

Houston, We've Had a Problem: Extreme Heat and Health

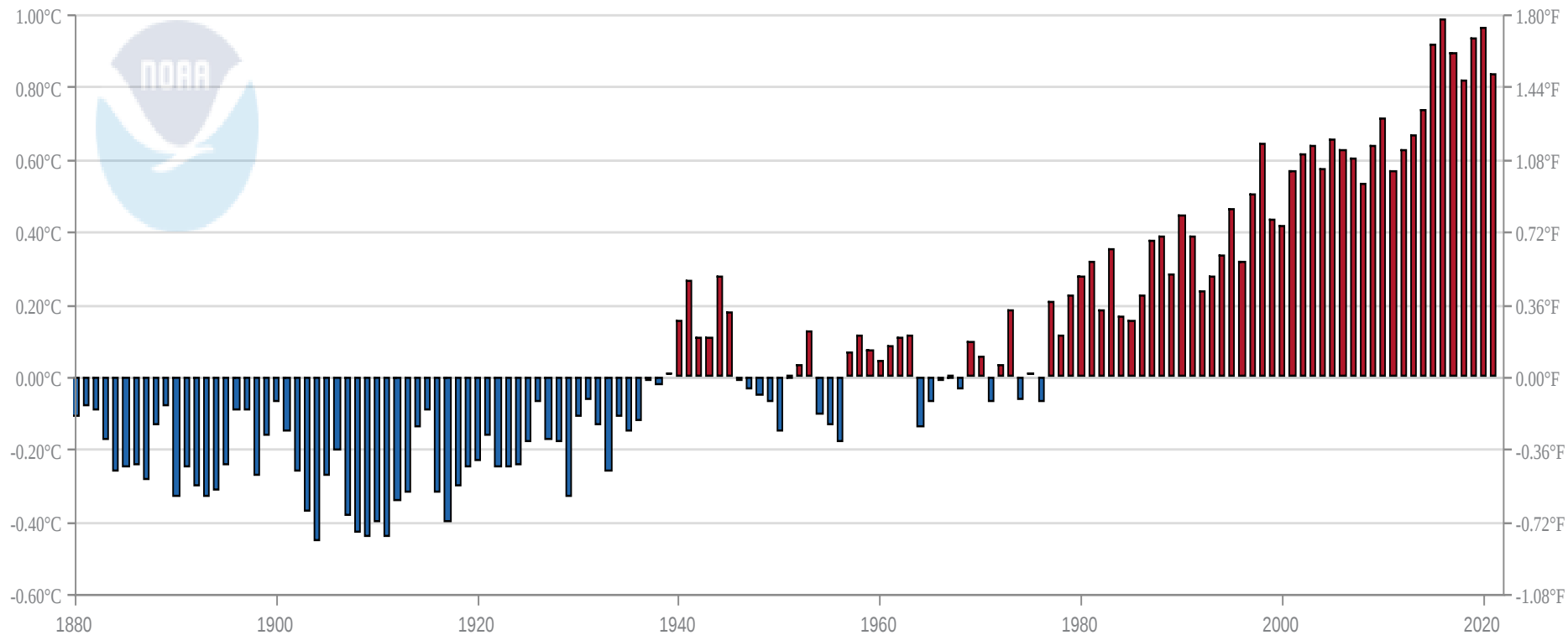


Kevin Lanza, Assistant Professor
UTHealth School of Public Health in Austin

Average global temperatures have increased over time

Global Land and Ocean

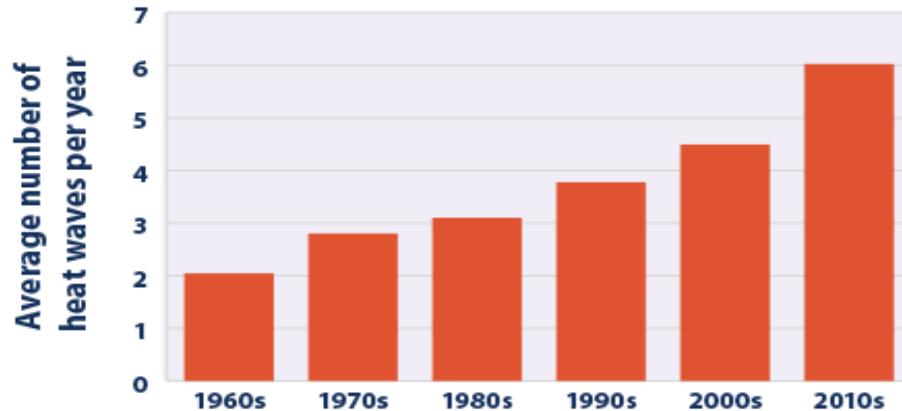
January-December Temperature Anomalies



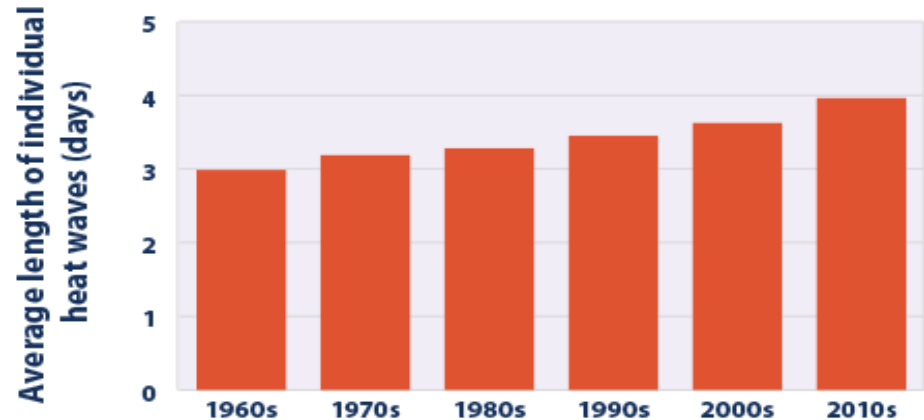
Anomalies are with respect to the 20th century average of 57°F

Heat waves have increased over time

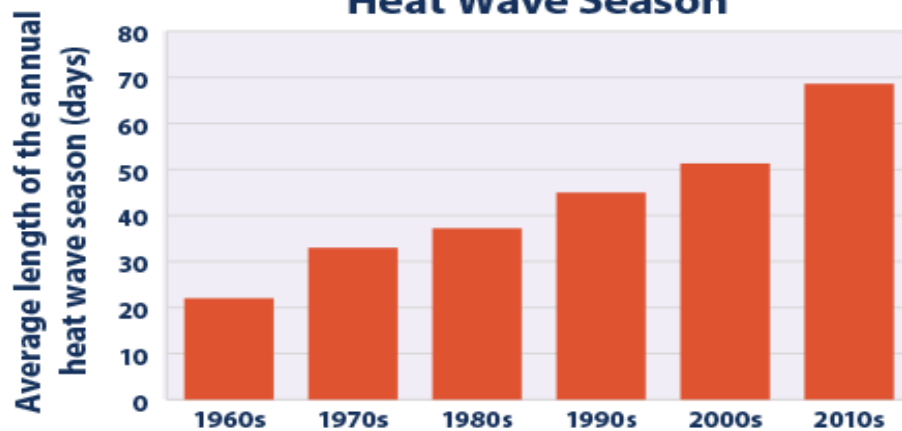
Heat Wave Frequency



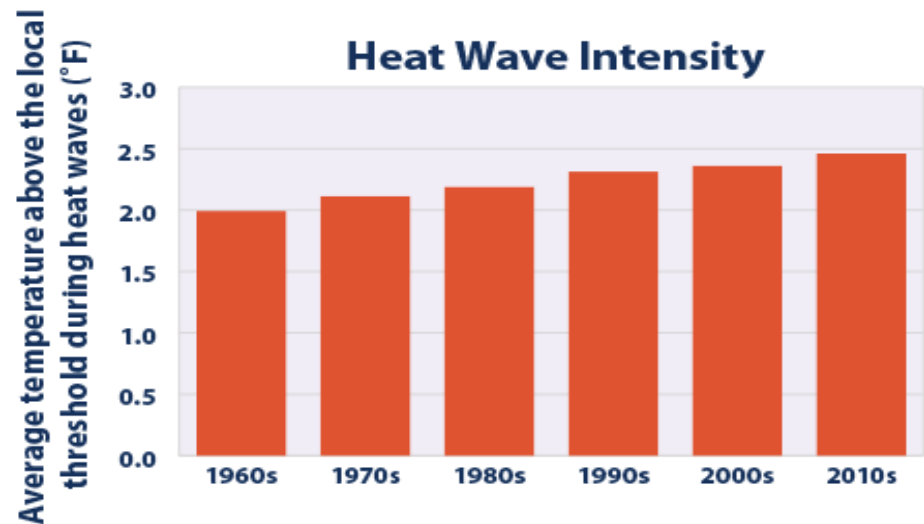
Heat Wave Duration



Heat Wave Season

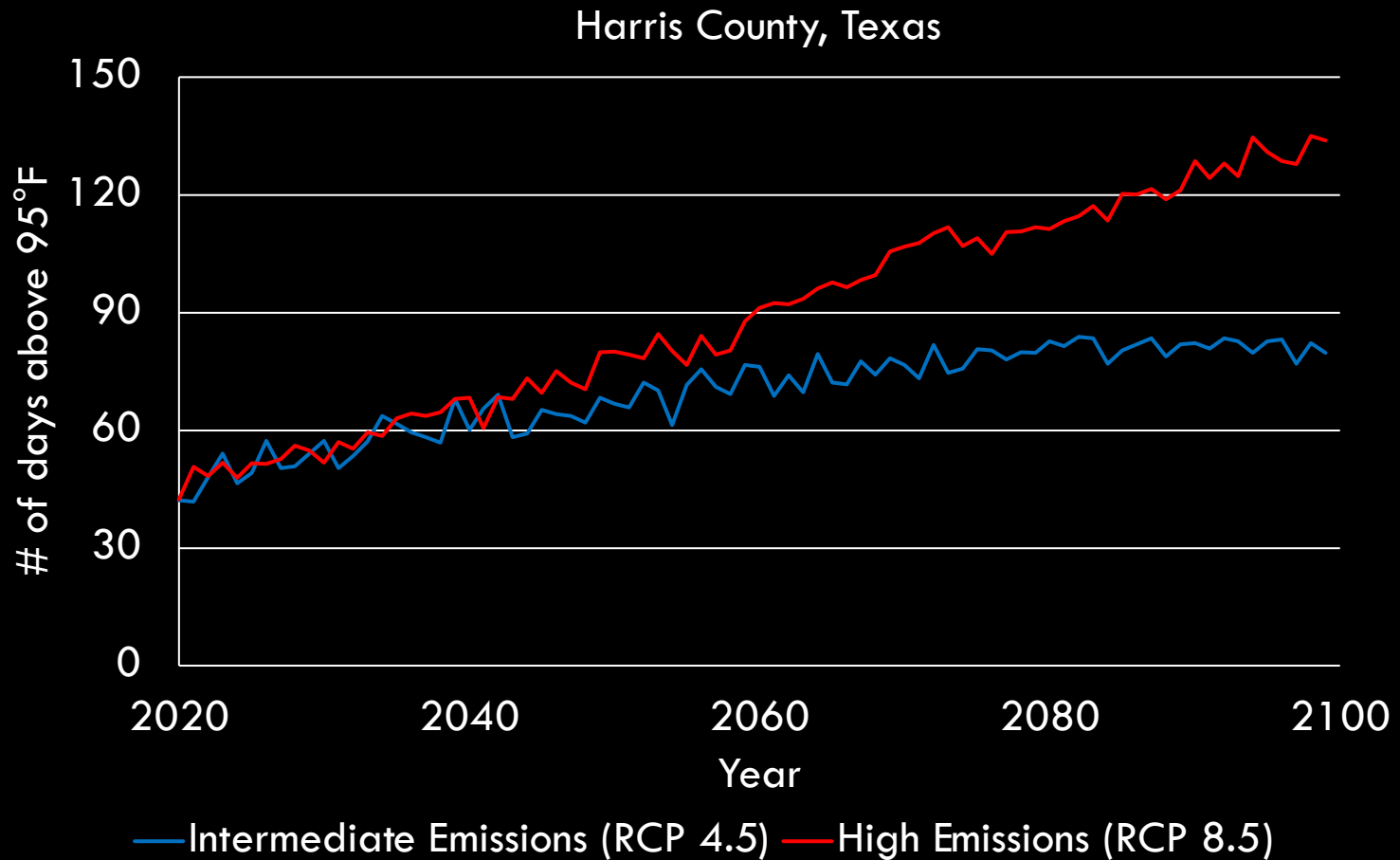


Heat Wave Intensity

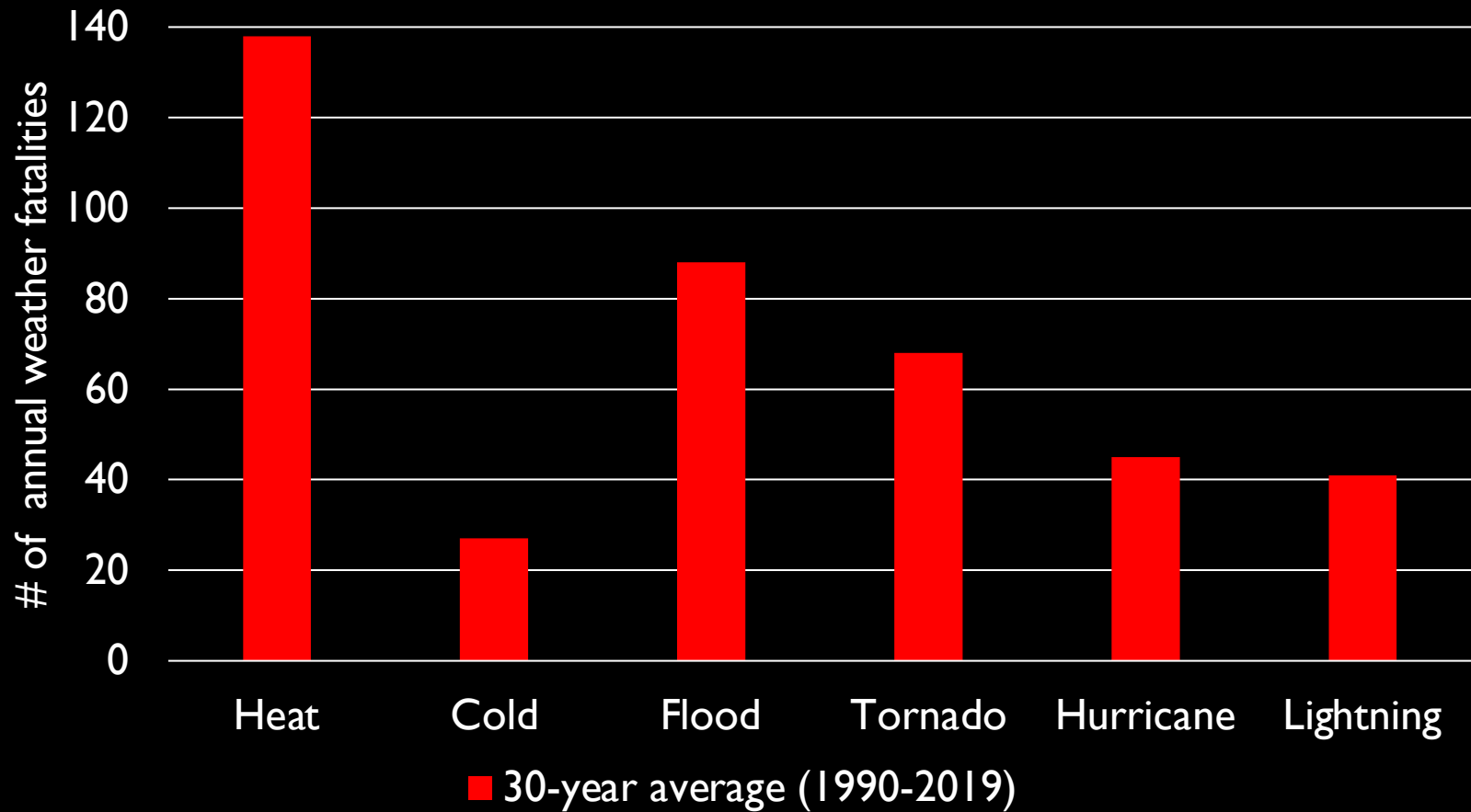


Decade

Climate models estimate more extreme heat days under different greenhouse gas emissions scenarios



Heat is the most deadly weather-related hazard in the U.S.



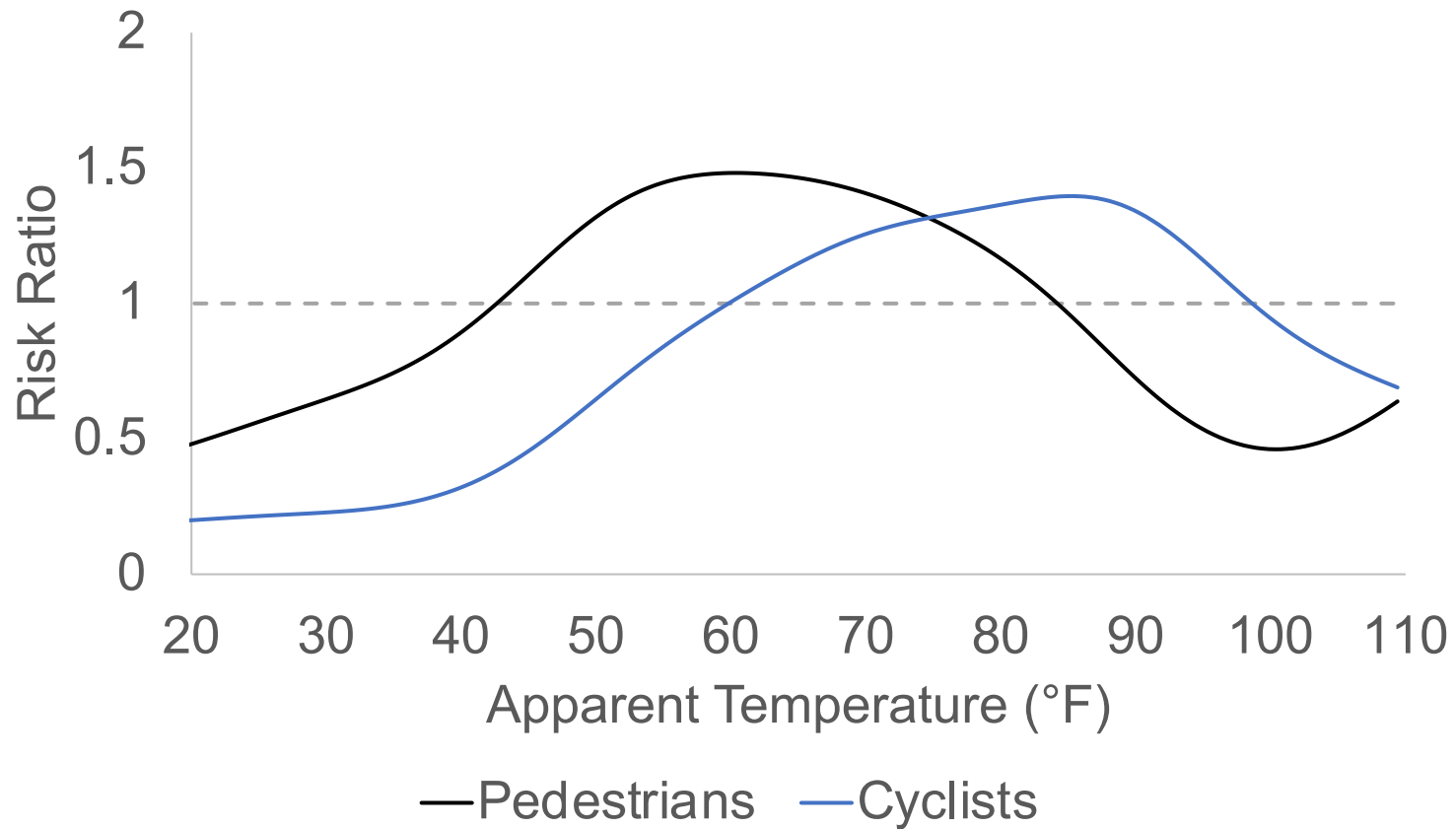
Climate change and physical activity: ambient temperature and urban trail use in Texas

[Kevin Lanza](#) , [Julia Gohlke](#), [Suwei Wang](#), [Perry E. Sheffield](#) & [Olga Wilhelmi](#)

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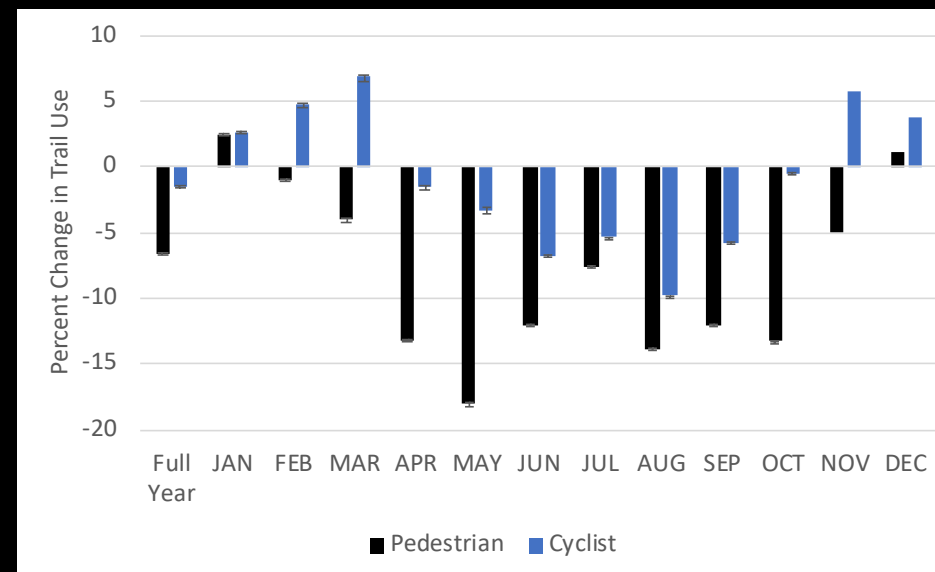
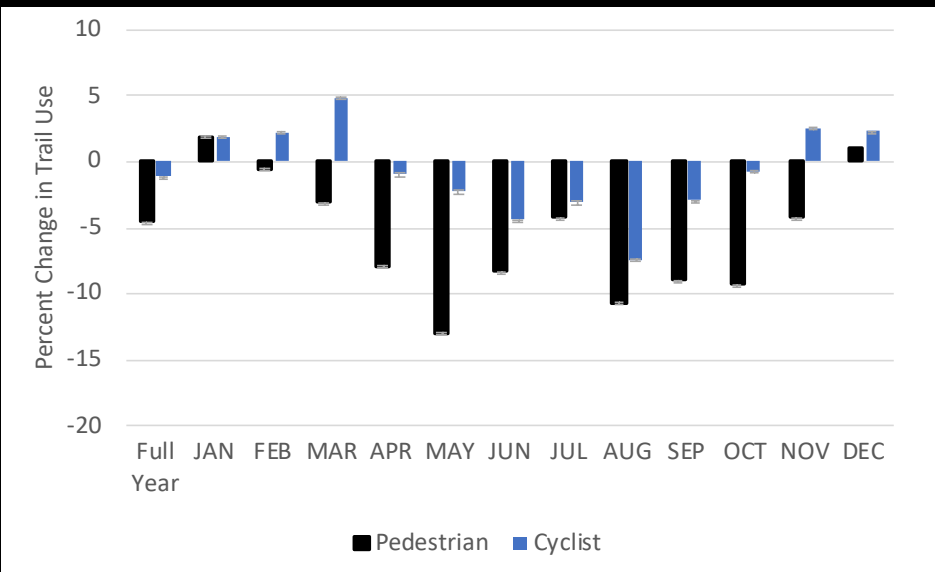


Temperature extremes are associated with lower trail use in Austin, TX



Climate change estimated to reduce overall trail use in Austin, TX

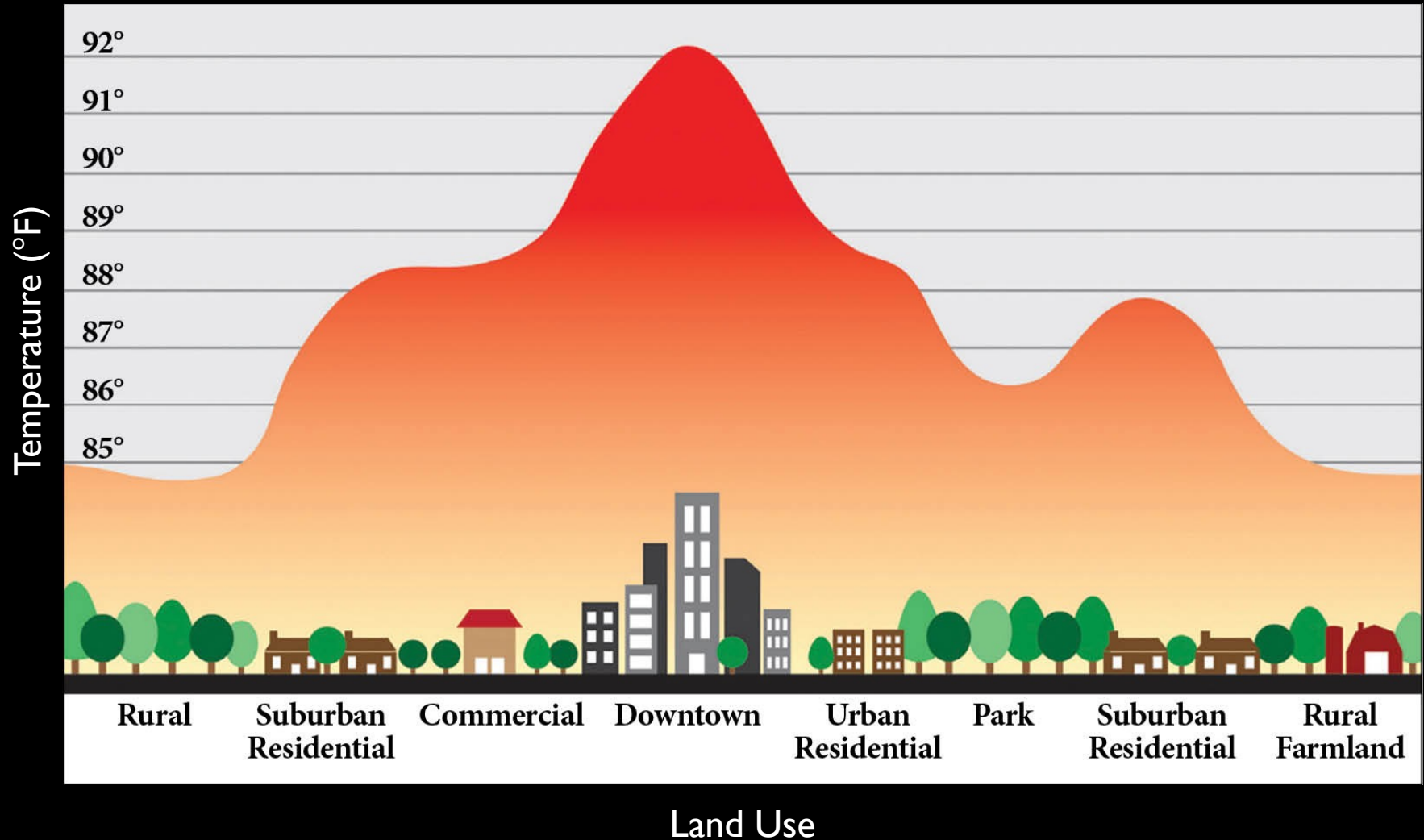
Projected Percent Change in Trail Use from Early (2006–2025) to Mid-Century (2041–2060)



Intermediate Emissions (RCP4.5)

High Emissions (RCP8.5)

Urban heat islands cause cities to be warmer than its surroundings

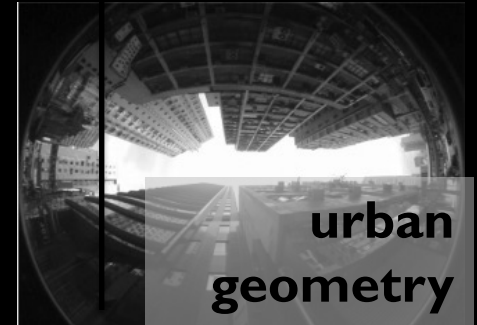


Drivers of Climate Change in Cities

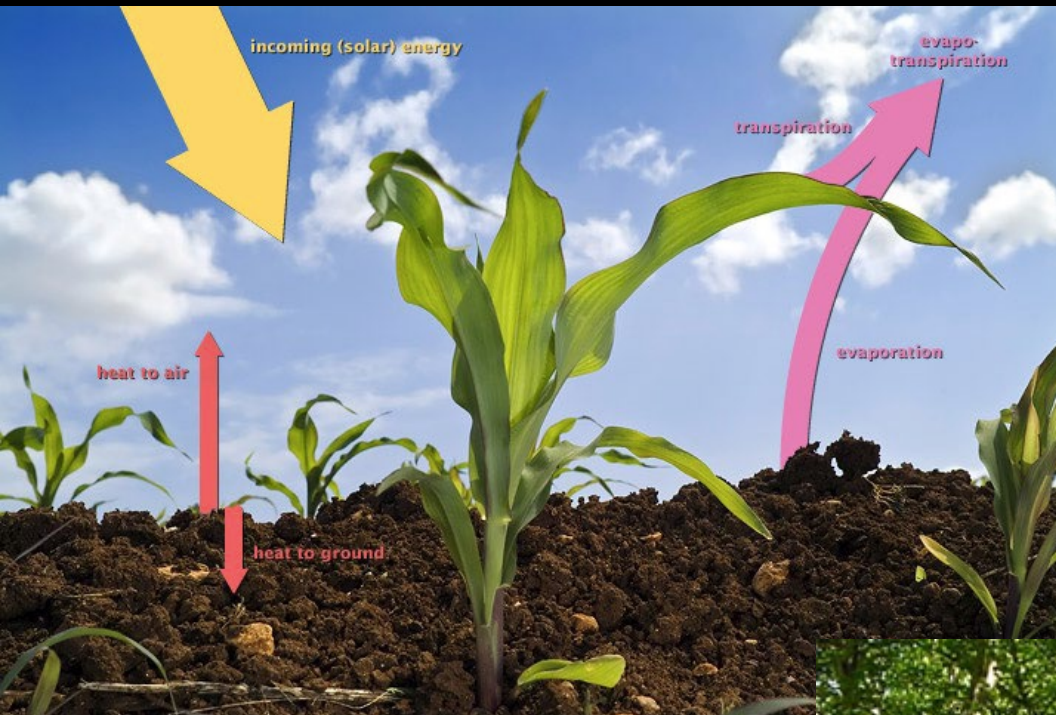
Global Drivers



Drivers of the Urban Heat Island (UHI) Effect



Loss of Vegetation UHI Drivers



- Evapotranspiration

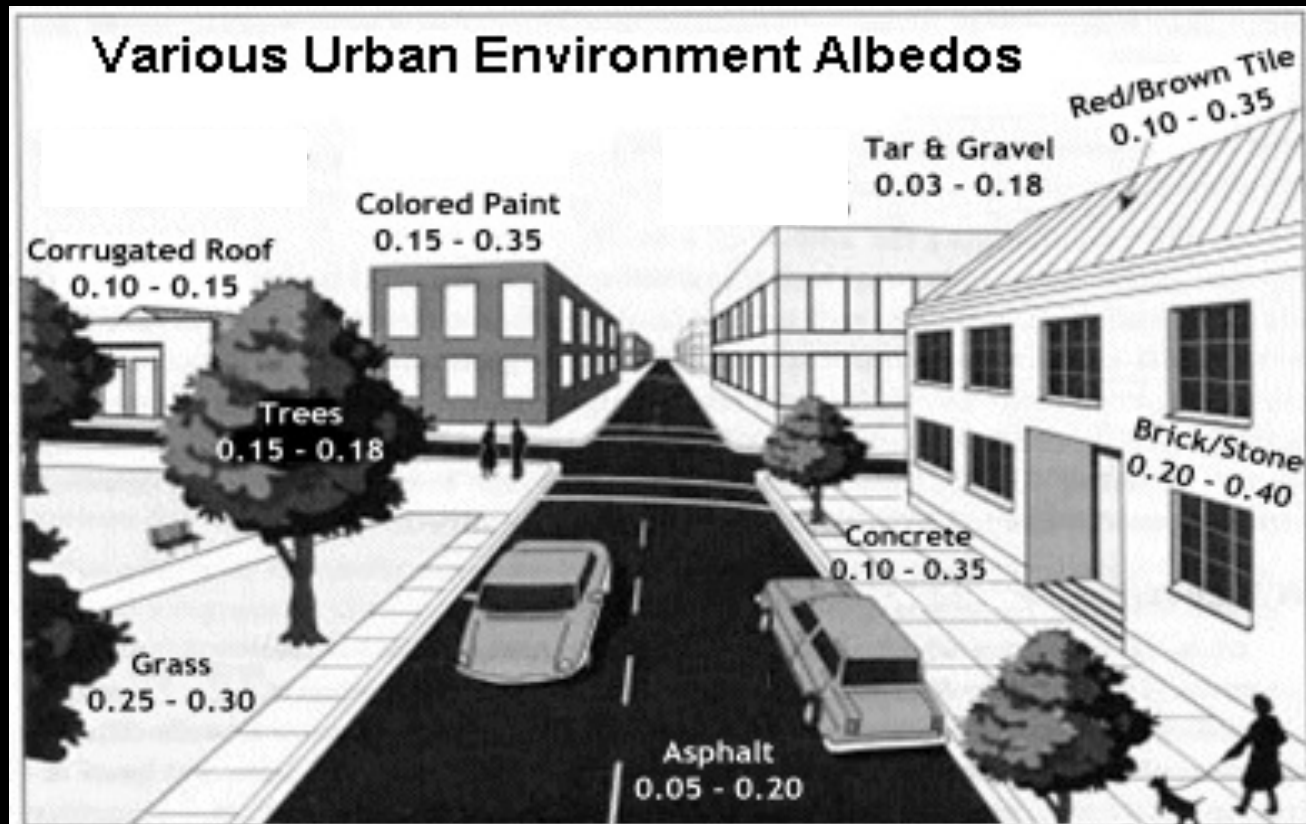
- Shading



Impervious Materials

UHI Drivers

- Building materials with low albedo
- Albedo is a measure of a material's ability to reflect sunlight
 - Albedo of 0 = surface absorbs all solar radiation
 - Albedo of 1 = total reflectivity of solar radiation



(U.S. EPA, 2006)

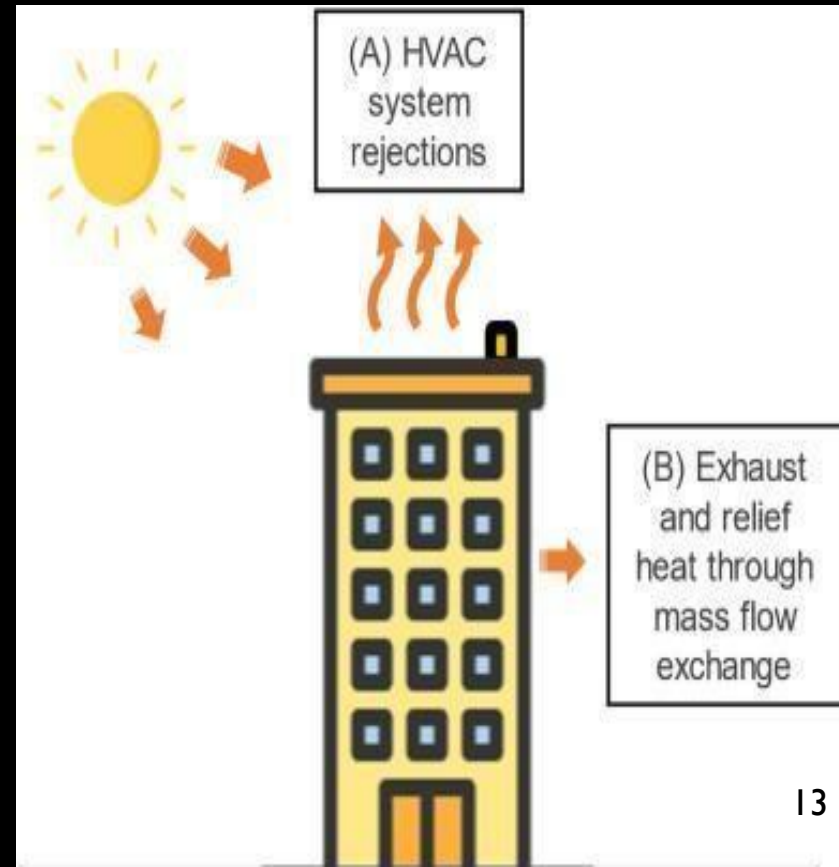
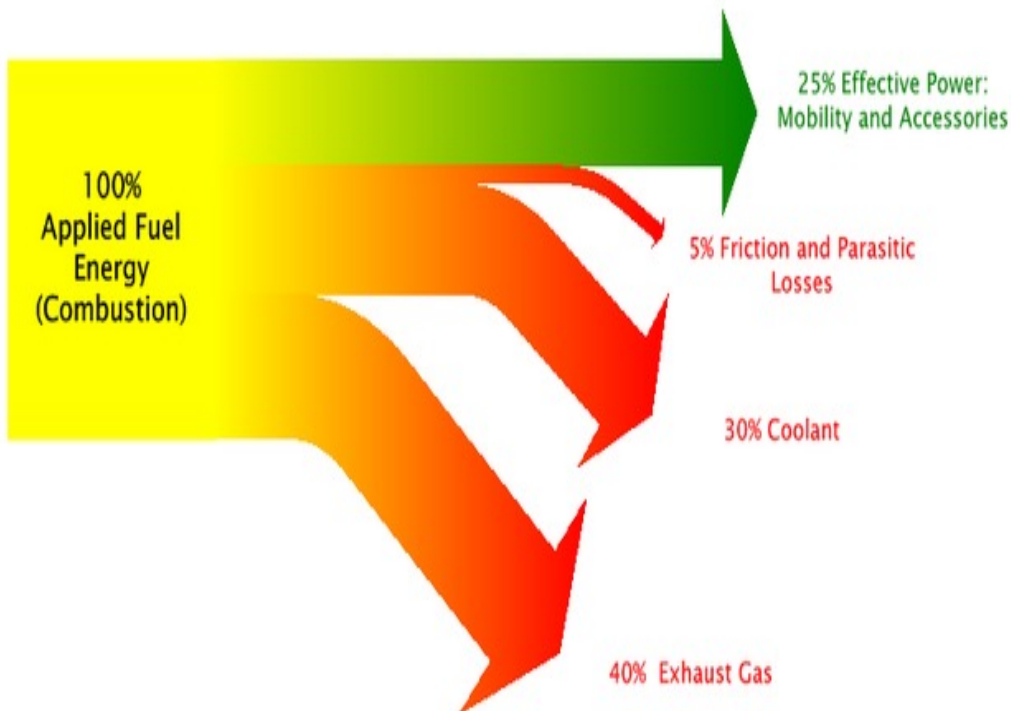
Waste Heat Emissions

UHI Drivers

Waste Heat

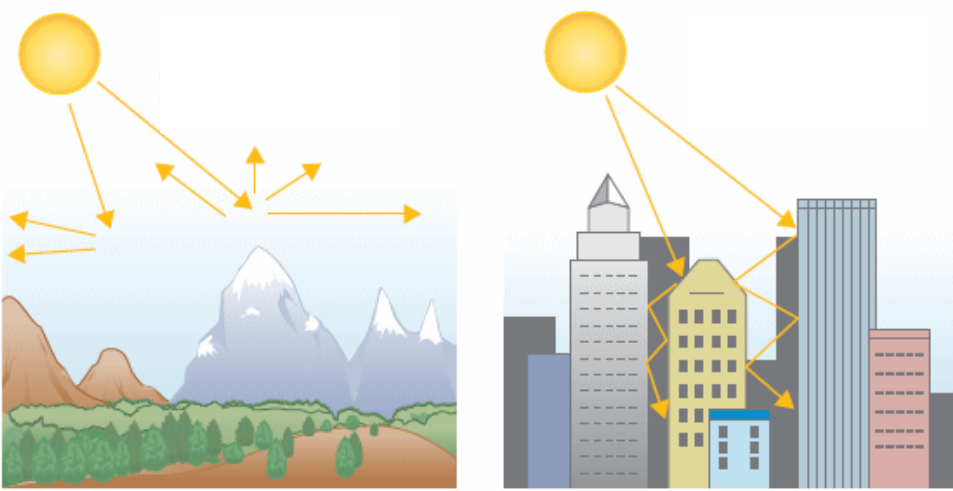
- In a process using energy, waste heat is the unused energy given to the surrounding environment.

Typical Energy Split in Gasoline Internal Combustion Engines



Urban Geometry

UHI Drivers



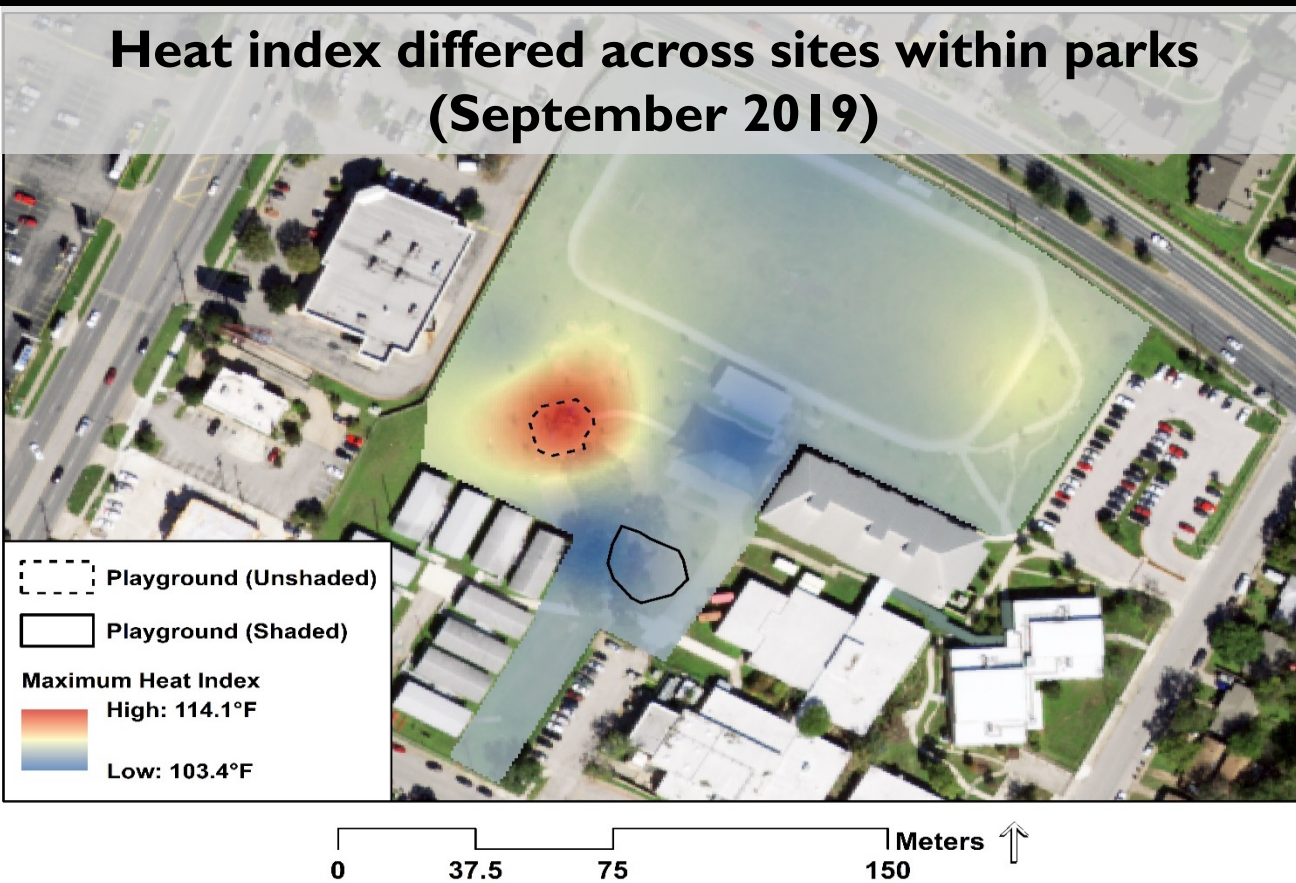
University of Wisconsin (n.d.)



Effects of trees, gardens, and nature trails on heat index and child health: design and methods of the Green Schoolyards Project

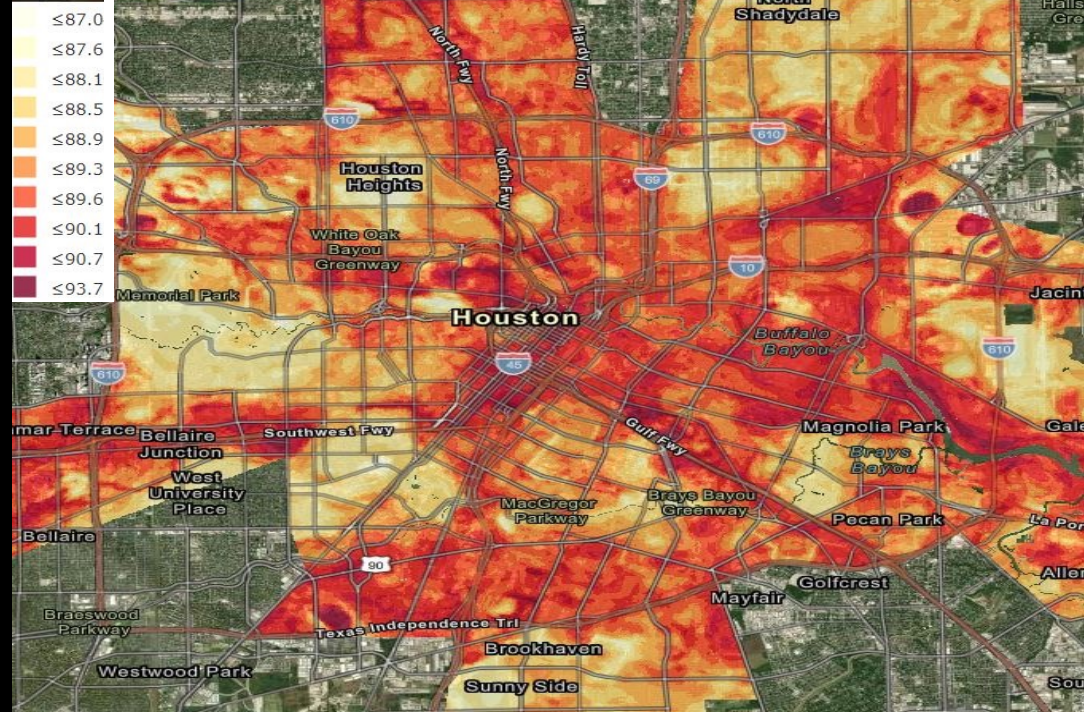
[Kevin Lanza](#),^{✉1} [Melody Alcazar](#),² [Deanna M. Hoelscher](#),¹ and [Harold W. Kohl, III](#)^{1,3,4}

Heat index differed across sites within parks (September 2019)

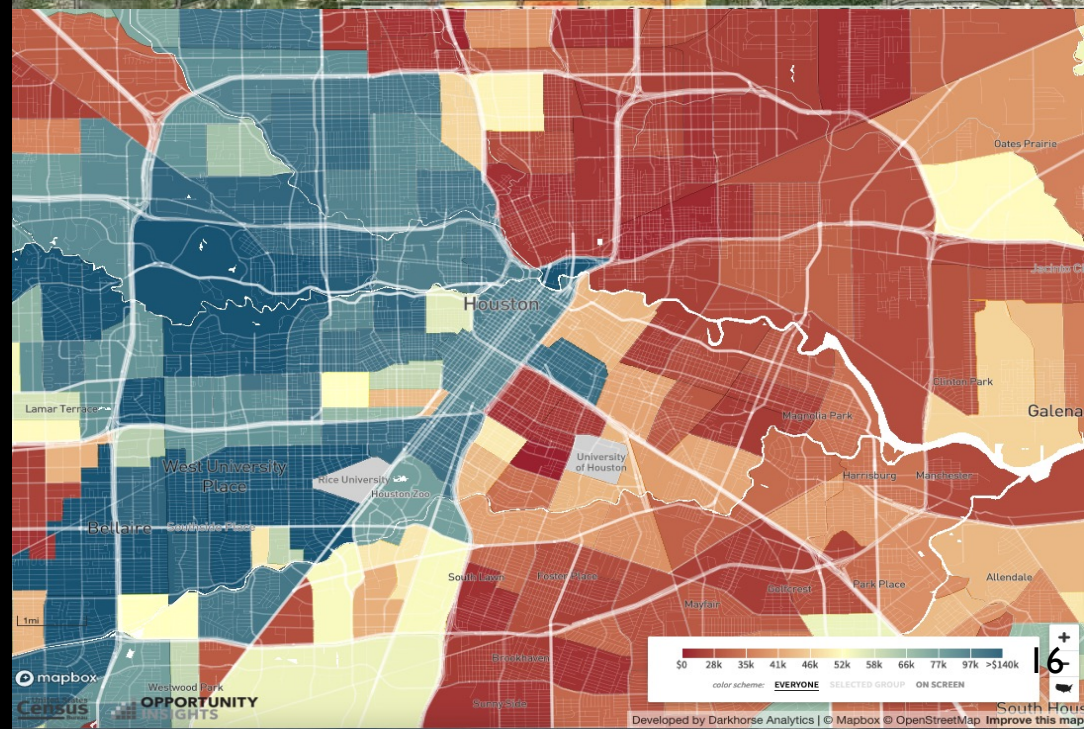


Heat is unequally distributed in Houston

Modeled Air Temperatures (7-8pm) →



Median Household Income (2012-2016) →



How Residents Experience Extreme Heat in Austin, Texas

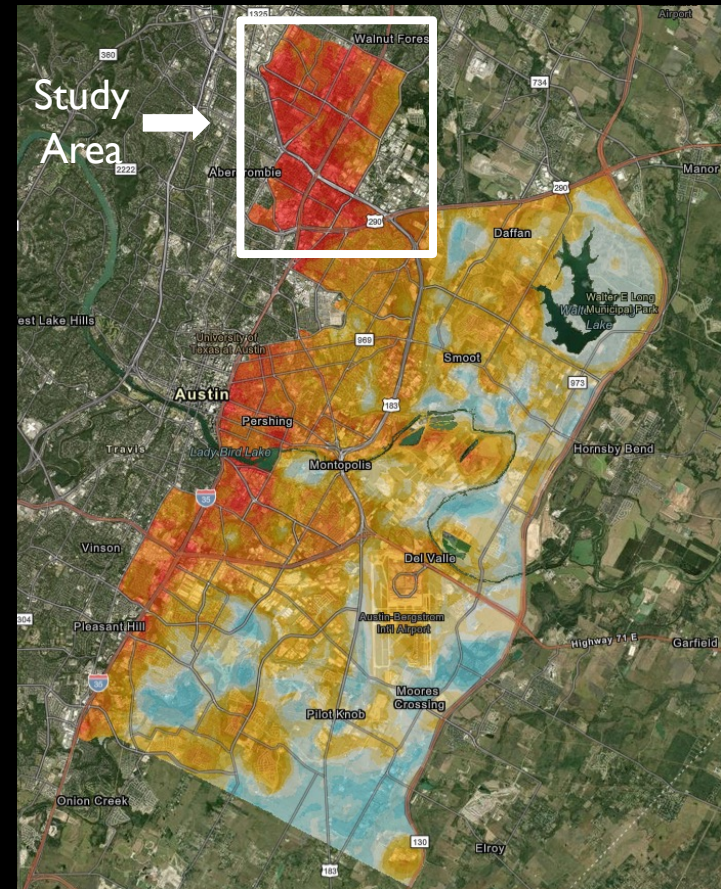
Summer of 2021

- Conducted interviews with 18 adults (94% female, 89% Latino)
- Focused on area with high urban heat island intensity in an economically disadvantaged community

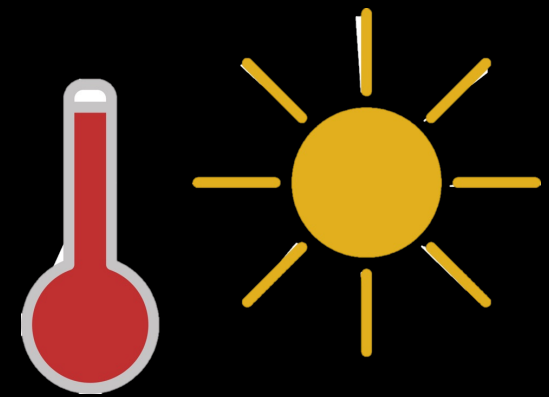
Interviews had two main questions:

Imagine it's 105°F outside...

1. What does your day look like?
2. What do you see in your community that would make it feel cooler?

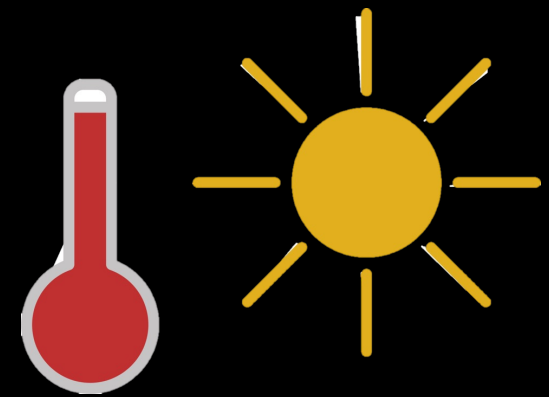


Seven Themes from Community Interviews



1. Residents were hot when traveling (e.g., to school) or working (e.g., construction)
2. The most affected by heat were children and those with diabetes
3. Physically, heat caused tiredness, headaches, dizziness, faintness, trouble breathing
4. Mentally, heat felt uncomfortable and bothersome
5. To adjust to heat, residents used AC, didn't go outside, and changed their schedule
6. Barriers to being comfortable included AC cost and lack of trees and other shade
7. To combat heat, residents wanted trees, parks, water bodies, and water fountains

Select Quotes from Community Interviews



“I'd like to be able to go outside and kind of walk around. But there are not a lot of green areas around my neighborhood, so I have to stay indoors.”

“We do not have time to go out because of the hot weather, the day goes by quickly, because it is so hot... we want to go out, we do not exercise, we do not walk, we gain weight.”

“It (heat) impacts us... I get more stressed, I get more tired. I don't feel like going for a walk to de-stress. We take shelter in the house, hoping that the air will keep us cool. It hits us hard because stressed children are also locked in.”

“I cannot even imagine a solution for the heat... It seems like nobody's smart enough to know exactly what to do.”



Those facing health inequities must be meaningfully involved in designing solutions

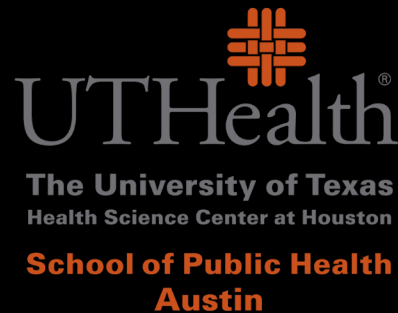
Thank You



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FLIR C5 Thermal Camera

- **White circle:** temperature of area within white circle
- **Red circle:** highest temperature within white box
- **Blue circle:** lowest temperature within white box

