# Coping with urban heat: Learning from residents' experiences

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Background
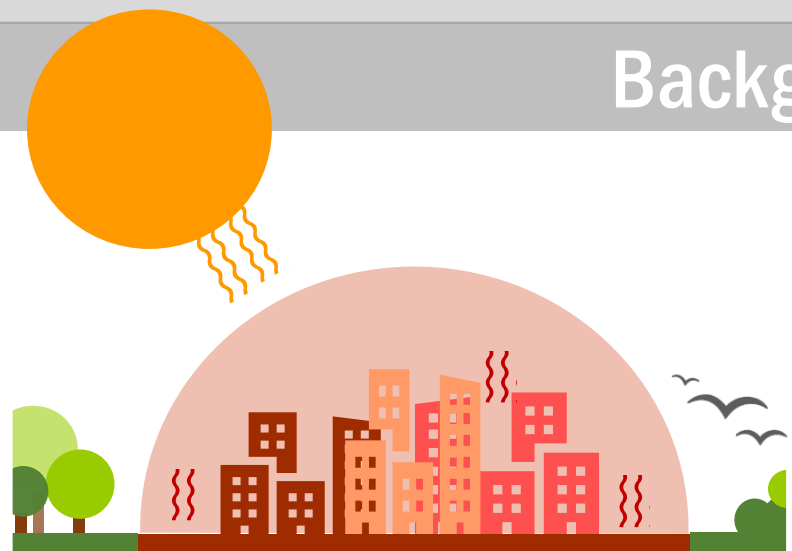
People living in urban heat islands are disproportionally exposed to extreme heat. [1][2] The intensity and frequency of heat waves is predicted to increase. [3] Heat-related morbidity and mortality are preventable, and cities are developing response and adaptation plans for this purpose.

Few comprehensive heat exposure assessments incorporate community-engaged intervention and mitigation planning.
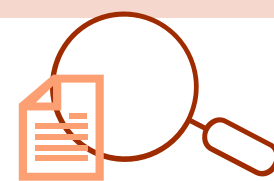
Methods

Objectives
Analyze personal and home exposure to heat. Our research question: **What are the physical, social, economic, and environmental factors contributing to heat exposure?**

1 **Engaged** with residents of **environmental justice communities** in urban heat islands in and near Boston, MA

2 Established an a**cademic-community partnership** to inform decision-making for heat adaptation strategies tailored to the local population, conditions, and context in Chelsea and East Boston, MA.

3 Recruited **22** residents, prioritizing **socio-economic**, **racial/ethnic** & **housing diversity.**

4 Collected personal, residential and outdoor temperatures as part of the 2020 study.

5 Administered **baseline, weekly, and exit questionnaires to complement** during the duration of the study to get a better understanding of participants' personal experiences dealing with heat .
Due to COVID-19, all recruitment, interviews and data collection were conducted remotely.

Questionnaire approach
We asked questions that helped us explore the nuances of dealing with extreme heat

Questionnaire Topics
- air conditioning
- home
- temperature perception
- sleep
- hydration
- Health
- transportation
- heat-coping strategies
- heat wave awareness
- heat illness concerns
- Income & financial health
- perceived social capital

Data Collection/Analysis
We used Qualtrics to distribute the questionnaire and collect answers.
We created descriptive statistics tables for all relevant questions using R version 4.0.2 (2020-06-22)

Results

Participants' Statistics

City	
Chelsea	15 (68%)
East Boston	7 (32%)
Language	
English	10 (45%)
Spanish	12 (55%)
Race/Ethnicity	
Hispanic/Latina/o	9 (41%)
Non-Hispanic White	6 (27%)
Other [a]	4 (18%)
Age range (years)	22-78
Rent/Own	N (%)
Rent	17 (77)
Own	4 (18)
Other	1 (5)
Housing Type	
Multi–Family [b]	16 (73%)
Single Family	4 (18%)
Public Housing	2 (9%)
Year Built	Mean (SD)
	1912 (42)
Number of Stories	
1	2 (9%)
2-3	17 (77%)
5	1 (5%)

[a] includes American Indian or Alaska Native, Asian, and Black or African American
[b] includes apt, condo, row end, decker
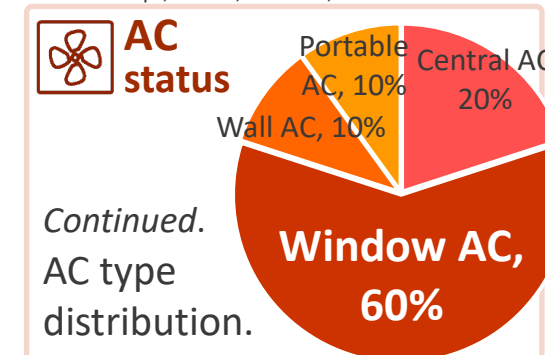
AC status: All **100%** of the participants had some form of **AC** in their homes. And yet, **~ 50%** of the participants described the living conditions in their residence last summer as **hot**, and **30%** as **warm.** The average AC setting range reported was **~60- 78º. F.**

AC status
Continued. AC type distribution.

Central AC 20%
Portable AC, 10%
Wall AC, 10%
Window AC, 60%

income & AC
Employment rate among participants was **54.2%**. Only **50%** of the employed participants had a household income above **$24,999**. Almost **40%** said they had to prioritize bill payments.

Opportunities
Subsidized AC upgrades
AC bills payment assistance
AC efficiency education

Interventions
City of Chelsea AC lottery and bill payment assistance *(implemented)* [4]
Community support to find programs that offer AC upgrades and bill payment assistance based on income *(implemented)* [5]

Homes
During the study period **54%** of the participants reported not leaving the house for a cooler area. Of those, **3** said they **didn't know of a place to go to cool down**

Opportunities
Residential upgrades to improve thermal comfort indoors
*
Increased outdoor cooling capacity

Interventions
White roofs *(being implemented)*

Hydration
Only **60%** of the participants reported drinking enough water.

Opportunities
Hydration stations/education

Interventions
Hydration stations *(implemented)*

Transportation
About **80%** rely on public transport to get to work and buy groceries. **60%** changed mode of transport due to COVID-19 and Heat.

Opportunities
cooling interventions stops/stations transportation vouchers

Interventions
Misting stations *(being tested)*

Discussion & Conclusion

House-related findings from the questionnaires helped identifying housing characteristics associated with higher indoor temperatures. These, in combination with AC use answers were referenced to model a **building heat index**.

Conclusion: More nuanced understanding of residents' experiences is required to develop effective extreme heat interventions. Through engaging with residents of urban heat islands and compiling questionnaires and temperature data findings we are better positioned to suggest interventions that meet the needs of those most impacted.
Limitations: The small sample size may not reflect the experiences of these populations accurately. Need for broader/ open-ended questions to capture the subtleties of our participants experiences coping with extreme heat.

References:
1. Vaidyanathan. A., J. Malilay, P. Schramm, and S. Saha. 2020. Heat-related deaths. United States, 2004– 2018. *Morbidity and Mortality Weekly Report* 69(24):729–734.
2. https://www.bu.edu/articles/2021/heat-exposure-hits-vulnerable-communities-harder-than-others/.
3. IPCC WG1 Report 2021. https://www.ipcc.ch/report/ar6/wg1/
4. https://boston.cbslocal.com/2021/06/23/chelsea-free-air-conditioning-ac-units-application/
5. https://allinenergy.org/c-heat-project.html