

# Integrated Social and Behavior Solutions of Extreme Heat to Decrease Impacts on Historically Underserved and Socially Vulnerable Communities

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EDUCATION RESEARCH IMPACT

This research is based on work supported by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Educational Partnership Program under Agreement No. NA16SEC4810006.

# Why this Work

- Global population growth is almost exclusively in urban areas.
- The rate at which climate change impacts urban areas is alarming.
- One of the deadliest forms of extreme weather is excessive heat and specifically heatwaves.
- Dangerous health effects: heat exhaustion, heat stroke, intensification of pre-existing conditions, and death.
- Economic Impacts: According to the Atlantic Council the nation loses \$100 billion annual due to extreme heat effects.



“...extreme heat exposure is highly unequal and most severely impacts the urban poor”  
(Tuholske, Caylor, and Funk, 2021).



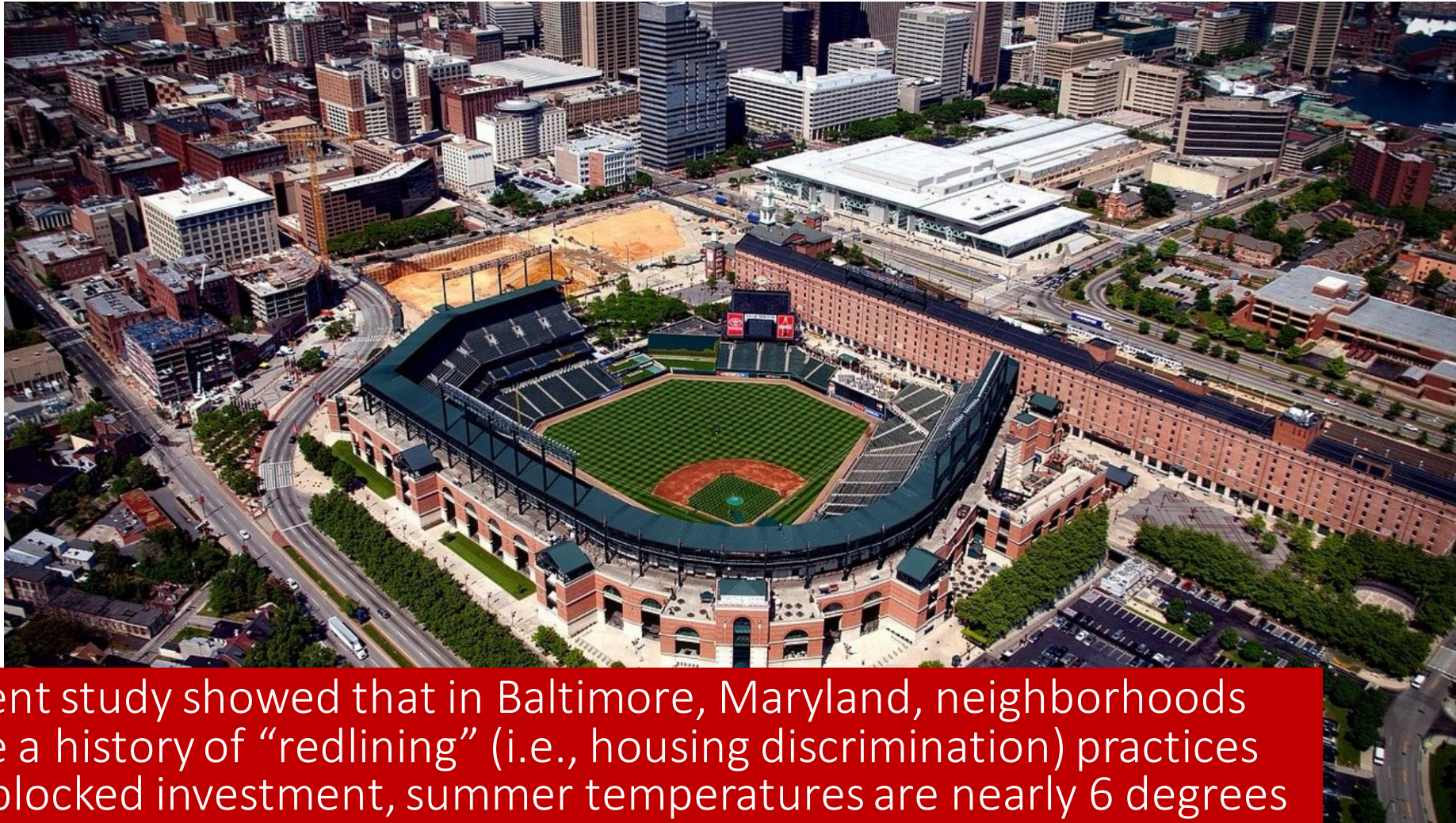
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# Research Strategy

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- The project uses an **interdisciplinary integrative citizen science** approach
- Collaboration with scholars from **multiple disciplines**: Atmospheric Sciences, Communications, Computer Science, and Sociology
  - Seeking guidance and input from the communities under examination
  - Assessment of heat exposure through a comparative analysis of the indoor and outdoor temperature differences in HUSVs and non-HUSVCs
  - Historical hot spot and social demographic profile analysis
  - Production and testing of risk communication messages
  - App development for testing messages and measuring behavioral responses to risks

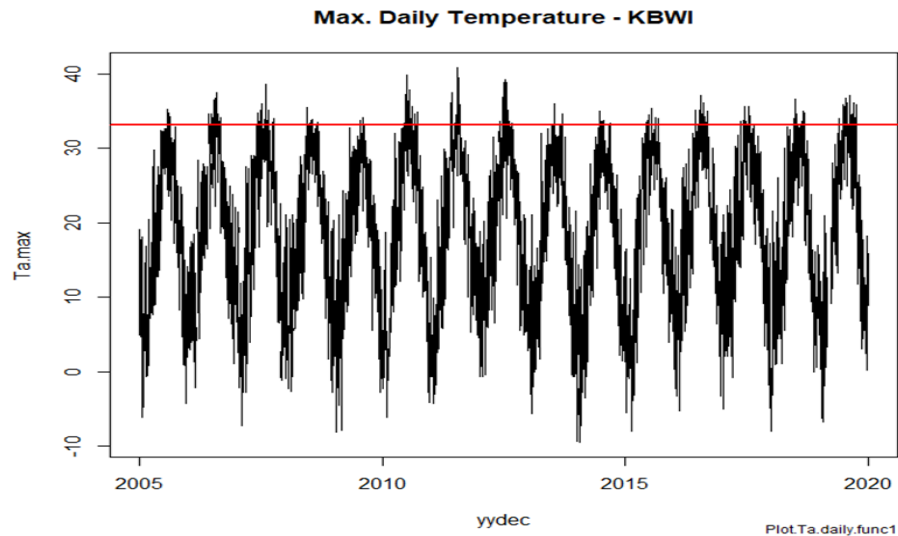




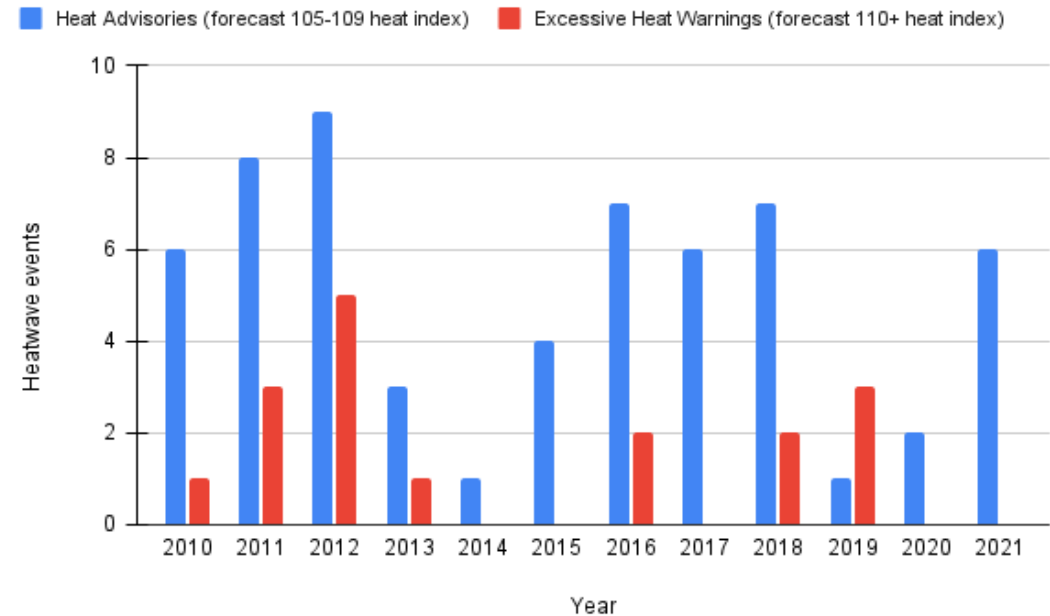
A recent study showed that in Baltimore, Maryland, neighborhoods where a history of “redlining” (i.e., housing discrimination) practices have blocked investment, summer temperatures are nearly 6 degrees hotter than the citywide average (Hoffman et al., 2020).



# Extreme Heat Trends



- Fluctuations in temperatures over time. (BWI Data)



- The occurrence of heatwaves in Baltimore city varies from year to year, but the issuance of heat advisories is constant.

# Sample Profile of Extreme Heat Zone in Baltimore

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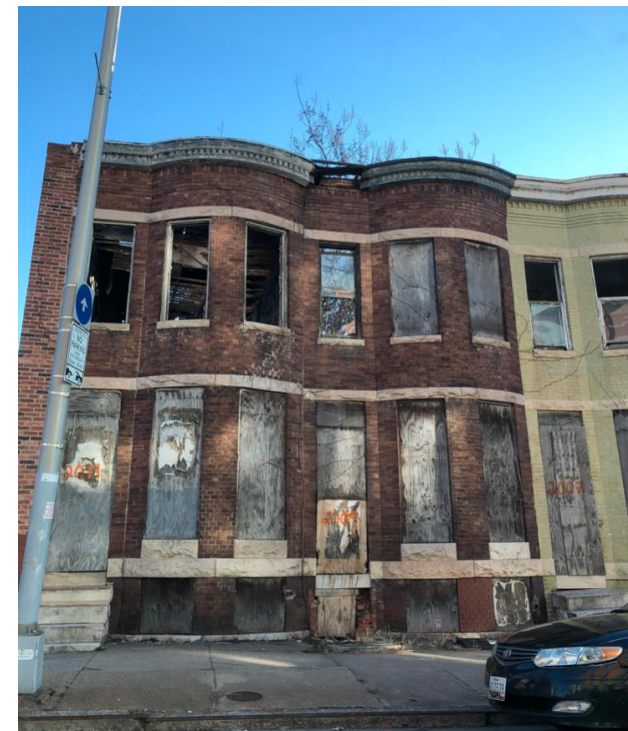
## Mcelderry Park

- 27,470 people per square mile (7,345 city)
- Median Household Income: \$52,830 (\$50,177 city)
- Average household size: 6.4 people (2.3 city)
- Percentage of family households 48.2% (35.2% city)
- Median age: 30 years (34.5 city)
- Occupations: management, service industry, and sales/office
- Percentage of population below poverty 37.2% (20.2%)

# Example of Extreme Heat Zone in Baltimore

## Greenmount West Neighborhood

- 24,066 people per square mile (7,345 city)
- Median household income in 2019 \$48,365 (\$50,177 city)
- Average household size 2.2 people (city 2.3)
- Percentage of family households 25.4% (35.2% city)
- Median age: 32.3 years (34.5 city)
- Occupations: service industry, healthcare, education
- Percentage of population below poverty 22.8% (20.2 city)





# Perceptions of Heat Risk

## Highlights from focus group research

“We go running. Me and my roommates. So, we ran later.”

“I didn’t come outside.”

“Try to do most things in the morning, like before 12 noon.”

“Well to me, it being 90 degrees didn’t really say anything, being from the Caribbean. Like sometimes, it’s a hundred, a hundred and five.”



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# Baltimore's All-Hazard Mitigation and Climate Adaptation Plan

- Enhance Baltimore City Community Resiliency Hub Program
- Convert vacant land and row houses into open space
- Certify Baltimore as a Community Wildlife Habitat through the National Wildlife Foundation
  - As of 2021 Racheal Wilson and Cab Calloway parks are undergoing changes
  - The conversion of vacant land and row houses open space is ongoing.
- Implement repaving strategy that addresses heat related damages to asphalt.



# Preliminary Findings

- Correlation between extreme heat hotspots and HUSVC's
- Baltimore city's heat mitigation activities are still in progress
- Knowledge of heat risks are not reflective of perceptions of personal risks
- Need for risk information to address the personalized needs of the audience
- Risk communication needs can be based on prior disaster experience, cultural heritage or background, religion and values (Murray-Johnson, Witte, Liu, & Hubbel, 2001)



# Future Work – Summer 2022

- Pilot test air monitoring devices (Spring 2022)
- Meet with community members (Spring 2022)
- Examine real-time monitoring data on environmental outdoor and indoor conditions using existing in-situ data and remote sensing products
- Examine impact of extreme heat on behavioral response data collected via a smartphone app

## Outcomes

- Heighten public awareness of heat risks
- Collection of actionable data to enhance mitigation and resilience plans
- Assessment data on the impacts of risk messaging on different populations



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Questions



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