



**William M.
Lapenta
Internship
Program**
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A Climate Justice Approach to Major Flooding Events

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1- NOAA/OAR/WPO

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About Me

- Washington, D.C. Native
- B.S., Environmental Science and Sustainability
- Board Member, PA Department of Environmental Protection's Environmental Justice Advisory Board



Introduction- Environmental and Climate Justice

Environmental Protection Agency Definition

- Every community has equal opportunity for participation in decision-making processes and protection from environmental and health risks

President Clinton 1994 Executive Order (12898)

- Federal Actions to Address Environmental Justice in Minority and Low-Income Populations

President Biden 2021 Executive Order (14008)

- Reaffirms Commitment to Advancing Environmental Justice through a “whole of government approach”



NOAA's Position on Environmental Justice

“Given vulnerable communities may bear the brunt of weather and climate impacts, it is critical that NOAA provide authoritative climate information and services that help all Americans become more resilient in the wake of more extreme weather events.”

Climate Justice

In recent years, environmental justice has broadened to include climate change perspectives. Promotes fair distribution of resources that addresses the impacts of climate change in vulnerable communities.



Climate Justice

(Impacts of Climate Change)

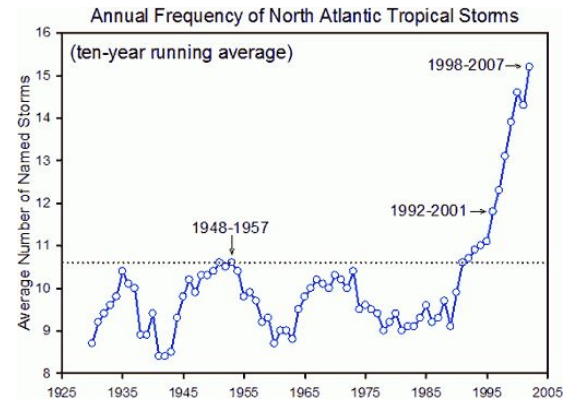
Shift of perspective from short-term, hazard specific to long-term phenomena:

- Shifts in geographic areas due to changing weather and hydrological patterns cause ecosystem changes, coastal flooding, and sea-level rise.
- Recognition that climate change exacerbates existing inequitable social conditions.
- Change in frequency and severity of hurricanes, droughts, or wildfires

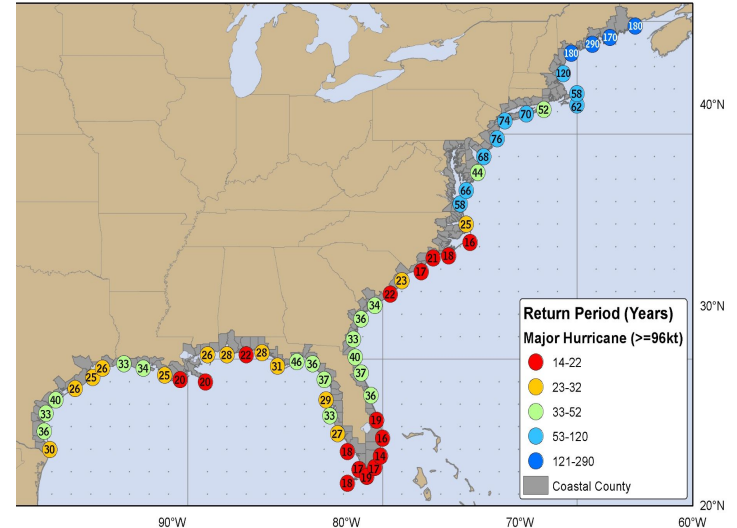


Example: Hurricane Frequency

- Due to climate change, hurricane frequency and intensity will increase over time
- Gulf and Atlantic coastal regions are most at risk
- Understanding long-term hurricane trends on vulnerable populations informs more equitable responses on
 - Recovery
 - Mitigation
 - Resilience



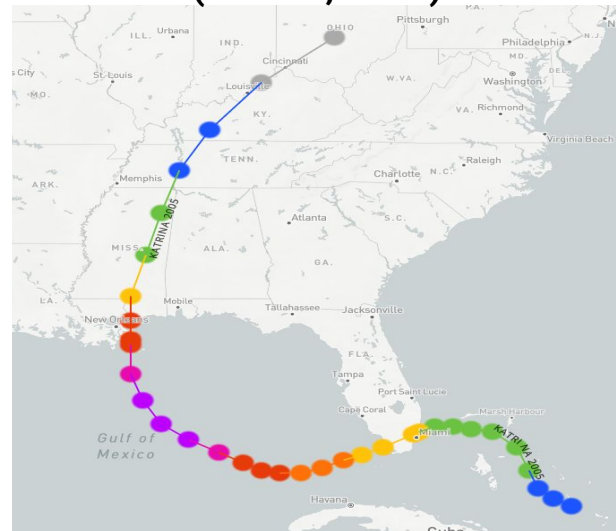
Hurricane Return Frequency (50 Nautical Miles)



Example: Hurricane Severity

- Hurricane Katrina (2005)
 - Category 5
 - Costliest hurricane on record at the time
 - ~\$145 billion
 - One of the deadliest
 - ~1,800 deaths (majority due to flooding)
- Devastated socially vulnerable populations
 - 100,000 homes were flooded
 - Majority of people who lost their homes were low-income African-American families
 - Destroyed communication and transportation facilities - low-income families had little access to food, shelter, and basic necessities
 - Estimated 95,000 New Orleans residents lost their jobs in the 10 months following the hurricane

NOAA's Historical Hurricane Track (Katrina, 2005)





Research Process

Purpose:

- Expand metrics for “socially vulnerable”
- Advance more equitable climate solutions
- Better inform decision support to mitigate both physical and social aspects of vulnerability related to flooding



Question:

How does flood extent and depth impact **socially vulnerable populations and neighborhoods** in extreme flooding events?



Methods:

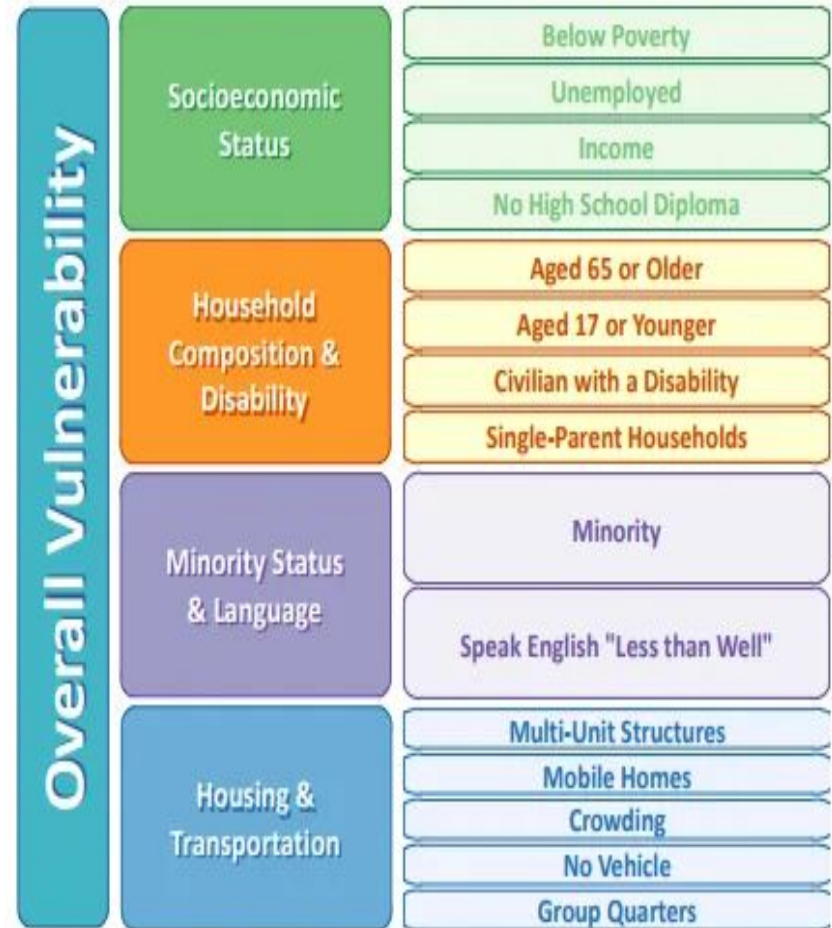
- Focus on post-Katrina New Orleans
- The goal: Overlay social data with flood extent/depth data
- Used multivariate clustering to analyze spatial clusters of extreme flood depths in SV areas.

What are Vulnerable Populations?

Many definitions, inconsistent/incomplete metrics

One example - CDC³/ATSDR⁴ Social Vulnerability Index

- Uses 16 census variables to assess social vulnerability at the tract level, identifying factors that hinder a community's ability to handle hazards
- Limited in scope
 - Lack of granularity - only at tract level
 - Limited to Census variables and misses key aspects of vulnerability, such as food insecurity and public aid



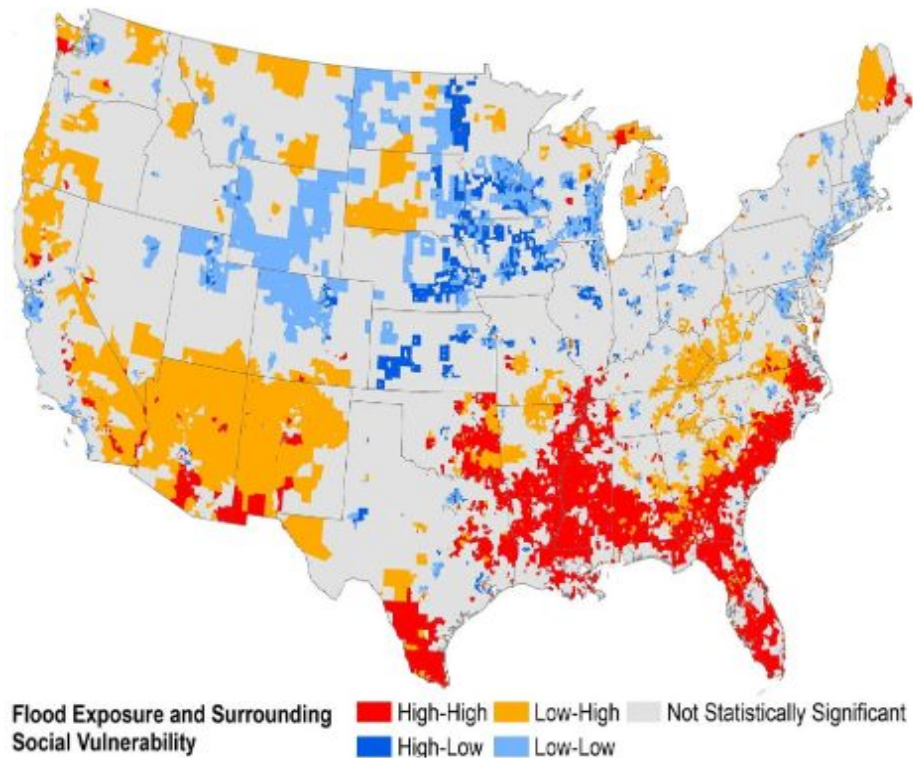
3- Centers for Disease Control

4- Agency for Toxic Substances and Disease Registry

Incorporating Social Data: The Potential

Flood Exposure and Social Vulnerability in the United States (Tate et al, 2020)

- Used American Community Survey 2012-2016 data and SoVI⁵ algorithm to build 29 variable index
- Used spatial analysis to map clusters of extreme flood exposure and social vulnerability in the contiguous United States
- Highlights the ability to integrate social and flood exposure data.

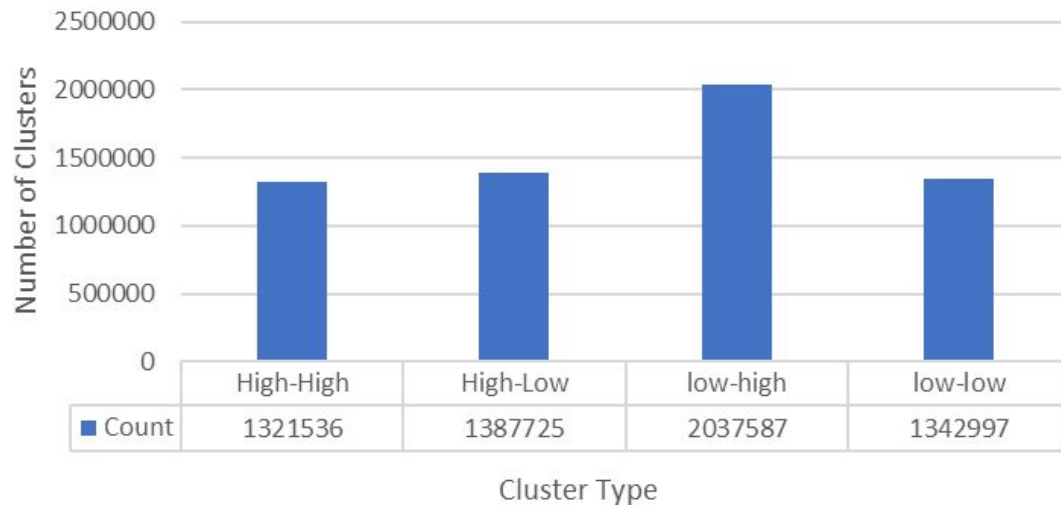


Tate, Eric, et al. "Flood exposure and social vulnerability in the United States." *Natural Hazards* 106.1 (2021): 435-457.

Results

- 55.2% of the Population are in High Flood Depths
- 44.5% of the Population are in High Socially Vulnerable Areas.
- 21.7% of High Socially Vulnerable Populations are in High Flood Depth Areas.

Distribution of Social Vulnerability & Flood Depth Clusters in New Orleans Post Hurricane Katrina



Future Social Application

- Data Availability and Integration Issue
 - Issues with FAIR data principles (Findable, Accessible, Interoperable, Reusable)
 - Data ownership and accessibility
- Exploring new types of social vulnerability data
 - Grocery Stores (Food Access)
 - Redlining Data



Conclusion

- My project focused on identifying the impact of flooding on socially vulnerable populations
 - Identified a number of continuing challenges in identifying, accessing, and integrating data
 - Shortcomings on all FAIR data principles
- Recent policies have recognized the need for greater accessibility to all types of data, including
 - Weather Research and Forecasting Innovation Act of 2018
 - Evidence-based Policymaking Act of 2018
 - The OPEN Government Data Act of 2018
- Prioritizing environmental and climate justice requires greater information and data to more accurately
 - Identify the multi-faceted needs of socially vulnerable populations
 - Craft policies that address these specific needs
 - Develop targeted responses on mitigation, resilience and recovery
- *As climate change increases the severity of disproportionate impacts, it is imperative to address the needs of our most vulnerable populations*





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THANK YOU
Questions?



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