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Data Article

Data on hurricane-induced unplanned school closures in the East and Gulf Coast of the US

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ABSTRACT

This paper presents data on Prolonged Unplanned School Closures (PUSCs) caused by hurricanes and affecting school districts along the East and Gulf Coasts of the United States between the 2011/12 and 2018/19 academic years. PUSCs are school closures lasting at least seven days that were not part of the school calendar at the start of the academic year. The dataset additionally includes counterfactual observations, meaning information pertaining to school districts affected by hurricanes, but that either did not close, or that did not experience a prolonged closure. We additionally incorporate school-district level data on socioeconomic characteristics, geography, school district capacity, and hazard characteristics. These data are used in the paper titled "Learning after the storm: Characterizing and Understanding Prolonged Unplanned School Closures After Hurricane"[1]. This dataset can be leveraged to uncover patterns of PUSCs, evaluate the impacts of various factors on school closure duration, and identify appropriate policies and strategies to enhance community resilience by minimizing the potential and the impacts of school closures. Looking ahead, the expected change of hurricane frequency and intensity under climate change

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makes such systematic data compilation an especially critical resource for both public and academic use.

Specifications Table

Subject	Education
Specific subject area	Prolonged Unplanned School Closures, Hurricanes
Type of data	Table, Excel file
Data format	Raw, Filtered, Aggregated
Data collection	The data were acquired from various publicly available resources listed below: 1) Community Interventions for Infection Control Unit/ Division of Global Migration and Quarantine at the CDC [2]; 2) IPUMS National Historical Geographic Information System (NHGIS) [3]; 3) Bureau UC. American Community Survey (ACS) [4]; 4) National Center for Education Statistics (NCES) [5]; 5) NOAA Northeast Regional Climate Center [6]; 6) NOAA Office for Coastal Management [7]; 7) Dave Leip's Atlas of US Presidential Elections [8]; 8) "stormwindmodel" R package [9]
Data accessibility	Data is available within this article in the link provided. Repository name: DesignSafe-CI (Data Depot) Data identification number: PRJ-5937 Direct URL to data: 10.17603/ds2-6egd-6q32 [10] Instructions for accessing these data: Click the DOI link above to access the dataset on DesignSafe. From the dataset page, you can download the data and citation files directly.
Related research article	Abbasi D, Safari S, Nateghi R, Reilly AC. Learning after the storm: Characterizing and understanding prolonged unplanned school closures after hurricanes. Int J Disaster Risk Reduct 2025;125:105611. 10.1016/j.ijdrr.2025.105611. [1]

1. Value of the Data

- This dataset provides the most comprehensive assembly of data to date regarding hurricane-related unplanned and prolonged school closures along the East and Gulf Coast of the U.S. It includes data on socioeconomic condition, school district capacity, and hazard-related characteristics at the school-district level and can be used to characterize both the likelihood and the duration of closures due to hurricanes in the US.
- This data provides value for researchers who wish to investigate how local resources and hazard intensity influence adaptive capacity of school districts to reopen after hurricanes, to develop models to understand whether the likelihood of unplanned school closures changes in the future, and to engage in education equity research to enhance the resilience of communities.
- This dataset and subsequent insights can assist policymakers in developing suitable policies and strategies to ensure education continuity in the aftermath of a hurricane hitting a school district.
- Researchers in various disciplines including sociology, economics, education and hazards engineering can collaborate for multidiscipline investigation of diverse aspects of school closures.
- This dataset can be expanded by linking with other educational data to enable broader analyses of education system resilience. Such extensions could support multi-hazard assessments, incorporate infrastructure fragility, and allow researchers to address wider sustainability and resilience challenges related to school systems.

- The results from the original article [1] can be replicated using the dataset provided in this article and using the explained methodologies.

2. Background

Natural disasters cause numerous unplanned school closures in the U.S. each year, with hurricanes accounting for most of these disruptions [2]. School closures prevent access to learning and essential social services. In some cases, school closures extend for long periods, leading to widespread negative consequences for students, families, and the broader community. Evaluating these closures and understanding the key factors contributing to their duration is essential for minimizing future disruptions. Here, we provide data on Prolonged Unplanned School Closures (PUSCs), school district characteristics, and other factors. PUSC are unplanned disruptions that last at least seven[1] days. This article enhances transparency of the original article [1], facilitates data replication, and supports further research on hurricane-related school closures. The proposed framework could be generalized to track PUSCs across diverse geographies and various hazards. Furthermore, this dataset could be connected to other outcome variables–such as student engagement and well-being–to better unpack the convergent problem of hurricanes, education, and learning outcomes [12,13]. These studies can offer valuable context and practical insights for policymakers, school administrators, and planners, helping them respond effectively to future disasters and strengthen the resilience of school districts.

3. Data Description

The data presented in this article is included in a single Excel file, accessible through the following link: https://doi.org/10.17603/ds2-6egd-6q32 [10]. This dataset contains 40 variables, detailed in Table 1, each attributed to a public school district in areas affected by hurricanes from the 2011/12 to 2018/19 academic years. School districts can be listed more than one time if they were affected by more than one hurricane. We assume a school district is affected by a hurricane if any part of it is located within a county that is declared a disaster via Presidential Disaster Declaration (PDD) [14], regardless of whether the district experiences a PUSC. In addition to data on school closures, the dataset includes variables categorized into four groups: geographic characteristics, hazard characteristics, school district capacity, and socioeconomic factors. These variables offer valuable insights into the resilience and adaptive capacity of school district communities, supporting further research on the factors influencing school closures and recovery processes.

4. Experimental Design, Materials and Methods

Data on PUSCs are obtained from the Community Interventions for Infection Control Unit/Division of Global Migration and Quarantine at the CDC [2]. The primary dataset includes all PUSCs in the US from the 2011/12 to 2018/19 academic years. The reasons for these closures vary and include natural hazards, inclement weather conditions, budget issues, and other disruptions.

This dataset presented here and in Abbasi et al. (2025) [1] subsets the PUSC data and specifically focuses on hurricane-related PUSCs. This accounts for over 80% of hazard-related PUSCs [2]. The data are additionally filtered to only include traditional public-school districts. Charter school districts, pseudo-school districts, vocational and special schools, school districts with no

[1] Note that PUSCs are typically defined as five (5) consecutive school days in the extant literature [11]. We change the definition slightly to include weekends and assume that school administrators use Saturday and Sunday to reopen schools.

Table 1
Variable description.

Variables	Description	Data Source
General Information		
NCESID	A unique 7-digit school district identification number	NCES
SD_NAME	The name of a school district	NCES
STATE_NAME	The name of the state in which the school district is located	NCES
STATE_FIPS	The Federal Information Processing Series (FIPS) code of the state in which the school district is located	
TOT_SCHOOL	Total number of schools in the school district in the year of the hurricane	NCES
TOT_STUD	Total number of students in the school district in the year of the hurricane	NCES
School Closure data		
HURRICANE	The name of the hurricane that impacted the school district	NCES
YEAR	The year when the school closure occurred due to the hurricane	NCES
CLOSURE_DATE	The date when the school district closed♣	CDC
REOPEN_DATE	The date when the school district reopened♣	CDC
CLOSURE_DUR	The duration of the closure for school districts with PUSCs♣	CDC
CLOSURE_BIN	A binary value representing whether the school district experienced PUSC (1) or not (0)	OpenFEMA
Geography		
LOCALE	A binary value indicates whether the school district has urban (1) or rural (0) status	NCES
AREA	The land area of the school district (km2)	NCES
COASTAL	A binary value whether the school district resides in a coastal (1) or non-coastal (0) county	Office for Coastal Management
Hazard Characteristics		
MAX_WIND_GUST	Maximum 1-minute gust wind speed measured at 10-meter, experienced at the geo-centroid of each school district (m/s)	"stormwindmodel" R package
WIND_GUST_DUR	Duration that gust winds equaled or exceeded 20 m/s within each school district (minute)	"stormwindmodel" R package
PRECIPITATION	The sum of daily precipitation, starting at the date the hurricane made landfall to 6 days subsequent, for the school district (inch)	ACIS
School District Capacity		
TOT_REVENUE_PER_STUD	Total school district revenue from federal, state, and local sources per student (USD)	NCES
TOT_EXPENDITURE_PER_STUD	Total school district expenditures per student (USD)	NCES
CAPTL_OUTLAY_PER_STUD	Total school district expenditures on construction, instructional equipment, and land and existing structures per student (USD)	NCES
REV_PER_EXP	Total revenue to total expenditure ratio for the school district	NCES
HRI	Binary indicator for High Revenue Indicator (HRI) School districts with the top 10 percent of revenue receive a value of 1 and 0 otherwise	NCES

(*continued on next page*)

Table 1 (*continued*)

Variables	Description	Data Source
Socioeconomic Conditions		
POPULATION	Total population living within the school district boundary	IPUMS NHGIS
AGE18	% population living within the school district boundary below 18 years old	IPUMS NHGIS
AGE65	% population living within the school district boundary over 65 years old	IPUMS NHGIS
EDUCATION	% population living within the school district boundary with at least a college degree	IPUMS NHGIS
LANG_SD	% population living within the school district boundary with limited proficiency in English	
LANG_STUD	% students enrolled in school district with limited proficiency in English	IPUMS NHGIS
RACE_SD	% non-white population living within the school district boundary	
RACE_STUD	% non-white students enrolled in the school district	IPUMS NHGIS
PLACE_ATTCH	% population living within school district born in the state of their current residence	IPUMS NHGIS
RENTER	% renter-occupied households	IPUMS NHGIS
DISABILITY	% population living within school district with reported disabilities	IPUMS NHGIS
TRNSP_ACC	% households living within school district with at least one vehicle	IPUMS NHGIS
POLT_ALLNMT	% voters living within the school district voting Democratic in closest presidential election	Dave Leip's Atlas of U.S. Presidential Elections
PER_CAPITA_INCOME	Per capita income for population living within school district (USD)	IPUMS NHGIS
UNEMPLOYMENT	% unemployed civilian labor force living within school district	IPUMS NHGIS
GINI	Gini index representing income inequality of the population living within the school district boundary	IPUMS NHGIS
FRLP	% students enrolled in the school district that are eligible for free/reduced-price lunch	NCES

♣ N/A is reported for districts that do not experience a prolonged unplanned closure (i.e., at least 7 days)

schools or fewer than 15 students, school districts that serve only young learners (i.e., K-2), and school districts that serve only students with special needs are excluded.

The presented dataset additionally includes school districts affected by hurricanes but that did not require a PUSC. These school districts have at least part of their geographic extend lying within a county which received a Presidential Disaster Declaration (PDD) [14]. These districts had between zero and six days of unplanned school closures. The spatial distribution of school closure duration due to hurricanes is shown in Fig. 1 [1].

Additional data pertaining to school districts are included to help explain disparities in closure durations. The four dimensions of these data are: geographic region, hazard characteristics, school district capacity, and socioeconomic condition. These data are described in Table 1, including a description and their sources. While most variables within each dimension align with the school district level, a few are only available at other geographic scales. Any required scaling below is described below.

In the geography dimension, the "Coastal" variable is a binary indicator that specifies whether a school district resides in a coastal or non-coastal county. As it is possible that a school district overlaps with one or more counties, a school district is categorized as coastal if its geographic

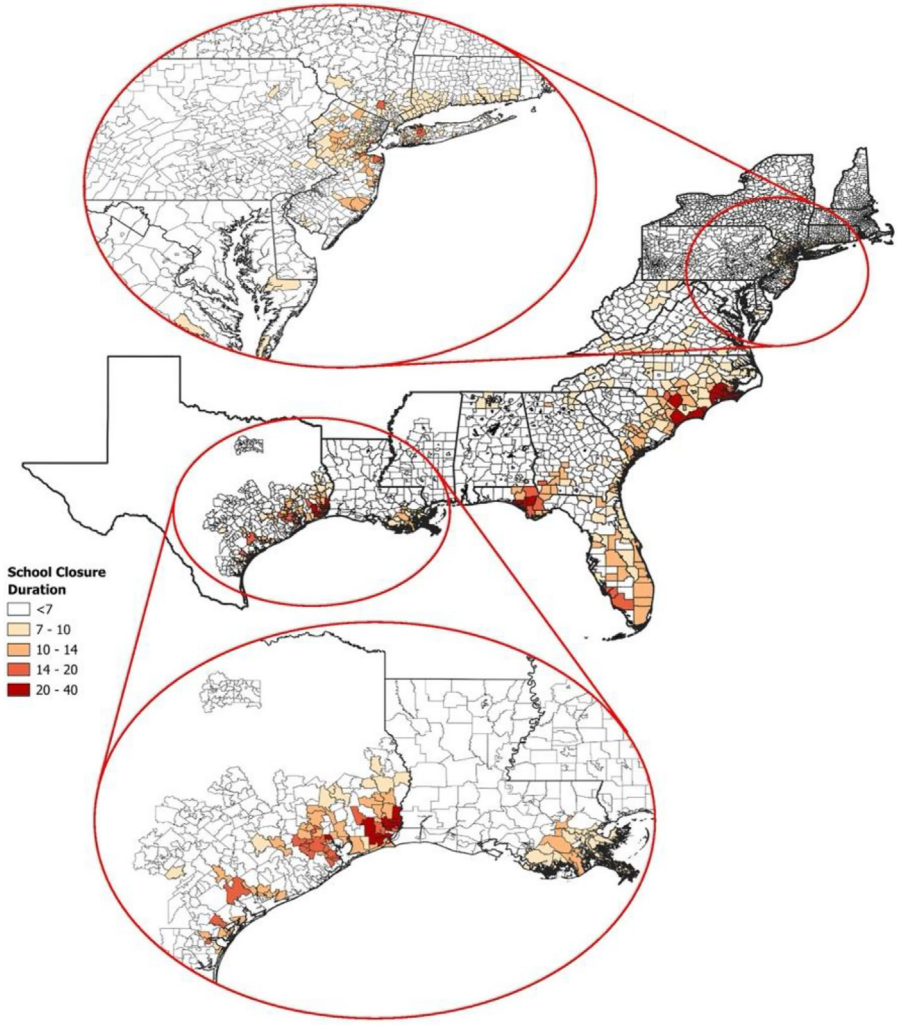

Fig. 1. Spatial distribution of school closures. The geographic unit is school district. For districts with more than one PUSCs, the maximum duration is reported [1].

centroid falls within a county that borders the Atlantic Ocean or the Gulf of Mexico. The "Locale" variable, obtained from the National Center for Education Statistics (NCES) [5], originally bins school districts into one of four categories [15]: city, suburb, town, and rural. We consolidated this into two categories: "Urban," which includes city, suburb, and town designations, and "Rural," which included the remainder.

The hazard characteristic variables came from diverse sources and required spatial transformation. Daily precipitation data from weather stations across the East and Gulf Coast are used to compile the “Precipitation” variable. First, daily rainfall (in inches) is collected for all weather stations in states affected by the hurricane starting two days before the hurricane made landfall until three days later. These values are then aggregated over time, producing the cumulative rainfall at each weather station. However, the spatial distribution of weather stations is not uniform, and some areas lack direct precipitation measurements. To generate continuous spatial

coverage of rainfall across all school districts and ensure completeness over the study area, we applied an interpolation technique. Specifically, we used the Voronoi Polygon method, which assigns each location to its nearest weather station by drawing boundaries around each station such that every point within a boundary is closer to that station than to any other. In cases where a school district overlaps multiple Voronoi polygons, we calculated the district-level precipitation as a weighted average of the rainfall values from each polygon. The weight for each polygon was determined by the proportion of its area that lies within the school district. The other two hazard characteristic variables, "Maximum Wind Gust" and "Wind Gust Duration", are gathered using the "stormwindmodel" R package [9]. This package requires inputting the 6-hour best (historical) hurricane track and the latitude and longitude where wind estimates are desired – in our case, the geo-centroids of all school districts. This R package employs the Willoughby wind model [16].

The school district capacity variables are all obtained from the National Center for Education Statistics (NCES) [5], which is reported at the school district level. Most of the socioeconomic condition variables were derived from the IPUMS National Historical Geographic Information System (NHGIS) database [3], which is available at school district level, and sourced from the 5-year American Community Survey (ACS) dataset [4]. To match each hurricane event with the corresponding socioeconomic data, we used the midpoint year of each 5-year ACS estimate (e.g., 2016 for the 2014–2018 dataset) as a reference point. Additionally, all economic variables in USD were adjusted to the year 2020 using the Consumer Price Index (CPI).

The "Free/Reduced-Price Lunch Program" and "Political Alignment" variables are the only two in this category not originally available at the school district level. The former is reported at the individual school level and was aggregated to the district level by calculating a weighted average of the percentage of eligible students, using school enrollment as weights. The latter is reported at the county level; when a county contains multiple school districts, the same proportion of Democratic voters is assigned to all districts within that county. In cases where a school district spans multiple counties, the proportion from the county occupying the largest land area within the district is used.

Limitations

This dataset only includes data for public school districts in the US that were affected by hurricanes. School districts with geographic boundaries outside counties designated as presidential disaster areas, private schools, charter schools, pseudo-school districts, vocational and special schools, school districts with no schools, school districts with fewer than 15 students, school districts which serve young children exclusively, and school districts that serve solely children with special needs are excluded. Data for non-PUSC is not reported in terms of days of closures; thus, one cannot distinguish non-PUSCs with no closures and closures lasting six (6) or fewer days. Access to telecommunications and broadband can help school districts adapt more effectively to disruptions, as more resilient infrastructure allows learning to continue remotely even when school buildings are closed [17]. However, such data are not included in this paper, and future research could extend the framework by incorporating measures of digital infrastructure to better capture districts' adaptive capacity in the wake of disasters. Finally, the originating PUSC data [2] are collected from publicly available online sources and are thus subject to collection biases.

Ethics Statement

There is no conflict of interest. The data are available in public domain.

The authors have read and followed all ethical requirement for publication in Data in Brief. The authors confirm that this work does not involve human subjects, animal experiments, nor any data collected from social medial platforms.

CRediT Author Statement

Abbasi: Conceptualization, Data curation, Visualization, Writing – original draft, Writing – review and editing; **Safari**: Data curation, Visualization, Writing – review and editing; **Nateghi**: Writing – review and editing; **Reilly**: Conceptualization, Funding acquisition, Project administration, Supervision, Writing – original draft, Writing – review and editing.

Data Availability

PROLONGED UNPLANNED SCHOOL CLOSURES CAUSED BY HURRICANE (Reference data) (DesignSafe Data Depot)

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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