



# COMMUNITY RESILIENCE OF NATURAL RESOURCE DEPENDENT COMMUNITIES AND THE URBAN, RURAL DIVIDE

---

Joseph Reed



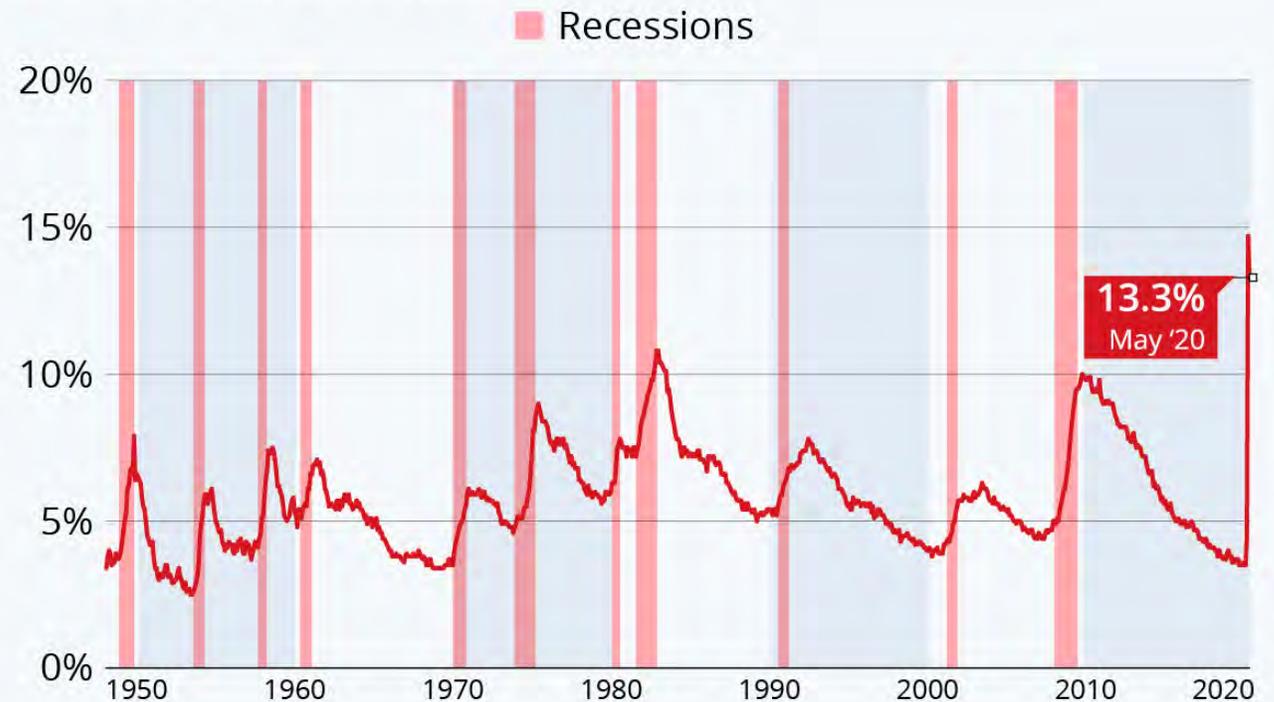
Oakridge, OR from Wikipedia

# Community Resilience

- Resilience is the ability of a place to respond to and rebound from a shock.
- National examples:
  - COVID-19
  - The Great Recession of 2008
- Local examples:
  - Major Employers Closing
  - Natural Disasters
  - New Policies

## Unemployment Rate Remains Historically High

Seasonally adjusted unemployment rate in the United States since 1948



Source: U.S. Bureau of Labor Statistics

## Rural Natural Resource Dependent Communities (NRDC) and Resilience

- Highly vulnerable to shocks.
- Lack the human capital of urban places.
- Reliant on one industry.
- This industry has much more uncertainty.
  - Examples:
    - Drought
    - Overfishing
    - New Regulations
- If this one industry fails or falls, this can cause a shock.
- Rural places have a stronger sense of community and are more self reliant, can outweigh negatives related to human capital.



# Community Resilience

- Resilience is the ability of a place to respond to and rebound from a shock.
- National examples:
  - COVID-19
  - The Great Recession of 2008
- Local examples:
  - • Major Employers Closing
  - • Natural Disasters
  - • New Policies

## 'Mass Exodus,' Possible Closure Feared As Jay Paper Mill Reduces Workforce

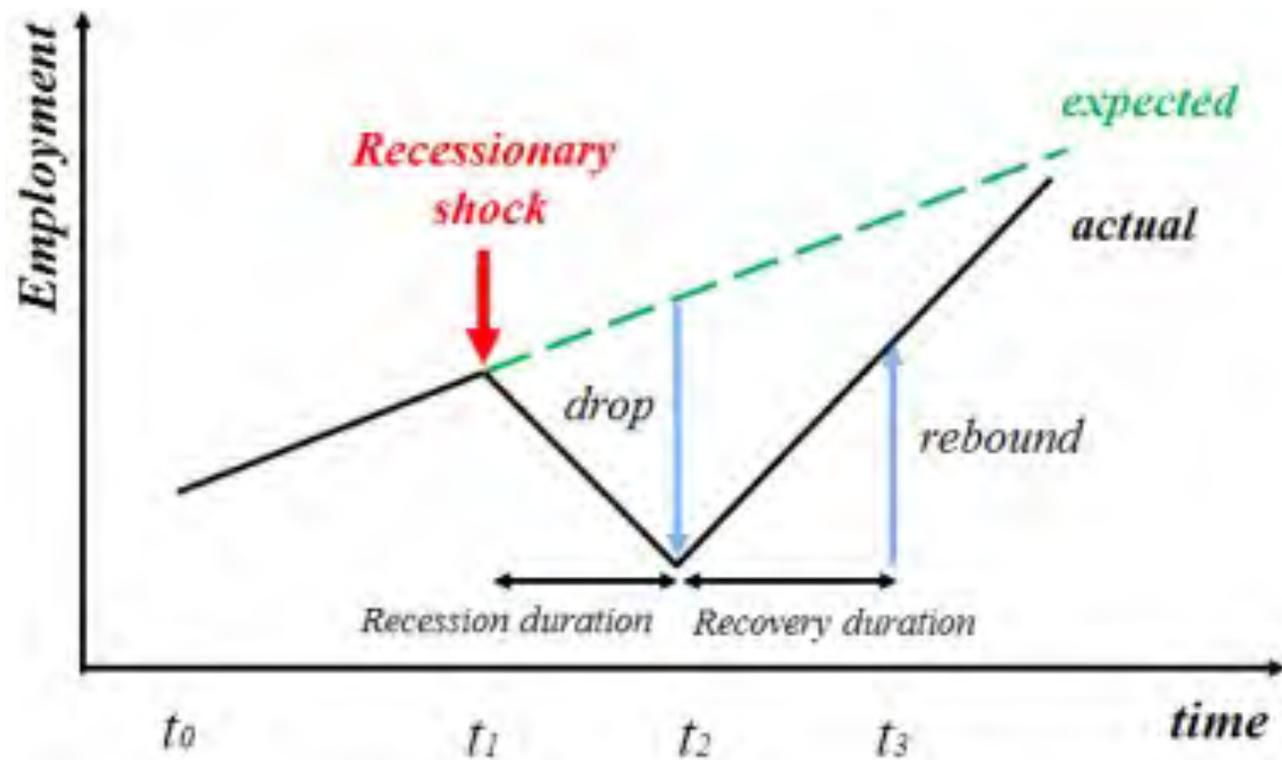
By WILLIS RYDER ARNOLD • DEC 4, 2020

PROGRAM  
All Things Considered with Nora Flaherty

[Share](#) [Tweet](#) [Email](#)



# Measuring Resilience



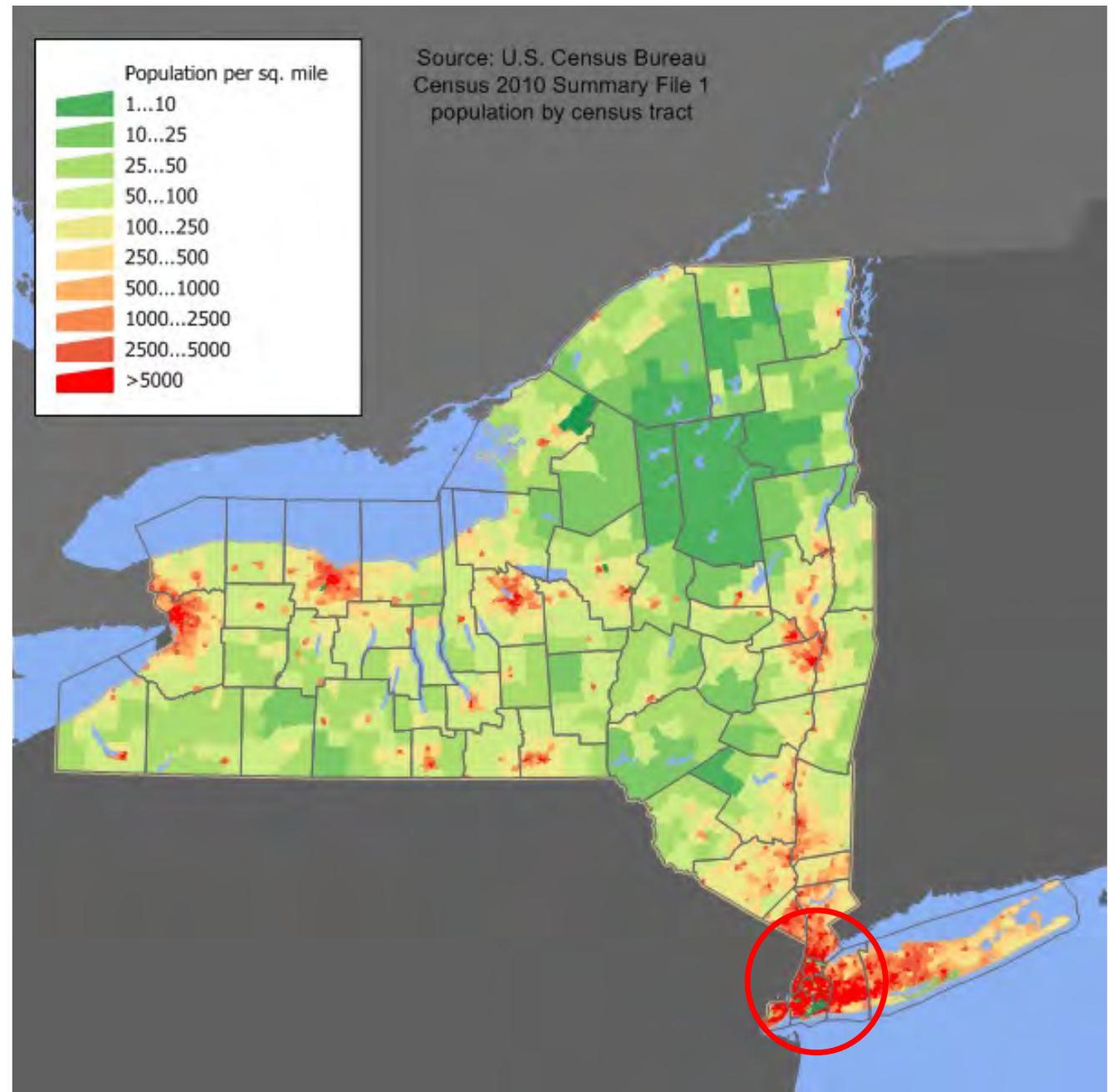
Graph is from Hanz and Goetz 2015

## Two ways to measure resilience:

- Length of recessionary period.
  - Historical data.
  - Doesn't predict future resilience, things can change.
  - Only can measure economic resilience.
- **Metrics we believe to be higher correlated with resilience, to give a resilience score.**
  - Examples:
    - Education attainment.
    - Median household income.
    - Owner-occupied housing.
  - Current level of resilience.
  - Can measure diverse aspects of resilience.
  - How well the metrics measure resilience unknown.

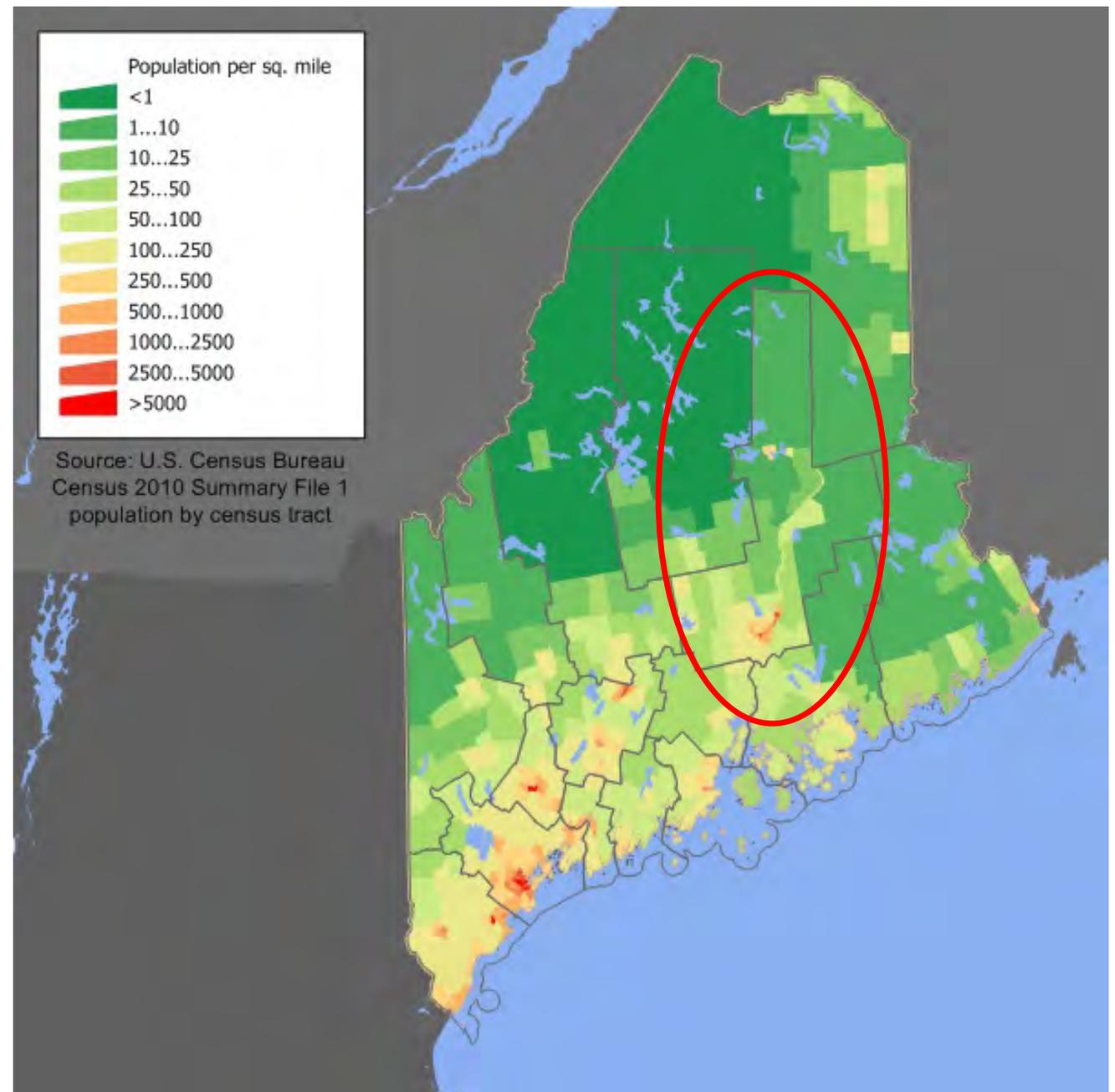
# Research Gap

- Historically, US resilience research has been done at a county level.
  - Mainly due to data availability and reliability.



# Research Gap

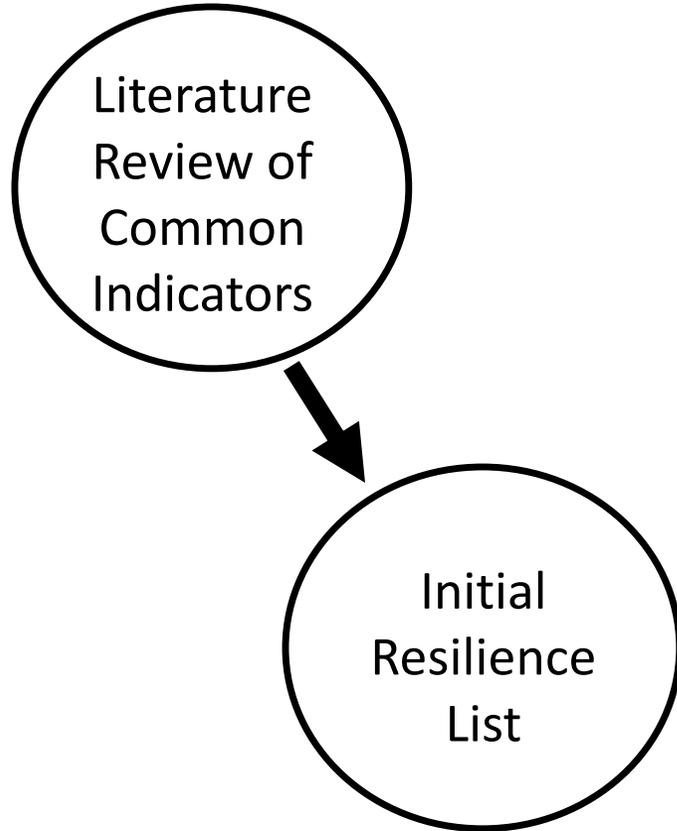
- Historically, US resilience research has been done at a county level.
  - Mainly due to data availability and reliability.
- County level resilience metrics measures the average level of resilience of communities.



# Goal and Objectives

- **Goal:** Measure resilience at a community level across the United States and test how it varies across resource dependency and urban/rural definitions.
- **Objectives:**
  - 1) **Develop** a quantitative community level resilience index to measure a diverse definition of resilience across the United States.
  - 2) **Analyze** the differences in resilience in natural resource dependent communities and across the urban/rural divide.

# Methods

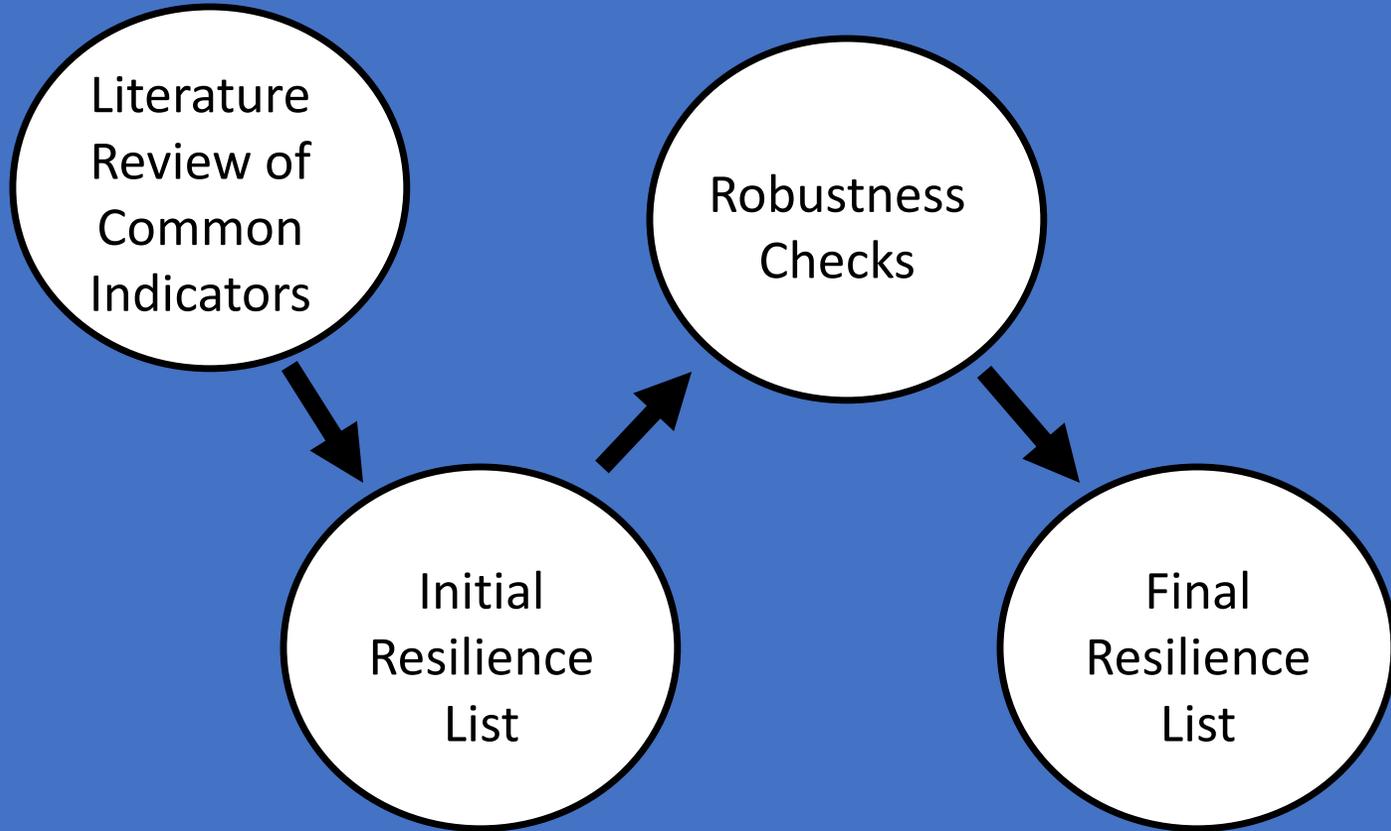


Indicators were chosen by:

- Commonality among sources.
- Uniqueness of indicator.
- **Data availability and consistency.**

# Methods

## Objective 1

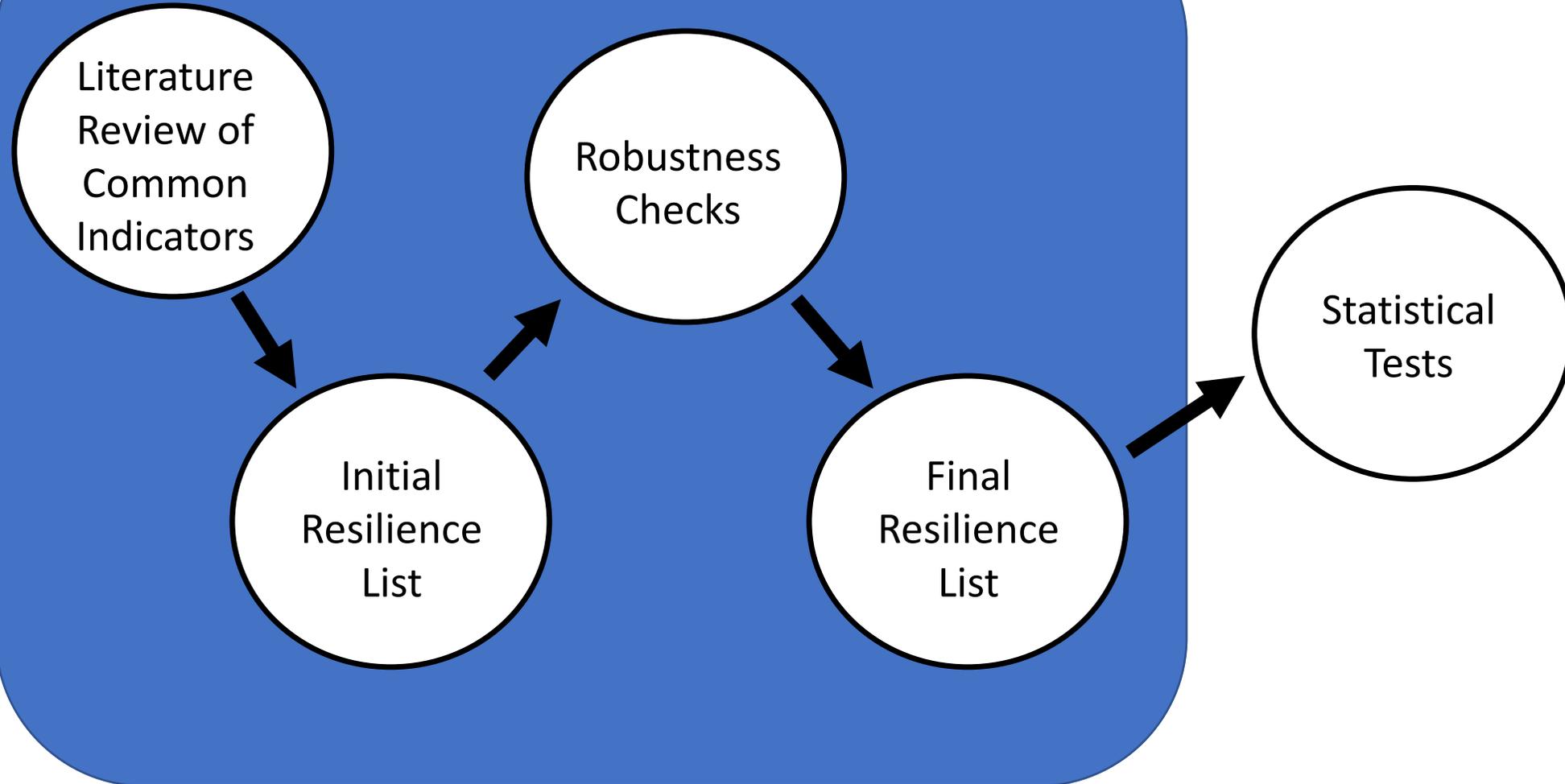


Robustness checks include:

- Correlation Matrix's
- Cronbach Alpha
- Expert Review

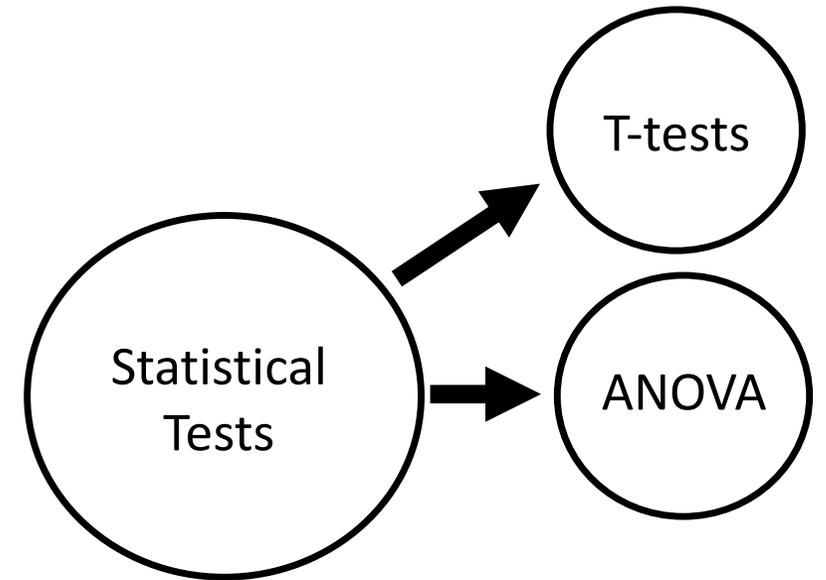
# Methods

## Objective 1



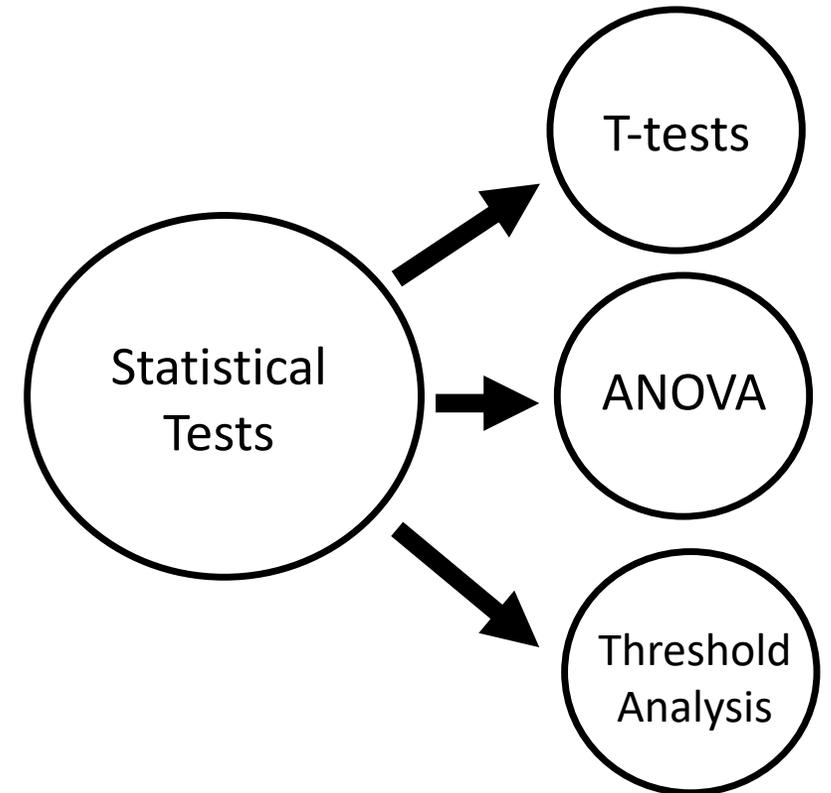
# Methods

- Does natural resource dependency impact a community's level of resilience?
- Do urban and rural places have significantly different levels of resilience?
- What is the larger driver of community resilience?



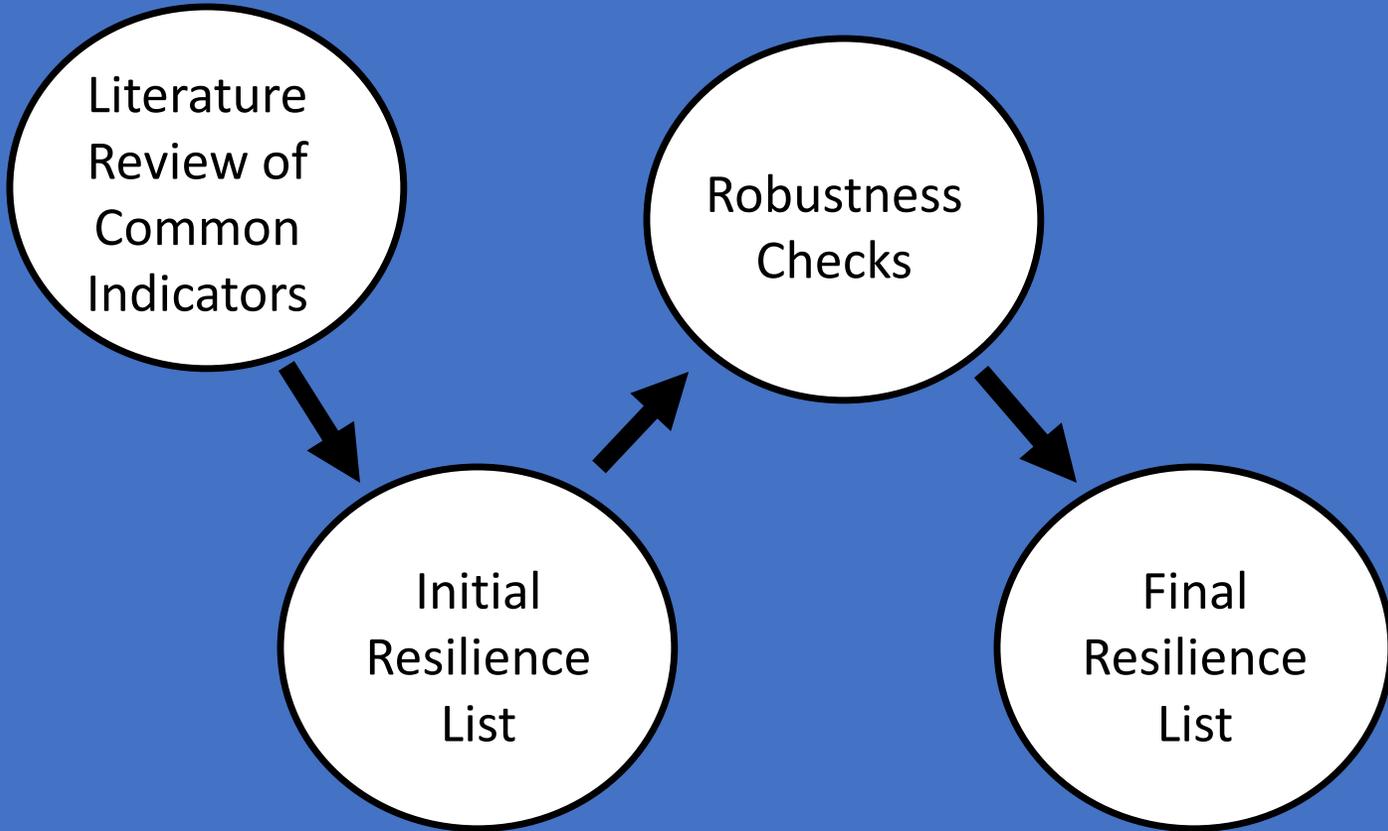
# Methods

- Natural resource dependency threshold:
  - **8% of employment in Agriculture; forestry; fishing and hunting; and mining (Economic Research Service).**
  - 10% employment (Stedman et al. 2005)
  - 20% employment (Bender et al. 1985)
- Urban/rural threshold:
  - **County subdivisions with more/less than 2500 people (U.S Census Bureau).**
  - 20,000 people (USDA Community Facilities)
  - 50,000 people (Non-metro).

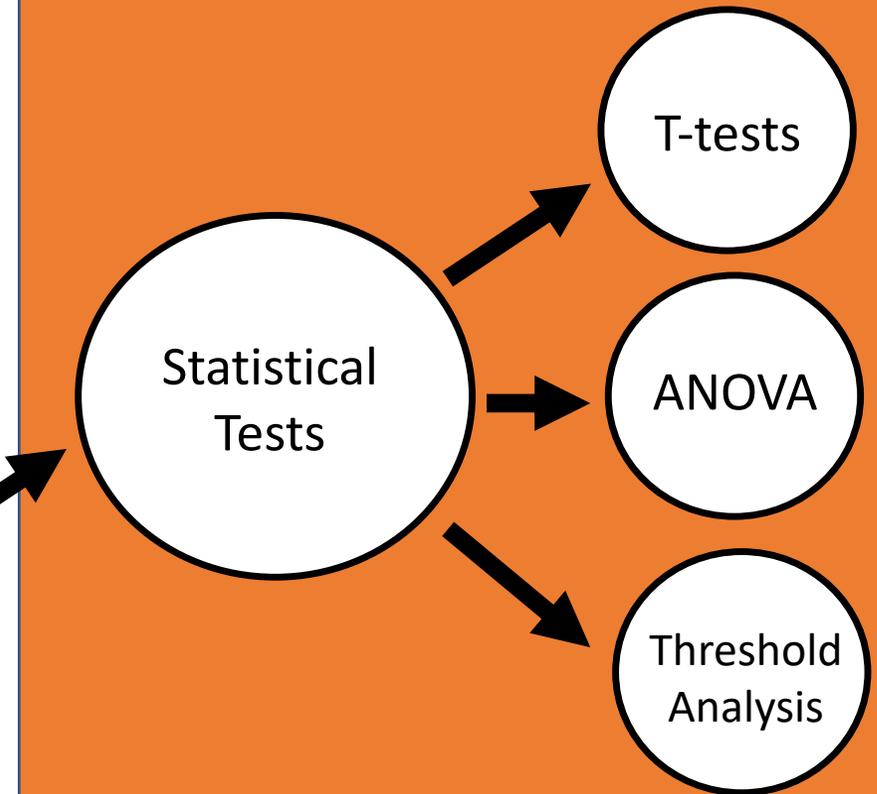


# Methods

## Objective 1



## Objective 2



# Results – Final Indicator List

→ Human well-being/cultural/social indicators

- Working age population (ages 20-65)
- Health insurance coverage
- Population with high school degrees
- People who speak English "less than well"
- Population change 2010-2018
- Mean advertised max broadband download speed

→ Economic/financial indicators

- Unemployment rate
- Medium household income
- Mean commuting time
- Service occupations
- Arts; entertainment; and recreation; accommodation & food services
- Households with social security
- Households with public assistance income
- Gini coefficient
- Gender income inequality

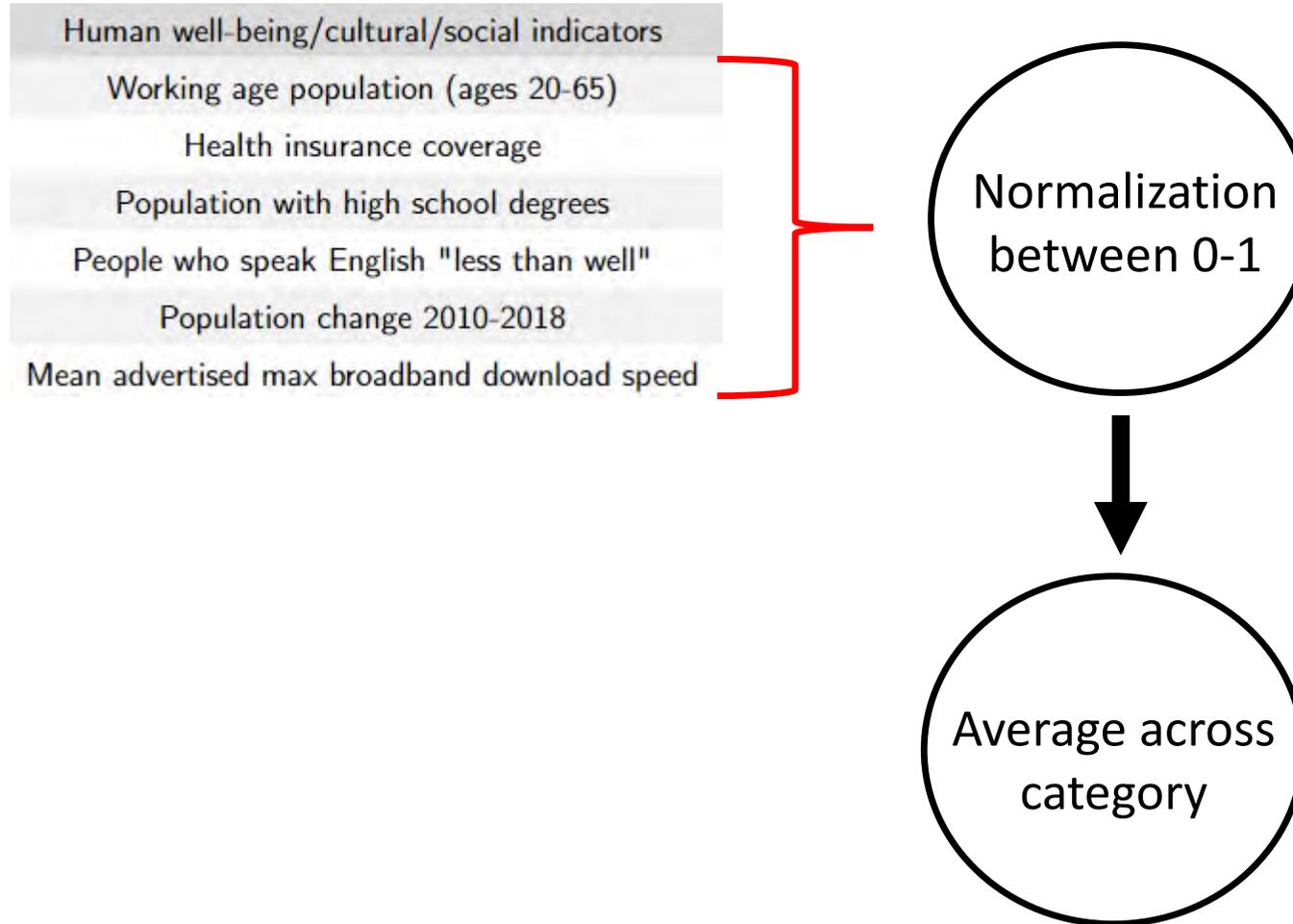
→ Infrastructure indicators

- Owner-occupied housing
- Households with no vehicle available
- Median housing value
- Housing occupancy rate
- Median monthly gross rent

→ Environmental/natural indicators

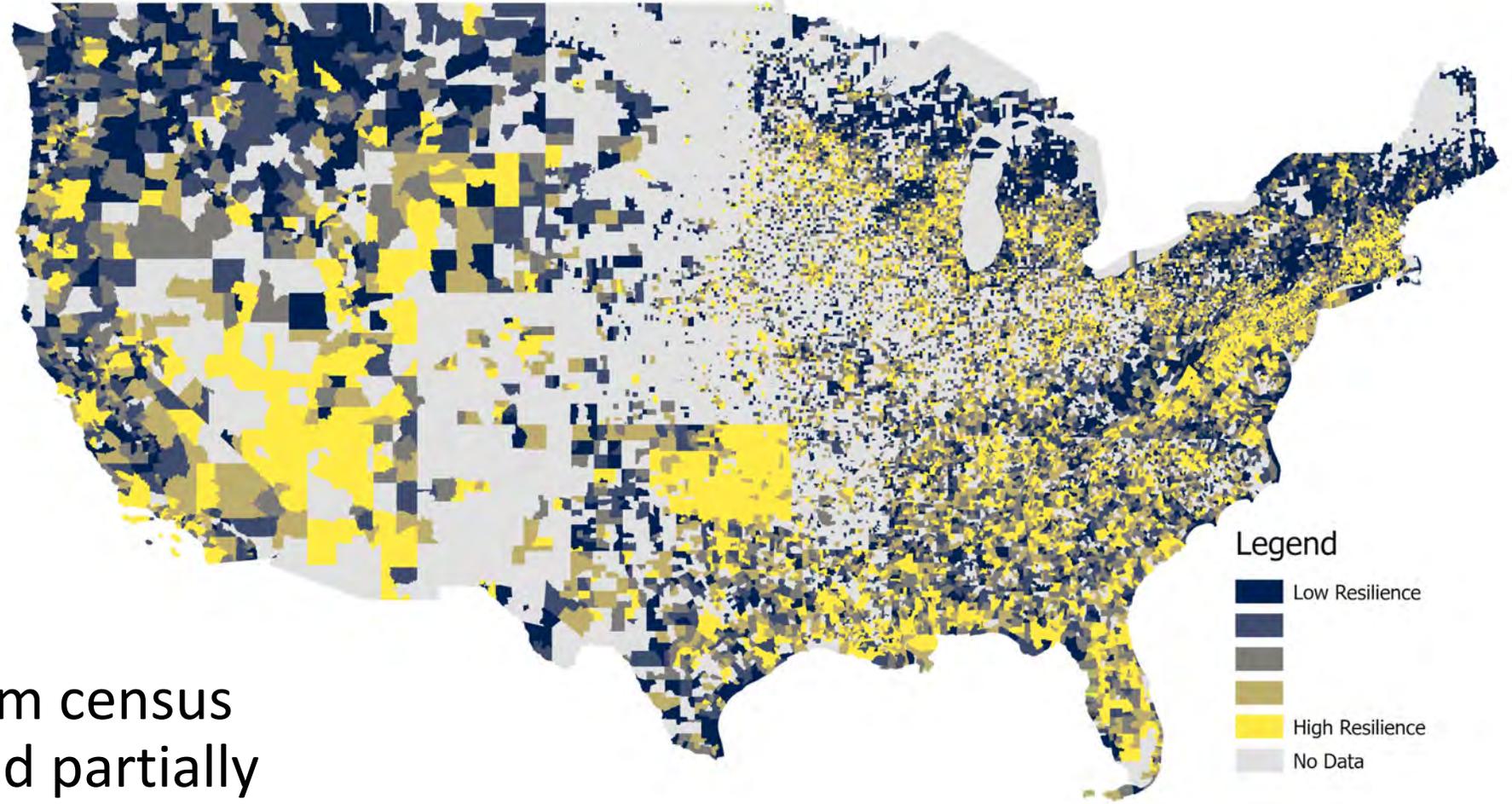
- Land in wetland
- Percent impervious land
- Public open space (parks, community forest, etc.)
- Recognized biodiversity value

# Results – Score Calculation



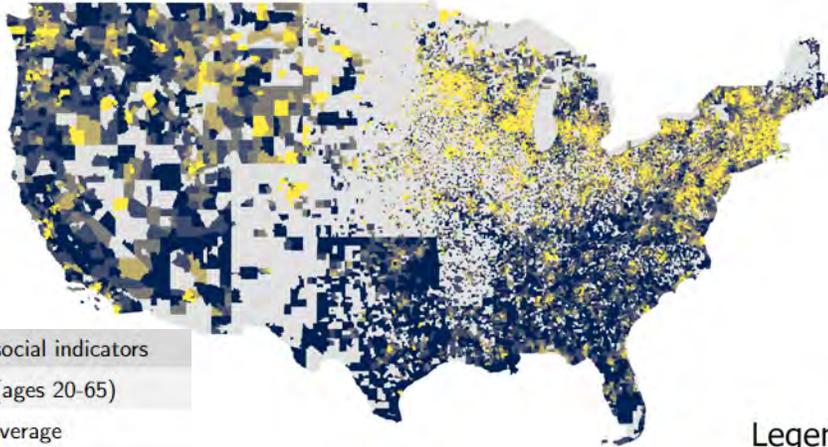


Spatially....



- Data loss mainly from census data suppression and partially from ArcGIS errors.

# Social



## Human well-being/cultural/social indicators

Working age population (ages 20-65)

Health insurance coverage

Population with high school degrees

People who speak English "less than well"

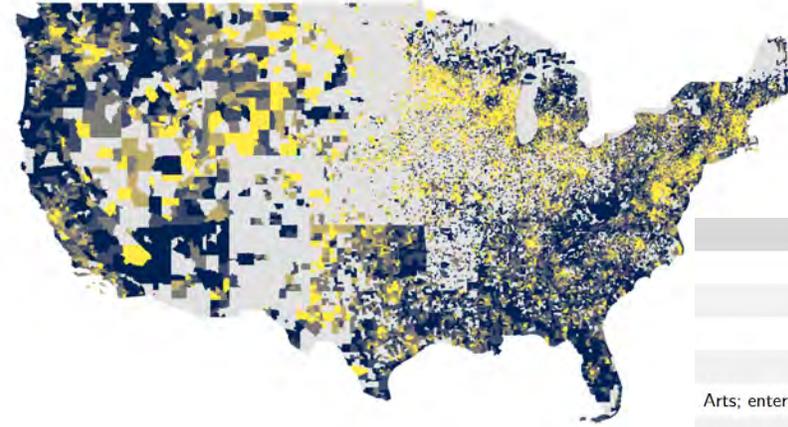
Population change 2010-2018

Mean advertised max broadband download speed

## Legend



# Economic



## Economic/financial indicators

Unemployment rate

Medium household income

Mean commuting time

Service occupations

Arts; entertainment; and recreation; accommodation & food services

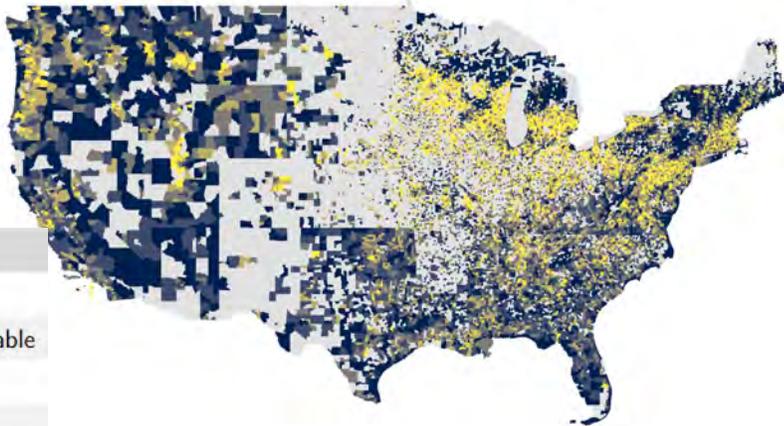
Households with social security

Households with public assistance income

Gini coefficient

Gender income inequality

# Infrastructure



## Infrastructure indicators

Owner-occupied housing

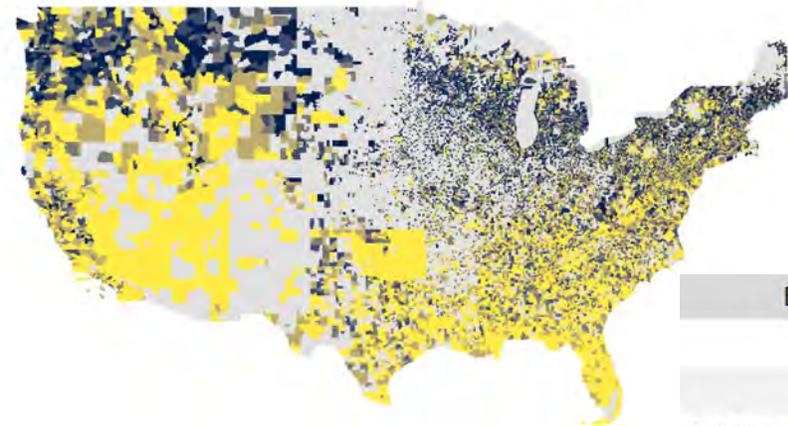
Households with no vehicle available

Median housing value

Housing occupancy rate

Median monthly gross rent

# Environmental



## Environmental/natural indicators

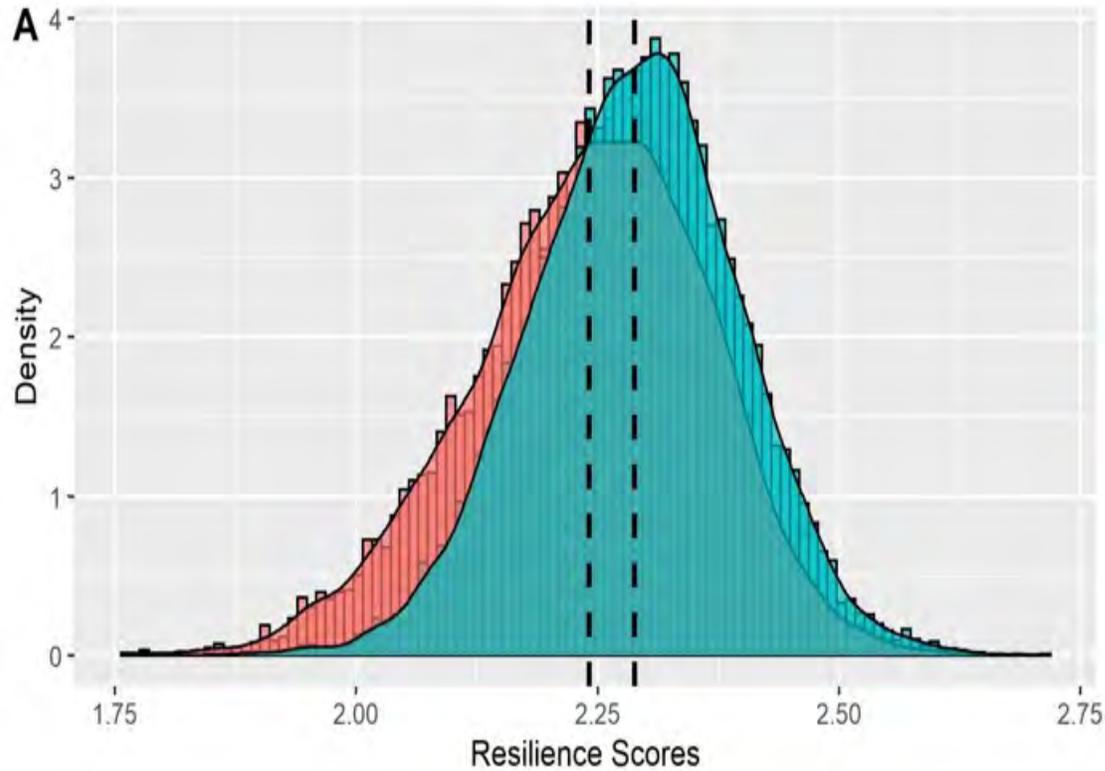
Land in wetland

Percent impervious land

Public open space (parks, community forest, etc.)

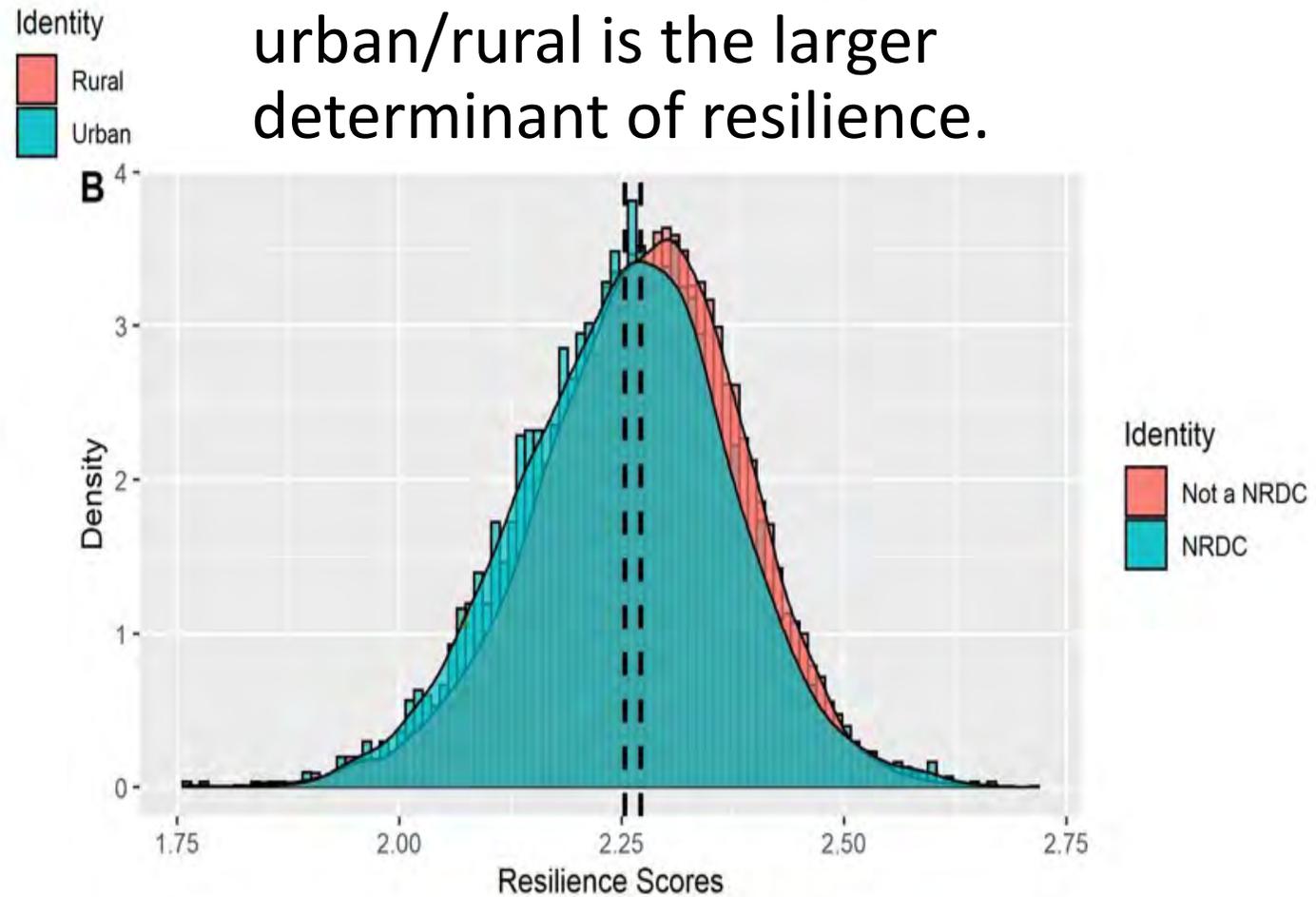
Recognized biodiversity value

# Results – Statistical Tests



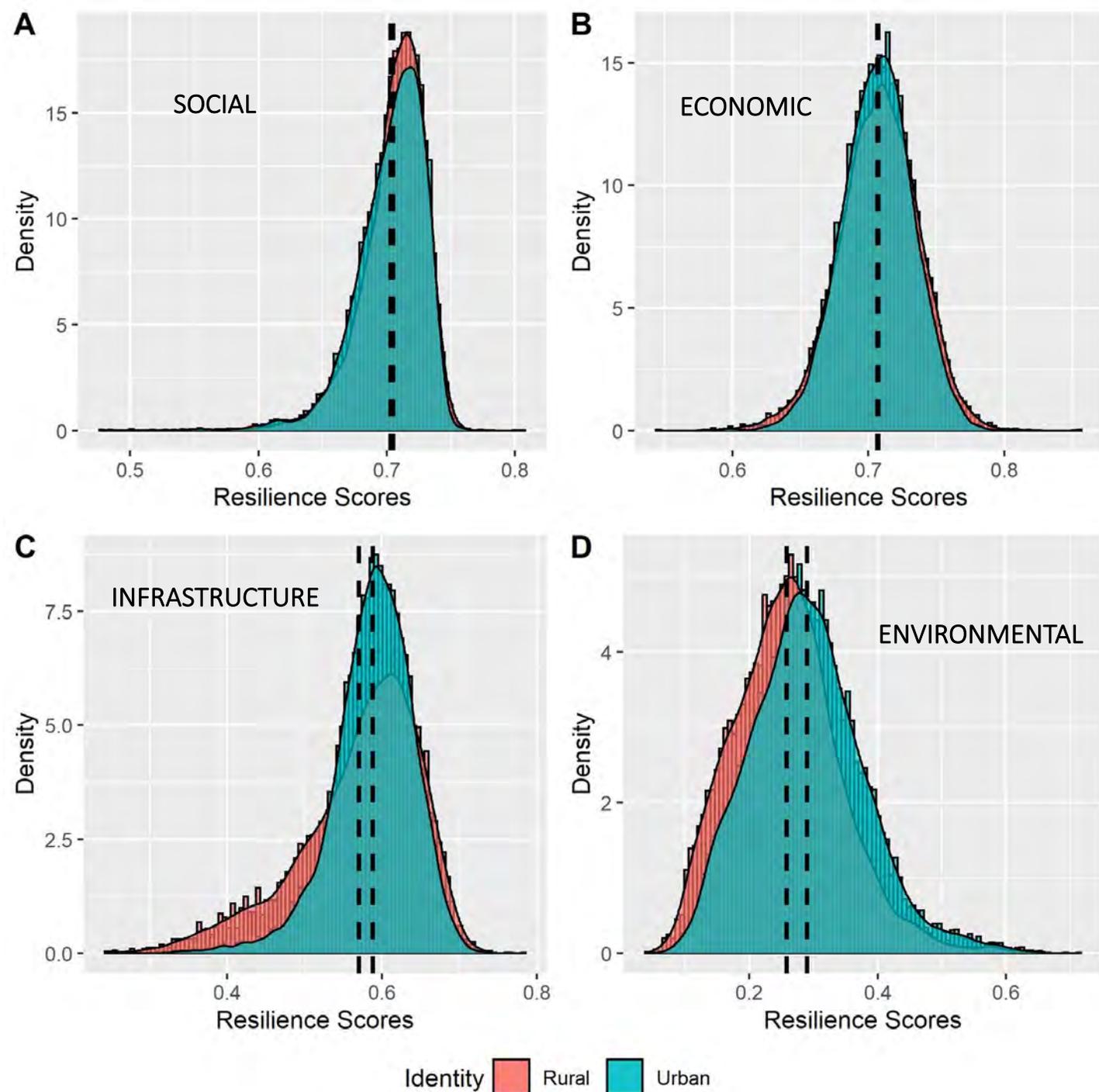
- Relationships stay consistent across threshold analysis.

- All samples statistically different. Urban/rural sample much more so.
- Two-way ANOVA suggests that urban/rural is the larger determinant of resilience.



# Results – Statistical Tests

- Rural places have **significantly** larger social scores.
- Urban places have **significantly** larger infrastructure and environmental scores.
- No statistical differences in economic scores.

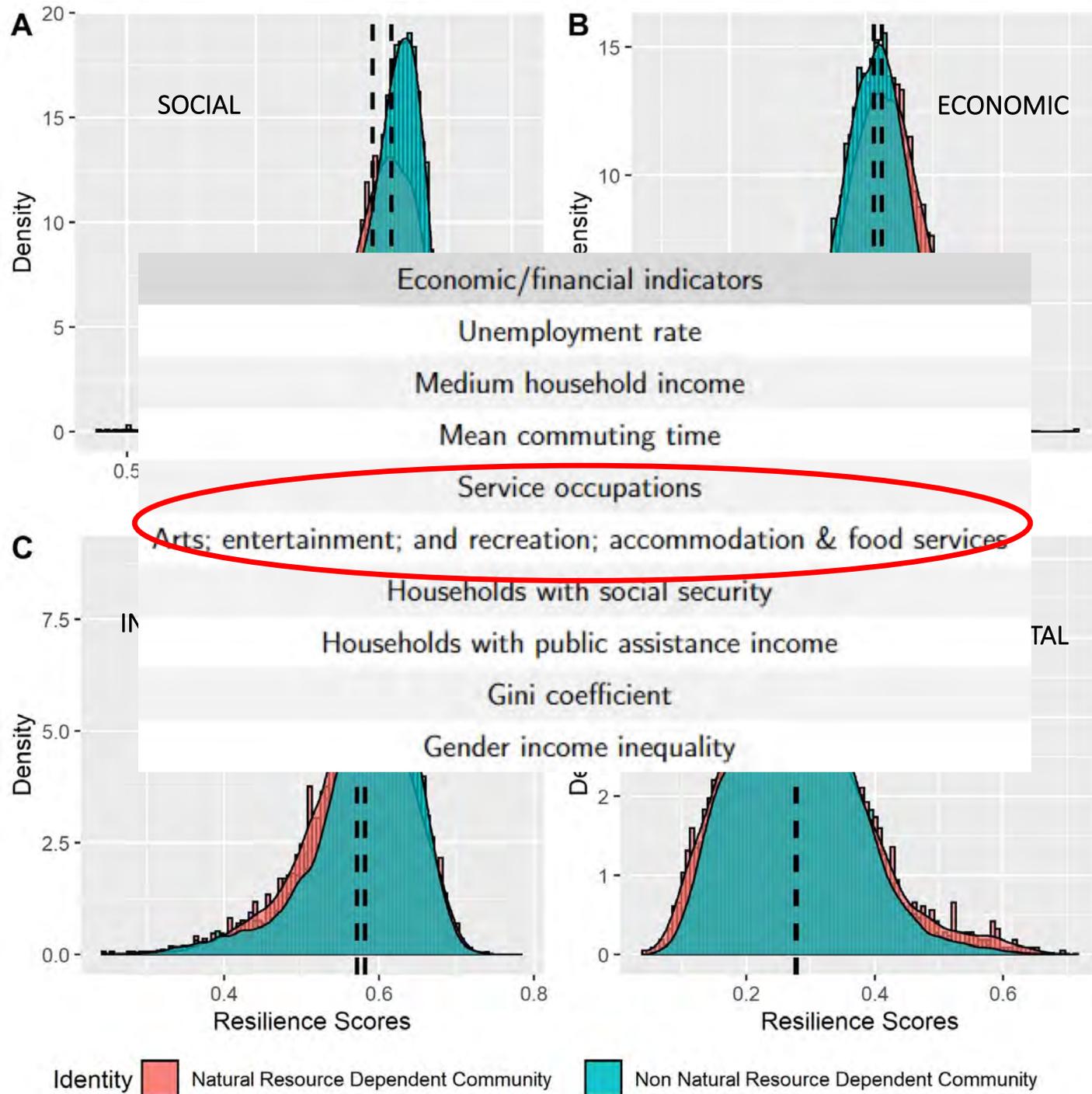


# Results – Statistical Tests

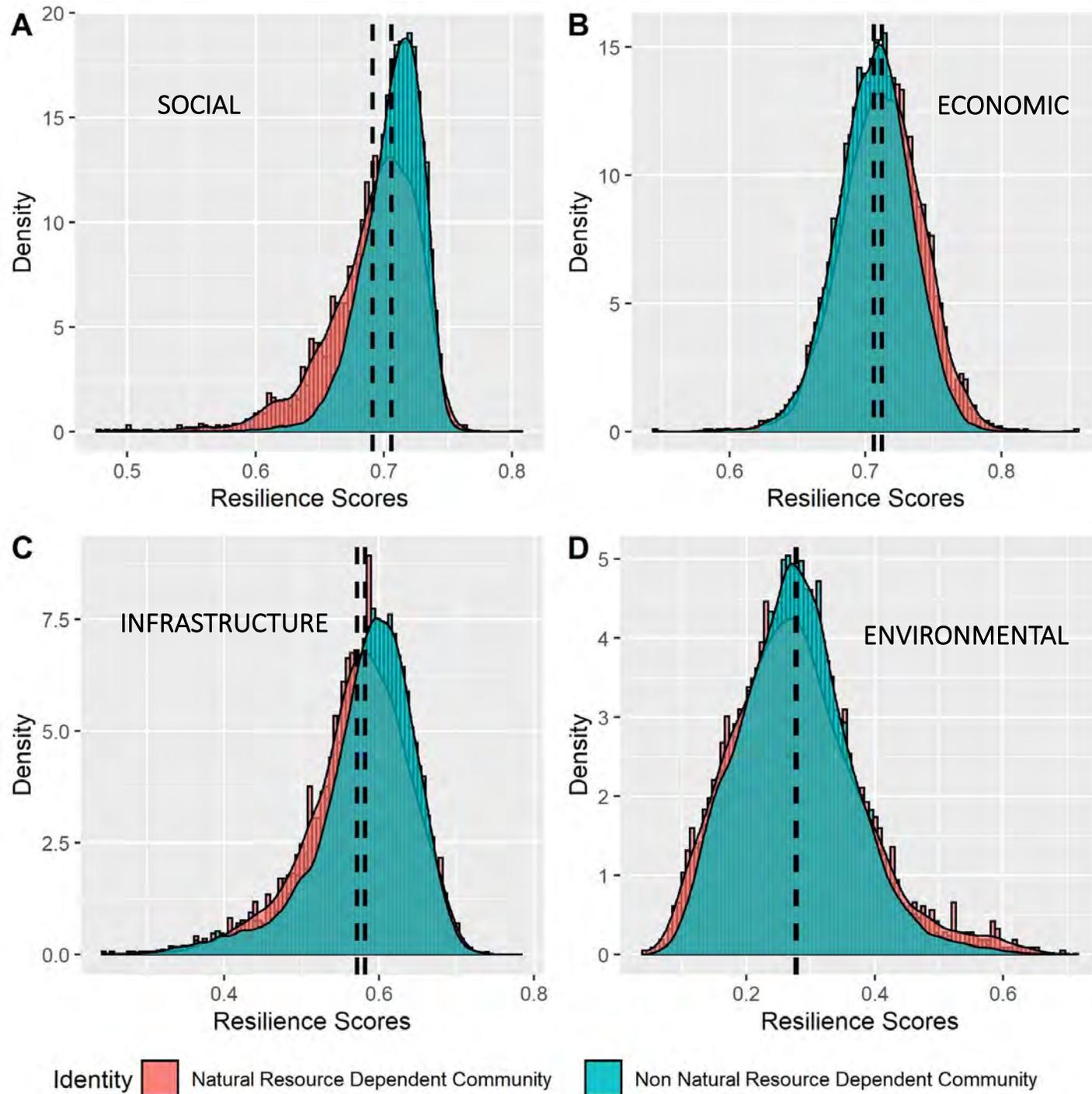
- Natural resource dependent places have **significantly** larger economic scores.



- When these metrics were removed natural resource dependent communities have **significantly** lower economic resilience.



# Results – Statistical Tests



- ~~Natural resource dependent places have significantly larger economic scores.~~
- Communities not considered natural resource dependent have **significantly** larger social and infrastructure scores.
- No statistical differences in environmental scores.

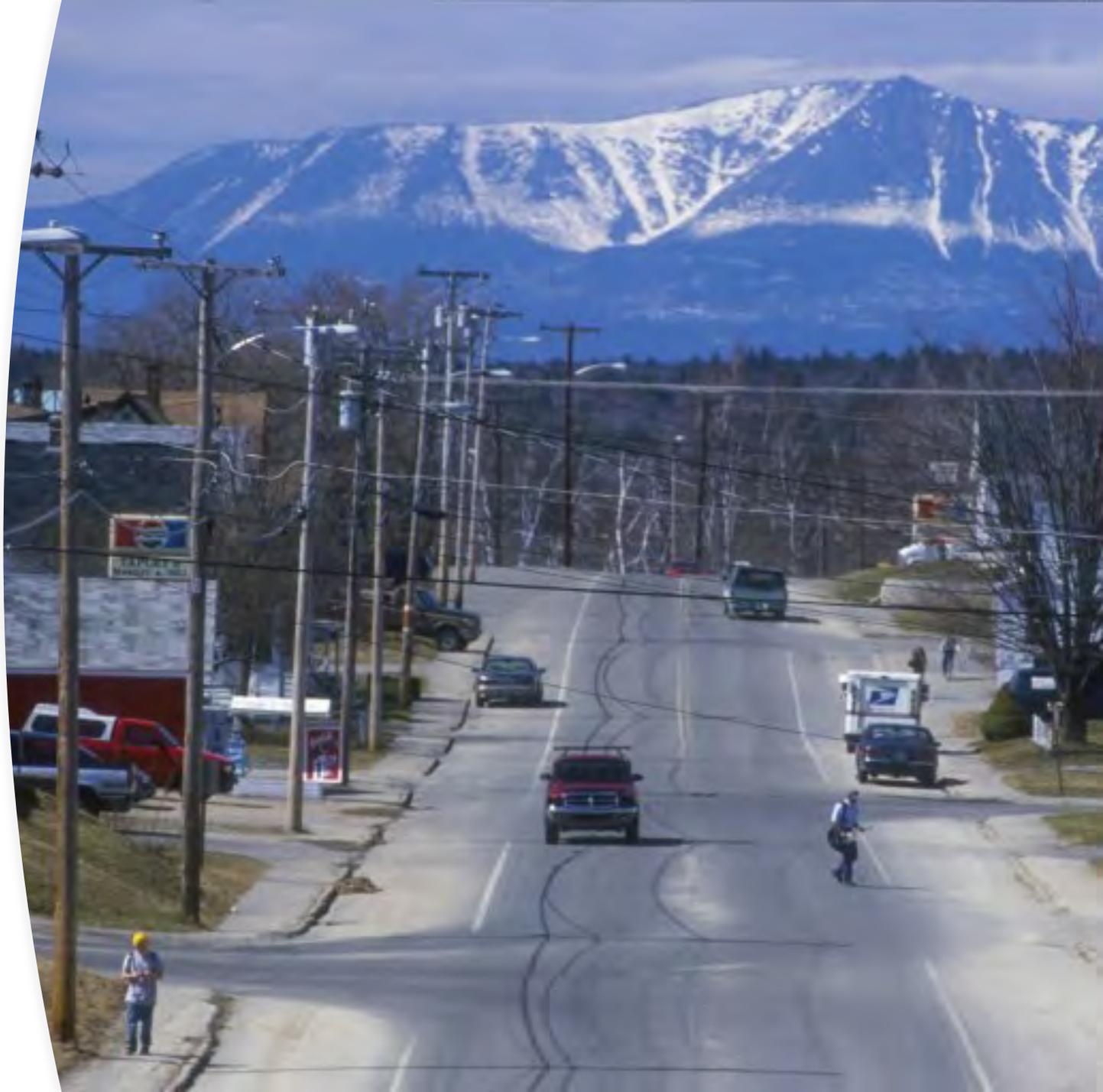


## Limitations

- Lost significantly more rural observations due to census data suppression of communities with small populations.
- Environmental indicators limited at CSD level.
- Resilience is an abstract concept, hard to measure.

# Implications

- Hoping this research opens the door for more community level resilience research.
- It allows for municipalities to access their vulnerabilities to a variety of shocks to determine their weakness for future resource allocation.
- Determine the extent at which policy makers should allocate resources across the urban/rural threshold.



# Acknowledgements



Northern Border  
Regional Commission



Senator George J. Mitchell  
Center for Sustainability Solutions



THE UNIVERSITY OF  
**MAINE**  
School of Economics

- I'd like to thank my advisory committee for assistance:
  - Adam Daigneault, Assistant Professor of Forest, Conservation, and Recreation Policy
  - Kathleen Bell, Director (Interim) and Professor
  - Andrew Crawley, Assistant Professor
- I would like to thank the funders of this project.
- I would also like to thank Samuel Roy, Xinyuan Wei, and Jianheng Zhao for their assistance with data collection.
- If you have any question, I will take them now, and if you would like to contact me to learn more about this project email me at: [joseph.reed@maine.edu](mailto:joseph.reed@maine.edu).

Thank you!

# Literature Citations:

- Cutter, S. L., Ash, K. D., & Emrich, C. T. (2014). The geographies of community disaster resilience. *Global Environmental Change*, 29, 65–77.  
<https://doi.org/10.1016/j.gloenvcha.2014.08.005>
- Cutter, S. L., Ash, K. D., & Emrich, C. T. (2016). Urban–Rural Differences in Disaster Resilience. *Annals of the American Association of Geographers*, 106(6), 1236–1252.  
<https://doi.org/10.1080/24694452.2016.1194740>
- Han, Y., & Goetz, S. J. (2015). The Economic Resilience of U.S. Counties during the Great Recession. *The Review of Regional Studies*, 20.

# Picture Citations:

- <https://unsplash.com/photos/Mk2ls9UBO2E>
- <https://unsplash.com/photos/8wuOLdN77A4>
- <https://unsplash.com/photos/gNoqNvYAsBg>
- <https://www.mainesbdc.org/katahdin-communications/>
- <https://www.mainepublic.org/post/mass-exodus-possible-closure-feared-jay-paper-mill-reduces-workforce>
- <https://www.opb.org/article/2020/08/11/trump-administration-wants-to-reduce-critical-habitat-for-northern-spotted-owls/>
- <http://extension.msstate.edu/news/feature-story/2005/katrina-leaves-damaged-crops-fuel-frustrations>
- <https://azjerome.com/>