PRESS CONFERENCE:
Unequal impacts of heat, pollution and climate change

Wednesday, 9 December
11:00 am US Eastern Time

AGU FALL MEETING

SHAPING THE FUTURE OF SCIENCE

AGU FALL MEETING

PANELISTS

Susanne Benz, University of California San Diego
Allison Grant, University of Mary Washington
Angel Hsu, University of North Carolina at Chapel Hill

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INFORMATION FOR REPORTERS

Slides from this presentation are available in the Fall Meeting Media Center:
https://www.agu.org/Fall-Meeting/Pages/Attend/Media-Center

A recording of this event will be posted to AGU's YouTube channel:
https://www.youtube.com/c/AGUvideos
Playlist "Fall Meeting 2020 Press Conferences"

An informal, 30-minute discussion room via Zoom will follow this event:
Link will be posted in this event's chat box
Meeting ID: 962 1469 2326
Passcode: agupress

Questions: Email news@agu.org

SHAPING THE FUTURE OF SCIENCE

UC San Diego

WHO'S FEELING THE BURDEN OF URBAN HEAT?

KEY FINDINGS:

WIDESPREAD CLASSIST DISPARITIES

WIDESPREAD RACIST DISPARITIES

UNEQUAL URBAN DESIGN

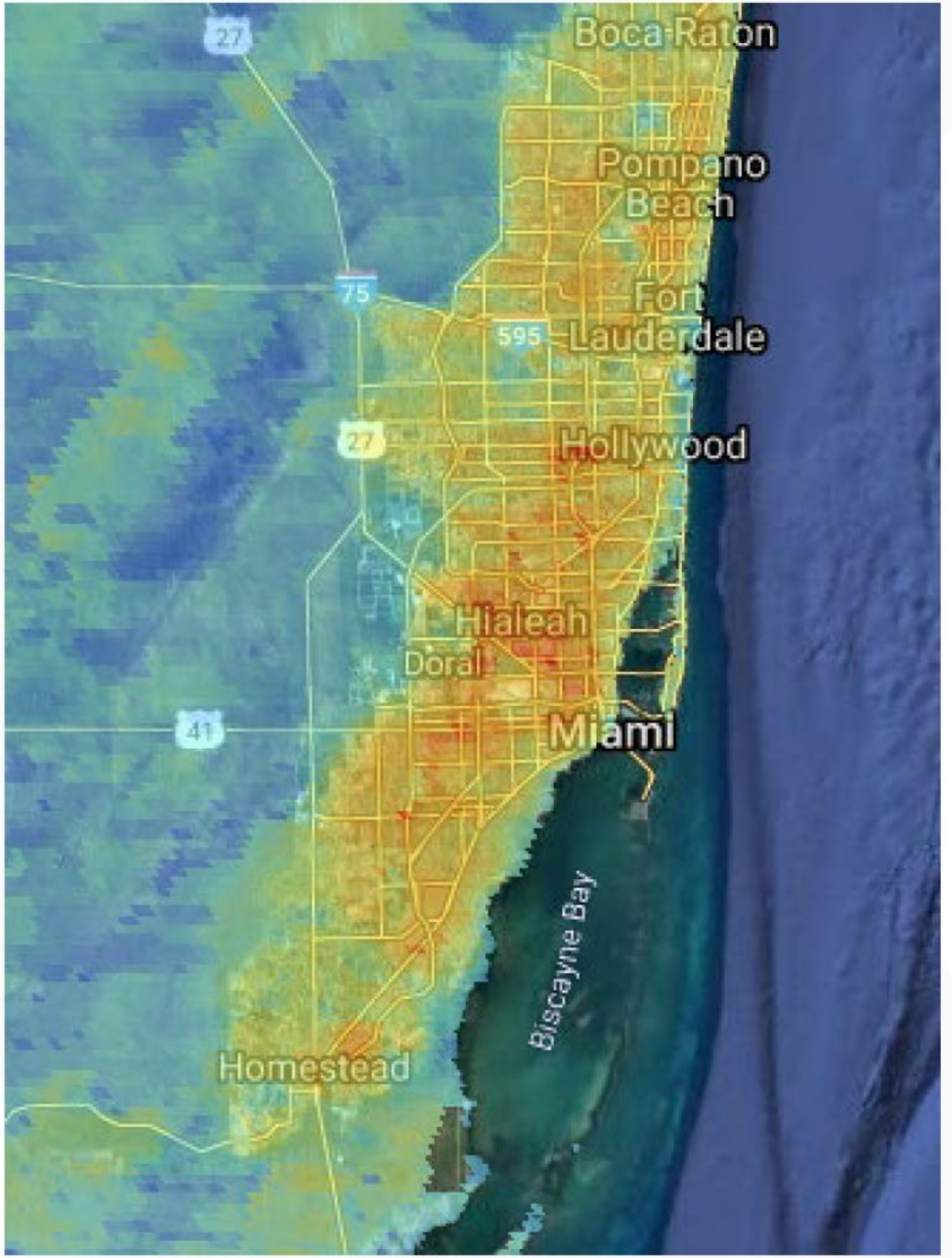
Susanne A. Benz and Jennifer Burney

9 Dec 2020

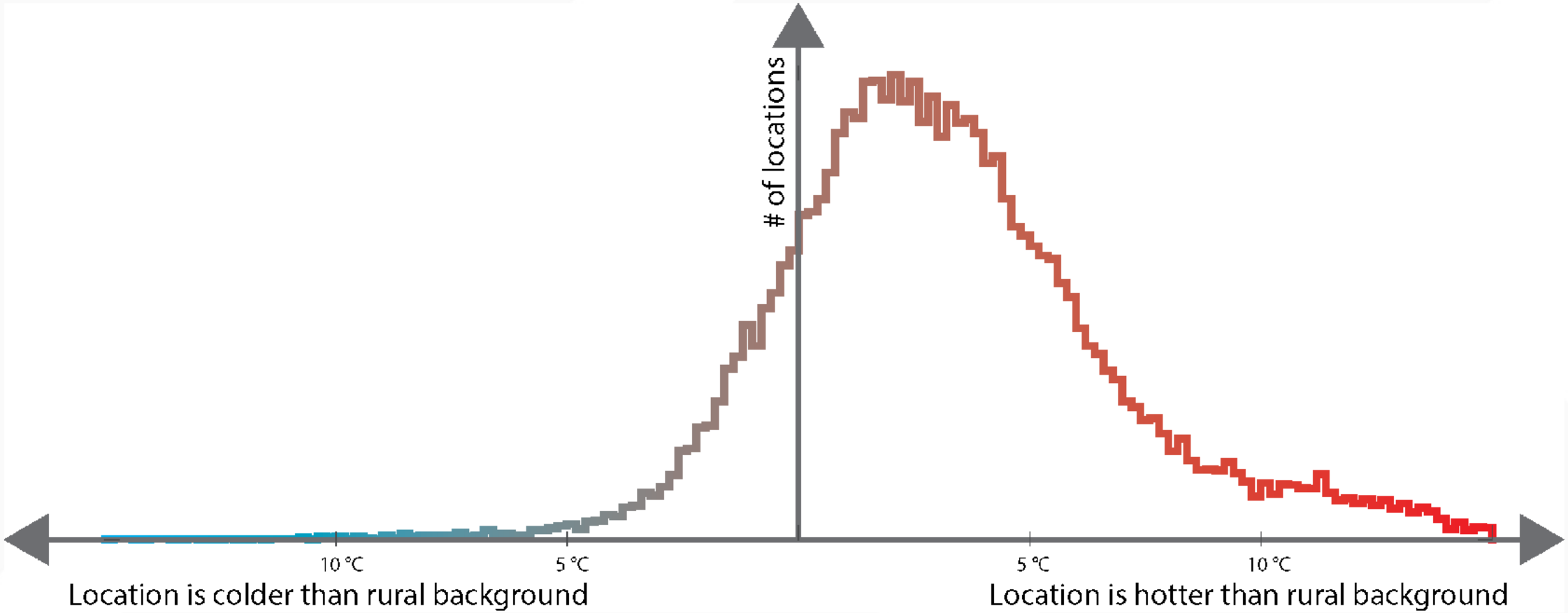
AGU press conference "Unequal impacts of heat, pollution and climate change"

WHAT IS URBAN HEAT?

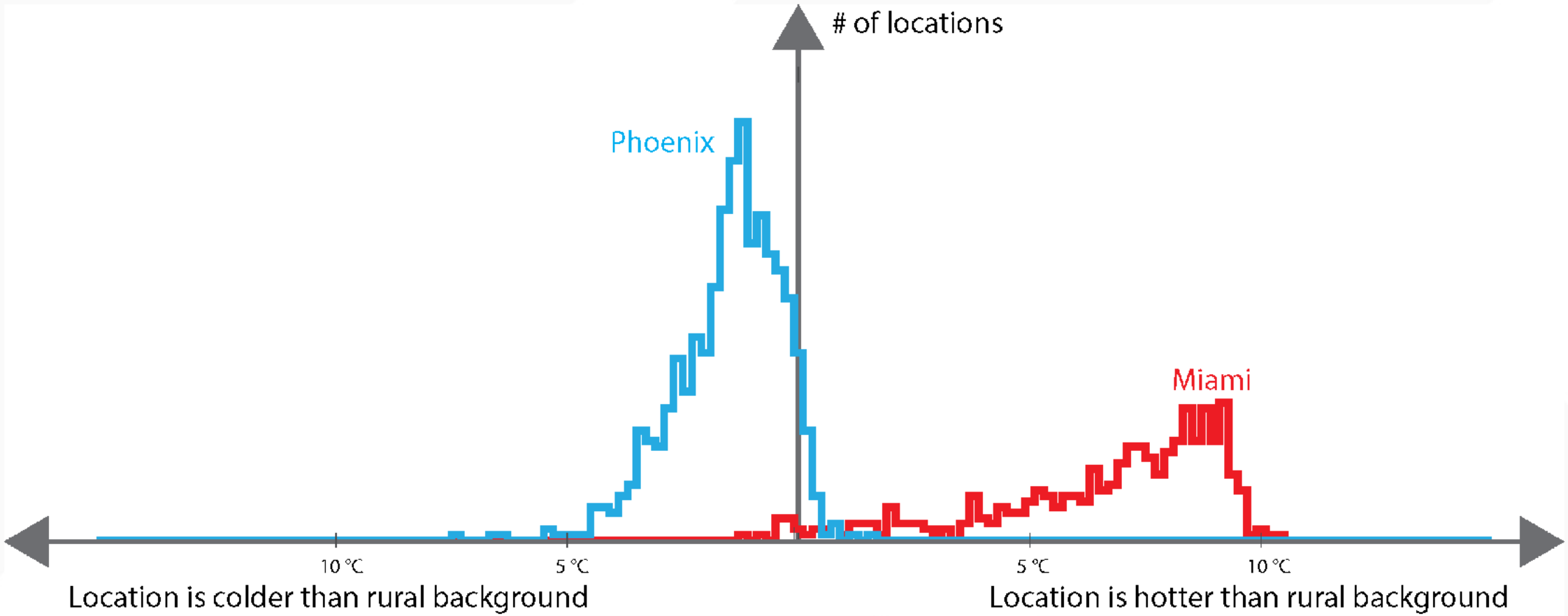
- Temperatures in a city are different than outside of a city.
- Most often, **cities are warmer than their surrounding**.
- Among others, these urban heat islands are caused by
  - darker surfaces (light is cooler than dark)
  - a lot of built-up area (trapping the heat)
  - only little vegetation (less “sweating”)
  - our waste heat.



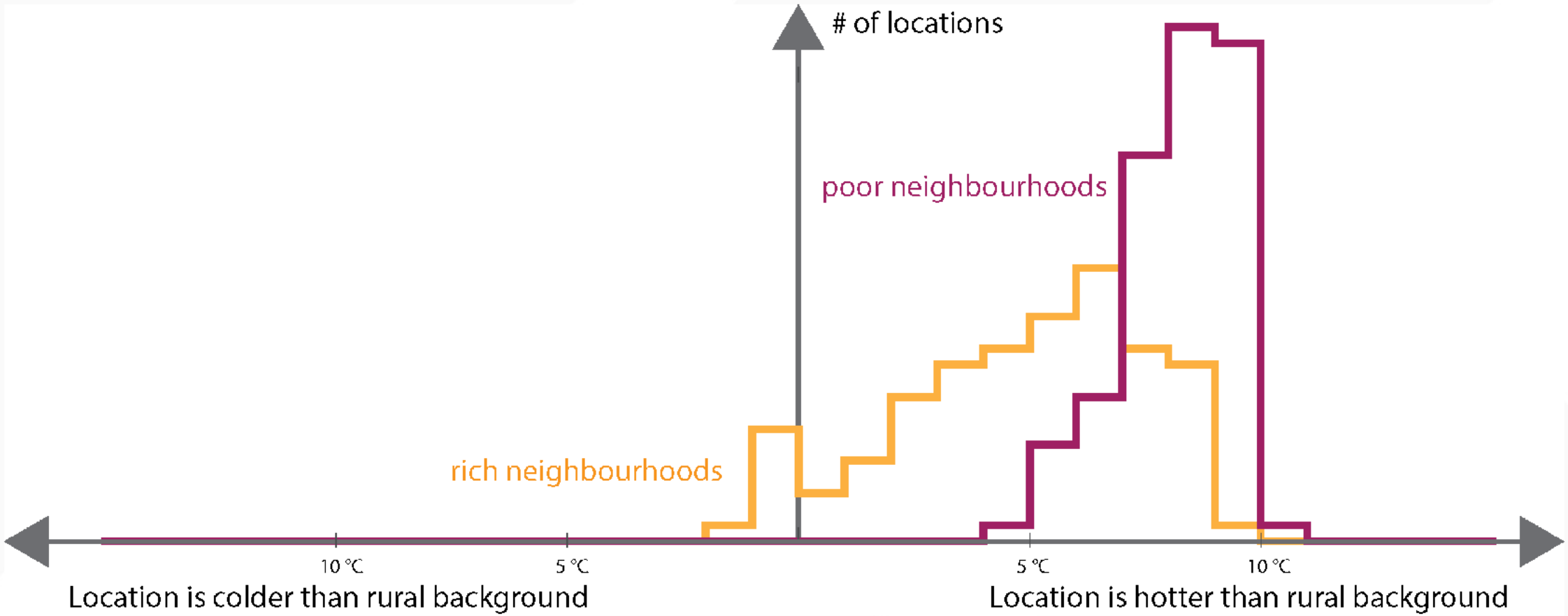
URBAN HEAT IN THE USA DURING SUMMER DAYS.



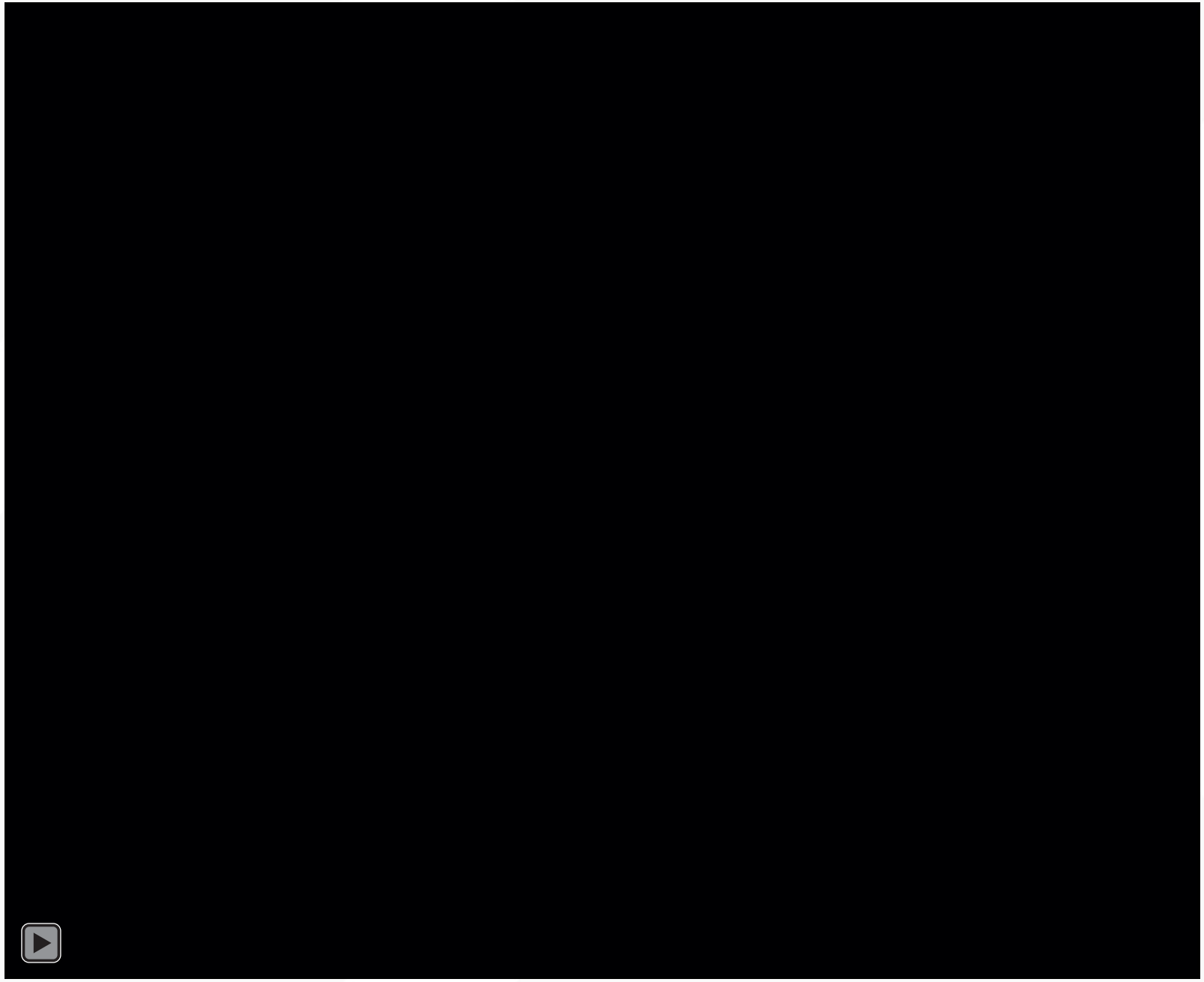
URBAN HEAT IN THE USA IS DIFFERENT FOR DIFFERENT COUNTIES.



WITHIN MIAMI, URBAN HEAT IS DIFFERENT FOR DIFFERENT COMMUNITIES.

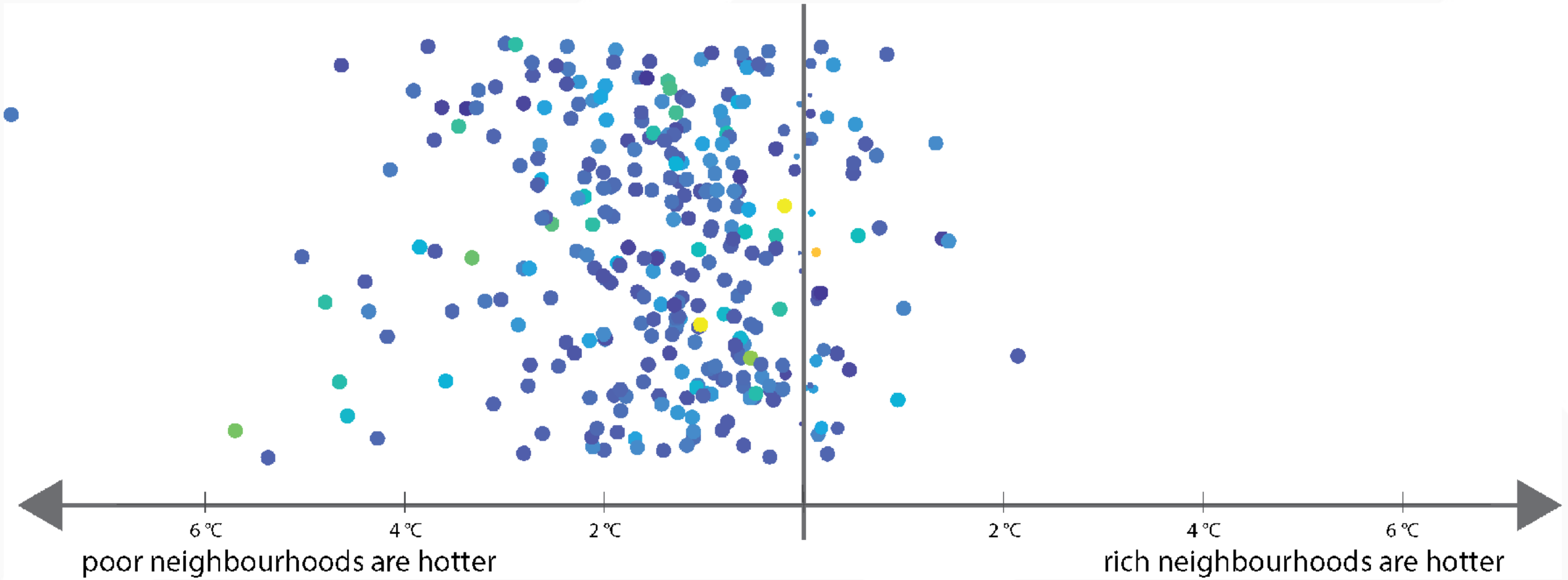


ANALYSIS PERFORMED FOR ALL URBAN COUNTIES.

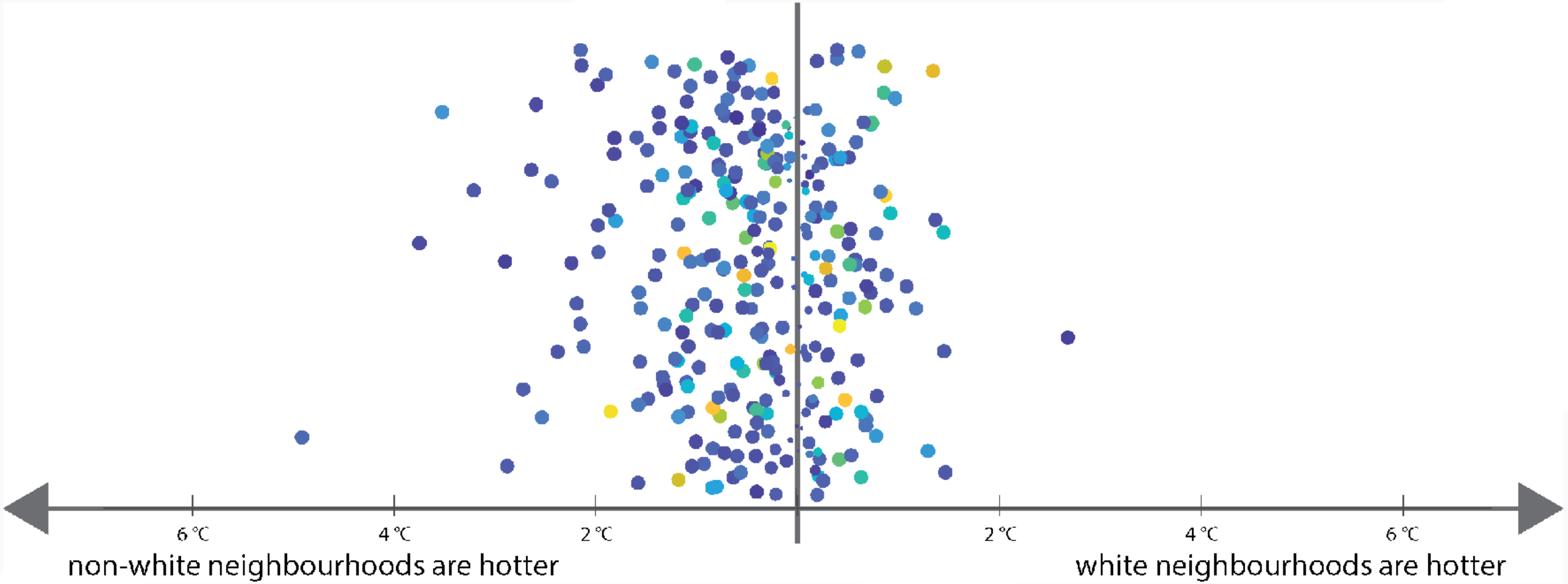


https://sabenz.users.earthengine.app/view/urbanheatusa

MORE THAN 80% OF ALL URBAN COUNTIES DISPLAY SIGNIFICANT CLASSIST DISPARITIES IN URBAN HEAT.



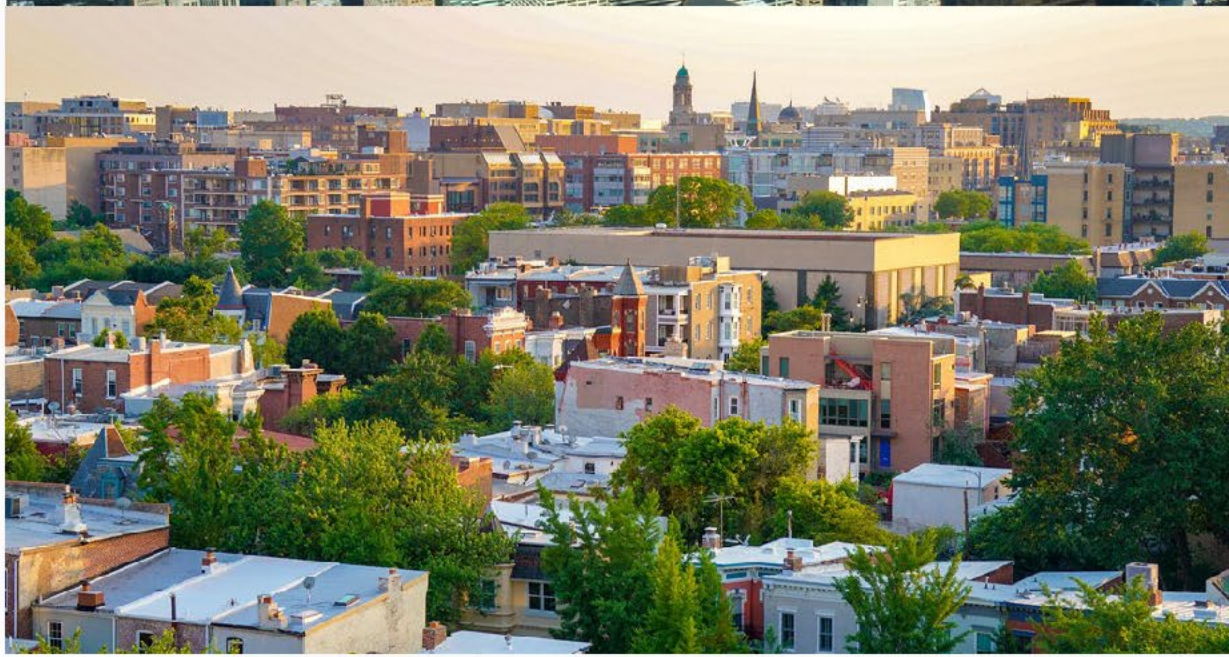
MORE THAN 50% OF ALL URBAN COUNTIES DISPLAY SIGNIFICANT RACIST DISPARITIES IN URBAN HEAT (IN ADDITION TO CLASSIST DISPARITIES).



THIS IS DUE TO DIFFERENCES IN THE URBAN DESIGN.

Throughout the US disadvantaged communities live in areas with

- a higher population density than their neighbors
  - ➢ they experience more waste heat
- less vegetation than their neighbors
  - ➢ their neighborhoods cannot “sweat”
- more built-up areas than their neighbors
  - ➢ their neighborhoods trap the heat



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ALLISON GRANT

Co-authors: Dr. Pamela Grothe[1], Dr. Jeremy S. Hoffman[2], and Dr. Bev Wilson[3]

[1]Department of Earth and Environmental Sciences, University of Mary Washington, [2]The Science Museum of Virginia, [3]School of Architecture, University of Virginia

Contact me: agrant@mail.umw.edu

AGU ADVANCING EARTH AND SPACE SCIENCE

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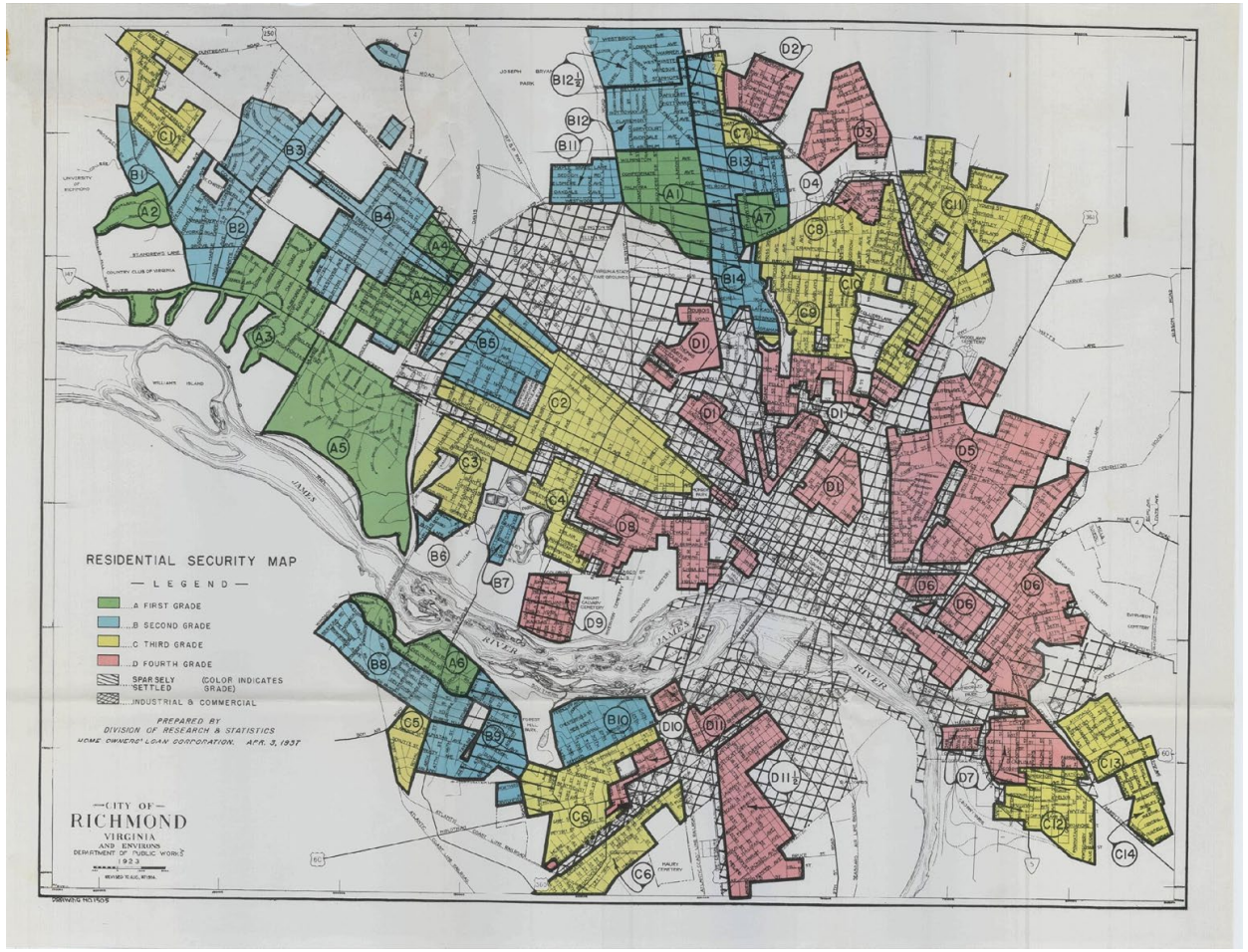
RICHMOND, VA

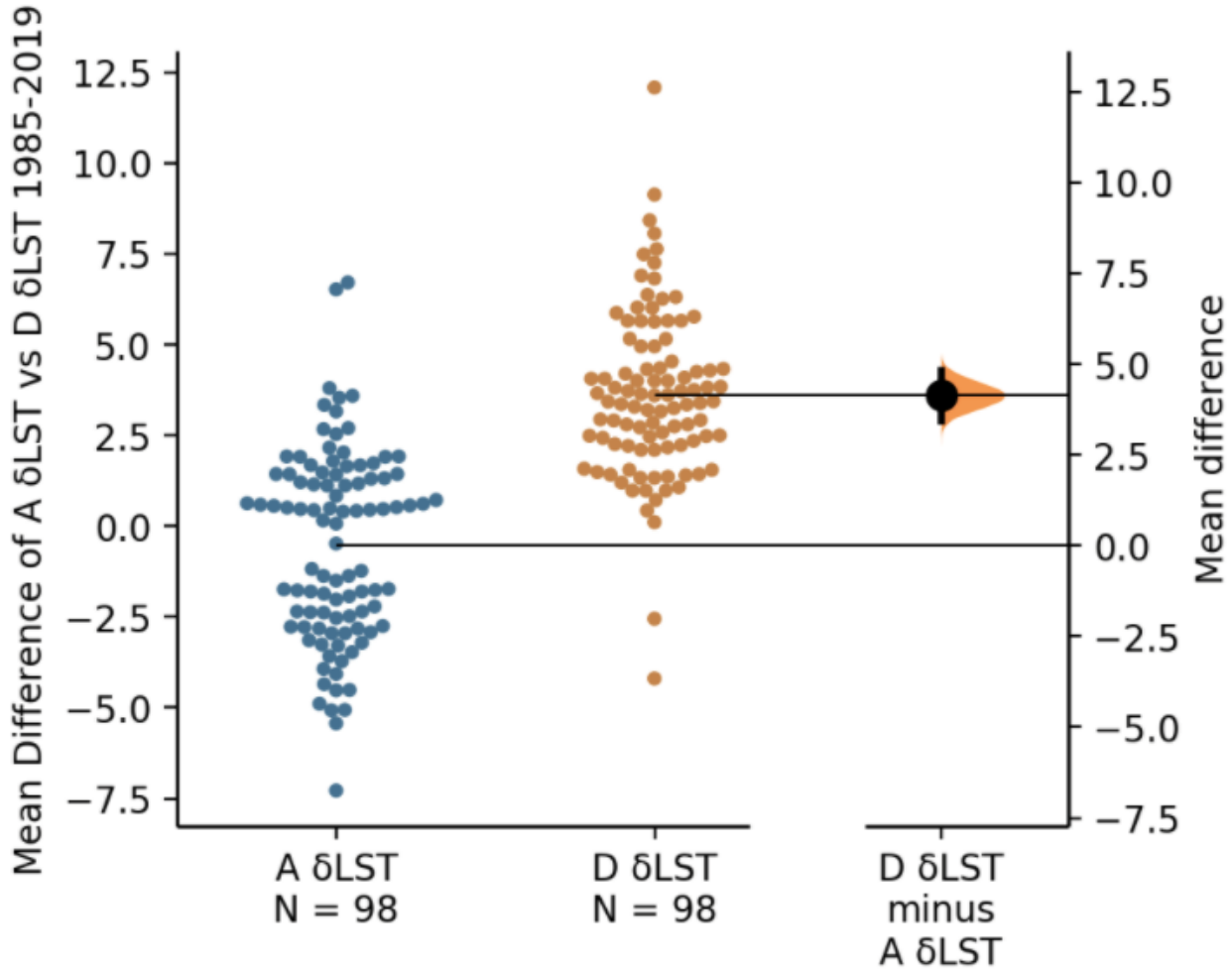


Home Owners' Loan Corporation Grading System

A	"Best"
B	"Still Desirable"
C	"Definitely Declining"
D	"Hazardous"

SHAPING THE FUTURE OF SCIENCE

Nelson, R. K., Winling, L., Marciano, R., & Connolly, N. (2018). Mapping inequality. https://dsl.richmond.edu/panorama/redlining

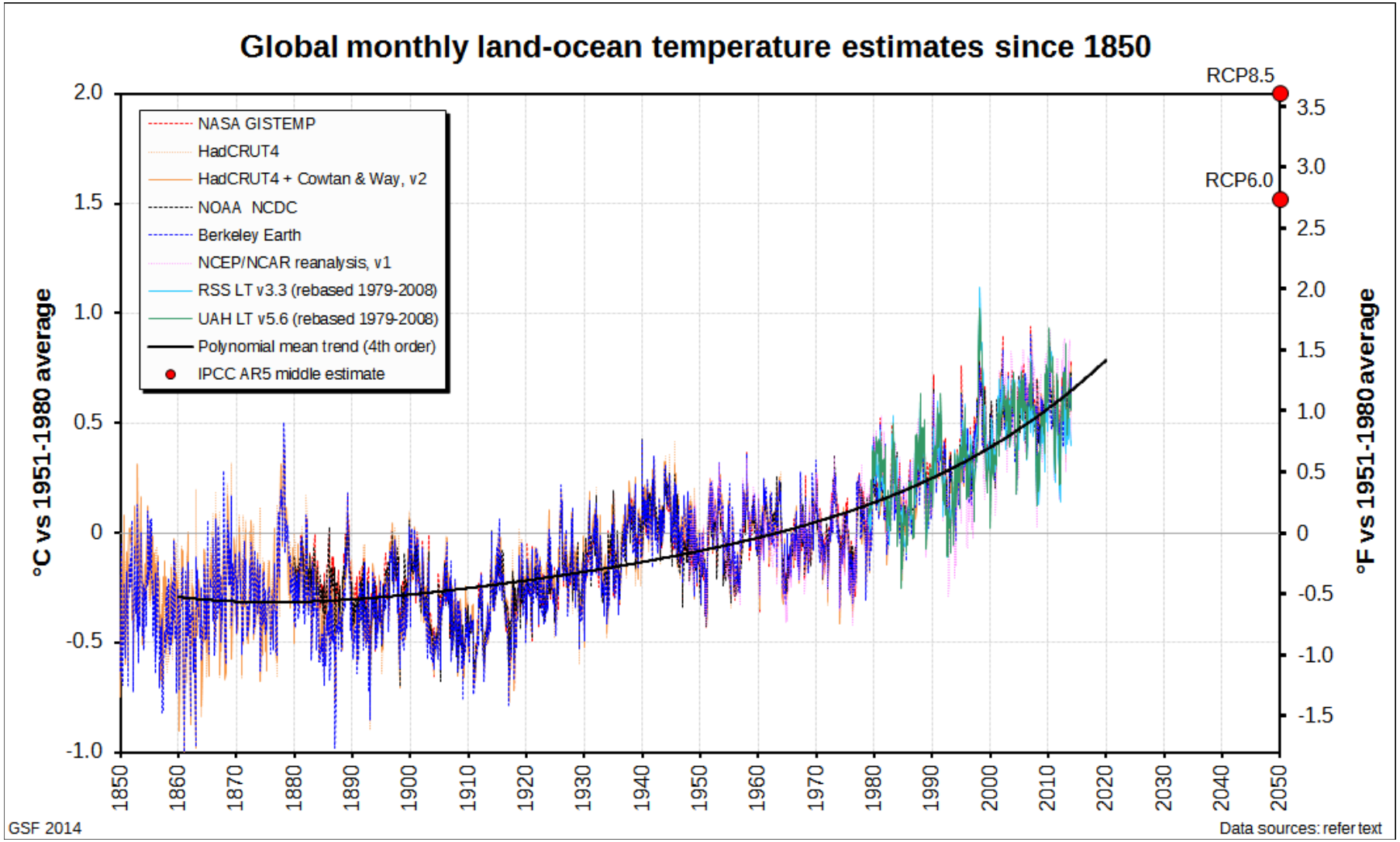


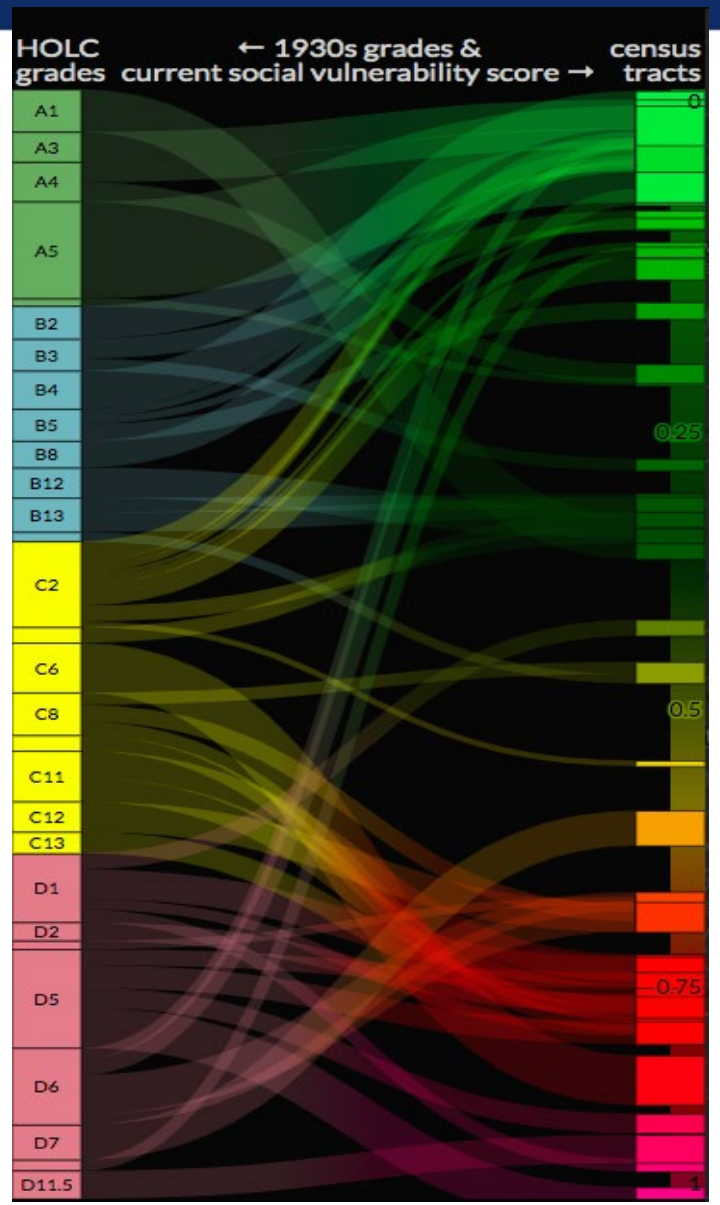
Redlined neighborhoods have significantly **higher summertime land surface temperatures** than non-redlined neighborhoods.

Long-term trends in land surface temperatures are **insignificant.**

Ho, J., Tumkaya T., Aryal S. Choi H., Claridge-Chang, A. (2019). Moving beyond P values: Everyday data analysis with estimation plots. Nature Methods, 1548-7105

IMPERVIOUS SURFACES





Center for Disease Control's Social Vulnerability Index

Example: Richmond, VA, USA

SHAPING THE FUTURE OF SCIENCE

Nelson, R. K., Winling, L., Marciano, R., & Connolly, N. (2018). Mapping inequality. https://dsl.richmond.edu/panorama/redlining

WHY SHOULD WE CARE?

- > 600 people are killed by extreme heat each year (Wilson, 2020)
- Populations are getting adversely exposed to urban heat
- This is a climate change issue AND a social justice issue

THANK YOU

Contact me:
agrant@mail.umw.edu

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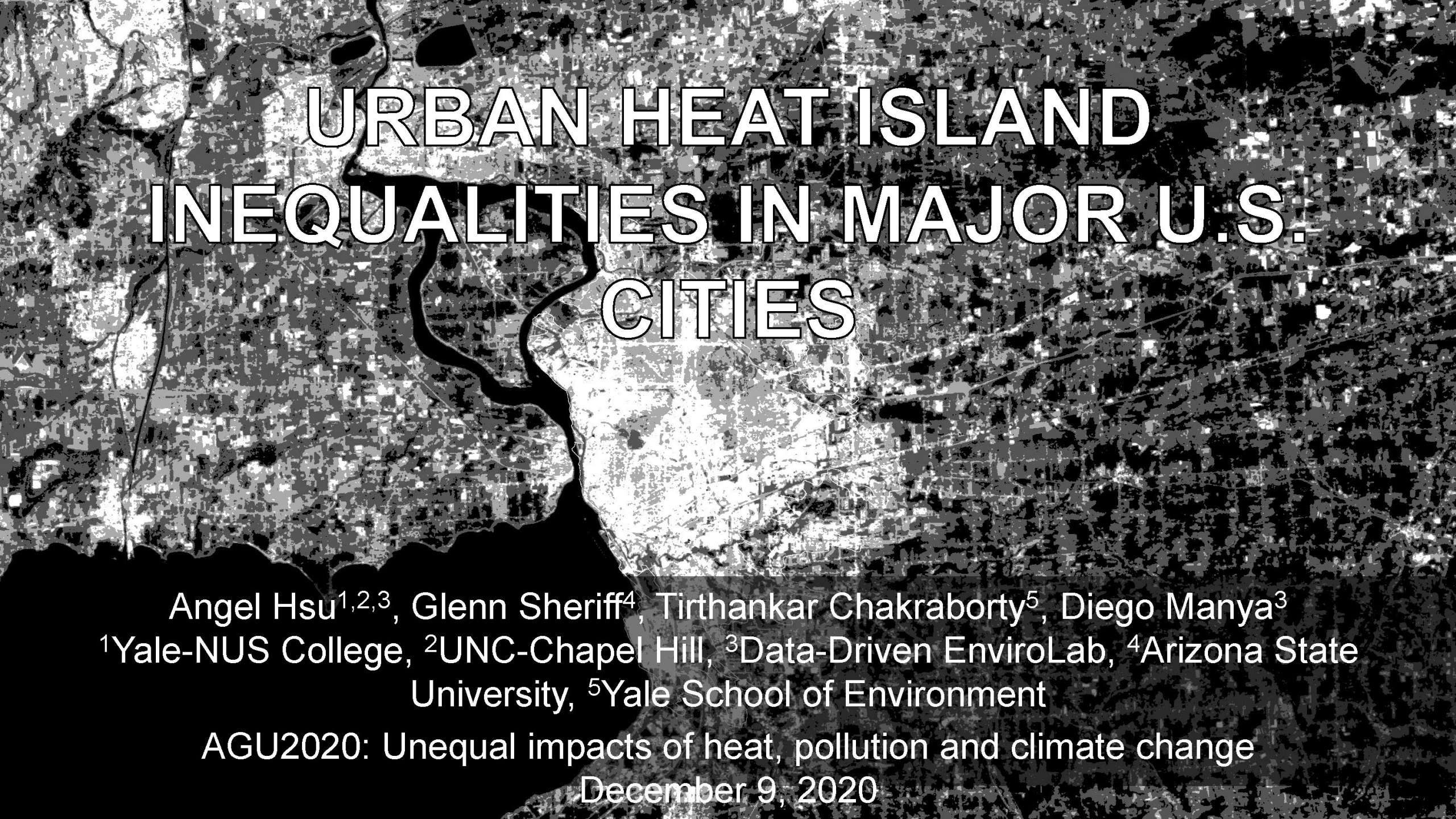


URBAN HEAT ISLAND INEQUALITIES IN MAJOR U.S. CITIES

Angel Hsu[1,2,3], Glenn Sheriff[4], Tirthankar Chakraborty[5], Diego Manya[3]
[1]Yale-NUS College, [2]UNC-Chapel Hill, [3]Data-Driven EnviroLab, [4]Arizona State University, [5]Yale School of Environment

AGU2020: Unequal impacts of heat, pollution and climate change
December 9, 2020

- Low-income, marginalized communities may be disproportionately burdened by urban heat.
- Small-scale case studies have found disparities in urban heat distribution.
- But are these patterns persistent, pervasive, across a range of sociodemographic factors (race/ethnicity, age, income)?

"All the News That's Fit to Print"

The New York Times

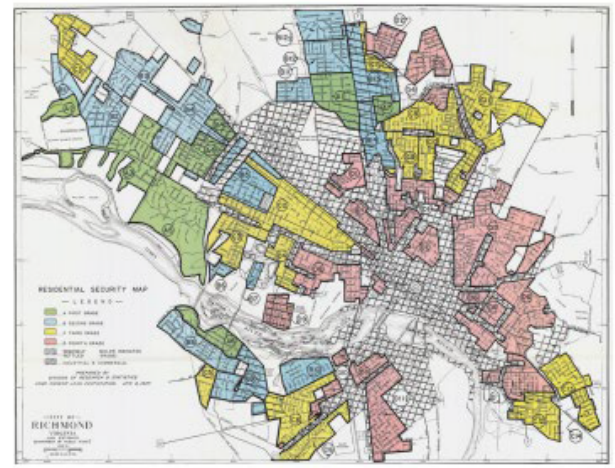
Late Edition

Today, mostly cloudy, heavy thunderstorms, humid, high 80. Tonight, thunderstorms, clearing, low 65. Tomorrow, sunny, breezy, less humid, high 78. Weather map. Page C8.

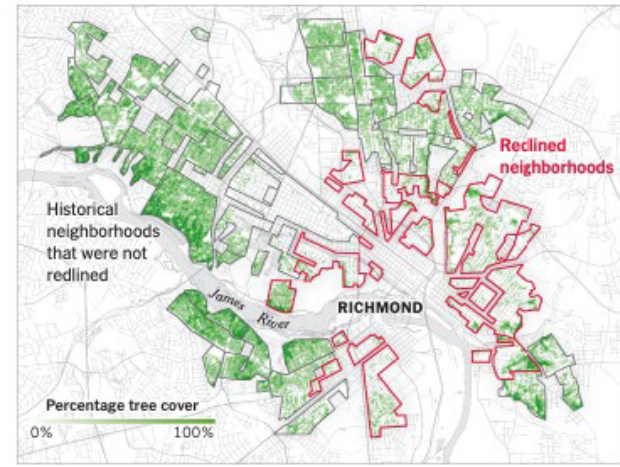
VOL. CLXIX ... No. 58,800 © 2020 The New York Times Company NEW YORK, SATURDAY, AUGUST 29, 2020 $3.00

Decades of Racist Housing Policies Worsen a Climate Crisis

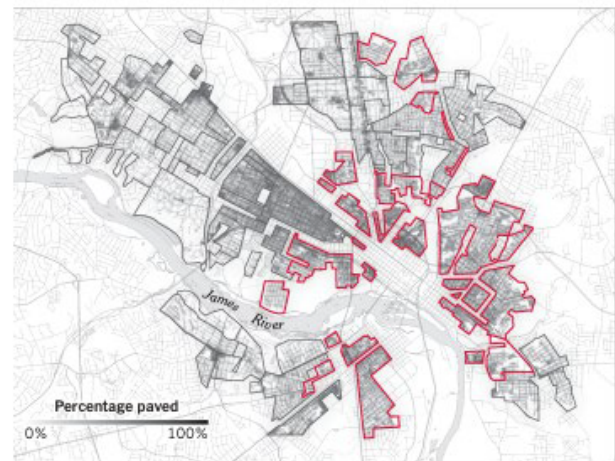
Practices like redlining helped reshape the landscape of U.S. cities. They also left communities of color far more exposed to the rising heat brought by climate change. Page A22.



In the 1930s, federal officials **redlined** majority-Black neighborhoods.

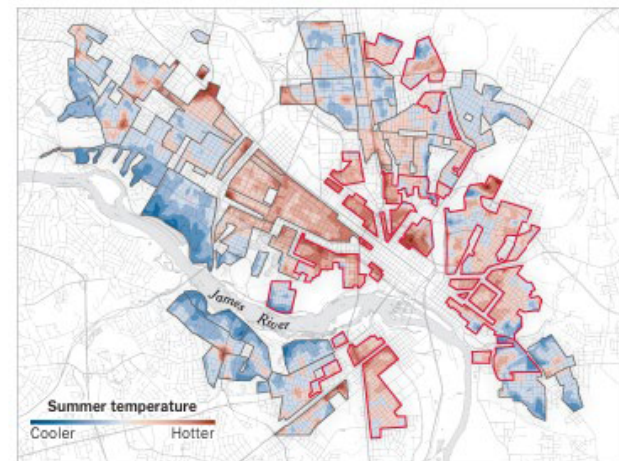


Formerly redlined areas have less **tree cover** today.



Source: Mapping Inequality; National Land Cover Database 2016; NASA/U.S.G.S. Landsat thermal data

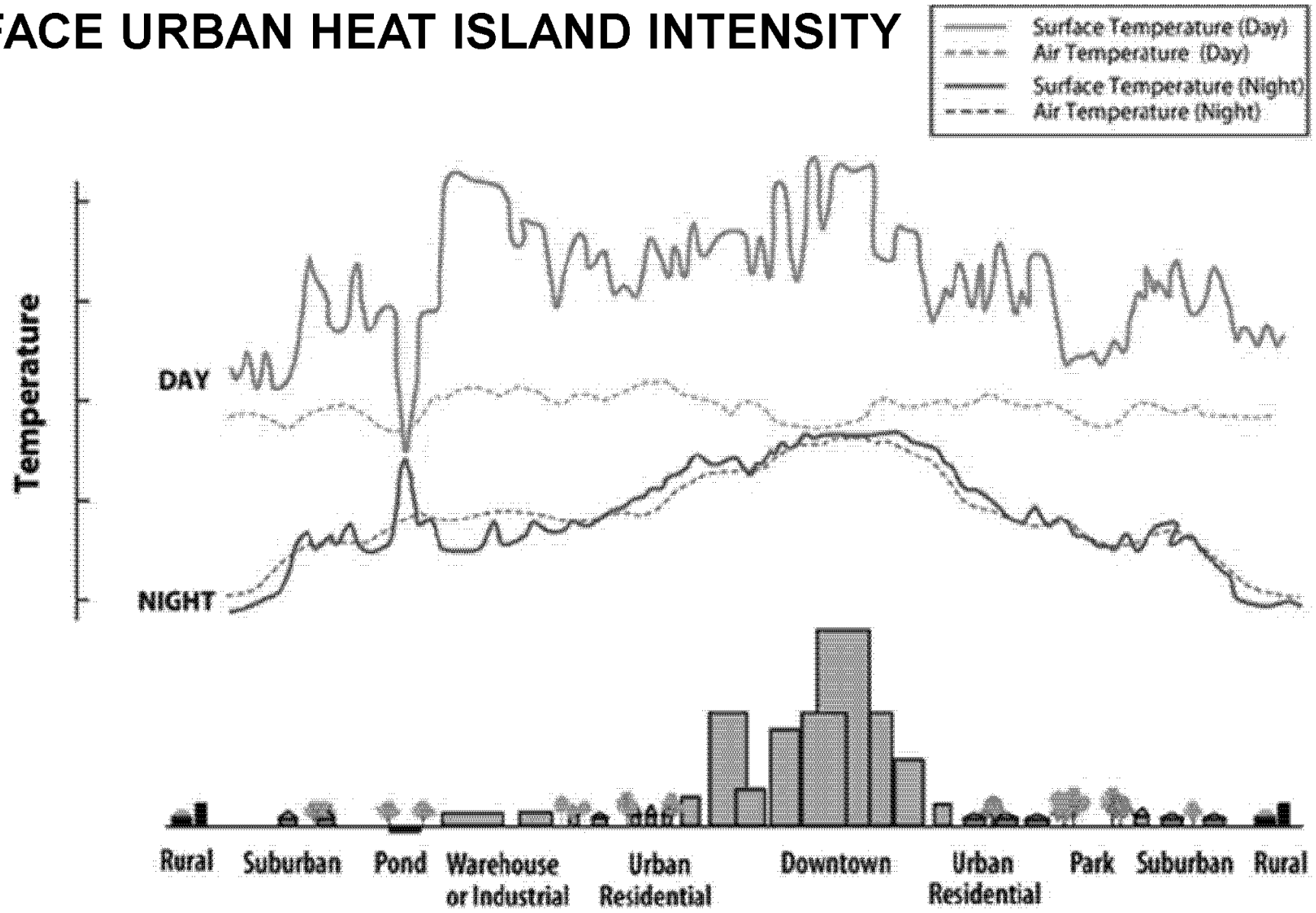
They also have more **paved surfaces**, like roads and parking lots.

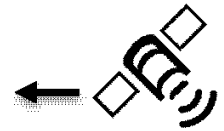


GRAPHICS BY NADJA POPOVICH/THE NEW YORK TIMES

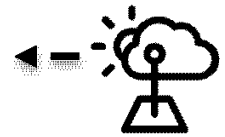
That adds up to more **sweltering heat** during the summer.

SATELLITE DATA PROVIDE GLOBALLY-CONSISTENT DATASET FOR SURFACE URBAN HEAT ISLAND INTENSITY





Satellite



Weather station

Source: NASA (2010)

US SURFACE URBAN HEAT ISLAND EXPLORER APP

Earth Engine Apps Experimental

Search places

Click on another census tract...

SUHI intensity

Display layer:

Annual day(°C)

- <-2.0
- -2.0 - -1.0
- -1.0 - 0
- 0 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- >3.0

Display layer:

Black population(%)

- 0%
- <20%
- 20%-40%
- 40%-60%
- 60%-80%
- >80%
- 100%

US SUHI Disparity Explorer

This platform displays census-tract level surface urban heat island (SUHI) intensities for US urbanized areas (polygons with red boundaries), as well as socioeconomic information at the same level of aggregation. Use the search bar to find your urbanized area of interest. Click on your neighborhood, and the corresponding SUHI and population statistics will be listed below.

Region: Chicago, IL--IN

Annual daytime UHI: 3.21 °C

Annual nighttime UHI: 0.72 °C

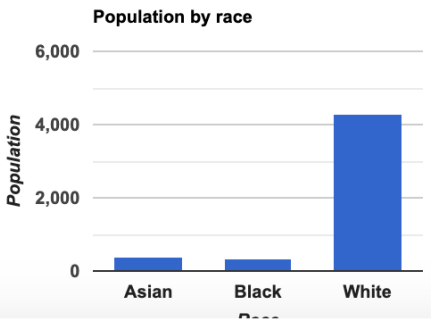
Summer daytime UHI: 3.79 °C

Summer nighttime UHI: 0.98 °C

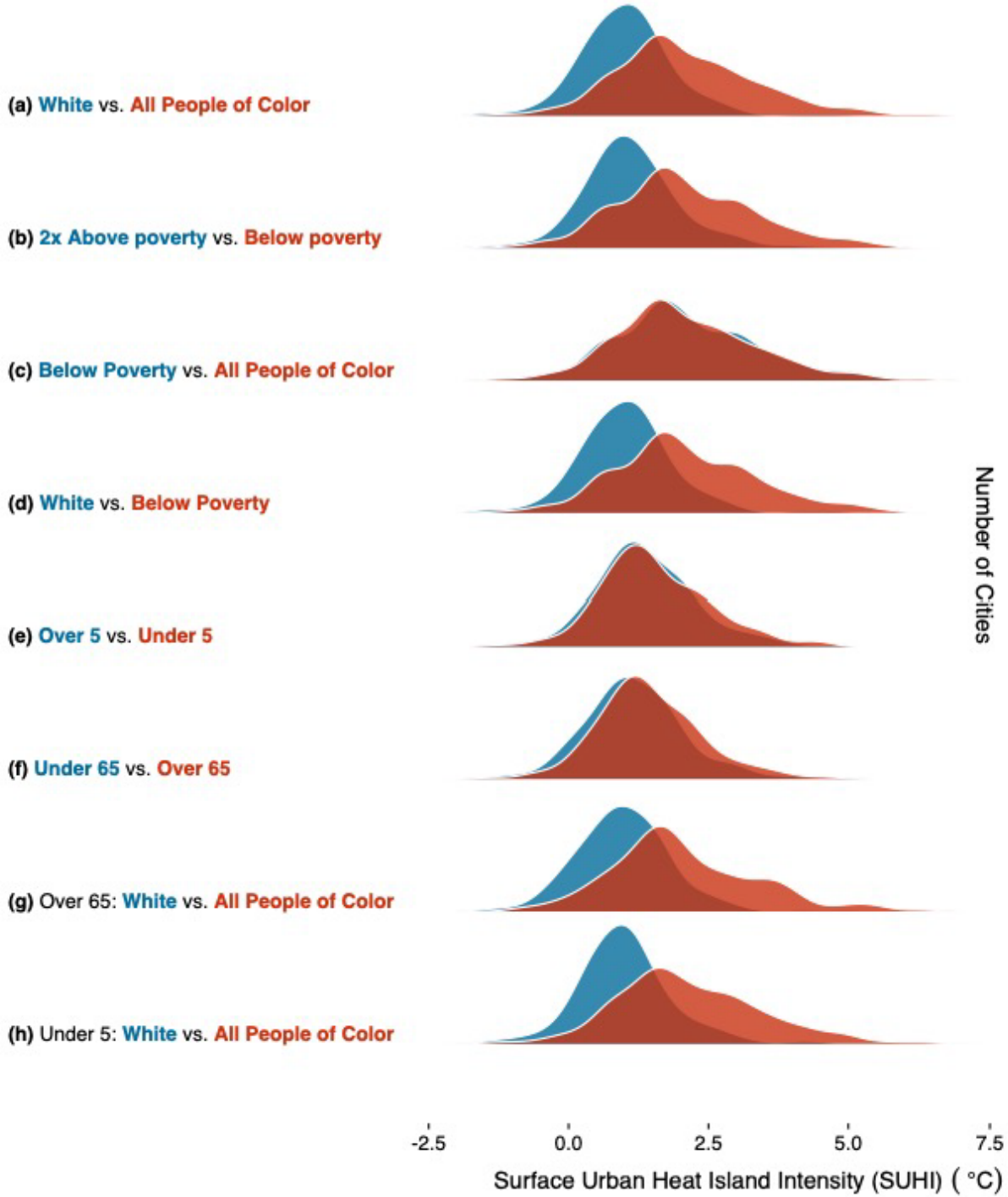
Winter daytime UHI: 1.62 °C

Winter nighttime UHI: 0.36 °C

Average Annual Income: $34760



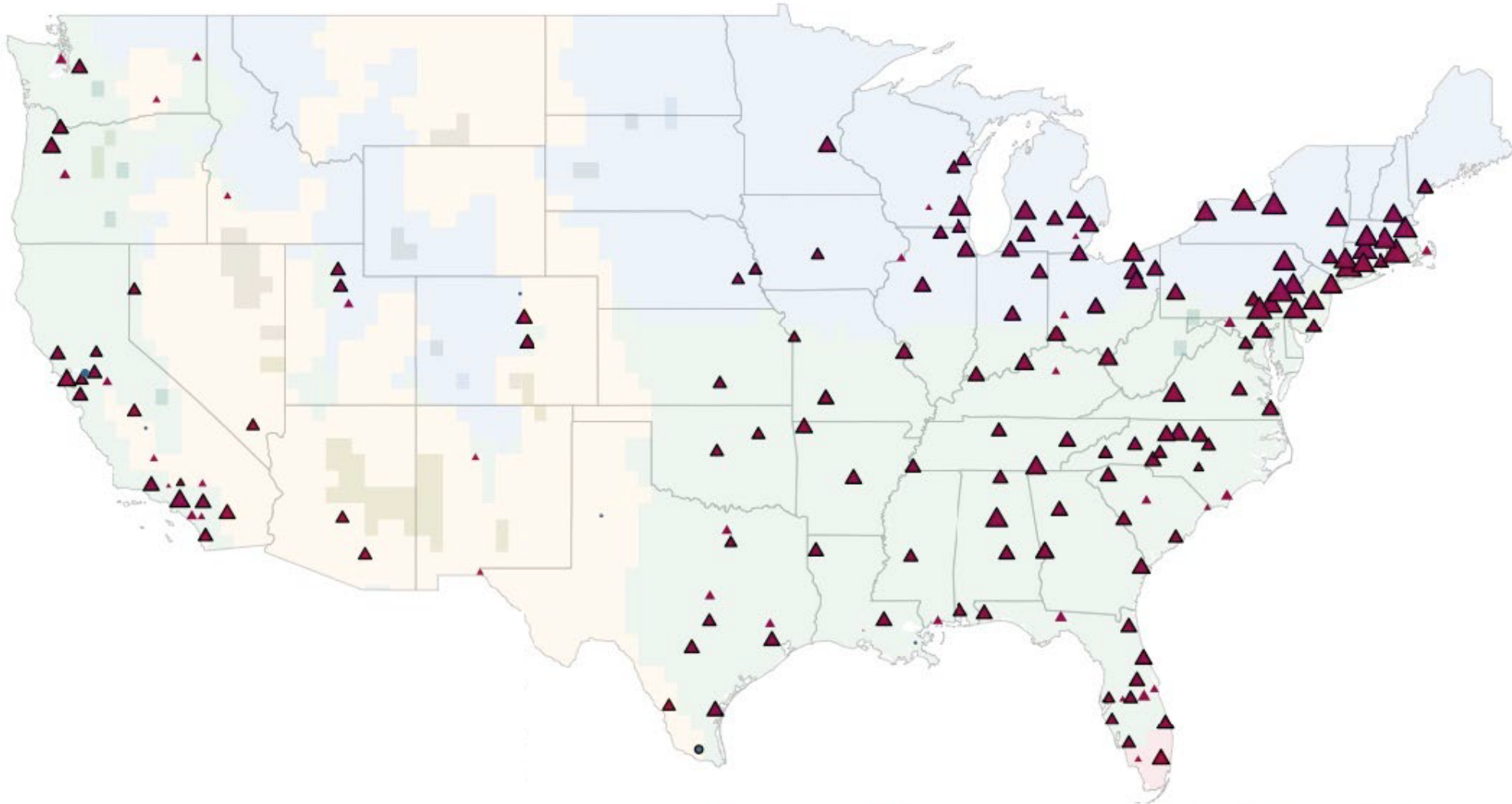
https://datadrivenlab.users.earthengine.app/view/usuhiapp



PATTERNS OF URBAN HEAT ISLAND DISPARITIES

- In most major U.S. cities, populations in red exposed to higher urban heat island intensity than populations in blue.
- Exposure patterns virtually identical for populations c) Below poverty and People of Color.
- Distributions for age alone similar, except when combined with race (g-h).

97% MAJOR US CITIES – EXPOSE MINORITY POPULATIONS TO HIGHER URBAN HEAT ISLAND INTENSITY

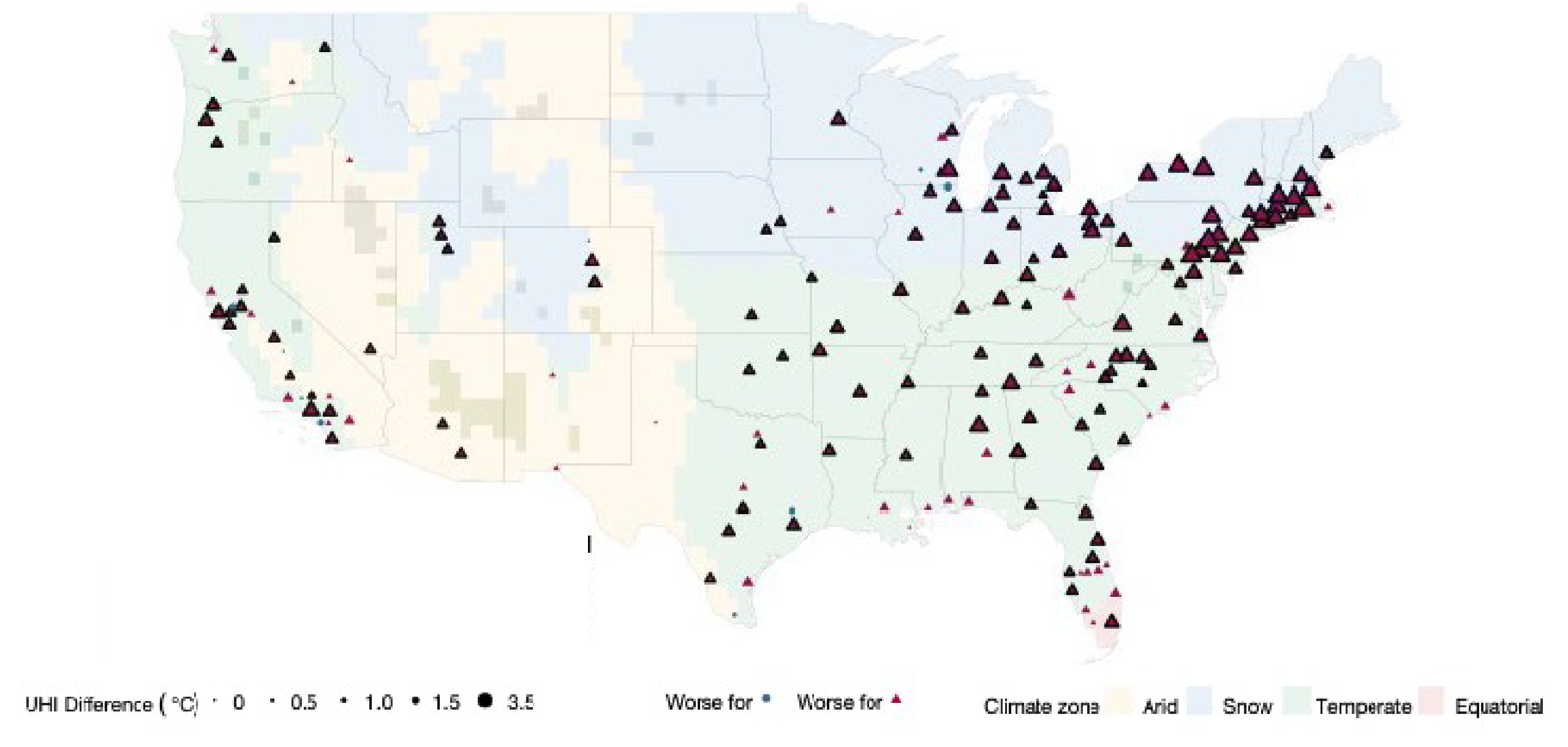


UHI Difference (°C) 0 0.5 1.0 1.5 3.5

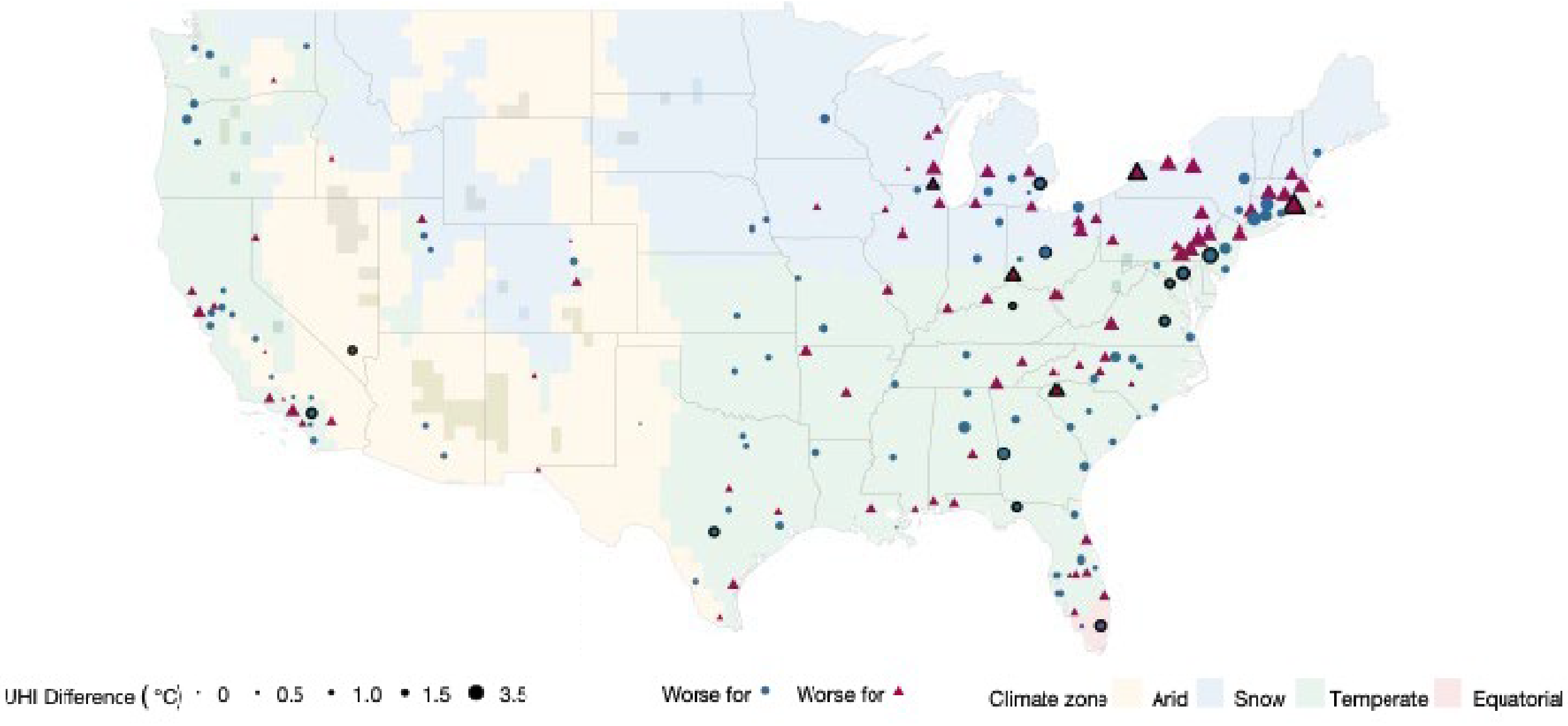
Worse for Worse for

Climate zone Arid Snow Temperate Equatorial

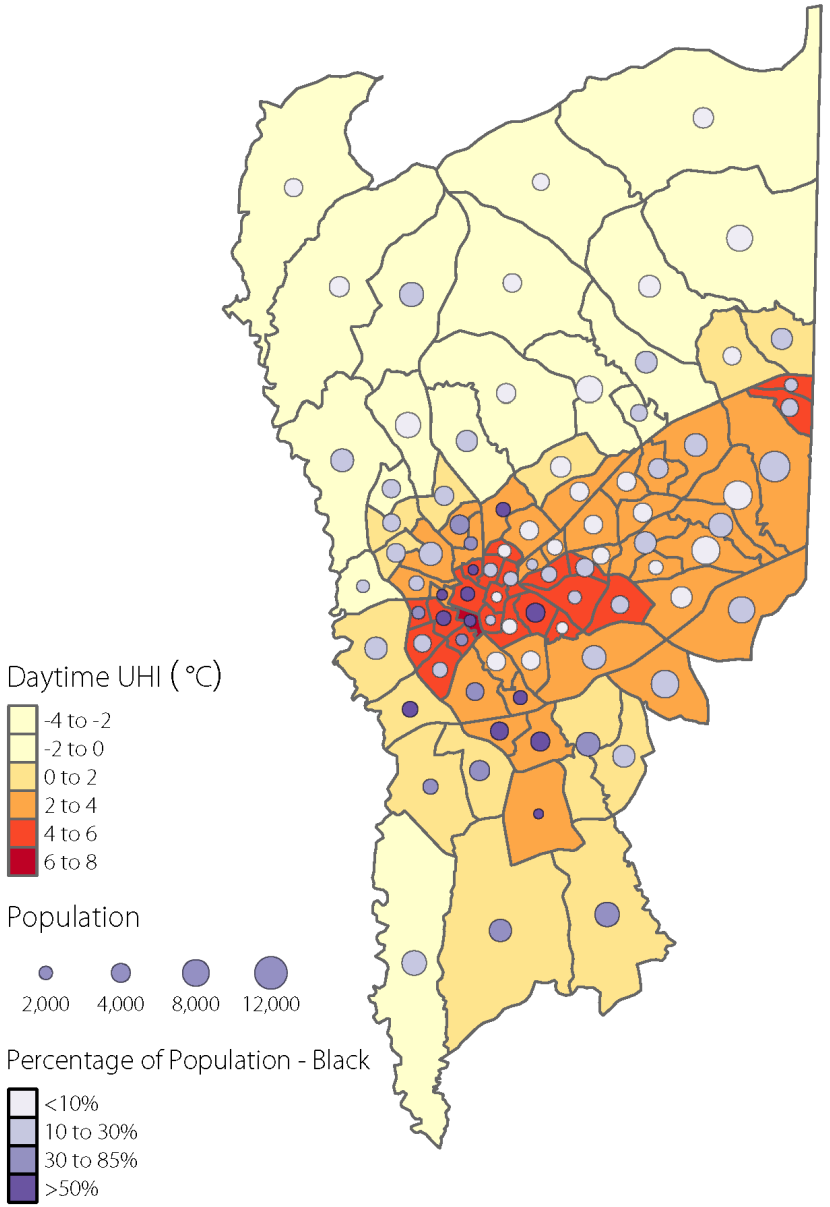
94% MAJOR US CITIES – EXPOSE BELOW POVERTY TO HIGHER URBAN HEAT ISLAND INTENSITY

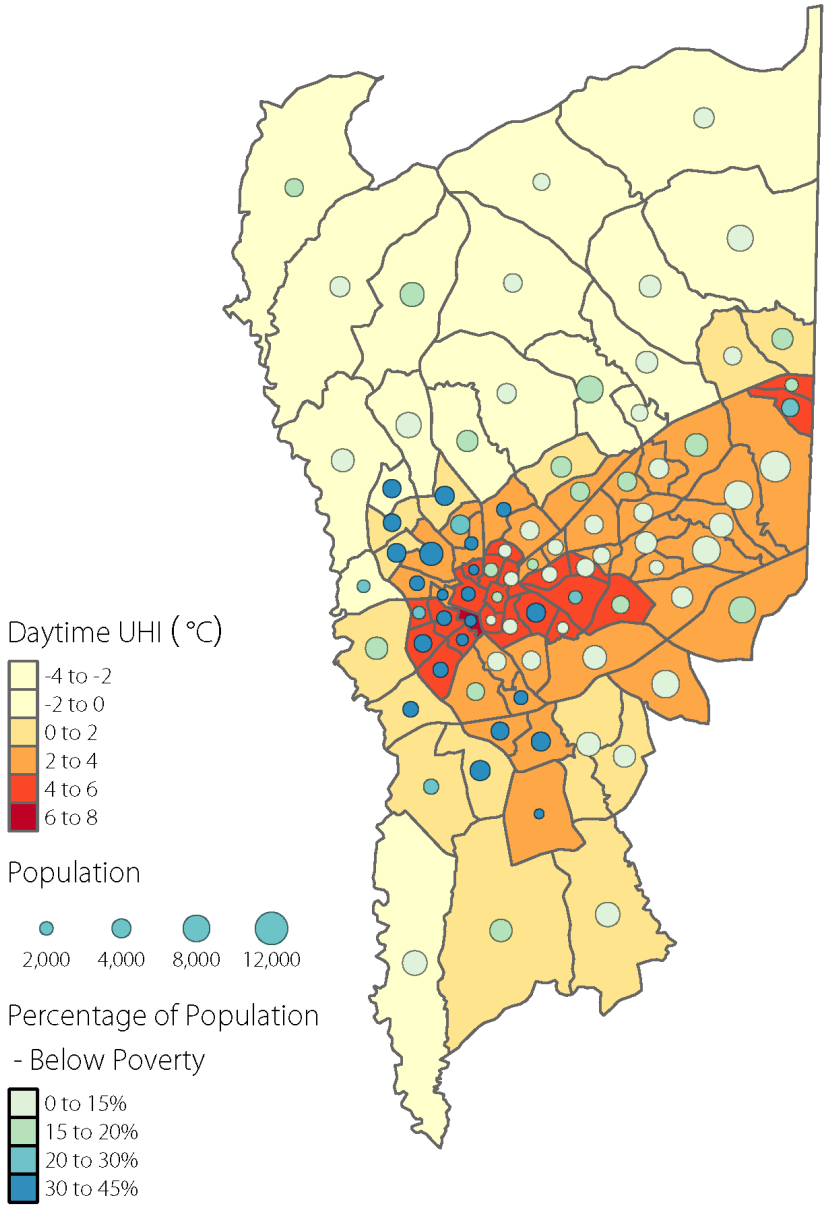


EXPOSURE FOR POPULATIONS OF COLOR AND BELOW POVERTY ROUGHLY EQUAL

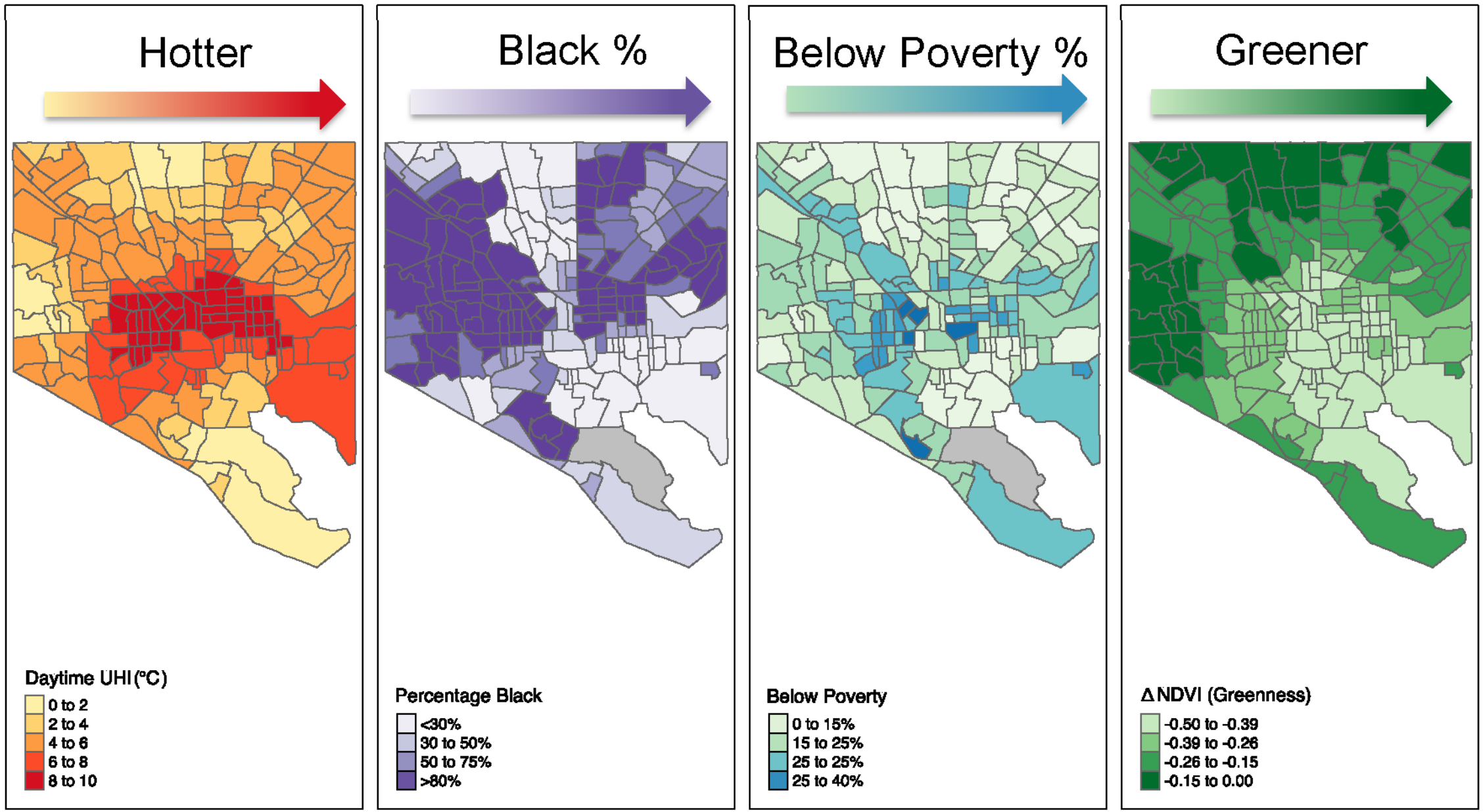


BUT PATTERNS OF EXPOSURE VARY BY CITY – GREENVILLE, SC





BUT PATTERNS OF EXPOSURE VARY BY CITY – BALTIMORE, MD



THANK YOU

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@datadrivenlab | @ecoangelhsu

QUESTIONS

Please write your questions in the Q&A box and AGU will ask it on your behalf.

Reminder: A 30-minute, informal discussion will commence in Zoom after this event ends.

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