THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

Exploring Heat-Related Vulnerability Using NOAA's Urban Heat Watch Mapping Campaigns

Chris Fuhrmann[1], Andrew Robinson[1], Chip Konrad[1], Abhi Bhatia[2]

[1] NOAA's Southeast Regional Climate Center, Department of Geography and Environment, University of North Carolina at Chapel Hill

[2] Carolina Health Informatics Program, University of North Carolina at Chapel Hill

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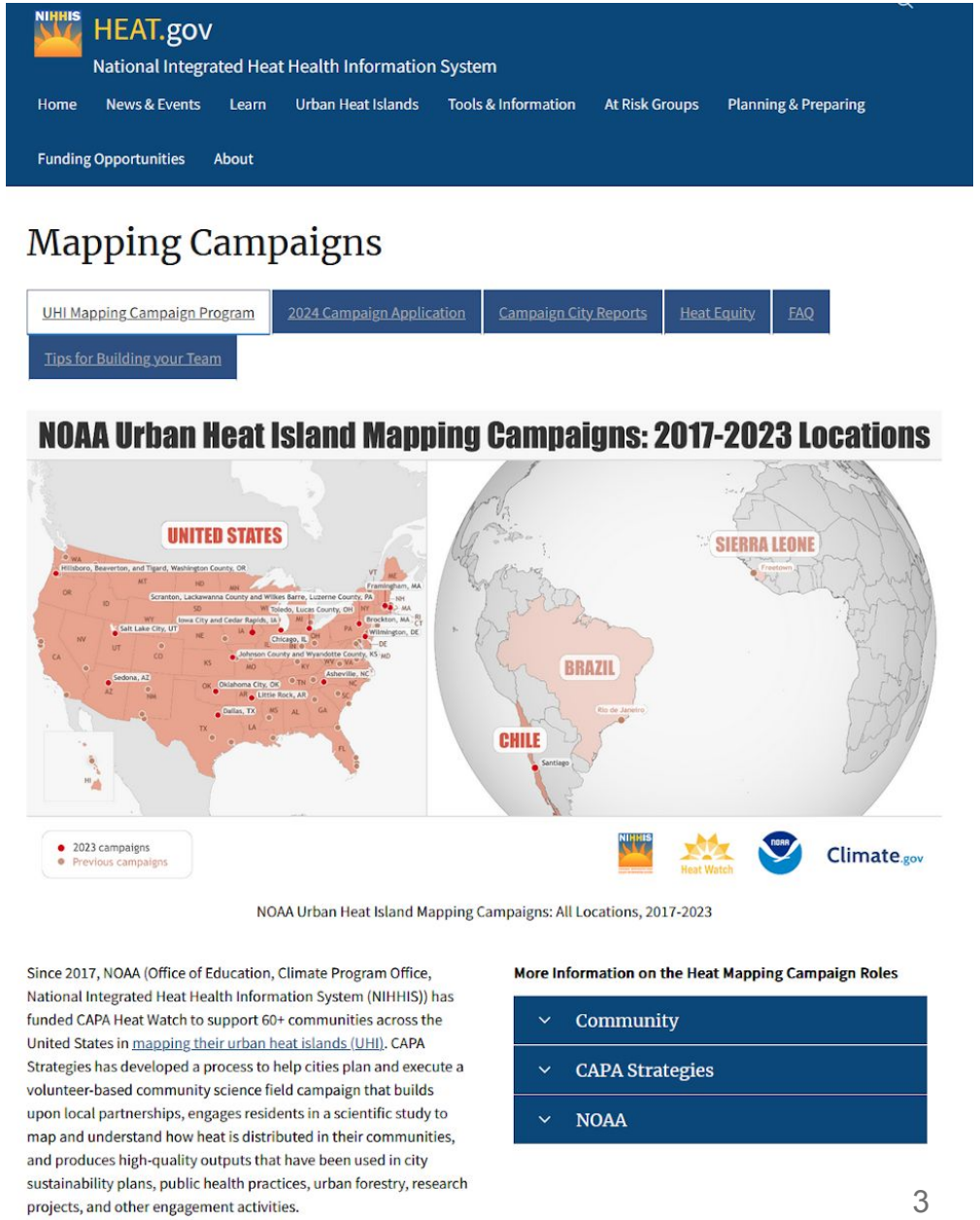
Background

- Differences in observed temperatures and associated health effects between urban and surrounding rural locations are well-documented
- However, the complex nature of cities results in significant intra-urban variability in temperature as well as variability in the underlying demographic and social characteristics of the urban population
- The growing appreciation for intra-urban temperature variability has led to field campaigns to measure the fine-scaled patterns of extreme heat across the urban landscape…

Heat Watch

- Many of these campaigns have been conducted under the Heat Watch program; developed by CAPA Strategies, funded by NOAA
- Since 2017, over 60 cities and communities have participated, resulting in detailed thermal “fingerprints” using data collected by volunteers

https://www.heat.gov/pages/mapping-campaigns

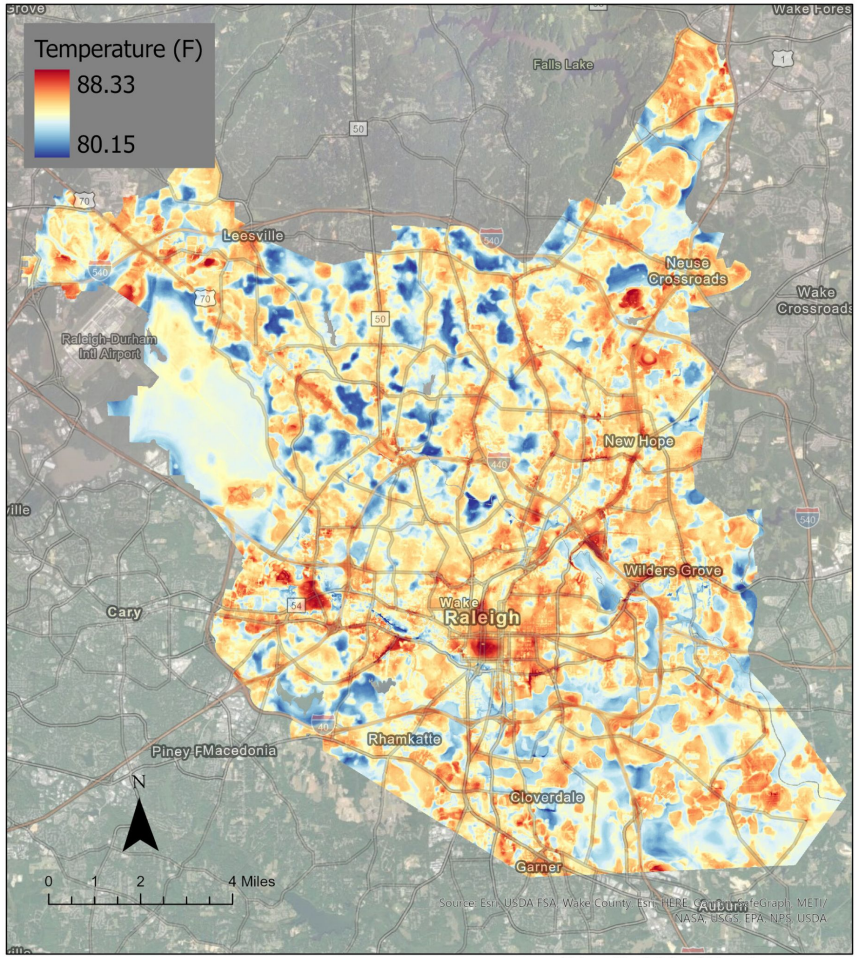


Raleigh Afternoon Traverse Points

Temperature (3 - 4 pm)

Raleigh Afternoon Temperature (3-4pm)

July 23, 2021



Urban Heat Island Mapping
climate.ncsu.edu/research/uhi

Addressing Vulnerability

- While these maps reveal the geographic distribution of heat across a city, *there remains a gap in applying these data to better understand and respond to local-scale inequities in heat exposure*
- In this study, we explore intra-urban vulnerability to extreme heat by linking the temperature data collected during several Heat Watch campaigns across the Southeast U.S. with commonly-cited demographic and social risk factors at the Census tract level

Raleigh Afternoon Temperature (3-4pm)
July 23, 2021

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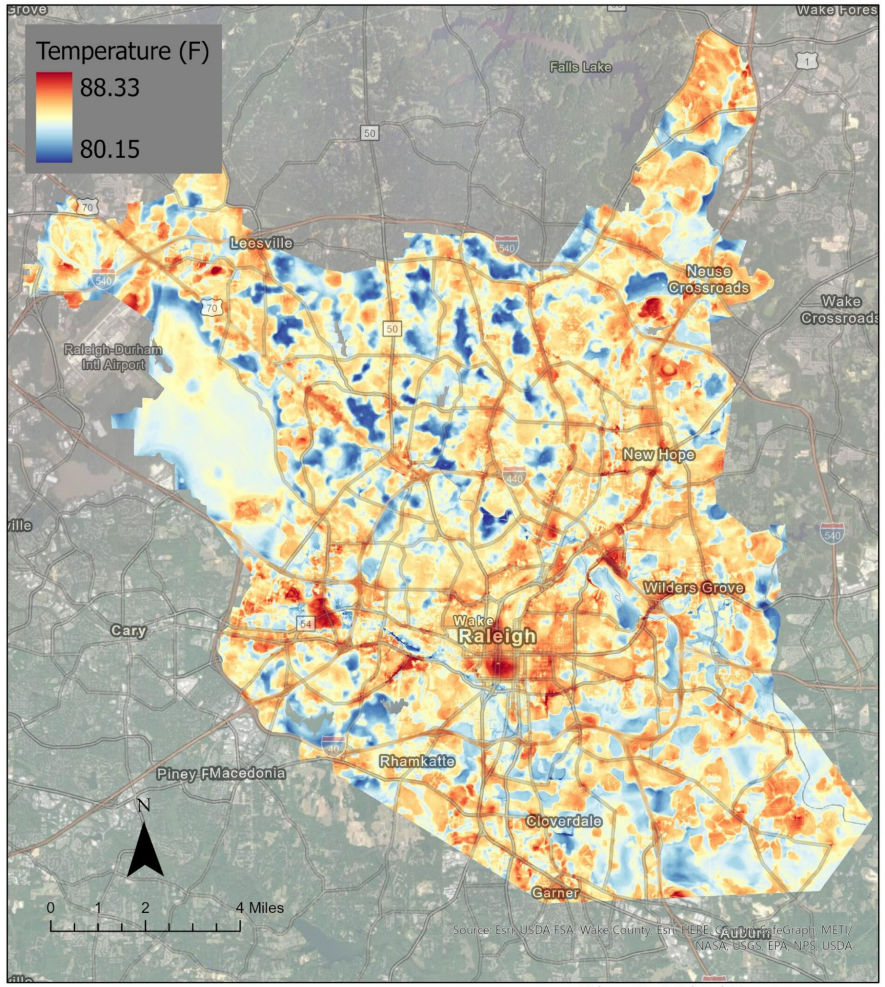

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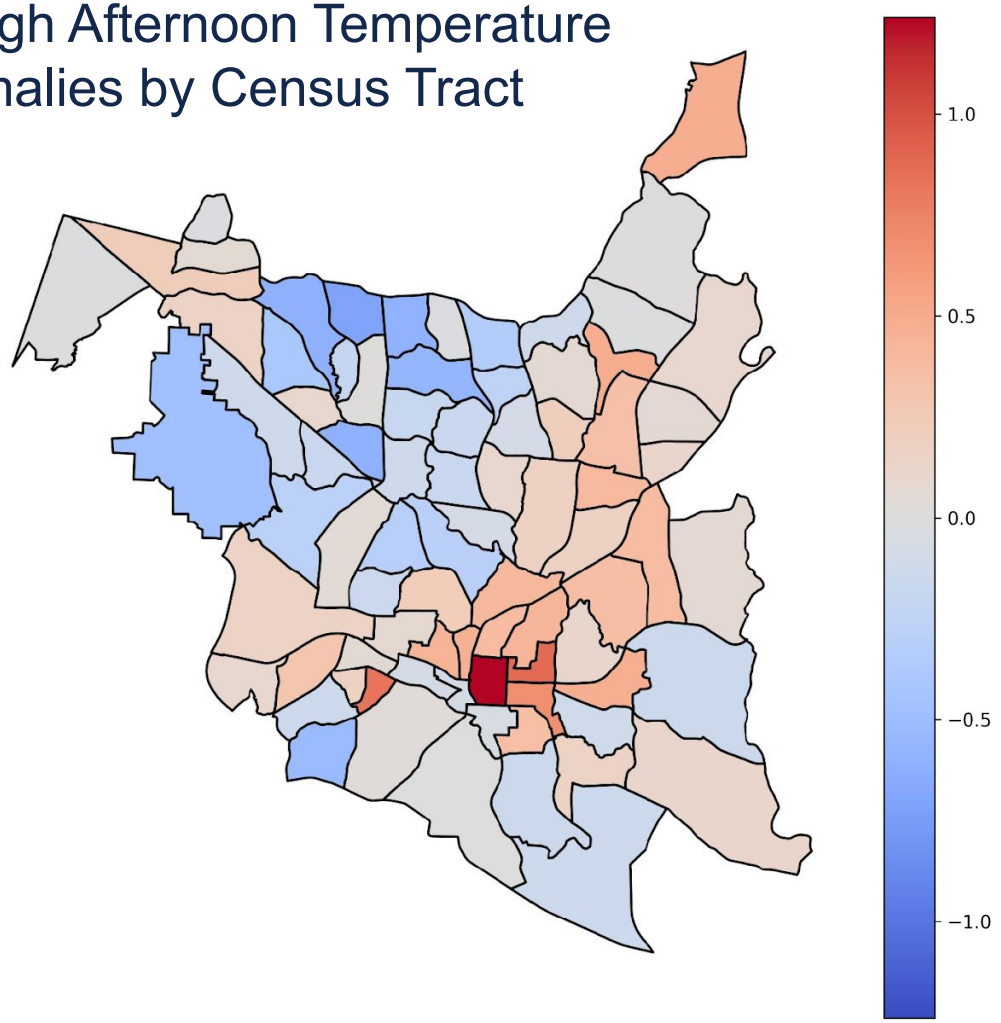
Raleigh Afternoon Temperature Anomalies by Census Tract



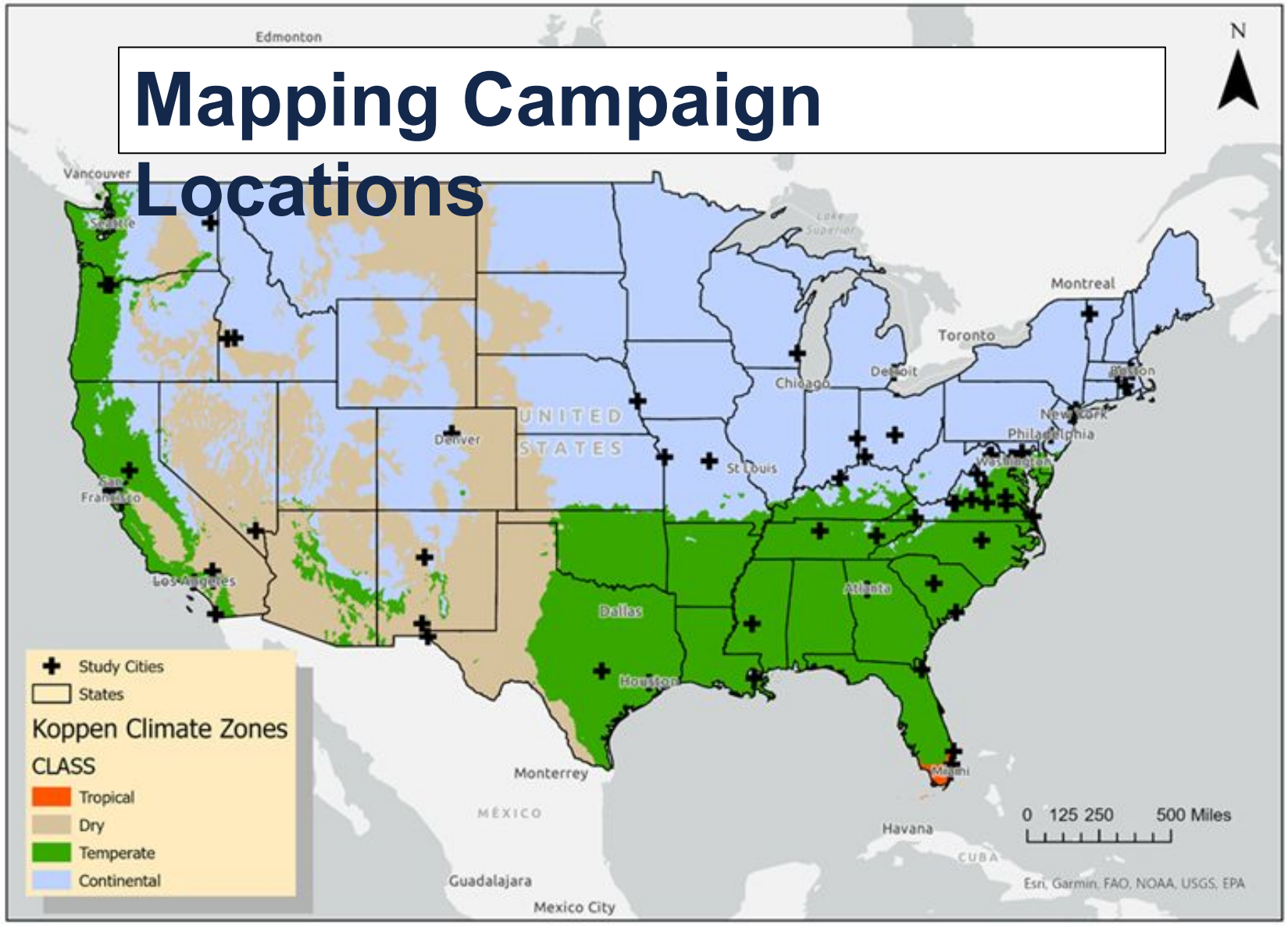
Virtual Roundtable Discussion

- Hosted by the Southeast Regional Climate Center on February 12th
- Included local organizers from several Heat Watch campaigns across the Southeast and representatives from NIHHIS, NWS, and CAPA Strategies
- Goal was to *gain insight into how we can develop effective policies and alert systems that address the complex, unequal, and localized heat hazard in urban areas*

Methods

- NOAA's Data Visualization Lab has curated the mapping data to the Census tract level; utilizes zonal statistics, calculates an average temperature and anomaly for each tract containing mapping data
- Combined with 2010 Census variables that have been tied to heat vulnerability, e.g. elderly, poverty, race, education level
- Additional step: Eliminated tracts with <50% raster coverage from the curated dataset; this removed the influence of tracts with limited mapping data, which were largely found along the periphery of the campaign area with cooler estimated temperatures

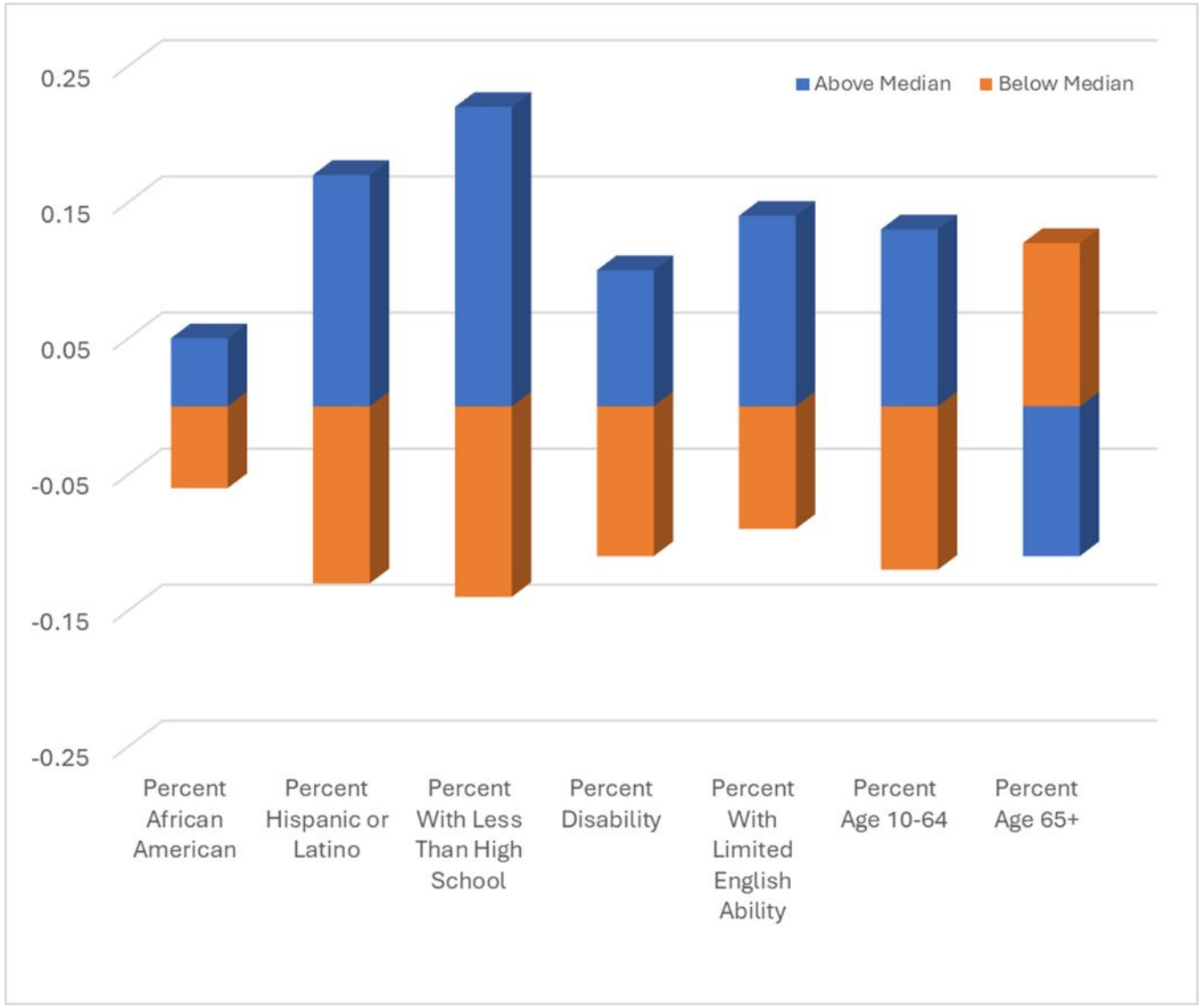
Mapping Campaign Locations



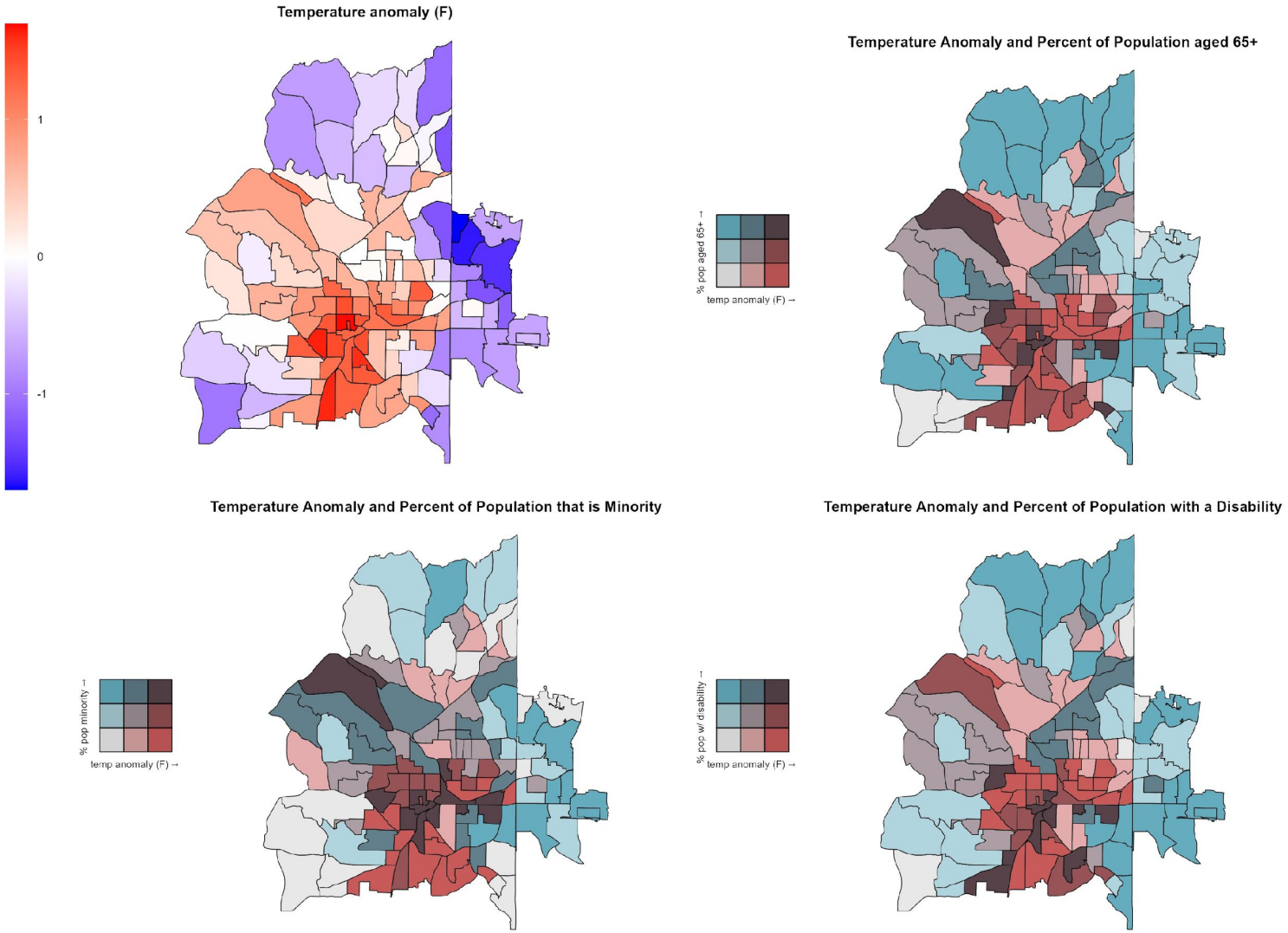
National Statistics

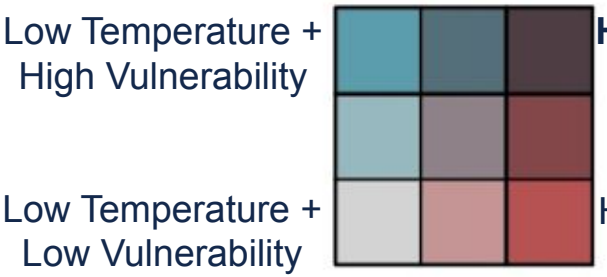
Comparison of the weighted temperature anomalies for selected vulnerability metrics that fall above (**blue bars**) and below (**orange bars**) their median values for all Census tracts across all mapping campaigns

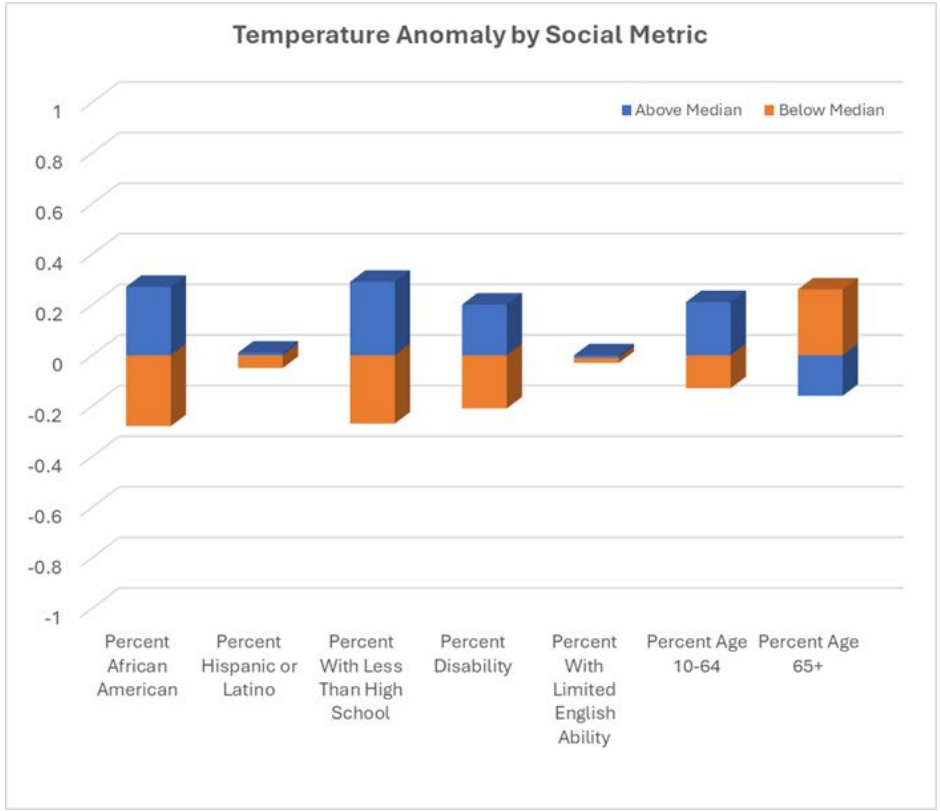
Tracts with a higher percentage of vulnerable individuals (except the elderly) experience warmer mean temperatures than tracts with a lower percentage of vulnerable individuals



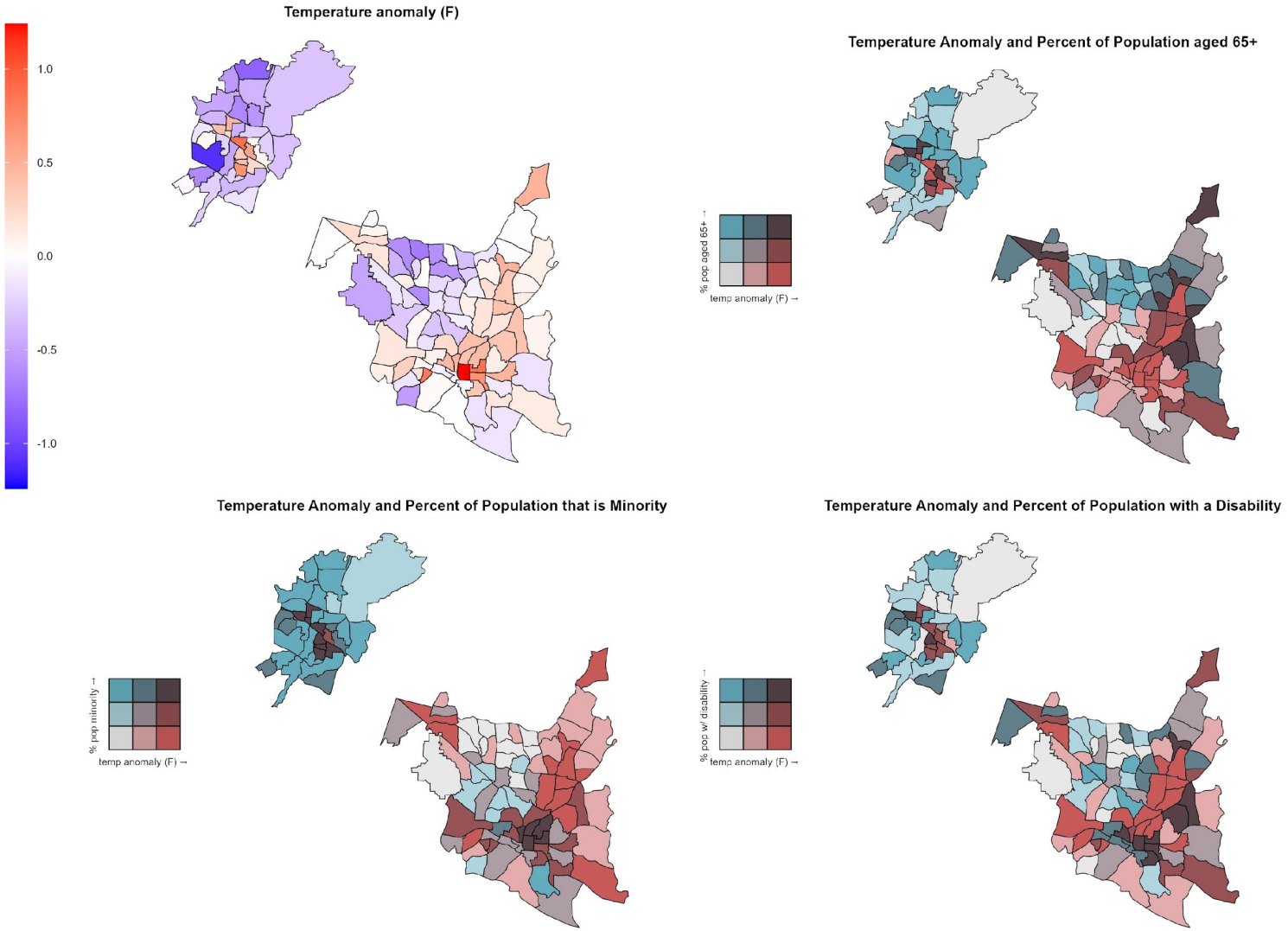
Atlanta, Georgia

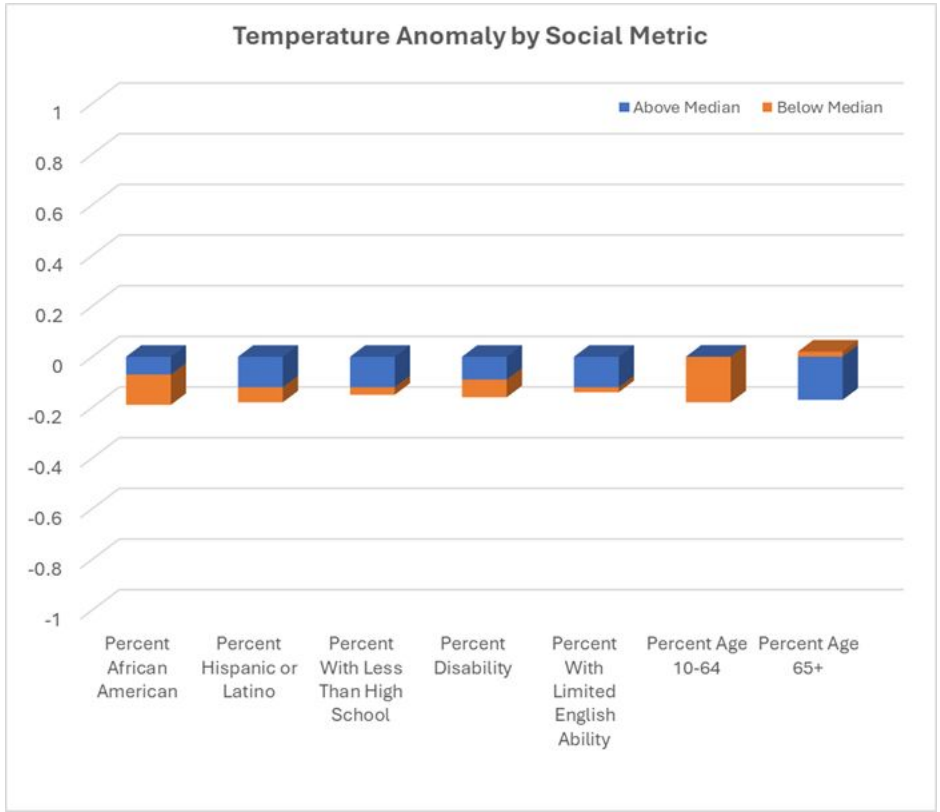




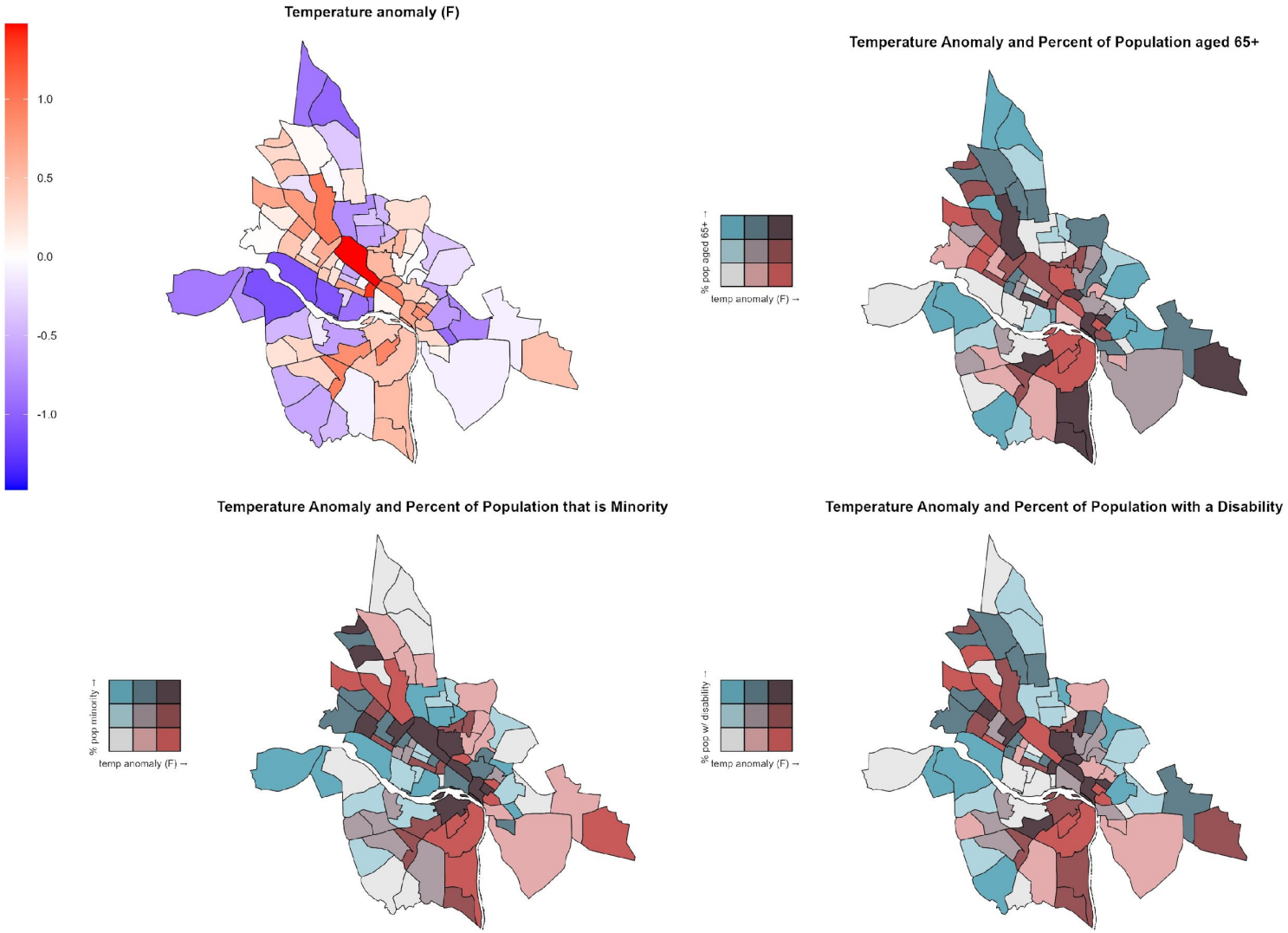


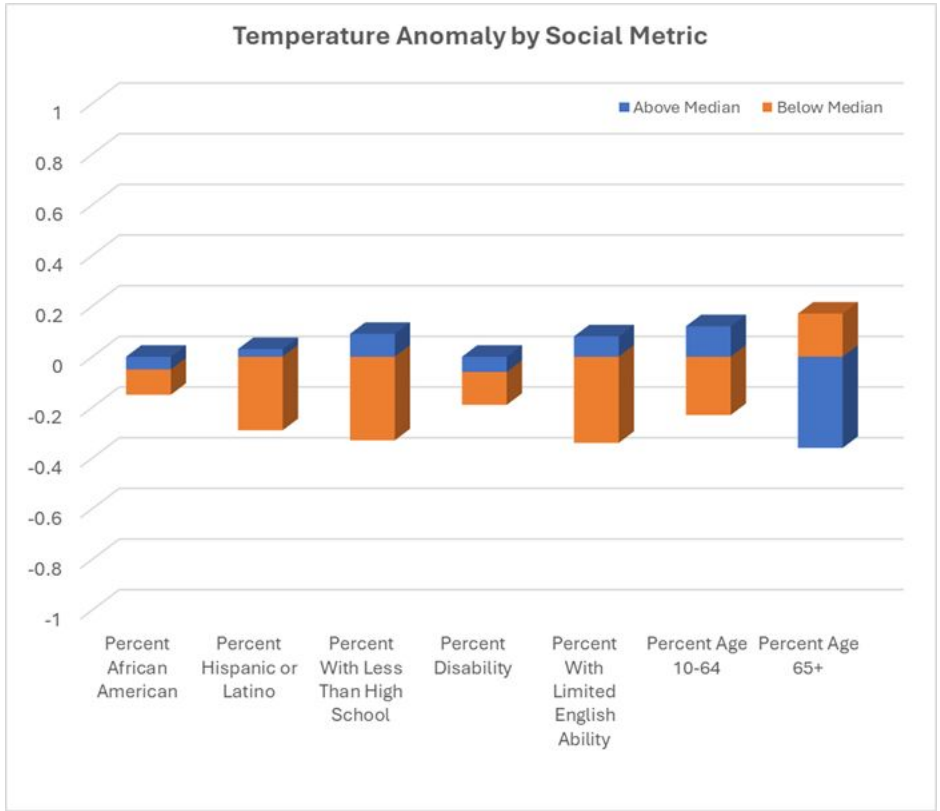
Raleigh and Durham, North Carolina



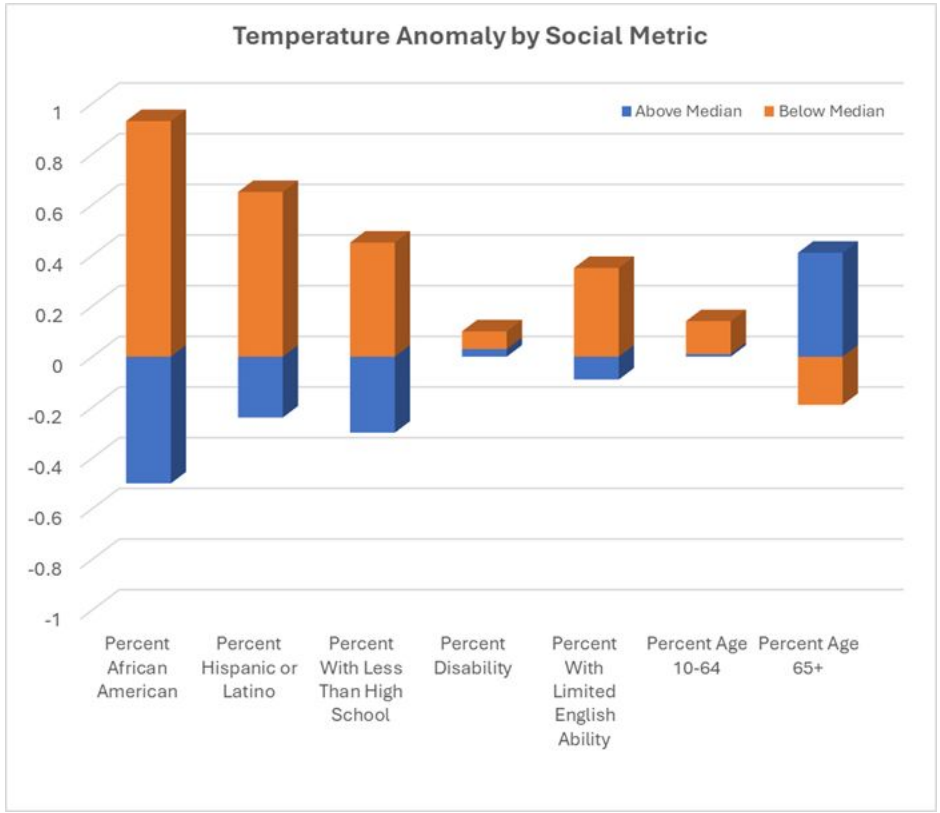


Richmond, Virginia

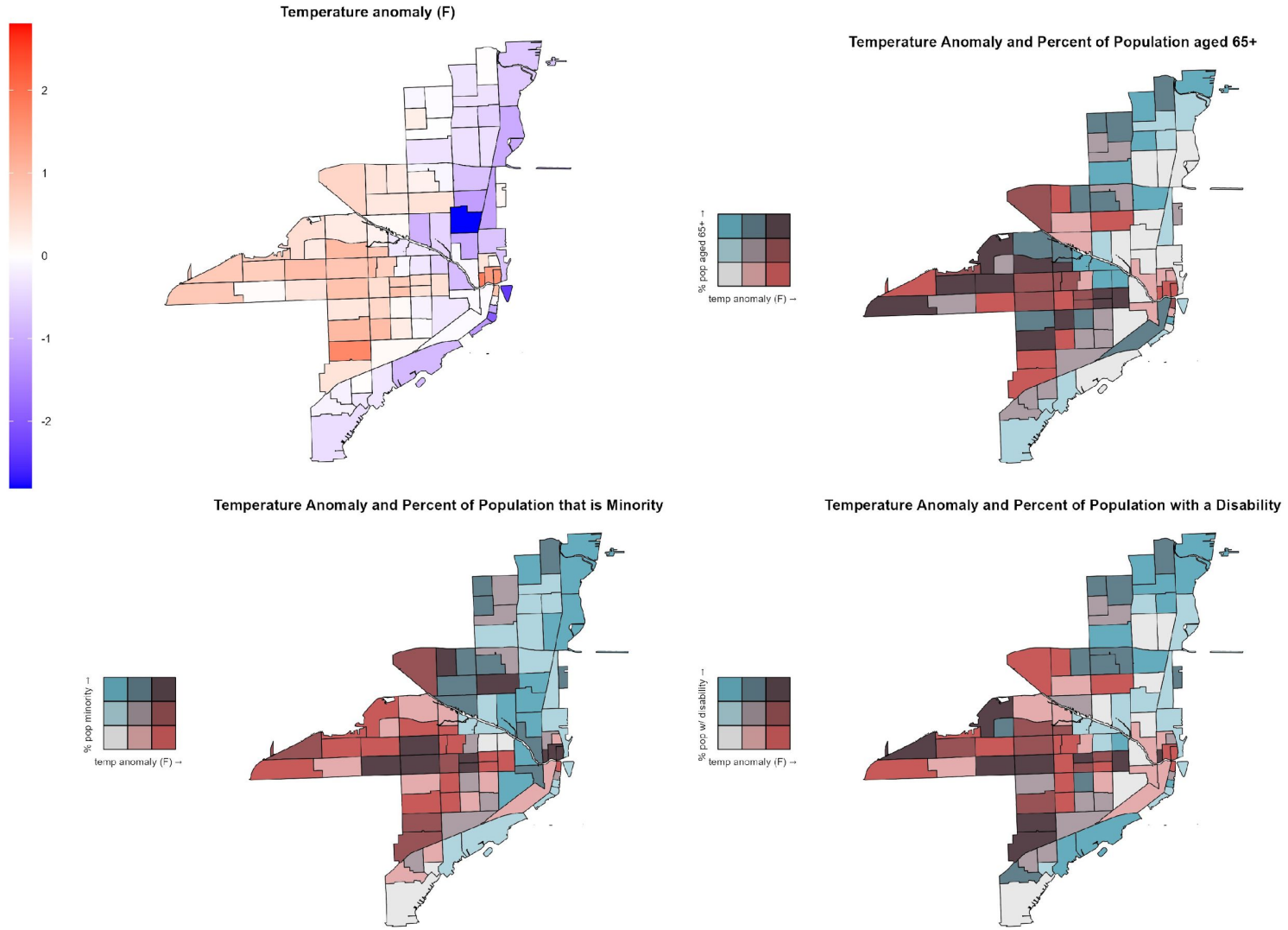


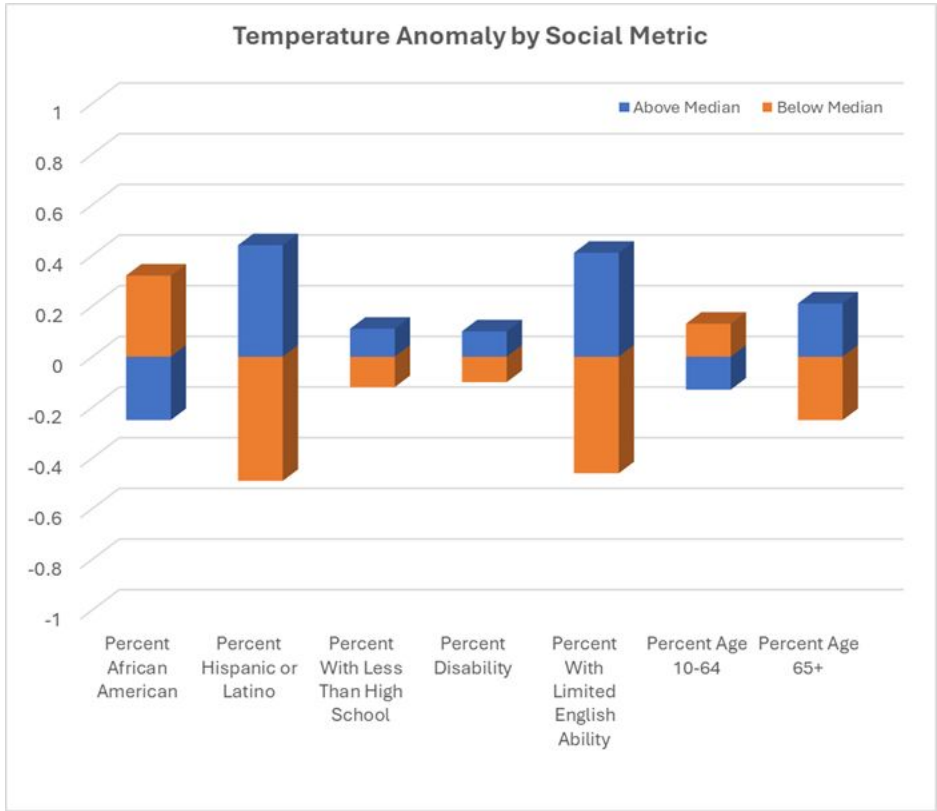


Columbia, South Carolina



Miami, Florida





Virtual Roundtable Discussion

- How do we apply the mapping data to better understand and respond to local-scale inequities in heat exposure?
- How can the data collected from these campaigns, combined with socioeconomic and other indicators, inform heat warnings and heat policies, particularly those that focus on more localized adaptation and mitigation strategies?
- Three themes emerged:
  - ***Issues and considerations scale***
  - ***Communication and engagement***
  - ***Taking action and prioritizing heat for policy***

Virtual Roundtable Discussion

- Issues and Considerations of Scale:
  - Census tracts vs. blocks
  - Developing baselines for heat exposure
- Communication and Engagement:
  - Building social capital through community listening sessions
  - Improving environmental and geographic literacy
- Taking Action and Prioritizing Heat for Policy
  - Look for synergies, intersectionalities, compound hazards
  - Mismatch between the level where information is generated and the level where action can be taken

Ideas for Next Steps

- Incorporate stationary and wearable sensors
- Consider other heat metrics, e.g. WBGT
- Extend the duration of the campaigns, build predictive models
- Investigate health indicators that better align with the mapping data
- Establish best practices on how to engage with communities at the proper scales
- Align heat with other hazards that are already tracked
- Focus on funding opportunities that promote community engagement and build social capital

Thank you!
Questions?

fuhrman1@email.unc.edu

We are grateful to NOAA's Regional Climate Center Program for funding this work and to all our roundtable participants

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