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# EVALUATION REPORT

***A Cross-sectional Study Exploring the Impact of Hurricane Harvey on Student Outcomes and School Finance in Houston ISD and Surrounding School Districts***

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**Abstract**

*Recurrent catastrophic weather events on the Texas Gulf Coast led to the need to explore how Hurricane Harvey affected PK-12 education in the geographical area. Consequently, changes in student demographic characteristics and academic outcomes were correlated with 2018–2019 NERD$ finance data for Houston ISD and surrounding school districts. The study found that enrollment decreased at 10 out of the 21 school districts included in this evaluation pre-to-post Hurricane Harvey. The highest negative change occurred in Pasadena ISD (-5.3%) and the highest positive change was evident in Tomball ISD (+13.6%). While enrollment of Black, Hispanic, and homeless students did not increase significantly, there was a statistically significant decrease in the mean number of White students enrolled in the targeted school districts over time ($M = 8565.05$ vs. $M = 8355.57$, $t = 2.330$; Mean diff. = 209.476, $p. = .030$). No significant associations were found between per-pupil expenditures and academic outcomes; however, there was a strong, positive association between the change in reading and math passing rates, $r = .863$, $n = 21$, $p < .000$, pre-to post Hurricane Harvey. Houston ISD served as a proxy to analyze the data at the campus level. Pearson correlation found that the higher the campus average per-pupil expenditure for Houston ISD, the lower the change in enrollment and attendance (strong, negative association). Linear regression indicated that change in the attendance rate pre-to- post Hurricane Harvey made the strongest unique contribution toward explaining per-pupil expenditures in Houston ISD, $R2 = .219$, $F(6, 215) = 9.795$, $p < .0001$. Logistic regression revealed the odds that changes occurred in student enrollment, attendance, and the percentage of economically-disadvantaged students was less likely for Houston ISD campuses with per-pupil expenditures at or above the district average.*

## Background

The Houston Independent School District (Houston ISD) is the largest school district in Texas and the eighth largest in the nation, covering 333 square miles within the Greater Houston area. During the 2020–2021 academic year, Houston ISD was comprised of 276 campuses and a diverse population of 209,772 students. The Vision of the district is that "every child shall have equitable opportunities and equal access to an effective and personalized education in a nurturing and safe environment" (Houston ISD, 2021).

Over the years, Southeast Texas, along the Gulf Coast, has been greatly impacted by catastrophic weather events, including hurricanes Rita, Ike, and Harvey (Emanual, 2017; Hoeppe, 2016, National Weather Service, 2017) (**Figure 1**). These events have negatively influenced whether students continue their education, how they are educated, and their academic trajectories as they progress through school (Kousky, 2016; Petal, 2008; Ross & Clay, 2018; SAMHSA, 2017). Minority and economically-disadvantaged students are often the hardest hit by natural disasters, leading to the economic downfall of their communities (Hallegatte et al., 2017; National Academy of Science, 2019).

School funding is driven by average daily attendance (ADA); therefore, school districts with large numbers of displaced students during natural disasters, struggle to provide the quality education that at-risk students need

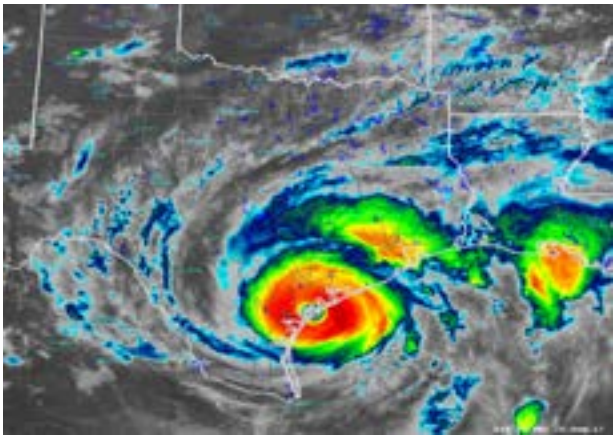

**Figure 1:** Hurricane Harvey, National Weather Service, 2017

**Figure 2:** Hurricane Harvey impacted students, *Project aDOORe Houston*. (**To view video, click the photo or use the following link: https://vimeo.com/247195641)**

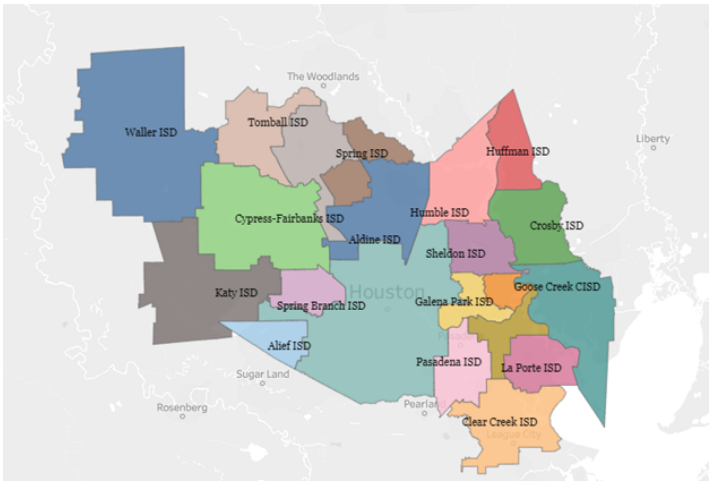


**Figure 3:** Houston ISD and 20 surrounding districts, 2020–2021 (**Click map to view the dashboard.**)

to be academically successful (Levin, 1989; OECD, 2012). The number of students enrolled, students' demographic characteristics, and a school's participation in special programs are key factors that influence school funding. Subsequently, when students miss school, they not only decrease their learning opportunities, but they also decrease the school's budget for the year. If a school has a 100% average daily attendance (ADA), it will receive 100% of its basic budget allocation. A lower ADA means a lower budget allocation (Texas Education Agency, 2021). Following Hurricane Harvey, schools made efforts to engage students to increase attendance, in order to maximize school funding. For example, **Figure 2** shows students creating an art project using doors from Hurricane Harvey affected homes. Student artists were enrolled in 25 of the most impacted campuses in Houston ISD.

## Purpose

This study explored the impact of Hurricane Harvey on student outcomes and school finance in Houston ISD and 20 surrounding school districts. Hurricane Harvey, the natural disaster of interest, was a Category 4 storm that made landfall on the Texas Gulf Coast in August 2017, which was the 2017–2018 academic year. A narrative report as well as a Tableau dashboard were developed to communicate study findings. Selecting the school districts in the dashboard's map controls the dashboard and highlights specific outcome measures under investigation. ***To view the dashboard, click Figure 3 or use the following link: https://public.tableau.com/views/ACross-sectionalNERDStudyonHurricaneHarvey/FinalNERDHoustonISDDashboard2021?:language=en-US&:display_count=n&:origin=viz_share_link***

The National Education Resource Database on Schools (NERD$) provided 2018–2019 school finance data, which allowed for the investigation of changes in student outcome that occurred the year before Hurricane Harvey (2016–2017) and the year after the event (2018–2019). NERD$ is a joint effort by Edunomics Lab and the Massive Data Institute at Georgetown University that provides year-over-year school spending data required by the Every School Succeeds Act (ESSA) (Edunomics Lab, 2021). This project was funded by a Edunomics Lab/ Massive Data Institute at Georgetown University mini-grant.

| Table 1: Houston ISD and Surrounding School Districts | | |
|---|---|---|
| Aldine ISD | Galena Park ISD | La Porte ISD |
| Alief ISD | Goose Creek CISD | Pasadena ISD |
| Channelview ISD | **Houston ISD** | Sheldon ISD |
| Clear Creek ISD | Huffman ISD | Spring Branch ISD |
| Crosby ISD | Humble ISD | Spring ISD |
| Cypress-Fairbanks ISD | Katy ISD | Tomball ISD |
| Deer Park ISD | Klein ISD | Waller ISD |

**Research Questions**:

1. What was the impact of Hurricane Harvey on enrollment and attendance in Houston ISD and surrounding school districts?
2. Did Hurricane Harvey affect students' demographic characteristics in targeted school districts?
3. To what extent was school finance influenced by attendance and enrollment pre- and post-Hurricane Harvey?
4. What was the affect of Hurricane Harvey on academic outcomes in Houston and surrounding school districts?
5. What was the association between change in academic outcomes before and after Hurricane Harvey and school finance for the 2018–2019 academic year?
6. How well did change in enrollment, attendance, economic status, and academic outcomes predict per-pupil expenditures in Houston ISD?

## Methods

### Study Population

The target population is Houston ISD and 20 surrounding school districts. The geographical location of the school districts are mapped in **Figure 3** and listed in **Table 1**. School districts in the study were, predominately, located west of Houston ISD, and closer to the Texas Gulf Coast relative to other school districts in the area.

### Data Collection and Analyses

Data for this study were extracted from multiple sources. Specifically, the NERD$ database (dated June 2021) was used to gather school finance data for the 2018–2019 academic year. While NERD$ continues to update files, the June 2021 file was available when data collection was initiated. Finance data included school-level total per-pupil expenditures. A district average

per-pupil expenditure was calculated for each school district in the study by adding the per-pupil expenditures for each school in the district and dividing by the number of students enrolled in the district. Further, the number and percentage of schools with per-pupil expenditures at or above the district average were computed and analyzed in the study. Finally, student enrollment and grade span data were extracted from the NERD$ database.

The Texas Academic Performance Reports (TAPR) provided demographic characteristics of the student population at each school district, including race/ethnicity and gender. Social factors captured in the study were the proportion of students who were homeless, economically disadvantaged, and "at risk" of dropping out of school. Characteristics related to program placement, included English learners and special education identification. The Public Education Information Management System (PEIMS) provided demographic characteristics of Houston ISD students at the school-level.

The dependent variables for the study were district-level and Houston ISD student-level average per-pupil expenditures. The independent variables were enrollment, attendance rates, and the percentage of students who met the passing standards in reading, mathematics, and science on the state-mandated State of Texas Assessments of Academic Readiness (STAAR®). Changes in outcomes from pre- to post-Hurricane Harvey were also independent variables, and were represented as percentage change or percentage-point differences. Students' demographic characteristics were used as control variables.

Paired samples t-test were conducted to evaluate pre- to post-Hurricane Harvey changes over time. The level of statistical significance was $p < .05$ (two-tailed tests). Correlational analyses examined the linear relationships between variables. The guidelines for interpretation of coefficient interval relationships were: 0.00 – 0.10 (negligible), 0.10 - 0.39 (weak), 0.40 - 0.69 (moderate), 0.70 - 0.89 (strong), and 0.90 - 1.00 (very strong). Cohen's d effect size analyses assessed the strength of the relationship between variables. Cohen's d interpretation was: small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) (Cohen, 1988). Linear regression was used to predict the dependent variable based on independent and control variables in the study.

**Study Limitations**

There were several limitations to the study. Foremost, differences in how finance data were captured by school districts may have led to inconsistencies in reporting to NERD$. In addition, analyses at the district-level may not have fully disclosed the equitable distribution of funds, while the use of school-level data may not have completely revealed whether students received the same level of resources to produce comparable student outcomes (National Center for Education Statistics, 1996). Neither district nor school-level data accounted for non-district resources that may have been used at the school level (Roellke, 1994). Finally, Hurricane Harvey may have affected student attendance rates, and the number of days may have varied by school district. To mitigate these limitations, the study methodology explored how school districts performed at or above their corresponding district average. Further, school-level analyses, using Houston ISD, served as a proxy to understand more about how the allocation of per-pupil expenditures affected student-level outcomes. Moreover, the evaluation involved investigating change before and after Hurricane Harvey. These procedures allowed for a more stable measurement system relative to assessing associations and impact.

**Review of the Literature**

Sufficient funding is vital for providing a quality education to prekindergarten to twelfth-grade students in public U.S. schools (Baker & Chingos, 2019; Condron, & Roscigno, , 2003; Slavin, 1999). However, natural disasters often disrupt the education funding system, resulting in displaced students who strain school resources due to lack of re-enrollment, poor attendance, mental health problems, and academic deficits (Pane, McCaffrey, Kalra, & Zhou, 2008). Inadequate school funding limits the ability to hire qualified staff, alters class sizes, and restricts the ability to purchase support services for impacted students. This is, particularly troubling, given that students from disadvantaged backgrounds tend to require more resources than their more affluent peers to achieve the same level of educational outcomes (Baker, Di Carlo, & Weber, 2020).

A historical perspective on the issue reveals that the primary source of federal kindergarten through twelfth-grade financial support began in 1965 with the enactment of the Elementary and Secondary Education Act (ESEA) (U.S. Department of Education Facts, 2005). Under this act, school districts that enrolled more low-income students received additional funding. Over the years, researchers have documented the impact of ESEA through the Annual Survey of School System Finances. It was noted that, per-pupil spending for grades prekindergarten through twelve, for all 50 states and the District of Columbia, increased by 5.0% ($13,187 during the 2019 fiscal year compared to $12,559 per pupil in 2018). This was, primarily, due to an overall increase in revenue, which was the largest increase in more than a decade (U.S. Census Bureau, 2019). The report revealed that the ranking of many of the school districts in the study population fell among the top 100 public school systems (based on enrollment) that spent the most per pupil in FY 2019 (U.S. Census Bureau, 2019), during the year of Hurricane Harvey. Houston ISD ranked 8th, Cypress-Fairbanks ISD - 21st, Katy ISD - 43rd , Fort Bend - 46th, Aldine ISD - 59th, Conroe ISD - 65th, Klein ISD - 79th, and Pasadena ISD ranked 80th among the top 100 school districts. Considering that per-pupil expenditures may have been affected by Hurricane Harvey, it should be expected that lower per-pupil expenditures will correlate with poorer outcomes for children, particularly from low-income families (Krueger, 1998).

Further, natural disasters may lead to inequalities in financial resources, thus, becoming a key contributor to achievement gaps among affected schools across neighborhoods, socioeconomic status, and race/ethnicity (Jackson, Johnson, & Persico, 2016). Research conducted by Jackson, Johnson, and Persico (2016) found that a 25% increase in per-pupil spending throughout the school-age years could eliminate achievement gaps between children from low-income and more affluent families and improve the adult labor market outcomes for low-income children. While research conducted on 32 community school districts across the U.S. found that budgets per pupil were distributed such that high-poverty districts received higher per pupil amounts, expenditures per pupil showed the opposite relationship (U.S. Department of Education, 1996). In contrast, Baker, Di Carlo, and Weber (2019) found that "higher-poverty districts do not receive more funds and in some cases receive substantially less than do lower-poverty districts, even controlling for factors that affect

costs, such as regional wage variation, district size, and population density" (p.1).

Many high-poverty schools are constantly dealing with high numbers of truant and chronically-absent students (Knoff, 2021). Natural disasters, such as Hurricane Harvey, may exacerbate the school attendance problem due to homelessness and loss of family resources. Schools may struggle to increase attendance rates knowing that chronic absenteeism contributes to students' lack of educational progress (Railback, 2004) and achievement (Caldas, 1993; Lamdin, 1996; Johnston, 2000, Roby, 2003; Dobkin, Gil & Marion, 2010). An exploration of these issues may add to the body of research on the impact of natural disasters in communities.

## What was the impact of Hurricane Harvey on enrollment and attendance in Houston ISD and surrounding school districts?

**Table 2** shows student enrollment in Houston ISD and surrounding school districts pre- and post-Hurricane Harvey. Student enrollment decreased at 10 out of 21 school districts included in this evaluation. Houston ISD experienced the highest decline in enrollment by 6,334 students (-2.9%), while Katy ISD had the highest increase in enrollment by 5,485 students (+7.4%). However, the highest negative percentage change in enrollment occurred at Pasadena ISD by -5.3%, while the highest positive percentage change in enrollment was at Tomball ISD by +13.6%.

A paired samples t-test was conducted to evaluate the impact of Hurricane Harvey on enrollment. There was a decrease in enrollment pre- (M = 42,939; SD = 48,695.67) to post-Hurricane Harvey (M = 42,886.33; SD = 47,725.57), t (21) = .105, p = .918 (two-tailed test). The mean decrease in enrollment was 52.714 students, with a 95% confidence interval ranging from -995.966 to 1101.395. The decrease in enrollment was not statistically significant. The Cohen's d statistic (0.022) indicated a negligible effect size.

Attendance rates pre- and post-Hurricane Harvey are shown in **Appendix A** (p. 11). Katy ISD had the highest attendance rate pre- and post-Hurricane Harvey (96.7% and 96.5%, respectively). In contrast, Spring ISD had the lowest attendance rate pre- and post-Hurricane Harvey (93.8% vs. 93.6%). The attendance rate at Houston ISD dropped by two percentage points, from 95.5% to 95.3% over the same time period.

Change in attendance rates is reflected in **Figure 4 (**p. 5**)**. Channelview ISD had the largest change in attendance rates from pre- to post-Hurricane Harvey by +0.9 percentage points, followed by Sheldon ISD, by +0.8 percentage points. Alief, Tomball, and Waller ISDs had no change in attendance rates. At the same time, Clear Creek and Galena Park ISDs had negligible decreases in attendance rates by -0.1 percentage points for both school districts.

A paired samples t-test was conducted to evaluate the impact of Hurricane Harvey on attendance (**Table 3**, p. 5). There was a statistically significant decrease in the attendance rate from pre- (M = 95.505; SD = .6689) to post-Hurricane Harvey (M = 95.243; SD = .7500), t (21) = -4.428, p = .000 (two-tailed test). The mean decrease was -.2619, with a 95% confidence interval ranging from -.1385 to .3853. The Cohen's d statistic (0.380) indicated a small effect size.

## Did Hurricane Harvey affect students' demographic characteristics in targeted school districts?

**Table 2: Student Enrollment by School District, Pre (2016–2017) vs. Post-(2018–2019) Hurricane Harvey**

| | Pre-Hurricane Harvey | Post-Hurricane Harvey | (N) Change | % Change |
|---|---|---|---|---|
| School District | Enrollment 2016–2017 | Enrollment 2018–2019 | 2016–2019 | 2016–2019 |
| Aldine ISD | 69,768 | 66,854 | -2,914 | -4.2 |
| Alief ISD | 46,376 | 45,436 | -940 | -2.0 |
| Channelview ISD | 9,529 | 9,593 | 64 | +0.7 |
| Clear Creek ISD | 41,819 | 42,205 | 386 | +0.9 |
| Crosby ISD | 5,992 | 6,331 | 339 | +5.7 |
| Cypress-Fairbanks ISD | 114,868 | 116,512 | 1,644 | +1.4 |
| Deer Park ISD | 13,185 | 12,937 | -248 | -1.9 |
| Galena Park ISD | 22,784 | 22,289 | -495 | -2.2 |
| Goose Creek CISD | 23,926 | 23,837 | -89 | -0.4 |
| **Houston ISD** | **216,106** | **209,772** | -6,334 | -2.9 |
| Huffman ISD | 3,443 | 3,546 | 103 | +3.0 |
| Humble ISD | 41,224 | 43,553 | 2,329 | +5.6 |
| Katy ISD | 74,428 | 79,913 | 5,485 | +7.4 |
| Klein ISD | 51,810 | 53,328 | 1,518 | +2.9 |
| La Porte ISD | 7,713 | 7,384 | -329 | -4.3 |
| Pasadena ISD | 56,282 | 53,291 | -2,991 | -5.3 |
| Sheldon ISD | 8,884 | 9,401 | 517 | +5.8 |
| Spring Branch ISD | 35,079 | 34,681 | -398 | -1.1 |
| Spring ISD | 36,698 | 35,385 | -1,313 | -3.6 |
| Tomball ISD | 14,932 | 16,962 | 2,030 | 13.6 |
| Waller ISD | 6,874 | 7,403 | 529 | 7.7 |

Data Source: NERD$; Paired samples t-test results yielded - Pre: M = 42,939; SD = 48,695.67; Post: M = 42,886.33; SD = 47,725.57; Mean Diff. = 52.714; t = .105; p = .918

The extent to which Hurricane Harvey affected students' demographic characteristics in Houston ISD and surrounding districts was explored in this study. District-level data, including the number and percentage of students by gender and race/ethnicity for each school district, are presented in **Appendix B** for the 2016–2017 and the 2018–2019 academic years (pps. 12–13, respectively). In addition, comparable data for students coded as special education, English language learners, "at risk" of dropping out of school, homeless, and economically-disadvantaged are shown in **Appendix C** (pps. 14–15). Finally, changes in these characteristics were investigated for the years pre- and post-Hurricane Harvey (2016–2017 vs. 2018–2019).

### Race/Ethnicity

Students in all school districts were predominately Hispanic, African American, and White pre- and post-Hurricane Harvey. However, Humble ISD experienced the largest positive change in the percentage of African American students by +2.6% (Appendix B, pps. 12–13). The percentage of Hispanic students increased by 5.4% in Crosby ISD and decreased by 4.0% in Pasadena ISD. Over the same time period, the percentage of White students increased by 6.8% in Channelview ISD and decreased by 3.6% in Deer Park ISD and La Porte ISD.

Paired t-tests were conducted to determine whether the change in the racial/ethnic composition of students in Houston ISD and the surrounding school districts was statistically significant. The results are shown in **Table 4** (p. 5). There was a statistically

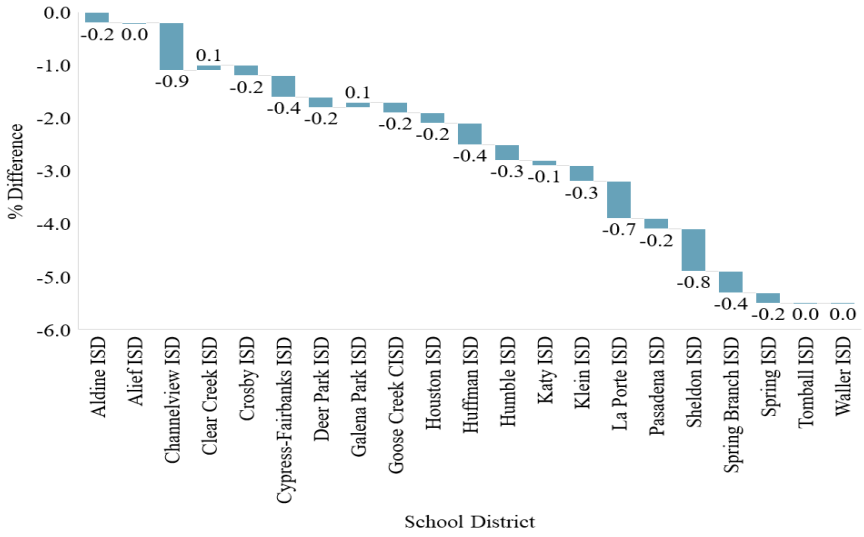


**Figure 4:** Percent difference, attendance rates, 2016–2017 vs. 2018–2019 (Data Source: TAPR)

*Project aDOORe* Hurricane Harvey display, 2017

**Table 3: Attendance Rates, Dependent Samples T-test, Pre (2016–2017) vs. Post- (2018–2019) Hurricane Harvey**

| | Attendance Rates | |
|---|---|---|
| | **Pre** | **Post** |
| N | 21 | 21 |
| Mean | 95.51 | 95.24 |
| SD | .6689 | .7500 |
| Mean Diff. | -.2619 | |
| t | -4.428 | |
| Sig. | .000*** | |
| Cohen's d | 0.380 | |
| Data Source: TAPR; 2-tailed test; *** p < .0001, ** p < .001, *p < .05 | | |

**Table 4: Race/Ethnicity Profile, Dependent Samples T-test, Pre (2016–2017) vs. Post- (2018–2019) Hurricane Harvey**

| | African American | | Hispanic | | White | |
|---|---|---|---|---|---|---|
| | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| N | 21 | 21 | 21 | 21 | 21 | 21 |
| Mean | 7702.00 | 7701.05 | 23151.05 | 23146.76 | 8565.05 | 8355.57 |
| SD | 11663.71 | 11204.37 | 29660.93 | 28640.17 | 9139.34 | 8975.39 |
| Mean Diff. | -.952 | | -4.286 | | -209.476 | |
| t | -.005 | | -.014 | | -2.330 | |
| Sig. | .996 | | .989 | | .030* | |
| Cohen's d | 0.000 | | 0.000 | | 0.023 | |
| Data Source: TAPR; 2-tailed test; *** p < .0001, ** p < .001, *p < .05 | | | | | | |

**Table 5: Social Factors, Dependent Samples T-test Pre (2016–2017) vs. Post- (2018–2019) Hurricane Harvey**

| | Homeless | | Economically Disadvangaged | | At Risk+ | |
|---|---|---|---|---|---|---|
| | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| N | 21 | 21 | 21 | 21 | 21 | 21 |
| Mean | 570.52 | 615.48 | 26110.95 | 27199.38 | 23817.33 | 23746.43 |
| SD | 1003.89 | 1358.60 | 36514.80 | 36765.78 | 31459.85 | 30028.13 |
| Mean Diff. | 44.952 | | 1088.43 | | -70.91 | |
| t | .490 | | 2.996 | | -.113 | |
| Sig. | .630 | | .007** | | .911 | |
| Cohen's d | 0.038 | | 0.030 | | .002 | |
| Data Source: TAPR; 2-tailed test; *** p < .0001, ** p < .001, *p < .05; + at-risk of dropping out of school | | | | | | |

significant decrease in the mean number of White students enrolled in the targeted school districts pre- to post-Hurricane Harvey (M = 8565.05, SD = 9139.34) vs. (M = 8355.57, SD = 8975.39), t (21) = -2.330, p. = .030 (two-tailed test). Cohen's d (0.023) indicates the difference is negligible, although it is statistically significant.

### Homeless

Most school districts had minimal change in the percentage of students classified as homeless pre- and post-Hurricane Harvey (Appendix C, pps. 14–15). The largest change occurred at Crosby ISD (+1.1%), followed by Houston ISD (+0.9%). In contrast, Alief ISD had the largest decrease in students classified as homeless (-1.2%). Paired t-tests revealed that, while the mean number of homeless students increased, the difference was not statistically significant (M = 570.52, SD = 1003.89) vs. (M = 615.48, SD = 1358.60), t (21) = .490, p = .630 (two-tailed test) (**Table 5**).

### Economically Disadvantaged

Pasadena ISD had the largest positive change in the percentage of economically disadvantaged students (+8.5%), followed by Deer Park ISD and Galena Park ISD (+5.3% and +5.2%, respectively) (Appendix C, pps. 14–15). Huffman ISD was the only school district that posted a negative change for this student group (-0.2%). Table 5 reveals that the increase in the number of economically-disadvantaged students was statistically significant pre- to post-Hurricane Harvey (M = 26110.95, SD = 36514.80) vs. (M = 27199.38, SD = 36765.78), t = 2.996, p = .007 (two-tailed test). Cohen's d (0.030) reveals the difference is negligible, although it is statistically significant.

### "At Risk" of Dropping Out of School

Analyses were conducted to determine how "at risk" students were impacted in the targeted school districts by Hurricane Harvey.

| Table 6: Program Placement, Dependent Samples T-test, Pre (2016–2017) vs. Post- (2018–2019) Hurricane Harvey | | | | |
|---|---|---|---|---|
| | Special Education | | English Learners | |
| | Pre | Post | Pre | Post |
| N | 21 | 21 | 21 | 21 |
| Mean | 3486.52 | 3797.67 | 10427.00 | 10378.24 |
| SD | 3604.40 | 3816.92 | 15091.25 | 14504.72 |
| Mean Diff. | 311.143 | | -48.762 | |
| t | 3.954 | | -.297 | |
| Sig. | .001** | | .769 | |
| Cohen's d | 0.084 | | 0.003 | |
| Data Source: TAPR; 2-tailed test; *** p < .0001, ** p < .001, *p<.05 | | | | |

Cypress-Fairbanks ISD had the largest positive change in "at risk" students (+6.0), followed by Pasadena ISD (+3.9) (Appendix C, pps. 14–15). In contrast, Spring ISD had the largest negative change in the percentage of "at risk" students (-6.3%), followed by Klein ISD (-5.5%). Table 5 (p. 5) shows that there was no statistically significant difference in the mean number of "at-risk" students pre- to post-Hurricane Harvey (M = 23817.33, SD = 31459.85) vs. M = 23746.43, SD = 30028.13), t (21) = -.113, p = .911 (two-tailed test).

**Special Education**

Relative to special education identification, Huffman ISD and Katy ISD had the largest positive change in the percentage of special education students (+1.9%), followed by Waller ISD (+1.4%). Tomball ISD was the only school district with a negative change in the percentage of special education students pre- to post-Hurricane Harvey (-0.1%). **Table 6** reveals that the increase in the number of special education students was highly statistically significant pre- to post-Hurricane Harvey (M = 3486.52, SD = 3604.40) vs. (M = 3797.67, SD = 14504.72), t (21) = 3.954, p = .001 (two-tailed test). Cohen's d (0.084) denotes the difference as negligible, although statistically significant.

**English learners**

Channelview ISD had the highest positive change in the percentage of English learners (3.1%), followed by Sheldon ISD (+2.8%) pre- to post-Hurricane Harvey. At the same time, Pasadena ISD had the highest negative change in English learners (-1.2%). Table 6 reveals that there was no statistically significant difference in the number of English learners pre- to post-Hurricane Harvey (M = 10427.00, SD = 15091.25) vs. (M = 10378.24, SD = 14504.72), t (21) = -.297, p = .769 (two-tailed test).

## To what extent was school finance influenced by attendance and enrollment pre- and post-Hurricane Harvey?

School finance data post-Hurricane Harvey is shown in **Figure 5**, which include the district average per-pupil expenditure post-Hurricane Harvey (2018–2019). Districts were also grouped in quartiles based on the number of schools in each district that fell at or above the district average per-pupil expenditure (**Table 7**, p. 7). The grouped data provides a format to explore funding inequalities among the districts.

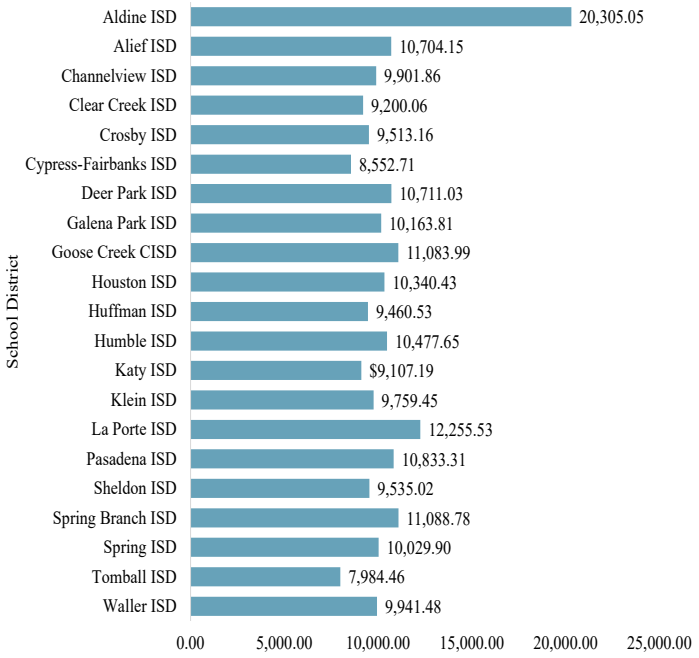


**Figure 5:** District average per-pupil expenditure data, 2018–2019 (Data Source: NERD$)

No observable trends relative to enrollment and per-pupil expenditures were found in the data. Specifically, Figure 5 reveals that Aldine ISD had the highest, while Tomball ISD had the lowest district average per-pupil expenditure ($20,305.05 vs. $7,984.46), compared to $10,340.43 for Houston ISD, which had the highest enrollment among the districts. Further, Houston ISD, which enrolled over 200,000 students fell in Quartile 2, while Cypress-Fairbanks ISD, with the second highest enrollment, fell in Quartile 4 for per-pupil spending (**Table 7**, p. 7). Huffman ISD has the lowest enrollment (3,443 students) and fell in Quartile 1, while Crosby ISD had the second lowest enrollment (6,331 students), but fell in Quartile 4.

The relationship between change in enrollment and attendance post-Hurricane Harvey and per-pupil expenditures was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. The results are presented in **Table 8** (p. 7). There was a medium, negative correlation between the percent of schools at or above the district average per-pupil expenditure and change in enrollment pre-post Hurricane Harvey, r = -.510, n = 21, p < .036. In addition, there was a medium, negative relationship between attendance change and percent of schools at or above the district average pre-post Hurricane Harvey, r = -.471, n = 21, p < .031. In other words, the higher the percent of schools at or above the district average per-pupil expenditures, the lower the change in enrollment and attendance pre-post Hurricane Harvey.

Houston ISD was used as a proxy to examine the relationship between change in enrollment and attendance post-Hurricane Harvey and per-pupil expenditures based on school-level data (**Table 9**, p. 7). The Pearson product-moment correlation coefficient found a strong, negative correlation between campus average per-pupil expenditures and change in enrollment pre-post Hurricane Harvey, r = 1.301, n = 269, p < .000. In addition, there was a strong, negative relationship between campus average

| Table 7: Number and Percent of Schools At or Above District Average Per-pupil Expenditure, Post-Hurricane Harvey, 2018–2019 | | | | |
|---|---|---|---|---|
| | Post-Hurricane Harvey, 2018-2019 | | | |
| School District | Total Number Of Schools | At or Above District Average | % Schools At or Above District Average | |
| | N | n | % | Quartile |
| Alief ISD | 44 | 5 | 11.4 | 1 |
| Huffman ISD | 4 | 1 | 25.0 | |
| Klein ISD | 49 | 17 | 34.7 | |
| Deer Park ISD | 13 | 5 | 38.5 | |
| Waller ISD | | | | |
| La Porte ISD | 13 | 5 | 38.5 | |
| Goose Creek CISD | 28 | 11 | 39.3 | 2 |
| Houston ISD | 274 | 115 | 42.0 | |
| Aldine ISD | 80 | 34 | 42.5 | |
| Clear Creek ISD | 45 | 20 | 44.4 | |
| Sheldon ISD | 11 | 5 | 45.5 | |
| Tomball ISD | 19 | 9 | 47.4 | 3 |
| Humble ISD | 44 | 21 | 47.7 | |
| Spring ISD | 39 | 19 | 48.7 | |
| Channelview ISD | 12 | 6 | 50.0 | |
| Galena Park ISD | 23 | 12 | 52.2 | |
| Cypress-Fairbanks ISD | 86 | 46 | 53.5 | 4 |
| Pasadena ISD | 67 | 37 | 55.2 | |
| Crosby ISD | 9 | 5 | 55.6 | |
| Katy ISD | 66 | 37 | 56.1 | |
| Spring Branch ISD | 46 | 26 | 56.5 | |
| Data Source: NERD$; Note: NERD$ was used to categorize school districts in quartiles and groups at or above district average. | | | | |

per-pupil expenditures and attendance change pre-post Hurricane Harvey, r = -.293, n = 267, p < .000. In other words, the higher the campus average per-pupil expenditure, the lower the change in enrollment and attendance pre-post Hurricane Harvey in Houston ISD. These school-level findings are similar to the district level findings for Houston ISD and surrounding districts combined.

## What was the affect of Hurricane Harvey on academic outcomes in Houston and surrounding school districts?

Academic outcomes of students in targeted school districts were examined using pre- and post-Hurricane Harvey state-mandated STAAR assessment results (**Appendix D**, p. 16).

| Table 8: Correlation analysis, Houston and Surrounding School Districts, 2016–2017 through 2018–2019 | | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 1. District Average Per Pupil Expenditures | - | | | |
| 2. Percent of Schools At/Above District Average Per Pupil Expenditure | -.036 | | | |
| 3. Enrollment Change | -.426* | .235 | | |
| 4. Attendance Change | -.038 | -.471* | -.006 | - |
| *Correlation is significant at p<.05 | | | | |
| Note: Coefficient interval: 0.40 - 0.599 (medium relationship) | | | | |
| Data Sources: NERD$, TAPR | | | | |

| Table 9: Correlation analysis, Houston ISD, 2016–2017 through 2018–2019 | | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 1. Campus Average Per Pupil Expenditures | 1 | | | |
| 2. Total Campus Expenditures | -.102 | 1 | | |
| 3. Enrollment Change | -.301** | .112 | 1 | |
| 4. Attendance Change | -.293** | .089 | | 1 |
| **Correlation is significant at p<.01 | | | | |
| Note: Coefficient interval: 0.40 - 0.599 (medium relationship) | | | | |
| Data Source: NERD$, PEIMS | | | | |

Notable findings were that, the passing rate on the reading subtest increased by 6.0 percentage points at Crosby ISD, which was the highest among all districts in this study (**Figure 6**), while the reading passing rate for Houston ISD and Pasadena ISD increased by 5.0 percentage points. In contrast, there was a decrease in the reading performance of students at Clear Creek ISD and Humble ISD by 1.0 percentage point.

STAAR math results are reflected in **Figure 7** (p. 8). The passing rates for students in Pasadena ISD and Sheldon ISD increased by 5.0 percentage points, while there was no change in performance at Cypress-Fairbanks ISD and Katy ISD. At the same time, there was a decrease in the math passing rates for students in Huffman ISD and Humble ISD by 3.0 percentage point. This was the highest decrease among the targeted school districts.

On the STAAR science assessment, the passing rate at Cypress-Fairbanks ISD dropped substantially by 14 percentage points, while Katy ISD and Spring ISD experienced no change in science performance (**Figure 8**, p. 8). The greatest increase was noted at Channelview ISD and Pasadena ISD (+4 percentage points).

Paired samples t-test were conducted to evaluate the impact of Hurricane Harvey on academic performance among the districts before and after the event (**Table 10**, p. 8). There was a statistically significant increase in the reading passing rate (M = 72.52; SD =

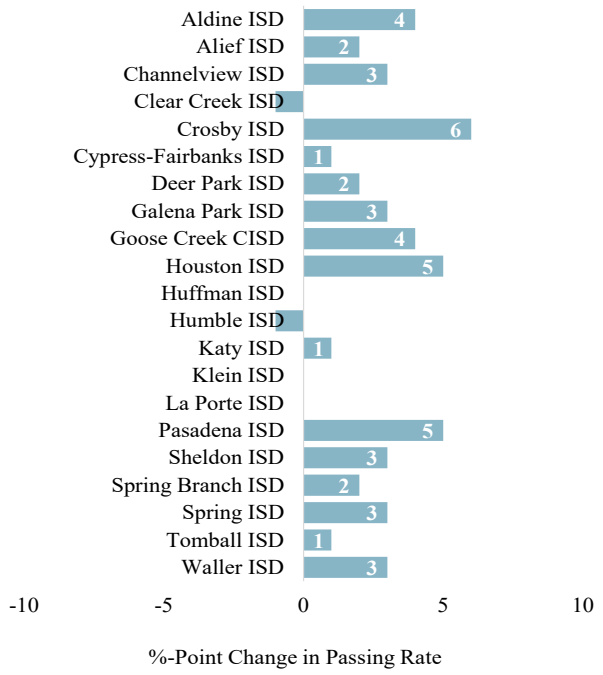


**Figure 6:** Reading results, 2016–2017 vs. 2018–2019, using TAPR

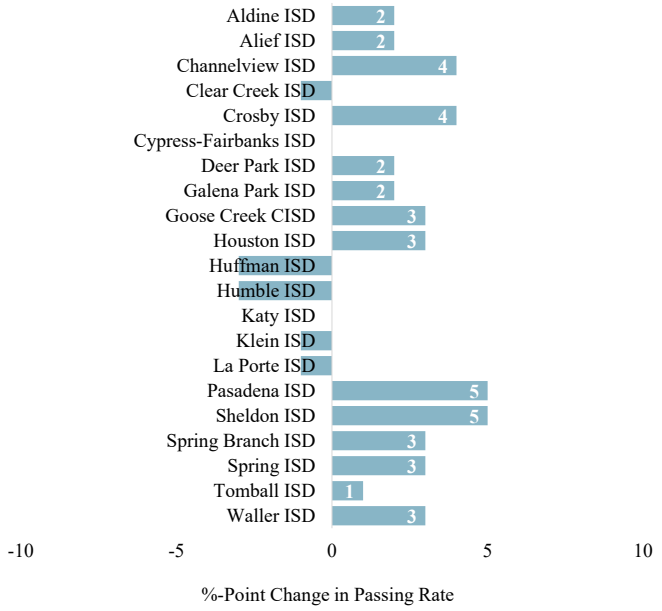


**Figure 7:** Math results, 2016–2017 vs. 2018–2019, using TAPR

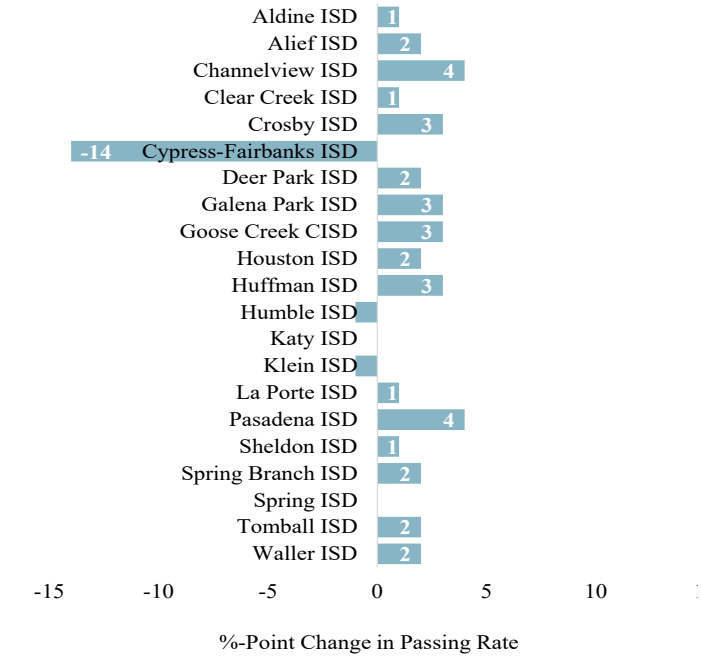


**Figure 8:** Science results, 2016–2017 vs. 2018–2019, using TAPR

8.565) vs. (M = 74.71, SD = 7.295), t (21) = 5.043, p = .000) and the math passing rate over time (M = 80.62, SD = 6.756) vs. (M = 82.19, SD = 5.845), t (21) = 1.571, p = .007 (two-tailed test). The science passing rate also increased from pre- to post-Hurricane Harvey; however, the change was not statistically significant (M = 80.43, SD = 6.997) vs. (M = 81.38, SD = 6.874), t (21) = 1.177, p = .253 (two-tailed test). The mean increase in reading was 2.190, with a 95% confidence interval ranging from -3.097 to -1.284. The mean increase in math was 1.571 (95% confidence interval from -2.654 to -.489). The mean increase in science was .952 (95% confidence interval from -2.640 to .735). The Cohen's d statistic in reading (0.275) and math (0.249) indicated a small effect.

**Table 10: Paired t-test, students' passing rates on reading, math, and science STAAR state-mandated assessment, 2016-2017 vs. 2018–2019**

| | Reading | | Math | | Science | |
|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post |
| N | 21 | 21 | 21 | 21 | 21 | 21 |
| Mean | 72.52 | 74.71 | 80.62 | 82.19 | 80.43 | 81.38 |
| SD | 8.565 | 7.295 | 6.756 | 5.845 | 6.997 | 6.874 |
| Mean Diff. | 2.190 | | 1.571 | | .952 | |
| t | 5.043 | | 3.028 | | 1.177 | |
| Sig. | .000 | | .007 | | .253 | |
| Cohen's d | 0.275 | | 0.249 | | 0.137 | |

Data Source: TAPR; 2-tailed test; *** p < .0001, ** p < .001, *p<.05

## What was the association between change in academic outcomes before and after Hurricane Harvey and school finance for the 2018–2019 school year?

The correlation between change in academic outcomes and school finance are shown in **Table 11**. The Pearson product-moment correlation coefficient found a positive correlation between district average per-pupil expenditures and change in reading, r = .250, n = 21, p < .275; math, r = .090, n = 21, p < .697; and science, r = .144, n = 21, p < .533. However, the findings were not statistically significant at p < .05 (two-tailed test). There was a strong, positive association between the change in reading and math passing rates from pre- to post-Hurricane Harvey in the targeted school districts, r = .863, n = 21, p < .000. The association revealed that the higher the change in reading passing rate, the higher the change in math passing rate.

## How well did change in enrollment, attendance, economic status, and academic outcomes predict per-pupil expenditures in Houston ISD?

Regression analyses were conducted based on Houston ISD school-level results to predict the impact of campus per-pupil expenditures. Isolating Houston ISD, with its large number of campuses, provided a more reliable, stable measure. The findings are presented in **Table 12** (p. 9). The variables that made a

**Table 11: Correlation analysis, Houston and Surrounding School Districts, 2016–2017 through 2018–2019**

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. District Average Per Pupil Expenditures | - | | | | |
| 2. Percent of Schools At/Above District Average Per Pupil Expenditure | -.036 | - | | | |
| 3. Reading Assessment Change | .250 | -.091 | - | | |
| 4. Math Assessment Change | .090 | -.062 | .863** | - | |
| 5. Science Assessment Change | .144 | -.184 | .340 | .338 | |
| *Correlation is significant at p<.05 | | | | | |

Data Sources: NERD$, TAPR; Note: Coefficient interval: 0.40 - 0.599 (medium relationship)

**Table 12: Linear Regression on the Effect of Campus Per-Pupil Expenditure and Change in Enrollment, Attendance, Economic Status, and Academic Outcomes, Houston ISD**

| | Campus Per-Pupil Expenditures | |
|---|---|---|
| Independent Variables | Beta | 95% CI |
| Attendance Change (%) | -470.383* | (-745.358, -195.407) |
| Enrollment Change (N) | -7.594* | (-7.594, -.658) |
| Economic Status Change (N) | 9.592* | (-9.592, -2.396) |
| Reading Assessment Change | -112.583*** | (-112.583, -37.332) |
| Math Assessment Change | -8.140 | (-8.140, 67.372) |
| Science Assessment Change | .666* | (.666, 43.095) |
| $R^2$ | .219 | |
| F | 9.795** | |
| $R^2$ Change | .219 | |
| F Change | 9.795 | |

Data Sources: PEIMS, STAAR; Note: N = 215, CI = confidence interval, *** p < .0001, ** p < .001, *p<.05

**Table 13: Linear Regression on the Effect of Campus Per-Pupil Expenditure and Change in Enrollment, Attendance, Economic Status, and Academic Outcomes, Houston ISD**

| | B | SE | Wald | df | Sig | Exp (B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| Constant | .719 | .354 | 4.110 | 1 | .043* | 2.052 | | |
| Attendance (%) | -.515 | .244 | 4.470 | 1 | .034* | .598 | .371 | .963 |
| Enrollment (N) | -.009 | .003 | 13.247 | 1 | .000*** | .991 | .986 | .996 |
| Economic Status (N) | -.016 | .003 | 24.281 | 1 | .000*** | .985 | .978 | .991 |
| Reading | -.002 | .025 | .009 | 1 | .923 | .998 | .950 | 1.047 |
| Math | .029 | .024 | 1.380 | 1 | .240 | 1.029 | .981 | 1.079 |
| Science | -.013 | .014 | .900 | 1 | .343 | .987 | .960 | 1.014 |
| Cox & Snell R Square | | .230 | | | | | | |
| Nagelkerke R Square | | .312 | | | | | | |

Data Source: PEIMS, STAAR; *** p < .0001, ** p < .001, *p<.05

significant contribution to the model were change in attendance (B = -.470.383, t(215) = -3.372, p < .001), enrollment, economic status, along with reading and science passing rates. However, change in the attendance rate made the strongest unique contribution toward explaining per-pupil expenditures pre- and post-Hurricane Harvey. These variables also explained a significant proportion of variance in per-pupil expenditures, R2 = .219, F(6, 215) = 9.795, p < .0001.

Logistic regression was conducted to predict whether school per-pupil expenditure fell at or above the district average. The independent variables used in the model were change in attendance rate, enrollment, economic status, along with reading, math, and science passing rates. The results are depicted in **Table 13**. In the model, the major factors influencing campus per-pupil expenditure at or above the district average were attendance, enrollment, and economic status. The odds of attendance change was .515 times less likely, enrollment change was .99 less likely, economic status change was .985 less likely for campuses with per-pupil expenditures at or above the district average.

**Discussion**

The study used a cross-sectional design to explore the impact of Hurricane Harvey on students' demographic characteristics, enrollment, attendance, and academic outcomes. The recurrent catastrophic weather events on the Texas Gulf Coast led to the need to explore how these types of events were associated with the variables of interest. Consequently, pre- post-Hurricane Harvey student-related outcomes were examined in Houston ISD and surrounding school districts, to build on the availability of 2018–2019 finance data from NERD$. An underlying assumption of the study was that school finance drives who attends school, how often they attend, and, ultimately, how they perform in school.

The study found that enrollment decreased at 10 out of 21 school districts included in this evaluation pre-post-Hurricane Harvey. The highest negative percentage change occurred in Pasadena ISD and the highest positive percentage change was evident in Tomball ISD. There was a statistically significant decrease in the mean number of White students enrolled in the targeted school districts, while Black, Hispanic, and homeless students did not increase significantly. Houston ISD was used as a proxy to explore the data at the school level. No significant associations were found between per-pupil expenditures and academic outcomes; however, there was a strong, positive association between the change in reading and math passing rates. Pearson correlation found that the higher the percent of schools at or above the district average per-pupil expenditure, the lower the change in enrollment and attendance (medium, negative association). Linear regression indicated that change in the attendance rate pre- post-Hurricane Harvey made the strongest unique contribution toward explaining per-pupil expenditures in Houston ISD. Logistic regression revealed that the odds of a significant change in the attendance rate, enrollment, and the proportion of economically-disadvantaged students in a Houston ISD school, the less likely that the campus' per-pupil expenditure was at or above the district average.

It should be acknowledged that the school district is the primary local entity with fiscal authority in Texas school districts and across the United States. Evaluating how much financial resources are needed for at-risk students to succeed academically should be a high priority for school districts. Creating reliable data sources that provide a comprehensive view of school expenditures is imperative to fully comprehend the impact of school finance on student outcomes. This may be, particularly, important in areas where catastrophic events, such as Hurricane Harvey, are recurrent and have the potential to affect the availability of school resources for at-risk students who reside in economically-challenged communities. To that end, it imperative that school-level fiscal analysis becomes an integral component of school-based management, so that adjustments can be made to ensure that all students receive equitable services, in spite of environmental circumstances. Future research may explore whether modifications in NERD$ databases revealed more significant associations between school finance in Houston ISD and surrounding school districts. The addition of subsequent years of NERD$ data may disclose more information concerning longitudinal effects of Hurricane Harvey in the targeted population.

**References:**

Baker, B. D., & Chingos, M. M. (2019). Toward a Rich Data Future for School Finance Research. AERA Open. https://doi.

org/10.1177/2332858419887735

Baker, B. D., Di Carlo, M., and Weber, M. (2019). The Adequacy and Fairness of State School Finance Systems .

Baker, B. D., Di Carlo, M., and Weber, M. (2019). The Adequacy and Fairness of State School Finance Systems. 2nd Edition. Retrieved from https://www.schoolfinancedata.org/wp-content/uploads/2020/02/SFID_AnnualReport_2020.pdf

Condron, D. J., & Roscigno, V. J. (2003). Disparities within: Unequal Spending and Achievement in an Urban School District. Sociology of Education, 76(1), 18–36. https://doi.org/10.2307/3090259

Edunomics Lab. (2021). Financial Transparency. Retrieved from https://edunomicslab.org/our-research/financial-transparency/

Emanuel, K. (2017). Assessing the present and future probability of Hurricane Harvey's rainfall Proc. Natl Acad. Sci. 114 12681–4

Hallegatte, S., Vogt-Schilb, A., Bangalore, M., & Rozenberg, J. (2017). Climate Change and Development Series: Unbreakable; Building the resilience of the poor in the face of natural disasters. Washington, DC: World Bank. doi:10.1596/978-1-4648-1003-9 License: Creative Commons Attribution CC BY 3.0 IGO

Hoeppe, P. (2016). Trends in weather related disasters – consequences for insurers and society. Weather and Climate Extremes 11: 70–79.

Houston ISD. (2021). Mission, Vision, Beliefs, Goals, amd Constraints. Retrieved from https://www.houstonisd.org/Page/32469

Jackson, C. K., Johnson, R., & Persico, C. (2016). The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms. The Quarterly Journal of Economics 157–218. doi:10.1093/qje/qjv036. Advance Access publication on October 1, 2015.

Knoff, H.. (2019). The Impact of Inequitable School Funding: Solutions for Struggling Schools Without the Money to Fully Help Struggling Students: Equity & Access Pre K-12: The American Consortium for Equity in Education." Equity & Access Pre K-12 | The American Consortium for Equity in Education, Project ACHIEVE Educational Solutions. Retrieved from https://www.ace-ed.org/inequitable-school-funding/

Kousky, C. (2016). Impacts of natural disasters on children. Future of Children 26: 73–92.

Krueger, Alan B. (1998). Reassessing the View that American Schools Are Broken, New York Federal Reserve Economic Policy Brief.

Levin H. M. (1989). Financing the Education of At-Risk Students. Educational Evaluation and Policy Analysis;11(1):47-60. doi:10.3102/01623737011001041

National Academies of Sciences, Engineering, and Medicine; Division on Earth and Life Studies; Water Science and Technology Board; Policy and Global Affairs; Program on Risk, Resilience, and Extreme Events; Committee on Urban Flooding in the United States. Framing the Challenge of Urban Flooding in the United States. Washington (DC): National Academies Press (US). (2019). Summary. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK541176/

National Weather Service. (2017) Hurricane Harvey & Its Impacts on Southeast Texas (August 25-29, 2017). Retrieved from https://www.weather.gov/hgx/hurricaneharvey

Pane, J., McCaffrey, D., Kalra, N., & Zhou, A. (2008). Effects of Student Displacement in Louisiana During the First Academic Year After the Hurricanes of 2005. Journal of Education for Students Placed at Risk (JESPAR) 13(2-3):168-211. DOI:10.1080/10824660802350169. Retrieved from https://www.researchgate.net/publication/248940896_Effects_of_Student_Displacement_in_Louisiana_During_the_First_Academic_Year_After_the_Hurricanes_of_2005

Railsback, J. (2004). By Request: Increasing Student Attendance: Strategies from Research and Practice. Retrieved from https://educationnorthwest.org/sites/default/files/increasing-student-attendance.pdf

Roellke, C. F. 1996. The Local Response to State Initiated Education Reform: Changes in the Allocation of Human Resources in New York State Schooling Systems, 1983_1995. Doctoral dissertation, Department of Education, Cornell University.

SAMHSA. (2017). Disaster Technical Assistance Center Supplemental Research Bulletin Greater Impact: How Disasters Affect People of Low Socioeconomic Status. Retrieved from https://www.samhsa.gov/sites/default/files/dtac/srb-low-ses_2.pdf

Schober, P., Boer, C., & Schwarte, L. (2018). Correlation Coefficients: Appropriate Use and Interpretation, Anesthesia & Analgesia: May 2018 - Volume 126 - Issue 5 - p 1763-1768. doi: 10.1213/ANE.0000000000002864

National Center for Education Statistics. (1996). Assessment and Analysis of School-Level Expenditures, Working Paper No. 96-19, by Joel D. Sherman, Clayton Best, and Lawrence Luskin. William Fowler, project officer. Washington, D.C.

U. S. Census Bureu. (2019). Annual Survey of School System Finances. Retrieved from https://www.census.gov/programs-surveys/school-finances.html

U. S. Department of Education. (2005). 10 Facts About K-12 Education Funding. Retrieved from https://www2.ed.gov/about/overview/fed/10facts/index.html

# Appendix A

| Attendance Rates for Students Enrolled in Houston ISD and Surrounding School Districts, 2016–2017 (Post-Hurricane Harvey) | | | | |
|---|---|---|---|---|
| | Pre-Hurricane Harvey 2016–2017 | Hurricane Harvey 2017–2018 | Post-Hurricane Harvey 2018–2019 | %-Point Diff. |
| Aldine ISD | 94.5% | 94.0% | 94.3% | -0.2% |
| Alief ISD | 95.2% | 94.9% | 95.2% | 0.0% |
| Channelview ISD | 95.7% | 94.5% | 94.8% | -0.9% |
| Clear Creek ISD | 95.5% | 95.8% | 95.6% | 0.1% |
| Crosby ISD | 95.1% | 95.0% | 94.9% | -0.2% |
| Cypress-Fairbanks ISD | 95.9% | 95.4% | 95.5% | -0.4% |
| Deer Park ISD | 95.7% | 95.6% | 95.5% | -0.2% |
| Galena Park ISD | 96.1% | 95.7% | 96.2% | 0.1% |
| Goose Creek CISD | 95.2% | 94.9% | 95.0% | -0.2% |
| **Houston ISD** | 95.8% | 95.4% | 95.4% | -0.4% |
| Huffman ISD | 95.9% | 95.6% | 95.6% | -0.3% |
| Humble ISD | 96.7% | 96.5% | 96.6% | -0.1% |
| Katy ISD | 95.7% | 95.5% | 95.4% | -0.3% |
| Klein ISD | 95.0% | 94.7% | 94.3% | -0.7% |
| La Porte ISD | 94.6% | 94.2% | 94.4% | -0.2% |
| Pasadena ISD | 95.4% | 93.9% | 94.6% | -0.8% |
| Sheldon ISD | 95.9% | 95.4% | 95.5% | -0.4% |
| Spring Branch ISD | 93.8% | 93.8% | 93.6% | -0.2% |
| Spring ISD | 96.5% | 96.4% | 96.5% | 0.0% |
| Tomball ISD | 95.9% | 95.6% | 95.9% | 0.0% |
| Waller ISD | 95.5% | 95.4% | 95.3% | -0.2% |
| Source: Data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR). | | | | |

# Appendix B

| Demographic Characteristics of Students Enrolled in Houston ISD and Surrounding School Districts, 2016–2017 (Pre-Hurricane Harvey) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Asian/Pacific Islander | | African American | | Hispanic | | White | | American Indian | | Two or More Races | |
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| Aldine ISD | 35,636 | 51.1 | 34,132 | 48.9 | 942 | 1.4 | 16,107 | 23.1 | 50,634 | 72.6 | 1,512 | 2.2 | 134 | 0.2 | 439 | 0.6 |
| Alief ISD | 24,106 | 52.0 | 22,270 | 48.0 | 5,783 | 12.5 | 13,324 | 28.7 | 24,455 | 52.7 | 1,915 | 4.1 | 596 | 1.3 | 303 | 0.7 |
| Channelview ISD | 4,932 | 51.8 | 4,597 | 48.2 | 101 | 1.1 | 1,074 | 11.3 | 7,448 | 78.2 | 743 | 7.8 | 105 | 1.1 | 58 | 0.6 |
| Clear Creek ISD | 21,366 | 51.1 | 20,453 | 48.9 | 4,104 | 9.8 | 3,405 | 8.1 | 12,768 | 30.5 | 19,543 | 46.7 | 87 | 0.2 | 1,912 | 4.6 |
| Crosby ISD | 3,137 | 52.4 | 2,855 | 47.6 | 23 | 0.4 | 940 | 15.7 | 2,195 | 36.6 | 2,685 | 44.8 | 13 | 0.2 | 135 | 2.3 |
| Cypress-Fairbanks ISD | 59,010 | 51.4 | 55,858 | 48.6 | 10,737 | 9.3 | 19,836 | 17.3 | 51,145 | 44.5 | 29,485 | 25.7 | 861 | 0.7 | 2,804 | 2.4 |
| Deer Park ISD | 6,677 | 50.6 | 6,508 | 49.4 | 161 | 1.2 | 364 | 2.8 | 7,237 | 54.9 | 5,126 | 38.9 | 41 | 0.3 | 256 | 1.9 |
| Galena Park ISD | 11,735 | 51.5 | 11,049 | 48.5 | 168 | 0.7 | 3,544 | 15.6 | 17,742 | 77.9 | 1,111 | 4.9 | 77 | 0.3 | 142 | 0.6 |
| Goose Creek CISD | 12,297 | 51.4 | 11,629 | 48.6 | 420 | 1.8 | 3,705 | 15.5 | 14,588 | 61.0 | 4,726 | 19.8 | 64 | 0.3 | 423 | 1.8 |
| **Houston ISD** | 109,443 | 50.6 | 106,663 | 49.4 | 8,525 | 3.9 | 51,706 | 23.9 | 134,132 | 62.1 | 18,918 | 8.8 | 533 | 0.2 | 2,292 | 1.1 |
| Huffman ISD | 1,790 | 52.0 | 1,653 | 48.0 | 16 | 0.5 | 87 | 2.5 | 723 | 21.0 | 2,564 | 74.5 | 7 | 0.2 | 45 | 1.3 |
| Humble ISD | 21,016 | 51.0 | 20,208 | 49.0 | 1,451 | 3.5 | 8,168 | 19.8 | 14,325 | 34.7 | 16,232 | 39.4 | 176 | 0.4 | 872 | 2.1 |
| Katy ISD | 38,919 | 52.3 | 36,509 | 49.1 | 11,307 | 15.0 | 7,780 | 10.3 | 26,048 | 34.5 | 27,851 | 36.9 | 275 | 0.4 | 2,167 | 2.9 |
| Klein ISD | 26,778 | 51.7 | 25,032 | 48.3 | 4,560 | 8.8 | 7,337 | 14.2 | 20,800 | 40.1 | 17,394 | 33.6 | 223 | 0.4 | 1,496 | 2.9 |
| La Porte ISD | 4,038 | 52.4 | 3,675 | 47.6 | 78 | 1.0 | 513 | 6.7 | 3,657 | 47.4 | 3,201 | 41.5 | 51 | 0.7 | 213 | 2.8 |
| Pasadena ISD | 29,047 | 51.6 | 27,235 | 48.4 | 1,741 | 3.1 | 4,254 | 7.6 | 46,550 | 82.7 | 3,305 | 5.9 | 65 | 0.1 | 367 | 0.7 |
| Sheldon ISD | 4,496 | 50.6 | 4,388 | 49.4 | 42 | 0.5 | 1,886 | 21.2 | 6,272 | 70.6 | 574 | 6.5 | 12 | 0.1 | 94 | 1.1 |
| Spring Branch ISD | 18,154 | 51.8 | 16,925 | 48.2 | 2,248 | 6.4 | 1,613 | 4.6 | 21,135 | 60.2 | 9,337 | 26.6 | 77 | 0.2 | 669 | 1.9 |
| Spring ISD | 18,965 | 51.7 | 17,733 | 48.3 | 1,262 | 3.4 | 14,697 | 40.0 | 16,182 | 44.1 | 3,271 | 8.9 | 768 | 2.1 | 518 | 1.4 |
| Tomball ISD | 7,580 | 50.8 | 7,352 | 49.2 | 1,054 | 7.1 | 689 | 4.6 | 4,491 | 30.1 | 8,094 | 54.2 | 33 | 0.2 | 571 | 3.8 |
| Waller ISD | 3,577 | 52.0 | 3,297 | 48.0 | 45 | 0.7 | 713 | 10.4 | 3,645 | 53.0 | 2,279 | 33.2 | 33 | 0.5 | 159 | 2.3 |

Note: Demographic characteristics data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR).

## Appendix B (cont'd)

| Demographic Characteristics of Students Enrolled in Houston ISD and Surrounding School Districts, 2018–2019 (Post-Hurricane Harvey) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Asian/Pacific Islander | | African American | | Hispanic | | White | | American Indian | | Two or More Races | |
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| Aldine ISD | 33,907 | 50.7 | 32,947 | 49.3 | 837 | 1.3 | 15,195 | 22.7 | 48,640 | 72.8 | 1,571 | 2.3 | 175 | 0.3 | 436 | 0.7 |
| Alief ISD | 23,694 | 52.1 | 21,742 | 47.9 | 5,391 | 11.9 | 13,125 | 28.9 | 24,646 | 54.2 | 1,710 | 3.8 | 319 | 0.7 | 245 | 0.5 |
| Channelview ISD | 4,982 | 51.9 | 4,611 | 48.1 | 93 | 1.0 | 1,049 | 10.9 | 7,640 | 79.6 | 649 | 6.8 | 116 | 1.2 | 46 | 0.5 |
| Clear Creek ISD | 21,706 | 51.4 | 20,499 | 48.6 | 4,087 | 9.7 | 3,456 | 8.2 | 13,221 | 31.3 | 19,333 | 45.8 | 109 | 0.3 | 1,999 | 4.7 |
| Crosby ISD | 3,326 | 52.5 | 3,005 | 47.5 | 25 | 0.4 | 929 | 14.7 | 2,539 | 40.1 | 2,679 | 42.3 | 14 | 0.2 | 145 | 2.3 |
| Cypress-Fairbanks ISD | 59,755 | 51.3 | 56,757 | 48.7 | 10,992 | 9.4 | 21,602 | 18.5 | 51,687 | 44.4 | 28,181 | 24.2 | 1,025 | 0.9 | 3,025 | 2.6 |
| Deer Park ISD | 6,560 | 50.7 | 6,377 | 49.3 | 142 | 1.1 | 332 | 2.6 | 7,489 | 57.9 | 4,662 | 36.0 | 21 | 0.2 | 291 | 2.2 |
| Galena Park ISD | 11,462 | 51.4 | 10,827 | 48.6 | 149 | 0.7 | 3,351 | 15.0 | 17,635 | 79.1 | 915 | 4.1 | 70 | 0.3 | 169 | 0.8 |
| Goose Creek CISD | 12,240 | 51.3 | 11,597 | 48.7 | 419 | 1.8 | 3,623 | 15.2 | 14,886 | 62.4 | 4,372 | 18.3 | 73 | 0.3 | 464 | 1.9 |
| **Houston ISD** | 106,306 | 50.7 | 103,466 | 49.3 | 8,917 | 4.3 | 48,934 | 23.3 | 129,941 | 61.9 | 18,982 | 9.0 | 465 | 0.2 | 2,533 | 1.2 |
| Huffman ISD | 1,864 | 52.6 | 1,682 | 47.4 | 17 | 0.5 | 91 | 2.6 | 838 | 23.6 | 2,541 | 71.7 | 12 | 0.3 | 47 | 1.3 |
| Humble ISD | 22,112 | 50.8 | 21,441 | 49.2 | 1,629 | 3.7 | 9,306 | 21.4 | 15,784 | 36.2 | 15,815 | 36.3 | 140 | 0.3 | 879 | 2.0 |
| Katy ISD | 41,212 | 51.6 | 38,701 | 48.4 | 12,431 | 15.6 | 8,907 | 11.1 | 28,282 | 35.4 | 27,578 | 34.5 | 250 | 0.3 | 2,465 | 3.1 |
| Klein ISD | 27,546 | 51.7 | 25,782 | 48.3 | 4,547 | 8.5 | 8,010 | 15.0 | 22,103 | 41.4 | 16,695 | 31.3 | 232 | 0.4 | 1,741 | 3.3 |
| La Porte ISD | 3,874 | 52.5 | 3,510 | 47.5 | 91 | 1.2 | 543 | 7.4 | 3,657 | 49.5 | 2,935 | 39.7 | 46 | 0.6 | 112 | 1.5 |
| Pasadena ISD | 27,529 | 51.7 | 25,762 | 48.3 | 1,628 | 3.1 | 3,853 | 7.2 | 44,419 | 83.4 | 2,977 | 5.6 | 76 | 0.1 | 338 | 0.6 |
| Sheldon ISD | 4,827 | 51.3 | 4,574 | 48.7 | 51 | 0.5 | 1,983 | 21.1 | 6,704 | 71.3 | 524 | 5.6 | 24 | 0.3 | 115 | 1.2 |
| Spring Branch ISD | 17,779 | 51.3 | 16,902 | 48.7 | 2,264 | 6.5 | 1,709 | 4.9 | 20,529 | 59.2 | 9,334 | 26.9 | 93 | 0.3 | 752 | 2.2 |
| Spring ISD | 18,261 | 51.6 | 17,124 | 48.4 | 1,074 | 3.0 | 14,147 | 40.0 | 16,276 | 46.0 | 2,651 | 7.5 | 678 | 1.9 | 559 | 1.6 |
| Tomball ISD | 8,490 | 50.1 | 8,472 | 49.9 | 1,273 | 7.5 | 801 | 4.7 | 5,163 | 30.4 | 9,002 | 53.1 | 50 | 0.3 | 673 | 4.0 |
| Waller ISD | 3,765 | 50.9 | 3,638 | 49.1 | 60 | 0.8 | 776 | 10.5 | 4,003 | 54.1 | 2,361 | 31.9 | 29 | 0.4 | 174 | 2.4 |

Note: Demographic characteristics data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR).

# Appendix C

| Academic Placement and Social Factors of Students Enrolled in Houston ISD and Surrounding School Districts, 2016–2017 (Post-Hurricane Harvey) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Special Education | | English Language Learners | | "At Risk" of Dropping out of School | | Homeless | | Economically Disadvantaged | |
| | n | % | n | % | n | % | n | % | n | % |
| Aldine ISD | 5,168 | 7.7 | 24,076 | 34.5 | 50,929 | 73.0 | 183 | 0.3 | 60,136 | 86.2 |
| Alief ISD | 3,403 | 7.4 | 19,785 | 42.7 | 34,786 | 75.0 | 1,003 | 2.2 | 38,294 | 82.6 |
| Channelview ISD | 891 | 9.2 | 2,853 | 29.9 | 5,618 | 59.0 | 105 | 1.1 | 7,576 | 79.5 |
| Clear Creek ISD | 4,254 | 10.1 | 4,441 | 10.6 | 16,589 | 39.7 | 777 | 1.9 | 11,841 | 28.3 |
| Crosby ISD | 542 | 8.8 | 754 | 12.6 | 2,983 | 49.8 | 84 | 1.4 | 2,968 | 49.5 |
| Cypress-Fairbanks ISD | 9,507 | 8.2 | 17,448 | 15.2 | 46,461 | 40.4 | 713 | 0.6 | 57,348 | 49.9 |
| Deer Park ISD | 1,367 | 10.5 | 1,559 | 11.8 | 4,701 | 35.7 | 149 | 1.1 | 5,512 | 41.8 |
| Galena Park ISD | 1,961 | 8.7 | 7,387 | 32.4 | 14,272 | 62.6 | 758 | 3.3 | 18,295 | 80.3 |
| Goose Creek CISD | 2,464 | 10.4 | 3,631 | 15.2 | 12,195 | 51.0 | 370 | 1.5 | 15,387 | 64.3 |
| **Houston ISD** | 15,500 | 7.2 | 68,659 | 31.8 | 145,725 | 67.4 | 4,721 | 2.2 | 166,370 | 77.0 |
| Huffman ISD | 340 | 9.6 | 195 | 5.7 | 1,368 | 39.7 | 37 | 1.1 | 1,229 | 35.7 |
| Humble ISD | 3,317 | 7.8 | 3,676 | 8.9 | 20,173 | 48.9 | 643 | 1.6 | 13,769 | 33.4 |
| Katy ISD | 7,805 | 10.1 | 12,691 | 17.1 | 29,213 | 39.3 | 291 | 0.4 | 21,699 | 29.2 |
| Klein ISD | 4,768 | 9.0 | 7,762 | 15.0 | 21,087 | 40.7 | 104 | 0.2 | 21,014 | 40.6 |
| La Porte ISD | 845 | 11.1 | 710 | 9.2 | 3,383 | 43.9 | 135 | 1.8 | 3,813 | 49.4 |
| Pasadena ISD | 5,483 | 10.0 | 16,913 | 30.1 | 32,735 | 58.2 | 979 | 1.7 | 43,728 | 77.7 |
| Sheldon ISD | 643 | 7.1 | 2,468 | 27.8 | 6,050 | 68.1 | 72 | 0.8 | 7,010 | 78.9 |
| Spring Branch ISD | 2,713 | 7.7 | 12,050 | 34.4 | 19,880 | 56.7 | 490 | 1.4 | 19,628 | 56.0 |
| Spring ISD | 3,018 | 8.4 | 8,432 | 23.0 | 23,702 | 64.6 | 242 | 0.7 | 25,124 | 68.5 |
| Tomball ISD | 1,280 | 8.0 | 1,616 | 10.8 | 4,683 | 31.4 | 35 | 0.2 | 3,239 | 21.7 |
| Waller ISD | 489 | 6.8 | 1,861 | 27.1 | 3,631 | 52.8 | 90 | 1.3 | 4,350 | 63.3 |

Note: Demographic characteristics data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR).

## Appendix C (cont'd)

| Academic Placement and Social Factors of Students Enrolled in Houston ISD and Surrounding School Districts, 2018–2019 (Post-Hurricane Harvey) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Special Education | | English Language Learners | | "At Risk" of Dropping out of School | | Homeless | | Economically Disadvantaged | |
| | n | % | n | % | n | % | n | % | n | % |
| Aldine ISD | 891 | 9.2 | 23,112 | 34.6 | 49,076 | 73.4 | 239 | 0.4 | 58,292 | 87.2 |
| Alief ISD | 4,254 | 10.1 | 19,837 | 43.7 | 36,078 | 79.4 | 446 | 1.0 | 38,349 | 84.4 |
| Channelview ISD | 542 | 8.8 | 3,173 | 33.1 | 5,786 | 60.3 | 73 | 0.8 | 7,734 | 80.6 |
| Clear Creek ISD | 9,507 | 8.2 | 5,080 | 12.0 | 16,899 | 40.0 | 580 | 1.4 | 12,112 | 28.7 |
| Crosby ISD | 1,367 | 10.5 | 926 | 14.6 | 3,304 | 52.2 | 157 | 2.5 | 3,377 | 53.3 |
| Cypress-Fairbanks ISD | 1,961 | 8.7 | 16,529 | 14.2 | 54,064 | 46.4 | 538 | 0.5 | 63,433 | 54.4 |
| Deer Park ISD | 2,464 | 10.4 | 1,514 | 11.7 | 4,944 | 38.2 | 98 | 0.8 | 6,088 | 47.1 |
| Galena Park ISD | 15,500 | 7.2 | 7,567 | 33.9 | 14,569 | 65.4 | 705 | 3.2 | 19,059 | 85.5 |
| Goose Creek CISD | 340 | 9.6 | 4,102 | 17.2 | 12,879 | 54.0 | 320 | 1.3 | 16,492 | 69.2 |
| **Houston ISD** | 3,317 | 7.8 | 66,452 | 31.7 | 136,849 | 65.2 | 6,427 | 3.1 | 167,456 | 79.8 |
| Huffman ISD | 7,805 | 10.1 | 243 | 6.9 | 1,369 | 38.6 | 63 | 1.8 | 1,259 | 35.5 |
| Humble ISD | 4,768 | 9.0 | 4,102 | 9.4 | 21,354 | 49.0 | 634 | 1.5 | 16,510 | 37.9 |
| Katy ISD | 845 | 11.1 | 13,457 | 16.8 | 31,503 | 39.4 | 782 | 1.0 | 25,168 | 31.5 |
| Klein ISD | 5,483 | 10.0 | 8,216 | 15.4 | 18,763 | 35.2 | 163 | 0.3 | 24,108 | 45.2 |
| La Porte ISD | 643 | 7.1 | 695 | 9.4 | 3,219 | 43.6 | 115 | 1.6 | 3,957 | 53.6 |
| Pasadena ISD | 2,713 | 7.7 | 15,384 | 28.9 | 33,085 | 62.1 | 900 | 1.7 | 45,945 | 86.2 |
| Sheldon ISD | 3,018 | 8.4 | 2,879 | 30.6 | 6,364 | 67.7 | 48 | 0.5 | 7,764 | 82.6 |
| Spring Branch ISD | 1,280 | 8.0 | 11,858 | 34.2 | 19,256 | 55.5 | 376 | 1.1 | 20,405 | 58.8 |
| Spring ISD | 489 | 6.8 | 8,988 | 25.4 | 20,641 | 58.3 | 158 | 0.4 | 24,790 | 70.1 |
| Tomball ISD | 1,238 | 8.3 | 1,690 | 10.0 | 4,494 | 26.5 | 18 | 0.1 | 4,109 | 24.2 |
| Waller ISD | 428 | 6.2 | 2,139 | 28.9 | 4,179 | 56.5 | 85 | 1.1 | 4,780 | 64.6 |

Note: Demographic characteristics data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR).

# Appendix D

**Academic Performance on the Texas State Assessment (STAAR) of Students Enrolled in Houston ISD and Surrounding School Districts, Pre- and Post-Hurricane Harvey, 2016–2017 vs. 2018–2019**

| | Reading | | | Math | | | Science | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2016–2017 % | 2018–2019 % | % Diff. | 2016–2017 % | 2018–2019 % | % Diff. | 2016–2017 % | 2018–2019 % | % Diff. |
| Aldine ISD | 61 | 65 | 4.0 | 75 | 77 | 2.0 | 71 | 72 | 1.0 |
| Alief ISD | 63 | 65 | 2.0 | 73 | 75 | 2.0 | 71 | 73 | 2.0 |
| Channelview ISD | 68 | 71 | 3.0 | 80 | 84 | 4.0 | 77 | 81 | 4.0 |
| Clear Creek ISD | 84 | 83 | -1.0 | 87 | 86 | -1.0 | 86 | 87 | 1.0 |
| Crosby ISD | 69 | 75 | 6.0 | 80 | 84 | 4.0 | 81 | 84 | 3.0 |
| Cypress-Fairbanks ISD | 81 | 82 | 1.0 | 86 | 86 | 0.0 | 88 | 74 | -14.0 |
| Deer Park ISD | 78 | 80 | 2.0 | 87 | 89 | 2.0 | 89 | 91 | 2.0 |
| Galena Park ISD | 70 | 73 | 3.0 | 82 | 84 | 2.0 | 79 | 82 | 3.0 |
| Goose Creek CISD | 67 | 71 | 4.0 | 77 | 80 | 3.0 | 78 | 81 | 3.0 |
| **Houston ISD** | 64 | 69 | 5.0 | 74 | 77 | 3.0 | 72 | 74 | 2.0 |
| Huffman ISD | 76 | 76 | 0.0 | 79 | 76 | -3.0 | 82 | 85 | 3.0 |
| Humble ISD | 79 | 78 | -1.0 | 84 | 81 | -3.0 | 85 | 84 | -1.0 |
| Katy ISD | 87 | 88 | 1.0 | 91 | 91 | 0.0 | 92 | 92 | 0.0 |
| Klein ISD | 78 | 78 | 0.0 | 85 | 84 | -1.0 | 85 | 84 | -1.0 |
| La Porte ISD | 78 | 78 | 0.0 | 86 | 85 | -1.0 | 82 | 83 | 1.0 |
| Pasadena ISD | 67 | 72 | 5.0 | 77 | 82 | 5.0 | 76 | 80 | 4.0 |
| Sheldon ISD | 62 | 65 | 3.0 | 70 | 75 | 5.0 | 73 | 74 | 1.0 |
| Spring Branch ISD | 70 | 72 | 2.0 | 77 | 80 | 3.0 | 78 | 80 | 2.0 |
| Spring ISD | 60 | 63 | 3.0 | 67 | 70 | 3.0 | 68 | 68 | 0.0 |
| Tomball ISD | 88 | 89 | 1.0 | 93 | 94 | 1.0 | 91 | 93 | 2.0 |
| Waller ISD | 73 | 76 | 3.0 | 83 | 86 | 3.0 | 85 | 87 | 2.0 |

Note: Texas state assessment STAAR data extracted from the Texas Education Agency, Texas Academic Performance Reports (TAPR).