

Background

On October 29, 2012 at 7:30 PM Post-Tropical Cyclone Sandy made U.S. landfall near Brigantine, NJ bringing substantial impacts to the highly populated I-95 corridor. Sandy damaged or destroyed at least 650,000 homes and led to power outages to 8.5 million customers. Damage estimates from 24 affected states from Sandy exceeded \$50 billion.



Vulnerability is widely used in the global change and variability literature, particularly to analyze effects of environmental hazards on populations and how vulnerability varies in both time and space (Cutter et al. 2003; Adger 2006; Myers et al. 2008). The vulnerability of a place to weather hazards can be defined as a function of exposure (extent, frequency, severity) and the sensitivity of the population. Sensitivity is determined by the capability of a population to prepare for, respond to, cope with, recover from, and adapt to hazards (Cutter 2000).

Research Objectives

1) Develop a geographic database of Sandy related fatality data, 2) Determine the role that Sandy related exposures (wind, precipitation, storm surge) played in the spatial distribution of fatalities. 3) Determine the role that social vulnerability and variables used to determine social vulnerability played in the spatial distribution of fatalities.

Data & Methods

- Fatality data for the study were acquired from the New York Times (NYT). The NYT data included death location and cause of death fields. Death location was available for 105 fatalities.
- This study used storm surge (FEMA MOTF), precipitation (NWS MPE), and wind reanalysis (NARR) data to infer exposure at each death location.
- Social vulnerability data included the SoVI calculated for 2000 because of its availability at the census tract spatial scale. This study also analyzes each of the 32 socioeconomic variables used to calculate SoVI.
- Fatality locations were spatially joined with the exposure metric data to determine the precipitation, wind, and storm surge impacts for each location.
- Fatality locations were spatially joined with U.S. Census tracts in order to assess the socioeconomic makeup of the neighborhoods where fatalities occurred.
- A PCA was conducted on SoVI, elevation (at fatality location), and the 32 socioeconomic variables used to calculate SoVI to determine which variables explain the most variance in the locations where fatalities occurred.



imary Source: New York Times

An Analysis of U.S. fatalities of "Superstorm" Sandy **Using Socioeconomic and Exposure Metrics**

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Fig. 6. Age distribution of Sandy fatalities. The data show a skew towards elderly populations. Younger populations



Figs. 7 and 8. Results of principal component analysis show that principal component 1 accounts for 30% of the variance in the census tracts where fatalities occurred. The top contributors to PC1 were education related variables (QED12LES), economic status (PERCAP, QRICH), and poverty (QPOVTY, QRENTER, QSERV). Another top

Conclusions

The authors find that 68 of the 105 deaths occurred within the storm surge buffer. 62 of those 68 fatalities occurred inside the NYC metro. The other 6 fatalities occurred along the New Jersey coastline. In addition, the three primary causes of deaths were drowning (34%), tree fall related (20%), and non-tree fall related blunt force trauma (13%). A principal component analysis (PCA) was completed to determine which social variables contributed the most to the social vulnerability of those communities that experienced fatalities. This showed that education, poverty, and age related variables were the most

This study suggests that the climate scientist community must continue to improve public awareness of the lethality of storm surge. The skew toward elderly fatalities shows the need to target this vulnerable population subset during storm preparations. Multilingual weather watches and warnings need to be more readily available to help better prepare those non-English speaking populations. Future preparations also need to improve on strategies to educate low-income, lower educated populations of environmental hazards.

References

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