Staying Cool on a Hot Planet: Dealing with Extreme Heat

Local Solutions:
Eastern Climate Preparedness Conference
May 1, 2018 | Manchester, NH

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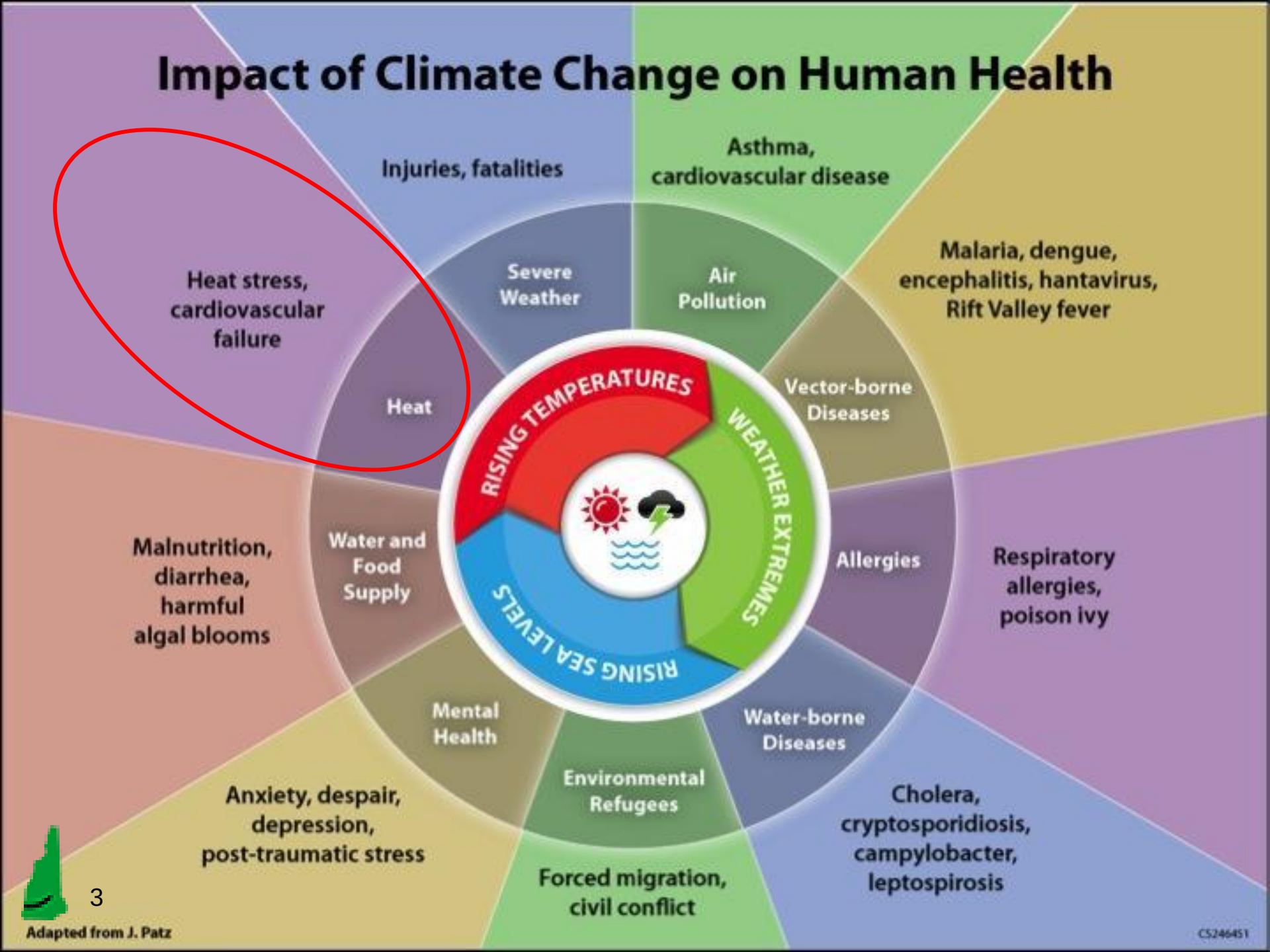
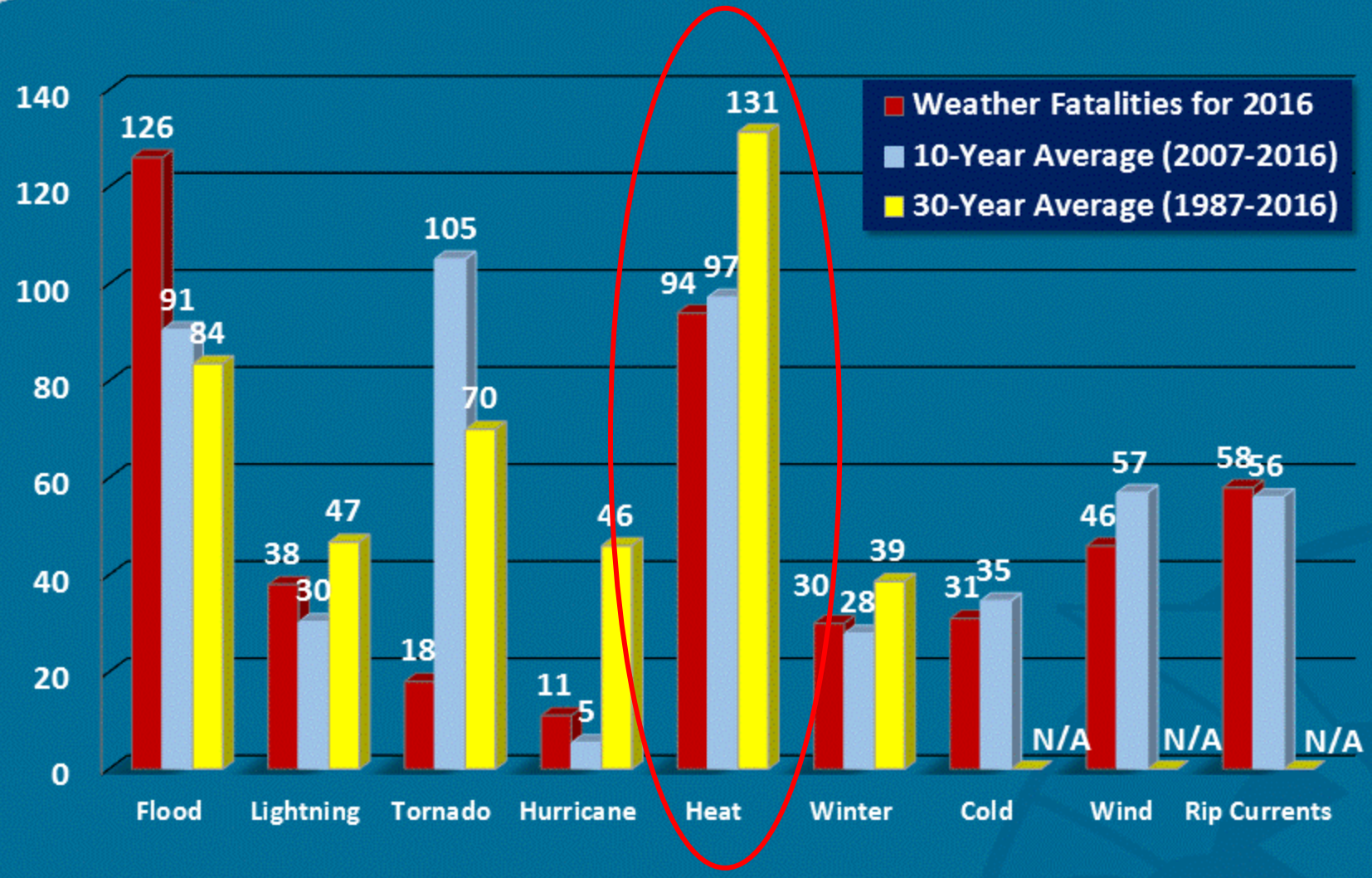
Public Health Services
Improving health, preventing disease, reducing costs *for all*
Department of Health and Human Services

Educational Objectives

- Identify challenges and opportunities in addressing rising temperatures, heat stress and actions to stay cool
- Report on findings of Heat and Health Study, and emphasize impact of moderate heat
- Report on findings of community-level interventions, and emphasize the need for evidence-based actions
- Discuss heat-related activities within our agency or community

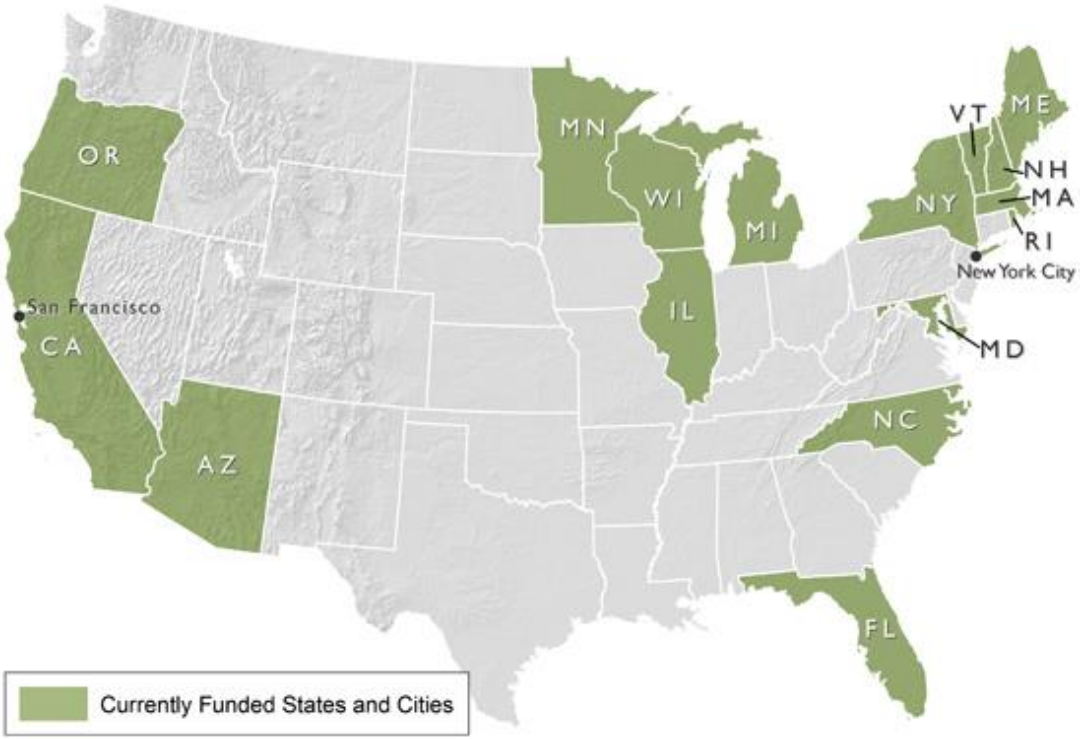

Impact of Climate Change on Human Health
Injuries, fatalities
Asthma, cardiovascular disease
Heat stress, cardiovascular failure
Severe Weather
Air Pollution
Malaria, dengue, encephalitis, hantavirus, Rift Valley fever
Heat
Vector-borne Diseases
RISING TEMPERATURES
WEATHER EXTREMES
RISING SEA LEVELS
Malnutrition, diarrhea, harmful algal blooms
Water and Food Supply
Allergies
Respiratory allergies, poison ivy
Mental Health
Water-borne Diseases
Anxiety, despair, depression, post-traumatic stress
Environmental Refugees
Cholera, cryptosporidiosis, campylobacter, leptospirosis
Forced migration, civil conflict
Adapted from J. Patz
CS246451

Weather Fatalities 2016

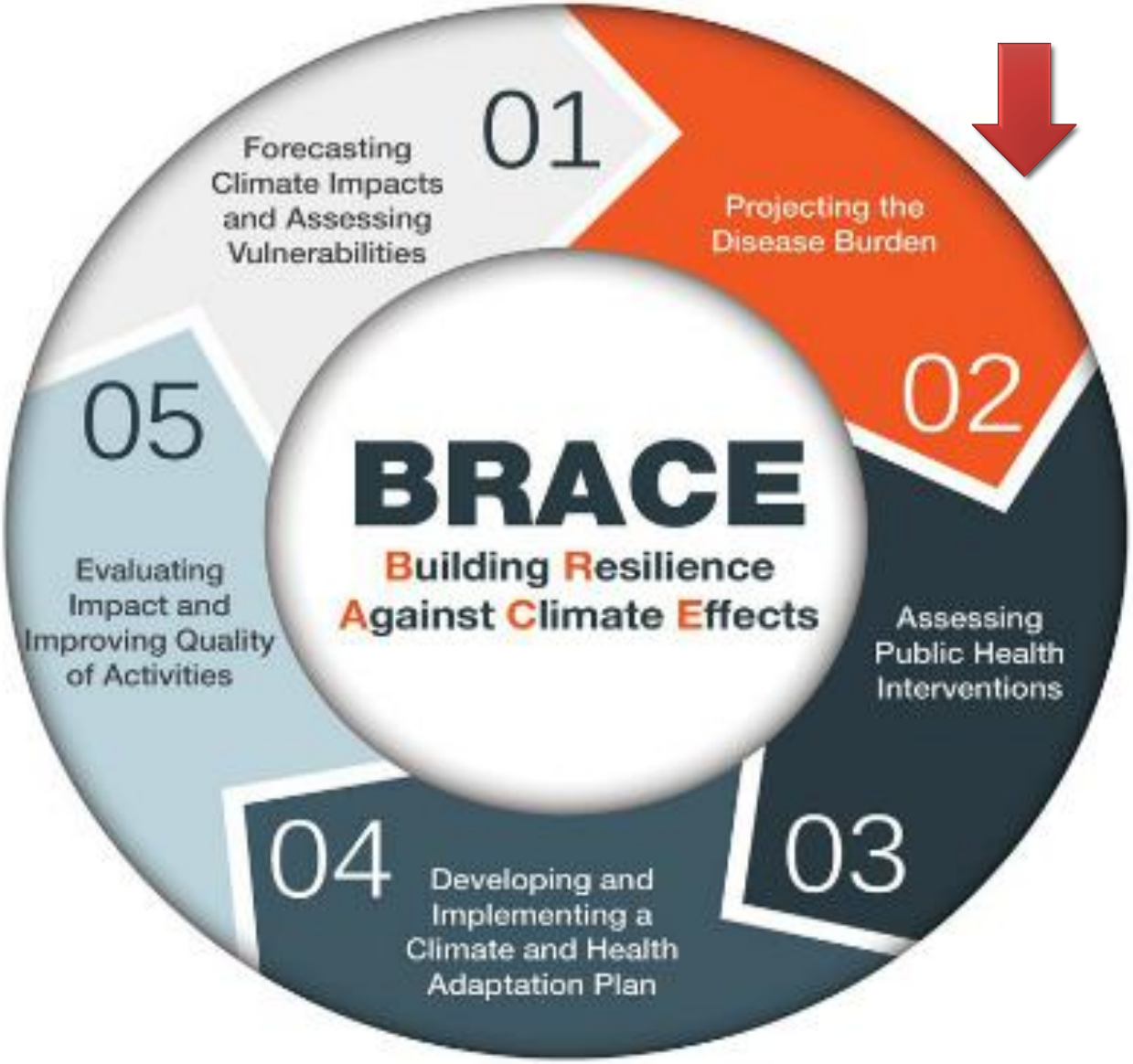


Intro to the BRACE Process

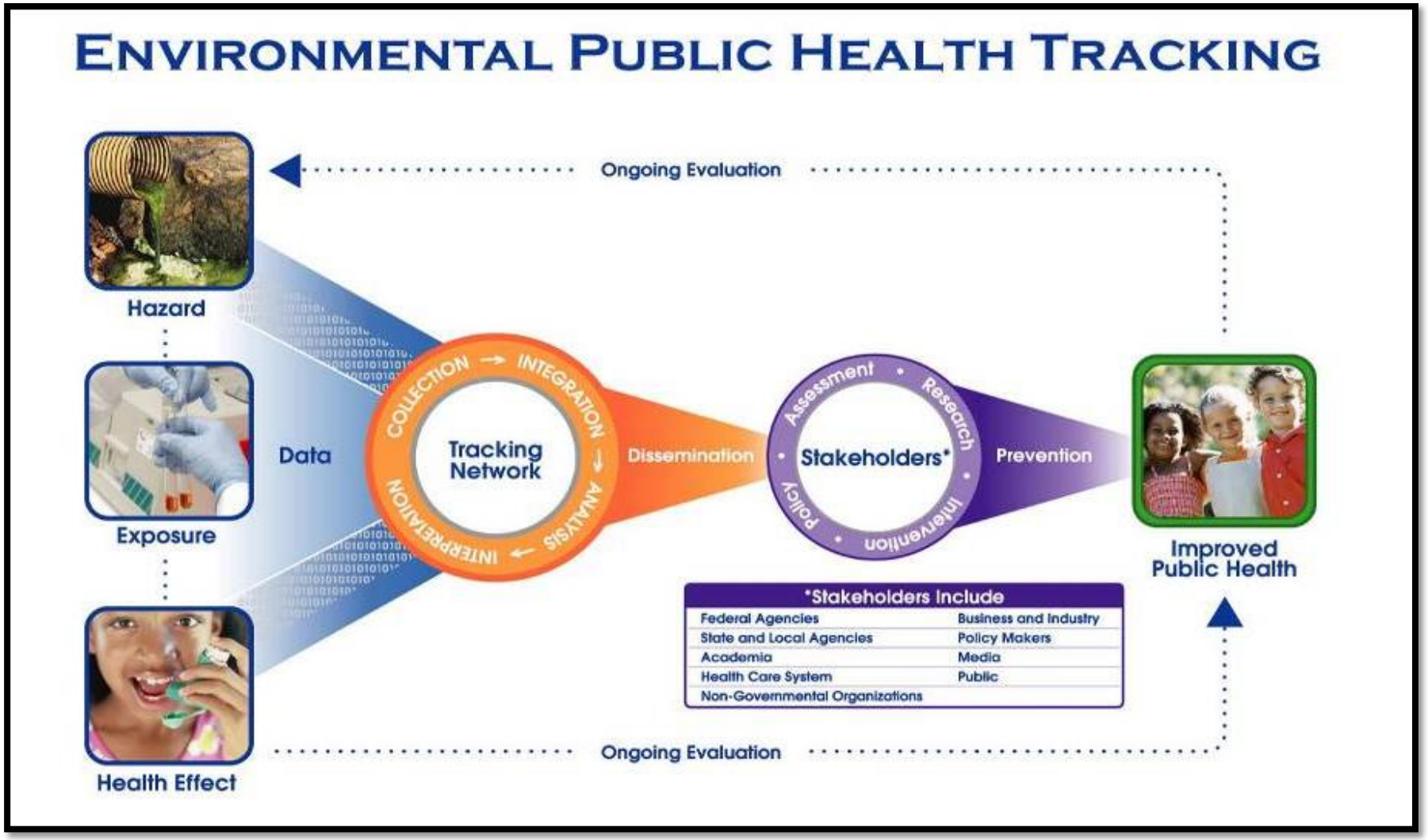
- Our charge: Building Resilience Against Climate Effects, so they can ‘bounce back’ or adapt to health threats
- Our peers: The framework is being tested in 16 states, 2 cities, and 3 tribal nations
- Our framework for action:
  A 5-step process



The Framework

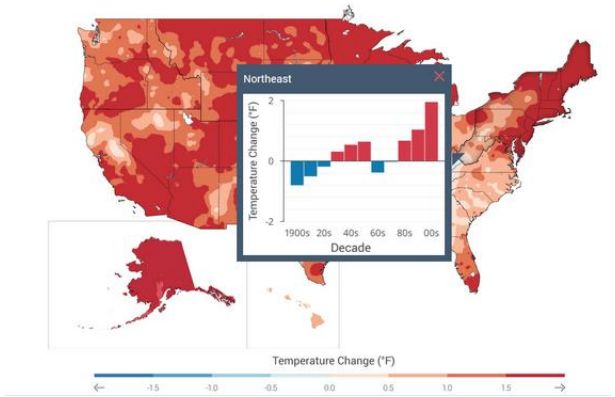


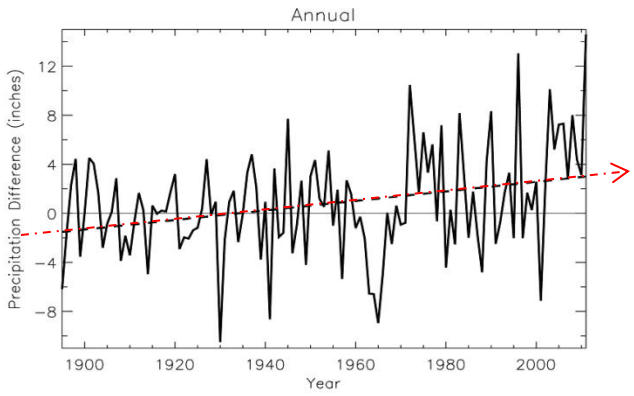
Intro to EPHT

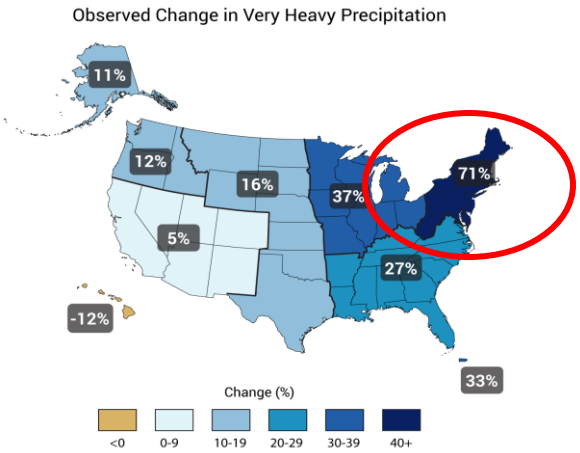


Climate Trends in the Northeast

- The Northeast is getter warmer, wetter, with more extreme weather, and sea level rise.







EXTREME WEATHER IMPACTS ON HUMAN HEALTH IN NEW HAMPSHIRE

Kelly Neugent, EriC Kelsey
Plymouth State University

Kathleen Bush, Matt Cahillane
NH Department of Health & Human Services

Final Report completed
January 20, 2017

WEATHER & INJURY STUDY

Phase I – Weather Trends. Explored exposure to Extreme Weather Metrics (EWMs), temp extremes, annual temperatures & precipitation from 1981-2015

Phase II – Health Trends. Explored adverse health outcome variables to identify trends, seasonality, and relation to exposure variables from 2001 – 2009

Phase III – Correlations. Evaluated the relationships between all exposure variables and all health outcome variables.

January 2017

Data & Methodology

New Hampshire Limited Use Hospital Discharge Dataset

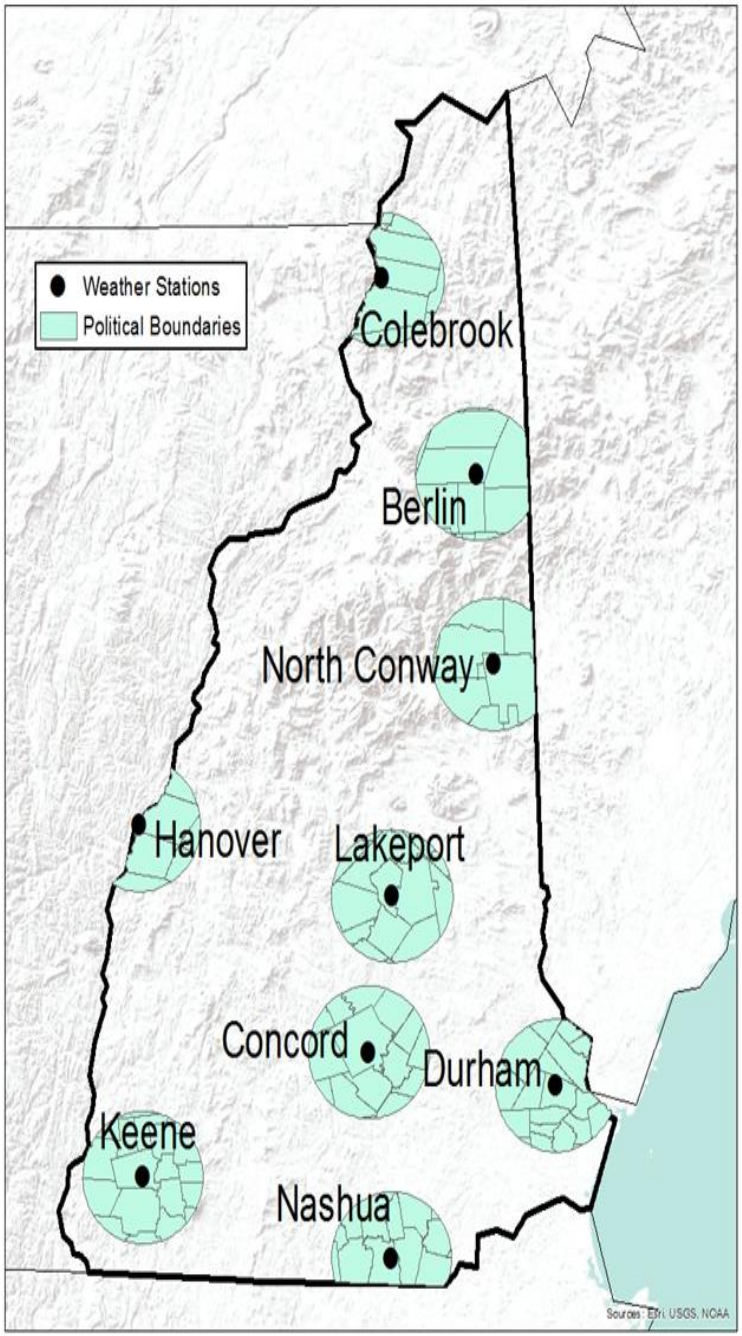
(2001-2009)

- All-Cause Injury
- Vehicle Accidents
- Accidental Falls
- Accidents due to Natural or Environmental Causes
- Accidental Drowning
- Carbon Monoxide Poisoning

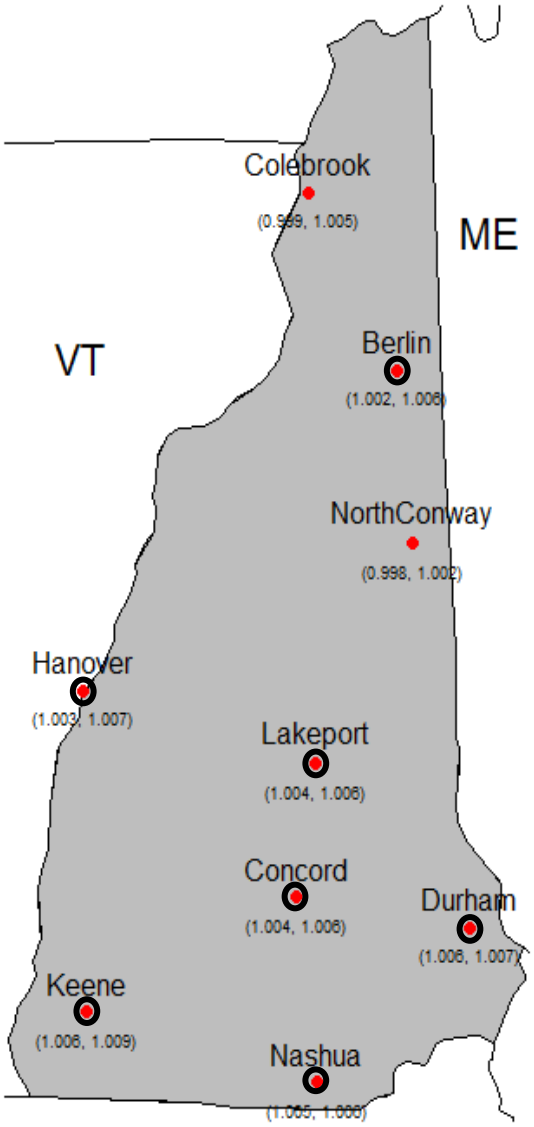
Methodology

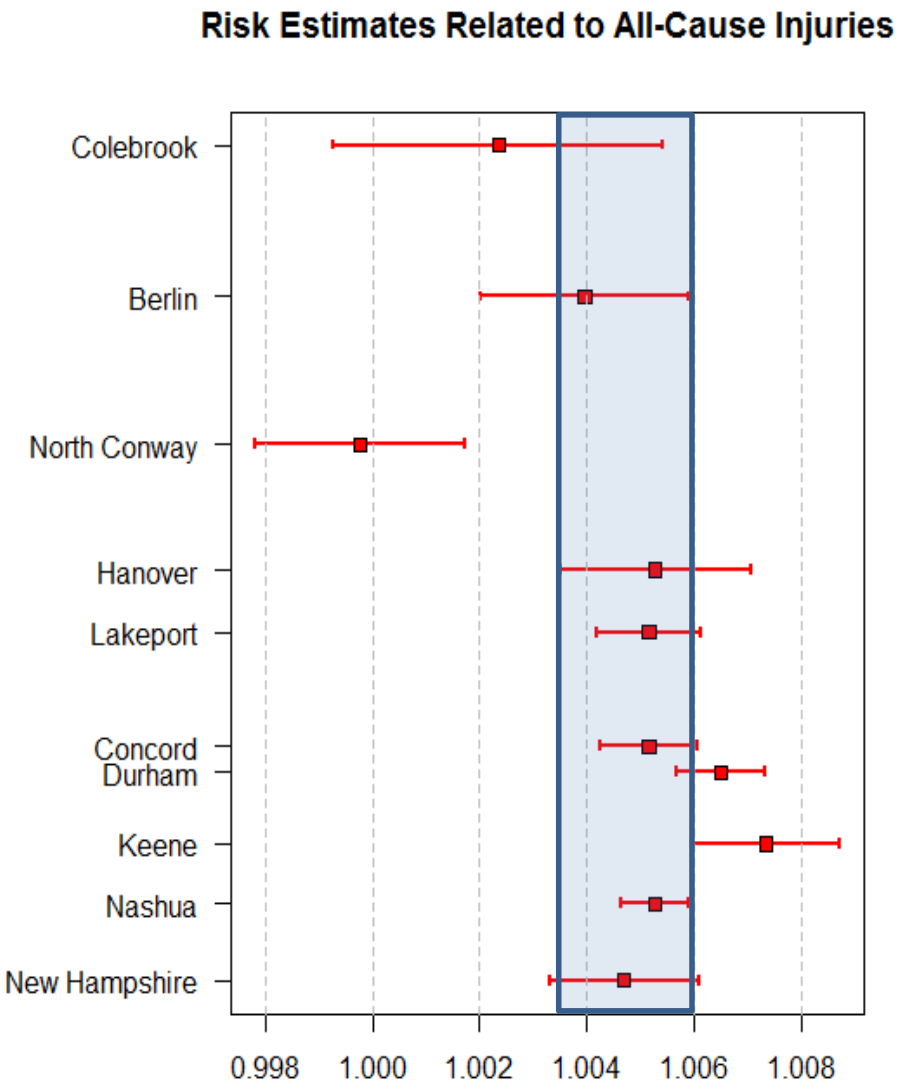
- Created 10 mile buffers
- Ran descriptive statistics
- Calculated Injury Rates
- Calculated Correlations
- Ran Regression Analyses

Towns within 10 miles of Weather Stations



Risk Estimates: Max Temp & All-Cause Injury





Overall Findings

TEMPERATURE: The lowest annual minimum temperature is increasing (less very cold days). The number of days below freezing are increasing (more moderate cold days); No change in number of hot days.

VEHICLE ACCIDENTS: MVAs are decreasing at a statistically significant rate (with the exception of Keene);

ACCIDENTAL FALLS: Slips and falls are increasing at a statistically significant rate (with the exception of Berlin, Hanover, and North Conway).

HEAT RELATED VISITS have the highest cumulative relative risk of all exposure outcome pairs, highest risk in Hanover;

ALL CAUSE & VEHICLE ACCIDENTS have comparable relative risks, highest risk in Keene;

ACCIDENTAL FALLS indicates decreasing risk as temperatures increase, highest risk in North Conway.

Climate Projections

Northern New Hampshire

Indicators	Historical* 1980–2009	Change from historical (+ or -)					
		Short Term 2010–2039		Medium Term 2040–2069		Long Term 2070–2099	
		Low Emissions	High Emissions	Low Emissions	High Emissions	Low Emissions	High Emissions
Temperature Extreme (days per year)							
<32°F	178.0	-9.7	-11.3	-16.5	-26.3	-20.2	-45.5
<0°F	28.0	-7.1	-7.0	-11.0	-15.8	-13.4	-21.2
>90°F	3.4	2.3	3.0	6.7	14.4	10.3	34.9
>95°F	0.4	0.3	0.6	1.2	3.6	2.3	12.5

Southern New Hampshire

Indicators	Historical* 1980–2009	Change from historical (+ or -)					
		Short Term 2010–2039		Medium Term 2040–2069		Long Term 2070–2099	
		Low Emissions	High Emissions	Low Emissions	High Emissions	Low Emissions	High Emissions
Temperature Extreme (days per year)							
<32°F	164.0	-9.5	-10.9	-15.8	-25.5	-19.5	-43.9
<0°F	16.0	-5.0	-5.1	-7.8	-10.6	-9.0	-14.2
>90°F	6.7	4.2	5.2	11.1	21.7	16.2	47.3
>95°F	1.0	0.8	1.2	2.7	7.0	5.1	21.8

Climate Solutions New England: https://sustainableunh.unh.edu/csne-pubs

Impact of Heat on Health

- The Northeast Regional Heat Collaborative

Lowering Our Heat Advisory Threshold to Protect Public Health

BROWN

State of Rhode Island
Department of Health

NH DIVISION OF
Public Health Services
Improving health, preventing disease, reducing costs for all
Department of Health & Human Services

Maine Center for Disease Control and Prevention
An Office of the Department of Health and Human Services
Paul R. LePage, Governor
Mary C. Mayhew, Commissioner

Rationale

Heat is a major threat to public health.

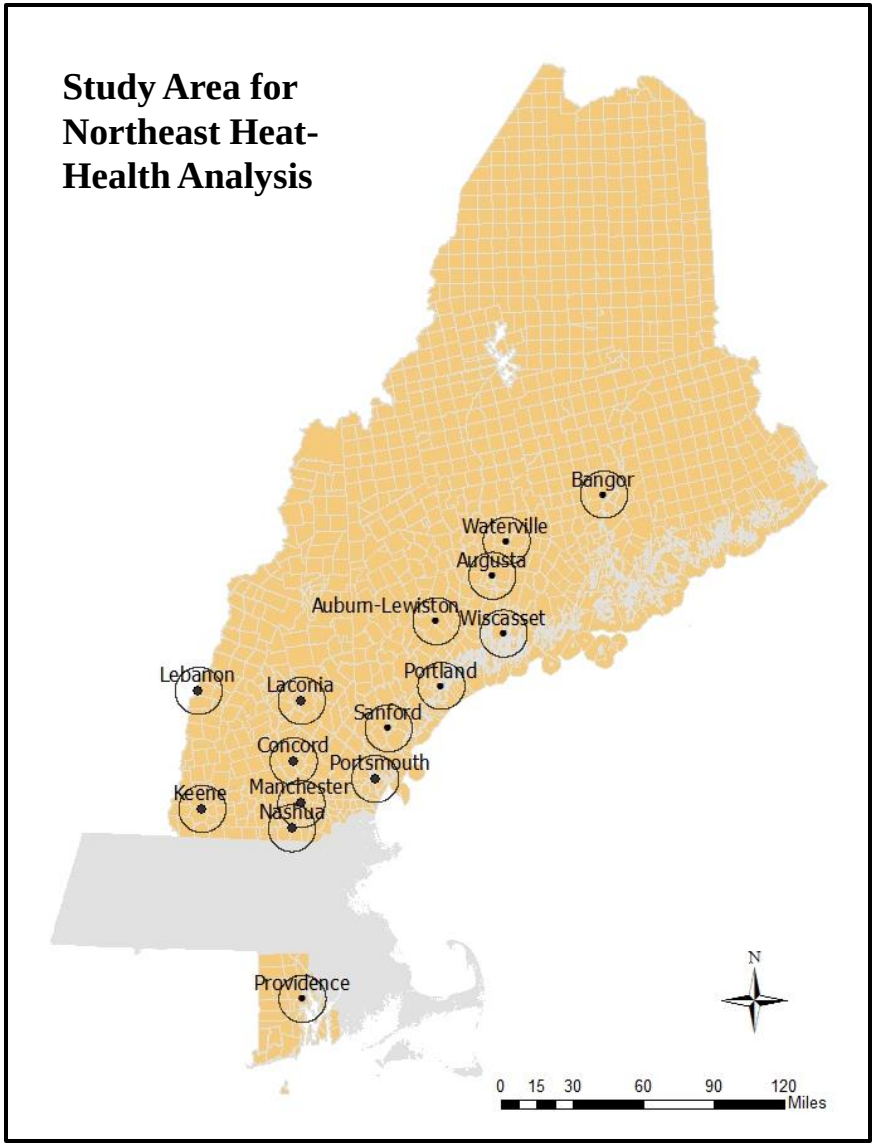
Limited information on:

- risk of ED visits,
- effects in the Northeast,
- impacts outside of large metropolitan areas.

Hypothesis: We can reduce heat-related illness and death by lowering the NWS heat advisory threshold and taking action sooner.

Key Questions

- How does heat index impact health?
- Are current Heat Advisories optimal for protecting public health in the Northeast?
- What can state and local health agencies do to reduce risk?



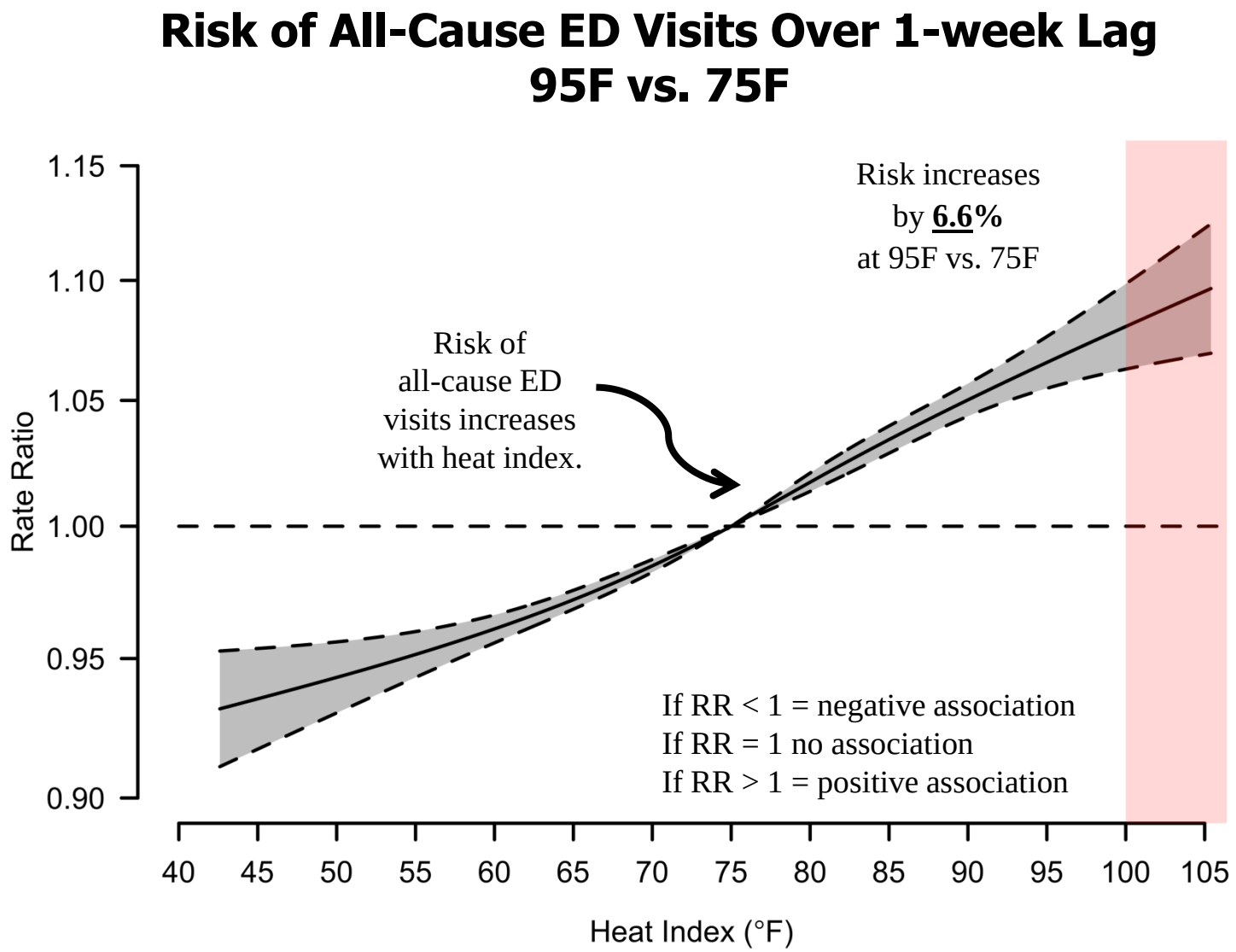
Meteorological Characteristics

Study Site	Maximum Daily Heat Index (F)			Average Annual Number of Days	
	Median	75th Percentile	Maximum	HI ≥ 95F	HI ≥ 100F
Concord	76	83	106	4.8	1.2
Keene	75	82	105	2.7	0.7
Laconia	74	81	103	2.5	0.6
Lebanon	75	81	105	3.2	0.7
Manchester	76	83	105	4.4	1.1
Nashua	78	85	113	9.4	3.9
Portsmouth	74	82	112	5.8	1.7

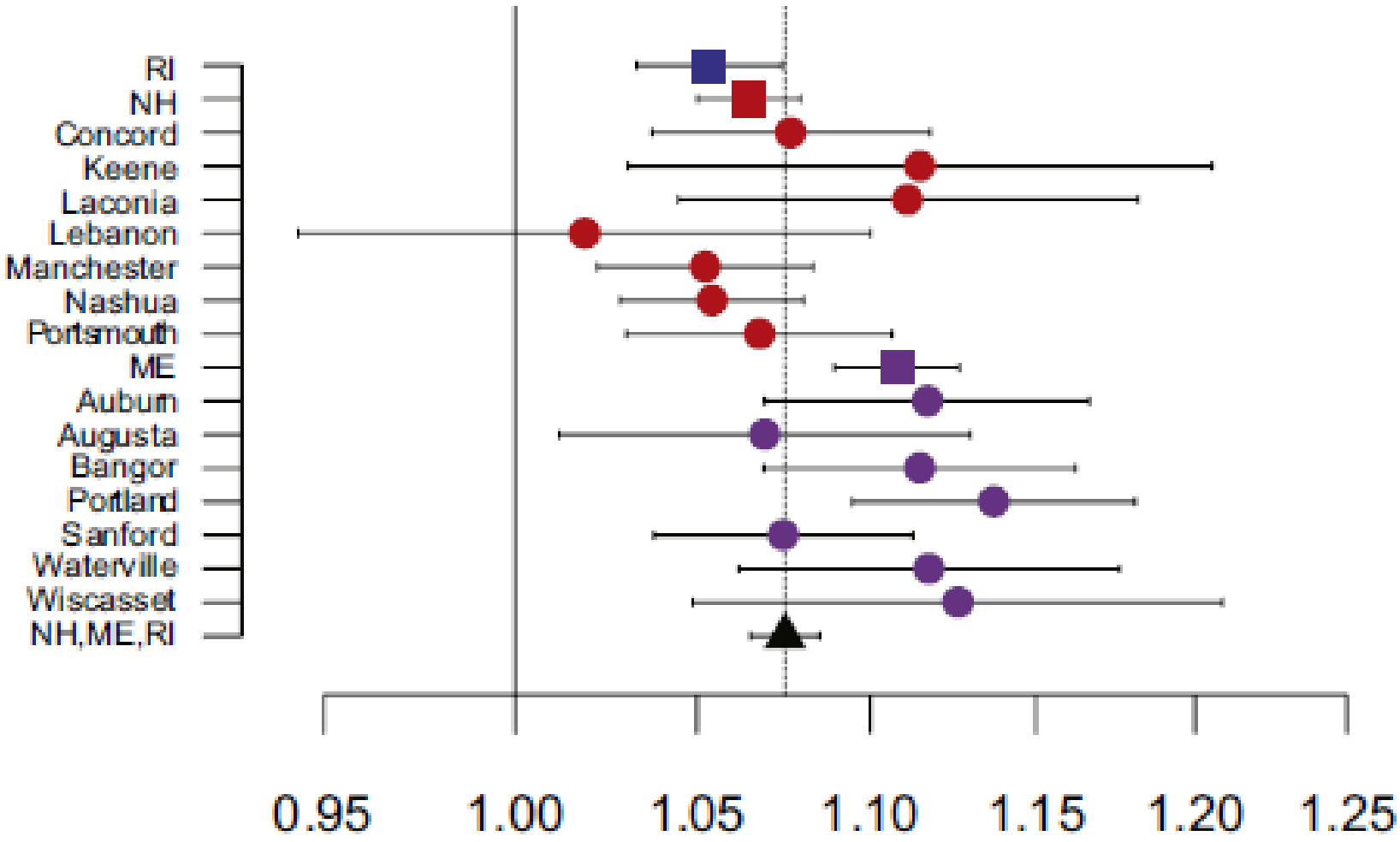
Patient Characteristics

Study Site	Emergency Dept Visits		Deaths	
	Median Age	Age ≥ 65 (%)	Median Age	Age ≥ 65 (%)
Concord	36	14.7	79	76.3
Keene	38	21	80	79.7
Laconia	38	20.6	79	78.4
Lebanon	39	19.2	81	82.4
Manchester	34	12.5	78	73.8
Nashua	36	14	77	72.6
Portsmouth	37	17.8	80	80.3

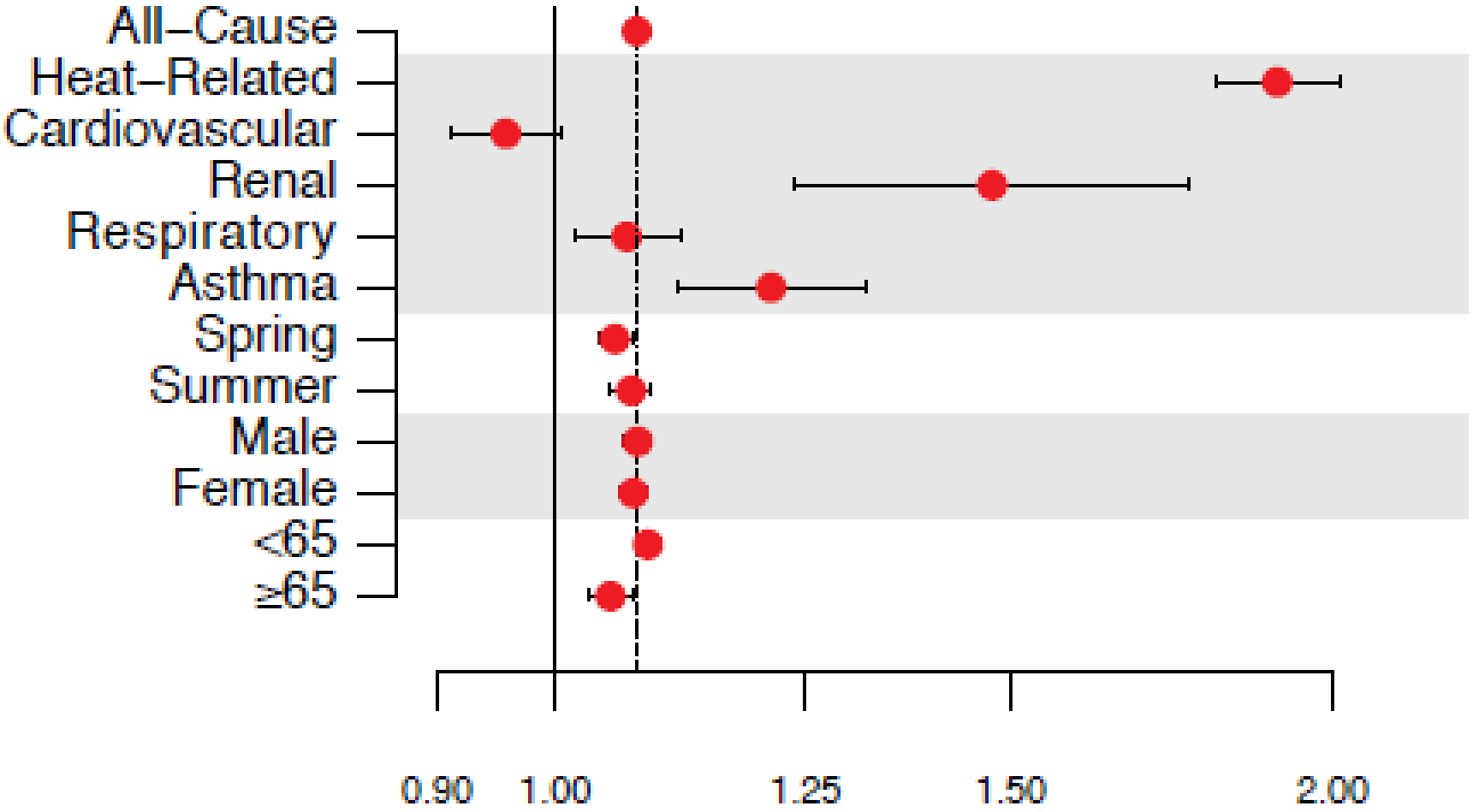
Heat and Health – Estimating risk



Risk of All-Cause ED Visits by Study Location



Risk of All-Cause ED Visits by Cause, Season and Demographics



Summary of Results

For a day when the max heat index was 95ºF (compared to 75ºF):

- **All-cause ED visits ↑ 6.6% over the following 7 days**
- **Heat-related ED visits ↑ 89% over the following 7 days**
- **Deaths ↑ 5.8% on the same day**

Key point: Health effects occur at 'moderate' heat index below the current NWS threshold for a Heat Advisory.

Policy Change

OLD NWS THRESHOLDS FOR NORTHEAST

HEAT ADVISORY	HEAT WARNING	HEAT WAVE
100° - 104°F*	105°F and above	3 consecutive days 90°F or higher

*For 2 or more hours

NEW NWS THRESHOLDS FOR NORTHEAST

HEAT ADVISORY	HEAT WARNING	HEAT WAVE
95-104°F*	105°F and above	3 consecutive days 90°F or higher

For 2 or more days, or 100-104°F for any length of time

Taking Action in New Hampshire

Updating the NH State Heat Plan

Excessive Heat Outlook	Issued when the potential exists for a Heat Event in the next 3-7 days. An **Excessive Heat Outlook** provides information to those who need considerable lead time to prepare for the event.
Excessive Heat Advisory	A **Heat Advisory** is issued within 12 hours of the onset of extremely dangerous heat conditions. Issued when the Heat Index (HI) is forecast to be ***at least 100°F for any length of time*** or ***95°F for 2 consecutive days***.
Excessive Heat Warning	An **Excessive Heat Warning** is issued within 12 hours of the onset of extremely dangerous heat conditions. Issued when the HI is forecast to be ***105°F or higher for any length of time***.

Taking Action in New Hampshire

Federal **National Weather Service Northeast Region**

State

Health and Human Services
- Health Alert Network
- Emergency Services Unit
- Public Information Office
- Bureau of Elderly and Adult Services

Homeland Security and Emergency Management
- State Emergency Operations Center
- ReadyNH
- Occupational health

Non-Governmental Orgs
- New Hampshire 211
- Home Care Association of New Hampshire
- New Hampshire Hospital Association
- New Hampshire Senior Center Association

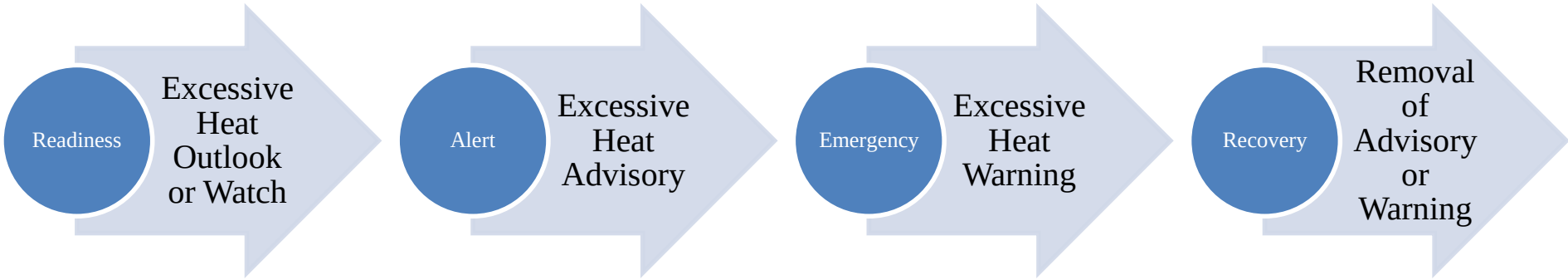
Regional
- Regional Public Health Networks
- Regional media
- ServiceLink
- Hospitals

Local
- Emergency Management Directors
- Community organizations
- Local health departments

Emergency Response Partners

Taking Action in New Hampshire

Phases of Response



Taking Action in New Hampshire

Activation Thresholds

Single Day Events

Forecast Lead Time (hours)	Heat Index (°F)		
	95	100	105
24	Alert	Alert	Warning
48	Readiness	Alert	Warning
72	Readiness	Readiness	Alert
96	Readiness	Readiness	Readiness

NWS issues a Heat Warning when the HI is forecast to be 105 °F or above for any length of time.

NWS issues a Heat Advisory when the HI is forecast to be 100 °F or above for any length of time, or 95 °F for two consecutive days.

Multi-Day Events

Forecast Lead Time (hours)	Heat Index (°F)			
	90	95	100	105
24	Readiness	Alert	Warning	Warning
48	X	Readiness	Alert	Warning
72	X	X	Readiness	Alert
96	X	X	X	Readiness

NWS issues a Heat Warning when the HI is forecast to be 105oF or above for any length of time.

NWS issues a Heat Advisory when the HI is forecast to be 100oF or above for any length of time, or 95oF for two consecutive days.

Heat-Vulnerable Populations

Extreme heat affects everyone, but some populations may be exceptionally vulnerable.

CHILDREN

EMERGENCY RESPONDERS

THE ELDERLY

OUTDOOR WORKERS

ATHLETES

PETS

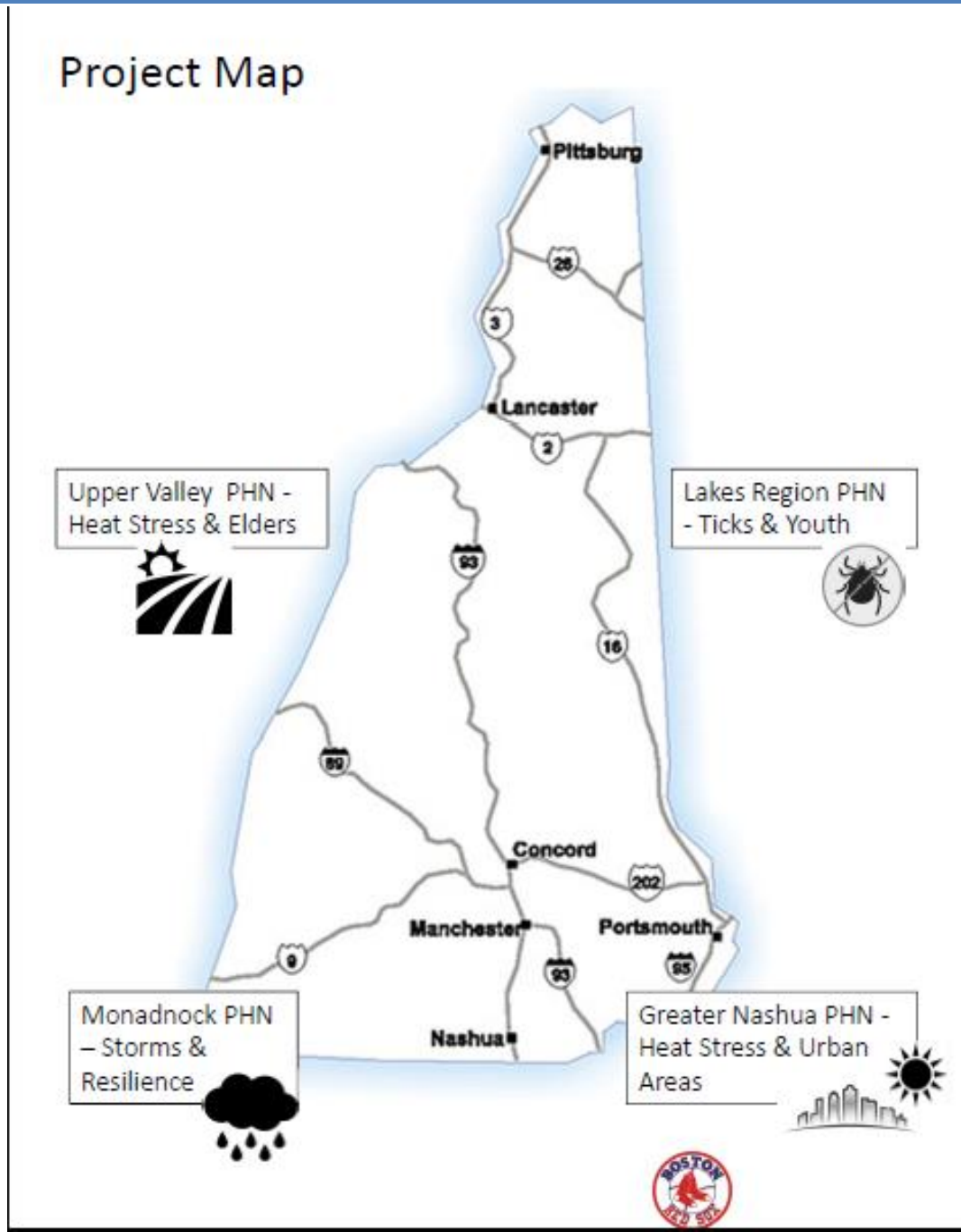
Evidence for Heat Interventions

Heat-related illness Interventions		
Intervention	Description	Evidence
Heat Alert System	*Heat alert system* refers to a city preparing **a comprehensive plan that is activated when temperatures exceed a threshold**. The systems often have **levels of incremental activities** based on heat advisories by an agency that provides weather forecasts.	Sufficient evidence
Education & Information	*Education and information* is when entities **provide information about heat-related illness, and how to prevent, identify, and treat it**.	Some evidence
Access to Cooling	*Access to cooling* refers to **making air conditioned places publicly available** for those who do not have access to air conditioning.	Some evidence
Real-Time Surveillance	*Real-Time Data Surveillance and Warnings* consists of monitoring ambient heat-related hospital visits, 9-11 calls, and weather data.	Little evidence
Built Environment	*Built environment* refers buildings & public spaces designed to reduce outdoor and indoor temperatures.	Insufficient evidence
Zoning/Building Regulations	*Zoning/Building Regulations* are city codes to reduce ambient and indoor heat in residential or commercial development plans.	Insufficient evidence

Source: Illinois DoH, Heat-Related Illness Interventions, 2016. unpublished

4 Climate Adaptation Projects

- Communities funded to plan & act via BRACE framework
- Focused on regional hazards, at-risk pops, and likely health impacts
  - Rural heat stress
  - Urban heat stress
  - Tickborne disease
  - Severe precipitation/flood



Resources Invested $

- Our community-level climate adaptation projects received $20k per year for 2-3 years
- Vendors needed significant training, tech support, and templates from state agency, DoH labor estimated at >30 hours per project
- Budget also included technical assistance from a project evaluation consultant at >20 hours per project
- Total investment of $40-60k per project
- Projects required a timeline of 4 years to raise funds, develop contract, implement interventions, and report on the impact

Heat Stress in Older Adults

Upper Valley PHN
Heat Stress & Elders

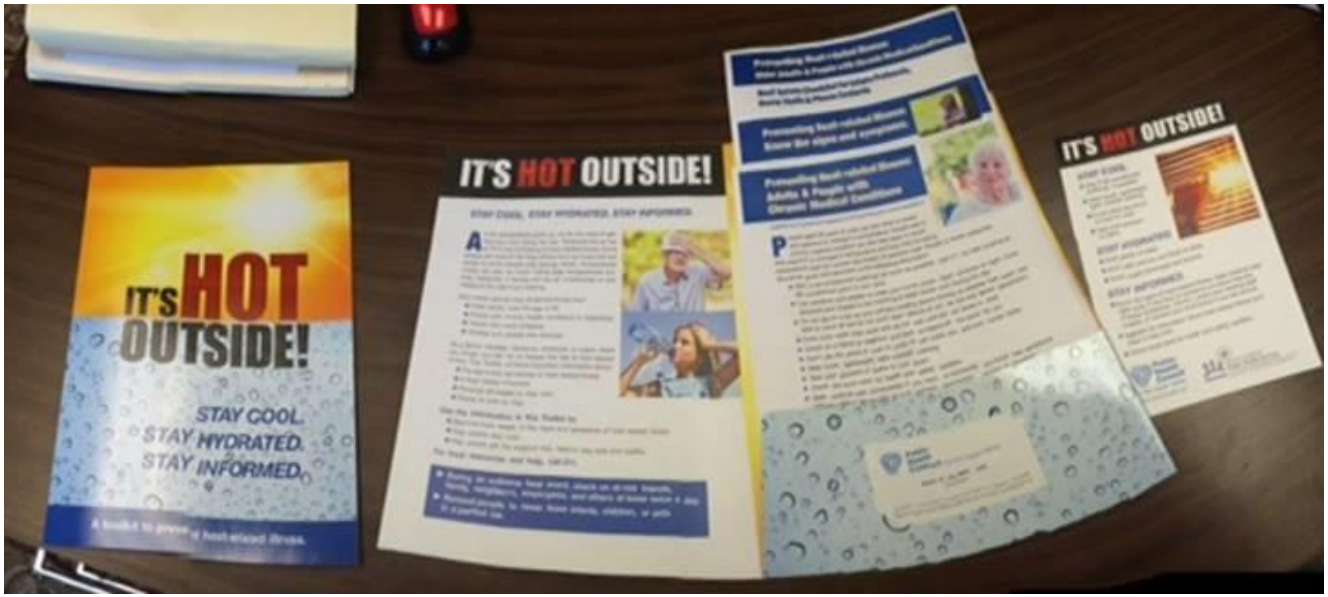
- Target audience was caregivers & volunteers
- At-risk population was identified as older adults (65+) living alone
- Found access to elders via activity events & existing meal delivery service

meals on wheels

Upper Valley Education Project

Upper Valley PHN
Heat Stress & Elders

- Engaged with a focus group of local advisors to assess climate hazards & community wants/needs
- Prioritized areas of rising temps, heat stress and injury among older adults, especially those living alone (shut-ins)
- Intervened via education lecture to target audience of 39 caregivers to teach risk factors, then they reached out to older adults



Preliminary Results

Training

- Train the Trainer
  - Trained 4 people from 3 organizations, then these people trained 26 volunteers and 13 staff in direct contact with older adults (39 total)
- Educational materials
  - Toolkit
  - Information Card
  - Tumbler
  - Magnets

Evaluation

- Pre-test Surveys (39)
- Post-test Surveys (12)
- Demonstrated small increases in knowledge (5-10%), large loss to follow up (70%)

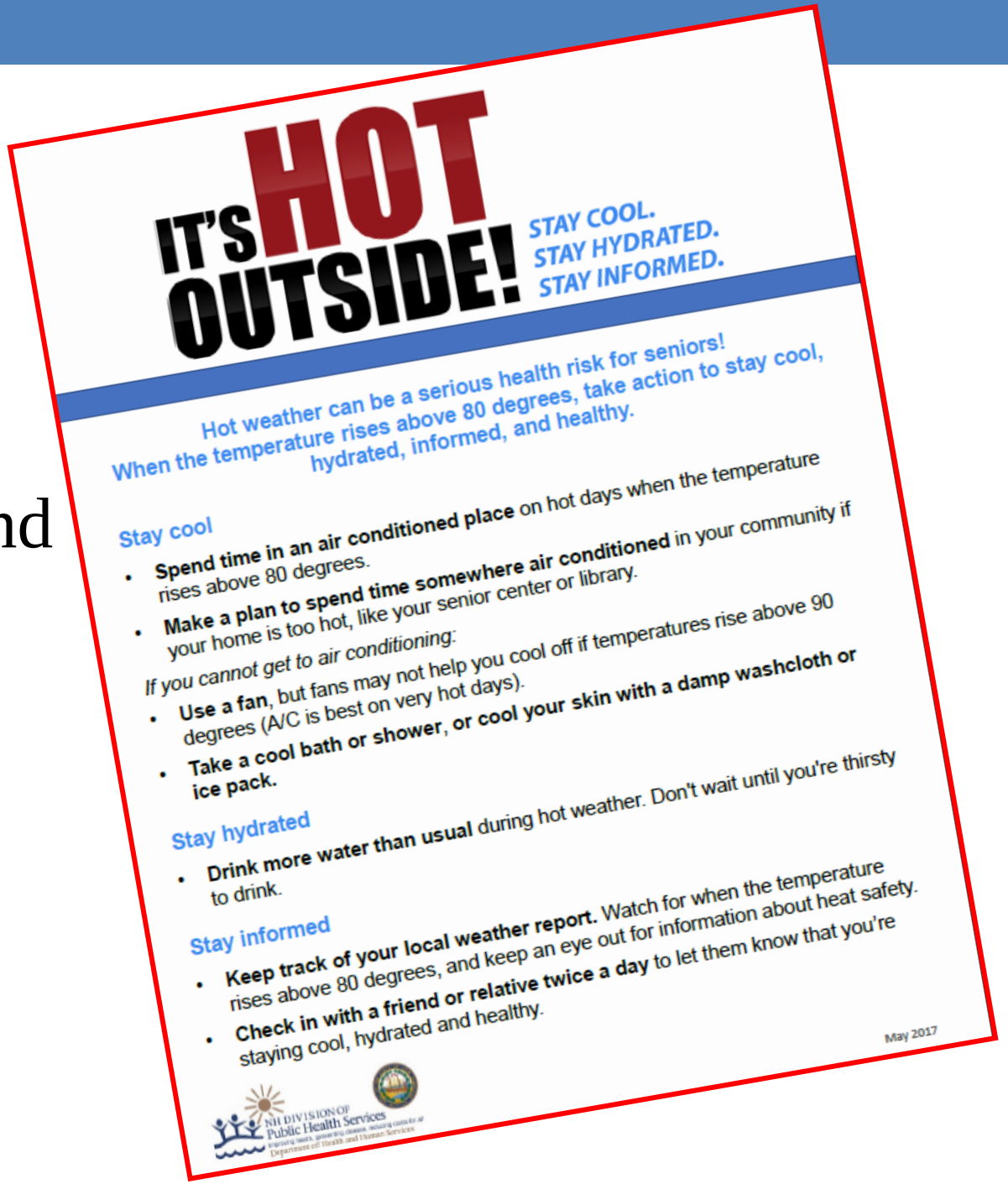
Contact Results

- 156 Contacts, and 29 Follow Ups
- 129 at Senior Lunches

Factsheet for Older Adults

Simple content and format:

- Stay Cool
- Stay Hydrated
- Stay Informed



IT'S HOT OUTSIDE!

STAY COOL.
STAY HYDRATED.
STAY INFORMED.

Hot weather can be a serious health risk for seniors!
When the temperature rises above 80 degrees, take action to stay cool, hydrated, informed, and healthy.

Stay cool

- **Spend time in an air conditioned place** on hot days when the temperature rises above 80 degrees.
- **Make a plan to spend time somewhere air conditioned** in your community if your home is too hot, like your senior center or library.

If you cannot get to air conditioning:

- **Use a fan**, but fans may not help you cool off if temperatures rise above 90 degrees (A/C is best on very hot days).
- **Take a cool bath or shower, or cool your skin with a damp washcloth or ice pack.**

Stay hydrated

- **Drink more water than usual** during hot weather. Don't wait until you're thirsty to drink.

Stay informed

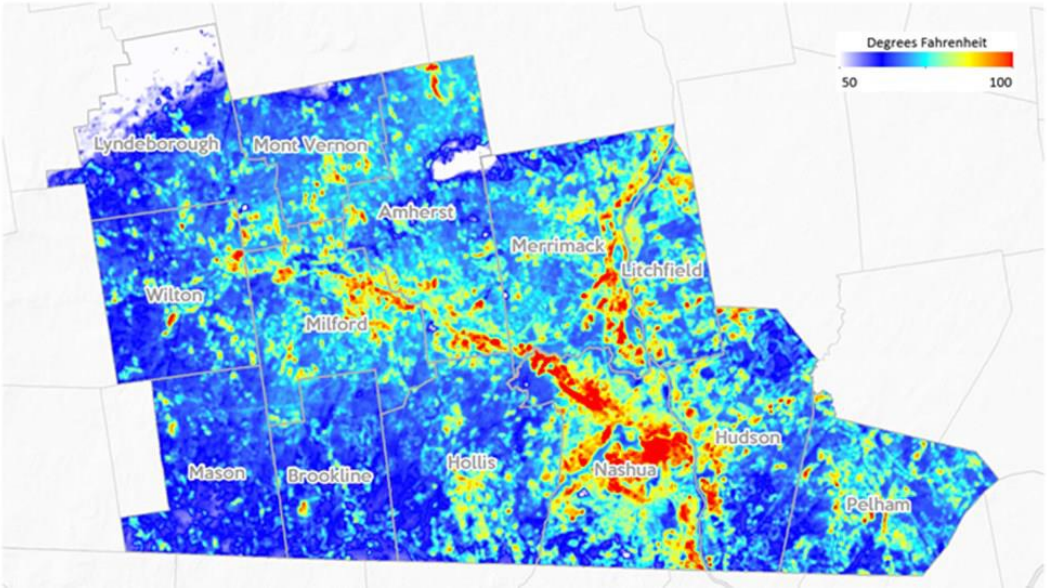
- **Keep track of your local weather report.** Watch for when the temperature rises above 80 degrees, and keep an eye out for information about heat safety.
- **Check in with a friend or relative twice a day** to let them know that you're staying cool, hydrated and healthy.

May 2017

NH DIVISION OF Public Health Services

Nashua Heat Stress Training and Awareness

- Target audience was municipal emergency managers who were in charge of preparedness and response
- At-risk population was defined as urban and sub-urban residents, some affected by heat island effect.
- Created access to emergency managers via an existing training event



Heat map of urban hot spots in the Greater Nashua region.

CITY OF NASHUA
Division of Public Health & Community Services
18 MULBERRY STREET • NASHUA, NH • 03060

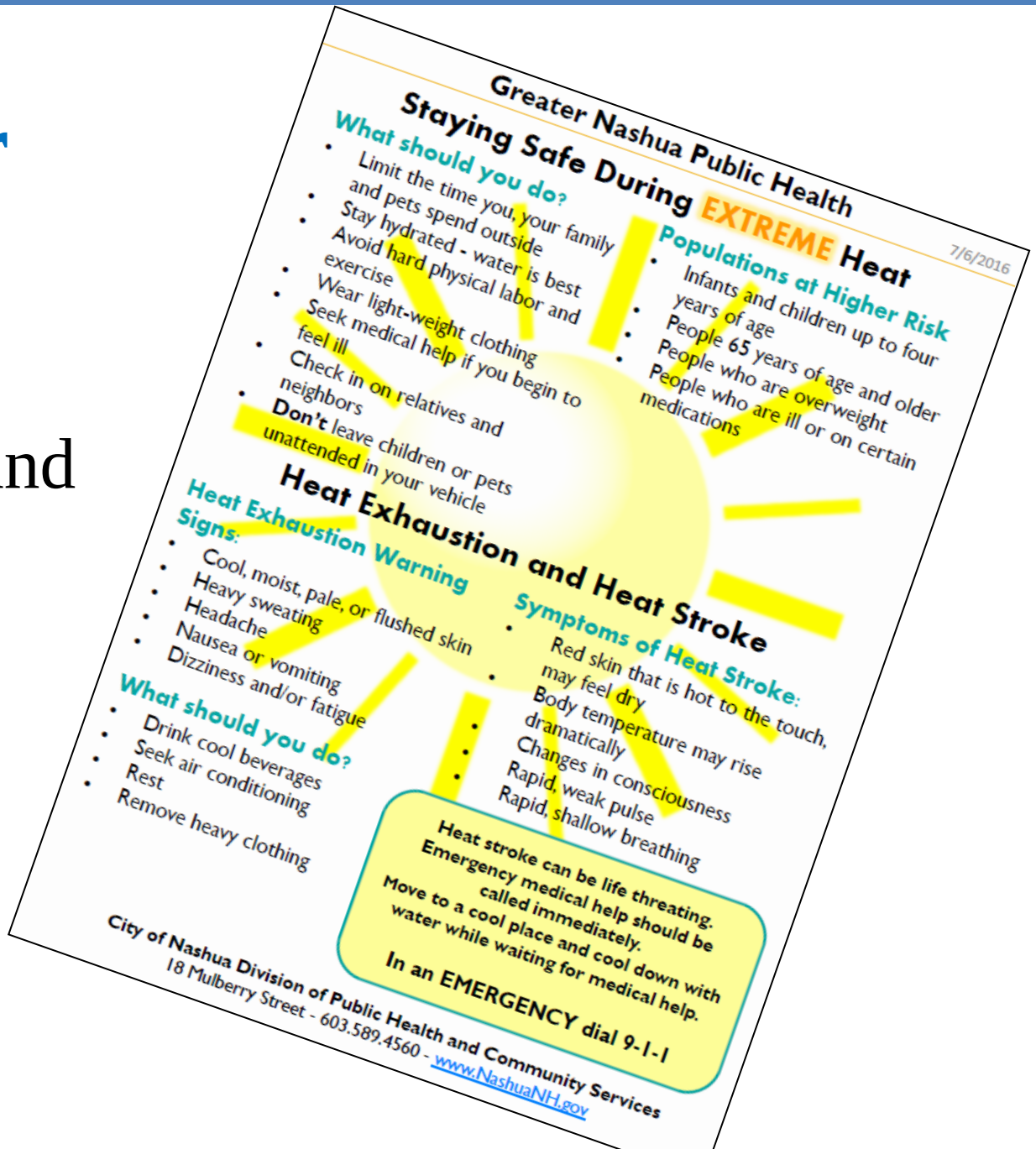
Nashua Area Education Project

- Engage with local advisors to assess climate hazards & community wants/needs
- Prioritized areas of rising temps, heat stress and injury among all residents, with a focus on low-income neighborhoods
- Intervened via education lecture to target audience of 20 emergency managers
- Evaluation showed small increase in knowledge on a quiz, no loss to follow up as pre-post tested on same day

Factsheet for Urban Area

Simple content and format:

- What to do
- Who's at risk
- Warning signs



Lessons Learned

- Planning and choosing climate hazards took a lot of time and energy, which delayed the intervention process
- Interventions produced modest change in knowledge
- Agency capacity building and partnerships may be worth more than the change in knowledge or behavior
- In the future, fund fewer projects with more focused attention on methods, taking action and support for evaluating success
- In the future, limit the # hazard types in order to maximize intervention efforts

Developing an Action Plan

1. What ideas do you have for next steps / future work?
2. What heat-related work are you doing in your community?
3. How will you incorporate what you learned today into your work?
4. What is one concrete thing you will implement this Heat Season?
5. Who is the target audience?
6. How will you measure your impact?

Additional Discussion

Establishing Communication Channels

- How does your jurisdiction/organization receive weather alerts?
- How do you share this information with others?
- How can you increase community awareness of heat events?
- What are the key messages?

Identifying Vulnerable Populations

- Who are the most vulnerable populations in your jurisdiction/organization?
- How do you reach vulnerable populations during a heat event?

Implementing Heat Response Plans

- What are the triggers for action in your jurisdiction/organization?
- How and when are key messages disseminated?
- What are the most important actions to take during a heat event?

Thank you.

Questions? Comments? Feedback?

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- Contents of this presentation are the views of the authors and do not reflect the official views of the CDC or their respective health agencies.

- Please visit and support the CDC at:

https://www.cdc.gov/climateandhealth/default.htm