Beyond Alerts

Using Heat-Health Data to Inform Local Action

Welcome!

MAPC

BU School of Public Health
Center for Climate & Health

Mystic River
WATERSHED ASSOCIATION

RESILIENT MYSTIC
COLLABORATIVE

In the chat, please share:

- Name
- Organization
- How do you use heat data in your existing work?

Today's Agenda:

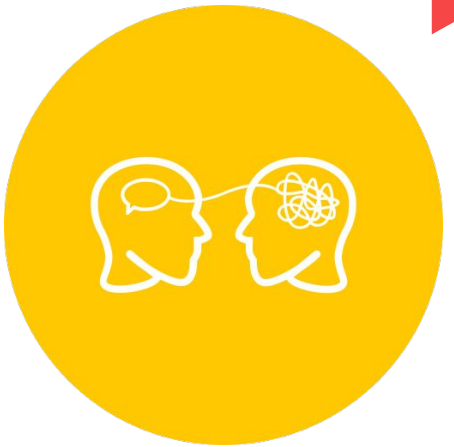
- Grounding & Introductions - **10 min**
- Current Data and Heat Alert Practices - **20 min**
- Heat & Health Data - **30 min**
- Breakout Session: Priorities for Future Analysis - **15 min**
- Report Back & Close - **15 min**

Current Data and Heat Alert Practices

What problem are we trying to solve?

Our cities are hot

Lower Mystic is even hotter



Existing warnings are not working for heat

We need a coordinated, community-driven approach to heat resilience communication!

National Weather Service
Heat watches, warnings, and advisories to alert the public via cell push alerts, social media, web, radio, TV, local news, etc.

MEMA Notifications
Preparedness tips and public alerts about about severe weather, emergency situations, and disasters via push alerts & gov't website notices, as well as social media.

Health & Homeland Alert Network (HHAN) System
Dangerous heat warnings and urgent public health messages via email to Public Health Directors, healthcare providers, and participating organizations

City/Town Emergency Notifications (ex. CodeRed, ReadySOS, etc.)
Local alerts about severe weather, emergencies, and other community notices via text, robo-call, and email to subscribers.

Climate Central Realtime Climate Alerts
Local climate alerts with context for email subscribers

National Weather Service
Heat watches, warnings, and advisories to alert the public via cell push alerts, social media, web, radio, TV, local news, etc.

In our review, most cities/towns relied on National Weather Service (NWS) alerts (or local news reporting on NWS alerts) to trigger local heat response actions

Most residents and community groups relied on local notification systems.

Some non-governmental groups relied on Climate Central Alerts. For example, healthcare systems.

City/Town Emergency Notifications (ex. CodeRed, ReadySOS, etc.)
Local alerts about severe weather, emergencies, and other community notices via robo-call, and email to subscribers.

Climate Central Realtime Climate Alerts
Local climate alerts with context for email subscribers

Poll: Which of these alert systems, if any, have you used in the past?

- ❑ National Weather Service
- ❑ MEMA Notifications
- ❑ Health & Homeland Alert Network (HHAN) System
- ❑ City/Town Emergency Notifications
- ❑ Climate Central Realtime Climate Alerts
- ❑ Other (*please share in the chat!*)

Beyond NWS Alerts - building a responsive local heat response system

The Limitation

NWS alerts are designed to serve the region; many communities experience dangerous heat before regional alerts are issued

One-size-fits-all alerts are important, but don't account for local conditions

The Opportunity

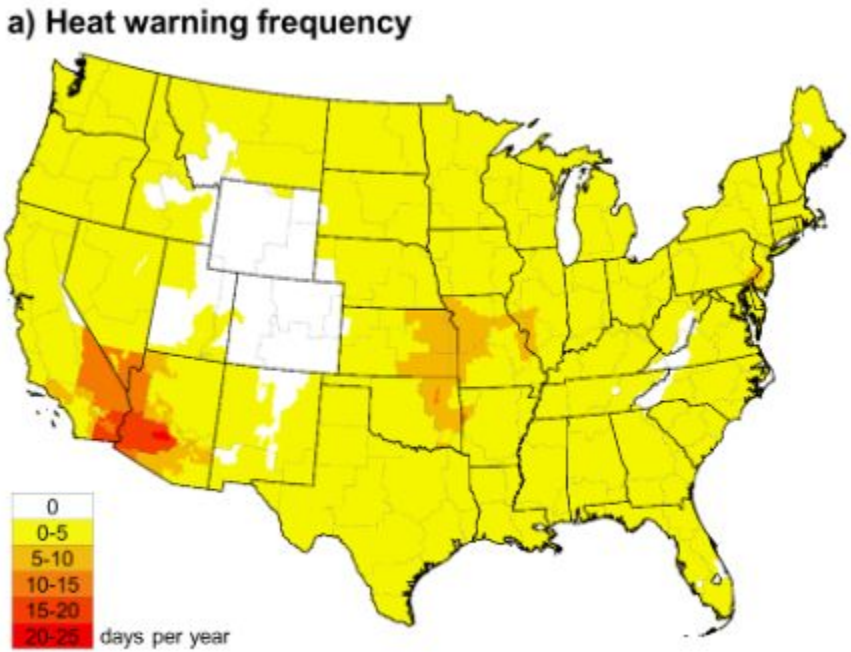
Heat & health data allows cities/towns to establish heat response thresholds that make sense for their community

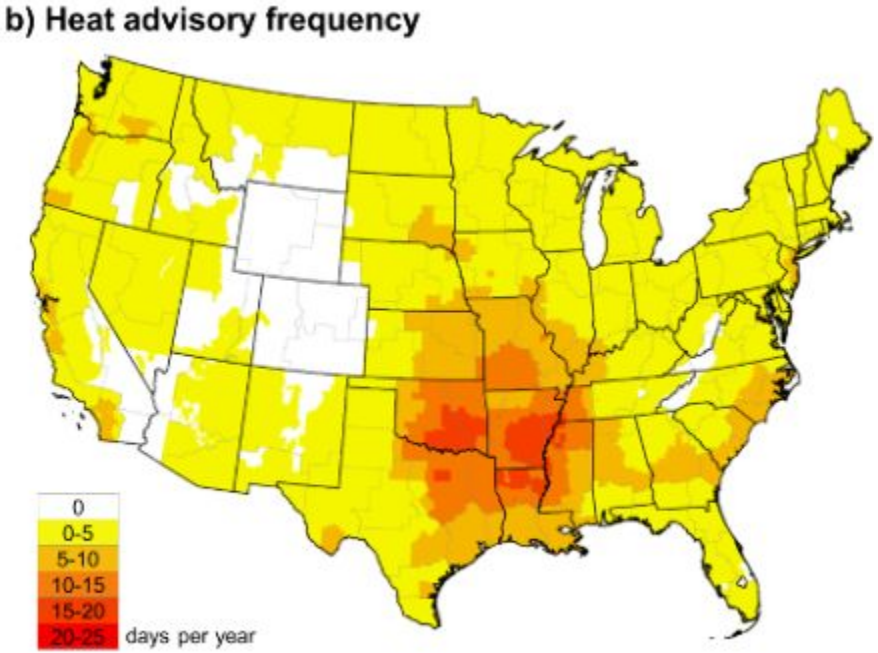
Local Hospitals and the City of Boston are already piloting this approach!

Towards Evidence-Based Policy

- In the US, the National Weather Service (NWS) issues heat advisories and warnings when the heat index (HI) is forecast to be “high”
  - Warnings and advisories (“alerts”) provide information the public can take to protect their health
  - Warnings may trigger activation of local heat response plans
  - Optimal thresholds for issuing heat alerts unknown
  - NWS provides local offices with guidance about when to issue heat alerts

Use of Heat Alerts Varies by Forecast Office





Hondula et al. *BAMS.* 2022

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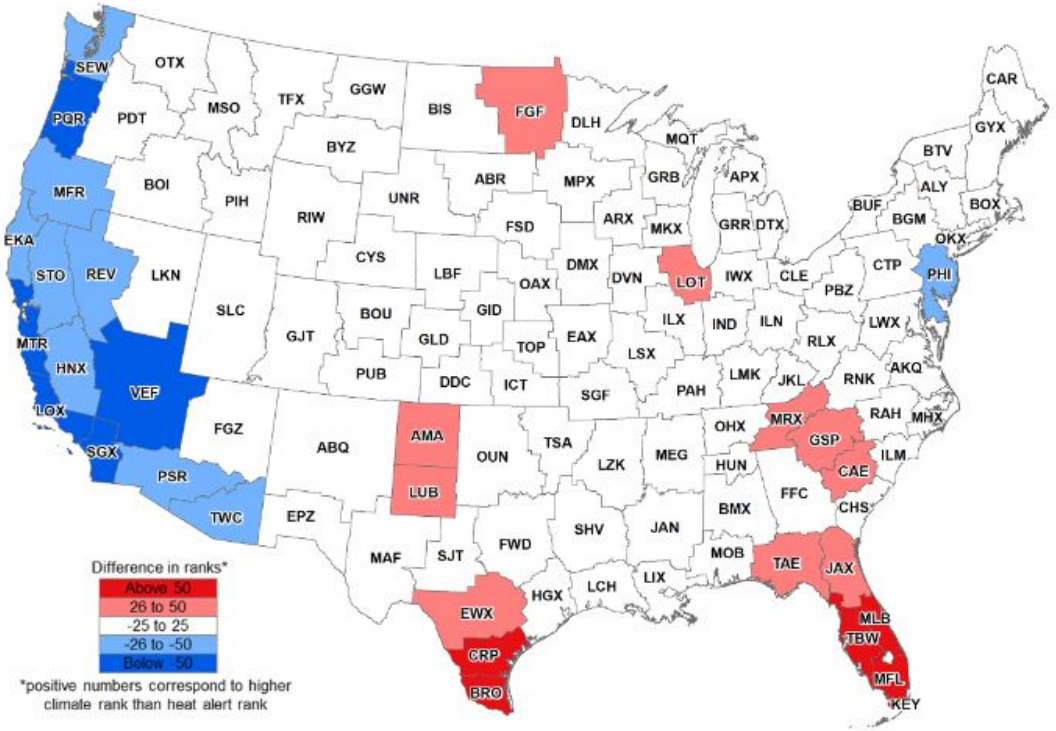
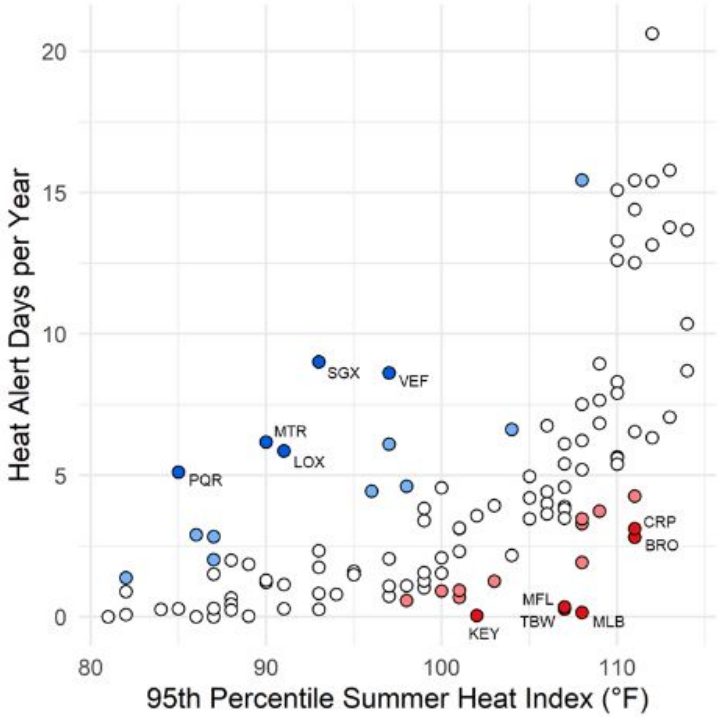
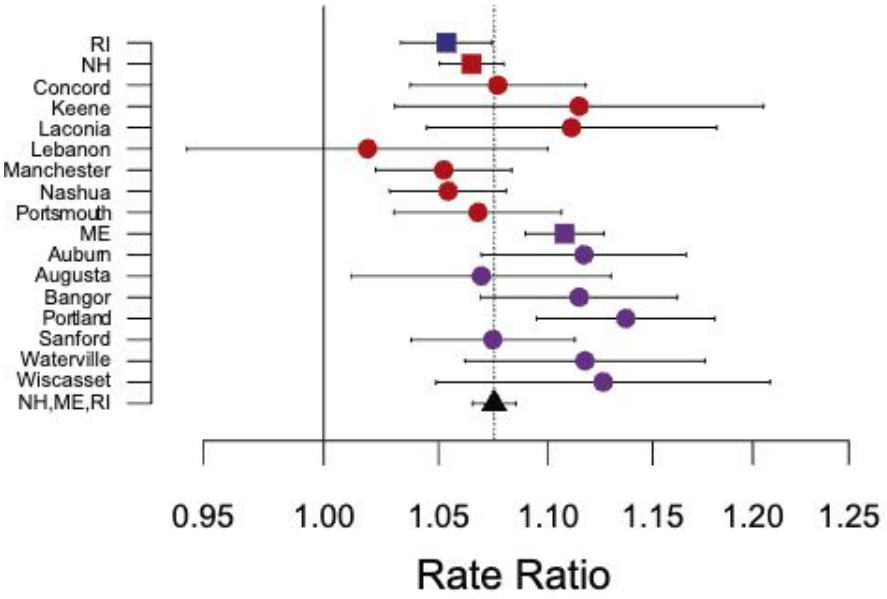




Hondula et al. *BAMS.* 2022

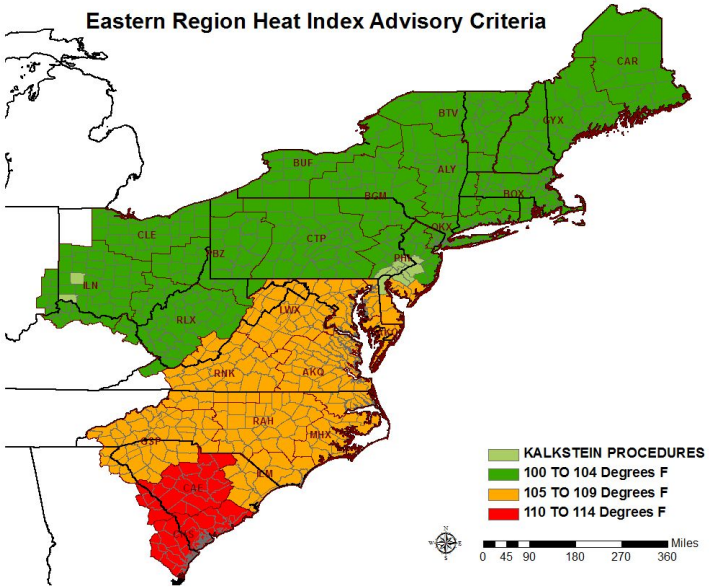
- In New England, a day with a heat index of 95°F day is associated with about a 7.5% higher risk of emergency department visits compared to a 75°F day
- Relative risk varies by location, age, and cause



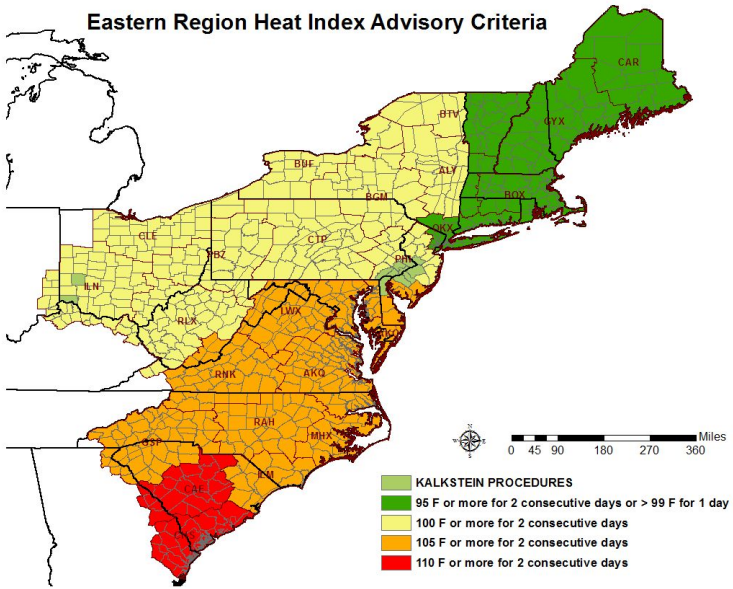
Wellenius et al. *Environ Res.* 2017

Towards Evidence-Based Policy

Summer 2016



Summer 2017



But Are NWS Heat Warnings Effective?

- Strong desire to optimize local heat early warning and response systems
  - What is the optimal threshold for issuing heat alerts?
  - Assumes issuing heat advisories/warnings reduces heat-related morbidity or mortality
  - What local actions should be triggered by heat alerts to optimize their benefits?

What Science Shows

- Extreme heat is associated with higher rates of death and illness
- Moderate heat also associated with morbidity and mortality
- Vulnerability varies by personal, housing, and neighborhood characteristics and timing in season
- As the world continues to warm, more people are suffering from heat

What We Need to Know

- What are the local health risks associated with moderate or extreme heat?
- Who (when? where?) is at greatest risk/most susceptible?
- What local actions can we take to protect public health?
- How effective are these interventions?

Heat & Health Data

MA Emergency Dept. Visits

- To enable local research and advocacy, we need local health data
- Center for Health Information and Analysis (CHIA) collects hospital data from *most hospitals in the state
- The Case-Mix data includes Emergency Department (ED) visits
- ED data can be useful for studying health impacts of acute and chronic exposures

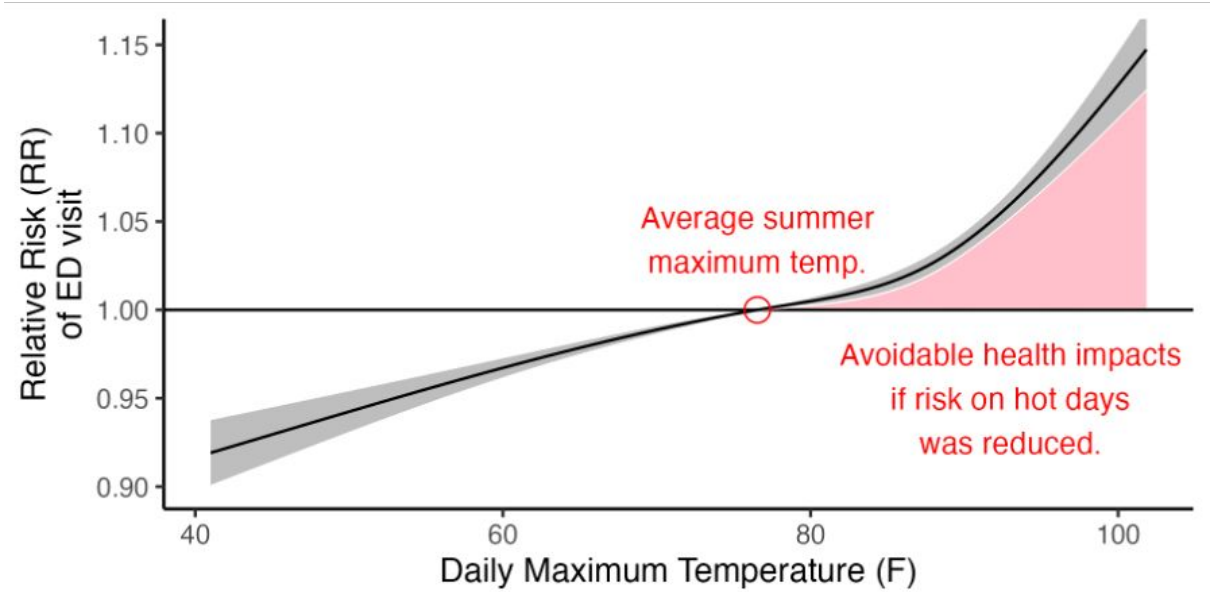
MA Emergency Dept. Visits

- Approximately 2.5 Million ED visits in the state per year
- Purchased data from 2010 to 2023 (~30 Million ED visits in total)
- Temporal resolution: Daily
- Spatial resolution: Patient Zipcode
- Visit information:
  - Date/time of entry and exit, length of time, source of visit, primary and secondary diagnosis codes, payor type and status, newborn age in weeks, and many others
- Individual-level:
  - Unique patient id, unique mother's patient id, age, sex, Race, Ethnicity, Hispanic, Experiencing Homelessness, and many others

Estimating the impact of Heat on Health

- Use a regression model to compare days across the summer
- Compare days within a municipality, so variation comes from heat
- Not just “heat-related” outcomes, but trends in **all-cause** ED visits
- Account for **lagged** and **non-linear** effects
  - Your exposure yesterday (and the day before) matters as well as your exposure today, but probably to a lesser extent
  - The health impacts related to 80F, 90F, and 100F likely go up exponentially, rather than linearly

RESULT: Heat and All-Cause ED visits statewide



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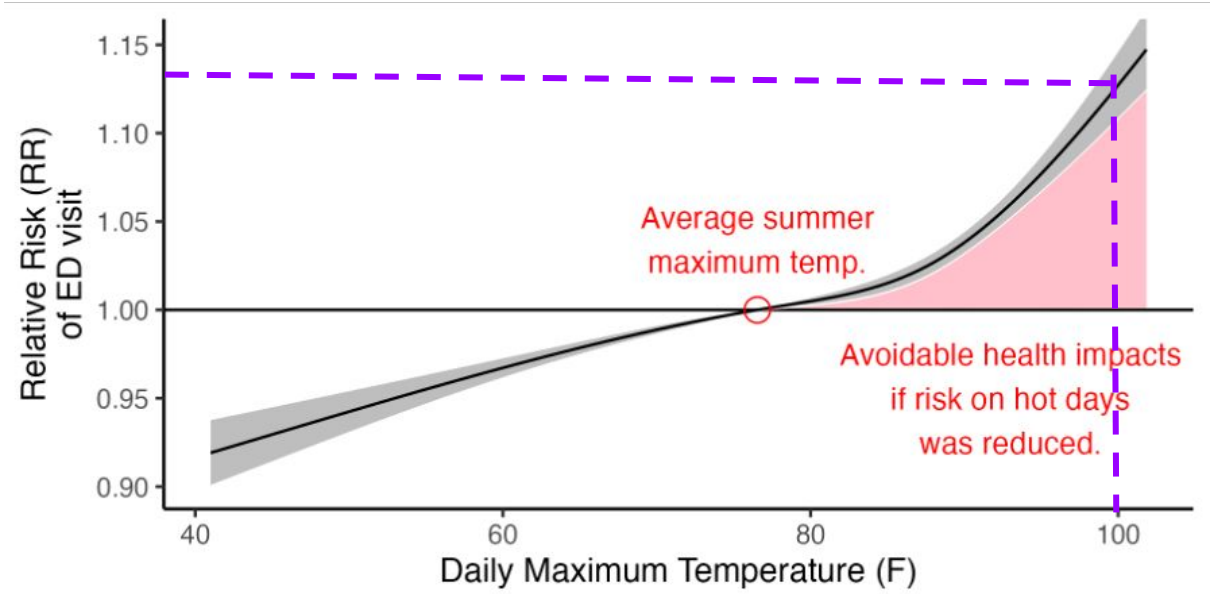


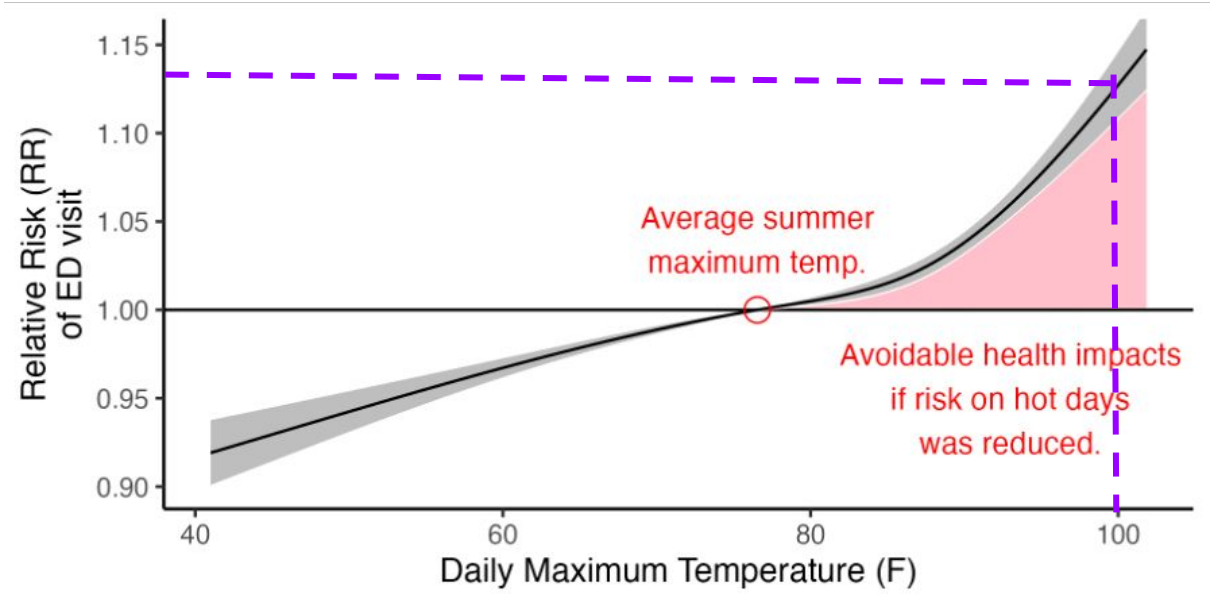
How to read this graph:

For this graph, or a temperature of 100 F, the relative risk (RR) of an ED visit is approximately **1.14**

The comparison temperature chosen for this graph was **75 F** (the average 'hot' temperature)

So, for this graph, a relative risk of **1.14** means your risk of an ED visit on a day where the temperature is **100 F** is **14%** higher than on a day where the temperature is **75 F**

RESULT: Heat and All-Cause ED visits statewide



What does this mean:

If you add up all the higher risk of an ED visit on days where the daily maximum temperature is greater than 75 F, you can estimate the total number of ED visits that could be avoided if we reduced the risk on hot days.

RESULT

Approximately **8,500 ED visits** per year are potentially avoidable

Two important concepts

Relative Risk of 1.14

- Using a reference temperature of 75F, the risk of an ED visit on a day with daily maximum temperature of 100F is 14% higher.

Attributable number of 8,500

- Using a reference temperature of 75F, the number of all-cause ED visits that are associated with temperature **higher than 75F** is 8,500.
- Thus, if we reduced the risk on hotter days, we could potentially avoid these ED visits

RESULT: Spatial distribution of Relative Risk

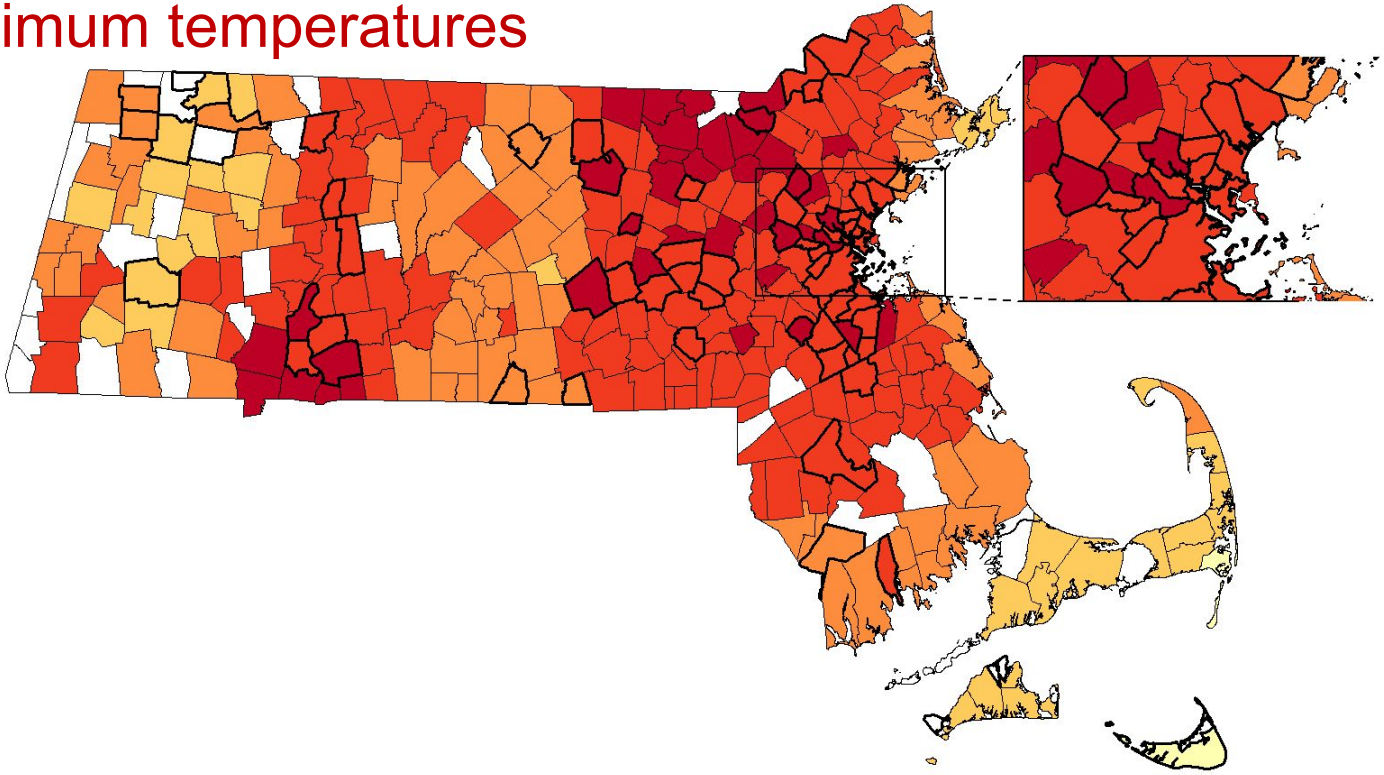
Relative Risk of 1.14

- Using a reference temperature of 75F, the risk of an ED visit on a day with daily maximum temperature of 100F is 14% higher.

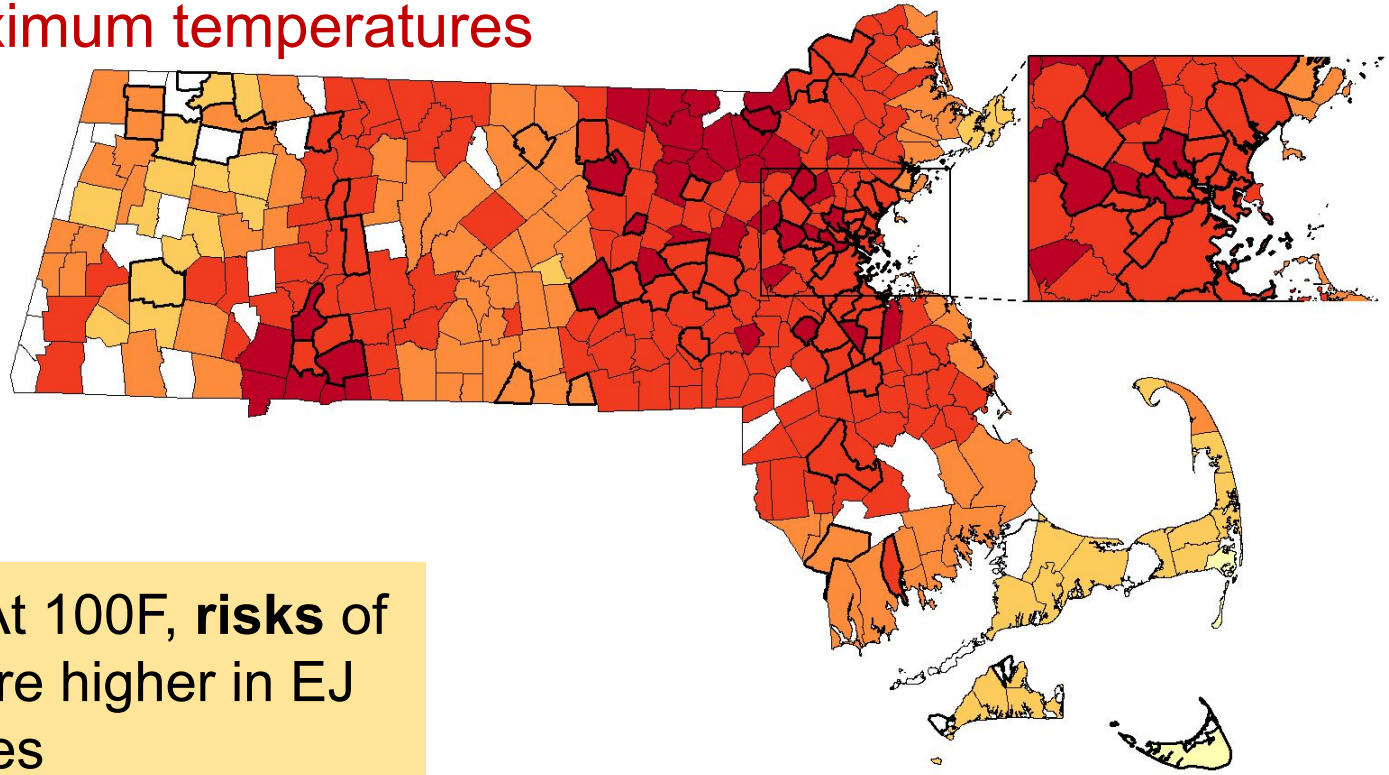
How does this vary across municipalities?

Some will have higher risk on days with 100F, some will have lower

RESULT: Spatial distribution of Relative Risk on days with 100F daily maximum temperatures



RESULT: Spatial distribution of Relative Risk on days with 100F daily maximum temperatures



TAKEWAY: At 100F, **risks** of ED visits are higher in EJ communities

RESULT: Spatial distribution of Attributable Number

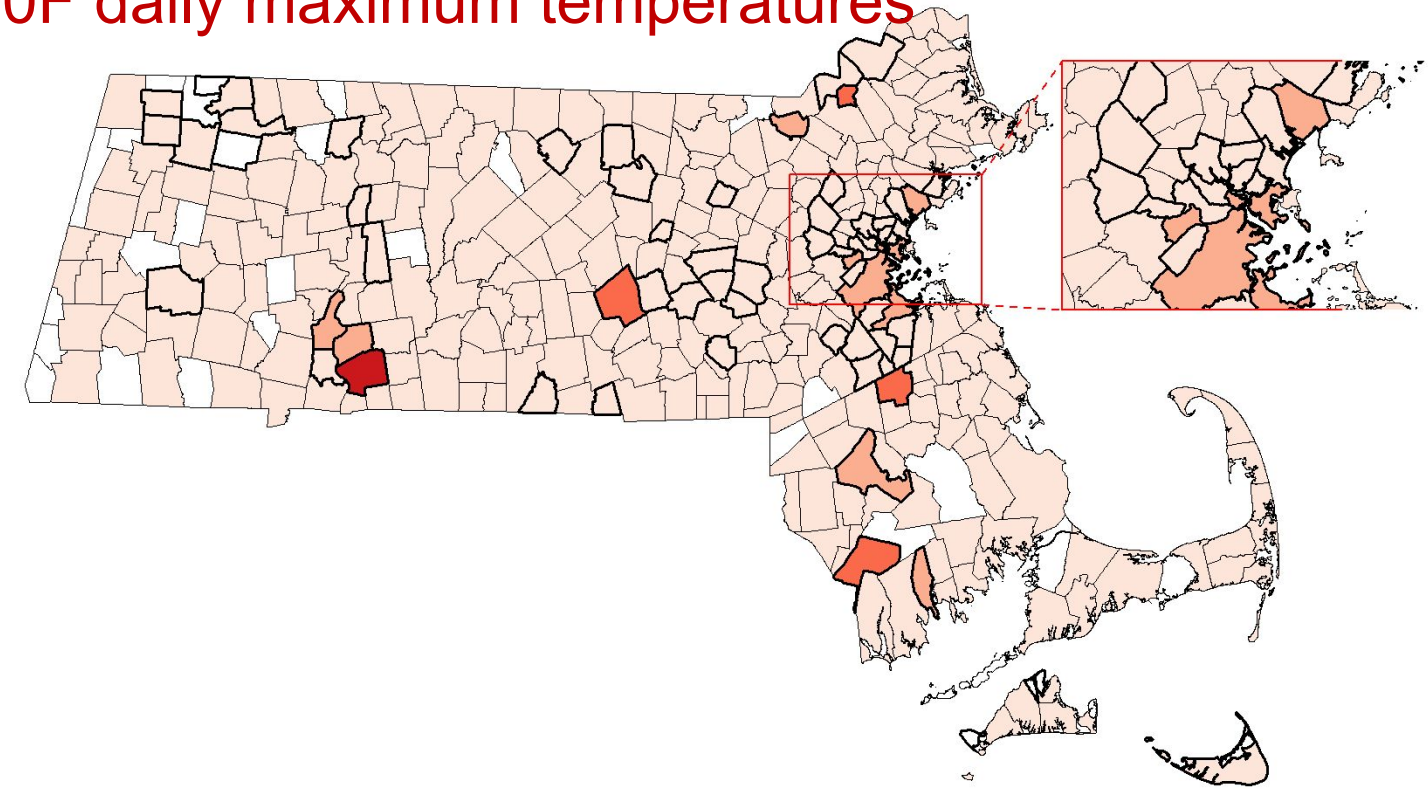
Attributable number of 8,500

- Using a reference temperature of 75F, the number of all-cause ED visits that are associated with temperature **higher than 75F** is 8,500.

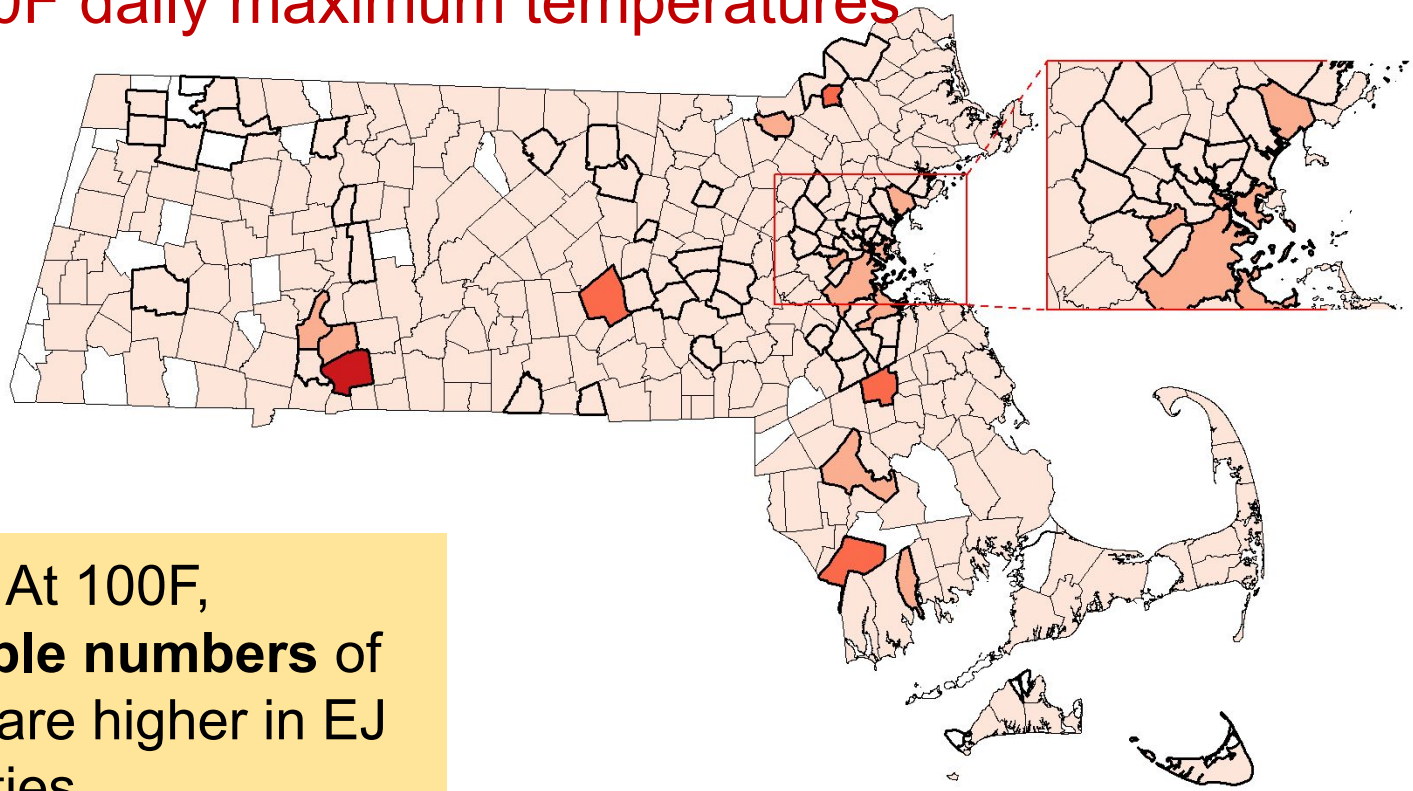
How does this vary across municipalities?

Some will have higher attributable number on days with 100F, some will have lower

RESULT: Spatial distribution of Attributable Number on days with 100F daily maximum temperatures



RESULT: Spatial distribution of Attributable Number on days with 100F daily maximum temperatures



TAKEWAY: At 100F, **attributable numbers** of ED visits are higher in EJ communities

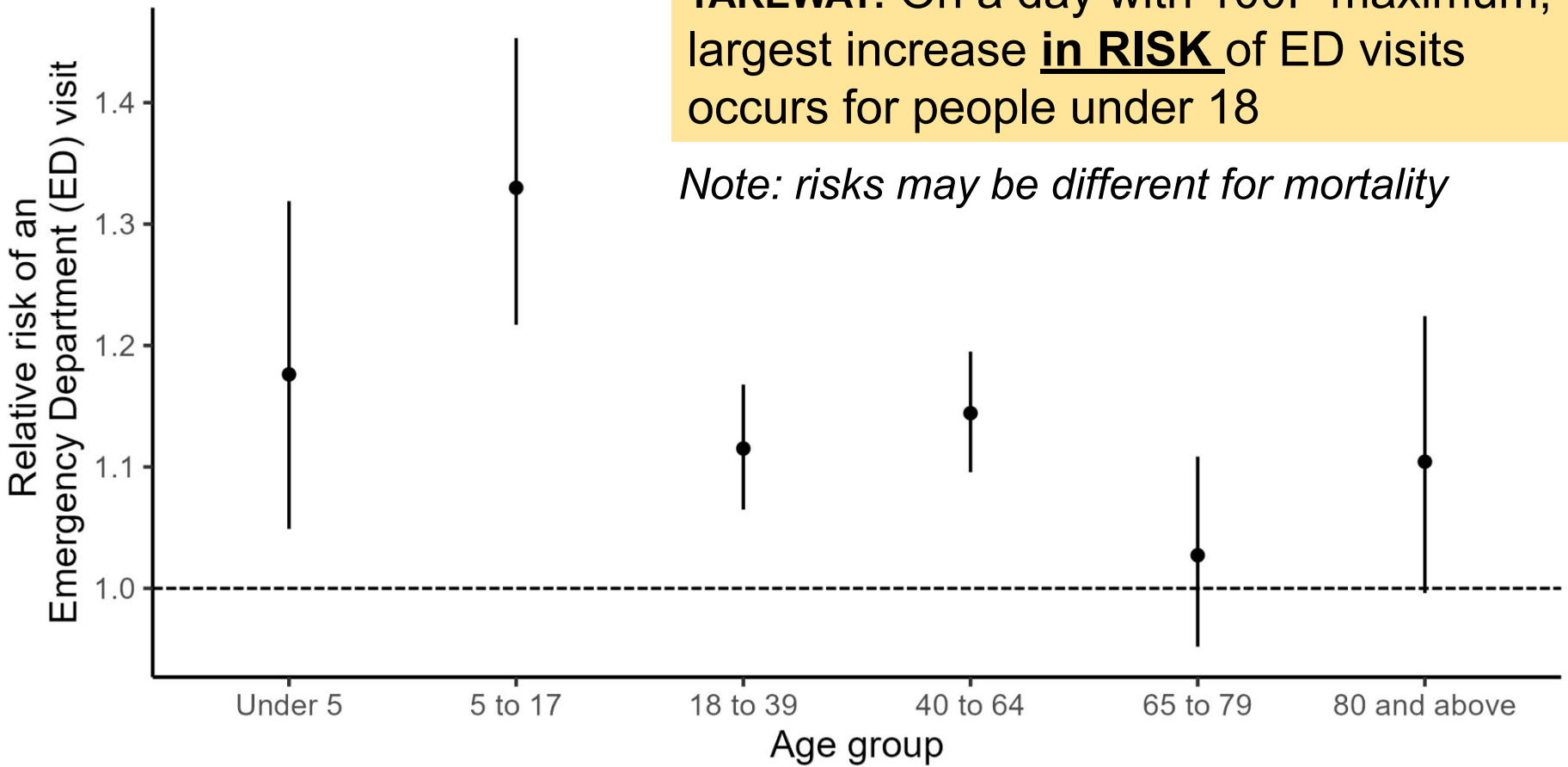
Variation by demographics

- One of the most relevant factors in heat-related ED visits is age

- So, how do the risks vary by age group?

TAKEWAY: On a day with 100F maximum, largest increase **in RISK** of ED visits occurs for people under 18

Note: risks may be different for mortality



Future analyses to enable action

- Analysis of cause-specific ED visits

  Mental health, pregnancy, unhoused

- Identifying drivers of this risk :

  low Air Conditional use/prevalence, historical redlining, payor status

- Other suggestions **for applicability?**

Break Outs: Shaping Our Heat Research

Break Out Room Activity

Goals:

- Identify additional heat & health analyses we should take on as part of this project
- Shape the longer-term heat & health research agenda

Discussion Prompts:

- What surprised you?
- What information seemed the most helpful?
- What else would you like to know?

Report Back

Discussion Prompts:

- What surprised you?
- What information seemed the most helpful?
- What else would you like to know?

Cool Communications - Next Steps:

- We'll attend the RMC Spring Heat Working Group to present our initial communication materials and discuss how this analysis can guide implementation

Wrap Up & Close

Fostering Collaborations: A Symposium to Advance Equitable Health Actions

Symposium Goal: Foster cross-sector dialogue to bridge the gap between research and practice in heat health and resilience through stakeholder engagement.

Date: June 18, 2025

Symposium Objectives:

- Identify key challenges and research gaps related to the health impacts of extreme heat on communities.
- Foster interdisciplinary collaboration that accelerates research-to-action pathways.
- Engage funders and decision-makers to catalyze investment in heat-health research and community resilience.
- Sustain dialogue and translate symposium insights into actionable strategies for state and local implementation.

Town Halls

Goals of Town Halls: Facilitate conversations that allow participants to self-select priorities and key topics for discussion to inform a well-rounded symposium agenda.

Town Hall 2 (May 13): 2-3 pm

Town Hall 3 (May 14): 10-11 am

Register Here: https://us06web.zoom.us/meeting/register/tdjvNjuqSeisxu_9t99wfQ

Exit Survey

Your feedback will help us improve our analysis and future events – thank you for your time!

https://mapc.ma/BeyondAlerts