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# Prekindergarten Outcomes for Texas Public School Students



Texas Education Agency

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## Overview

The state of Texas began providing formula funding for eligible students to attend half-day prekindergarten programs in 1985. Students enrolled in one of the early cohorts of prekindergarten classes in the 1999-2000 school year would be 21 in the fall of 2016. In an attempt to examine the state's long-term investment in prekindergarten, the agency analyzed three different cohorts of prekindergarten participants to assess immediate, short-term, and long-term academic outcomes, including:

- Prekindergartners in 1999-2000, examining outcomes through 2014-2015 with a specific focus on high school completion and college persistence to-date
- Prekindergartners in 2010-2011, examining outcomes through 2014-2015 with a specific focus on academic achievement indicators up to the Grade 3 State of Texas Assessments of Academic Readiness (STAAR)
- Prekindergartners in 2014-2015, examining outcomes through 2015-2016 with a specific focus on kindergarten readiness

## Key Findings

Overall, there are small but statistically significant differences in short- and long-term outcomes between eligible students who attended public prekindergarten and eligible students who did not. These include:

- Long-Term Outcomes:
  - Prekindergarten attendance was associated with a 2-percentage point lower likelihood of dropping out of school (7% vs. 9%)
  - Prekindergarten attendance was associated with a 6-percentage point higher likelihood of graduating high school on time (72% vs. 66%)
  - Prekindergarten attendance was associated with a 7-percentage point higher likelihood of enrolling in college (38% vs. 31%)
  - Prekindergarten attendance was associated with a 6-percentage point higher likelihood for students who enrolled in college to persist in attending a second year of college (28% vs. 22%)
- Short-Term Outcomes:
  - Prekindergarten attendance was associated with a 3-percentage point lower likelihood of requiring accelerated instruction for reading in first grade (44% vs. 47%); however, by second grade, both groups were just as likely to need accelerated instruction in reading (47% vs. 47%)
  - Prekindergarten attendance was associated with a negligible, but statistically significant, difference in Grade 3 STAAR Reading performance when controlling for school environment (1.4 point scale score difference), but no different in passing rates
- Immediate Outcomes:
  - Prekindergarten attendance was associated with a 16-percentage point higher likelihood of demonstrating the knowledge and skills to be considered ready for kindergarten upon initial kindergarten enrollment (58% vs. 42%)

Evidence from this analysis shows that attending prekindergarten builds a strong foundation for beginning kindergarten. Also, attending prekindergarten may have longer term impacts on students in ways not reflected on academic achievement assessments but which are reflected in broader achievements like high school graduation. However, as evidenced by our analysis, additional educational supports in kindergarten and beyond are likely needed to help students continue to demonstrate achievement on academic assessments that build on the preparation that prekindergarten provides.

Also, this analysis should be reviewed with a significant caveat. A randomized control trial design was not used in this study to examine the effect of attending prekindergarten on academic outcomes; however, multiple cohorts of students who were eligible for prekindergarten who either attended or did not attend public prekindergarten were compared. These students are alike in broad demographic terms (including being eligible for a free/reduced-price lunch or being identified as English language learners), allowing for some controls in the analysis. But the cohorts could be different in unidentified ways, including parental characteristics. This provides a basis to draw inferences from the correlations, but cannot be interpreted to be causal under this research design.

Additionally, no attempt was made to differentiate underlying prekindergarten practice in this study. Some prekindergarten classrooms operate on a full day, some on a half. They have varying class sizes and adult-to-child ratios. They are staffed with teachers and assistants with varying levels of training. However, the data required to differentiate these factors does not exist in much of the sample analyzed, so the only conclusions that can be drawn are about the overall prekindergarten program, regardless of how it was implemented. Additional analysis focused on those underlying factors may find differing levels of impact.

## Background

Research suggests prekindergarten is consistently associated with small but meaningful cognitive gains for children over time and is one of many factors associated with ensuring children's academic success (Camilli, Vargas, Ryan, & Barnett, 2010). Researchers are continuing to explore how long-lasting and far-reaching the benefits of prekindergarten are, what factors influence the magnitude of prekindergarten effects, and the underlying mechanisms that explain why prekindergarten matters (see e.g., Dodge, Bai, Ladd, & Muschkin, 2016; Yoshikawa et al., 2013). For example, there is evidence that the benefits of prekindergarten can diminish over time, but there is also evidence that prekindergarten can have long-term effects, even lasting into adulthood (Schweinhart et al., 2005). The goal of this investigation was to examine short- and long-term academic outcomes of Texas public school (TPS) students who were eligible for free, public prekindergarten and whether there were differences across these outcomes as a function of prekindergarten attendance.

## Method

In order to examine student outcomes over time, three cohorts of students who were eligible to attend prekindergarten in TPS were tracked. The longest cohort followed students from 1999-00 to 2014-15. Outcomes for this cohort included Grade 3 and Grade 7 Texas Assessment of Knowledge and Skills (TAKS) performance, the likelihood of graduating or dropping out of high school, and college enrollment and persistence. In order to investigate recently available data that is also more proximal to prekindergarten attendance, a second group of students was tracked from 2010-11 to 2014-15. Outcomes for this cohort included Grades 1 and 2 Early Reading Indicator (ERI) scores and Grade 3 STAAR scores. Finally, in order to examine recently collected kindergarten readiness data, a third group of students was tracked from 2014-15 to 2015-16. Data from the three cohorts were analyzed separately. Results were compared using descriptive statistics, and statistical models were used to estimate the statistical significance of differences in the performance of students who were eligible for and attended prekindergarten in TPS and their non-attending peers. It should be noted that there were a number of methodological limitations to this study; therefore, the following results should be interpreted with these limitations in mind:

1. All data were not available within a single cohort of students. Therefore, outcome measures had to be examined using different cohorts. As a result, longitudinal analysis across all data points was not possible.
2. TEA only has historical prekindergarten attendance data for Texas public schools. Students may have attended prekindergarten in a private school or out of state.
3. Eligibility determination requires student enrollment in a Texas public school. If students did not attend a prekindergarten program, we did not know if they might have been eligible until they attended kindergarten.

4. Other important data points, such as parent motivation, could not be examined in this analysis. Without considering such data it could be wrongly assumed that differences detected were due to the treatment (attending prekindergarten) when they could be explained by other factors.
5. The quality of the prekindergarten that students attended is an important factor that could affect the results of the study. Data to determine this including both structural features like student-to-teacher ratio and process quality like teacher-child interactions was undeterminable with this sample.

## Results

Analysis revealed that the largest positive effect for prekindergarten attendance was on kindergarten readiness for the groups examined in this study. Students who were eligible for and attended prekindergarten in TPS were statistically more likely than their non-attending peers (58% vs. 42%) to demonstrate the knowledge and skills to be considered ready for kindergarten.

In addition, eligible students who attended prekindergarten in TPS were statistically less likely to need accelerated instruction for reading in first grade than their non-attending peers (44% vs. 47%); however, by second grade, both groups were just as likely to need accelerated instruction in reading (47% vs. 47%). A negligible, but statistically significant, difference in Grade 3 STAAR Reading performance was found between the two groups, with eligible students who attended prekindergarten scoring slightly higher than their non-attending peers when controlling for school environment (1.4 point scale score difference). Despite this scale score difference, the percent passing across the two groups was the same, with 72% of students in both groups meeting the grade-level standard on the Grade 3 STAAR Reading assessment. Small, but statistically significant, average scale score differences were also found between eligible students who attended prekindergarten in TPS and their non-attending peers on Grades 3 and 7 TAKS reading performance, but passing rates were approximately 1 percentage point different between the two groups in both analyses. For mathematics performance, eligible students who attended prekindergarten in TPS had small, yet statistically significant, higher scores than their non-attending peers on the Grade 3 STAAR exam as well as the Grade 3 and 7 TAKS Mathematics exams (i.e., 1-2 percentage point differences in passing rates).

Analysis of longer-term academic outcomes also revealed small, but positive statistically significant effects for eligible students who attended prekindergarten in TPS when compared to their non-attending peers. Specifically, for eligible students, prekindergarten attendance was associated with a lower likelihood of dropping out of school (7% vs. 9%), a higher likelihood of graduating high school on time (72% vs. 66%), and enrolling and persisting in college (38% vs. 31% and 28% vs. 22%, respectively). Please note, however, given the length of time between prekindergarten and high school and early adulthood, there are likely outside, unmeasured factors that could partially or fully account for these long-term effects.

The current investigation also explored whether school environment after prekindergarten moderated the effects of attending prekindergarten on standardized test scores of students who had been eligible to attend. For example, in one set of analyses, standardized test scores for mathematics for eligible prekindergarten attendees and non-attendees were examined across high- and low-performing elementary and middle schools. Results revealed that students who were eligible and attended prekindergarten in TPS performed better than their non-attending peers in both high- and low-performing schools; however, overall, all students-prekindergarten attendees and non-attendees-who attended high-performing schools performed better than their peers (prekindergarten attendees and non-attendees) at low-performing schools. In other words, the quality of schools attended after prekindergarten influenced student performance on standardized tests in mathematics, but effects attributable to prekindergarten attendance were also seen. Detailed results of all analyses are presented in the full report.

## Discussion

Researchers largely agree that prekindergarten has short-term benefits for children, including better reading, language, and mathematics skills (e.g., Yoshikawa et al., 2013). Some studies have found these benefits to fade over time (e.g., Lipsey, Farran, & Hofer, 2015), but a handful of studies have found prekindergarten to influence long-term outcomes including high school graduation, college attendance, and earning potential (e.g.,

Schweinhart et al., 2005; Temple & Reynolds, 2007). Results from the current investigation were in line with previous research.

Researchers are continuing to investigate the mechanisms through which prekindergarten effects are sustained, and there is some evidence that the positive effects of high-quality prekindergarten programs can be lasting when student achievement is fostered by family and school support (Temple & Reynolds, 2007). Indeed, given the length of time between prekindergarten and high school or adulthood, there are likely outside factors that either build on or account for the effects of prekindergarten attendance over time, which may explain why long-term results have varied across studies. For example, there may be a reciprocal relationship between academic and parental factors, such that gains in one domain are associated with gains in another and vice-versa. On one hand, parental involvement in prekindergarten has been associated with better prekindergarten outcomes (Marcon, 1999), and early academic gains can set students on a trajectory of greater achievement and commitment to schooling (Bailey, Duncan, Odgers, & Yu, 2015). On the other hand, better academic outcomes can also lead to increased parental involvement in their children's education (Reynolds, Ou, & Topitzes, 2004) and make it more likely that students and parents seek more rigorous coursework and better quality schools (Temple & Reynolds). Furthermore, parental involvement, especially parental expectations, is positively associated with numerous academic outcomes, including better grades and standardized test performance for students across all race/ethnicities (Jeynes, 2007). Finally, studies have also shown that students are more likely to enroll and succeed in college when they have higher academic achievement in high school and they have involved parents who encourage them to attend college (Eccles, Vida, & Barber, 2004). In sum, when prekindergarten effects are long-lasting, prekindergarten attendance is likely not the only factor involved; rather the benefits are due to an interaction of prekindergarten with many other factors – student, family, and school characteristics chief among them.

Isolating the effects of prekindergarten is a complicated task, and in the current investigation, Texas Education Agency has preexisting data related only to students attending public schools. As such, fully exploring the interplay between prekindergarten and other factors was not possible. For example, the current analyses support that later school environment can influence academic outcomes, but these analyses could not include factors related to one's parents. Indeed, parents are not required to enroll their eligible children in public prekindergarten, and it is possible that parents who enroll their children in prekindergarten differ in some meaningful way from those who do not. For instance, if parents who enroll their children in prekindergarten do so because they are more invested in their children's education than parents who do not, they may also be motivated to seek educational opportunities and provide supports that benefit their children throughout their academic careers.

In summary, this study finds both short- and long-term small but positive outcomes for students who were eligible for and attended public prekindergarten in Texas when compared to their eligible peers who did not attend. This study also indicated that the positive impacts of kindergarten attendance on students' academic outcomes may not always be sustained, hinting at the importance of academically facilitative environments after prekindergarten attendance. However, there are limitations of the current investigation, including the inability to examine other factors known to be associated with prekindergarten and children's later academic outcomes, such as parental involvement. In conclusion, although the results of this investigation reveal that prekindergarten is associated with many positive outcomes, these results should be considered within the larger context (e.g., school, family, community) that we were not able to fully explore. In other words, prekindergarten is beneficial, but is not the singular solution for ensuring children's academic success.

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## Methodology

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### Overview

This section describes the steps that were followed to inform research questions of interest regarding the effects associated with attending public prekindergarten in Texas.

The primary focus of this analysis was on students who were eligible to attend prekindergarten and either attended (treatment) or did not attend (comparison) TPS prekindergarten. To examine differences between treatment and comparison groups, three separate cohorts of students were tracked, each with slightly different academic outcomes. The longest cohort ("2000 Cohort") tracked students through the second year of college and examined TAKS test performance in Grades 3 and 7, dropout and graduation rates, and college enrollment and persistence rates. The shorter cohort ("2011 Cohort") tracked students through Grade 3 and examined Early Reading Indicator (ERI) scores in Grades 1 and 2 and Grade 3 STAAR test performance. The shortest cohort ("2015 Cohort") tracked students through kindergarten and examined kindergarten readiness. The analyses also examined whether the effects of prekindergarten attendance on standardized tests differed at high- versus low-performing campuses and urban versus non-urban campuses.

### *Building the cohorts*

Three closed cohorts were constructed:

1. Prekindergarten to 2<sup>nd</sup> Year in College – "2000 Cohort" – 1999–00 to 2014–15
2. Prekindergarten to Grade 3 – "2011 Cohort" – 2010–11 to 2014–15
3. Prekindergarten to Kindergarten – "2015 Cohort" – 2014-15 to 2015-16

Three separate closed cohorts were built to assess the different outcome variables of interest, as they were not all available to any single cohort. For example, ERI data were not available in the 2000 Cohort, and kindergarten readiness data were neither available in the 2000 nor the 2011 Cohorts. Eligibility status was determined for the treatment and comparison groups using data from their earliest year of school attendance. In other words, eligibility status for those who attended TPS prekindergarten was based on attendance data from their prekindergarten year, while eligibility status for those who did not attend TPS prekindergarten was based on attendance data from their kindergarten year.

A closed cohort refers to students who attended Texas public schools every year from prekindergarten or kindergarten through the outcome year of interest. Closed cohorts were used to limit other factors (e.g., attending a private school and then returning to a Texas public school) that may affect the outcome variables. Students who entered Texas public schools after kindergarten were omitted from the cohort, as were students who left Texas public schools prior to the outcome year of interest, with two exceptions: Early graduates and students who dropped out between grades 7 and 12 were included in the 2000 cohort, because their status as a graduate or dropout was an outcome of interest. For the 2011 and 2015 cohorts, only students who remained on-grade (i.e., not retained) were included in the cohort.

Students who left TPS for at least one year were removed from the cohort whether or not they returned to TPS in the future, resulting in sample attrition. Students were not, however, required to have all outcomes. In the 2000 Cohort, for example, students who left TPS in Grade 4 were included in the Grade 3 analysis but not later analyses. The Grade 3 TAKS analysis therefore includes more students than the Grade 7 TAKS analysis, which includes more students than the high-school graduation analysis.

Furthermore, only first-time kindergarten students in the 2000-01 school year, first-time kindergarten students during the 2011-12 school year, and first-time kindergarten students during the 2015-16 school year were included in the 2000, 2011, and 2015 Cohorts respectively. Students who would have entered any cohort after being retained in kindergarten were excluded.

*Determining Prekindergarten Eligibility*

Prekindergarten eligibility status was determined differently for the 2000 Cohort than the 2011 and 2015 Cohorts. When prekindergarten programs were first introduced in the 1980s, eligibility was based on *low family income* and *limited English proficiency*. Additional eligibility criteria have been added over the years, such that the 2011 and 2015 cohorts also incorporate *homelessness* and being a *child in foster care* or *of an active duty member of the armed forces* to determine eligibility. It also should be noted that in the 2011 Cohort, two eligibility variables – *child of an active duty member of the armed forces* and *child in foster care* -- were only available in prekindergarten enrollment data; therefore, eligibility status for students who did not attend prekindergarten did not include those criteria. The variables *child of an active duty member of the armed forces* and *child in foster care* were, however, available for both years of the 2015 Cohort. The table below summarizes the variables used to determine eligibility for each grade and cohort.

	<b>Did Not Attend Prekindergarten</b>	<b>Attended Prekindergarten</b>
<b>2000 Cohort</b>	Econ, LEP	Econ, LEP
<b>2011 Cohort</b>	Econ, LEP, Homelessness	Econ, LEP, Homelessness, Military, Foster
<b>2015 Cohort</b>	Econ, LEP, Homelessness, Military, Foster	Econ, LEP, Homelessness, Military, Foster

Table M.1 compares the demographics of prekindergarten eligible students who attended prekindergarten with those who did not attend for the three cohorts. Students who attended prekindergarten were demographically similar to those who did not attend, with only a few differences. Students who attended prekindergarten were slightly more likely to be Hispanic and English Language Learners, and slightly less likely to be White, than their peers who did not attend, particularly in the 2011 and 2015 Cohorts.



**Table M.1**  
**Students Eligible for Prekindergarten by Race/Ethnicity, Student Characteristics, and Gender**

<b>2000 Cohort</b>		
<b>Group</b>	<b>Percent Did Not Attend Pre-K N = 75,339</b>	<b>Percent Attended Pre-K N = 117,609</b>
African American	17.0	16.1
Native American	0.4	0.3
Asian	2.5	2.8
Hispanic	60.9	63.7
White	19.2	17.1
Economically Disadvantaged	94.2	93.7
English Language Learner	35.0	39.6
Female	48.0	49.1
Male	52.0	50.9

  

<b>2011 Cohort</b>		
<b>Group</b>	<b>Percent Did Not Attend Pre-K N = 54,447</b>	<b>Percent Attended Pre-K N = 163,063</b>
African American	15.0	13.9
Native American	0.5	0.6
Asian	3.5	3.0
Hispanic	59.5	68.4
White	19.6	12.9
Economically Disadvantaged	94.5	92.5
English Language Learner	28.2	44.6
Female	49.7	50.6
Male	50.3	49.4
Homeless	3.3	2.5
Foster	N/A	0.5
Military	N/A	1.4

  

<b>2015 Cohort</b>		
<b>Group</b>	<b>Percent Did Not Attend Pre-K N = 52,077</b>	<b>Percent Attended Pre-K N = 147,199</b>
African American	14.3	14.4
Native American	0.4	0.8
Asian	3.9	3.0
Hispanic	57.6	67.8
White	21.0	12.4
Economically Disadvantaged	90.1	90.8
English Language Learner	27.7	42.6
Female	48.3	49.8
Male	51.7	50.2
Homeless	3.4	2.6
Foster	0.5	0.9
Military	4.0	2.7



## Identifying High- and Low-Performing Schools

To examine whether campus-level academic performance influenced the effects of prekindergarten attendance on statewide standardized test scores, students were classified as attending either high- or low- performing campuses during their testing year (i.e., Grade 3 or Grade 7). High-performing campuses were defined as stipulated in the request as having at least 60% of students collectively meet proficiency levels on statewide standardized assessments (TAKS or STAAR) across all grades served by the campus and all subject areas. Campuses not meeting this definition were considered low-performing. Table M.2 reveals the percentage of prekindergarten attendees and non-attendees who were classified as attending low- and high-performing campuses. Approximately 85% of students in the 2000 and 2011 Cohorts in Grade 3, and 75% of students in the 2000 Cohort in Grade 7, were classified as attending high-performing campuses based on this metric.

**Table M.2**  
**Prekindergarten Attendance Status and Campus Performance**

Test and Group	Did Not Attend Pre-K (%)	Attended Pre-K (%)
	N ~ 43,350 <sup>a</sup>	N ~ 84,080
2000 Cohort Grade 3 Low-Performing	15.8	15.1
2000 Cohort Grade 3 High-Performing	84.2	84.9
	N ~ 38,695	N ~ 76,652
2000 Cohort Grade 7 Low-Performing	26.7	22.9
2000 Cohort Grade 7 High-Performing	73.3	77.1
	N ~ 50,850	N ~ 155,600
2011 Cohort Grade 3 Low-Performing	13.2	13.8
2011 Cohort Grade 3 High-Performing	86.8	86.2

<sup>a</sup>There were small differences in the final sample sizes used in the analyses as not all students had reading and mathematics test results.

## Identifying Campuses within Urban Districts

To examine whether school district location influenced the effects of prekindergarten, students were classified as attending campuses within urban or non-urban districts using the agency's District Type data. Ten districts were identified as *major urban*; all others were identified as non-urban.

For the 2000 Cohort, students were classified based on the district they attended during the year they took the TAKS test, regardless of their prekindergarten or kindergarten district location. In contrast, for the 2011 Cohort, students had to be enrolled in an urban district both in their prekindergarten/kindergarten year *and* the year they took the STAAR test to be included in the analysis. The 2000 Cohort used slightly less restrictive criteria to identify urban students because of concerns about the potential impact on sample size of requiring students to attend urban districts from kindergarten to Grade 7. Table M.3 reveals the percentage of prekindergarten attendees and non-attendees classified as attending urban and non-urban campuses across the TAKS and STAAR tests. Approximately 21% (grade 7) to 26% (grade 3) of the 2000 Cohort was classified as attending urban schools. Approximately 18% of the 2011 Cohort was classified as attending urban schools.

**Table M.3**  
**Prekindergarten Attendance Status and District Type**

Test and Group	Did Not Attend Pre-K (%)	Attended Pre-K (%)
	<b>N ~ 43,465<sup>a</sup></b>	<b>N ~ 84,362</b>
2000 Cohort Grade 3 Urban	29.4	24.8
2000 Cohort Grade 3 Non-Urban	70.6	75.2
	<b>N ~ 38,729</b>	<b>N ~ 76,725</b>
2000 Cohort Grade 7 Urban	24.4	19.9
2000 Cohort Grade 7 Non-Urban	75.6	80.1
	<b>N ~ 50,850</b>	<b>N ~ 155,600</b>
2011 Cohort Grade 3 Urban	21.8	21.3
2011 Cohort Grade 3 Non-Urban	78.2	78.7

<sup>a</sup>There were small differences in the final sample sizes used in the analyses as not all students had reading and mathematics test results.

## Data Analysis

Data from the three cohorts were analyzed separately. For ease of interpretation, results in the full report are presented as descriptive statistics. In addition, statistical models were used to estimate the statistical significance of any differences found between prekindergarten attendees and non-attendees. For the TAKS and STARR outcomes, which are scored on a continuous scale, multilevel modeling was used. For dichotomous outcomes (i.e., data with only two categories), logistic regressions were used. These two models are described below. Multilevel models are often used in educational research because they account for students attending campuses that vary in performance when estimating the statistical significance of results. In this study, two-level models were specified to estimate the effects of prekindergarten attendance on TAKS and STAAR scores. In the first level of the two-level model, a TAKS or STAAR test score  $Y$  for student  $i$  who is in school  $j$  is modeled as a function of his or her school mean test score  $\beta_{0j}$ , a matrix of predictor variables  $X_{ij}$  (e.g., prekindergarten attendance, campus performance, urban location), the vector of coefficients  $\beta$  describing the effects of those variables on test scores, and the random effect for each student  $r_{ij}$  as shown in Equation 1.

$$Y_{ij} = \beta_{0j} + X_{ij}\beta + r_{ij} \quad (1)$$

In the second level of the model, the school mean TAKS or STAAR test score  $\beta_{0j}$  is modeled as a function of the grand mean TAKS or STAAR score  $\gamma_{00}$  and the random effect for each school  $u_{0j}$  as shown in Equation 2.

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad (2)$$

The use of multilevel models enables the effects of prekindergarten attendance to be interpreted as occurring for students who attend the same campus.

Logistic regression models are often used when outcome variables of interest are dichotomous, as they are for the prekindergarten readiness, ERI, high school graduation and dropout, and college enrollment and persistence outcomes. To estimate the effects of prekindergarten attendance on those outcomes, logistic regression models were specified of the form:

$$\text{logit}(\pi) = \log\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta x,$$

where  $\pi$  is the probability of success with respect to the dichotomous outcome of interest,  $\alpha$  is an intercept parameter,  $x$  represents prekindergarten attendance, and  $\beta$  is a slope parameter that describes the effect of prekindergarten attendance on the outcome of interest. Logistic regression provides a method for estimating whether prekindergarten attendance has a statistically significant effect on the probability success, when the two available outcomes are success and failure.

Results of the comparative descriptive statistics, multilevel models, and logistic regressions are presented in the following section of the paper. While interpreting the results, it is important to consider that prekindergarten is one of many factors that have been shown to influence the long-term success of children, and that factors examined in this study were limited to those previously collected by the Texas Education Agency.

## Limitations

The current study has several limitations that affect the rigor of the study and subsequently the confidence with which the findings can be attributed to prekindergarten attendance, as well as the generalizability of the findings to any prekindergarten attendance. The major limitations are described below. It is important to consider all the factors that constrain the meaningfulness of the results before drawing any conclusions about the impact of attending prekindergarten on the outcomes measured.

*Quasi-experimental design.* A true experimental design could not be employed because the current investigation was limited to only data previously collected by TEA. Furthermore, students within the state are not randomly assigned to prekindergarten nor are they chosen to attend by a lottery system, which would better approximate a random sample. Therefore, a quasi-experimental design was chosen for this analysis. Only with a true experimental study can one confidently establish a cause and effect relationship between a treatment condition and subsequent outcomes because all other outside factors are considered equal. Within a quasi-experimental design, there may be other, unexamined factors that explain the relationship between predictor and outcome variables.

For example, assignment to the treatment and comparison groups in the present study is likely due to self-selection. Specifically, some parents choose to enroll their children into prekindergarten programs and other parents do not. The likelihood of attending prekindergarten may reflect parents' personal opinions about prekindergarten or may reflect additional burdens (e.g., lack of transportation) that some parents face. Within quasi-experimental designs, there is a concern that factors such as these that are unrelated to a treatment may partially confound the results. Additional steps are usually taken to try to control for these outside factors. In the current study, the demographics of the prekindergarten attendees and non-attendees were determined to be similar (e.g., similar percentages were economically disadvantaged), thereby allowing us to assume that the differences in educational outcomes are not attributed to the difference in demographic characteristics. Robust statistical procedures can also mitigate some of these concerns. Some factors that may affect the results, such as school environment, were included in the statistical analyses, using multilevel models, to the extent possible, however other factors were unmeasured.

*Other predictive factors.* Many important factors that have been well researched and documented as critical influences to students' educational outcomes were not examined in the current study, because of unavailability of data. Other important factors that were not considered include prekindergarten instruction (e.g., Camilli et al., 2010; Burchinal et al., 2010; Mashburn, et al., 2008), quality of later instruction, school support, and parental encouragement and involvement (e.g., Eccles, et al., 2004; Hossler, Schmit, & Vesper, 1999; Jeynes, 2007; Reynolds, Ou, & Topitzes, 2004). Without considering such factors, one could wrongly assume differences detected were due to attending prekindergarten when they could be explained by other factors.

*Other outcome measures.* There are other outcome measures that may indicate the impacts of prekindergarten. For example, key elements of school readiness other than school-entry reading skills, such as attention and socioemotional skills and school-entry math skills (e.g., Camilli, et al., 2010; Duncan, et al., 2007), were not included in our outcome analyses because such data were not available.

*Multiple cohorts.* The current study involves three different cohorts. This was necessary in order to understand the effects of prekindergarten over a long time (2000 cohort) as well as examining the effects reflected on the currently administrated assessments (STAAR for 2011 cohort) including those that are more proximal to prekindergarten attendance (early reading indicator for 2011 cohort and kindergarten readiness for 2015 cohort). The three cohort analyses are a strength of the current study in that it was possible to examine the results with different groups of students who were going through the TPS system at different times. However, it is prohibitive in telling one coherent story from the fragments of results from the different cohorts, requiring extra caution not to overgeneralize the results of one cohort to the contexts of other cohorts. For example, prekindergarten attendees scored higher than non-attending peers in Grade 3 reading in 2000 cohort, while the difference in Grade 3 reading was negligible in the 2011 cohort. It is important not to compare these two cohorts as other factors, such as sensitivity of the instruments (TAKS vs. STAAR) may have been the reason for the difference. Similarly, prekindergarten attendees were much more likely to be school ready than their non-attending peers in

2015 cohort, but it cannot be assumed that such effects would have been observed had the data been available to be examined for the other cohorts.

*Prekindergarten outside of TPS schools.* Whether or not a student has attended prekindergarten was determined by the records in prekindergarten attendance data. TEA only has historical prekindergarten attendance data for TPS, and there is no way to determine if students have attended prekindergarten in a private school or out of state.

*Non-attendeess' eligibility determination.* Eligibility determination requires information from student enrollment in a TPS. For students who did attend TPS prekindergarten, eligibility status was determined based on prekindergarten attendance data and kindergarten data (for students who joined later in the prekindergarten year). For students who did not attend prekindergarten in TPS, eligibility status was determined based on kindergarten and Grade 1 (for students who joined later in the kindergarten year) enrollment data. It is possible that students' situations such as their economically disadvantaged status changed from the previous year, and thus, there may be some cases where the eligibility of non-attendeess at prekindergarten age were wrongly assumed based on kindergarten and Grade 1 enrollment information.

*Students excluded in the analyses.* The analyses excluded the students for whom missing data occur. Specifically, students were excluded from analysis if they did not take the state mandated tests, took test versions that were not included in our analyses (e.g., SDAA, TAKS-M, TAKS-Alt, or STAAR Alternate 2), or when the student identification information was unable to be matched between our cohort datasets and test datasets. For 2011 cohort, the sample is limited to those students who attended TPS in their expected grades from kindergarten through grade 3. This method omits children who left TPS or were held back.

## Data Interpretation

In the following section, results from both descriptive and inferential statistics are presented in a series of tables. The descriptive tables are summaries of the outcome variables by group (i.e., eligible TPS prekindergarten attendees and non-attendees) and are included to simply describe the sample. For example, Table R.2 presents the counts and percentages of eligible TPS prekindergarten attendees and non-attendees in the 2015 cohort who were or were not kindergarten-ready based on their performance on beginning of year kindergarten assessments. This table reveals that of those eligible students who did not attend prekindergarten, 21,704 (41.7%) were found to be ready for kindergarten while 30,365 (58.3%) were not. Of the eligible students who attended prekindergarten, 84,739 (57.6%) were found to be ready for kindergarten while 62,460 (42.4%) were not.

When an outcome variable was dichotomous (e.g., kindergarten ready or not kindergarten ready), a logistic regression analysis (see Table R.3) was used to determine whether the difference in being kindergarten ready between eligible TPS prekindergarten attendees and non-attendees was statistically significant. In other words, was the difference due to chance or error or is there a statistically significant relationship between attending prekindergarten and being kindergarten ready? The main value of interest in Table R.3 is the p-value or probability (labeled:  $Pr > \text{ChiSq}$  for the effect "Attend Prekindergarten"). In any statistical analysis, a p-value of .05 or smaller is considered statistically significant. In this case, the table results reveal that there is a statistically significant difference in kindergarten readiness between those who attended prekindergarten and those who do not. Specifically, these results can be interpreted as, "There is less than a 0.1% probability ( $p < 0.001$ ) that the difference in kindergarten readiness is due to chance or error, suggesting prekindergarten is positively associated with kindergarten readiness". Please note, however, that there may be other unexamined variables that contribute to or fully account for this statistical relationship. Additionally, these data are correlational in nature and therefore we cannot say that attending prekindergarten causes kindergarten readiness.

Outcome variables that were continuous (e.g., scale scores on standardized tests) required different statistical analyses. Multilevel models (MLM) are an ideal statistical analysis as these models take into account that students within a campus have shared experiences/environments. For example, students within a single campus may have the same teachers and/or classroom environments. Their shared experiences, however, are different from the shared experiences of other students at other campuses. When students have shared environments, it can be expected that scores within one campus are likely to be more similar to one another than they are to scores from another campus. MLM analyses determine whether a relationship between variables is statistically significant while taking into account these shared environments and the variation between them. For example, Table R.9 compares Grade 3 STAAR Mathematics and STAAR Reading performance (separately) between those eligible students who attended TPS prekindergarten and those who did not attend. Again, the value of primary interest in this table is the p-value or probability (labeled:  $Pr > |t|$ ). For mathematics, there was a statistically significant effect ( $p < 0.001$ ) of attending prekindergarten (effect labeled: Attend Pre-K) on STAAR performance. Said another way, there is less than a 0.1% chance that the differences in math scores for those attending prekindergarten versus those who did not are due to error or chance. In summary, the results of Table R.9 can be interpreted as, "TPS eligible prekindergarten attendees scored statistically significantly higher on the Grade 3 STAAR mathematics exam than non-attendees. An average student who attended prekindergarten and attended an average campus scored 5.6 points higher on mathematics than the average student who did not attend prekindergarten." Please note, a scale score difference of 5.6 points is quite small and represents less than one additional question on STAAR Mathematics being answered correctly. Again, it is also important to note that there may be other unexamined variables that contribute to or fully account for the statistical relationship between prekindergarten attendance and standardized test scores. Furthermore, it is important to note that these data are correlational in nature and therefore the results should not be interpreted as causal.

## Results

### 2015 Cohort

#### Kindergarten-Readiness Results

**Table R.1**  
**Kindergarten Readiness by Exam and Prekindergarten Attendance, Eligible Prekindergarten Students, 2015 Cohort**

Status	Did Not Attend Pre-K		Attended Pre-K	
	Students	Percentage (%)	Students	Percentage (%)
<b>ISIP-ER</b>				
Kindergarten-ready	13,379	52.0%	42,586	69.9%
Not Kindergarten-ready	12,332	48.0%	18,353	30.1%
<b>TPRI</b>				
Kindergarten-ready	3,629	28.7%	19,416	50.4%
Not Kindergarten-ready	9,014	71.3%	19,091	49.6%
<b>ISIP-S</b>				
Kindergarten-ready	2,132	43.4%	15,263	67.0%
Not Kindergarten-ready	2,783	56.6%	7,501	33.0%
<b>Tejas LEE</b>				
Kindergarten-ready	2	0.1%	153	1.5%
Not Kindergarten-ready	2,009	99.9%	10,304	98.5%
<b>MAP</b>				
Kindergarten-ready	1,407	46.4%	4,164	58.0%
Not Kindergarten-ready	1,627	53.6%	3,016	42.0%
<b>DIBELS Next</b>				
Kindergarten-ready	882	48.3%	2,546	65.8%
Not Kindergarten-ready	943	51.7%	1,322	34.2%
<b>PAPI</b>				
Kindergarten-ready	270	15.2%	546	19.1%
Not Kindergarten-ready	1,502	84.8%	2,309	80.9%
<b>PAPI-S</b>				
Kindergarten-ready	3	2.3%	32	6.3%
Not Kindergarten-ready	127	97.7%	477	93.7%
<b>IDEL</b>				
Kindergarten-ready	0	0.0%	32	30.8%
Not Kindergarten-ready	26	100%	72	69.2%
<b>RAPS 360</b>				
Kindergarten-ready	0	0.0%	0	0.0%
Not Kindergarten-ready	1	100%	10	100%
<b>easyCBM</b>				
Kindergarten-ready	0	0.0%	1	16.7%
Not Kindergarten-ready	1	100%	5	83.3%



**Table R.2**  
**Kindergarten Readiness by Prekindergarten Attendance, Eligible**  
**Prekindergarten Students, 2015 Cohort**

Status	Did Not Attend Pre-K		Attended Pre-K	
	Students	Percentage (%)	Students	Percentage (%)
Kindergarten-ready	21,704	41.7	84,739	57.6
Not Kindergarten-ready	30,365	58.3	62,460	42.4

**Table R.3**  
**Logistic Regression Results: Kindergarten Readiness by Prekindergarten**  
**Attendance, Eligible Prekindergarten Students, 2015 Cohort**

Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	-0.02	0.005	1	8.93	0.003
Attend Prekindergarten	0.32	0.005	1	3846.75	< 0.001

## 2011 Cohort

### Grade 1 Results, Early Reading Indicator (ERI)

**Table R.4**  
**Early Reading Performance by Prekindergarten Attendance, Eligible Prekindergarten Students, Grade 1, 2011 Cohort**

Early Reading Indicator	Did Not Attend Pre-K		Attended Pre-K	
	Students	Percentage (%)	Students	Percentage (%)
Passed	25,456	52.8	81,933	55.9
Needs Accelerated Instruction	22,773	47.2	64,554	44.1

**Table R.5**  
**Logistic Regression Results: Early Reading Performance by Prekindergarten, Eligible Prekindergarten Students, Grade 1, 2011 Cohort**

Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	0.17	0.005	1	1103.27	< 0.001
Attend Prekindergarten	0.06	0.005	1	145.50	< 0.001

## 2011 Cohort

### Grade 2 Results, Early Reading Indicator (ERI)

**Table R.6**  
**Early Reading Performance by Prekindergarten Attendance, Eligible Prekindergarten Students, Grade 2, 2011 Cohort**

Early Reading Indicator	Did Not Attend Pre-K		Attended Pre-K	
	Students	Percentage (%)	Students	Percentage (%)
Passed	26,552	53.2	80,636	53.4
Needs Accelerated Instruction	23,344	46.8	70,294	46.6

**Table R.7**  
**Logistic Regression Results: Early Reading Performance by Prekindergarten Attendance, Eligible Prekindergarten Students, Grade 2, 2011 Cohort**

Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	0.13	0.005	1	660.60	< 0.001
Attend Prekindergarten	0.004	0.005	1	0.67	0.412

2011 Cohort  
Grade 3 STAAR Results, Overall

**Table R.8**  
**STAAR Mathematics and Reading Performance by Prekindergarten Attendance, Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	50,878	1421	71.3	155,648	1426	72.9
Reading	50,837	1403	71.8	155,545	1403	72.3

**Table R.9**  
**MLM Results: STAAR Performance by Prekindergarten Attendance, Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1424.1	0.93	4377	1534.30	< 0.001	
Attend Pre-K	5.6	0.65	4225	8.60	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1407.1	0.84	4377	1669.02	< 0.001	
Attend Pre-K	1.4	0.66	4226	2.20	0.028	

## 2011 Cohort

### Grade 3 STAAR Results, Low/High Performing Schools

**Table R.10**  
**STAAR Mathematics and Reading Performance by Prekindergarten Attendance and Campus Performance , Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	44,176	1429	73.9	134,170	1434	75.2
Math Low Performing	6,690	1365	53.6	21,455	1379	58.3
Reading High Performing	44,139	1411	74.4	134,083	1411	74.6
Reading Low Performing	6,687	1349	54.9	21,440	1358	57.7

**Table R.11**  
**MLM Results: STAAR Performance by Prekindergarten Attendance and Campus Performance, Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1432.0	0.9	4376	1540.90	< 0.001	
Attend Prekindergarten	4.4	0.7	4224	6.34	< 0.001	
Attend Low Performing School	-69.7	2.7	4376	-25.69	< 0.001	
Attend Pre-K and Low Performing School	9.3	1.9	4224	4.80	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1414.3	0.8	4376	1688.11	< 0.001	
Attend Prekindergarten	0.6	0.7	4225	0.86	0.391	
Attend Low Performing School	-64.7	2.4	4376	-26.73	< 0.001	
Attend Pre-K and Low Performing School	6.5	1.9	4225	3.37	< 0.001	

2011 Cohort  
Grade 3 STAAR Results, Campuses within Urban Districts

**Table R.12**  
**STAAR Mathematics and Reading Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	9,432	1413	68.2	27,791	1424	71.6
Reading	9,423	1392	68.9	27,782	1397	70.5

**Table R.13**  
**MLM Results: STAAR Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2011 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1427.2	1.0	4376	1377.96	< 0.001	
Attend Pre-K	4.2	0.7	4224	5.72	< 0.001	
Attend Urban School	-15.2	2.3	4376	-6.57	< 0.001	
Attend Pre-K and Urban School	6.5	1.6	4224	4.11	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1410.5	0.9	4376	1502.01	< 0.001	
Attend Pre-K	0.6	0.7	4225	0.75	0.454	
Attend Urban School	-16.8	2.1	4376	-8.07	< 0.001	
Attend Pre-K and Urban School	4.1	1.6	4225	2.58	0.010	

## 2011 Cohort

## Grade 3 STAAR Results, Performance/Campuses within Urban Districts

Table R.14

**STAAR Mathematics and Reading Performance by Prekindergarten Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, Short Cohort**

STAAR Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	7,492	1425	72.2	21,816	1434	75.0
Math Low Performing	1,938	1366	52.5	5,971	1387	59.5
Reading High Performing	7,485	1404	73.0	21,805	1407	73.8
Reading Low Performing	1,936	1344	52.9	5,973	1359	58.6

Table R.15

**MLM Results: STAAR Performance by Pre-K Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, Short Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1418.9	1.7	2913	848.24	< 0.001	
Attend Prekindergarten	8.8	1.5	1741	5.79	< 0.001	
Attend Low Performing School	-58.1	4.1	2913	-14.28	< 0.001	
Attend Pre-K and Low Performing School	10.8	3.5	1741	3.10	0.002	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	1401.7	1.7	2913	863.73	< 0.001	
Attend Prekindergarten	3.8	1.6	1740	2.39	0.017	
Attend Low Performing School	-56.8	3.9	2913	-14.59	< 0.001	
Attend Pre-K and Low Performing School	9.1	3.6	1740	2.51	0.012	



2000 Cohort  
Grade 3 TAKS Results, Overall

**Table R.16**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	43,465	2207.2	86.6	84,362	2215.1	87.5
Reading	43,513	2244.2	87.8	84,362	2251.0	88.6

**Table R.17**  
**MLM Results: TAKS Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2213.3	1.2	3738	1777.7	< 0.001	
Attend Pre-K	6.5	1.0	3536	6.5	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2250.4	1.1	3742	1962.6	< 0.001	
Attend Pre-K	5.7	1.1	3554	5.4	< 0.001	

2000 Cohort  
Grade 7 TAKS Results, Overall

**Table R.18**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	38,732	2198.7	74.7	76,726	2206.5	76.6
Reading	38,730	2241.9	84.5	76,704	2246.3	85.6

**Table R.19**  
**MLM Results: TAKS Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2202.2	1.6	1879	1355.9	< 0.001	
Attend Pre-K	5.7	1.1	1701	5.5	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2247.8	1.4	1881	1620.0	< 0.001	
Attend Pre-K	3.5	1.0	1702	3.3	< 0.001	

2000 Cohort  
Grade 3 TAKS Results, Low/High Performing Schools

**Table R.20**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance and Campus Performance, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	36,459	2218.3	88.7	71,402	2225.2	89.4
Math Low Performing	6,860	2146.0	75.3	12,678	2155.8	76.9
Reading High Performing	36,500	2252.9	89.4	71,373	2259.1	89.9
Reading Low Performing	6,861	2196.3	79.3	12,708	2204.0	81.2

**Table R.21**  
**MLM Results: TAKS Performance by Pre-K Attendance and Campus Performance, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

Mathematics					
Effect	Estimate	Standard Error	DF	t-value	Pr >  t
Intercept	2141.3	3.0	3712	704.4	< 0.001
Attend Pre-K	10.9	2.5	3537	4.4	< 0.001
Attend High Performing School	82.3	3.3	3712	25.1	< 0.001
Attend Pre-K and High Performing School	-5.0	2.7	3537	-1.85	0.064

Reading					
Effect	Estimate	Standard Error	DF	t-value	Pr >  t
Intercept	2196.5	2.8	3713	784.9	< 0.001
Attend Pre-K	7.1	2.5	3533	2.8	0.005
Attend High Performing School	61.5	3.0	3713	20.3	< 0.001
Attend Pre-K and High Performing School	-1.5	2.8	3533	-0.6	0.584

## 2000 Cohort

### Grade 7 TAKS Results, Low/High Performing Schools

**Table R.22**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance and Campus Performance, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	28,382	2215.6	78.7	59,075	2222.2	80.2
Math Low Performing	10,316	2151.6	63.9	17,577	2153.5	64.4
Reading High Performing	28,379	2255.6	86.8	59,056	2257.9	87.6
Reading Low Performing	10,316	2204.0	78.4	17,573	2207.1	79.0

**Table R.23**  
**MLM Results: TAKS Performance by Pre-K Attendance and Campus Performance, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2141.9	3.1	1845	702.3	< 0.001	
Attend Pre-K	4.6	2.0	1694	2.3	0.024	
Attend High Performing School	76.8	3.5	1845	22.3	< 0.001	
Attend Pre-K and High Performing School	1.3	2.3	1694	0.5	0.592	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2200.8	2.5	1846	872.0	< 0.001	
Attend Pre-K	5.9	2.1	1695	2.9	0.004	
Attend High Performing School	58.7	2.9	1846	20.4	< 0.001	
Attend Pre-K and High Performing School	-3.2	2.4	1695	-1.4	0.178	

2000 Cohort  
Grade 3 TAKS Results, Campuses within Urban Districts

**Table R.24**  
**TAKS Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	12,770	2200.9	85.4	20,908	2208.9	85.9
Reading	12,770	2238.0	86.2	20,926	2246.5	87.1

**Table R.25**  
**MLM Results: TAKS Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2216.1	1.4	3737	1557.6	< 0.001	
Attend Pre-K	5.5	1.2	3555	4.7	< 0.001	
Attend Urban School	-11.8	2.9	3737	-4.1	< 0.001	
Attend Pre-K and Urban School	4.0	2.2	3555	1.8	0.072	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2252.5	1.3	3741	1730.6	< 0.001	
Attend Pre-K	5.4	1.2	3553	4.5	< 0.001	
Attend Urban School	-9.2	2.6	3741	-3.6	< 0.001	
Attend Pre-K and Urban School	1.3	2.2	3553	0.6	0.558	

## 2000 Cohort

### Grade 7 TAKS Results, Campuses within Urban Districts

**Table R.26**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	9,432	2189.6	71.8	15,266	2195.4	73.4
Reading	9,433	2235.9	83.8	15,256	2241.2	84.8

**Table R.27**  
**MLM Results: TAKS Performance by Pre-K Attendance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2204.4	1.8	1845	1246.1	< 0.001	
Attend Pre-K	5.4	1.2	1694	4.7	< 0.001	
Attend Urban School	-11.5	4.5	1845	-2.6	0.010	
Attend Pre-K and Urban School	1.3	2.4	1694	0.6	0.578	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2249.4	1.5	1846	1518.3	< 0.001	
Attend Pre-K	3.1	1.2	1695	2.6	0.009	
Attend Urban School	-9.0	3.6	1846	-3.1	0.002	
Attend Pre-K and Urban School	2.5	2.5	1695	1.2	0.224	

2000 Cohort  
Grade 3 TAKS Results, Performance/Campuses within Urban Districts

**Table R.28**  
**TAKS Mathematics and Reading Performance by Pre-K Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	9,394	2217.5	88.9	14,891	2228.4	89.2
Math Low Performing	3,332	2152.7	75.4	5,973	2159.4	77.3
Reading High Performing	9,404	2251.3	88.7	14,903	2262.1	89.4
Reading Low Performing	3,323	2199.9	78.9	5,979	2207.3	81.6

**Table R.29**  
**MLM Results: TAKS Performance by Pre-K Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 3, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2150.0	4.5	772	477.4	< 0.001	
Attend Pre-K	9.2	3.7	761	2.5	0.012	
Attend High-Performing School	71.0	5.2	772	13.6	< 0.001	
Attend Pre-K and High-Performing School	0.7	4.3	761	0.2	0.875	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2201.6	4.4	772	501.6	< 0.001	
Attend Pre-K	4.9	3.8	761	1.3	0.200	
Attend High-Performing School	54.8	5.1	772	10.8	< 0.001	
Attend Pre-K and High-Performing School	3.0	4.4	761	0.7	0.495	



## 2000 Cohort

## Grade 7 TAKS Results, Performance/Campuses within Urban Districts

Table R.30

**TAKS Mathematics and Reading Performance by Pre-K Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math High Performing	5,060	2220.8	78.8	8,238	2226.1	80.1
Math Low Performing	4,349	2151.9	63.6	6,972	2157.3	65.4
Reading High Performing	5,055	2260.9	87.4	8,228	2266.0	88.7
Reading Low Performing	4,354	2205.6	79.5	6,972	2210.6	80.1

Table R.31

**MLM Results: TAKS Performance by Pre-K Attendance and Campus Performance within Campuses in Urban Districts, Eligible Prekindergarten Students, Grade 7, 2000 Cohort**

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2143.9	5.7	215	376.7	< 0.001	
Attend Pre-K	9.5	3.1	212	3.0	0.003	
Attend High-Performing School	84.0	7.5	215	11.2	< 0.001	
Attend Pre-K and High-Performing School	-5.2	4.2	212	-1.2	0.224	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2199.8	4.6	215	474.1	< 0.001	
Attend Pre-K	7.5	3.2	213	2.3	0.021	
Attend High-Performing School	66.5	6.1	215	10.8	< 0.001	
Attend Pre-K and High-Performing School	-2.6	4.3	213	-0.6	0.552	

2000 Cohort

High School Graduation and Dropout, College Enrollment, and College Persistence Results

**Table R.32**  
**High School and Postsecondary Outcomes by Pre-K Attendance, Eligible Prekindergarten Students, 2000 Cohort**

Outcome	Did Not Attend Pre-K N = 49,521		Attended Pre-K N = 92,017	
	Students	Percentage (%)	Students	Percentage (%)
Dropped out	4,462	9.0	6,495	7.1
Graduated	32,479	65.6	65,922	71.6
Enrolled in college	15,381	31.1	34,834	37.9
Persisted in college	11,040	22.3	25,786	28.0

**Table R.33**  
**Logistic Regression Results: High-School Outcomes by Prekindergarten Attendance, Eligible Prekindergarten Students, 2000 Cohort**

Likelihood of Dropping Out					
Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	-2.5	0.006	1	58047	< 0.001
Attend Prekindergarten	-0.1	0.006	1	171.01	< 0.001

Likelihood of Graduating					
Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	0.8	0.010	1	17277	< 0.001
Attend Prekindergarten	0.1	0.010	1	555.56	< 0.001

**Table R.34**  
**Logistic Regression Results: College Outcomes by Prekindergarten Attendance, Eligible Prekindergarten Students, 2000 Cohort**

Likelihood of College Enrollment					
Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	-0.7	0.006	1	11899	< 0.001
Attend Prekindergarten	0.2	0.006	1	647.70	< 0.001

Likelihood of College Persistence					
Effect	Estimate	Standard Error	DF	Chi-Square	Pr > ChiSq
Intercept	-1.1	0.007	1	28188	< 0.001
Attend Prekindergarten	0.2	0.007	1	546.84	< 0.001

## Supplemental Analyses

### 2000 Cohort

#### Grade 5 TAKS Results, Overall

We received an additional data request to investigate the Grade 5 TAKS performance of prekindergarten eligible students who attended prekindergarten versus those who did not attend. Given the similarity of this request to the data already presented in this report, we are presenting the results here. Grade 5 TAKS results were similar to other results presented in this report; prekindergarten attendees performed better in math and reading than their non-attending peers.

**Table S.1**  
TAKS Mathematics and Reading Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 5, 2000 Cohort

TAKS Test	Did Not Attend Pre-K			Attended Pre-K		
	Students	Mean Scale Score	Percent Passing	Students	Mean Scale Score	Percent Passing
Math	38,740	2257.8	78.2	76,493	2268.4	79.8
Reading	38,733	2195.3	75.8	76,424	2199.7	77.0

**Table S.2**  
MLM Results: TAKS Performance by Pre-K Attendance, Eligible Prekindergarten Students, Grade 5, 2000 Cohort

Mathematics						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2266.6	1.7	3572	1331.8	< 0.001	
Attend Pre-K	8.5	1.4	3355	6.0	< 0.001	

  

Reading						
Effect	Estimate	Standard Error	DF	t-value	Pr >  t	
Intercept	2203.5	1.3	3571	1756.4	< 0.001	
Attend Pre-K	2.6	1.0	3362	2.3	0.020	