# Enhancing Social Vulnerability Assessment by Incorporating Climate Indicators: Insights from NYS

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## Introduction

**Social Vulnerability:** Pre-existing conditions within a community that influence its capacity to prepare for, respond to, and recover from disasters.

**Social Vulnerability Indices (SVI):**SVIs are composite measures that quantify the social and economic characteristics of populations, indicating their ability to withstand, adapt to, and recover from disasters

- Traditional SVI framework often overlook climate-specific risks.
- Our Approach

Including climate-specific indicators measured by 127 stations across NYS Mesonet.

•Heat Index
•Wind Chill
•Precipitation



## Methods

**Climate Vulnerability (C) Calculation**

•Input: Apparent temperature extremes (heat index + wind chill and precipitation data ) from 127 NYS stations.
•Classification: Extreme days identified using standardized thresholds.
•Weighting: Severity scores (1=Caution, 4=Extreme Danger) assigned.

**•Geospatial Interpolation**

•Kriging: Ordinary kriging generated county-level vulnerability maps.
•SVI Theme Modification
•Adjusted CDC SVI themes

For each theme $i$ (where $i \in \{1, 2, 3, 4\}$):

$$T_{i,\text{modified}} = \begin{cases} T_i & \text{if } T_i \geq 0.7 \\ 0.7T_i + 0.3C & \text{if } T_i < 0.7 \end{cases}$$

**•Correlation Analysis**

**•Spearman's ρ (monotonic) & Pearson's *r* (linear):** Linked modified SVI themes to Expected annual loss/hospitalizations.

## Maps

Fig 1.Climate Vulnerability map

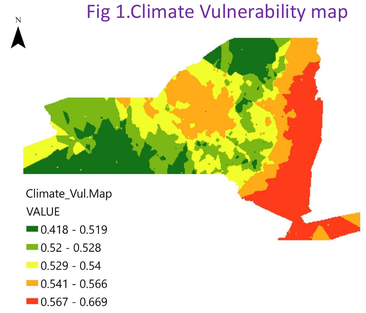



Fig 2 CDC Social Vulnerability Index across NYS

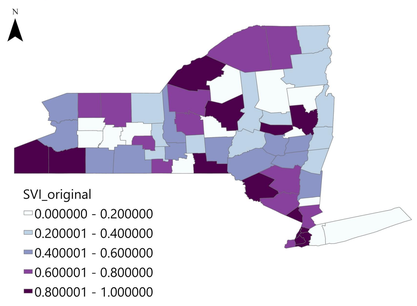
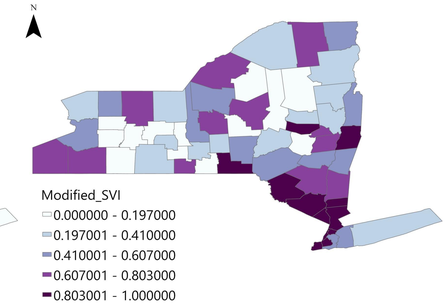
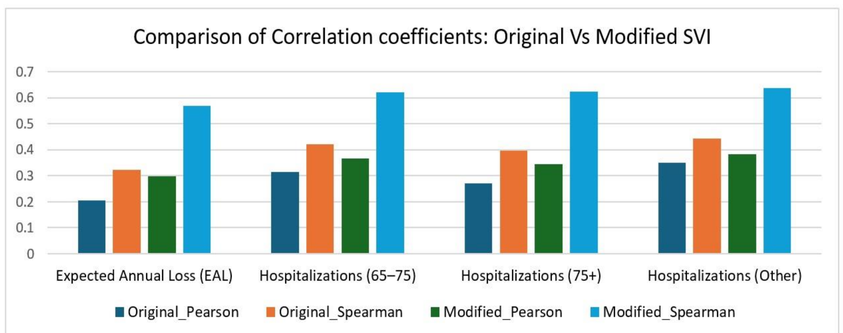
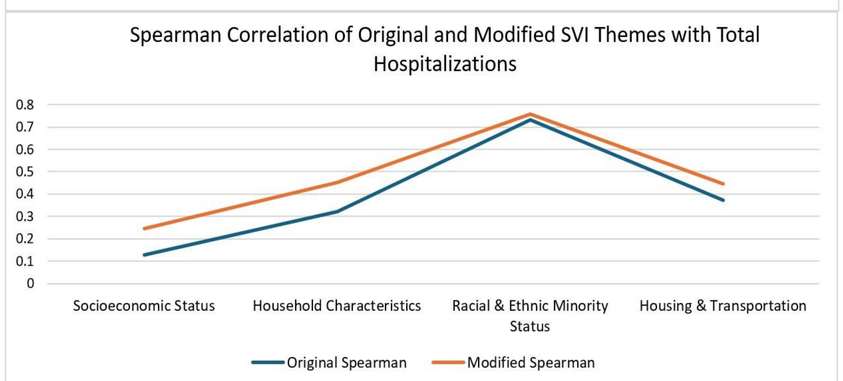



Fig 3 Modified CDC Social Vulnerability Index across NYS




## Results




## Results

**Improved Predictive Power:** The Modified SVI shows stronger and more consistent correlations with disaster impacts and health outcomes across all themes.

**Racial & Ethnic Disparities:** Racial & Ethnic Minority Status has the strongest link to climate-related health **risks** (Pearson: 0.51–0.61 | Spearman: 0.63–0.78).

**Age-Related Vulnerability:**

**Older Adults (75+):** Highest vulnerability to climate risks (Spearman ρ up to 0.78).

**Working-Age Adults:** "Other" hospitalization group shows consistently high health risks.

## Recommendations

**Integrate Climate Data:** Incorporate heat index, cold extremes, and precipitation into vulnerability assessments to better anticipate health risks and expected annual losses

**Advance Equity**

Target support for racial, ethnic, and linguistically isolated communities to reduce disaster-related financial and health burdens.

**Climate-Responsive Planning**

Use climate-adjusted vulnerability data to strengthen emergency medical response for heat- and cold-related events.

**Enhance Healthcare Systems**

Invest in healthcare infrastructure in high-risk areas to meet growing hospitalization demands.

**Prioritize Elderly Care**

Improve healthcare access and emergency services for adults aged 75+ during extreme weather conditions.

## References

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