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### Identifying Socially Vulnerable Communities in Coastal Virginia

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# Identifying Socially Vulnerable Communities in Coastal Virginia

A photograph showing a rescue operation in a flooded residential area. In the foreground, a red metal platform is partially submerged in the water. Two people wearing waders are standing on it. In the water, a person in a wader and a high-visibility vest is carrying a young child. Other people, including a police officer, are also in the water. In the background, there are houses and trees.

Sarah Stafford and Jeremy Abramowitz  
Jefferson Program in Public Policy  
College of William and Mary



## Median household income (In 2010 Inflation adjusted dollars)

ACS 2006 -- 2010 (5-Year Estimates)

Enter address or geography



Show data by:  
Tract

Visualization type:  
Shaded Area



**One option: Use data to identify areas with populations that are likely to have a difficult time reacting to or recovering from a natural disaster.**

Social Explorer

Zoom: 9 10 mi



## Median household income (In 2010 Inflation adjusted dollars)

ACS 2006 -- 2010 (5-Year Estimates)

Enter address or geography



Show data by:  
Tract

Visualization type:  
Shaded Area



### Pros:

- Uses readily available data.
- No need to expend limited resources to conduct your own data collection/assessment.
- May identify areas that would otherwise “slip” through the cracks.
- May help demonstrate compliance with Environmental Justice requirements.

## Median household income (In 2010 Inflation adjusted dollars)

ACS 2006 -- 2010 (5-Year Estimates)

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Show data by:  
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Shaded Area



### Pros:

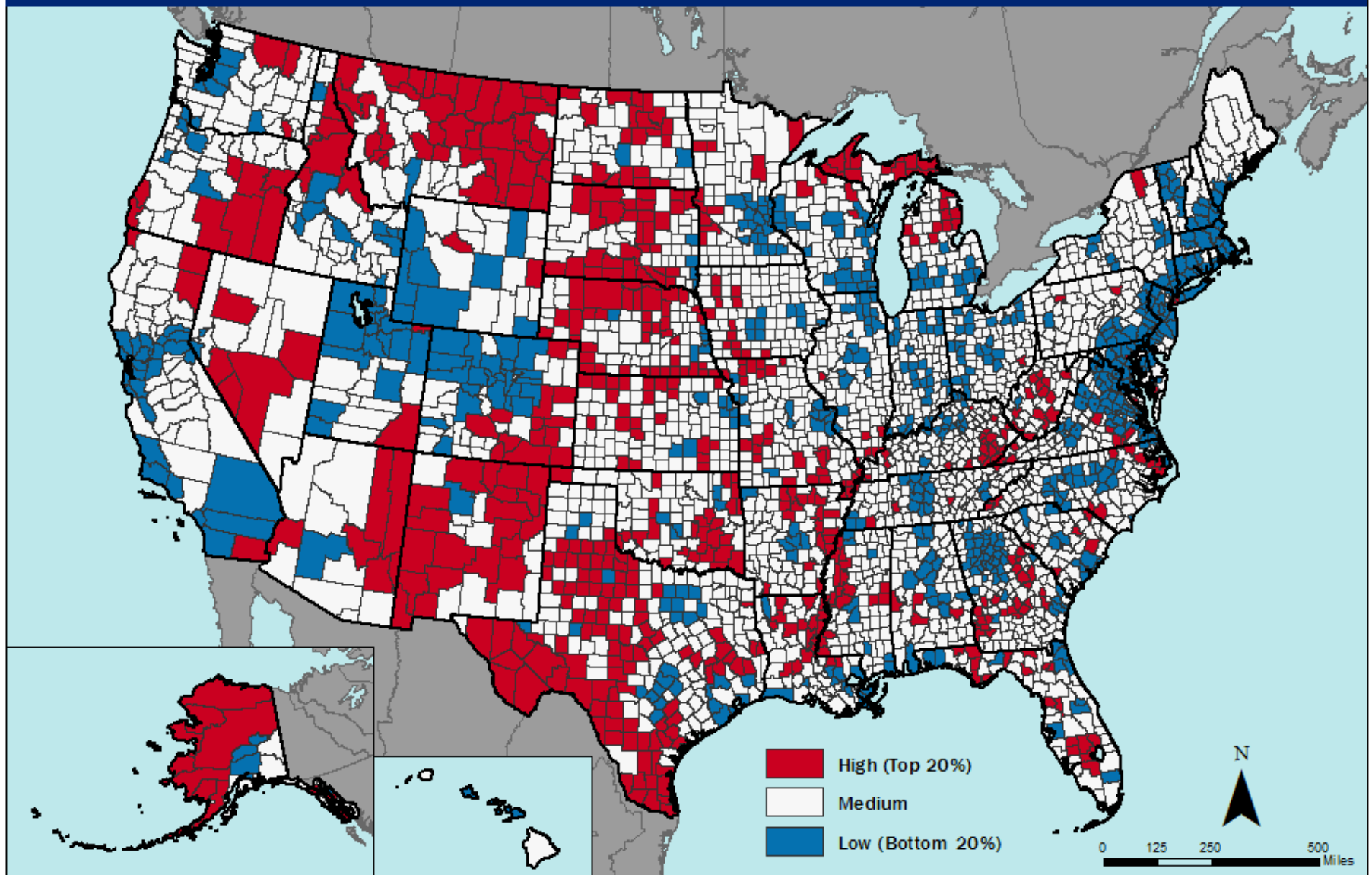
- Uses readily available data.
- No need to expend limited resources to conduct your own data collection/assessment.
- May identify areas that would otherwise “slip” through the cracks.
- May help demonstrate compliance with Environmental Justice requirements.

### Cons:

- Only uses readily available data, which is collected for lots of other purposes, not specifically to identify socially vulnerable communities.
- Can't look at each community individually or completely.



# Social Vulnerability to Environmental Hazards



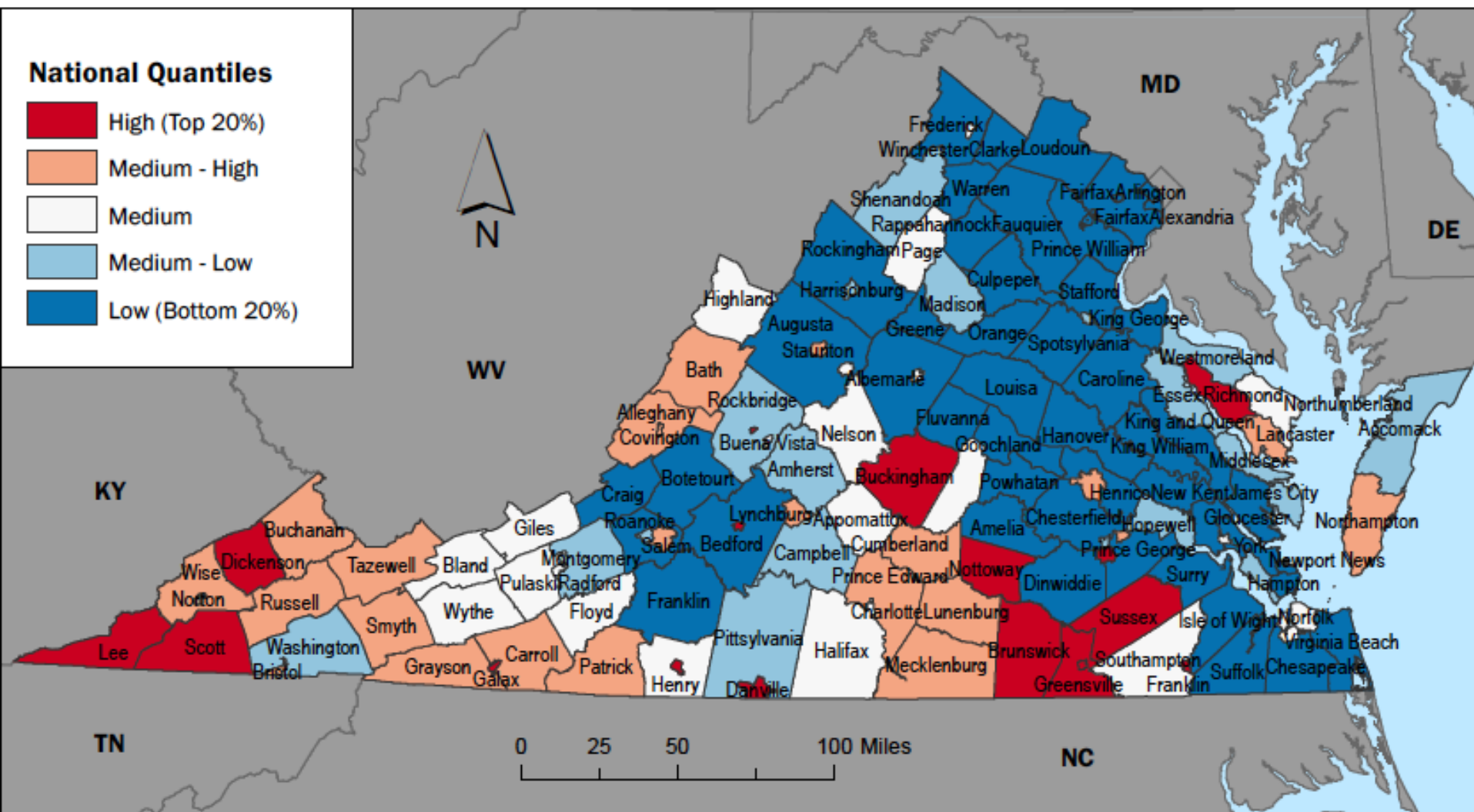
Social Vulnerability Index 2006-10

Based on U.S. Census 2010 & American Community Survey, 2006-2010

# Social Vulnerability Index (SoVI)

- Uses Principal Component Analysis to reduce a large matrix of data to a single index of vulnerability.
- Larger values indicate a more vulnerable community.
- All values are relative – there is no absolute measure of vulnerability.

### County Comparison within the Nation

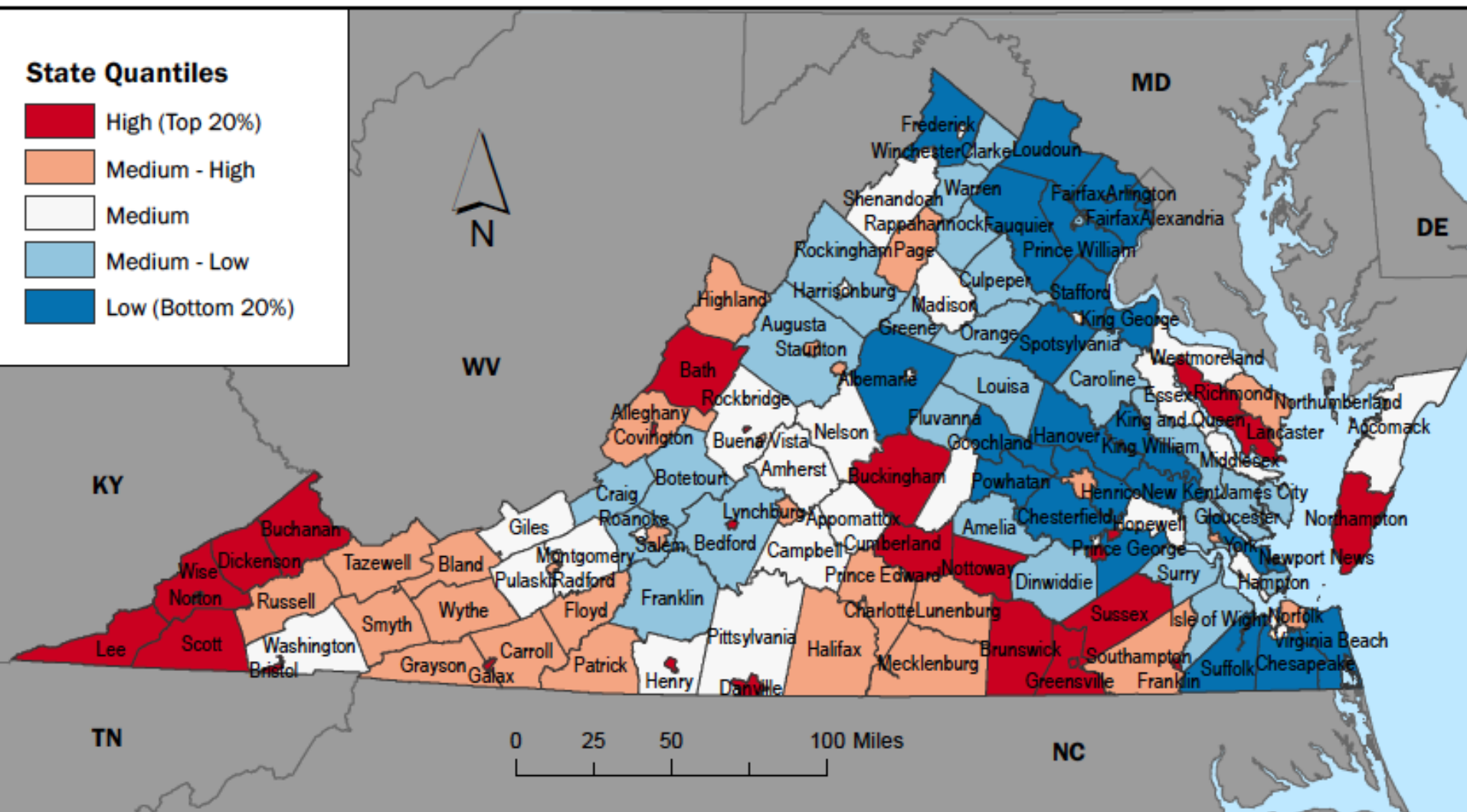




# Social Vulnerability to Environmental Hazards

## State of Virginia

### County Comparison within the State



# What Data is Used?

- Different sets of variables have been used for different iterations, but generally includes:
  - Age (mean age; pct. over 65, under 5)
  - Race (pct. Black, Hispanic, Asian, Native American)
  - Financial status (mean income, house value, and rent; pct. in poverty, unemployed, receiving soc. security)
  - Household characteristics (pct. female head of household, renter, living in mobile homes; mean number in household)
  - Other (pct. employed in service industries, extractive industries; pct. in nursing homes, without HS degree; pct. Female labor force participation)

# Limitations of SoVI

- Geographic scope and level of analysis affects the determination of vulnerability.
- Interpretation is difficult.
- Tracts that “hit” on lots of different factors score higher than tracts that hit on just one factor, but one factor alone may be enough to make a community vulnerable.
- Not as objective as it might seem.
  - The researcher must use her judgment at various steps in the process because the relationship between the different data elements and vulnerability is not always obvious or unidirectional.



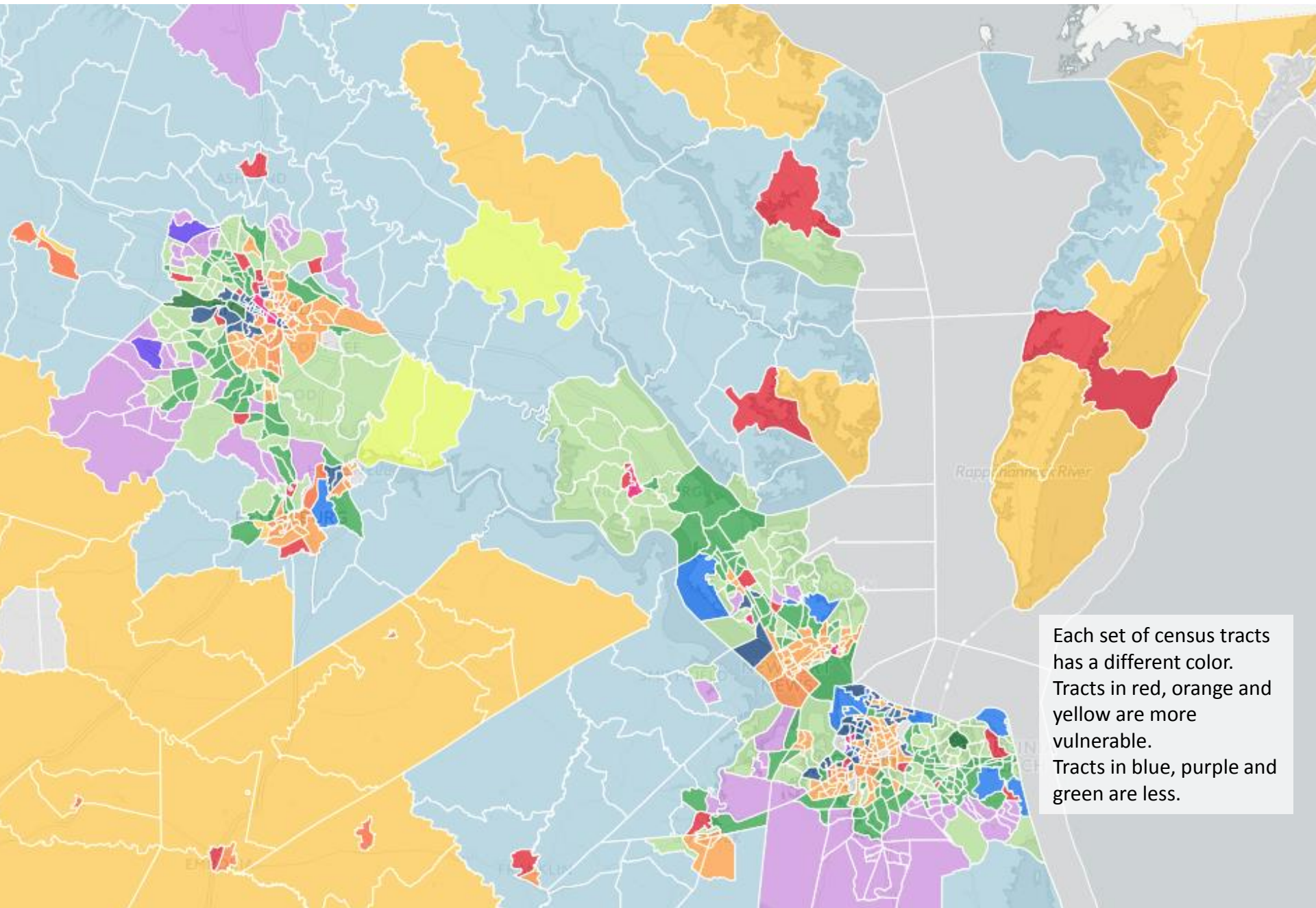
# Alternative Approach

- Rather than reduce a large matrix of data to a single index of vulnerability, we are using a cluster analysis to identify different “sets” of census tracts that look similar to each other.
- We can then look at the characteristics of each set and determine whether tracts in that set are socially vulnerable.

# Cluster Analysis

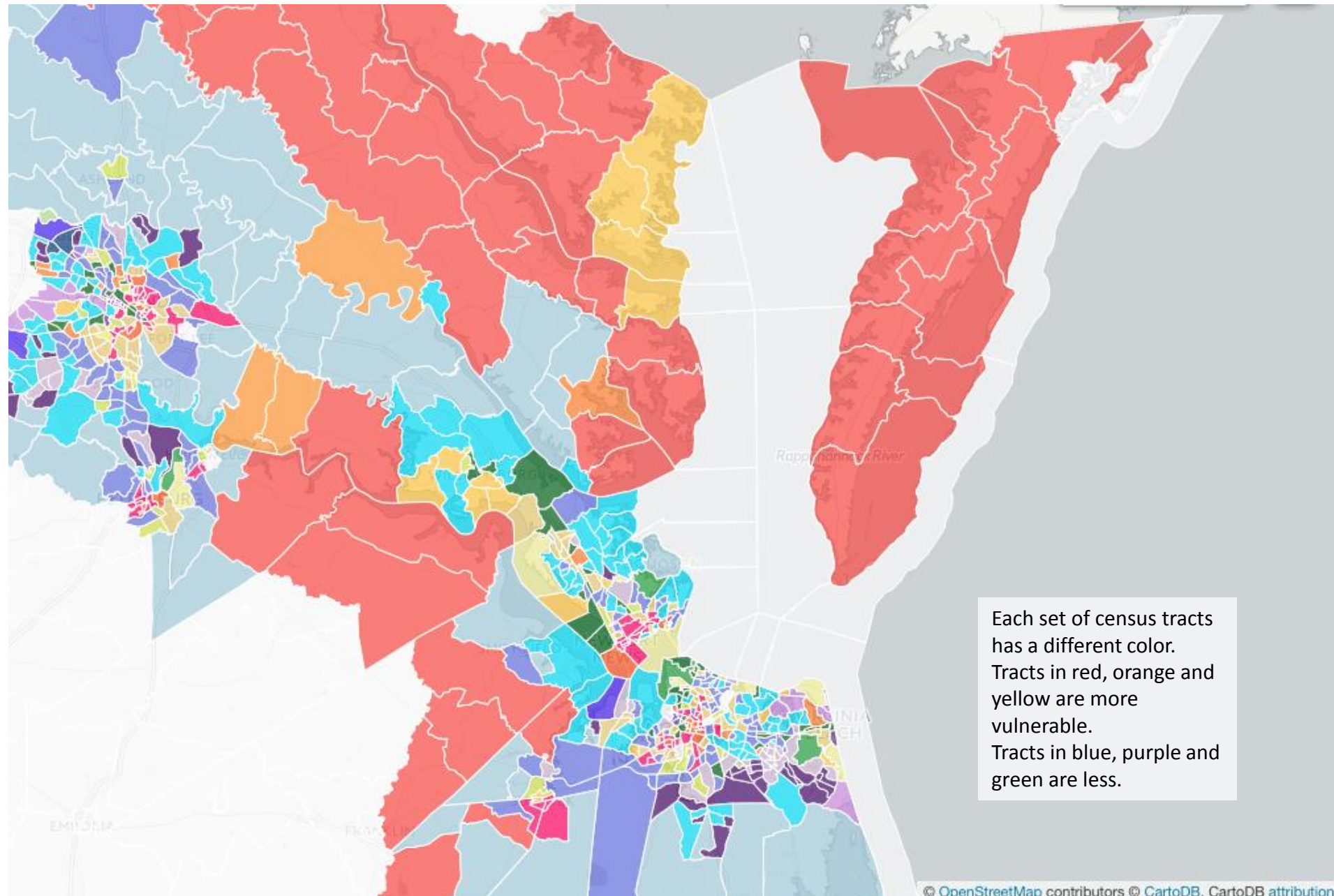
- Pros
  - Identifies tracts that may be vulnerable in only one or two dimensions.
  - Allows factors to be considered holistically.
  - Allows researchers to make the vulnerability determination.
- Limitations
  - Researchers have to make value judgments.
  - Clustering process can miss some vulnerable tracts and can include non-vulnerable tracts.

# Preliminary Categorization for all of Virginia





# Preliminary Categorization for Coastal Virginia



# Using the Results

- Regardless of which data-driven method used is used, the results need to be validated.
  - We plan to “ground-truth” the results of both the SoVI and cluster analysis by holding focus groups with community leaders to see which communities are successfully identified and which are missed.
- We also need to evaluate how well any vulnerability measure predicts a community’s resilience.
  - To do this, we need to find a robust measure of resilience as well as appropriate events that test a community’s resilience.