

Climate Change and Public Health: CDC's Role



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Chief
Climate and Health Program

**Division of Environmental Hazards and Health Effects
National Center for Environmental Health
Centers for Disease Control and Prevention**

Objectives

- Review evidence for climate change and its impact on human health
- Describe CDC efforts to prepare for health effects of climate change

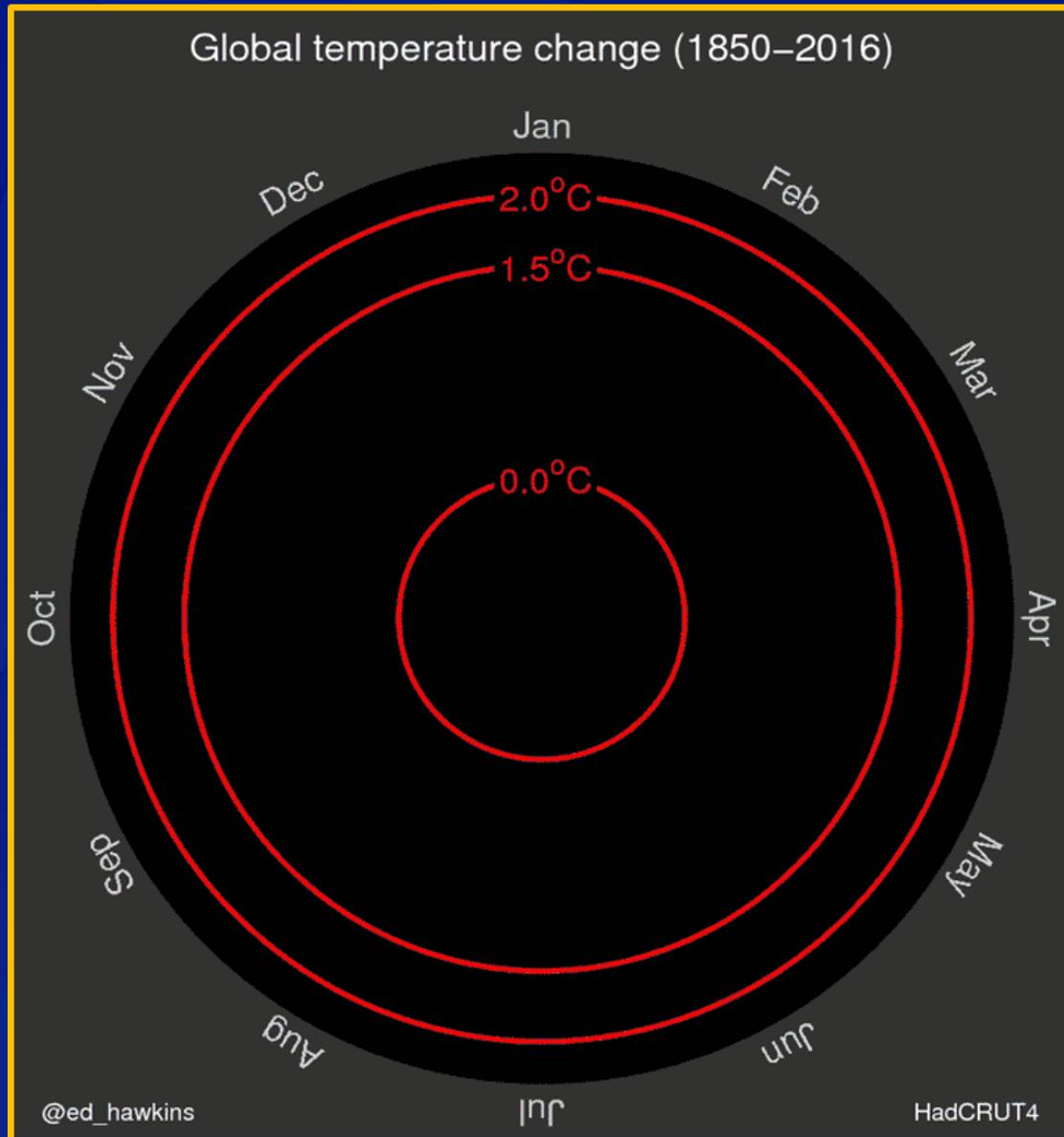


Climate Change Science: Key Findings

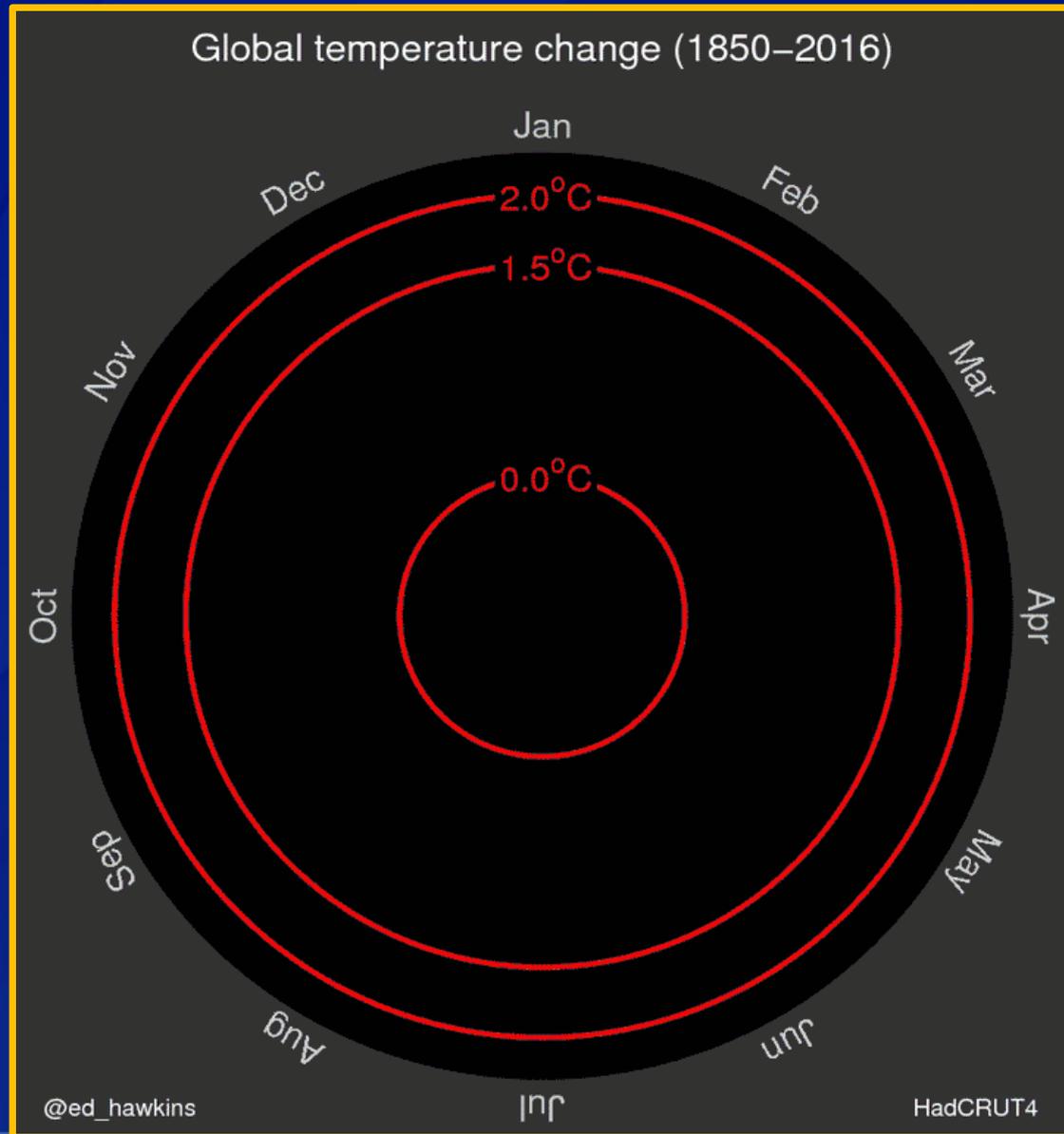
- ❑ Climate change is altering both the average (mean) global temperature *and* the global frequency of extremely hot temperatures (variance)
- ❑ The impacts of climate change will vary significantly by region; some places are warming faster than others.



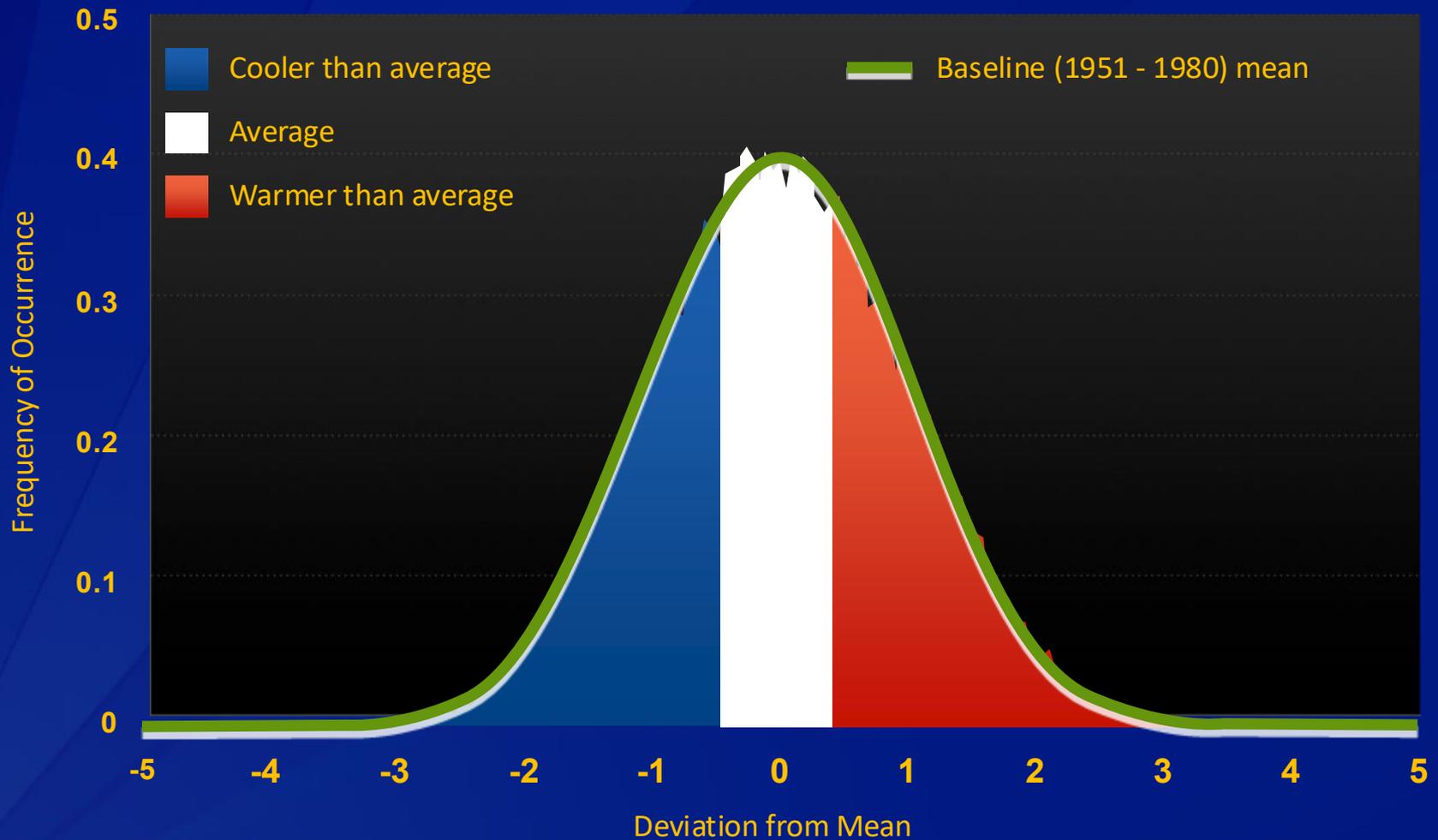
Global Average Temperatures have been increasing



Global Average Temperatures have been increasing

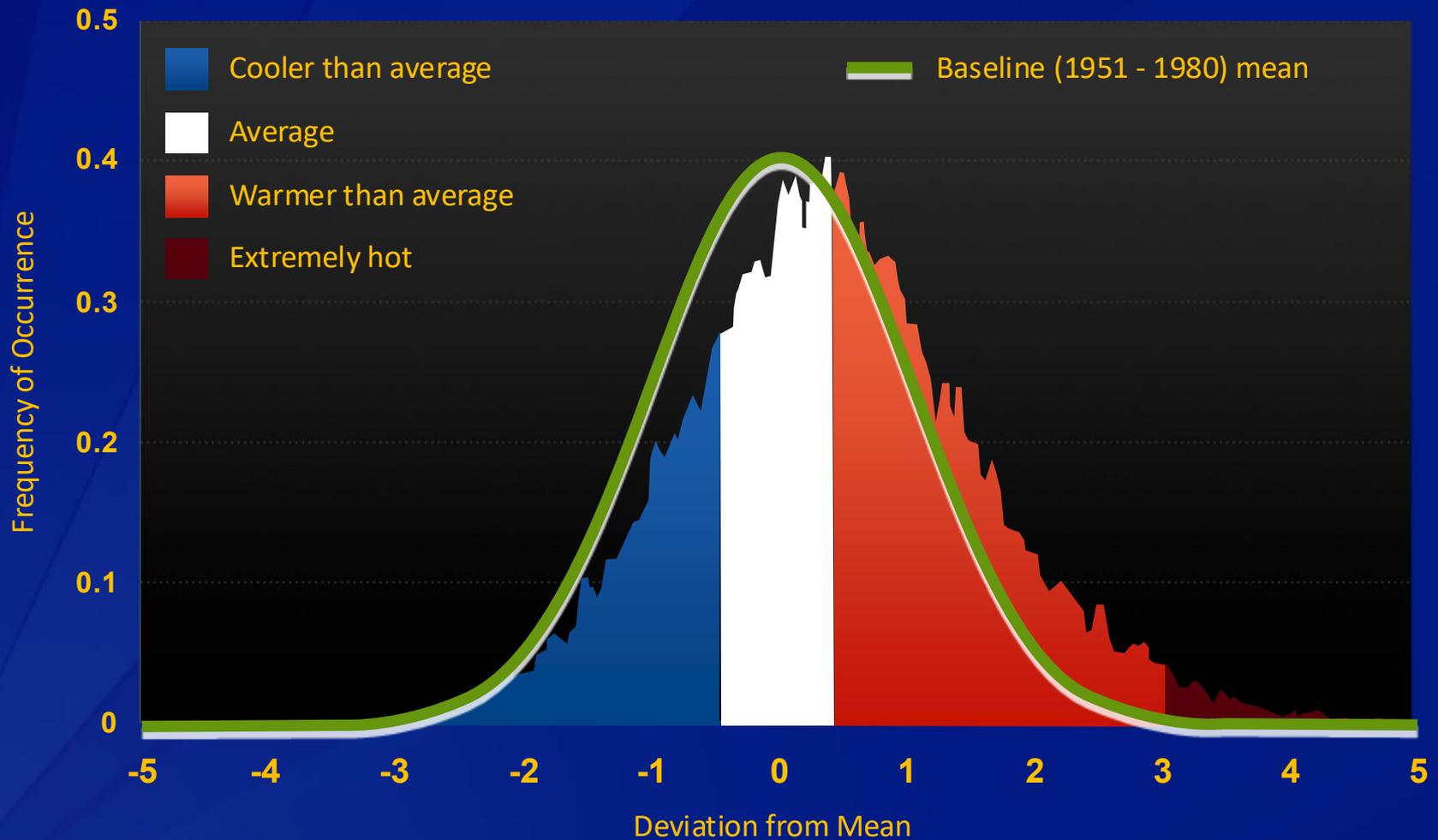


Summer Temperatures 1951–1980



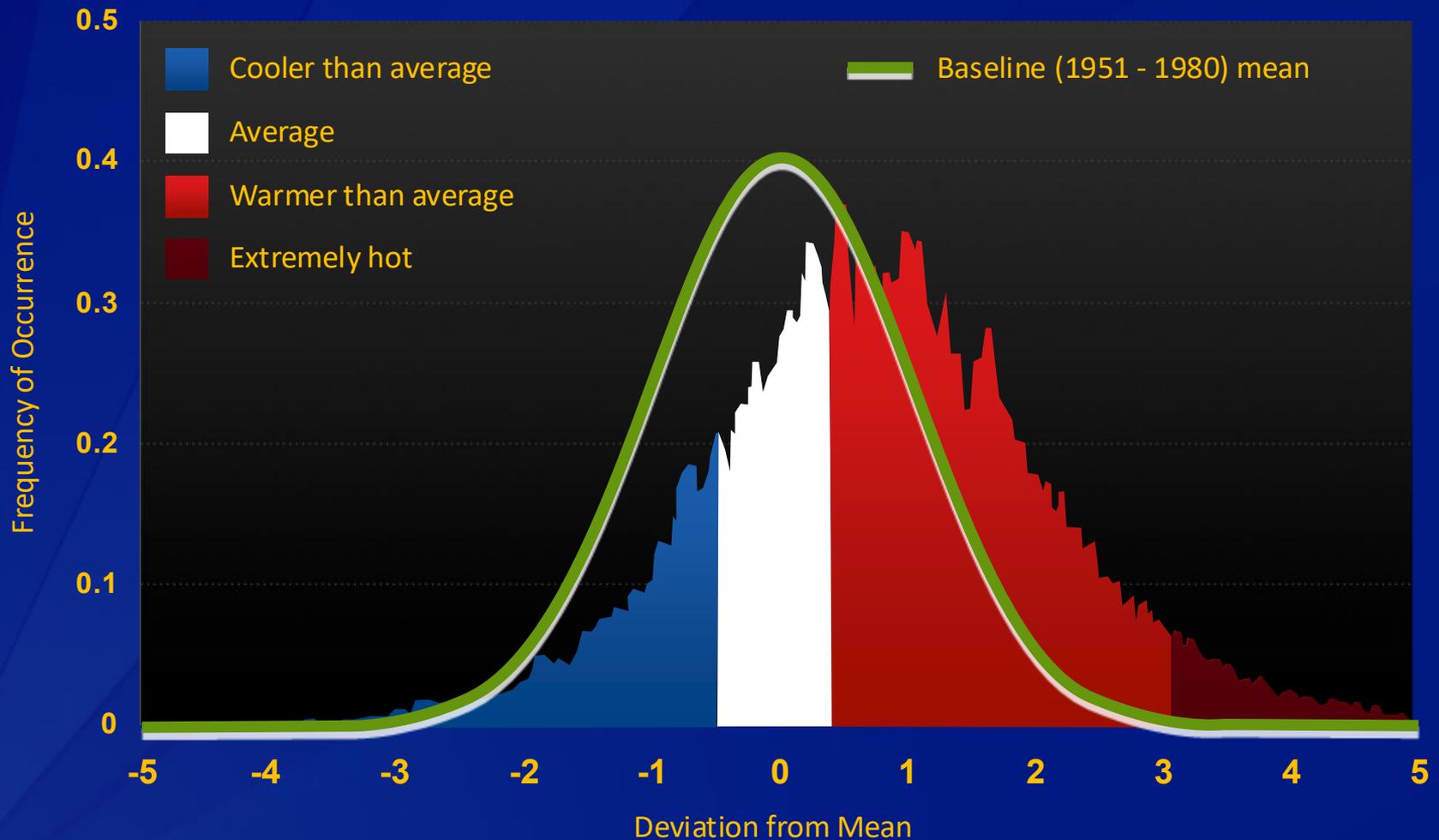
Source: NASA/GISS; Hansen, et al., "Perceptions of Climate Change," Proc. Natl. Acad. Sci. USA 10.1073, August 2012

Summer Temperatures 1981–1991



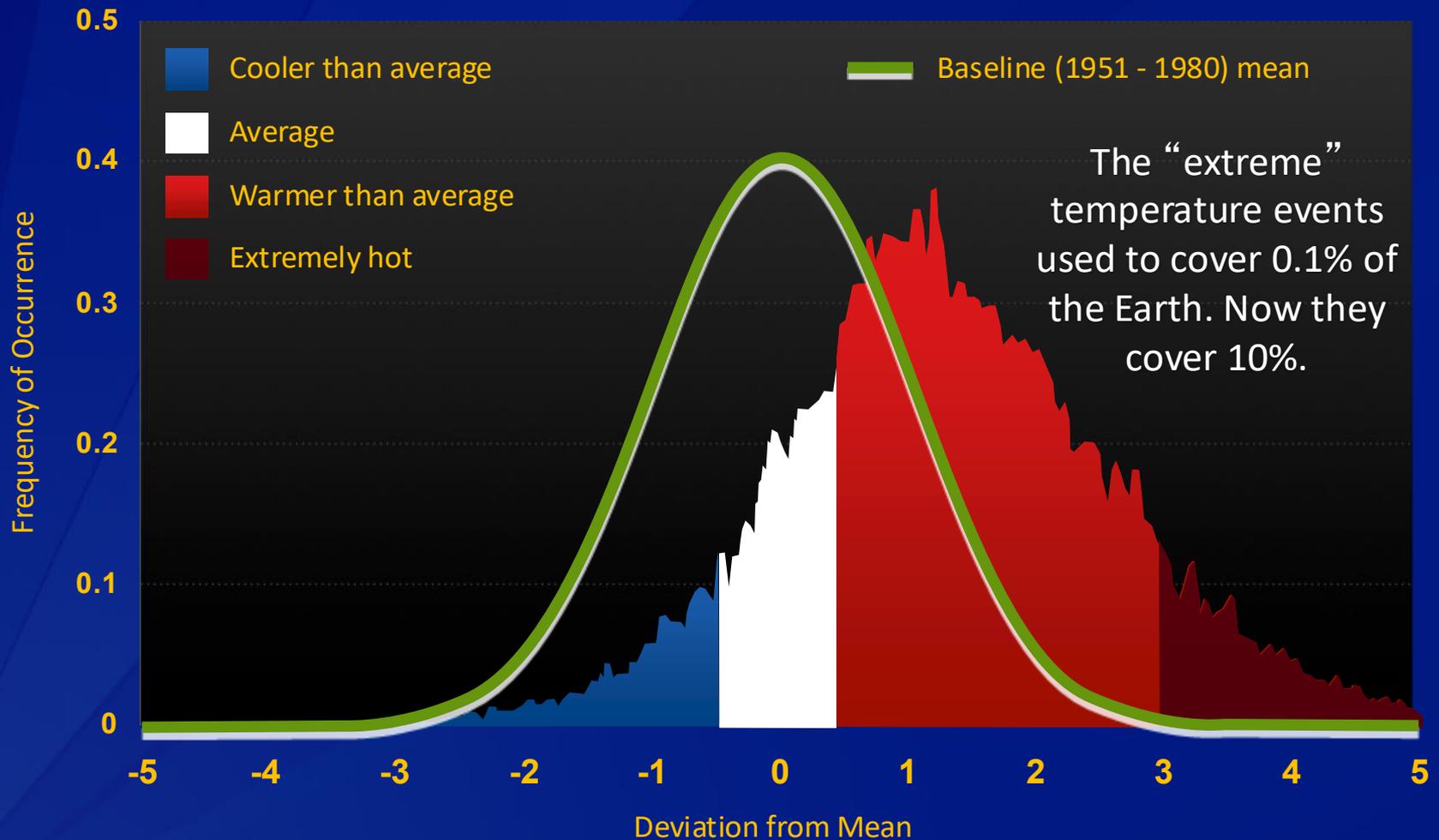
Source: NASA/GISS; Hansen, et al., "Perceptions of Climate Change," Proc. Natl. Acad. Sci. USA 10.1073, August 2012

Summer Temperatures 1991–2001



Source: NASA/GISS; Hansen, et al., "Perceptions of Climate Change," Proc. Natl. Acad. Sci. USA 10.1073, August 2012

Summer Temperatures 2001–2011



Source: NASA/GISS; Hansen, et al., “Perceptions of Climate Change,” Proc. Natl. Acad. Sci. USA 10.1073, August 2012

Key Health Threats from Climate Change

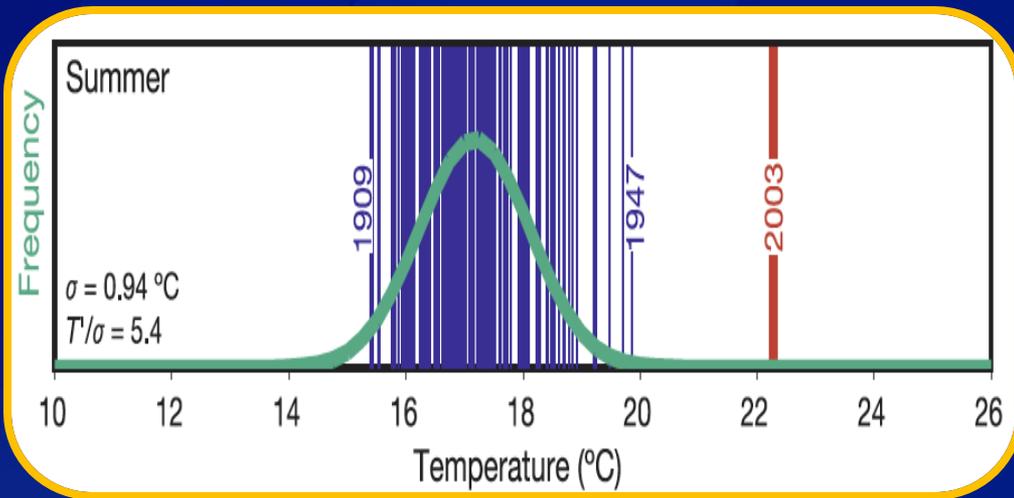
“Disaster within a disaster”

Extreme events increase the probability of “complex emergencies” where multiple system failures can occur which can exceed response capacity.



Heat Waves Impact Human Health

European Heat Wave of 2003



Confirmed Mortality

UK	2,091
Italy	3,134
France	14,802
Portugal	1,854
Spain	4,151
Switzerland	975
Netherlands	1,400-2,200
Germany	1,410
TOTAL	29,817-30,617

Vandentorren et al. *Am J Public Health* 2004; 94(9):1518-20.

Haines et al. *Public Health* 2006;120:585-96.

Key Health Threats from Climate Change

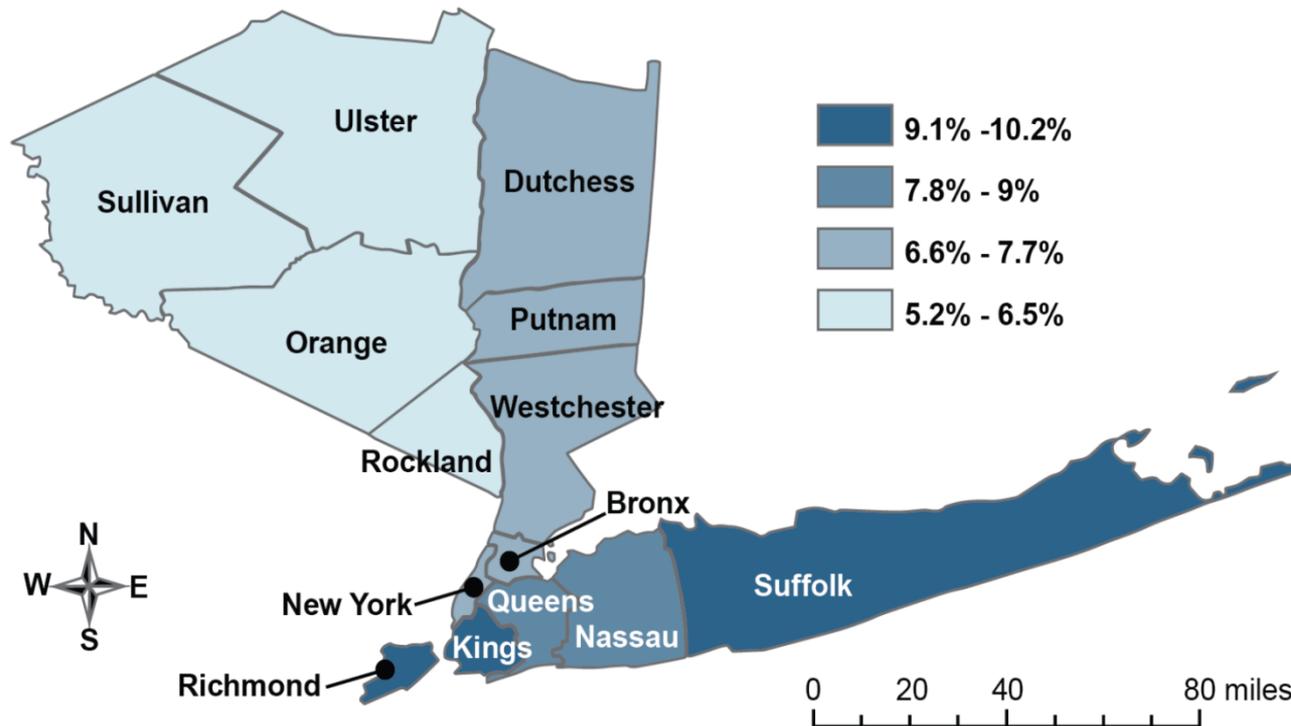
“Morbidity and Mortality by a thousand cuts”

Impacts add to the *cumulative* stresses currently faced by vulnerable populations and in locations most vulnerable to extreme events & ongoing, persistent climate-related threats



Impact of Increased Ozone: Projected Increase in Pediatric ED Visits for Asthma in 2020

Projected Climate Change Worsens Asthma



Source: Sheffield PE, Knowlton K, Carr JL, Kinney PL. 2011. Modeling of Regional Climate Change Effects on Ground-Level Ozone and Childhood Asthma. *American Journal of Preventive Medicine* 41(3):251-257

Key Health Threats from Climate Change

Novel threats emerge

Large scale ecological perturbations facilitate disease emergence and redistribution.

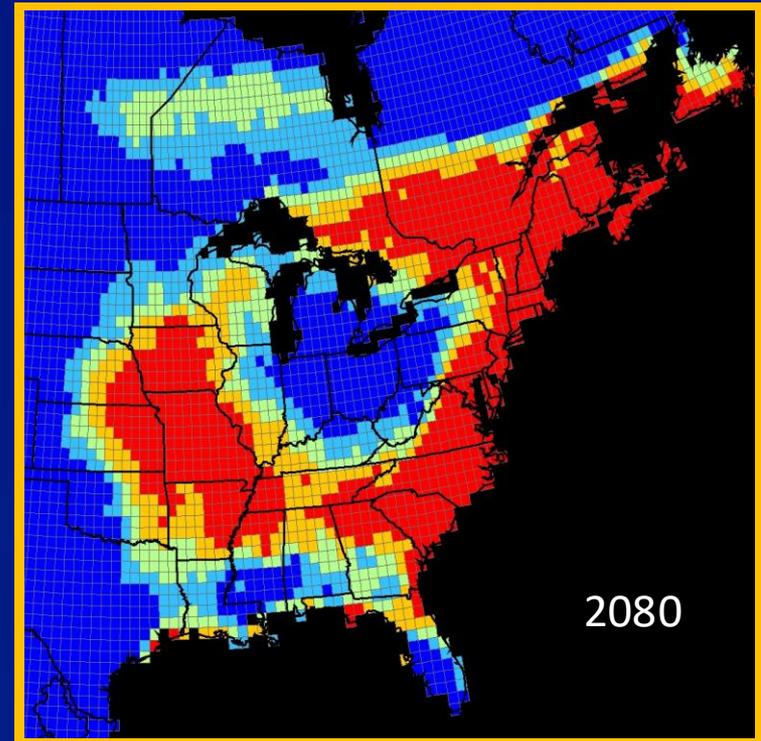


Precipitation, Humidity, and Temperature Changes Impact Human Health: Lyme Disease

□ Spread of Lyme disease factors

- Climate
- Ecological
- Social

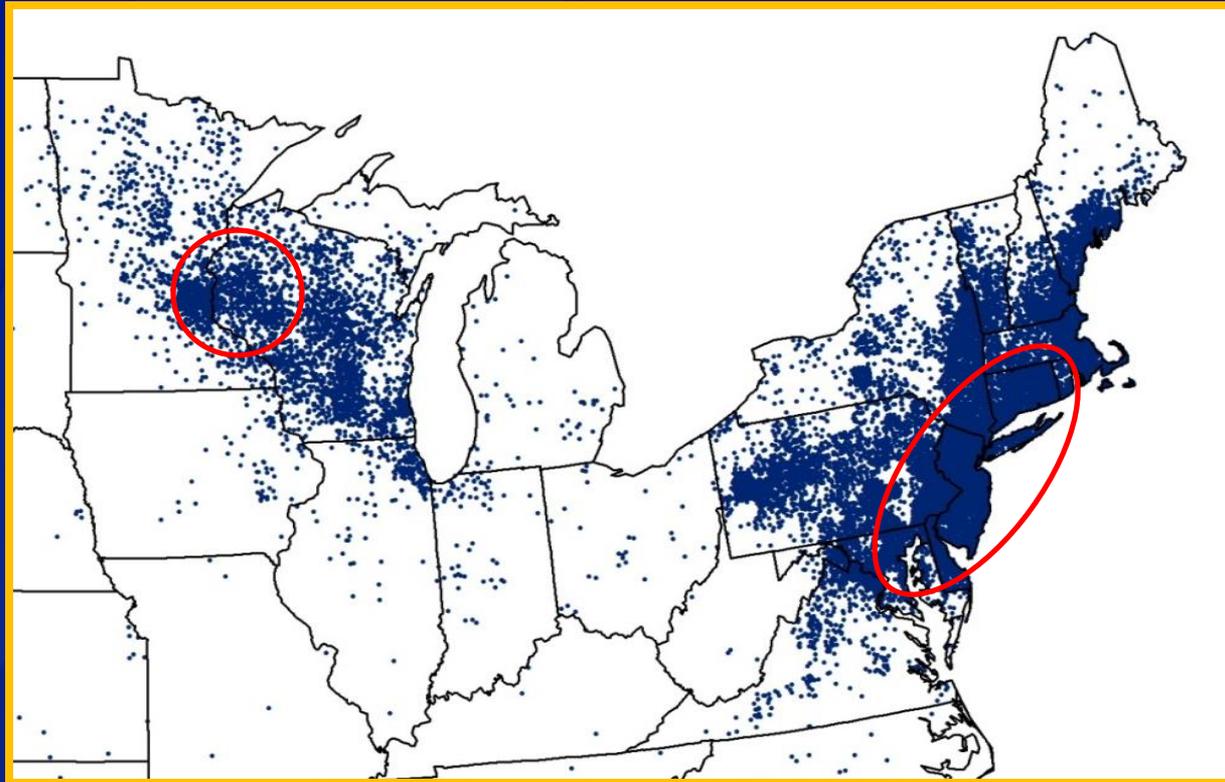
Range of suitable conditions for
Ixodes scapularis, the
Lyme disease tick



● Constant suitability ● Expanded suitability

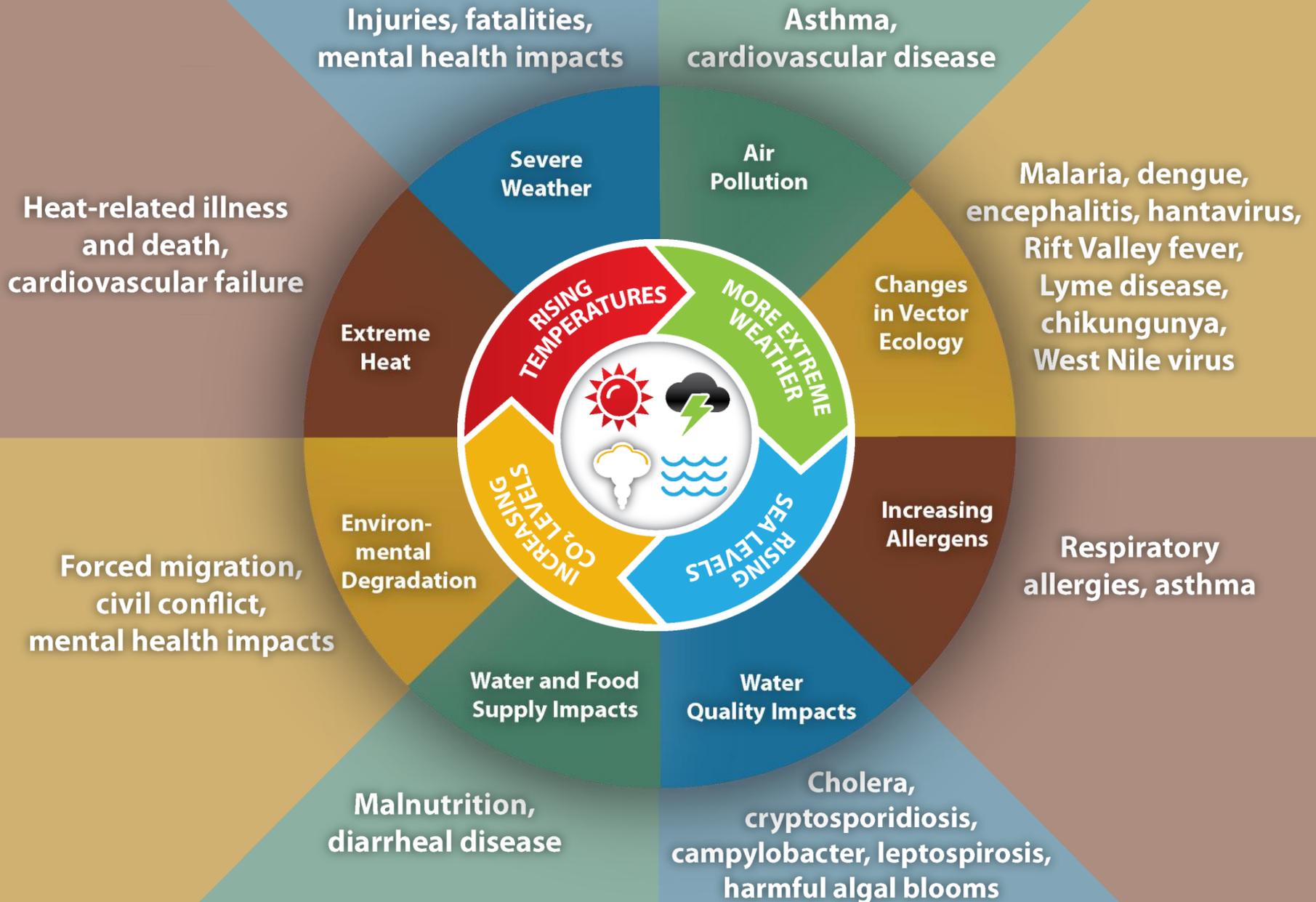
Source: Brownstein JS, Holford TR, Fish D. A climate-based model predicts the spatial distribution of the Lyme Disease vector *Ixodes scapularis* in the United States. *Environ Health Persp* 2003;111(9):1152-57.

Lyme Disease Case Distribution Change in the United States



1996

Impact of Climate Change on Human Health

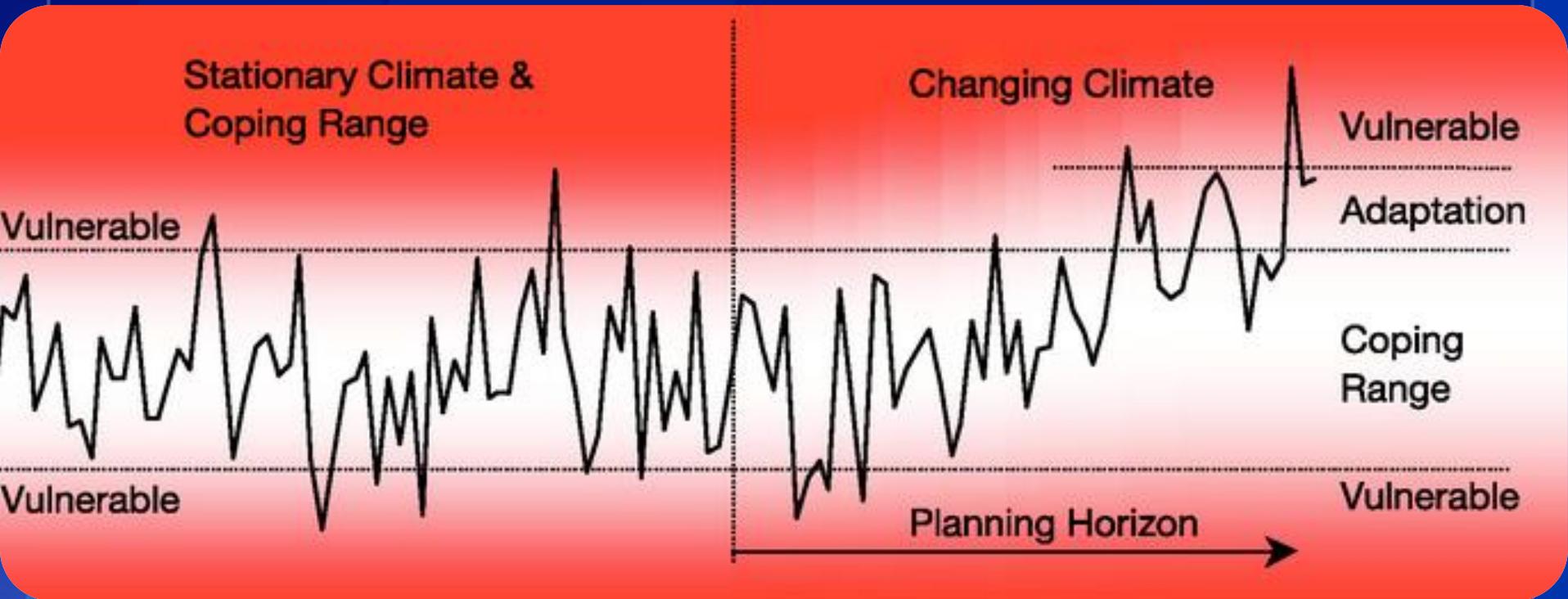


What is CDC doing to prepare for health effects of climate change?

- ❑ **CDC helps states and cities prepare for health challenges of climate change by**
 - Providing scientific guidance
 - Developing decision support tools
 - Ensuring public health concerns are considered in climate change adaptation and mitigation strategies
 - Creating partnerships between public health and other sectors

- ❑ **CDC's Climate and Health Program – nation's only investment in climate change preparedness for public health sector**

Priority Actions for Climate Change: Shift the Coping Range



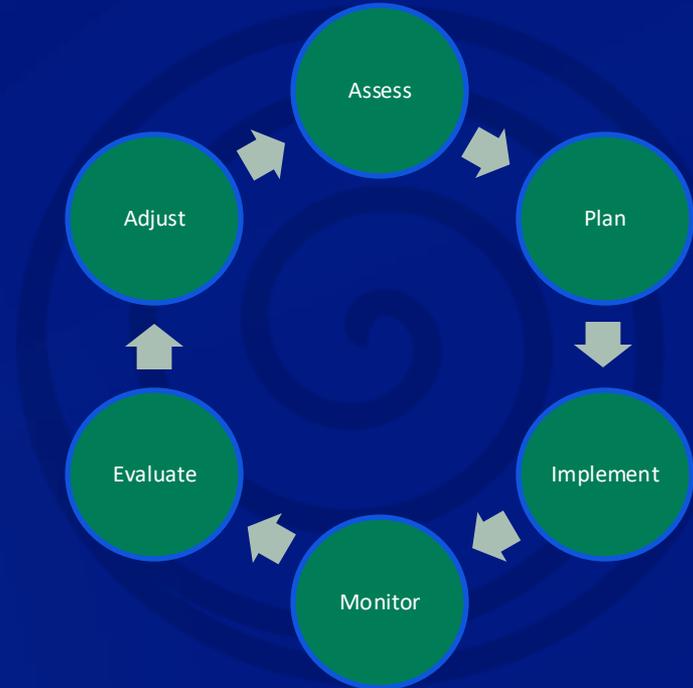
How to Shift a Coping Range?

Integrating Climate Change Adaptation into Public Health Practice: Using Adaptive Management to Increase Adaptive Capacity and Build Resilience

Jeremy J. Hess,^{1,2,3} Julia Z. McDowell,^{1,2} and George Luber¹

¹Climate and Health Program, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA; ²Department of Environmental Health, Rollins School of Public Health, and ³Department of Emergency Medicine, Emory University School of Medicine, Emory University, Atlanta, Georgia, USA

- Return to the risk equation
 - Reduce hazard probability
 - Reduce hazard exposure
 - Reduce vulnerability
- It is an iterative process
- Requires modeling, learning, and adaptive management

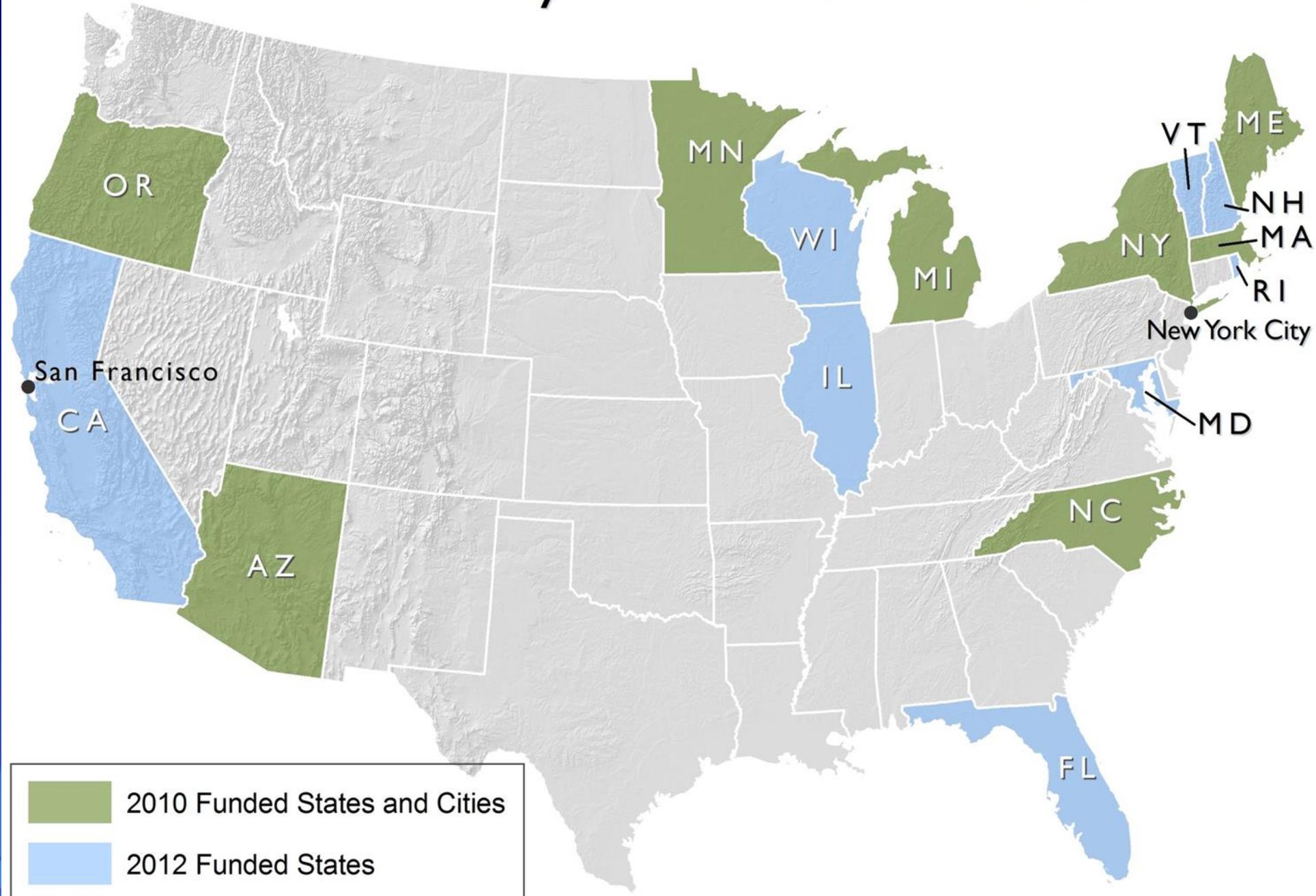


Climate-Ready States and Cities Initiative

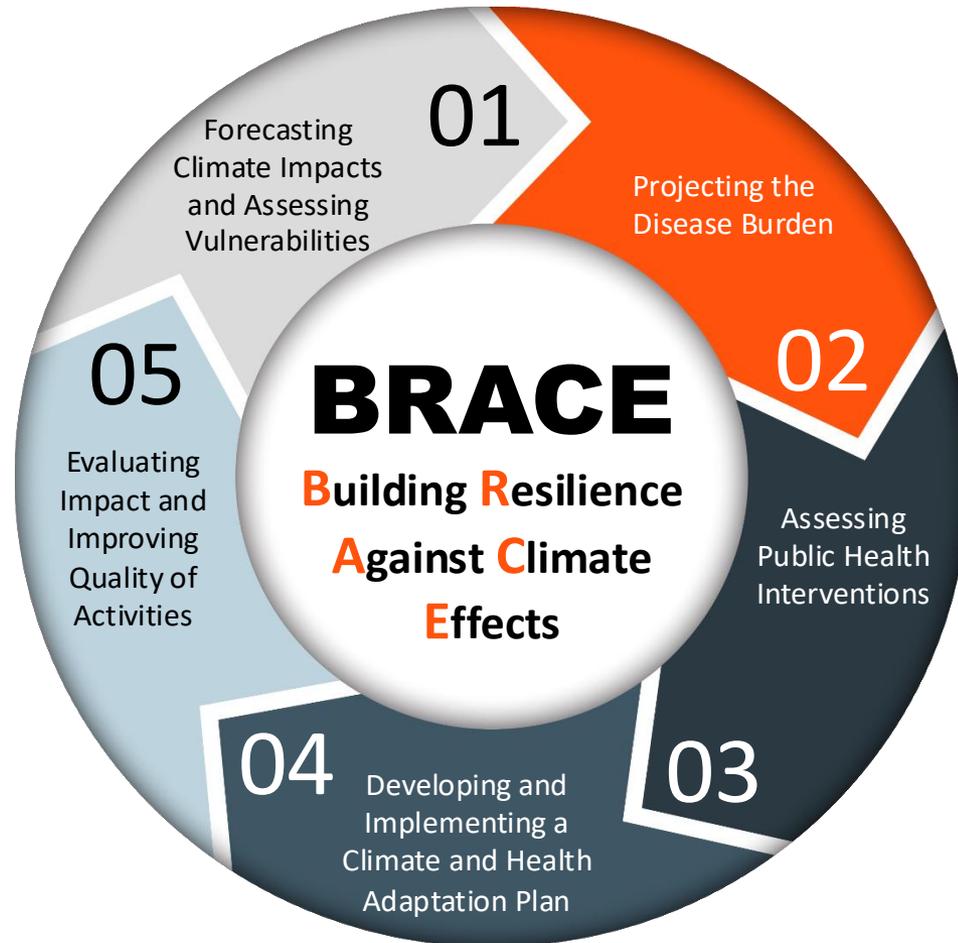
- ❑ **CDC effort to enhance capacity of state and local health agencies to deal with health challenges associated with climate change**

- ❑ **CDC accomplishes this by**
 - Funding 18 state and local health departments
 - Providing framework and tools for planning, implementing, and evaluating climate adaptation strategies
 - Tools to identify populations and places vulnerable to climate impacts
 - Materials to help communicate climate and health issues to public health partners (e.g., extreme heat toolkit)

CDC Climate Ready States and Cities Initiative



Building Resilience Against Climate Effects



BRACE Technical Guidance

Climate Models and the Use of Climate Projections:

A Brief Overview for Health Departments



Climate and Health Technical Report Series

Climate and Health Program, Centers for Disease Control and Prevention

Paul J. Schramm¹, Christopher K. Uejio², Jeremy J. Hess^{3,4},
Gino D. Marinucci⁵, George Luber⁶

¹Climate and Health Program, Division of Environmental Hazards and Health Effects (DEHHE), National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention (CDC), Atlanta, GA, USA

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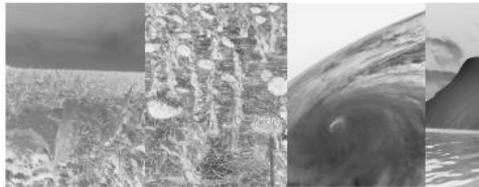
⁴Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

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Assessing Health Vulnerability to Climate Change

A Guide for Health Departments



Climate and Health Technical Report Series

Climate and Health Program, Centers for Disease Control and Prevention

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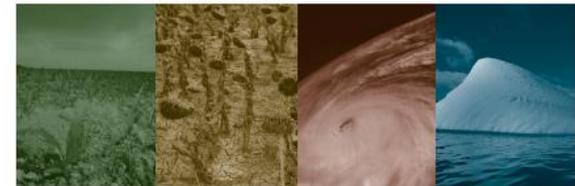
⁴Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

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Projecting Climate-Related Disease Burden:

A Guide for Health Departments



Climate and Health Technical Report Series

Climate and Health Program,
Centers for Disease Control and Prevention

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APHA Report: *Adaptation in Action*

ADAPTATION IN ACTION:

Grantee Success Stories from CDC's
Climate and Health Program

MARCH 2015



NEW YORK CITY: Creating Resilient Communities

"The events of the past few years show the serious public health threats New York City's 8.2 million residents already face from extreme weather events like heat waves and coastal storms. With climate change, the severity of these risks will increase. It is imperative that citywide climate adaptation and mitigation measures include health-focused strategies."

Andriana Azarias
ACTING DIRECTOR, CLIMATE AND HEALTH PROGRAM,
NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE

THE THREAT TO HEALTH:

- Average summer temperatures in New York City are increasing and more heat waves are predicted for the future, which will increase the risk of heat-related illness among vulnerable populations.
- Hotter temperatures coupled with poor air quality lead to increased hospital admissions for cardiac and respiratory problems.
- Flooding from coastal storms is projected to increase in frequency and severity and can result in more outages and home displacements.
- Power outages, from coastal storms or increased demand on the electrical grid during hot weather lead to a variety of health and safety hazards, such as food and drinking water contamination and heat

ADAPTATION IN ACTION:

- The Climate and Health Program has conducted risk assessments on rising summer temperatures, extreme heat and ground-level ozone, and coastal flooding and power outages to help inform citywide climate adaptation planning and improve public resilience.

(Note to review
still und

ARIZONA: Ready for Extremes

"Arizona is a beautiful place to live, where extreme heat, drought, monsoons and dust storms are the norm. Our program helps residents learn to respect and adapt to these extremes."

Matthew Roach
ENVIRONMENTAL EPIDEMIOLOGIST, EXTREME WEATHER AND PUBLIC HEALTH
PROGRAM, ARIZONA DEPARTMENT OF HEALTH SERVICES

THE THREAT TO HEALTH:

- Extreme heat is the nation's No. 1 weather-related cause of death, and Arizona is home to some of the country's hottest communities. From 1999 to 2009, 1,500 heat-related deaths occurred in Arizona. About 500 heat-related inpatient admission visits and 4,000 emergency department visits happen in Arizona every year.
- The rate of death due to heat exposure in Arizona is three to seven times higher than the overall U.S. rate.
- Arizona is experiencing an increase in the number and extent of extreme heat days. In fact, research conducted in the aftermath of an Arizona heat wave found that every 1-degree increase in temperature was associated with a 6 percent increase in mortality risk.

ADAPTATION IN ACTION:

- The Arizona Extreme Weather and Public Health Program conducted a department-wide assessment to measure the agency's overall capacity to monitor climate and health effects and to pinpoint gaps. Staff also reached out to local public health departments with the same assessment, which covered topics such as assessments, outreach and education, and policy development. The results will eventually be used to shape an extreme weather action plan.

To learn more about the Arizona Extreme

MICHIGAN: Responding to Local Needs

"Climate change is a global and national issue, but its impacts are felt at the local level, affecting the health and well-being of people in every community. Public health needs to engage with community partners, emergency response and citizen groups to advocate for the protection of the vulnerable and to promote tools and adaptations that make our community healthy, resilient and desirable places to live and work."

Lorraine Cameron
MANAGER, EPIDEMIOLOGY AND SURVEILLANCE SECTION, DIVISION OF ENVIRONMENTAL HEALTH,
MICHIGAN DEPARTMENT OF COMMUNITY HEALTH

THE THREAT TO HEALTH:

- Extreme heat events are associated with increased health care utilization. Between April and August of 2013, Michigan health officials recorded more than 4,500 heat-related emergency room visits.
- During a 2013 heat wave in Michigan, dehydration complaints increased nearly 80 percent, sun-associated complaints (i.e. sun burns, sun poisoning or sunscreen reactions) rose by nearly 117 percent, and heat-associated complaints (i.e. heat exhaustion, heat stroke or heat reaction) went up 900 percent.
- In Detroit alone, climate models predict the city will experience 30 to 50 days per year of 90 degrees or hotter and 45 to 50 days with temperatures above 90 degrees.

ADAPTATION IN ACTION:

- Thanks to CDC support, the Michigan Climate and Health Adaptation Program is improving state and local capacity to conduct climate change-related health impact assessments (HIA). An HIA is a process that helps evaluate the potential health effects of a plan, project or policy before it is built or implemented.⁴ Such assessments help public health officials more effectively protect people's health. As of 2013, the program had funded two local assessment projects: one in East Lansing and another in Grand Rapids. In East Lansing, local public health officials assessed and offered recommendations to enhance nonmotorized transportation improvements, which can help reduce the emissions that cause climate change while offering safe opportunities for physical activity and reducing pedestrian and bicyclist injuries. In Grand Rapids

local health officials assessed a major traffic corridor undergoing redevelopment. The recommendations from the assessment are helping city planners to better consider the health impacts of these activities.

- The program is involved in the Detroit Climate Action Collaborative, which works to ensure that the city's climate action plan protects and benefits all residents. Among its many activities, the collaborative is partnering with the Great Lakes Integrated Sciences and Assessments Center to develop Detroit-specific climate projections. The collaborative is also working with the University of Michigan College of Architecture and Urban Planning to assess the characteristics of climate vulnerable neighborhoods.
- The program works with academic and private sectors to translate research into practice. For example, health officials helped pilot a tool called I-HEAT, which involves the spatial mapping of heat and social vulnerabilities. Health officials also helped pilot a dynamic heat model developed by researchers at Michigan State University. The model considers heat-related social and behavioral factors, such as what prevents or motivates residents from going to cooling centers. The I-HEAT tool could be used by local health departments to better identify communities vulnerable to heat exposure.
- To tailor adaptations to community needs, the program funded two local health departments to assess residents' heat readiness. Altogether, more than 3,000 surveys were conducted, and the results are already shaping local response and outreach efforts. For example, in Ingham County, health officials learned that local food banks were an ideal venue to reach vulnerable residents with cooling center information.

To learn more about the Michigan Climate and Health Adaptation Program, visit www.michigan.gov/mdch/0,4612,7-132-54783_54784_55975--,00.html.

⁴ US Centers for Disease Control and Prevention: <http://www.cdc.gov/healthypeople/hia.htm>

Priority Actions for Climate Change:

Evidence-based decisions require data

- ❑ **The President's Climate Data Initiative: "Empowering America's Communities to Prepare for the Effects of Climate Change"**
- ❑ **Broad effort to leverage the Federal Government's extensive climate-relevant data resources**
- ❑ **Stimulate innovation and private-sector entrepreneurship in support of national climate-change preparedness**

climate.data.gov

- ❑ New climate-focused section of Data.gov
- ❑ Will make Federal data about climate more open, accessible, and useful

The screenshot shows the climate.data.gov website. At the top, there is a search bar with the text "Search Data.gov". Below the search bar is the Data.gov logo, which includes the American flag and the text "DATA.GOV". To the right of the logo are navigation links: "DATA", "TOPICS" (with a dropdown arrow), "IMPACT", "APPLICATIONS", "DEVELOPERS", and "CONTACT". Below the navigation bar is a blue header with the word "CLIMATE" in white. Underneath the header is a light blue navigation bar with links: "Themes" (with a dropdown arrow), "Data", "Resources", "Challenges", "FAQ", and "Feedback". The main content area has a white background and contains the following text: "Here you can find data related to climate change that can help inform and prepare America's communities, businesses, and citizens. Initially, in this pilot phase, you can find data and resources related to [coastal flooding](#) and [food resilience](#). Over time, you will be able to find additional data and tools relevant to other important climate-related impacts, including risks to human health, ecosystems, and energy infrastructure. Please share your [feedback](#)." Below this text is a blue section titled "HIGHLIGHTS" in white. The first highlight is titled "Launch of Water theme of Climate.Data.Gov" in white. The text below the title reads: "To help communities and individuals plan for the risks of climate-change-related impacts on water resources, the U.S. Government is releasing today a collection of datasets containing information relevant to this important issue. Select data are also being made available via mapping services on Geoplatform.gov. The resources provided here can be used to help answer a number of relevant questions, such as:" followed by a bulleted list item: "• How are human and natural components of the hydrologic cycle changing?"

CDC's National Environmental Public Health Tracking Network

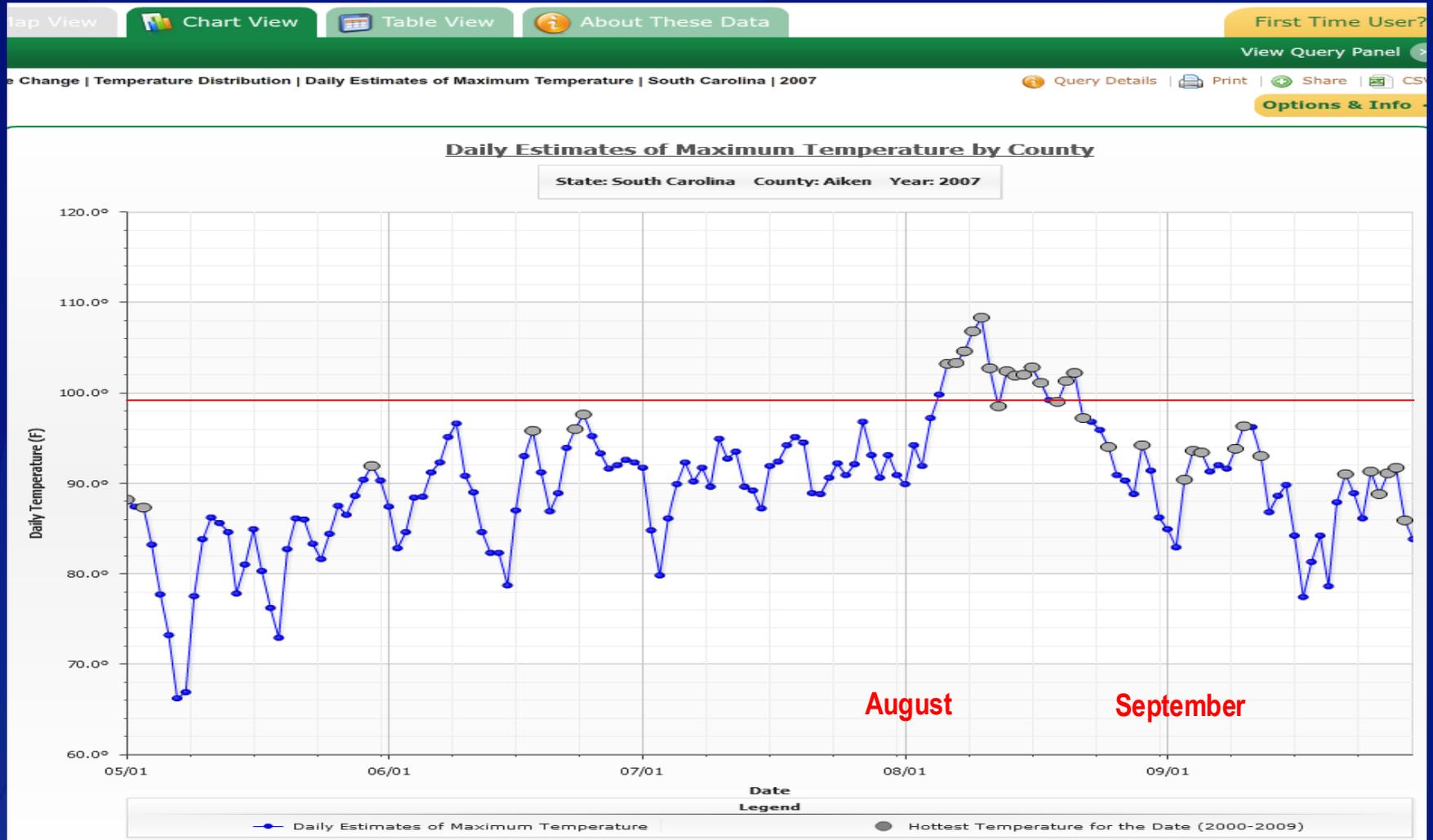
Includes data on climate change and heat:

- Historic temperature distribution and extreme heat days
- Projected extreme heat days
- Heat vulnerability
- Heat ER visits, hospitalizations and deaths

The screenshot displays the CDC's National Environmental Public Health Tracking Network interface, organized into four sequential steps:

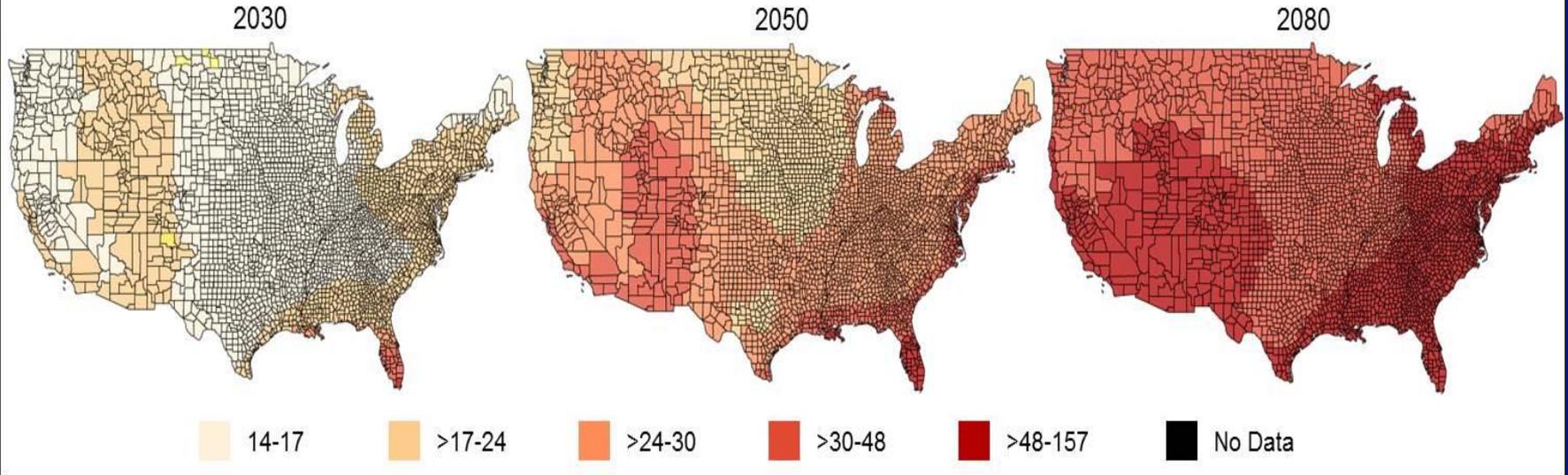
- Step 1: Select Your Content**
 - Climate Change
 - Future Projections of Extreme Heat
 - Projected Number of Future Extre...
 - Show only data about children
 - NATIONAL Environmental Public Health Tracking Program logo
- Step 2: Choose Geography & Time**
 - Geography list: Louisiana, Maine, Maryland (checked), Massachusetts, Michigan, Minnesota, Mississippi, Missouri
 - Time list: 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084 (checked)
 - Show Counties
 - Clear Geography button
 - Clear Time button
- Step 3: Advanced Options**
 - Advanced Options (Required)
 - Emissions Scenario
 - Low Emissions (B1)
 - High Emissions (A2)
 - Advanced Options (Select One)
 - Absolute Threshold
 - Relative Threshold
 - 98th Percentile
 - Clear Options button
- Step 4: Submit**
 - Run Query button

Historic temperature data (EPHTN)



Future modeled temperature data (EPHTN)

Projected number of extreme heat days above the 98th percentile based on a high emissions scenario (A2)



Source: NOAA, National Climate Assessment 2014

Priority Actions for Climate Change: Pioneering New Methods

- **Building community partnerships – Citizen Science**
 - **Systematic , on-going, collection of community observations of unusual shifts in local ecosystems and health hazards**
 - **Develop culturally appropriate risk communications and inform adaptation planning for Health and other sectors**



Alaskan coastal erosion from permafrost degradation





Erosion of the landscape



Loss of Cultural Resources Impacts Mental Health

Moving a traditional village site:
Shishmaref,

Gravesite erosion



Ancient graves pulled to sea



Human remains ... dragged to sea

By SEBASTIAN LANDER
in Alaska

Published: 03 May 2008

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ANCIENT graveyards are being dragged out to sea as climate change accelerates erosion in

MULTIMEDIA

[Grave danger in the Arctic](#)

RELATED STORIES

[Alaska's not on](#)

Climate Ready Tribes and Territories Initiative

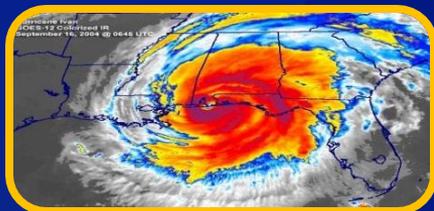
- ❑ New 2016 funding will be awarded later this year
- ❑ Will support climate and health adaptation activities within tribal groups and territories
- ❑ Will work with partners to identify vulnerable areas and populations
- ❑ Approximately 3 tribes and 2 territories will be funded



Summary



- The effects of climate change are already evident in our communities
- Climate change must be framed as a human welfare and public health issue.
- Early action, through evidence-based approaches, can help to protect the public's health



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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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