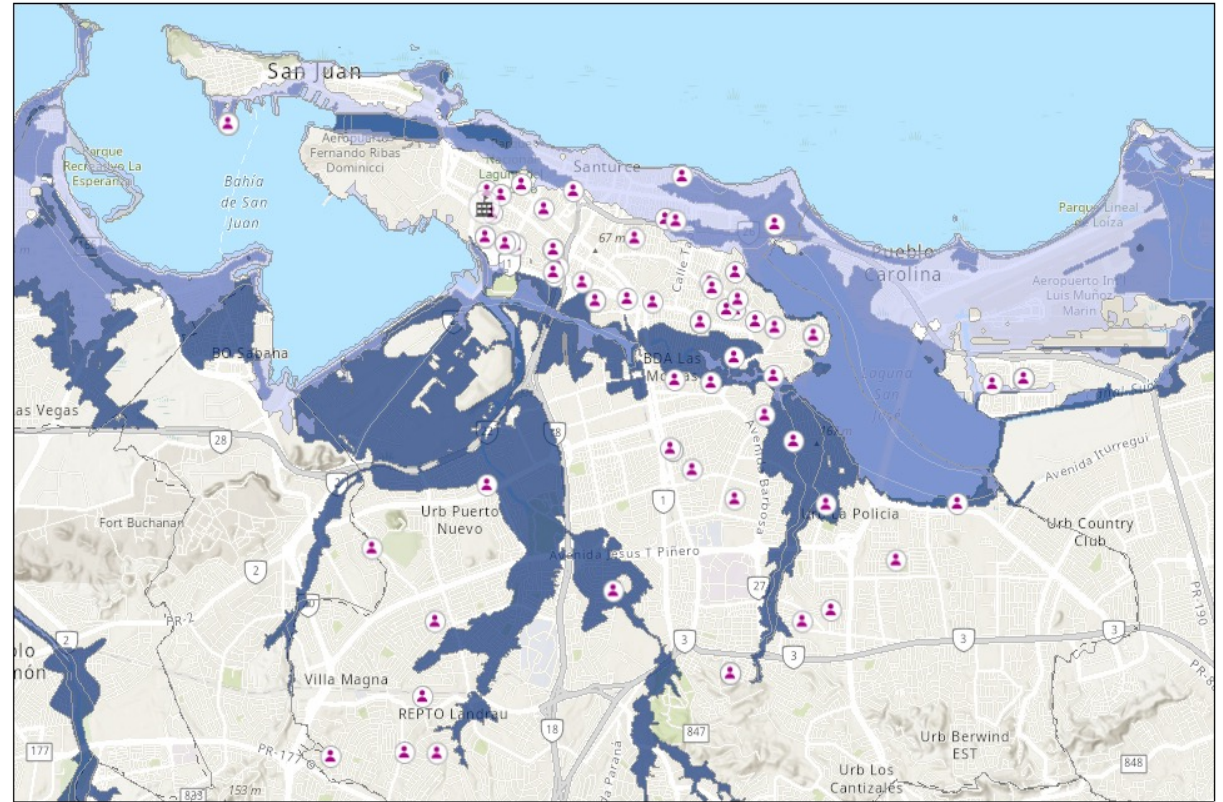


Mapping Puerto Rican Student Vulnerability and Risk To Improve School Emergency Planning



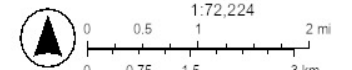
Eileen V. Segarra Alméstica
Yolanda Cordero Nieves
Amilcar Vélez Flores

Escuela Rafael Cordero San Juan y Riesgo de Inundación por Ríos y Tsunami



6/16/2023

- Escuela Rafael Cordero San Juan
- Estudiantes Escuela Rafael Cordero San Juan
- Municipios
- Zonas de Inundación por Tsunami 2012 (Red Sísmica)
- Zonas de Inundación Flood Hazard (FEMA)
- World Hillshade



Esri, NASA, NGA, USGS, Esri, HERE, Garmin, Foursquare, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, NPS

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Universidad de Puerto Rico

Call 3 and Continuation Call: Public Health Disaster Research Award Webinar
Public Health Disaster Research Award Program
August 3, 2023



Original Research Overview



Purpose

- Our research focuses on the link between school interruptions due to consecutive adverse events and academic outcomes, with a special interest in identifying the challenges of vulnerable students from low-income families or with disabilities.
- Current research focus on contributing to reduce school services interruption



Research Site

Observatory of Public Education in Puerto Rico, CEMGAP
University of Puerto Rico, Río Piedras



Timeline

January – Sept. 2023

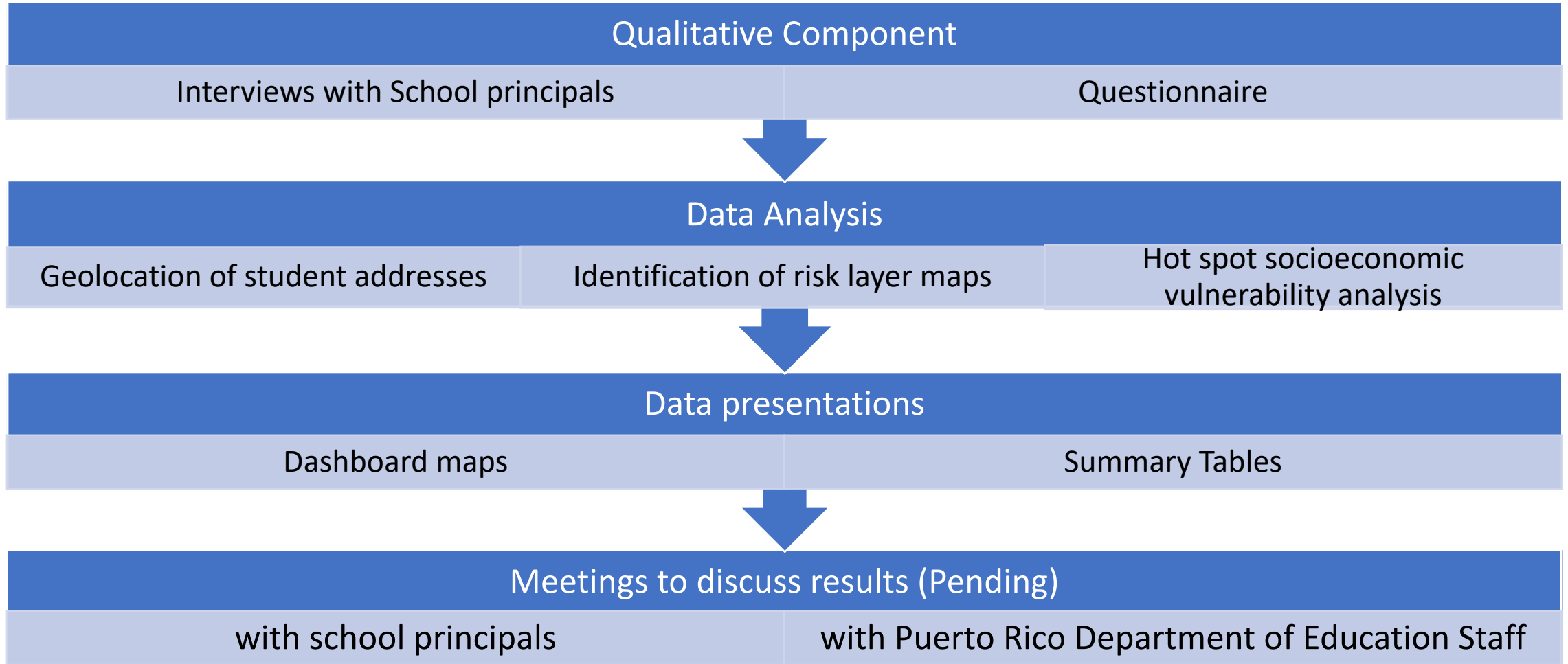
Continuation Research Overview

Our previous findings indicated that schools' limited preparedness led to improvisation and the extended interruption of essential school services after each disaster.

This pilot study evaluates the feasibility and potential benefit of merging information on schools, student socioeconomic status, and neighborhood characteristics with geographical hazard data into an effective risk planning and management tool for public schools in Puerto Rico.

The pilot project included 4 schools, three rural and one urban.

Methods



Preliminary Findings

Research question 1:

How accurately are students' residential addresses registered in the Department of Education's Student Information System? Do they allow for an accurate geographical location of their neighborhood of residence at the census block group or census tract level?

The file with the student addresses did not have a standard format, and many addresses were incomplete. Out of a sample of 136 addresses, only 20% could be geolocated through an automatic process.

We proceeded to manually geolocate or approximate the geolocation of each student's address using Google Maps.

Our approximations help schools to obtain a good sense of where their students live and conduct risk assessments. Using ArcGIS, the longitude and latitude associated with each student address can be related to the corresponding census area, in our case, the census block groups.

However, the lack of adequate address data for automatic geolocation represents a significant limitation regarding possible widespread implementation across schools island-wide.

Preliminary Findings

Research question 2:

How feasible is it to determine the probability of flooding, landslide, and socioeconomic vulnerability for students in a particular school using the neighborhood of residence, geographical hazard data available in Puerto Rico, and data from the Puerto Rico Community Survey?

An ArcGIS dashboard was created for each school. They include:

- Nine (9) Hazard layers related to earthquakes, flooding, landslides, and drought risks.
- One (1) anthropogenic risk layer related to crime rate.
- Eight (8) layers corresponding to socioeconomic vulnerabilities hotspot analysis: Extreme Poverty, Female-Headed Households with Children, Children in Grandparents' Households, Low Education, Low Employment, Lack of Vehicle, and Lack of Computer or Internet.

Summary Tables compare risks and vulnerabilities across schools.

Preliminary Findings

Research question 2: Differences across schools are highlighted

Percentage of Students in Landslide Risk Area

	Low Landslide Risk Area	Moderate Landslide Risk Area	High Landslide Risk Area
School 1 (Rural)	63.3	32.8	3.9
School 2 (Rural)	52.7	44.1	3.2
School 3 (Rural)	85.2	14.1	0.7
School 4 (Urban)	99.1	0.9	0.0

Number of Students By Flood Zone

Schools	Flood Zone A	Flood Zone AE	Flood Zone AO
School 1 (Rural)	0	0	0
School 2 (Rural)	0	0	0
School 3 (Rural)	1	2	0
School 4 (Urban)	0	25	0

Preliminary Findings

Research question 2: Differences across schools are highlighted

Vulnerability Factor	School 1(Rural) N=102		School 2 (Rural) N=242		School 3 (Rural) N=155		School 4 (Urban) N=95	
	Average value among students	% Student Living in Hotspot Zones	Average Value Among Students	% Student Living in Hotspot Zones	Average Value Among Students	% Student Living in Hotspot Zones	Average Value Among Students	% Student Living in Hotspot Zones
Extreme Poverty	27	0	19	0	21	0.7	30	46
Female-Headed Households with Children	27	2	18	1	24	4.5	25	77
Children in Grandparents' Households	4	0	19	3	23	0.7	13	0
Low Education	26	96	28	18	21	8.4	21	0
Low Employment	68	61	62	2	58	7.1	58	1
Without Vehicle	9	1	13	1	9	1.3	27	0
No computer or Internet	34	12	30	1	20	1.9	38	80

Preliminary Findings

Research Question 3:

How can student socioeconomic data, neighborhood data, school resilience, and hazard risk data be presented to school leaders and the Department of Education in a way that could be useful to improve school emergency plans?

Escuelas activas 2023 del Departamento de Educación de Puerto Rico

<https://arcg.is/19OmDT>

Escuela Gerardo Selles Sola Cayey

<https://arcg.is/KeW840>

Escuela Rafael Cordero San Juan

<https://arcg.is/1KeGnL0>

Escuela Pedro Bosch Juncos

<https://arcg.is/qj9Oy0>

Escuela George Washington de Lares

<https://arcg.is/5mrrv>

Public Health Implications



1

Schools can develop actions and disseminate knowledge that meets specific school community needs.

2

A school emergency plan tailored to the school's community can focus on attending to the more pressing needs.

3

Improving administrative data is an important step in order to be able to take advantage of innovations in data analysis and visualization tools for emergency planning.

Public Health Implication

1



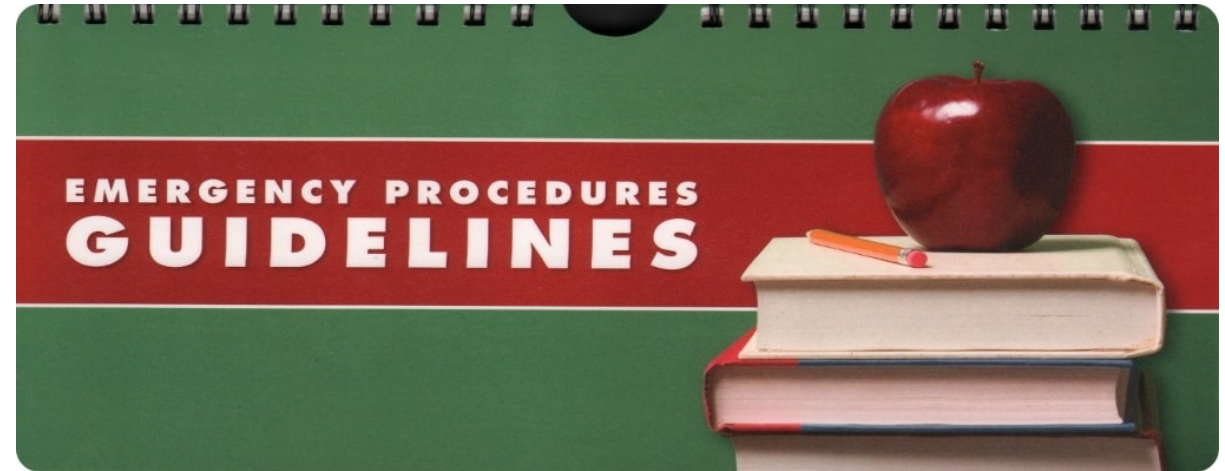
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Schools can develop actions and disseminate knowledge that meets specific school community needs.

A well-informed and organized school community can be engaged in preparation and mitigation efforts to attend to the community's needs when confronting an emergency threat.

Public Health Implication

2



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A school emergency plan tailored to the school's community can focus on attending to the more pressing needs.

Examples of these can be helping assure access to food or water, coordinating access to medical services with other agencies or groups, preparation and mitigation training for students and families, among others.

Public Health Implication

3

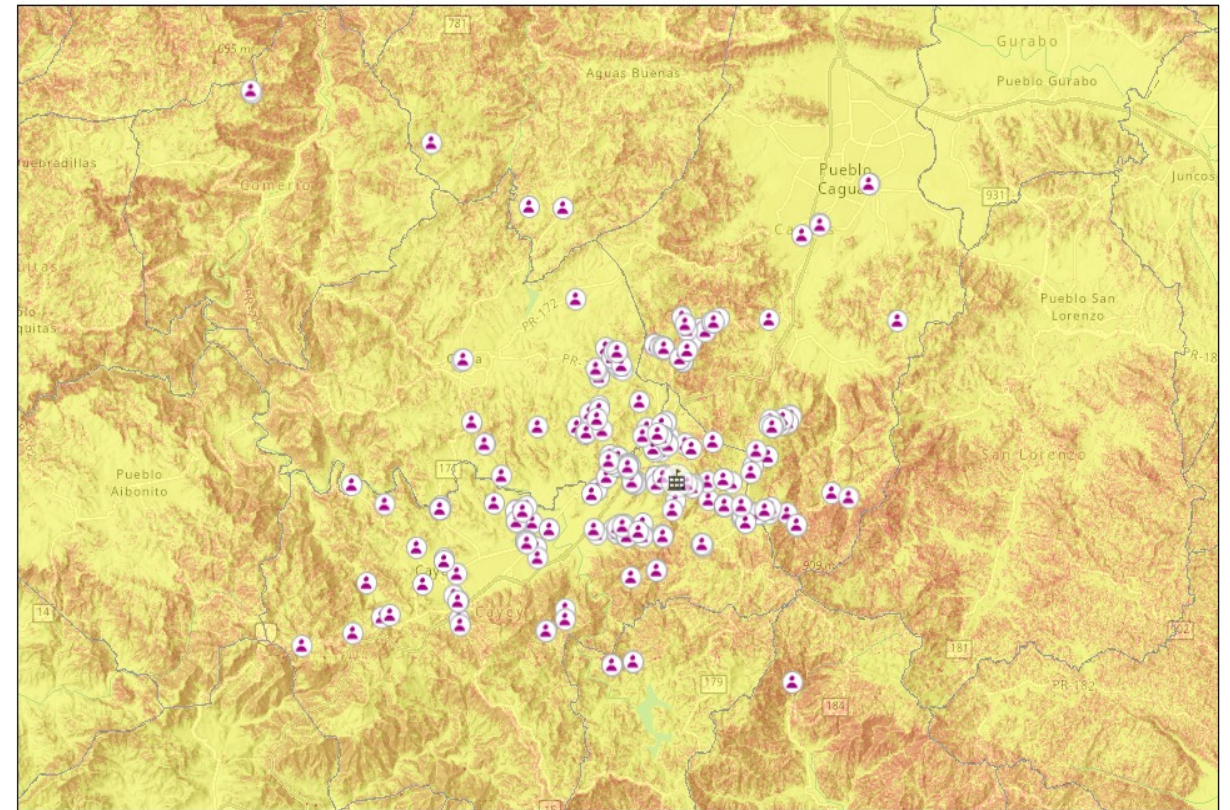
Improving administrative data is an important step in order to be able to take advantage of innovations in data analysis and visualization tools for emergency planning.

Acknowledgements

We acknowledge the Puerto Rico Department of Education's help in accessing the necessary data for this study.

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Escuela Gerardo Selles Sola Cayey y Susceptibilidad de Deslizamiento de Tierra



6/16/2023



Escuela Gerardo Selles Sola Cayey



Estudiantes Gerardo Selles Sola Cayey



Municipios

World Hillshade



1:170,178

0 1.25 2.5 5 mi

0 2.25 4.5 9 km

Esri, NASA, NGA, USGS, Esri, HERE, Garmin, Foursquare, SafeGraph, METINASA, USGS, NPS

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