

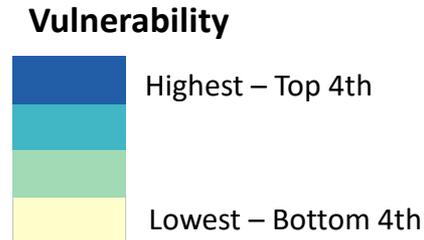
Multivariate Visualizations of CDC Social Vulnerability Data

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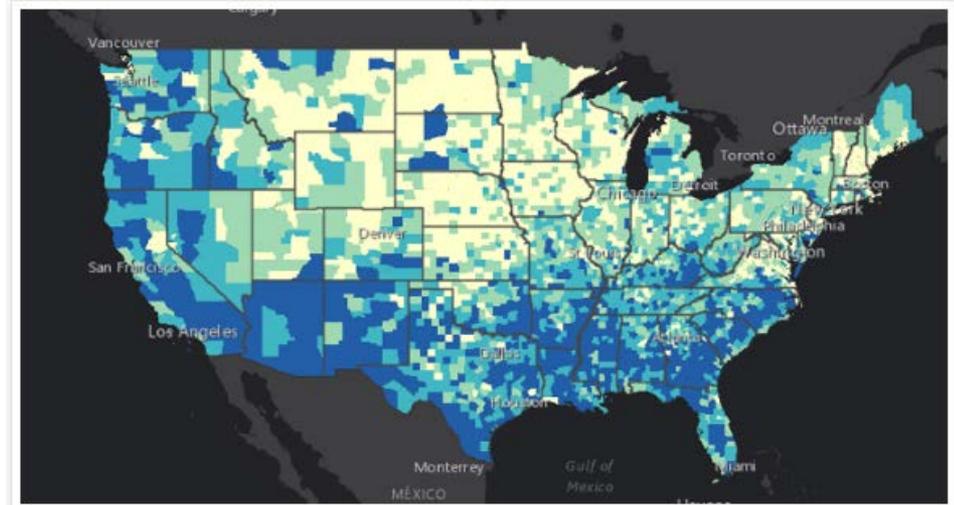
**NSF RCN-SEES: Predictive Modeling Network for
Sustainable Human-Building Ecosystems (SHBE)**
April 15 & 16, 2019
Tallahassee, FL

Social Vulnerability Index (SVI 2016)



Social Vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters such as tornadoes or disease outbreaks, to human-caused threats such as toxic chemical spills.

The Social Vulnerability (SVI) data depicts the social vulnerability of communities at the census tract level.



CDC's SVI databases and maps can be used to:

- Estimate the amount of needed supplies like food, water, medicine, and bedding.
- Help decide how many emergency personnel are required to assist people.
- Identify areas in need of emergency shelters.
- Plan the best way to evacuate people, accounting for those who have special needs, such as people without vehicles, the elderly, or people who do not understand English well.
- Identify communities that will need continued support to recover following an emergency or natural disaster.

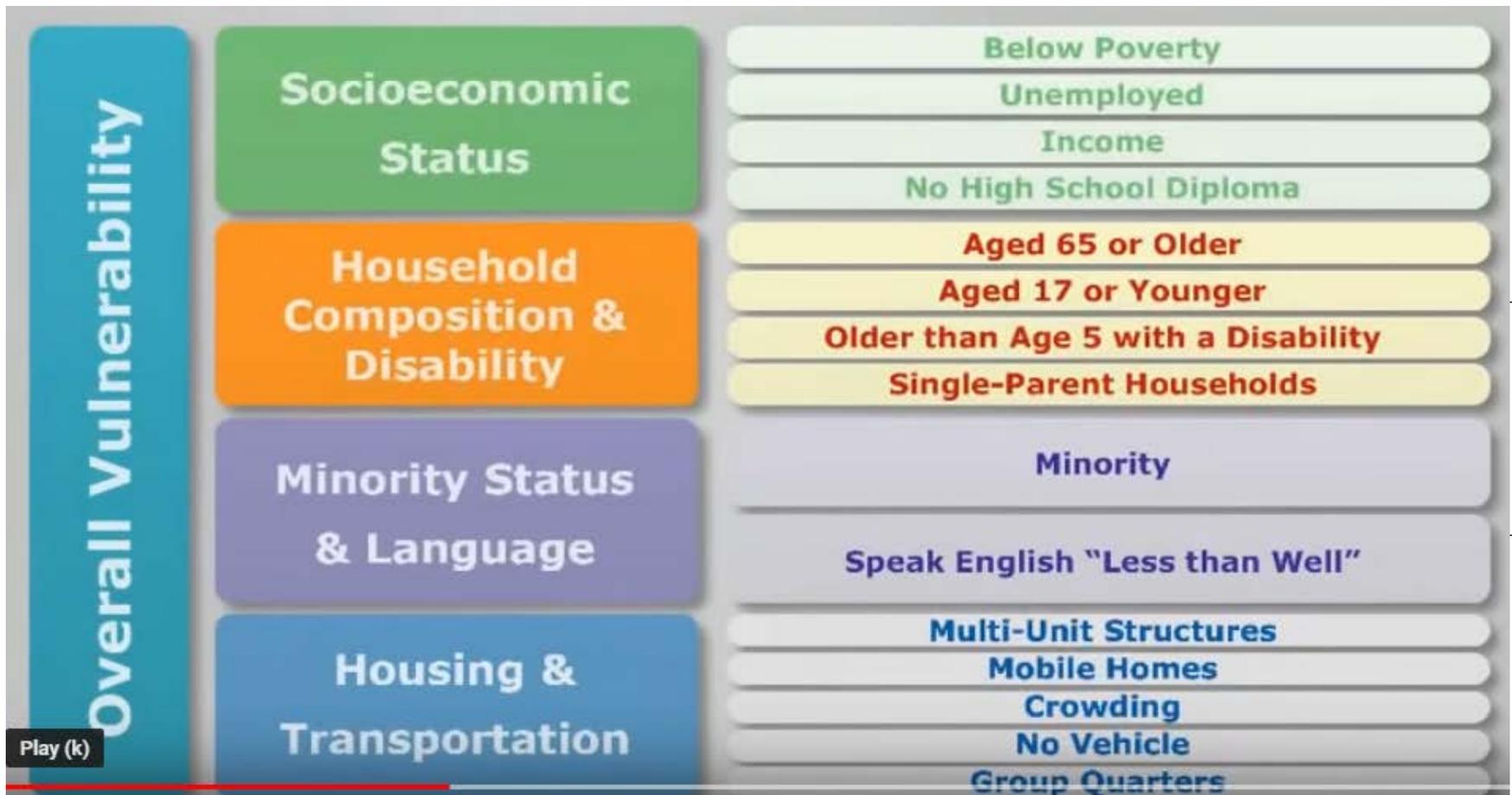
SVI Data

The SVI groups 15 census-derived factors into four themes. Factors include economic data, education, family characteristics, housing, language ability, ethnicity, and vehicle access.

Overall Index

Four Themes

Data Used to Develop Four Themes

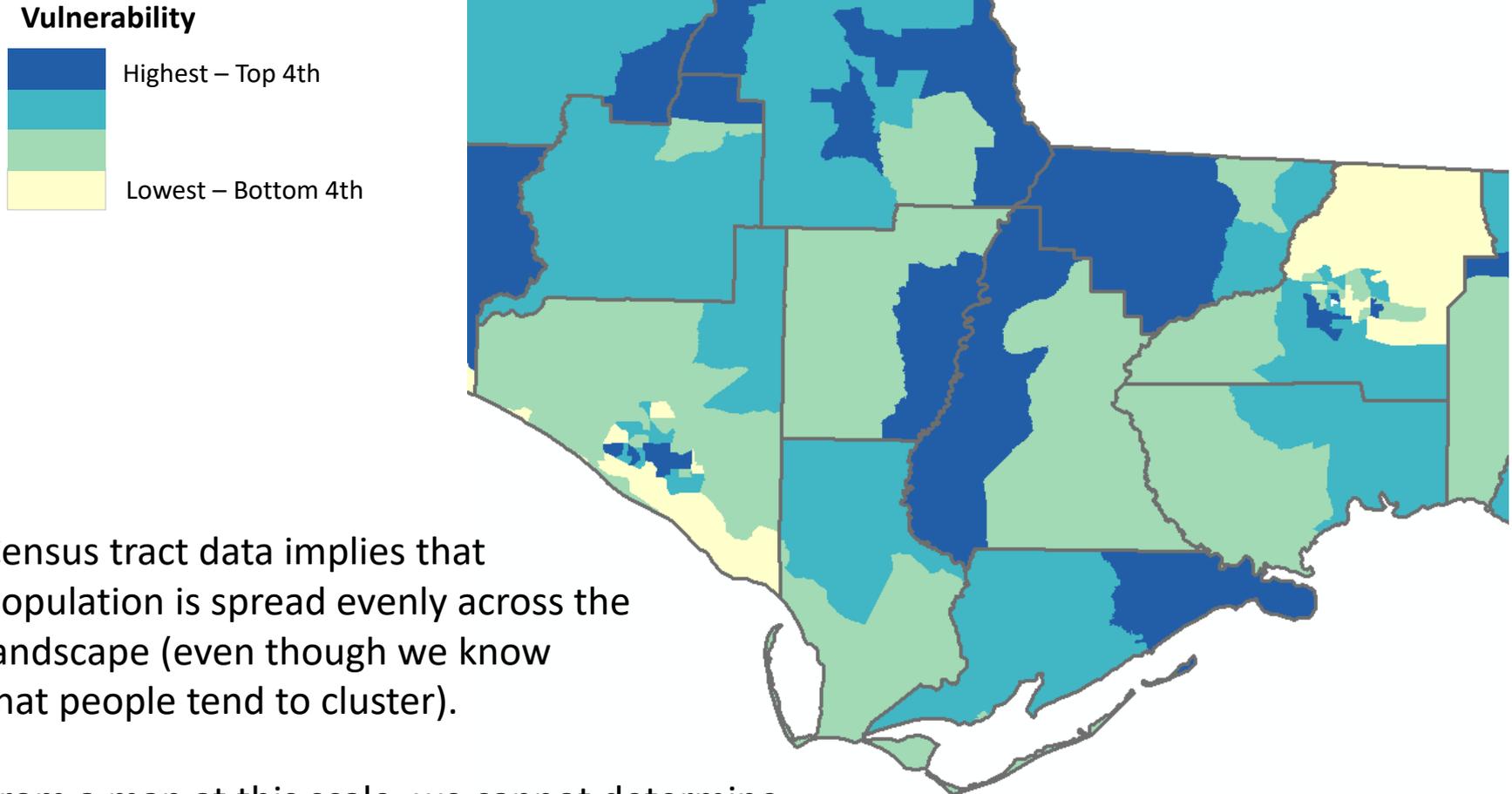


Research Goals

- Demonstrate alternative geovisualizations for:
 - SVI Index (composite of all data)
 - SVI Four Themes
- Study Area
 - Leon County, Florida

First, let's look at the overall
SVI Index

SVI Overall Index at Tract Level

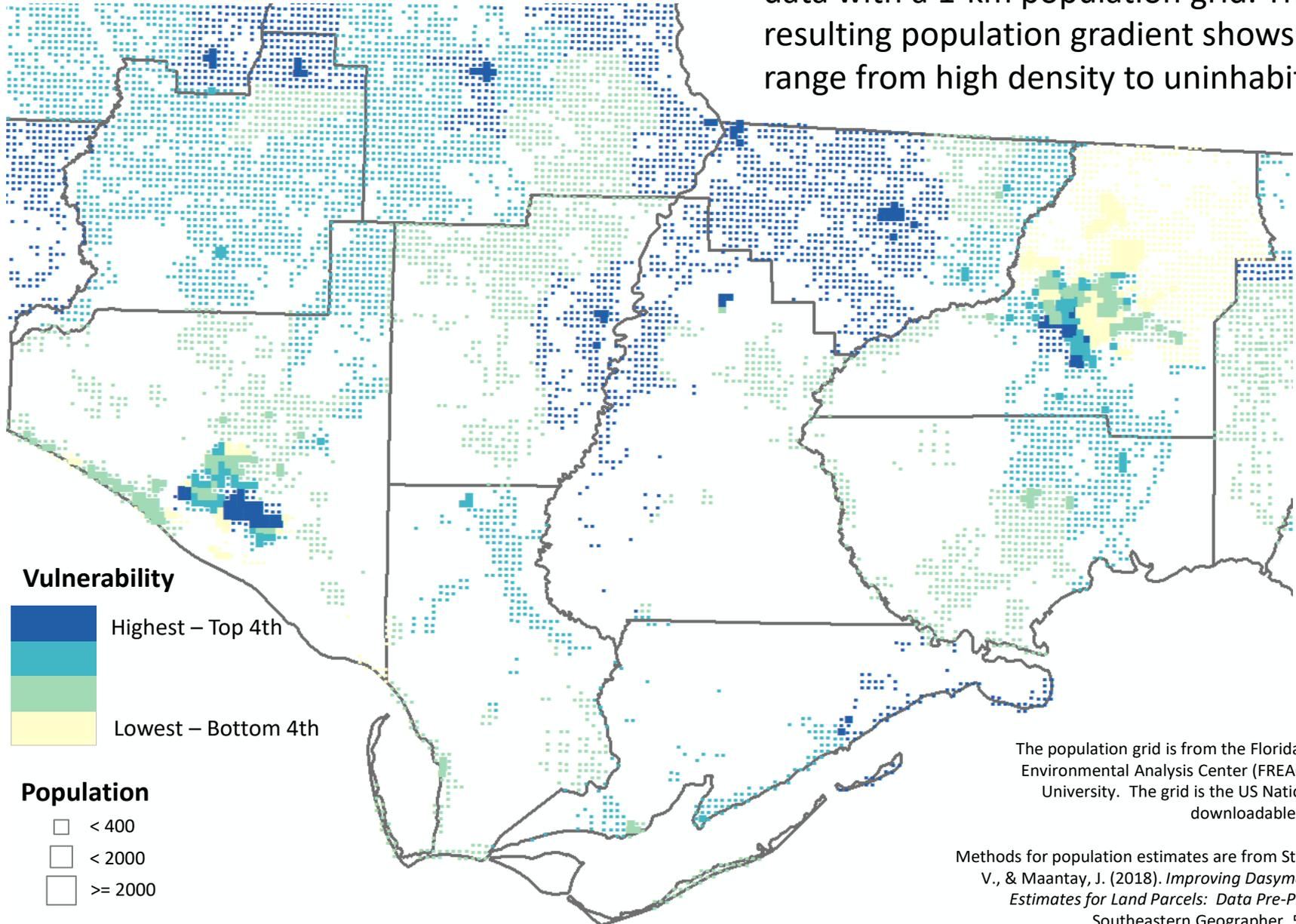


Census tract data implies that population is spread evenly across the landscape (even though we know that people tend to cluster).

From a map at this scale, we cannot determine the number of people at risk in any given area.

Social Vulnerability Index Plus Population

In order to know the number of people at risk in an area, we combine SVI census tract data with a 1-km population grid. The resulting population gradient shows the range from high density to uninhabited.

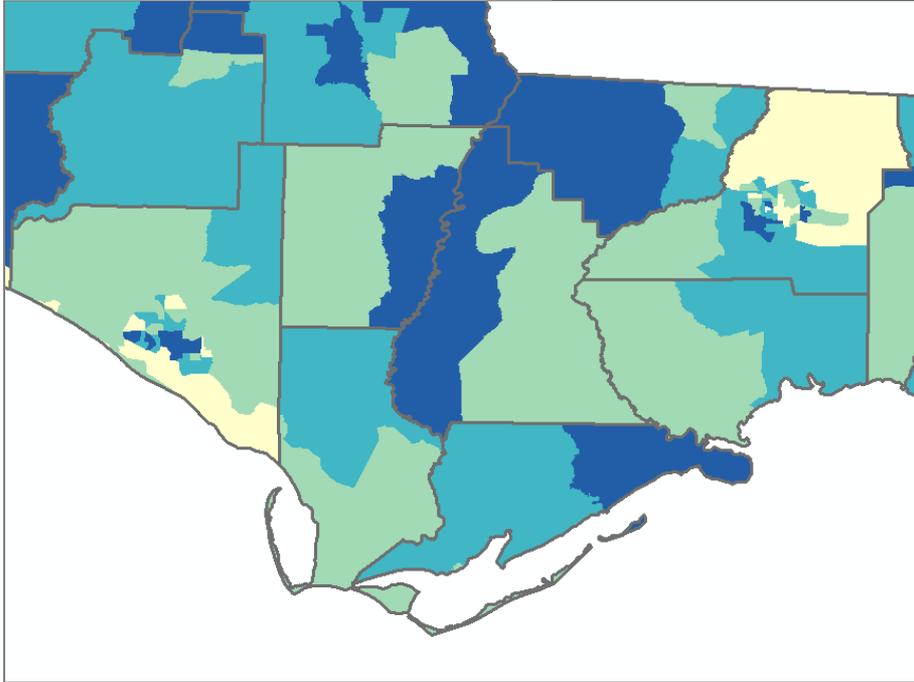


The population grid is from the Florida Resources and Environmental Analysis Center (FREAC), Florida State University. The grid is the US National Grid (1km), downloadable at usng-gis.org.

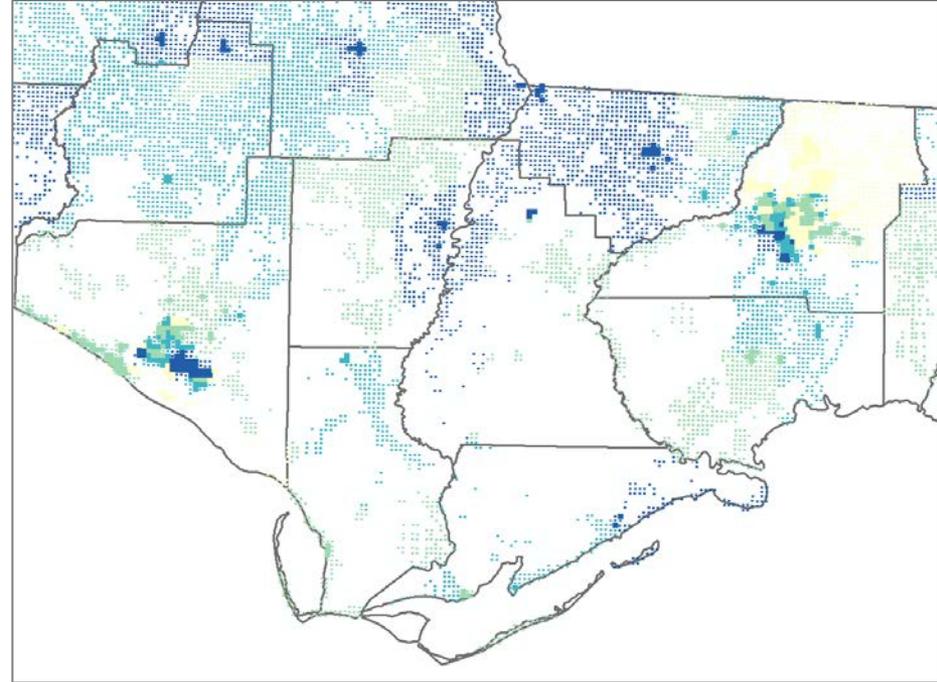
Methods for population estimates are from Strode G., Mesev, V., & Maantay, J. (2018). *Improving Dasymetric Population Estimates for Land Parcels: Data Pre-Processing Steps*. *Southeastern Geographer*, 58:3, p 300-316.

Side-by-side Comparison

The SVI data are the same. Only the scale and population filtering have changed.



Census Tract
Population Not Considered

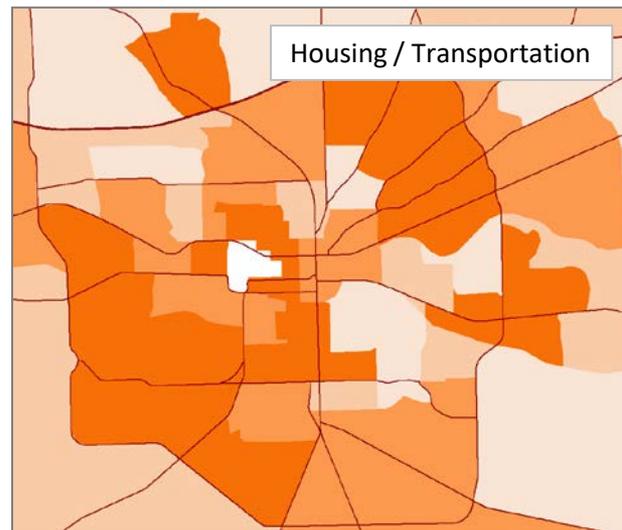
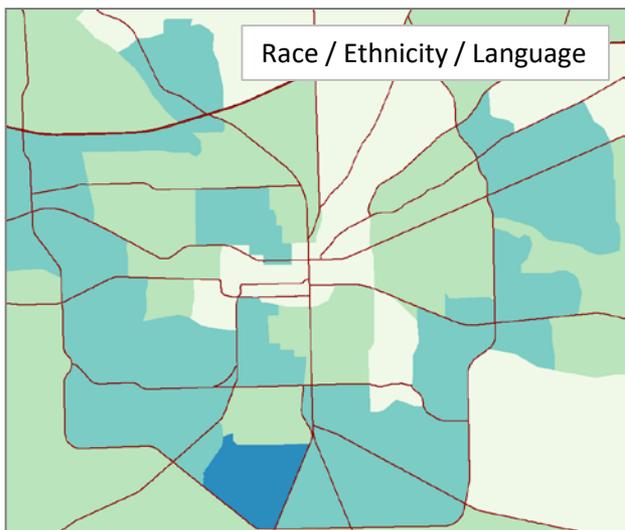
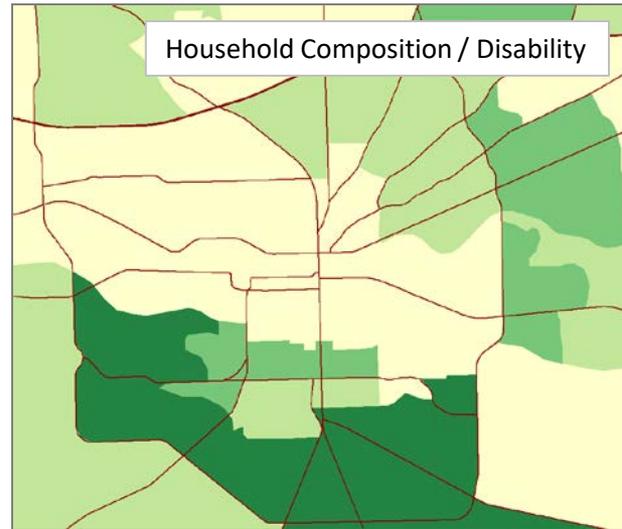
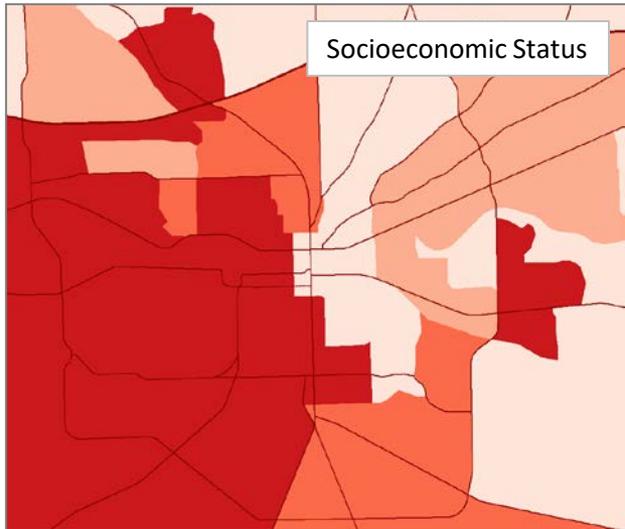


Filtered by 1-km Population

Now, let's look at the Four Themes
comprising the SVI

Traditional Method

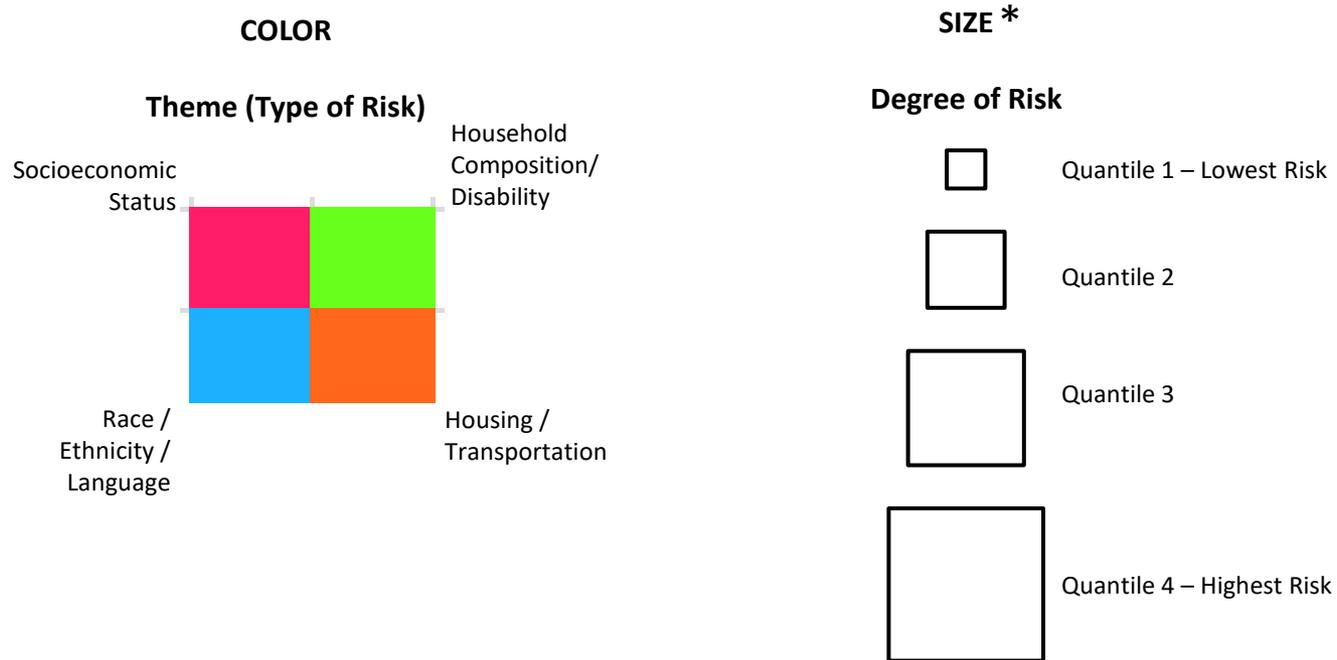
Traditional methods for communicating the CDC's Four Themes of Social Vulnerability required **four separate maps**. Maps of Tallahassee, Florida.



Could this process be easier?
More intuitive?

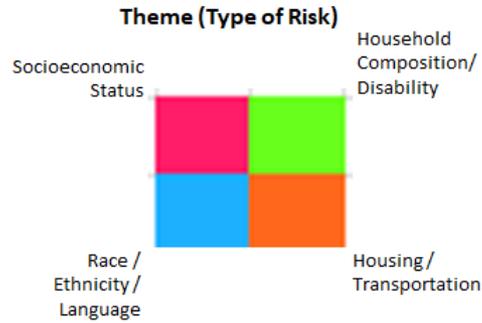
Could all Four Themes
Exist on One Map?

Glyphs Can Show Multiple Themes and Degree of Risk



* Size is relative, not absolute.

COLOR



Let's Practice



Low Risk
in all 4
Themes.



Highest
Socioeconomic
Risk. Low Risk in
other 3 Themes.



Varying Risks.
Low Household
Composition Risk.
High Housing and
Transportation
Risk.



Low
Socioeconomic
Risk. Other
Themes slightly
higher.

COLOR

Theme (Type of Risk)

Socioeconomic Status

Household Composition/
Disability

Race /
Ethnicity /
Language

Housing/
Transportation



Glyphs Show Type and Degree of Risk

SIZE *

Degree of Risk



Quantile 1 – Lowest Risk



Quantile 2

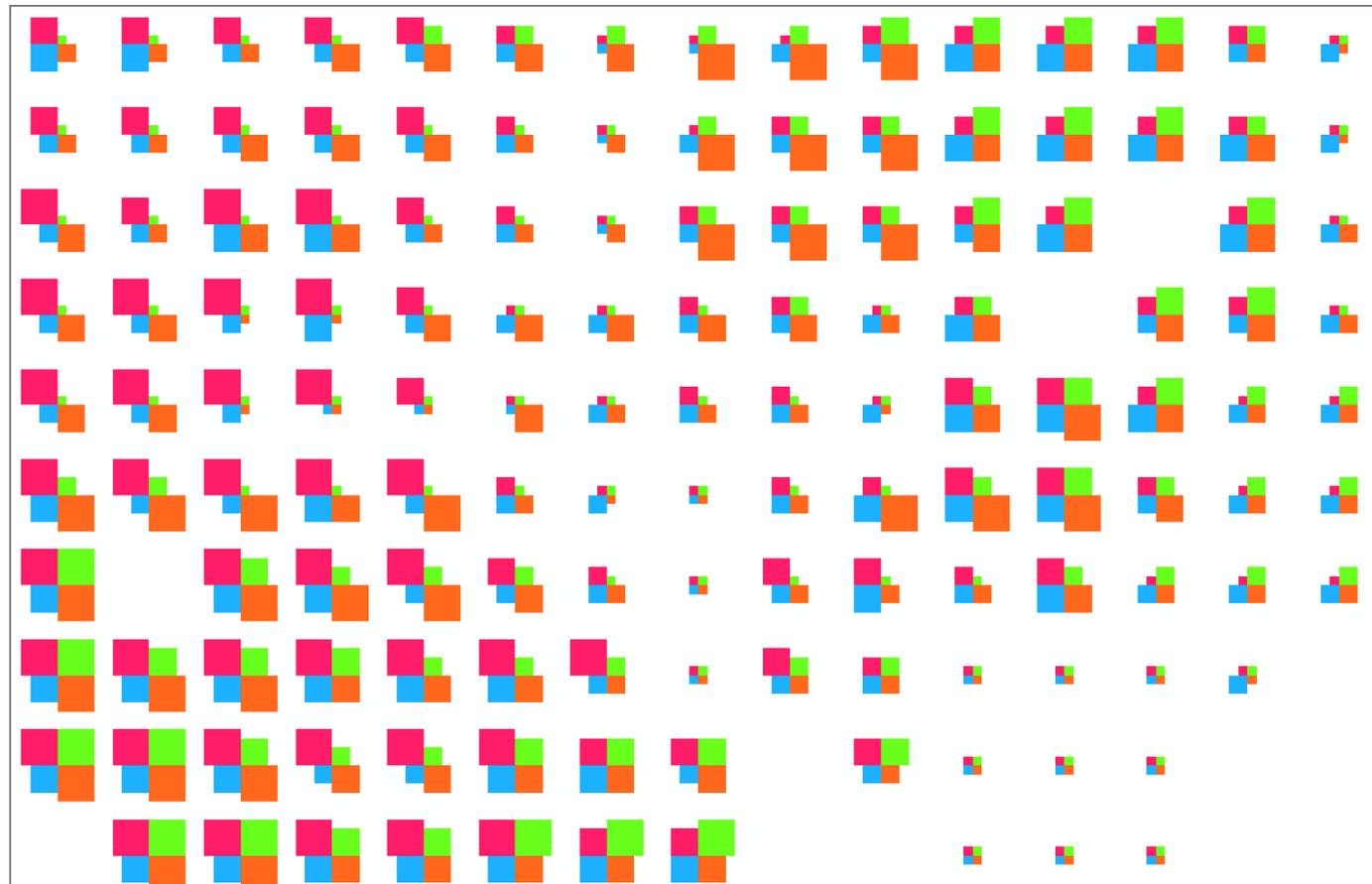


Quantile 3

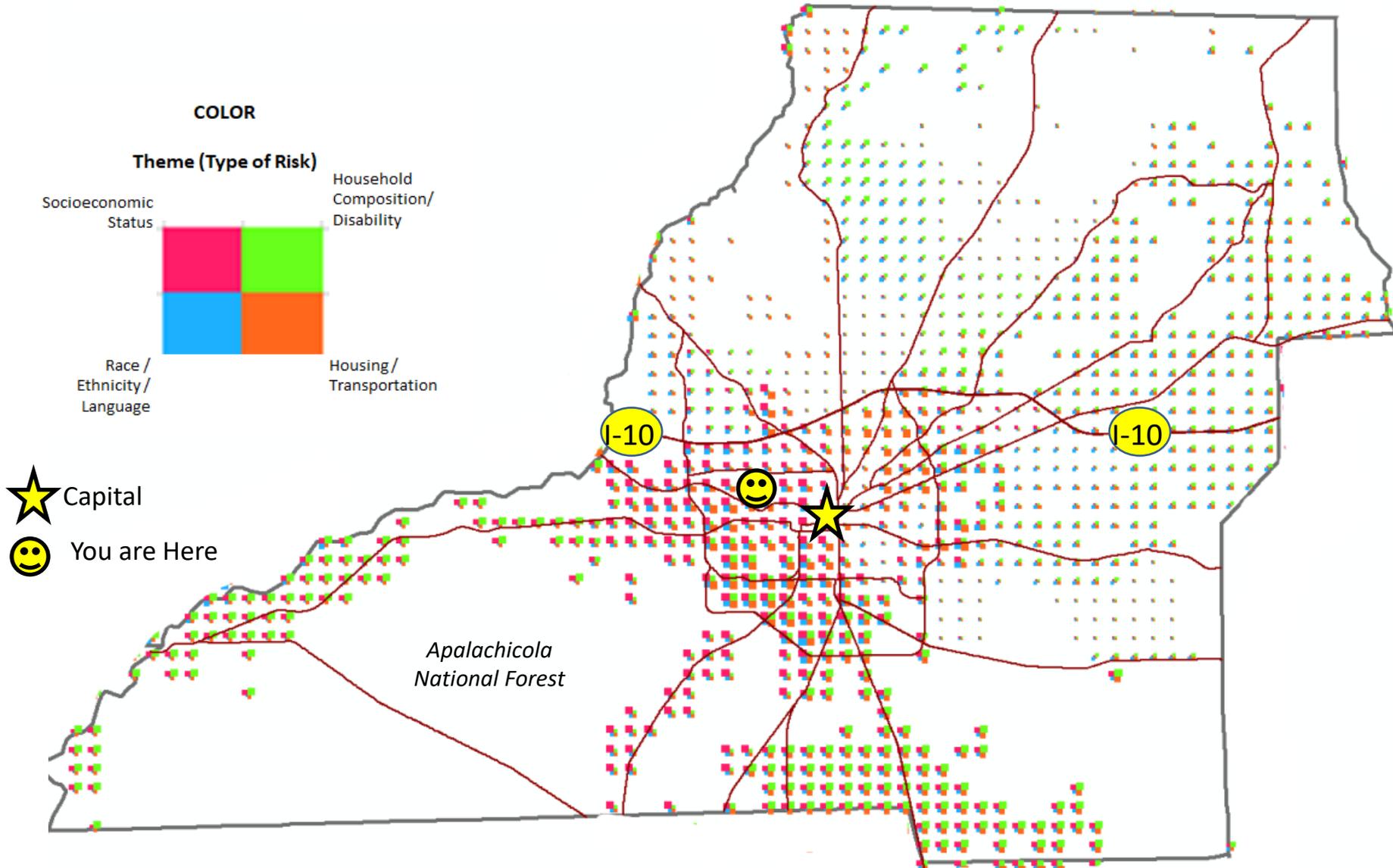


Quantile 4 – Highest Risk

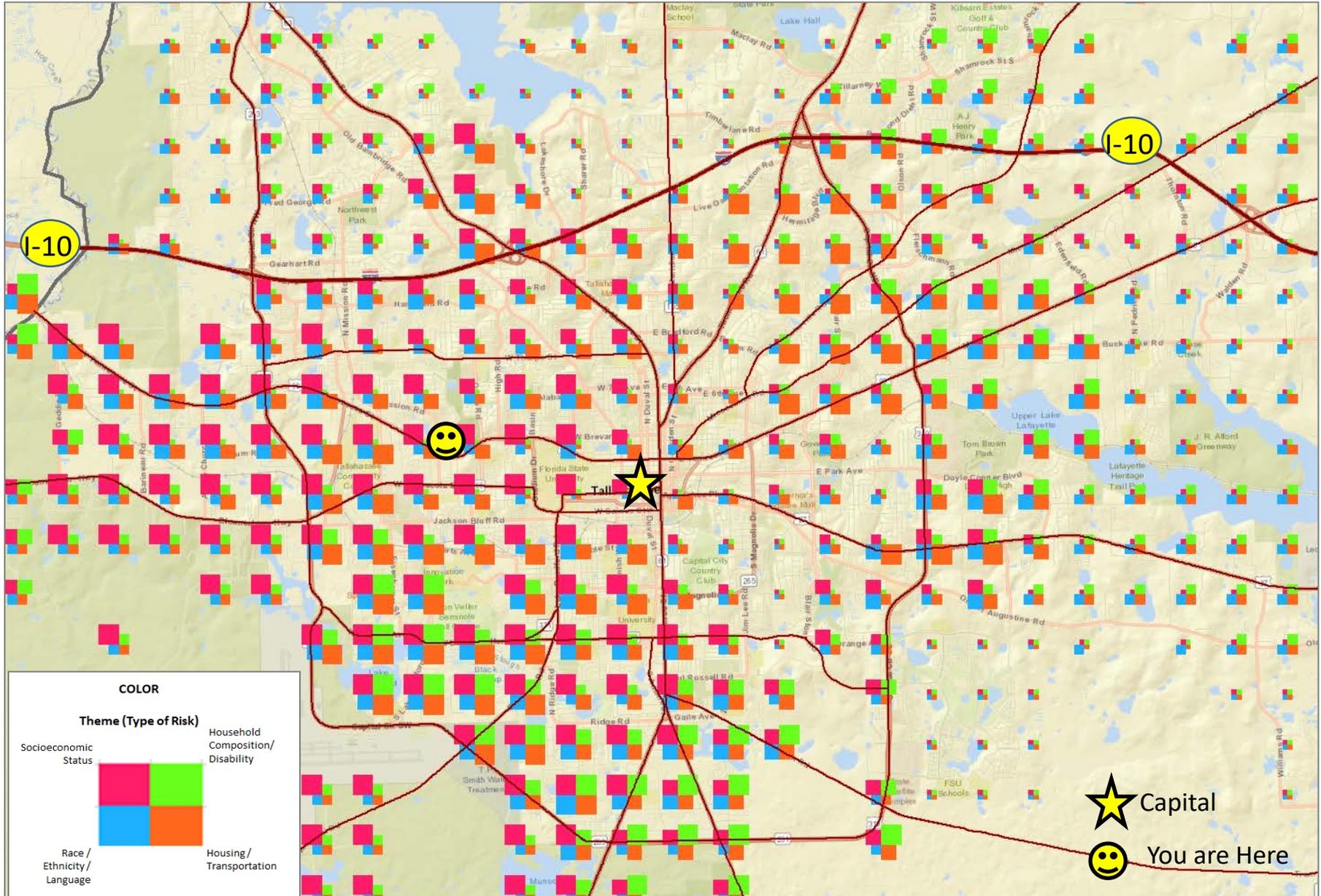
- Sizes not to Scale. Sizes are relative, not absolute.



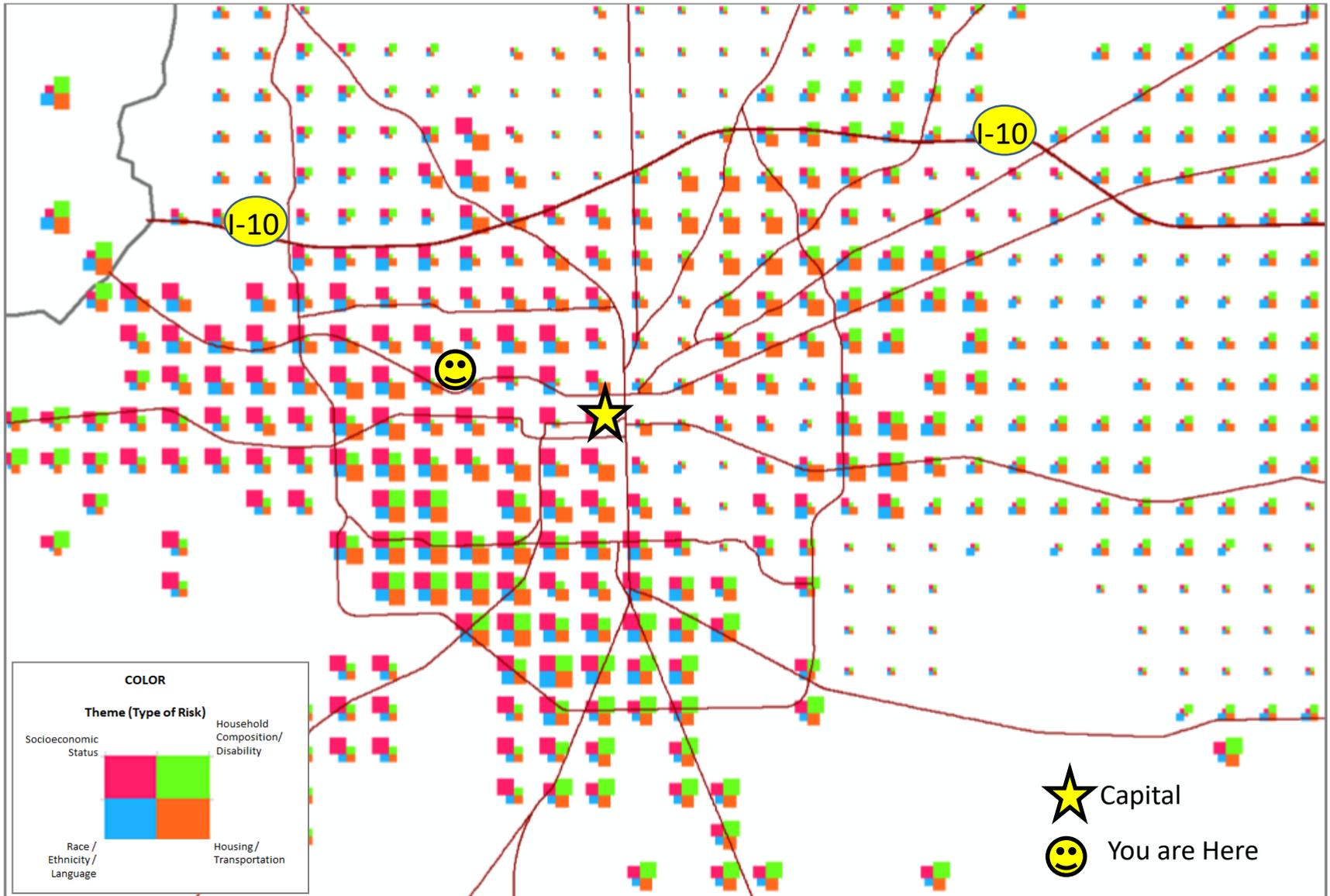
County View of the Four Themes of SVI Data



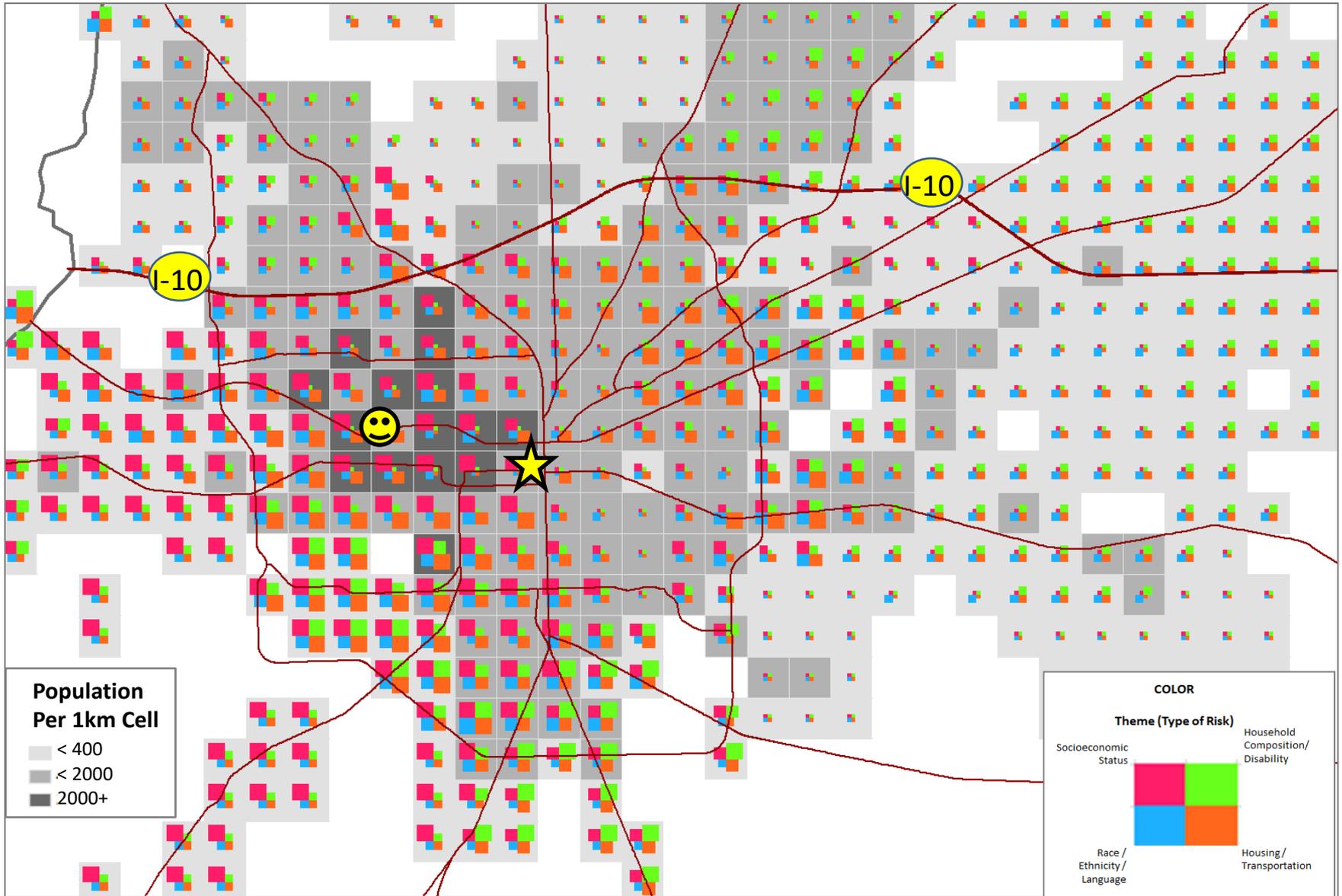
With Basemap Added



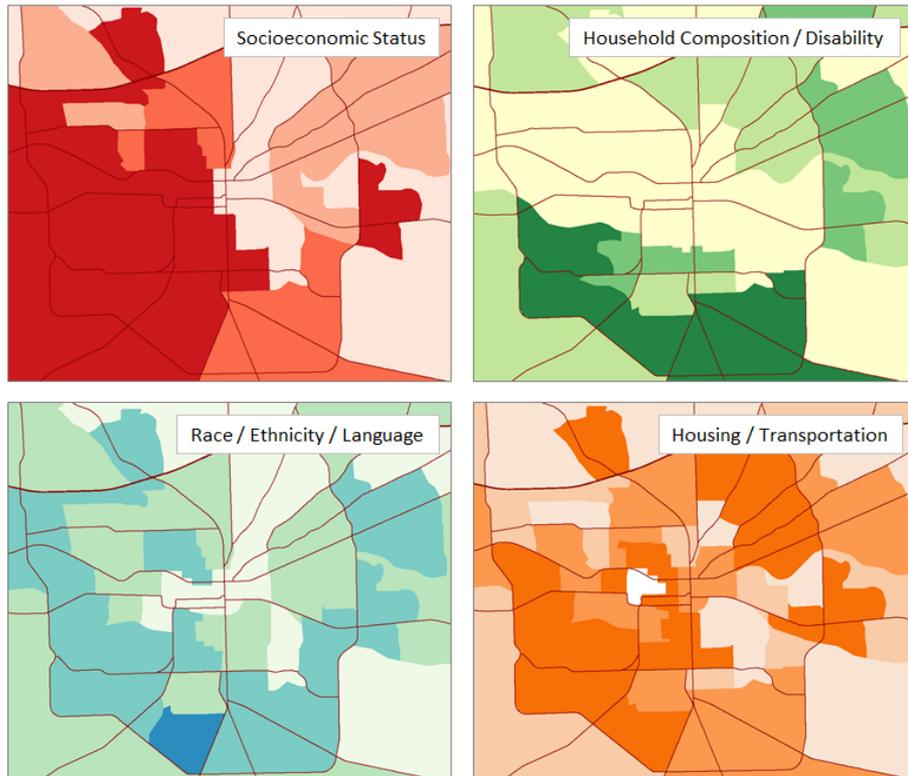
Streets Only



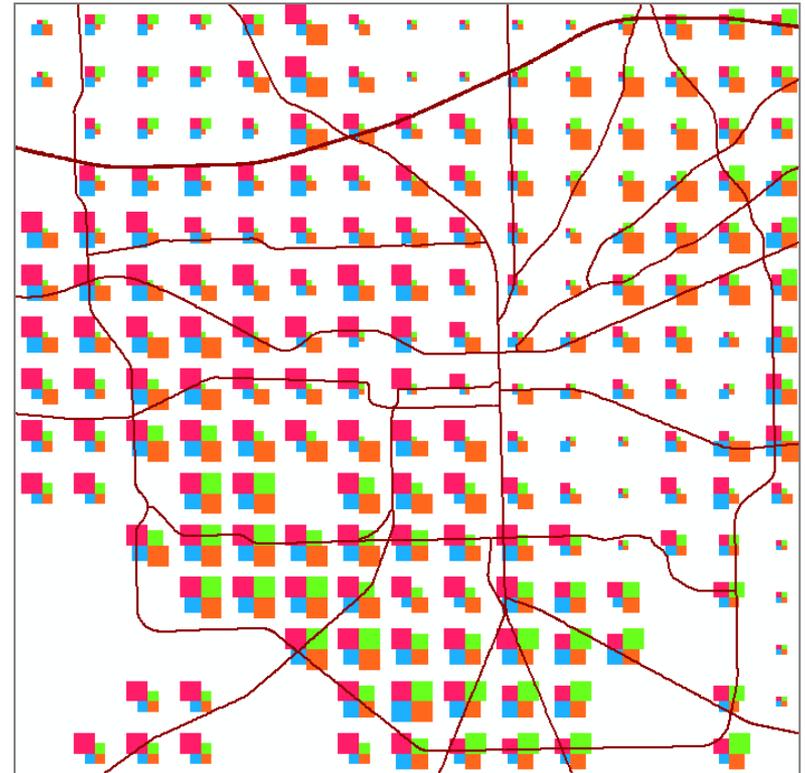
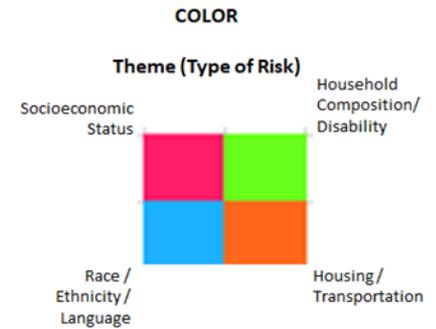
Population Grid as Basemap



Side-by-Side Comparison of Four Themes Mapping



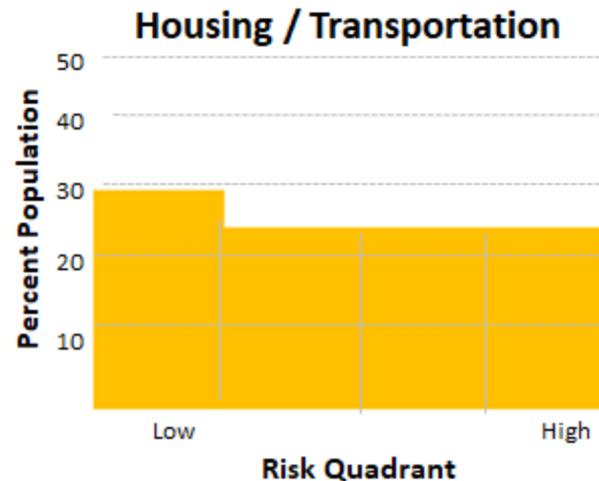
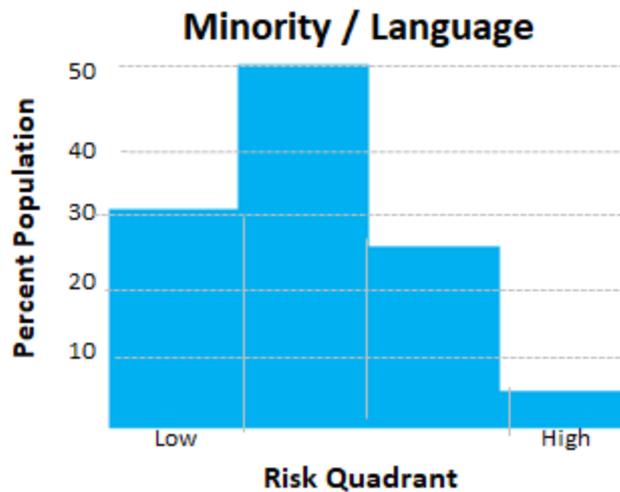
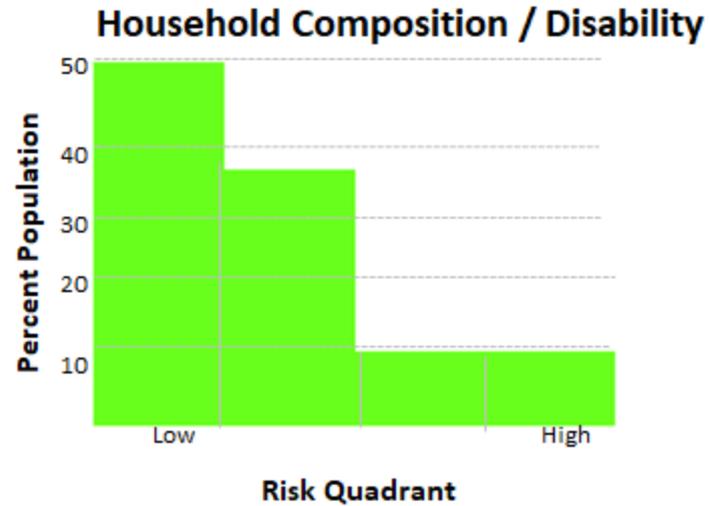
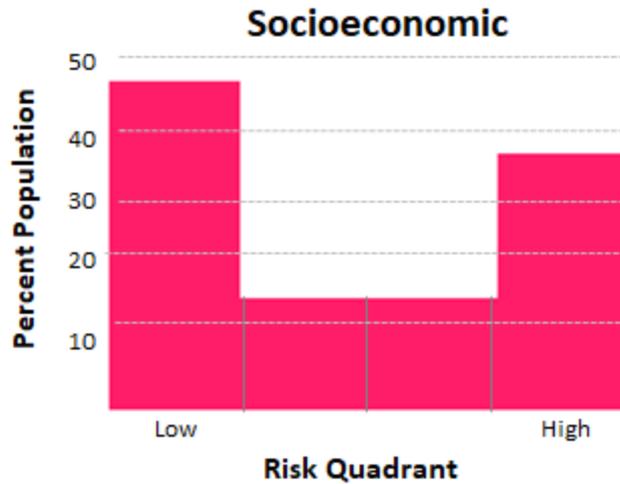
4 Univariate Census Tract Maps



1-km Gridded Multivariate

Risk Assessments of Leon County Population

Not to Scale



Discussion

- Alternative geovisualizations were shown for SVI Index and the Four Themes.
- The goal for the Index was to consider population so that readers can reasonably determine population in an area without the distraction of viewing unpopulated areas.
- The goal of the Four Themes was to offer data on a single map to avoid using four separate univariate maps.
- It is hoped that this research can be helpful in visualization of complex data.

Data for Download

<https://usng-gis.org>

Available Now:

GIS Data: *GIS Data is pre-styled for ArcMap and QGIS*

- SVI Index for Florida

In the Queue:

PDF:

- SVI Index for Leon County, Florida
- SVI Four Themes for Leon County, Florida

GIS Data:

- SVI Four Themes for Leon County only

Thank you for taking the time to consider something different!

Questions and Comments

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Download Data Here

