

Kindergarten Readiness Drives Third Grade Success

Evidence from a causal inference study using
observational data of Texas Kindergartners and
Their Third Grade Outcomes



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Executive Summary

A child who arrives at kindergarten already meeting developmental benchmarks in language and emergent literacy¹ is far more likely to achieve reading and mathematics proficiency by third grade than a similar child who did not meet those benchmarks. That is the central finding of this large-scale causal inference study using observational data of Texas kindergartners.

This study followed 66,800 students across a random sample of Texas schools, comparing children who were kindergarten-ready with statistically comparable peers who had not yet met readiness benchmarks. Kindergarten-ready students were 22 percentage points more likely to pass their third-grade reading exam and 21 percentage points more likely to pass their third-grade math exam. The benefits held for every racial and ethnic group, every income level, and every type of student examined.

Reading

+22 pp — kindergarten-ready students outperformed similar students who were not kindergarten-ready in 3rd-grade reading (38.7% vs. 60.7% probability of passage)

Math

+21 pp — kindergarten-ready students outperformed similar students who were not kindergarten-ready in 3rd-grade math (32.1% vs. 53.1% probability of passage)

Attendance

+0.8 pp — kindergarten-ready students attended school at slightly higher rates through 3rd-grade (94.0% vs. 94.8% attendance rate)

¹ Language and emergent literacy before kindergarten include phonological awareness, letter knowledge, letter-sound correspondence, print concepts, vocabulary, and oral language.



For Bexar County, the results tell the same story with an important local twist. Children in San Antonio benefit just as clearly from kindergarten readiness. Still, they start further behind than their peers across the rest of Texas, and remain further behind. As of 2025, fewer than half of Bexar County kindergartners met state readiness benchmarks, compared to 51 percent statewide (TEA, 2025). That gap is a call to action for all citizens concerned about San Antonio’s educational trajectory.

The findings point to three areas of action. First, expand access to high-quality early childhood programs from birth to age three, with accompanying investments in program quality, family engagement, and enrollment support. Second, use kindergarten readiness data proactively to identify struggling students early and connect them to evidence-based intervention before third grade. Third, pair readiness with sustained K-3 support, including structured literacy instruction, small-group intervention, and high-dosage tutoring, recognizing that readiness alone does not close persistent achievement gaps for economically disadvantaged, special education, and Black students. Some of these actions require state policy and investment. Others can be pursued by school districts, local governments, and community organizations today.

Statewide Findings

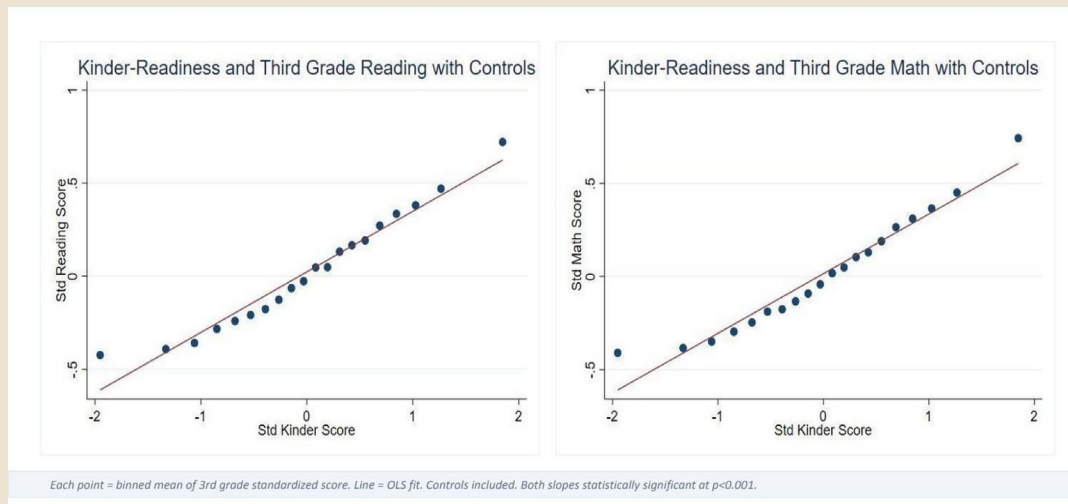
The headline numbers are large and consistent. Across the full Texas sample, kindergarten-ready students were 22 percentage points more likely to read at grade level by third grade than similar students who were not ready. The math advantage was nearly as large, at 21 percentage points. Both effects were statistically significant ($p < 0.001$) (Table 1).

To put those numbers in context: without kindergarten readiness, only about 4 in 10 students in the study sample passed third-grade reading. With kindergarten readiness, more than 6 in 10 passed. That represents a 57 percent relative improvement in the probability of reading proficiency, after controlling for student background characteristics.

The Dose-Response Relationship

The evidence of a causal relationship goes beyond the simple comparison of ready versus not-ready students. As shown in Figure 1, when the researcher plotted kindergarten assessment scores against third-grade outcomes, a clear and nearly linear relationship emerged, even after controlling for all student background

Figure 1. Dose-Response: Kindergarten Score vs. 3rd Grade Outcomes



A strong, near-linear relationship between kinder-readiness score and 3rd grade performance holds after controlling for student background. Each point = binned mean of 3rd grade standardized score. Line = OLS fit. Both slopes statistically significant at $p < 0.001$.

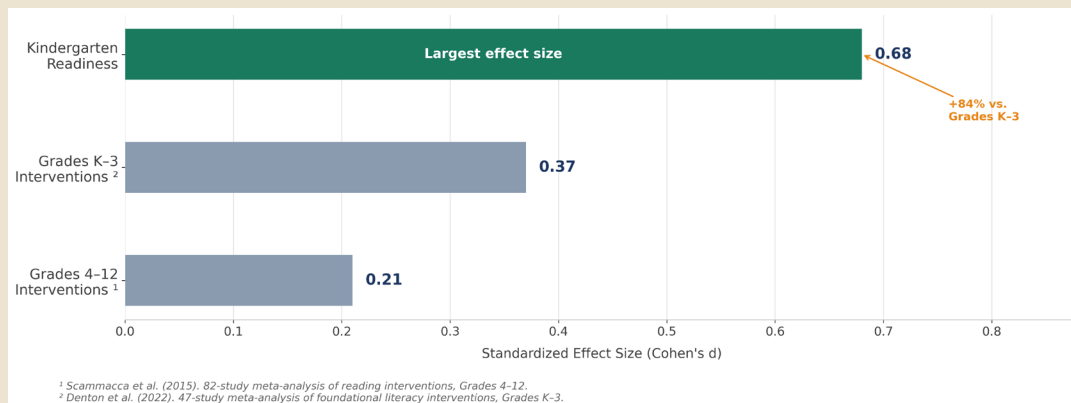
characteristics. Children at the bottom of the kindergarten readiness distribution tended to perform at the bottom of the third-grade distribution. Children at the top tended to perform at the top. This kind of dose-response relationship is consistent with a causal effect and is difficult to attribute to chance or random measurement error (Shadish et al., 2002).

The effect of kindergarten readiness is not simply a threshold phenomenon. It strengthens progressively with higher readiness scores, suggesting that every increment of readiness improvement matters, not just crossing the benchmark cutoff.

Early Investment Outperforms Later Remediation

As shown in Figure 2, the standardized effect size associated with kindergarten readiness was 0.68 standard deviations, estimated using the continuous kindergarten readiness score rather than the binary ready/not-ready classification used in the primary analysis. This is consistent with the dose-response relationship shown in Figure 1 and reflects the full gradient of readiness rather than a single cutpoint comparison. For context, 0.68 standard deviations is almost double the effect size found in meta-analyses of K-3 reading interventions ($d = 0.37$) and more than three times the effect size of grades 4-12 reading interventions ($d = 0.21$) (Denton et al., 2022; Scammacca et al., 2015). These comparisons are drawn from separate studies using different samples and methods, so

Figure 2. Comparative Effectiveness of Literacy Interventions



Standardized effect sizes (Cohen's d) comparing kindergarten readiness with published meta-analyses of reading interventions. Note: comparisons draw on separate meta-analyses using different samples and methods; direct numerical comparison should be interpreted with caution.



direct numerical comparison should be interpreted with caution. However, the consistent pattern across all three bodies of evidence, and across decades of early education research, supports the conclusion that intervening before kindergarten entry is associated with substantially larger academic gains than reading interventions delivered at any later grade level (Campbell et al., 2001; Heckman, 2006; Heckman et al., 2010; NSCDC, 2007a; Shonkoff & Phillips, 2000).

That pattern carries an important policy implication: every dollar invested before kindergarten entry produces greater academic gains than the same dollar spent on reading intervention after kindergarten. This is not merely a correlation. Multiple randomized controlled experiments have established that high-quality early childhood programs cause lasting improvements in academic outcomes (Campbell et al., 2002; Heckman et al., 2010; Schweinhart et al., 2005). The earlier the investment, the higher the return.

Attendance

The attendance findings are more modest but still meaningful. Kindergarten-ready students attended school at a rate of 94.8 percent through third grade, compared to 94.0 percent for similar students who were not ready. While a difference of less than one percentage point sounds small, it represents a consistent pattern across four years of schooling. Students who miss more school fall further behind, and schools serving high-need populations bear those costs most acutely (Chang & Romero, 2008; Gottfried, 2010).





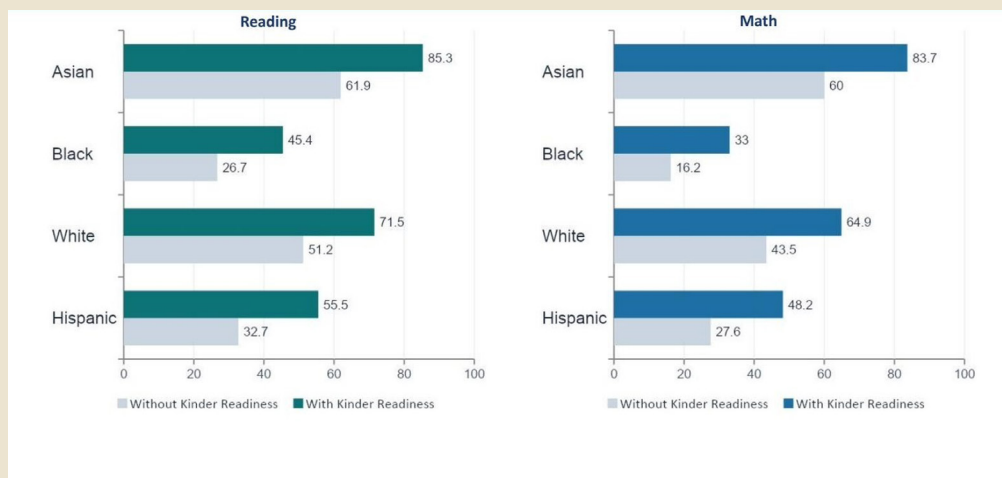
Who Benefits: Subgroup Findings

One of the most important findings of this statewide study is how consistent the kindergarten readiness effect is across every group of students examined. Regardless of race, income, special education status, language background, gender, or school mobility history, children who arrived at kindergarten ready outperformed similar students who did not. No subgroup was left out of the benefit. The full results are summarized in Table 2 and displayed in Figures 3 through 8.

Race and Ethnicity

The positive effect holds for every racial and ethnic group studied (Figure 3). Hispanic students, the largest racial and ethnic group in Texas public schools, saw reading proficiency rise from 32.7 percent to 55.5 percent with kindergarten readiness, a gain of 22.8 percentage points. Black students saw reading proficiency rise from 26.7 percent to 45.4 percent, a gain of 18.7 percentage points. White students saw proficiency rise from 51.2 percent to 71.5 percent, a gain of 20.3 percentage points. Asian students saw the largest absolute gain, with reading proficiency rising from 61.9 percent to 85.3 percent, a gain of 23.4 percentage points. Estimates for Native American, Pacific Islander, and other subgroups are not reported due to insufficient sample sizes.

Figure 3. Proficiency Rates by Race and Ethnicity and by Kindergarten Readiness



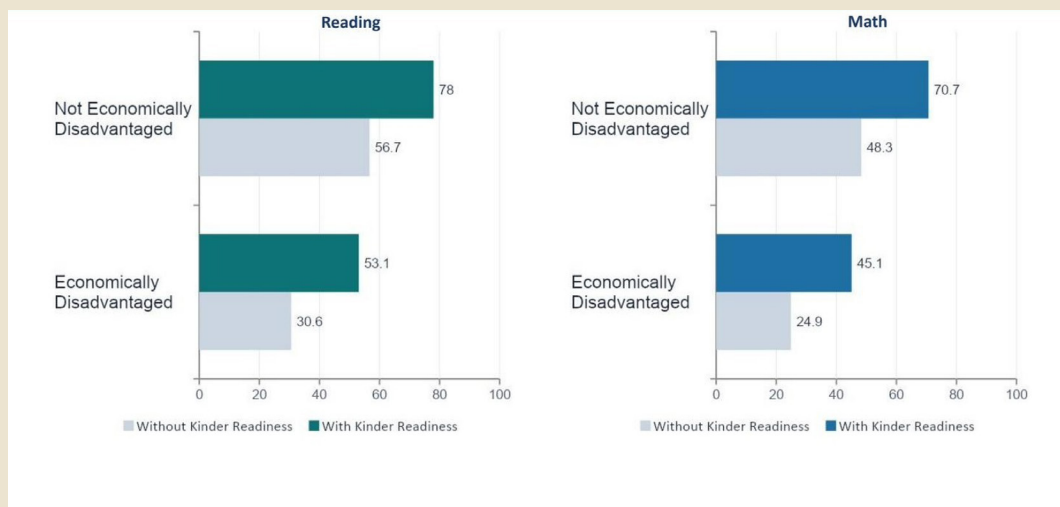
3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

Who Benefits: Subgroup Findings

Economically Disadvantaged Students

As shown in Figure 4, economically disadvantaged students benefit substantially from kindergarten readiness, with reading proficiency rising from 30.6 percent to 53.1 percent. However, the absolute gap between economically disadvantaged and non-disadvantaged students persists even after kindergarten readiness. Non-disadvantaged students who were kindergarten-ready reached 78.0 percent reading proficiency. Disadvantaged students who were also kindergarten-ready reached 53.1 percent. Kindergarten readiness helps close the gap, but does not eliminate it.

Figure 4. Proficiency Rates by Economic Disadvantage Status and by Kindergarten Readiness

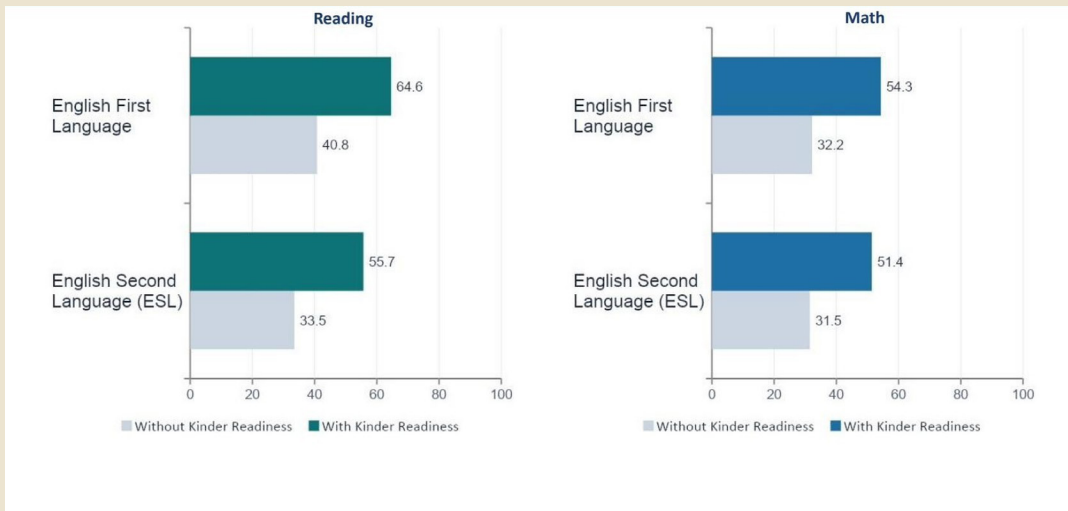


3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

Special Education and English Learners

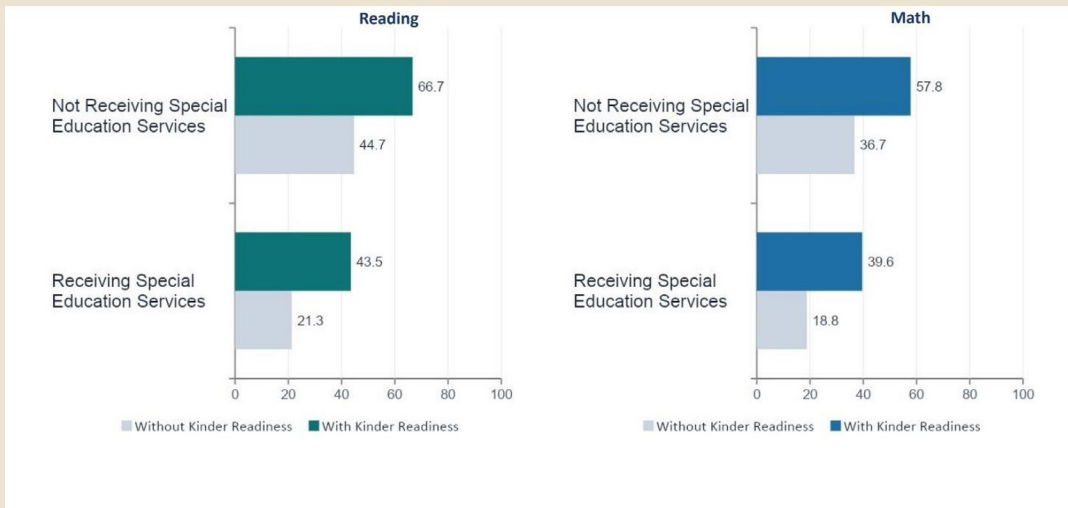
As shown in Figures 5 and 6, students receiving special education services also show strong gains from kindergarten readiness, with reading proficiency rising from 21.3 percent to 43.5 percent. English Language Learner (ELL) students saw reading proficiency rise from 33.5 percent to 55.7 percent. These findings show that kindergarten readiness is not a benefit reserved for children who are already on a strong developmental footing. It is associated with meaningful gains across a wide range of learning needs.

Figure 5. Proficiency Rates by English Learner Status and by Kindergarten Readiness



3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

Figure 6. Proficiency Rates by Special Education Status and by Kindergarten Readiness



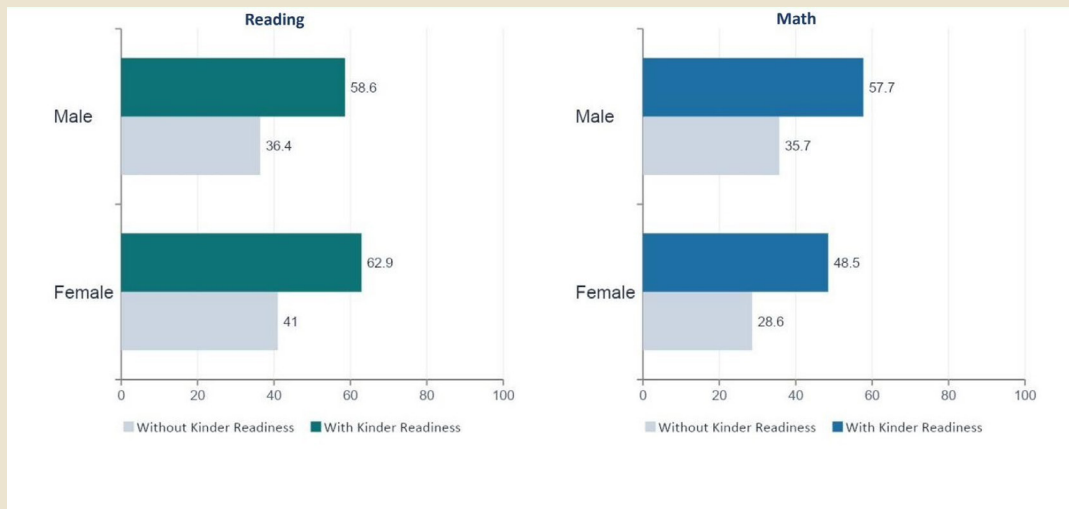
3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

Who Benefits: Subgroup Findings

Gender

As shown in Figure 7, the positive effect holds for both male and female students. Male students saw reading proficiency rise from 36.4 percent to 58.6 percent, a gain of 22.2 percentage points. Female students saw reading proficiency rise from 41.0 percent to 62.9 percent, a gain of 21.9 percentage points. Math gains were similar: 22.0 percentage points for males and 19.9 percentage points for females. Female students showed consistently higher absolute proficiency rates in reading, but the size of the kindergarten readiness effect was nearly identical across genders. This means that while girls enter third grade at a higher absolute level, boys and girls benefit equally from arriving at kindergarten ready.

Figure 7. Proficiency Rates by Gender and by Kindergarten Readiness



3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

School Mobility

As shown in Figure 8, students who changed schools frequently were less likely to reach proficiency overall, which is consistent with what researchers know about the harmful effects of school instability (Rumberger & Larson, 1998; Villarreal, 2020). However, even among students who changed schools once or twice, kindergarten readiness was associated with statistically significant gains in both reading and math. The one exception was reading for students who changed schools three or more times, where the effect was not statistically significant, likely due to the small size of that subgroup.

Figure 8. Proficiency Rates by School Mobility and by Kindergarten Readiness



Reading effect for students who changed schools 3+ times is not statistically significant ($p = 0.28$), likely due to small cell size. Math effect for this group is significant at $p < 0.001$. All other effects $p < 0.001$.

The Assessment Does Not Drive the Result

Beyond who benefits, it is also worth asking whether the findings depend on how readiness is measured. The study covered nine different kindergarten assessment providers used across Texas. The kindergarten readiness effect replicated across all nine. This consistency argues against the possibility that the findings are an artifact of any particular measurement tool. The effect appears robust regardless of how readiness was measured, which strengthens confidence in the overall findings.

Bexar County Findings

The statewide findings establish a clear and consistent pattern. The question for San Antonio leaders is what that pattern looks like at home. For the children of San Antonio, kindergarten readiness matters just as much as it does everywhere else in Texas. As shown in Figure 9, kinder-ready students in Bexar County were substantially more likely to achieve third-grade proficiency in reading and math. All effects were statistically significant ($p < 0.001$).

The treatment effects in Bexar County are comparable in magnitude to the statewide results. Reading proficiency rose from 30.1 percent among students who were not ready to 55.5 percent among similar students who were. Math proficiency rose as well, from 23.5 percent to 44.0 percent.

Figure 9. Proficiency Rates as Measured by STAAR: Bexar County vs. Other Texas Counties by Kindergarten Readiness



3rd grade proficiency: expected rate (gray) vs. kinder-ready rate (colored). All treatment effects statistically significant at $p < 0.001$.

Bexar County vs. the Rest of Texas

Among Bexar students who did not meet the state’s readiness standard, only 30.1 percent passed third-grade reading, compared to 39.3 percent in the rest of Texas. Both groups failed to meet the kindergarten readiness standard, yet Bexar County students trailed by nearly 10 percentage points by third grade.

For those who were identified as kindergarten ready, 55.5 percent of Bexar County children reached reading proficiency in third grade,



as compared to 61.1 percent in the rest of Texas. Though the reading proficiency gap is reduced, Bexar County still trails the rest of the state.

The pattern is the same in math. Bexar County children who were kindergarten-ready passed their third-grade math exam at a rate of 44.0 percent, compared to 53.8 percent for their counterparts elsewhere in Texas.

The treatment effect is large and statistically significant in Bexar. Yet Bexar County children appear to face a structural disadvantage that widens the gap for non-kindergarten-ready students and dampens the gains of kindergarten-ready students.

What This Means for San Antonio

Two separate problems require two separate solutions. The first is access: too few Bexar County children arrive at kindergarten ready (49.6 percent in 2025, according to TEA). Expanding access to high-quality early childhood programs serving children from birth to age three, early literacy support, and family engagement initiatives is the most direct lever available. The evidence in this study, supported by existing research, suggests that increasing the number of children who reach the readiness threshold will lead to large academic gains through third grade.

Bexar County Findings

As of 2025, 24 zip codes across Bexar County were identified as childcare deserts, areas where demand for licensed childcare far exceeds available supply, underscoring the structural barriers that limit access to quality early childhood programs before children ever reach kindergarten (Salibi et al., 2026).

The second problem is what happens after kindergarten. Even kindergarten-ready children in Bexar underperform their peers elsewhere in Texas. That gap points to structural factors within the K-3 educational environment, including instructional quality, resource allocation, and poverty and other social determinants concentrated in the communities served by Bexar County public schools. Bexar County's child poverty rate of 18.5 percent exceeds the state average, and its median household income trails the state by more than \$7,000. Resources are also inequitably distributed geographically, with West and South San Antonio consistently identified as underserved across health, early childhood, and social service domains (Salibi et al., 2026). Kindergarten readiness is necessary but not sufficient to close reading and math proficiency gaps. Targeted supports must continue after kindergarten.



Recommendations

The evidence is consistent across every subgroup, every assessment tool, and every statistical specification tested. The findings also align with research stretching back to the Perry Preschool Project, a landmark randomized experiment launched in 1962 that demonstrated that high-quality early childhood education produces lasting academic and life outcomes (Heckman et al., 2010; Schweinhart et al., 2005). This study adds to that body of evidence with local and statewide, contemporary data from Texas. Kindergarten readiness is one of the highest-leverage interventions for improving long-term student outcomes in Texas, and specifically in Bexar County. The findings point to three areas of action.

Some of these actions require state policy and investment. Others can be pursued by school districts, local governments, and community organizations today.



Expand access to quality early education. The dose-response findings displayed in Figure 1 show that every increment of kindergarten readiness improvement is associated with measurable gains in third-grade outcomes. Furthermore, more children meeting readiness benchmarks means more children reading at grade level by third grade. Closing that gap requires expanding access to high-quality early childhood programs serving children from birth to age three, strengthening early literacy support in pre-K settings, and deepening family engagement so that language and literacy development continues at home. The evidence in this study, supported by decades of research on early childhood investment, suggests that getting more children to the readiness threshold is among the highest-leverage actions available to Texas leaders at the state and local level (Campbell et al., 2001; Heckman, 2006; Shonkoff & Phillips, 2000). In Bexar County specifically, there are more subsidized childcare seats per low-income working child than the state average, yet kindergarten readiness still lags state levels, suggesting that expanding access alone is insufficient without accompanying investments in program quality (Salibi et al., 2026).



Use kindergarten data proactively. School districts can use readiness assessments not just to measure how many children arrive ready, but to identify those who need targeted K-3 support and connect them to services before they fall further behind. Current kindergarten readiness assessments (TX-KEA and mCLASS) provide actionable diagnostic information at the individual student

Recommendations



level. Districts that use that information to drive instruction and intervention in kindergarten and first grade give struggling students the best chance of reaching third-grade proficiency before the window for early intervention closes. Early screening also enables timely identification of dyslexia and other learning differences that, left unaddressed, compound into larger deficits by third grade. Texas law already requires universal dyslexia screening at the end of kindergarten and again in first grade (Texas Education Code §38.003). Ensuring that screening results translate into prompt, evidence-based intervention is the critical next step (Catts et al., 2015; Shaywitz & Shaywitz, 2020).



Pair readiness with continued support. As shown in Table 2, kindergarten readiness alone does not close persistent achievement gaps, particularly for economically disadvantaged, special education, and Black students. Early wins must be reinforced with sustained investment through third grade. Research points to four classroom strategies with strong evidence of effectiveness in the K-3 window: (1) explicit phonemic awareness instruction (Foorman et al., 2016); (2) systematic phonics instruction (Foorman et al., 2016); (3) small-group differentiated intervention through a Response to Intervention framework (Gersten et al., 2009); and (4) high-dosage tutoring by trained teachers or paraprofessionals during the school day (Nickow et al., 2024). For the large English learner population across Texas, and particularly in communities like Bexar County, all four require culturally and linguistically responsive adaptation (August & Shanahan, 2006). Addressing the structural factors that compound the challenge requires cross-sector investment beyond schools, including income support, community health services, and stable housing (Dahl & Lochner, 2012; Maier et al., 2017).

Methods & Study Design

To understand whether arriving at kindergarten ready actually causes better outcomes years later, the researcher faced a fundamental challenge: children who show up ready are not randomly selected. They tend to come from families with more resources, attend better-resourced schools, and have other advantages that independently affect academic success.

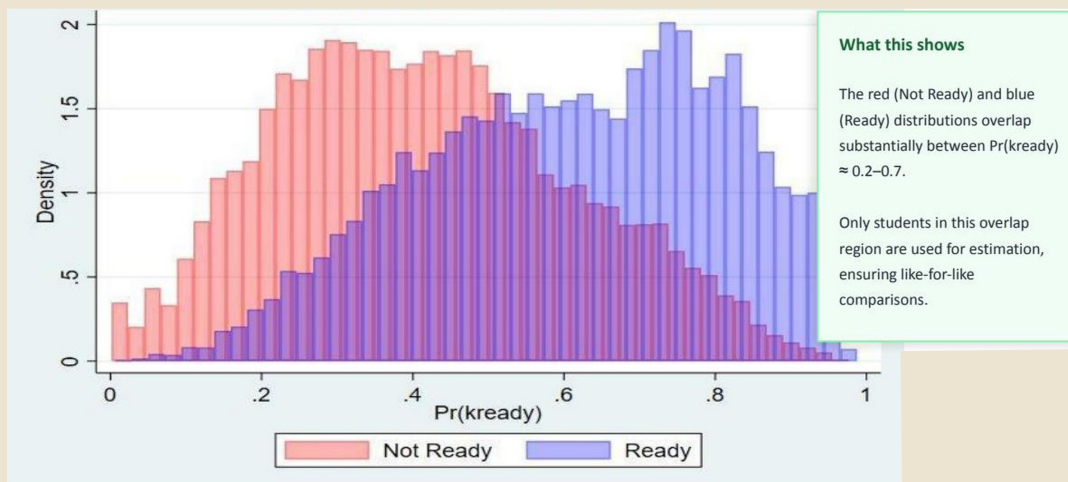
Simply comparing ready and not-ready students would confuse background advantages with the effect of readiness itself. To address this, the researcher used Augmented Inverse Probability Weighting (AIPW), a doubly robust method that combines two models: one predicting the probability of kindergarten readiness given student background characteristics, and one predicting third-grade outcomes directly. By weighting observations and augmenting with the outcome model, AIPW helps estimate the effect of readiness after accounting for race, income, gender, special education status, language background, and school (Bang & Robins, 2005; Robins et al., 1994). If at least one of the two models is correctly specified, the resulting estimate remains valid.



Methods & Study Design

Even after weighting, some students were so different from anyone in the comparison group that no valid comparison existed. Observations outside the region of common support were therefore trimmed prior to estimation (Figure 10), restricting the analysis to students for whom a valid comparison group existed and ensuring that estimates reflect comparisons rather than extrapolations (Crump et al., 2009).

Figure 10. Propensity Score Distribution and Common Support



The analysis is restricted to students whose estimated probability of being kinder-ready overlaps between groups (approximately $Pr(kready) = 0.2-0.7$), ensuring like-for-like comparisons and avoiding extrapolation beyond observed data.

Sample

The analysis drew on a random sample of 12 percent of Texas schools that had students entering kindergarten in fiscal years 2019 and 2020. All kindergartners within sampled schools with complete third-grade STAAR results and no missing background data were included. The sample spanned the entire state, covering all regions, all assessment providers, and all major student subgroups.

Kindergarten readiness was defined as meeting or exceeding established benchmarks in oral language and emergent literacy. These were measured using Texas state-approved assessment instruments. The treatment variable was binary: a student met the benchmark or did not.



Outcomes Measured

Outcomes included third-grade STAAR reading and math proficiency, and cumulative school attendance rates from kindergarten to third grade. Proficiency was measured as a categorical pass/fail rate in the primary analysis. A secondary analysis examined performance on STAAR exams using a continuous standardized scale score.

Robustness Checks

The study also tested results against multiple alternative methods, including propensity score matching with varying calipers and 1:1 and 3:1 matching ratios. Results were consistent across all specifications (Austin, 2011; Rubin, 1974; Stuart, 2010). The consistency of results across all these approaches reduces the likelihood that the findings are an artifact of any single methodological choice.

Furthermore, a dose-response analysis found that higher kindergarten readiness scores predicted progressively better third-grade outcomes in a smooth, linear pattern. This finding is consistent with a causal interpretation and difficult to explain by chance alone (Shadish et al., 2002).

Study Limitations

All observational studies share a common limitation: unmeasured confounders cannot be fully ruled out. This study relies on the assumption that all relevant confounders are captured in the data, directly or indirectly. Factors not measured, such as parental involvement, home literacy environment, and neighborhood characteristics, could influence results if they are correlated with both readiness and third-grade outcomes but not sufficiently captured by the socioeconomic and demographic variables included in the models. Sensitivity analyses show the findings are robust to moderate levels of unmeasured confounding, but estimates should be interpreted as credible causal evidence rather than certainty (Rosenbaum, 2002).

A second limitation concerns generalizability. Because the sample was drawn at the school level, results generalize most directly to students attending schools similar to those included in the sample. Readers should exercise caution when applying findings to school contexts that differ substantially from the Texas public school system, such as schools outside of Texas or private schools.

COVID-19 disrupted schooling in ways that likely affected study outcomes. During the 2020-2021 and 2021-2022 school years, students experienced varying periods of remote learning, with disruptions differing substantially across districts, campuses, and households. Because both the kindergarten-ready and not-ready groups experienced these disruptions, the internal validity of the comparisons is largely preserved. Even so, the relationships observed between kindergarten readiness and third-grade outcomes may reflect dynamics specific to pandemic-era schooling. Further research including more recent cohorts will help determine whether these relationships hold under more typical schooling conditions. At the time of this research, data on these cohorts were not available.

Appendix

Table 1. Key Statewide Findings

Average Treatment Effect (ATE) of kindergarten readiness on third grade outcomes, full Texas sample. Treatment and control rates represent the expected proficiency rate with and without kindergarten readiness, respectively.

Outcome	Without Kindergarten Readiness	With Kindergarten Readiness	Treatment Effect	Significance
3rd Grade Reading Proficiency	38.7%	60.7%	+22 pp	$p < 0.001$
3rd Grade Math Proficiency	32.1%	53.1%	+21 pp	$p < 0.001$
3rd Grade Attendance Rate	94.0%	94.8%	+0.78 pp	$p < 0.001$

Source: Texas Education Research Center (ERC). Analysis by Villarreal (2026) using AIPW. FY 2019-2020 cohorts. pp = percentage points.



Table 2. Subgroup Findings Summary

Third grade reading and math proficiency rates by student subgroup, comparing students without kindergarten readiness (control) and with kindergarten readiness (treatment). All effects statistically significant at $p < 0.001$ unless otherwise noted.

Subgroup	Category	Reading: Without	Reading: With	Math: Without	Math: With	Sig.
Race / Ethnicity	Hispanic	32.7%	55.5%	27.6%	48.2%	***
	Black	26.7%	45.4%	16.2%	33.0%	***
	White	51.2%	71.5%	43.5%	64.9%	***
	Asian	61.9%	85.3%	60.0%	83.7%	***
Economic Status	Econ. Disadv.	30.6%	53.1%	24.9%	45.1%	***
	Not Disadv.	56.7%	78.0%	48.3%	70.7%	***
Special Ed.	Receiving SpEd	21.3%	43.5%	18.8%	39.6%	***
	Not Receiving	44.7%	66.7%	36.7%	57.8%	***
ESL Status	English First	40.8%	64.6%	32.2%	54.3%	***
	ESL	33.5%	55.7%	31.5%	51.4%	***
Gender	Male	36.4%	58.6%	35.7%	57.7%	***
	Female	41.0%	62.9%	28.6%	48.5%	***
Geography	Bexar County	30.1%	55.5%	23.5%	44.0%	***
	Other Texas	39.3%	61.1%	32.7%	53.8%	***

Source: Texas Education Research Center (ERC). Analysis by Villarreal (2026) using AIPW. FY 2019-2020 cohorts. *** $p < 0.001$. Bold values indicate treatment (with kindergarten readiness) rates. Estimates for Native American, Pacific Islander, and other subgroups are not reported due to insufficient sample sizes.



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About This Study

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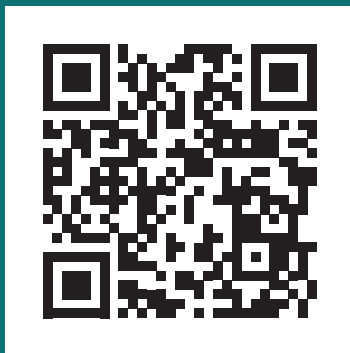


Notes

Kindergarten Readiness Drives Third Grade Success

Evidence from a causal
inference study using
observational data of Texas
Kindergartners and Their
Third Grade Outcomes

Michael Villarreal, PhD, CML Insight
Funded by Early Matters San Antonio
and UP Partnership
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