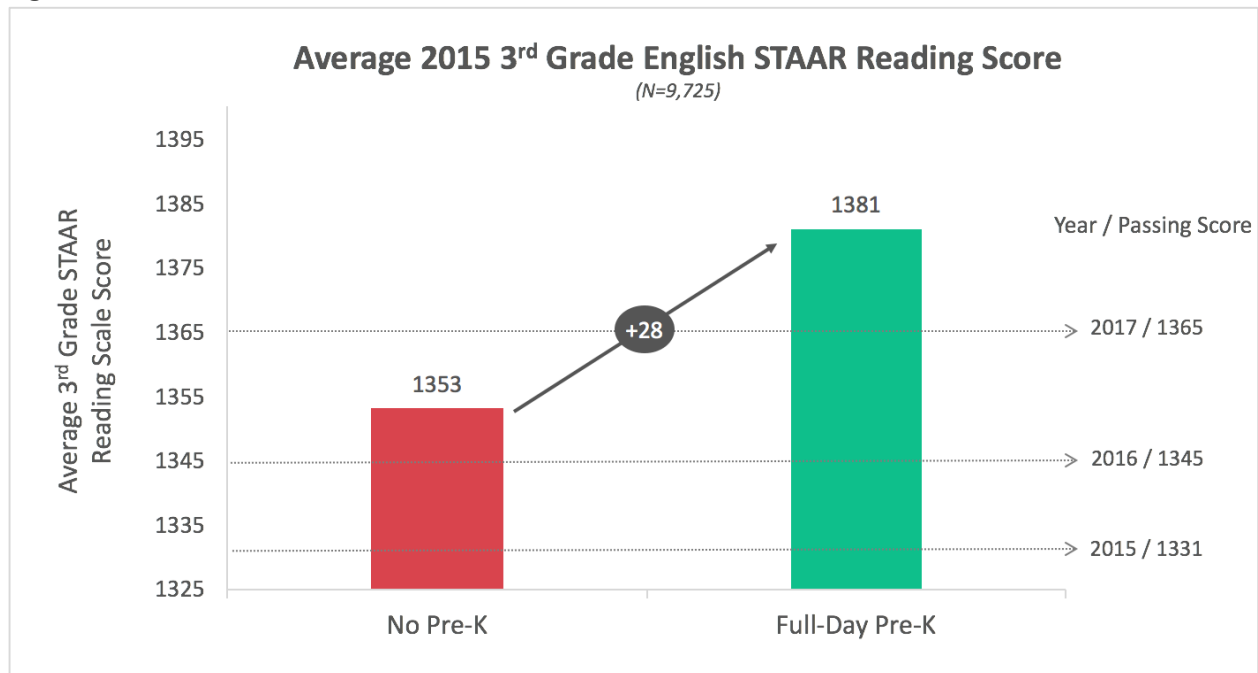
Figure 7

Figure 7. Adapted from Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>; Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/

On average, students who did not attend Pre-K scored marginally higher than the 2015 minimum score of 1331 required to be considered passing. While both groups of students reached this minimum 2015 passing scale score, on average, students who attended full-day Pre-K met and surpassed the more rigorous passing score of 1365. A score of 1365 is the 2017 score that students are required to meet in order to pass the assessment. Furthermore, for the students attending full-day Pre-K, their average scale score was closer to the more rigorous 2018 passing scale score of 1386. A scale score of 1386 is the 2018 scale score that students will be required to meet in order to pass the 3rd grade STAAR Reading assessment. In the third finding, there is in-depth analysis of how students who had both a high-quality Pre-K education and a high-quality Kindergarten-3rd grade education outperformed, especially in light of the progressively higher passing score students will be required to meet in the upcoming years.

Analysis of 19,323 economically disadvantaged students in over 500 elementary schools across Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD and San Antonio ISD also showed the following: For economically disadvantaged students, the odds of reading at a college-ready pace¹³ are 40% higher if they attended full-day public Pre-K.¹⁴

This particular analysis used a Pearson Chi-Square test to explore the likelihood that 2010-2011 Pre-K enrollment was not associated with passing the 2015 3rd Grade STAAR Reading assessment. This Chi-Square test found that it was highly unlikely that these two variables were not related. In other words, there was a significant association between full-day Pre-K for economically disadvantaged students and whether or not these students achieved the Level II

Final Recommended standard on the 2015 3rd Grade STAAR Reading assessment $\chi^2 (1) (60.54, p<.001)$.

This seems to represent the fact that, based on the odds ratio, the odds for low-income students achieving the 2015 STAAR Level II Final Recommended on the 3rd Grade Reading assessment were 1.38 (1.27, 1.49) times higher if they attended a full-day Pre-K in 2010-2011 than if they did not: economically disadvantaged students that attended public Pre-K in 2010-2011 had 40% higher odds of passing the 2015 STAAR Reading assessment than those that did not.

2. Investment in High Quality Pre-K Produces Results:

For districts that spent more per student on Pre-K than the 2014-2015 state average of \$3,327, there was a stronger positive relationship between Pre-K enrollment and 3rd grade STAAR Reading scores.

The scatter plot below shows the relationship between the percentage of students enrolled in Pre-K at a school district and their corresponding average 3rd grade STAAR Reading scale scores.

Figure 8

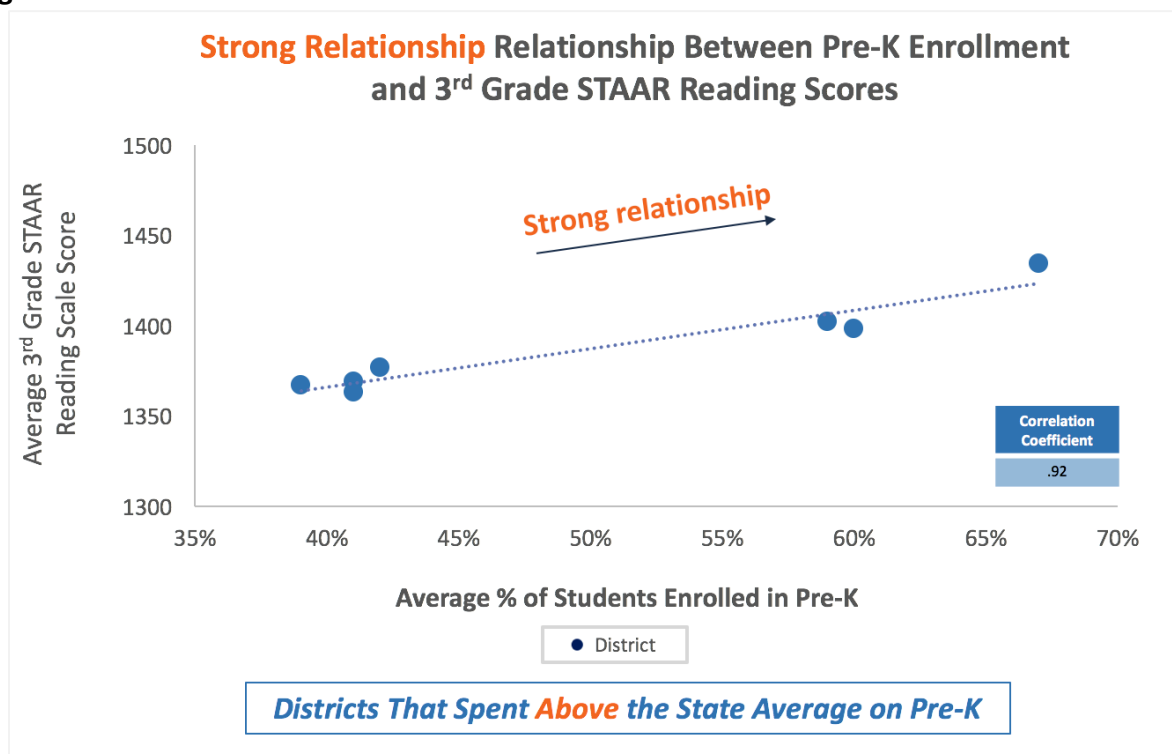


Figure 8. Adapted from Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>; Texas Education Agency (2016). STAAR Aggregate Data for 2014-2015 [Data file]. http://tea.texas.gov/Student_Testing_and_Accountability/Testing/State_of_Texas_Assessments_of_Academic_Readiness_%28STAAR%29/STAAR_Aggregate_Data_for_2014-2015/. Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/

This potentially suggests that Pre-K funding is a necessary component for creating quality Pre-K conditions that are associated with higher 3rd grade STAAR Reading outcomes.

Conversely, the graph below shows the relationship between the percentage of students enrolled in 2010-2011 Pre-K and 2014-2015 average 3rd grade STAAR Reading for districts that spent below the 2015-2016 state spending average of \$3,300 per student on Pre-K. The relationship between Pre-K attendance and 3rd grade STAAR Reading scores is weak for these districts.

Figure 9

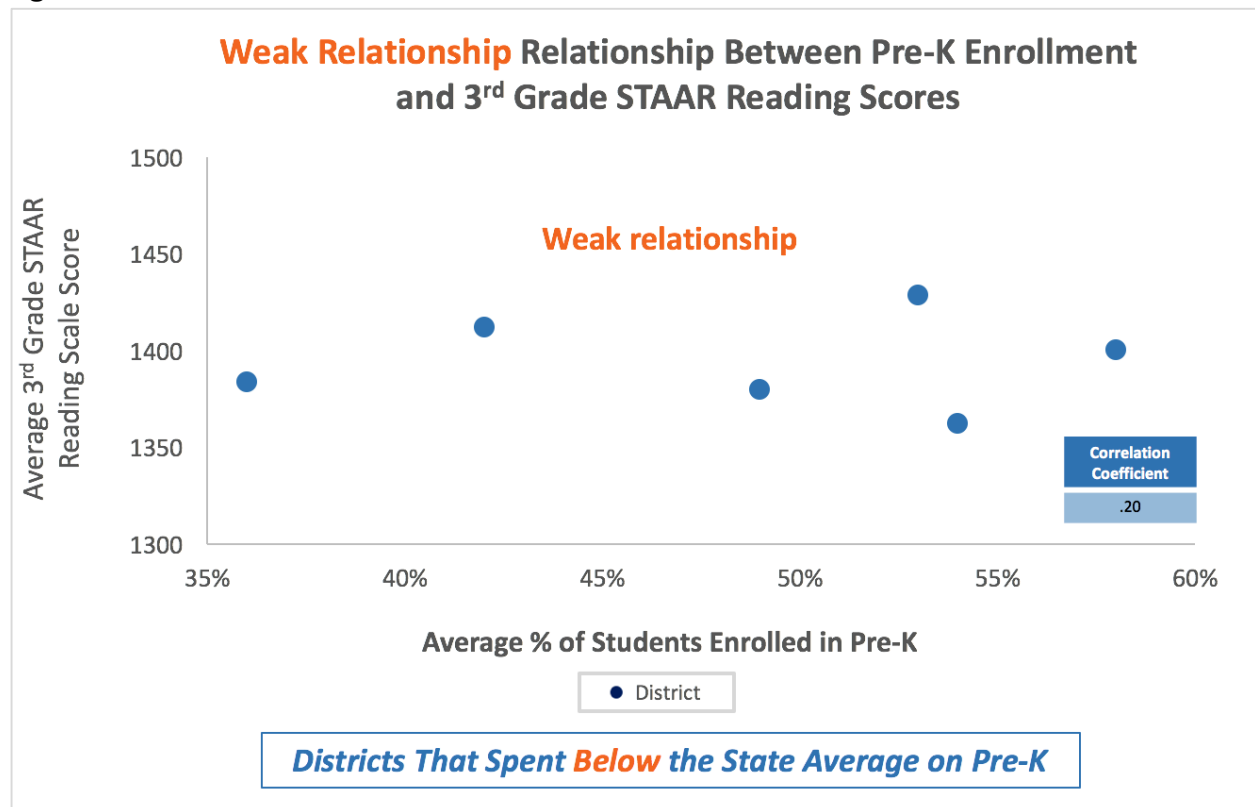


Figure 9. Adapted from Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>; Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/

3. Quality K-3 Matters:

For the overwhelmingly majority of economically disadvantaged students, the data suggests a quality Pre-K education and a quality Kindergarten-3rd grade education makes the biggest impact.

The graph below shows the average 3rd grade English STAAR scale score for three groups of students: “No Pre-K,” “Half-Day Pre-K and Quality K-3” and “Quality Pre-K and Quality K-3”:

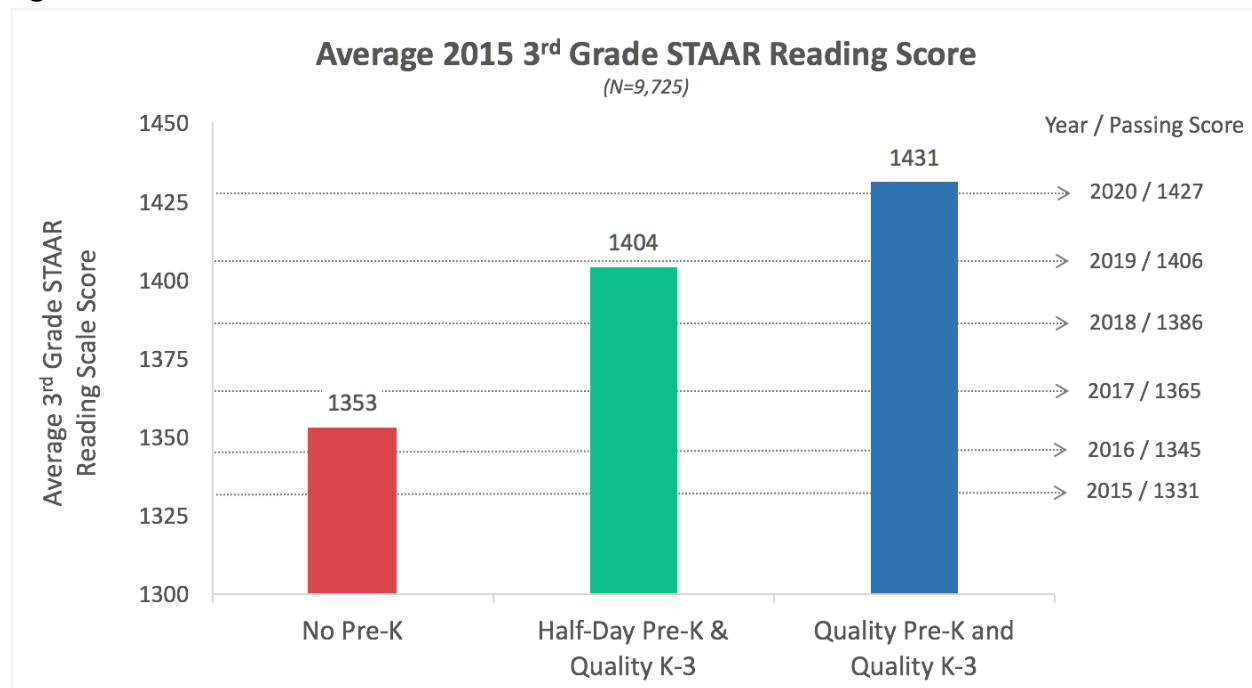
Figure 10

Figure 10. Adapted from CHILDREN AT RISK (2016). 2016 School Rankings [Data file]. Available from <http://www.childrenatrisk.org/>; Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/; Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>.

On average, economically disadvantaged students with some Pre-K (half-day or full-day) and a quality Kindergarten-3rd grade education scored significantly higher than students with No Pre-K at all.

On average, economically disadvantaged students with both half-day Pre-K and a quality Kindergarten-3rd grade education met and surpassed the minimum 2015, 2016, 2017, and 2018 passing scale scores.

Economically disadvantaged students that had both a quality Pre-K and a quality Kindergarten-3rd grade education had an average scale score of 1431, which exceeds the minimum passing scale score students will have to reach in 2019 and 2020, 1406 and 1427 respectively.

This data suggests economically disadvantaged students benefit the most from both quality Pre-K and a quality Kindergarten-3rd grade experience, highlighting the critical importance of a quality educational experience from Pre-K through 3rd grade.

Graham Elementary, a Gold Ribbon School

To broaden our understanding of the ways in which both a high-quality Pre-K and a high-quality Kindergarten-3rd grade education makes a difference, we looked at Graham Elementary School in Austin ISD, which is a gold ribbon school. Gold Ribbon is a performance indicator designed by CHILDREN AT RISK to signify schools that are high performing and high poverty. To obtain Gold Ribbon status a school must be more than 75% economically disadvantaged and must receive an CHILDREN AT RISK A or B school ranking. Schools with a CHILDREN AT RISK A or B school ranking are top performing schools in the state due to student growth and academic achievement in math and reading.

The graph below shows the average scale scores for economically disadvantaged 3rd graders at Graham Elementary by Pre-K Program type.

Figure 11

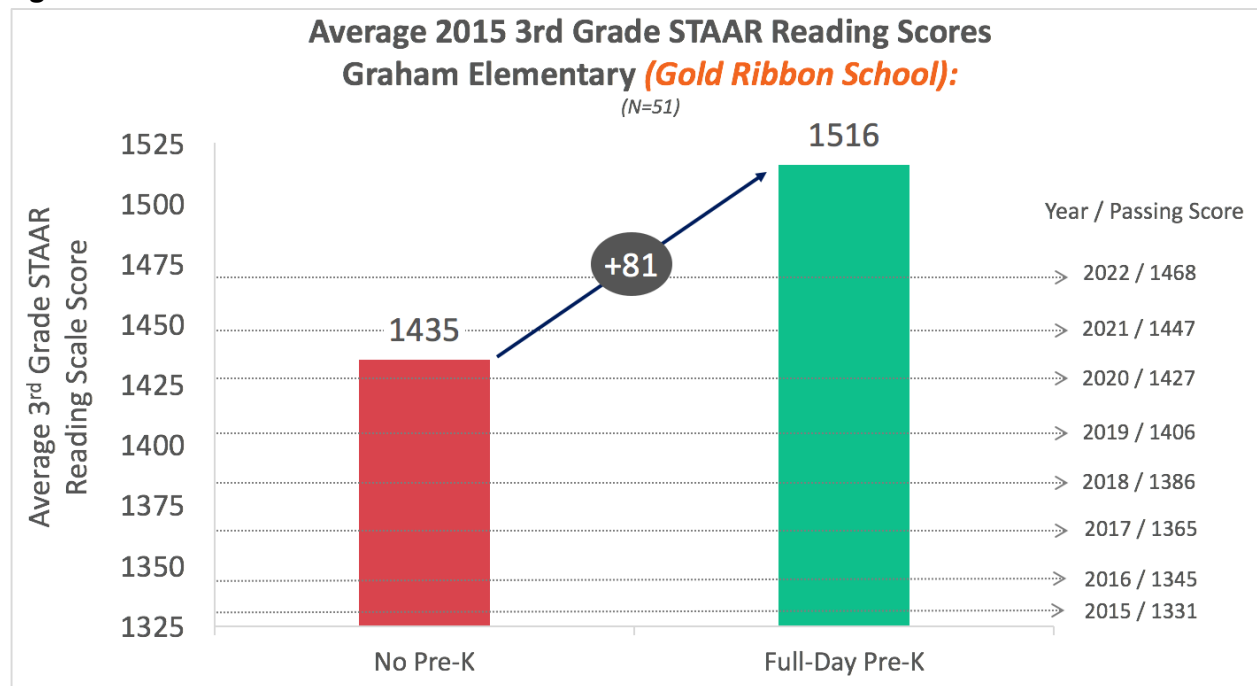


Figure 11. Adapted from Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/; Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>

On average, economically disadvantaged students who had both full-day Pre-K and a quality Kindergarten-3rd grade education scored significantly higher than students with No Pre-K at all.

Economically disadvantaged students that had both full-day Pre-K and a quality Kindergarten-3rd grade education at Graham Elementary had an average scale score of 1516, which exceeds the minimum passing scale score students will have to reach in every year from 2015 through

2022. A 3rd grade student with a scale score of 1516 needs to answer at least 80% of the questions correctly on the English 3rd grade STAAR Reading assessment, making that scale score particularly rigorous.

The example at Graham Elementary further highlights how critically important it is to provide economically disadvantaged students with both quality Pre-K and a quality Kindergarten-3rd grade experience.

Average STAAR English Reading Performance by Race/Ethnicity

In order to better understand the effect of Pre-K, we looked at the association between 2010-2011 quality Pre-K and 2014-2015 3rd grade STAAR English Reading scores by race/ethnicity.

Figure 12

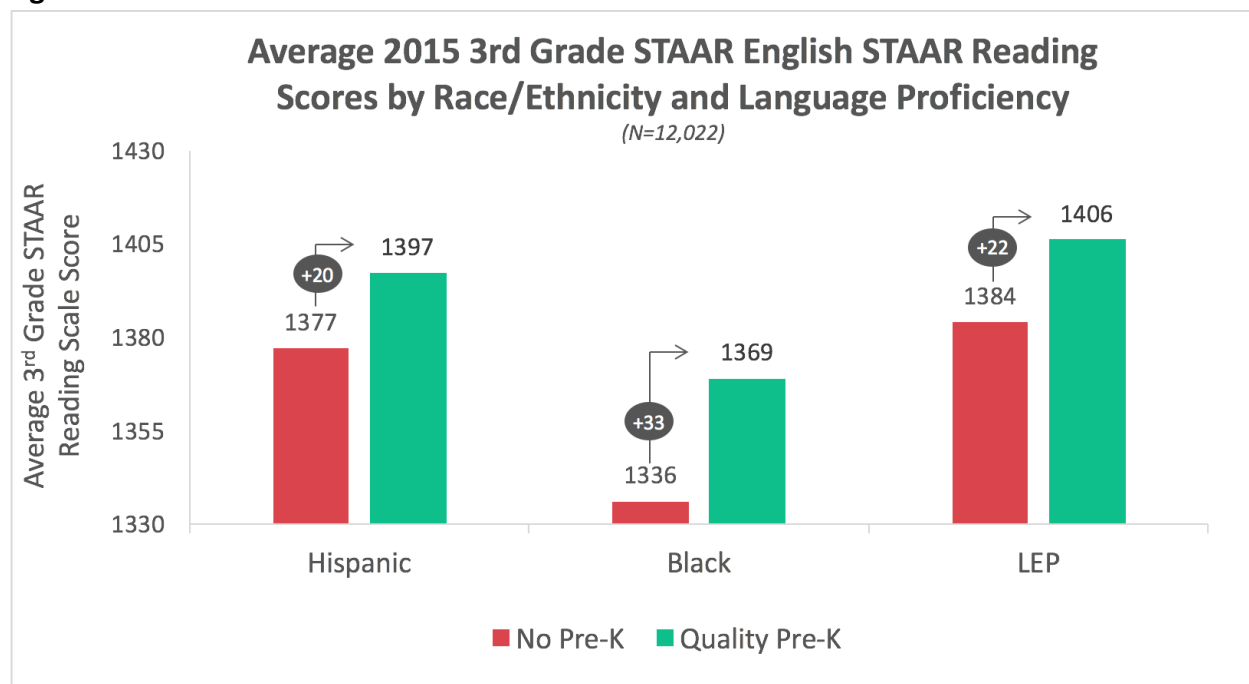


Figure 12. Adapted from Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>; Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/

Economically disadvantaged Hispanic, black, and students with limited English proficiency (LEP) who had a quality Pre-K experience in 2010-2011 outperformed other similar economically disadvantaged students with no Pre-K at all on the 2014-2015 3rd grade STAAR English Reading assessment. This difference was most notable for black students. Black students with quality Pre-K outperformed black students with no Pre-K by 33 points.

QUALITATIVE FINDINGS

Impact of Pre-K at Gold Ribbon Schools (High Poverty, High Performing)

To broaden our understanding even further of the ways in which Pre-K does or does not make a noticeable difference in Texas elementary schools, we conducted a set of in-depth, semi-structured interviews with principals of Gold Ribbon schools.

The chart below provides an overview of the schools in the study's sample. In addition to the Gold Ribbon indicators, we have included other fields to provide background information regarding the sample. Growth Index captures improvement over time in standardized test scores; Performance Index captures performance on the Student Achievement indicators using values adjusted for the percentage of economically disadvantaged students at each campus and; Achievement Index reflects raw performance in key academic areas determined by STAAR exam scores.

Table 7

Academic Performance of Gold Ribbon Schools in Texas

Elementary School	School District	% Economically Disadvantaged	State Rank	Grade Rank	Growth Index	Performance Index	Achievement Index
De Chaumes	Houston ISD	95%	282 of 4188	A+	82.9	99.8	87.3
Graham	Austin ISD	88%	304 of 4188	A+	88.5	99.4	84.6
Runyan	Conroe ISD	80%	409 of 4188	A	82.4	98.4	82
Walnut Hill	Dallas ISD	81%	696 of 4188	A	54.3	97.5	79
White	Houston ISD	84%	591 of 4188	A	85.5	96.4	73.4

Table 7. Adapted from CHILDREN AT RISK (2016). 2016 Elementary School Rankings [Data file]. Available from <http://www.childrenatrisk.org/>

The sample was comprised of five high performing, economically disadvantaged schools in Texas. These schools were chosen based on the following criteria: the schools were previously measured through CHILDREN AT RISK's annual school rankings; during the rankings process they were honored as Gold Ribbon schools and; they offer developed Pre-K programs. The purpose of this study was to discover prevalent patterns regarding the role of Pre-K in schools, as well as support our existing quantitative findings that Pre-K is a key component to academic success.

Four main research questions guided the study: (1) What can you tell us about the students at your school that do or do not attend Pre-K; is there any noticeable difference? (2) In your opinion, is there a relationship between attending Pre-K and Kindergarten readiness? (3) Are there any best practices at the Pre-K or K-3 level that you believe contributed to your school's Gold Ribbon status? (4) How do you engage the families of students who attend Pre-K?

Across these schools we found several trends. Three main themes consistently cut across the data and captured the impact of Pre-K on elementary schools and students in Texas: students

who attend Pre-K are better prepared for Kindergarten; students who attend Pre-K are more advanced across reading measures and; students who attend Pre-K are well-adjusted to classroom environment.

Pre-K Children Are Better Prepared for Kindergarten

As a whole, the principals reported that the Pre-K programs at their schools have significant impact on their students' Kindergarten readiness levels. Students who attend Pre-K are more independent and more likely to be comfortable in the school setting away from their parents. These students have a greater understanding of what school is and what is expected of them, and are more likely to understand healthy social behavior in relation to teachers and other students. In contrast, the students who do not attend Pre-K experience noticeable deficits academically, socially, and environmentally upon entering Kindergarten.

Pre-K Children Are More Advanced Across Multiple Reading Measures

The principals also noted significant and valuable differences in cognitive levels of students who attend Pre-K and those who do not. Students who attend Pre-K in their schools are more likely to be placed in advanced reading groups upon entering Kindergarten and throughout their elementary years. These students are also more likely to recognize high frequency words and sounds, and have overall higher language and comprehension skills.

Pre-K Children Are Well-Adjusted to the Classroom Environment

All five principals in the study's sample reported that students who attend Pre-K are more likely to adjust to classroom structure and environment. The students in their schools who attend Pre-K have a greater understanding of appropriate behavior, school routine, and interactions with authority. Moreover, the students who attend Pre-K are more likely to partner with other students and engage with their peers.

In addition, the study revealed three consistent best practices used by the five principals in their schools: vertical alignment of curriculum, collaboration amongst staff, and parent engagement.

Vertical Alignment of Curriculum Starting in Pre-K is Key

The principals reported that vertical alignment of curriculum starting in Pre-K has been a key component to school success. The idea is that through a heightened emphasis on forward planning and intentional curriculum development students experience higher levels of cognitive gains.

Collaboration Amongst Staff Leads to Overall Higher Educational Outcomes

The findings from the interviews revealed that success is greater when teachers engage in group learning and collaboration to determine best practices and strategies in the classroom. The principals noted that consistent communication of goals amongst staff, as well as a staff-wide commitment to excellence and teamwork ensures higher educational outcomes for students at all grade levels.

Parent Engagement is a Critical Component of a Quality Pre-K Program

The principals discussed with us the various ways in which they engage the parents and families of students who attend Pre-K at their schools. The central theme was that, overall, parents want to be involved in their child's education and want to know how to best contribute to academic success. Although the specificities of involvement vary, schools with developed Pre-K programs host regular parent workshops, community events, or training opportunities.

Three conclusions can be drawn from the results of this qualitative study: overall, there is a difference in the academic rigor and development of kids who attend Pre-K; enthusiastic teachers with a structured curriculum and interest in planning across grade levels is highly efficient and; collaboration at a staff level and a parent level are necessary for academic success, particularly for students enrolled in Pre-K.

In addition to consistent and saturated findings, we can suggest that this study has high external validity. As shown in the above table, the schools in the sample were chosen from varying districts across the state. Therefore, we can predict that the study's results are generalizable and applicable for other high performing, economically disadvantaged schools.

Conclusion

The three key findings from this 2016 CHILDREN AT RISK policy analysis – *Full-Day Pre-K Works*, *Investment in Higher Quality Pre-K Produces Results*, *Quality K-3 Matters* – are corroborated across our data, literature review, and interviews with principals throughout Texas.

Most importantly, these outcomes are consistent with findings from other studies, including a recent study from Duke University that tracked over a million students over 11 years. Our current analysis of quality Pre-K in Texas finds similar trends: High quality Pre-K (with adequate levels of funding) is associated with sustained gains in 3rd grade reading as measured by the Texas STAAR assessment. Furthermore, the environment students are in following Pre-K has an impact on their educational experience; both a quality Pre-K experience and a quality Kindergarten through 3rd grade experience makes the biggest difference for economically disadvantaged children.

Finally, when discussing what makes the biggest difference at Gold Ribbon schools, principals stressed the same quality components that Pre-K literature discusses: direct and quality instruction, vertical alignment of curriculum starting in Pre-K, collaboration amongst staff, and consistent parent engagement.

Over the past 50 years, studies on Pre-K education have moved from sample sizes of 123 (Schweinhart et.al, 2005) to current sample sizes of over one million (Dodge et.al, 2016). These numerous studies – different in size and scope – have demonstrated that high-quality Pre-K instruction is associated with positive and sustained outcomes for students if the Pre-K intervention is high-quality and if there is enough saturation. Equally as important, these studies have shown high-quality Pre-K is not a silver bullet. However, quality Pre-K appears to

be associated with high societal benefits when executed intentionally and within the quality education spectrum starting in Pre-K and through 3rd grade.

Policy Recommendations

The research makes it apparent that in order to maintain a strong workforce, the State of Texas needs to move towards ensuring all low-income children have access to full-day quality Pre-K. The following policy recommendations will move Texas in that direction:

1. Sustain the high-quality Pre-K Grant at \$236 million for the biennium.
2. Create sustainable funding for high-quality Pre-K through formula funding.
3. Limit Pre-K classrooms to a maximum of 22 students, allowing no more than 11 students for each teacher or aide in Pre-K classes with more than 15 students.
4. Create an Early Childhood through 3rd Grade teaching certificate to provide an option for teachers to gain in-depth expertise in early elementary grades.

Given the research showing a quality early childhood education is critical to long-term success, CHILDREN AT RISK also recommends the following policy changes that would strengthen the quality of educational services children under the age of five receive:

5. Increase inter-agency coordination of child care and Pre-K data systems through the Early Childhood Database System to improve outcomes for children and maximize efficiency of taxpayer dollars.
6. Increase local coordination of early education programs by supporting public/private partnerships between school districts and high-quality child care centers.

Appendix

Table A1*3rd Grade STAAR Average Scale Scores No Pre-K vs. Quality Pre-K*

No Pre-K vs. Quality Pre-K				
Hispanic				
	English		Spanish	
	Average Score	Sample Size	Average Score	Sample Size
No Pre-K	1377	4,848	1363	7,974
Quality Pre-K	1397	940	1376	976
<i>t</i> =	4.79		2.8	
<i>df</i> =	1330		1232	
<i>p-value</i> =	1.81		0	

Black				
	English		Spanish	
	Average Score	Sample Size	Average Score	Sample Size
No Pre-K	1336	4,248		
Quality Pre-K	1369	248		
<i>t</i> =	4.05			
<i>df</i> =	273			
<i>p-value</i> =	6.46			

LEP				
	English		Spanish	
	Average Score	Sample Size	Average Score	Sample Size
No Pre-K	1384	1,384	1363	7,972
Quality Pre-K	1406	354	1376	975
<i>t</i> =	3.18		2.81	
<i>df</i> =	562		1230	
<i>p-value</i> =	0		0	

Tables A1. Adapted from Texas Education Agency (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/; Texas Education Agency (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>; Texas Education Agency (2011). 2010-2011 Download of AEIS [Data file]. Available from <https://rptsrv1.tea.texas.gov/perfreport/aeis/2011/xplore/DownloadSelData.html>; CHILDREN AT RISK (2016). 2016 Elementary School Rankings [Data file]. Available from <http://www.childrenatrisk.org/>.

References

- Andrews, R. J., Jargowsky, P., & Kuhne, K. (2012). The effects of Texas' targeted pre-kindergarten program on academic performance (No. w18598). National Bureau of Economic Research.
- Ansari, A., & Winsler, A. (2013). Stability and sequence of center-based and family childcare: Links with low-income children's school readiness. *Children and Youth Services Review*, 35(2), 358-366.
- Aud, S., Fox, M. A., & Kewal Ramani, A. (2010). Status and trends in the education of racial and ethnic groups. NCES 2010-015. *National Center for Education Statistics*.
- Barnett, W. S. (2011). Effectiveness of early educational intervention. *Science*, 333(6045), 975-978.
- Barnett, W. S., Friedman-Krauss, A. H., Gomez, R. E., Horowitz, M., Weisenfeld, G. G., Clark Brown, K., & Squires, J. H. (2016). *The state of preschool 2015: State preschool yearbook*. Retrieved from the National Institute for Early Education Research: http://nieer.org/wp-content/uploads/2016/05/Yearbook_2015_rev1.pdf
- Bassok, D., Fitzpatrick, M., Greenberg, E., & Loeb, S. (2016). Within-and between-sector quality differences in early childhood education and care. *Child Development*.
- Campbell, F. A., Pungello, E. P., Burchinal, M., Kainz, K., Pan, Y., Wasik, B. H., ... & Ramey, C. T. (2012). Adult outcomes as a function of an early childhood educational program: an Abecedarian Project follow-up. *Developmental Psychology*, 48(4), 1033.
- Campbell, F., Conti, G., Heckman, J. J., Moon, S. H., Pinto, R., Pungello, E., & Pan, Y. (2014). Early childhood investments substantially boost adult health. *Science*, 343(6178), 1478-1485.
- Center on the Developing Child (2009). *Five Numbers to Remember About Early Childhood Development* (Brief). Retrieved November 21, 2016, from www.developingchild.harvard.edu.
- CHILDREN AT RISK (2016). 2016 School Rankings [Data file]. Available from <http://www.childrenatrisk.org/>
- Collier, K. (2016, July 14). Some schools rejecting pared down state pre-k grants. Retrieved November 23, 2016, from <https://www.texastribune.org/2016/07/14/some-schools-turning-down-state-pre-k-grants/>

- Dodge, K. A., Bai, Y., Ladd, H. F., & Muschkin, C. G. (2016, November 16). Impact of North Carolina's early childhood programs and policies on educational outcomes in elementary school[CT1] . *Child Development*. doi:10.1111/cdev.12645
- Dowsett, C. J., Huston, A. C., Imes, A. E., & Gennetian, L. (2008). Structural and process features in three types of child care for children from high and low income families. *Early Childhood Research Quarterly*, 23(1), 69-93.
- Duncan, G. J., Magnuson, K., & Votruba-Drzal, E. (2014). Boosting family income to promote child development. *The Future of Children*, 24(1), 99-120.
- Friedman-Krauss, A., Barnett, W. S., & Nores, M. (2016). How much can high-quality universal pre-k reduce achievement gaps? *Washington: Center for American Progress*.
- Gormley Jr, W. T., Phillips, D., Adelstein, S., & Shaw, C. (2010). Head Start's comparative advantage: Myth or reality?. *Policy Studies Journal*, 38(3), 397-418.
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., & Yavitz, A. (2010). The rate of return to the High Scope Perry Preschool Program. *Journal of Public Economics*, 94(1), 114-128.
- Huston, A., Gupta, A., & Schexnayder, D. (2012). Study of early education in Texas: The relationship of pre-k attendance to 3rd grade test results.
- Jiang, Y., Ekono, M., & Skinner, C. (2016). Basic facts about low-income children: Children under 18 Years, 2014. Fact Sheet. *National Center for Children in Poverty*.
- Lipsey, M., Farran, D., & Hofer, K. (2016). *Effects of a State Prekindergarten Program on Children's Achievement and Behavior through Third Grade*. Nashville, TN: Peabody Research Institute.
- Magnuson, K. A., Ruhm, C., & Waldfogel, J. (2007). Does prekindergarten improve school preparation and performance? *Economics of Education review*, 26(1), 33-51.
- Nores, M., & Barnett, W. S. (2014). Access to high quality early care and education: Readiness and opportunity gaps in America. *National Institute for Early Education and Center on Enhancing Early Learning Policy report*. New Brunswick, NJ: Center on Enhancing Early Learning Outcomes. Accessed February, 13, 2015.
- Ramey, C. T. (1974). The Carolina Abecedarian Project: A longitudinal and multidisciplinary approach to the prevention of developmental retardation.
- Schweinhart, L.J., Montie, J., Xiang, Z., Barnett, S.W., Belfied, C.R., & Nores, M. (2005). The High/Scope Perry Preschool Study Through Age 40:Summary, Conclusions, and Frequently Asked Questions. Ypsilanti, MI: High/Scope Press.

Smith, M. (2015, February 26). House takes the lead on Abbott's pre-k charge. Retrieved November 30, 2016, from <https://www.texastribune.org/2015/02/26/huberty-prek/>

Tex. H.B. 4, 84th Leg., R.S. (2015).

Texas Education Agency (2011a). 2010-2011 Download of AEIS [Data file]. Available from <https://rptsvr1.tea.texas.gov/perfreport/aeis/2011/xplore/DownloadSelData.html>.

Texas Education Agency. (2011b). Glossary of terms: 2010-11. Retrieved November 23, 2016, from <https://rptsvr1.tea.texas.gov/acctres/gloss1011.html>

Texas Education Agency. (2011-2015). PEIMS Public Information Request [Data file]. Available from http://tea.texas.gov/Reports_and_Data/Student_Data/Standard_Reports/PEIMS_Standard_Reports_Overview/

Texas Public Education Information Resource (2011-2015). Texas Education Reports [Data file]. Available from <http://www.texaseducationinfo.org/>

Texas Education Agency. (2014). Frequently Asked Questions About Prekindergarten. Retrieved November 30, 2016, from tea.texas.gov/ece/faq/full.aspx

Texas Education Agency. (2015). Student Assessment Public Information Request [Data file]. Available from <http://tea.texas.gov/student.assessment/>

Texas Education Agency. (2016a). STAAR Aggregate Data for 2014-2015 [Data file]. http://tea.texas.gov/Student_Testing_and_Accountability/Testing/State_of_Texas_Assessments_of_Academic_Readiness_%28STAAR%29/STAAR_Aggregate_Data_for_2014-2015/

Texas Education Agency. (2016b). STAAR Performance Standards. Retrieved November 23, 2016, from <http://tea.texas.gov/student.assessment/staar/performance-standards/>

Texas Education Agency. (2016c). Texas public prekindergarten programs and enrollment ages 3 and 4. Retrieved November 16, 2016, from www.texaseducationinfo.org/ViewReport.aspx

Zhai, F., Waldfogel, J., & Brooks-Gunn, J. (2013). Head Start, prekindergarten, and academic school readiness: A comparison among regions in the United States. *Journal of social service research*, 39(3), 345-364.

ENDNOTES

¹ Public Pre-K is defined as a half-day or full-day program offered by an independent school district in Texas. Students classified as “No Pre-K” were not found attending public Pre-K in Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD, or San Antonio ISD. These students could have been in informal child care, formal child care, Head Start, or another district Pre-K program outside the study group.

² CHILDREN AT RISK analyzed 47,608 students across 17 school districts (see subsequent endnote for participating school districts). Across these 17 school districts, anonymized student level Pre-K enrollment data from the Texas Education Agency was used to estimate the average percentage of students enrolling in Pre-K at each campus and district. This information was used in conjunction with district financial reports from the TPEIR to observe the relationship between the average percentage of students attending Pre-K and average scale scores for districts spending above and below the state average in public Pre-K. Of the 47,608 students, we were able to match student-level anonymized Spring 2015 STAAR Reading scores with 2010-2011 public Pre-K enrollment data for approximately 20,000 students.

³ Twelve additional school districts included: Alief ISD, Arlington ISD, Brownsville ISD, Edinburg CISD, Grand Prairie ISD, Irving ISD, Manor ISD, Mesquite ISD, Pasadena ISD, Pflugerville ISD, Pharr-San Juan Alamo ISD, South San Antonio ISD. These districts were selected due to their proximity to the five major urban school districts the Texas Education Agency provided anonymized student level data for.

⁴ The following controls were used to define high-quality public Pre-K: 2010-2011 full-day ISD Pre-K program offered at the district level, an average Kindergarten class size of 20 at the campus level (cutoff based on the quality classroom size standard set by the National Institute for Early Education Research), and district spending at or above the 2011-2012 state average of \$2,469 per-student (2010-2011 spending data unavailable). Students classified as “No Pre-K” were not found attending Pre-K at Austin ISD, Dallas ISD, Fort Worth ISD, Houston ISD, or San Antonio ISD. These students could have been in informal child care, formal child care, Head Start, or another district Pre-K program outside the study group. “Lower quality Pre-K” is defined as half-day public Pre-K program offered district-wide.

⁵ “At a college-ready pace” defined as students reaching the 2015 STAAR Reading Level II Final recommended metric.

⁶ Methodology: There was a significant association between full-day Pre-K for economically disadvantaged students and whether or not low income students achieved the final recommended level for their 3rd grade STAAR Reading scores χ^2 (1) (60.54, $p < .001$). This seems to represent the fact that, based on the odds ratio, the odds for low income students achieving STAAR level II recommended were 1.38 (1.27, 1.49) times higher if they attended a full-day public Pre-K program than if they did not.

⁷ Only schools with greater than 75% economically disadvantaged students are included in this district analysis. “Current state average” defined as the average Texas General Fund 2014-2015 Pre-K program spending per student information from TPEIR.

⁸ The following controls were used to define high-quality public Pre-K: 2010-2011 full-day ISD Pre-K program offered at the district level, an average Kindergarten class size of 20 at the campus level (cutoff based on the quality classroom size standard set by the National Institute for Early Education Research), and district spending at or above the 2011-2012 state average of \$2,469 per-student (2010-2011 spending data unavailable). “Quality Kindergarten through 3rd Grade education” includes only schools with a CHILDREN AT RISK A or B school ranking. Schools with an A or B ranking are top performing schools in the state due to student growth and academic achievement in math and reading.

⁹ This requirement can be waived if the creation of Pre-K requires building new facilities.

¹⁰ \$3,600 figure from the NIEER State of Preschool 2015 Report.

¹¹ “At a college-ready pace” defined as students reaching the 2015 STAAR Reading Level II Final recommended metric.

¹² Methodology: There was a significant association between full-day Pre-k for economically disadvantaged students and whether or not low income students achieved the final recommended level for their 3rd grade STAAR Reading scores χ^2 (1) (60.54, $p < .001$). This seems to represent the fact that, based on the odds ratio, the odds for low income students achieving

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¹³ “At a college-ready pace” defined as students reaching the 2015 STAAR Reading Level II Final recommended metric.

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