Understanding Social Vulnerability in an ACS World: Creating Metrics and Measures from the ACS and decennial Census

Association of Public Data Users

Annual Meeting

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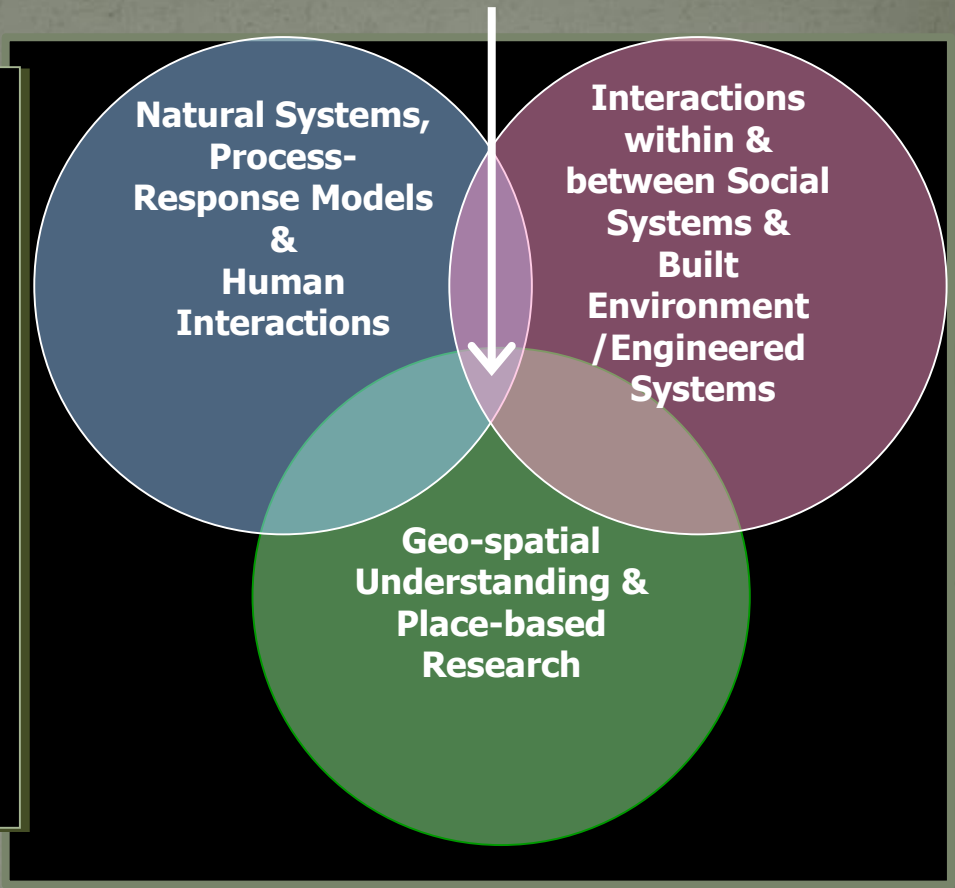
HVRI
HAZARDS & VULNERABILITY RESEARCH INSTITUTE

Vulnerability and Resilience Science

- What circumstances place people and localities at risk?
- What enhances or reduces the ability to respond to and recover from environmental threats?
- What are the geographic patterns between and among places?



Goal: Provide scientific basis for disaster and hazard reduction policies through the development of methods and metrics for analyzing societal vulnerability and resilience to environmental hazards and extreme events

Social Vulnerability

- Identification of population characteristics that influence (attenuate or exacerbate) the social burdens of risks
- How those factors affect the distribution of risks and losses

Based on extensive post-disaster field work monitoring the location of losses including surveys of affected populations as well as pre-impact studies

Some examples:

Special needs populations

difficult to identify (infirm, transient) let alone measure; invariably left out of recovery efforts; often invisible in communities

Age (elderly and children)

affect mobility out of harm's way; need special care; more susceptible to harm

Socioeconomic status (rich; poor)

ability to absorb losses and recover (insurance, social safety nets), but more material goods to lose

Race and ethnicity (non-white; non-Anglo)

impose language and cultural barriers; affect access to post-disaster recovery funding; tend to occupy high hazard zones

Gender (women)

gender-specific employment, lower wages, care-giving role

Housing type and tenure (mobile homes, renters)

Heinz Center, 2002. *Human Links to Coastal Disasters*. Washington D.C.: The H. John Heinz III Center for Science, Economics and the Environment.

Mapping social vulnerability: The Social Vulnerability Index (SoVI)

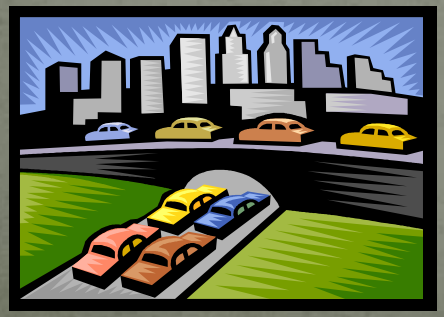
County level socioeconomic profiles based on decennial census

- 1960-2000
- 42 variables reduced to factors (~11)
- Explains 74% to 76% of variance in data

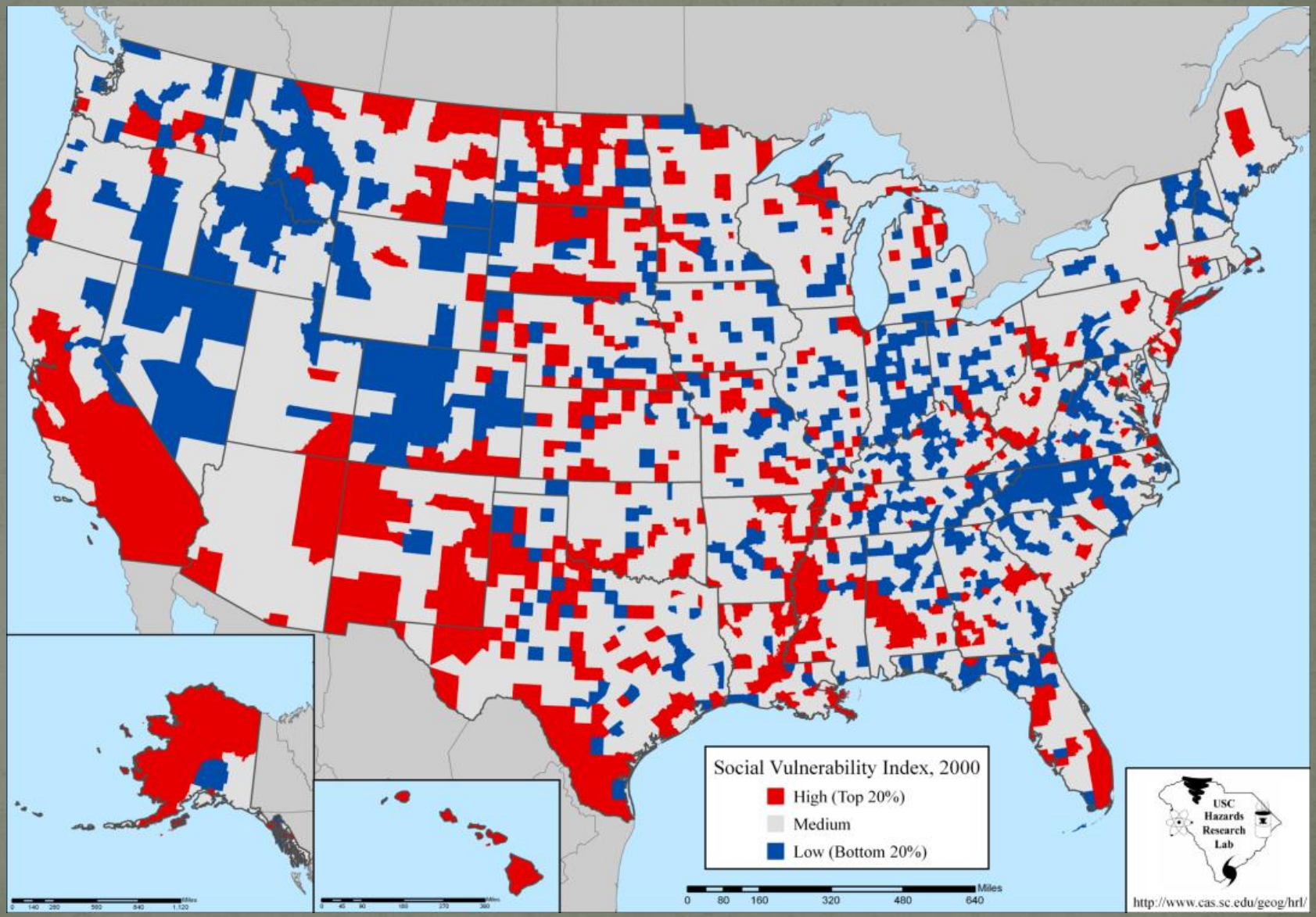
See Cutter et al. 2003. "Social Vulnerability to Environmental Hazards," *Social Science Quarterly* 84 (1): 242-261.

Social Vulnerability Factors (US Level 2000)

- Socioeconomic status
- Development density
- Age
- Race and gender (Black females)
- Rural
- Race-Asian
- Economic dependence (debt/revenue)
- Ethnicity-Hispanic
- Migration/growth
- Gendered employment (Working women)



Mapping Social Vulnerability *circa 2000*



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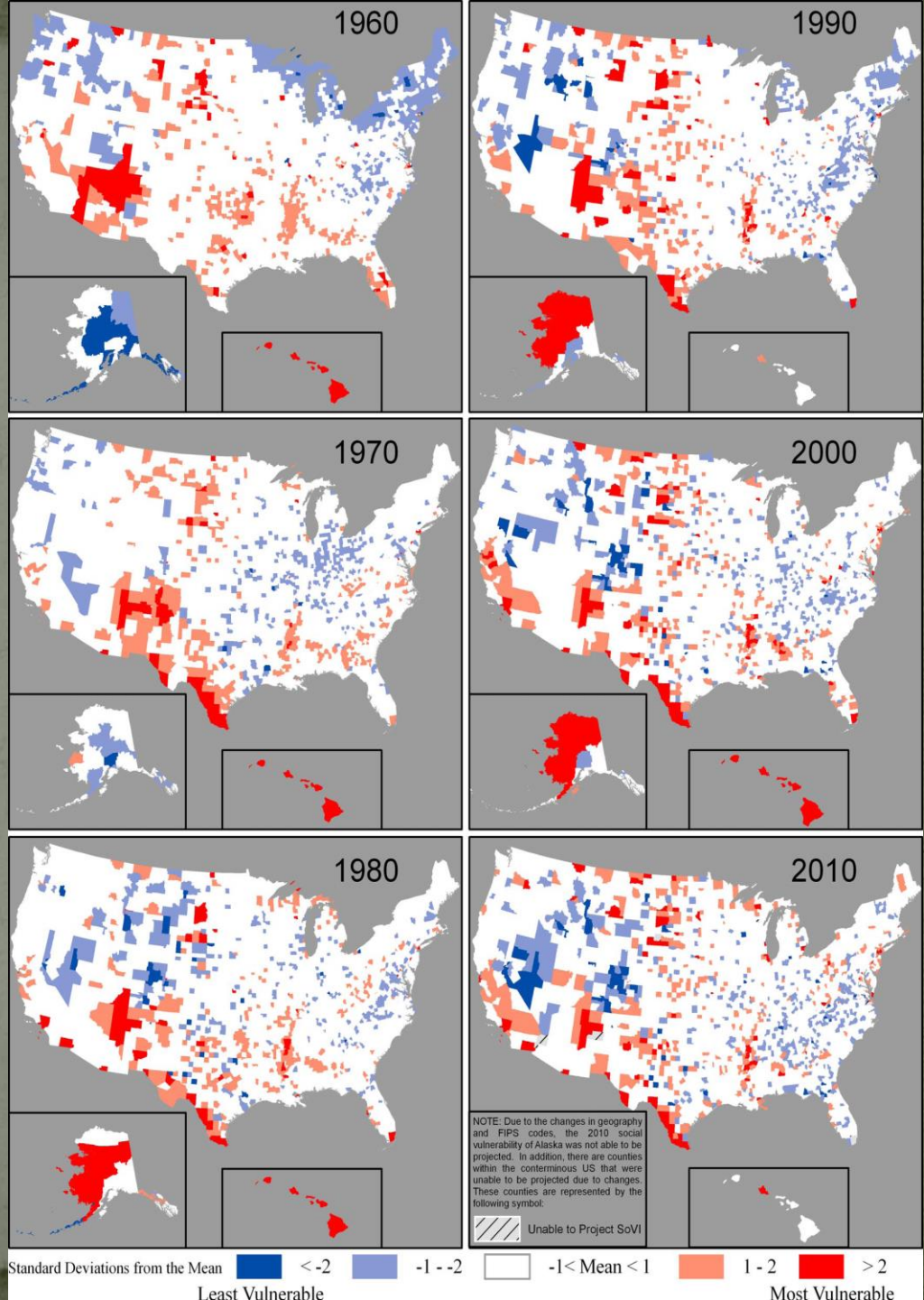
Changes in Social Vulnerability

1960–2010

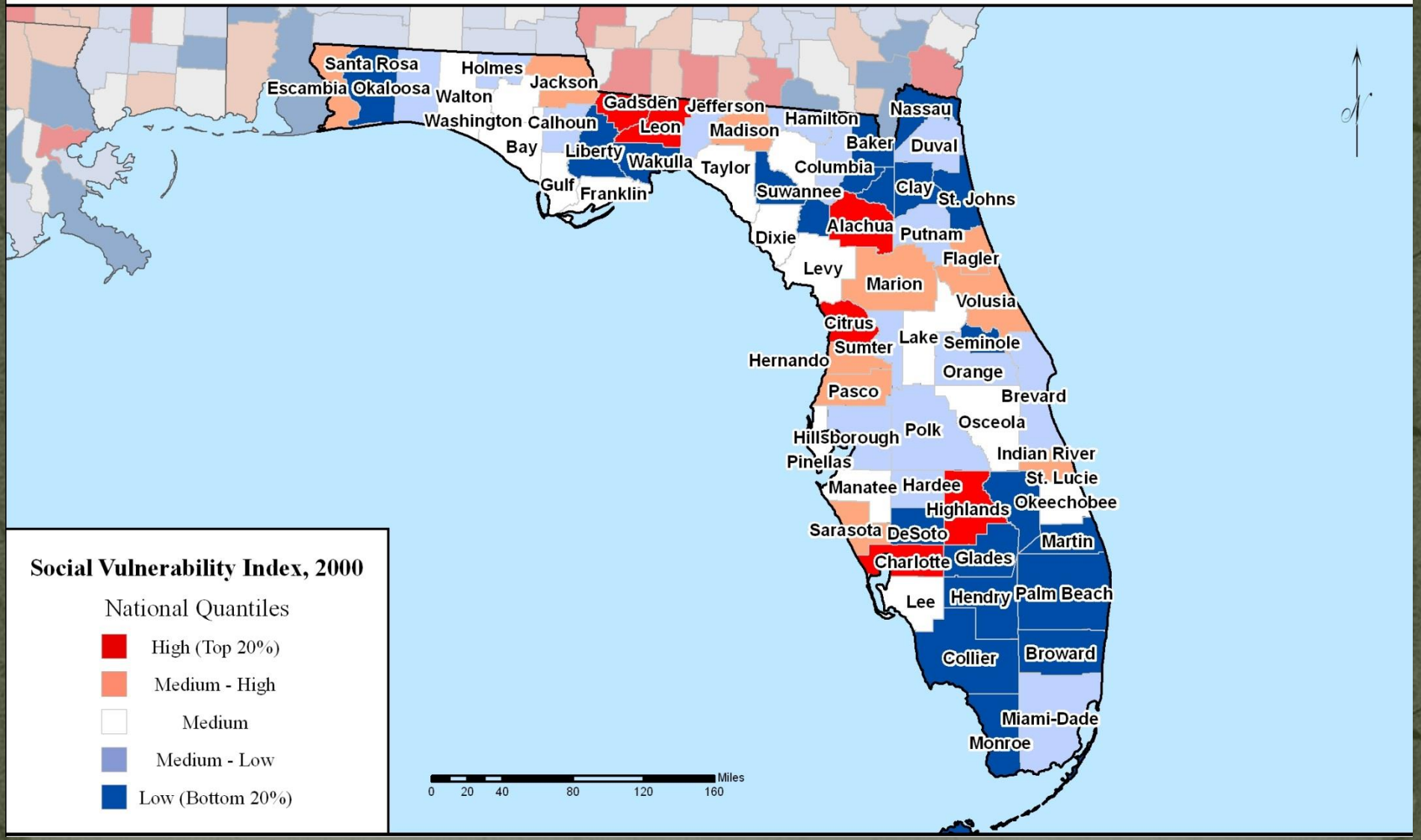


Cutter, S.L. and C. Finch, 2008. Temporal and spatial changes in social vulnerability to natural hazards. *PNAS* 105 (7): 2301-2306.

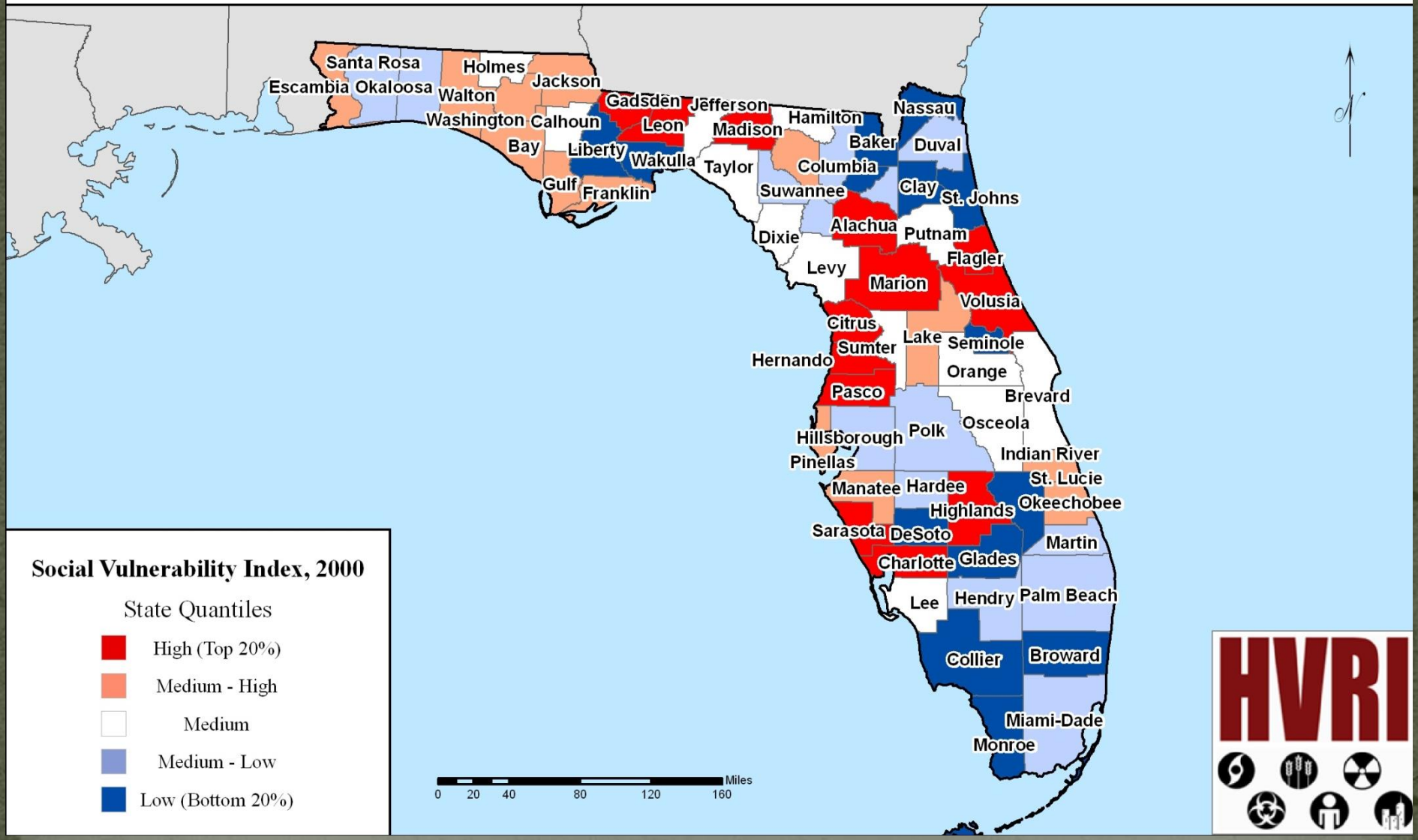
Social Vulnerability to Environmental Hazards, 2000

State of Florida

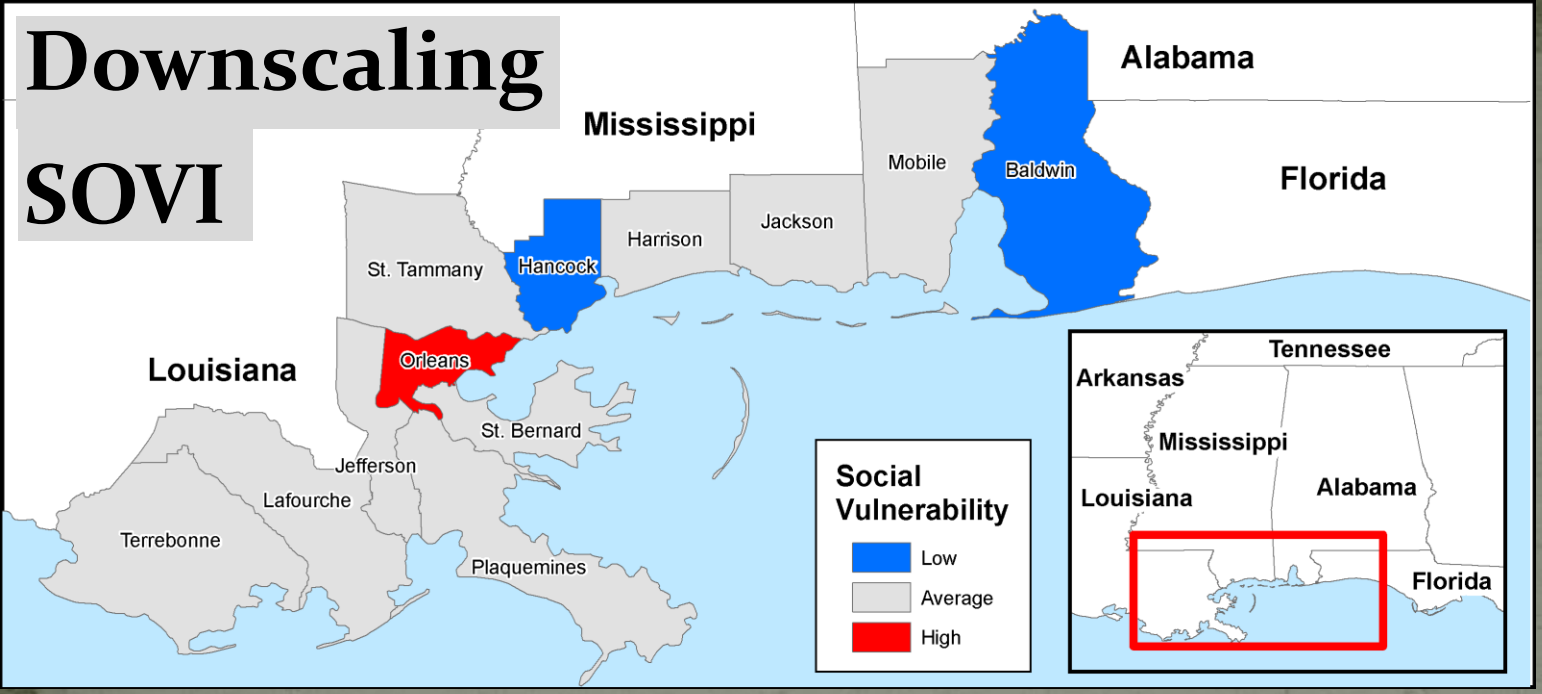
County Comparison Within the Nation



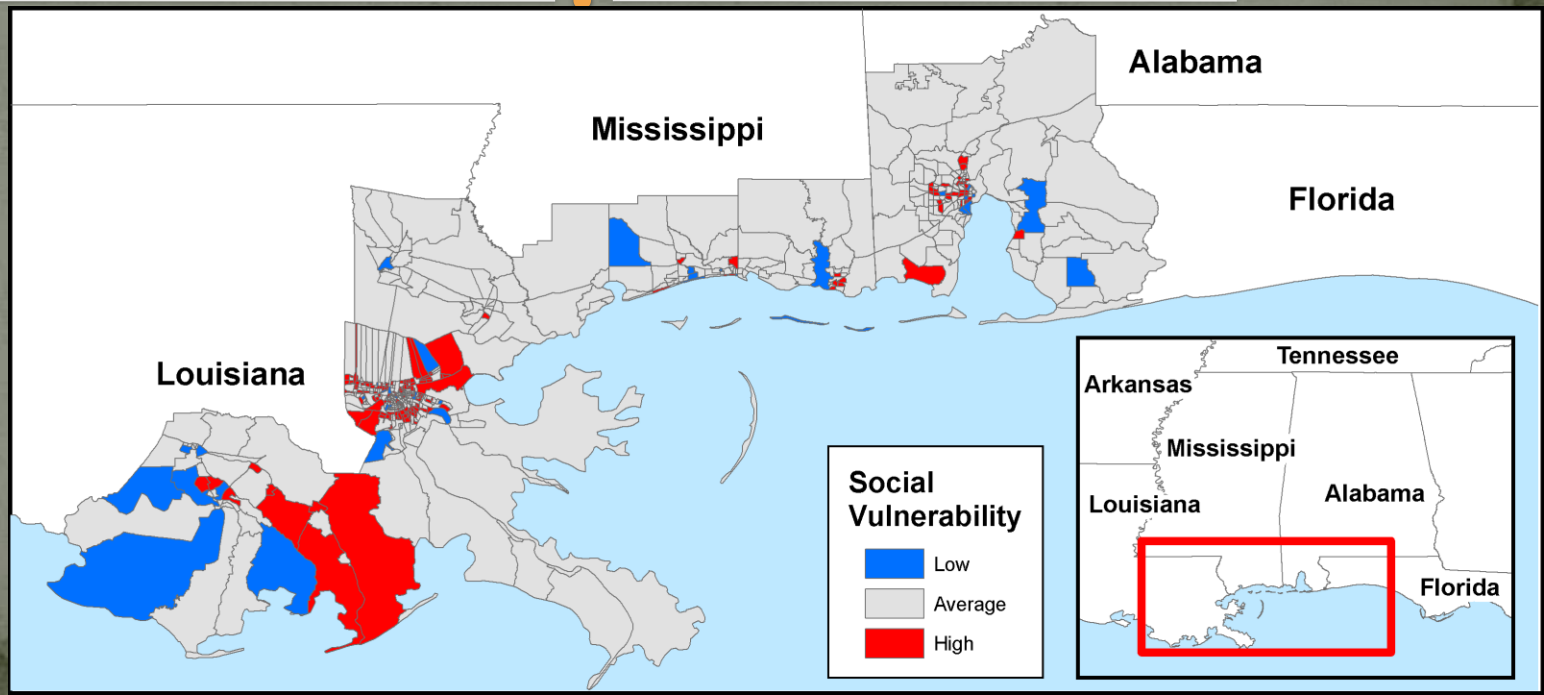
County Comparison Within the State



Downscaling SOVI



2000 SoVI (county)



2000 SoVI (tract)

Downscaling to Metro areas

Components:

Race/ethnicity & class

Age & ethnicity (Hispanic kids)

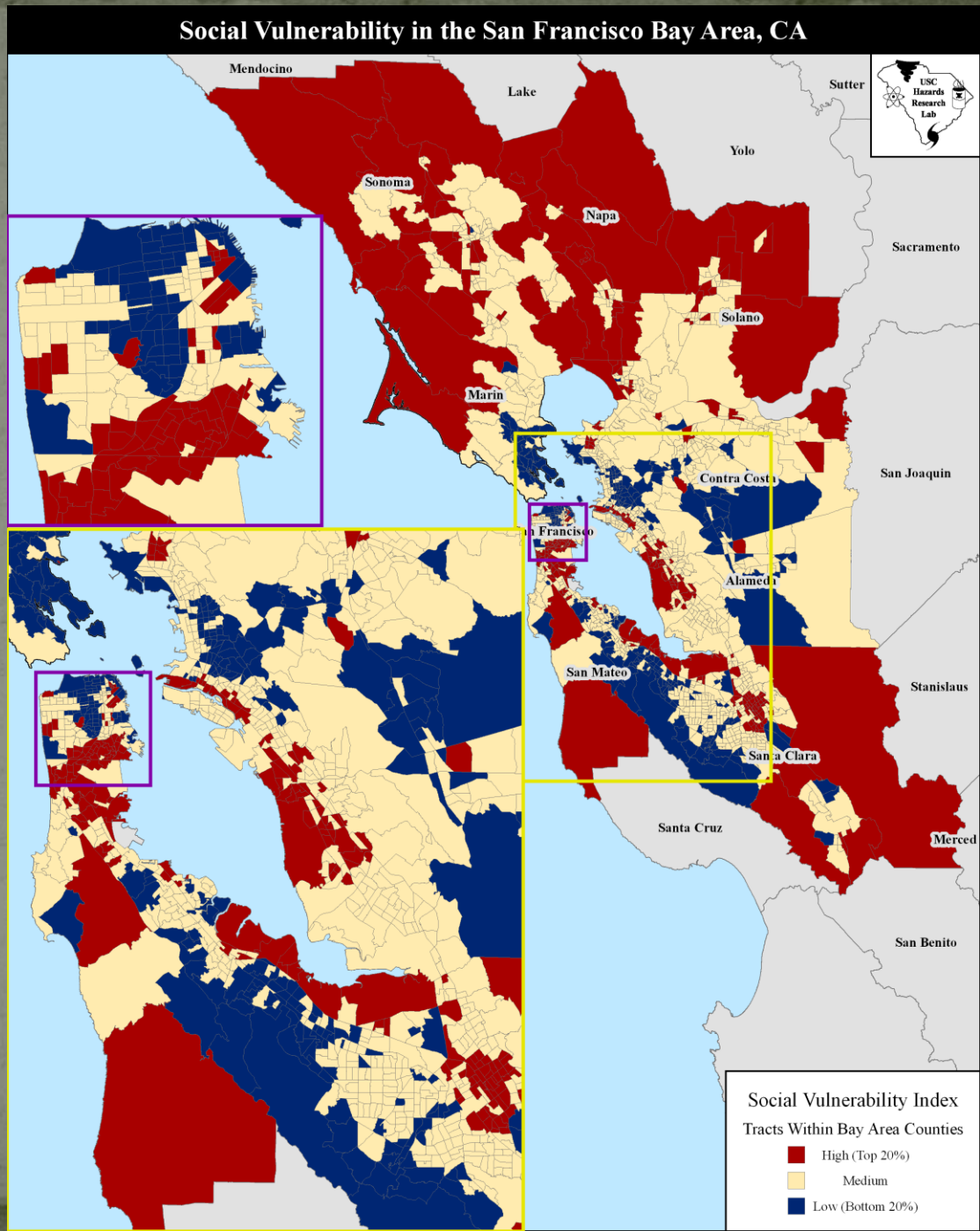
Urban/rural

Elderly

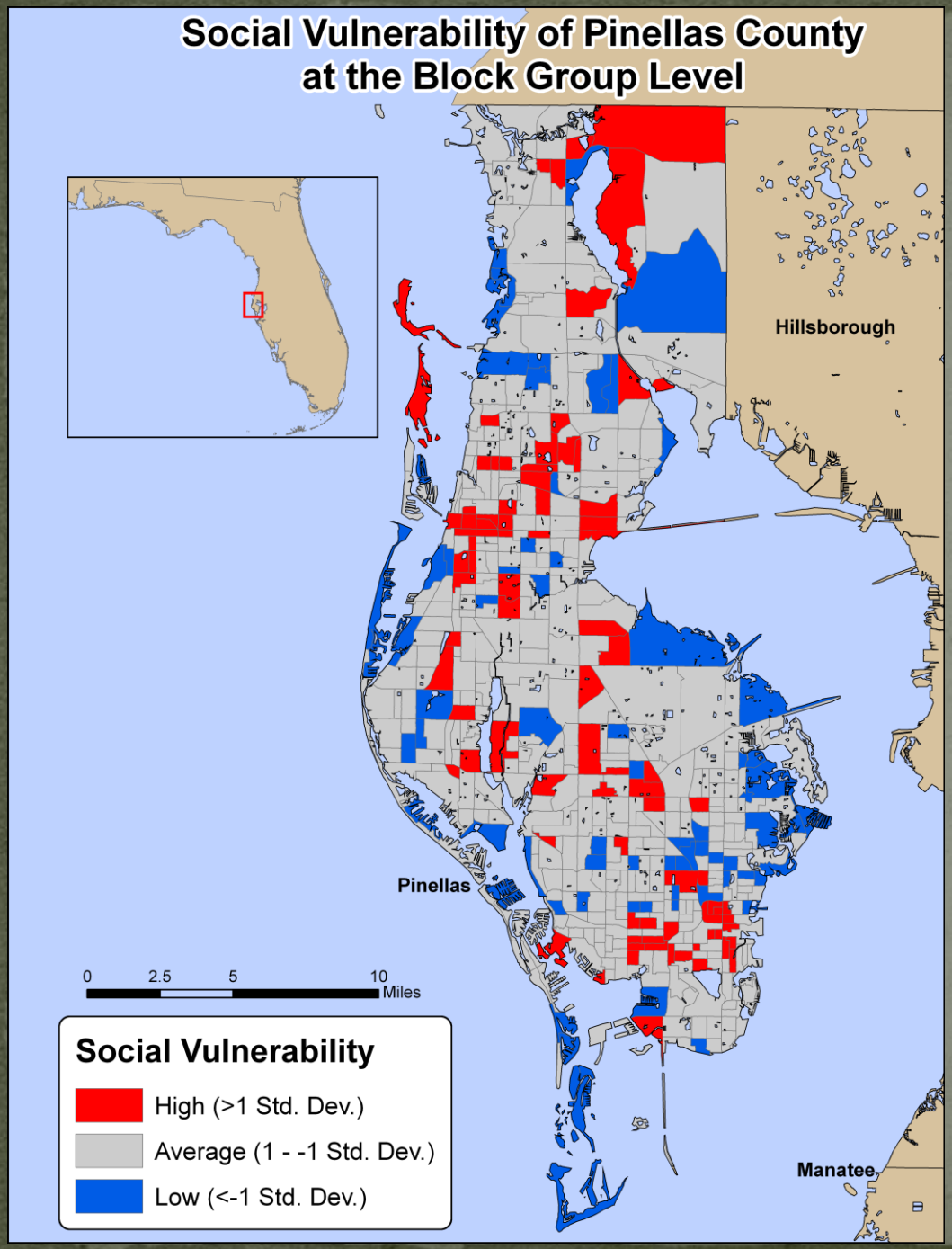
% Variance explained = 75.2%

8 factors

N=1404



Fritz Institute



Components:

Age
Race/Class
Income
Female Labor Force
Hispanic/Immigrants
Nursing Home Residents
Farm Area
Native American Population
Agriculture

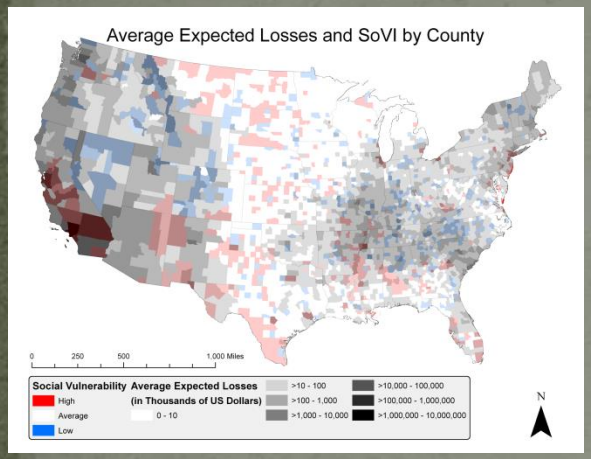
% Variance explained = 70.3%

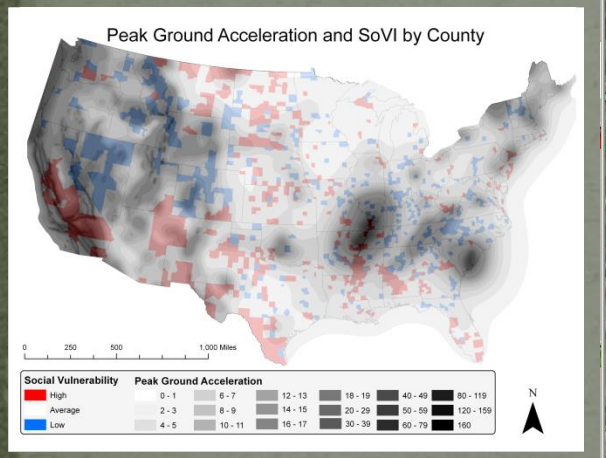
9 factors

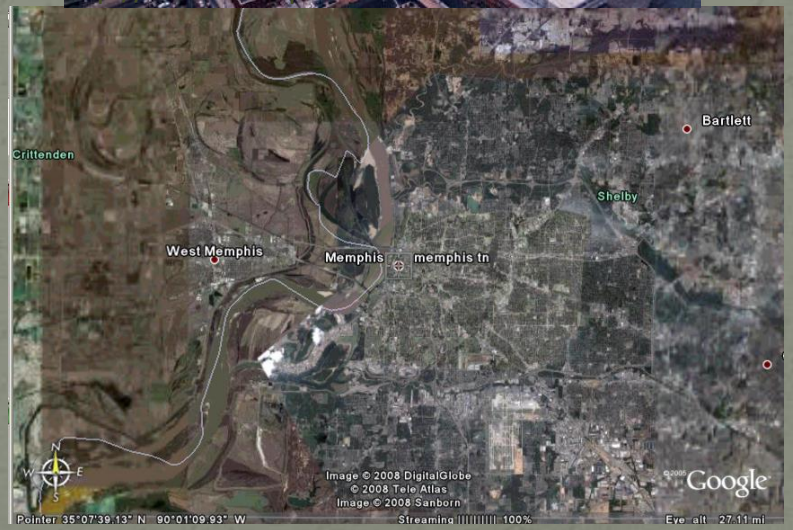
Important Note

Different geographies produce different results!

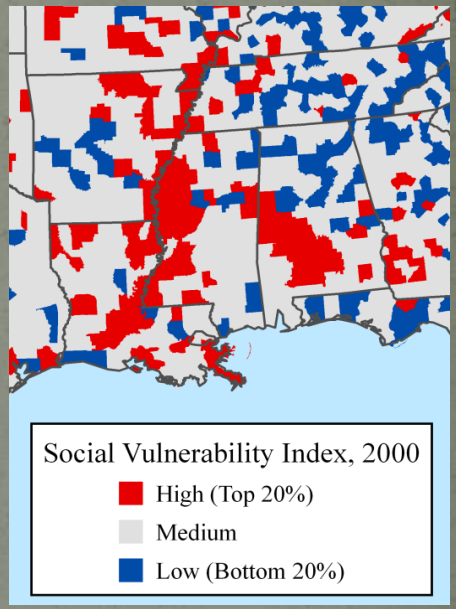
Some examples of Integrating SoVI and Hazards Information for Planning



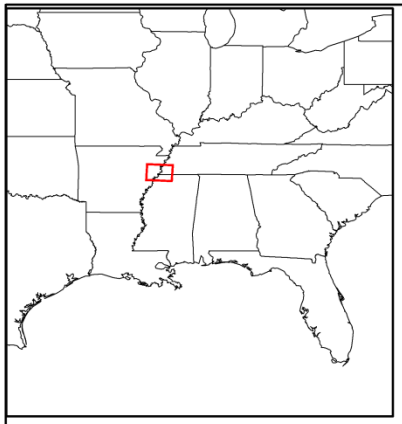


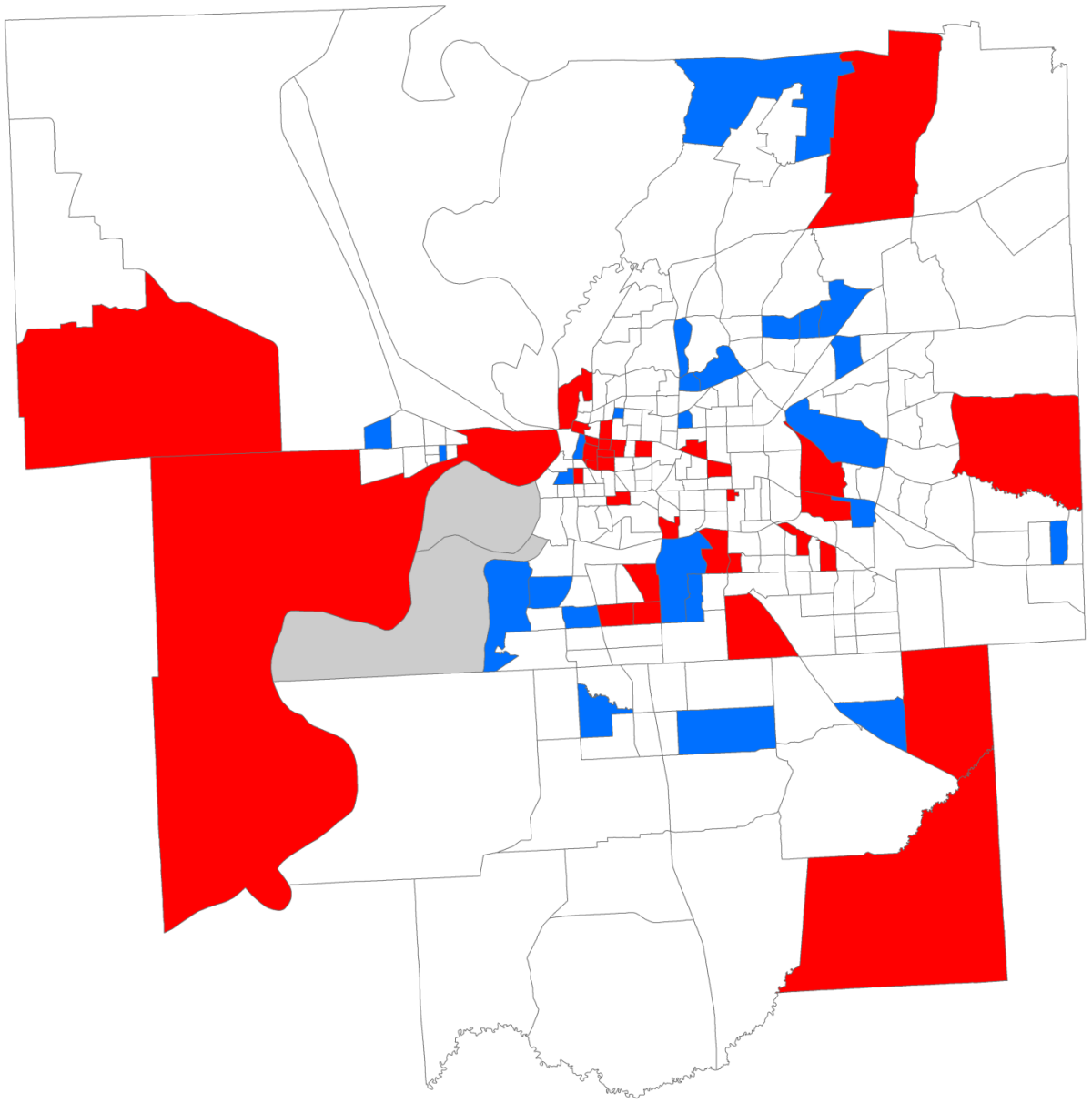


Case Study: Memphis Metropolitan Area



Social Vulnerability of Memphis Area



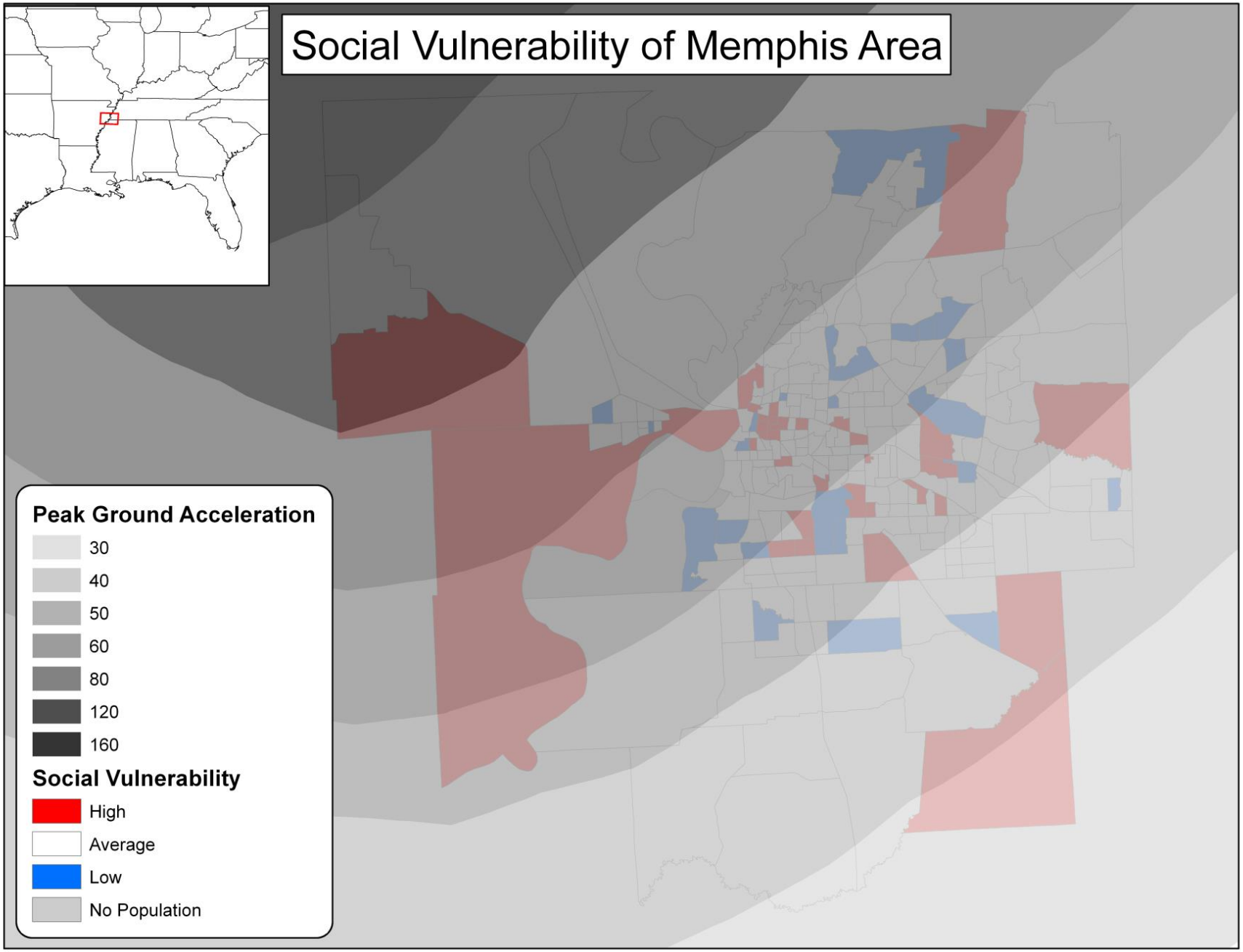


8 Factors, 74.2% variance explained

Socioeconomic status, age, renters, urban/rural

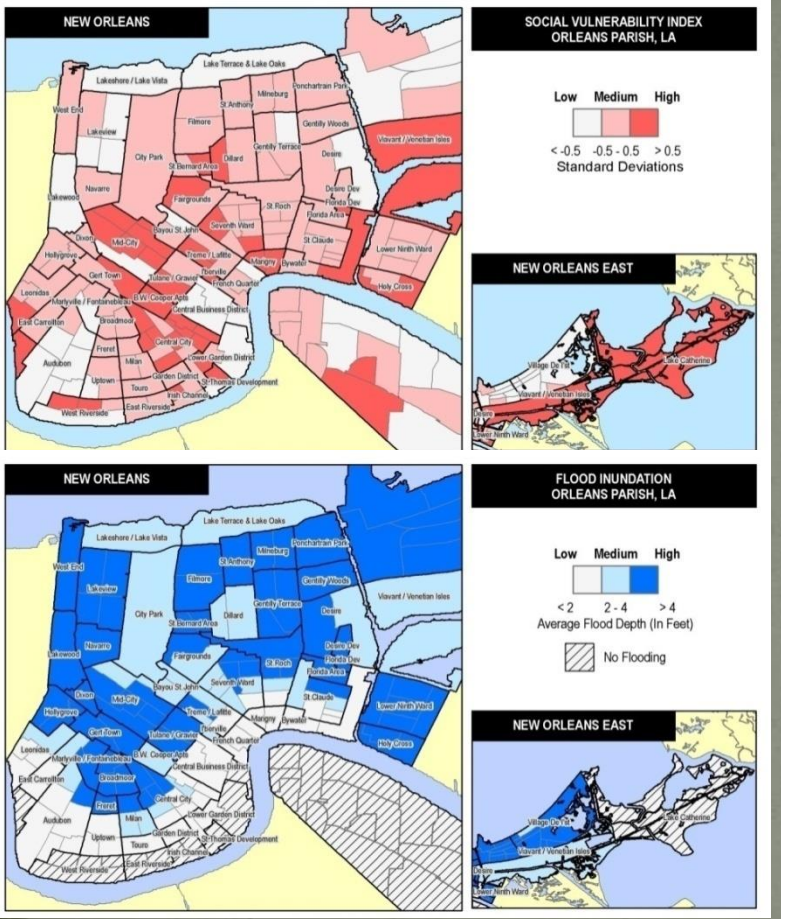
Social Vulnerability

- High
- Average
- Low
- No Population

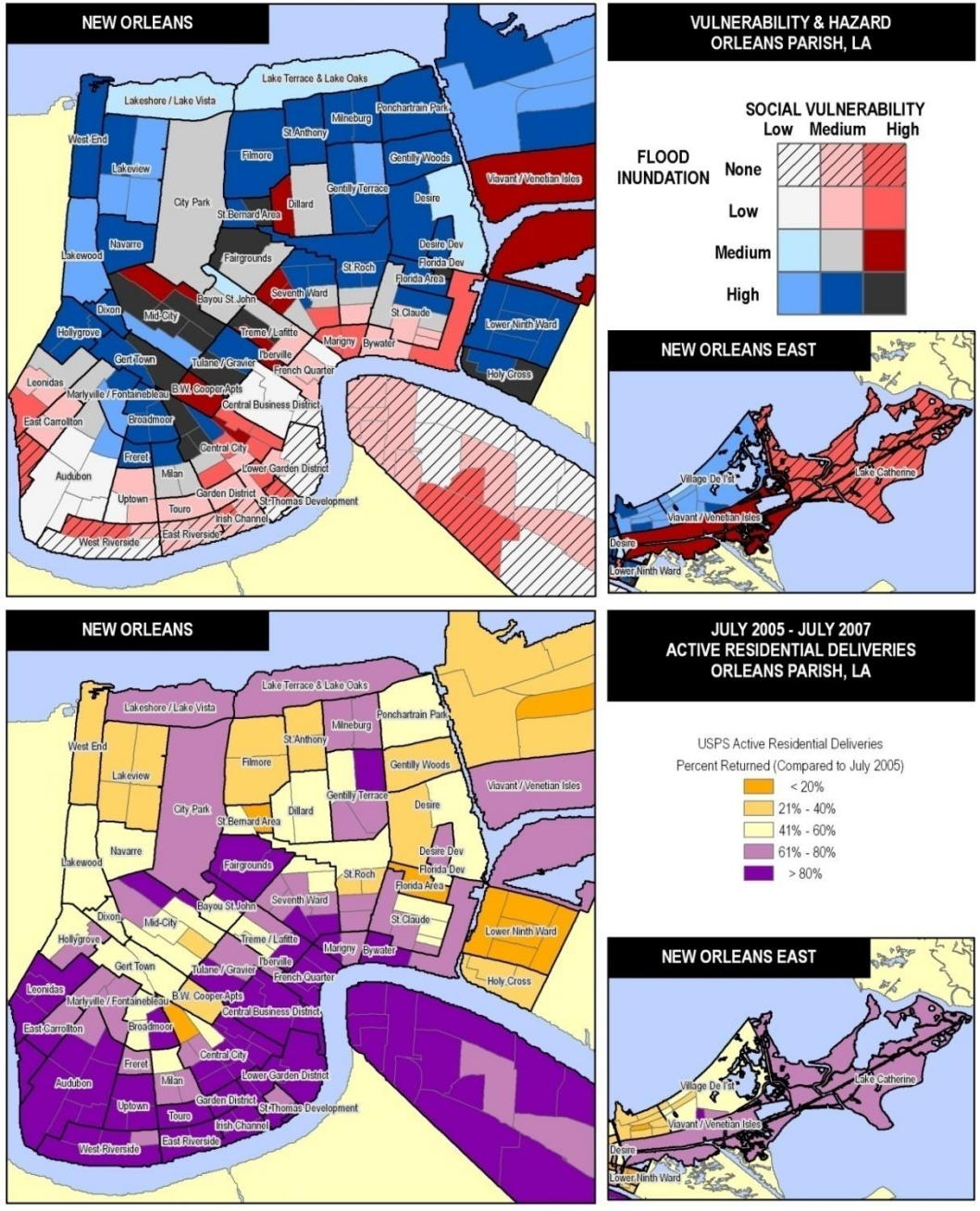

Social Vulnerability of Memphis Area
Peak Ground Acceleration
30
40
50
60
80
120
160
Social Vulnerability
High
Average
Low
No Population

Uneven impacts, recovery disparities

One size fits all strategy ignores the reality of social inequality and the nature of the driving forces that reduce resilience



9 factors, 78% explained variance
Race & class, female-headed working families, renters & poverty (housing projects); elderly



SoVI

- Robust algorithm, can be improved
  - Began with 42, moved to 32, now either 30 or 28 (depending on geography)
  - Currently reformulating SoVI06-10
- Provides indications where disparities in potential impacts and ability to recover from catastrophic failures occurs
- Vulnerability science provides an improved understanding of social systems, built environment, and physical processes in creating hazardscapes
- Is used in the creation and implementation of Policy—prioritize mitigation efforts and preparedness resources

For more info see http://sovius.org

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Thank you

For questions regarding methods, metrics, measurement and mapping.

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