Integrated Information Systems for Heat and Health

A growing public health concern

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Extreme Heat: The deadliest natural hazard

Fatalities by Hazard, 2006–2015

- Heat: 1,130 fatalities
- Tornadoes: 1,101 fatalities
- Floods: 842 fatalities
- Wind: 559 fatalities
- Cold: 317 fatalities
- Lightning: 313 fatalities
- Winter Storms: 259 fatalities
- Hurricanes: 43 fatalities

(NWS, 2016)
Heat waves will worsen

- Increase in intensity, duration, frequency

- Currently 30% of the population experiences 20 days of heat wave conditions, by 2100 it could be 74%

*Projected changes in deaths in U.S. during hot months (Apr. – Sept.) based on two models*

*Adapted from Schwartz et al. 2015*
Global average temperature has increased and this is projected to continue.

Source: National Climate Assessment, 2014 - Recent US Temperature Trends
Information is Needed Across **All Timescales** for Action

e.g. Disaster/emergency management response

- **RECOVERY:** e.g. Disaster/emergency management response
- **RESPONSE:** e.g. increased monitoring, surveillance, control, water management
- **PREPARATION:** e.g. Infrastructure development and urban planning, budget planning

- Forecast Uncertainty
- Forecast Lead Time
- Impact-Based Decision Support
- Minutes
- Hours
- Days
- 1 week
- 2 weeks
- Months
- Seasons
- Years
Information systems define the demand for this information, support knowledge sharing, and enhance forecasting capabilities.

Develop information and tools—and build trust—necessary to inform decisions.

Cultivate partnerships—map decision-making arrangements.

They improve understanding & communication of options for responding to future risk.

Identify research, data, and observation needs.
National Integrated Heat Health Information System (NIHHIS): Climate Services to Reduce Heat Risk

- NOAA and CDC launched the National Integrated Heat Health Information System (NIHHIS) in June of 2015 to integrate efforts.
- In July of 2015, an international set of heat-health practitioners – from local emergency managers to national public health and international meteorology – convened to establish a plan to move forward together.
- NIHHIS is part of the international effort, and informs decision makers in many sectors while also focusing on heat-related impacts on many vulnerable groups including the elderly, children, athletes, pets, and outdoor workers.

NIHHIS will facilitate an integrated approach to providing a suite of decision support services to reduce heat related illness and death.
NIHHIS Goals

• Address the increase of heat extremes now and into the future.
• Improve understanding and reduce impacts of extreme heat events across various time scales
• Build capacity across climate and public health communities
• Develop timely and accessible communication tools to inform preparedness and adaptation
NIHHIS is a global network that integrates partners’ knowledge, experience, and activities to effect a coordinated response to heat-health at many levels.

- **International Network**
  - Knowledge sharing
  - Cooperative research

- **National**
  - Agency-level coordination of resources and services
  - Shared set of core questions

- **Regional Engagements**
  - Regional understanding of geography
  - Co-development of climate and health tools and services

- **Local Pilots**
  - Deep knowledge of vulnerability and effective interventions & communication
NIHHIS North American Pilots consist of a region and a focal city, and are defined by a combination of climatological, political, social, and other boundaries.
The GHHIN was launched in 2016

Inherits the NIHHS framework as a structured approach to heat resilience

The first GHHIN Meeting will take place in 2017 in Southeast Asia
Extreme Heat Story Map

- Show the growing problem of extreme heat
- Use Esri’s analytical capabilities to show the vulnerability of populations and how we can use different interventions.
- Shape existing data into tool for decision makers planning for extreme heat

- Collaboration between NOAA, the National Integrated Heat Health Information System and Esri
Take Action: Tools to Understand and Prepare for Extreme Heat
Heat illness and death are more common in persons over 65 or under the age of four as well as those working outdoors, first responders, athletes, or people with medical conditions leading to increased vulnerability or isolation. Extreme heat lowers productivity, and has negative health effects on workers. Worker productivity is estimated to drop 20% by 2100.

Excessive heat exposure can result in:

- Heat stroke or heat exhaustion
- Organ damage
- Increased chance of injuries on the job
- Mood, behavior, and mental health effects
- Exacerbation of preexisting conditions such as cardiovascular and respiratory diseases
Most Vulnerable

Overall Score

1. Perry County, Alabama
2. Brooks County, Texas
3. Chicot County, Arkansas
4. Turner County, Georgia
5. Robeson County, North Carolina
6. Allendale County, South Carolina
7. Hardee County, Florida
8. Hendry County, Florida
9. Imperial County, California
10. Alexander County, Illinois

Most Vulnerable by Theme

Socioeconomic Status
1. Humphreys County, Mississippi
2. Stewart County, Georgia
3. East Carroll Parish, Louisiana
4. Holmes County, Mississippi
5. Quitman County, Mississippi
6. Sunflower County, Mississippi
7. Noxubee County, Mississippi
8. Perry County, Alabama
9. Brooks County, Texas
10. Allendale County, South Carolina

Household Composition & Disability
1. Knox County, Texas
2. Clay County, Georgia
3. Phillips County, Arkansas
4. Perry County, Alabama
5. Attala County, Mississippi
6. Covington County, Mississippi
7. Choctaw County, Oklahoma
8. Seminole County, Missouri
9. Randolph County, Georgia

Minority Status & Language
1. Starr County, Texas
2. Maverick County, Texas
3. Webb County, Texas
4. Zapata County, Texas
5. Hidalgo County, Texas
6. Imperial County, California
7. El Paso County, Texas
8. Hudspeth County, Texas
9. Val Verde County, Texas
10. Zavala County, Texas

Housing & Transportation
1. Claiborne County, Mississippi
2. Perry County, Alabama
3. Nacogdoches County, Texas
4. Allendale County, South Carolina
5. Sumter County, Alabama
6. Prince Edward County, Virginia
7. Ware County, Georgia
8. Alexander County, Illinois
9. Hardee County, Florida
Heat Alerts and GDP
Vulnerable Occupations

There were approximately **1,189 total workers** in occupations that are vulnerable to extreme heat, 27.6 percent of total workers.

The predominant vulnerable occupation was **Production (Manufacturing)**.

- Farming, Fishing, and Forestry Workers: 0.2%
- Construction and Extraction Workers: 8.3%
- Production (Manufacturing) Workers: 10.7%
- Food Preparation and Serving Related Workers: 8.4%

Vulnerable Occupations - County

Predominant Occupation
Symbolized by Color

- Farming, Fishing, and Forestry
- Construction and Extraction
- Production (Manufacturing)
- Food Preparation and Serving Related

Total Workers Vulnerable to Extreme Heat Symbolized by Size

> 650,000
Future Heat Wave Predictions

Heatwaves: Number of deadly heat days

Experiment: Strong Mitigation (RCP2.6)

Year: 2000

High (365 days)

Low (0 days)
What is being done to mitigate impacts?
Urban Tree Canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above, and UTC can help reduce peak summer temperatures. Understanding UTC can help give context to other heat plans and interventions.

Urban Tree Canopy at Ward Level - Urban Tree Canopy - Ward Level

Percentage of Existing UTC

> 50
Washington, DC operates cooling centers during the summers, typically activated during heat advisories.

**Cooling Centers**

10 Minute Walk to Cooling Centers
Washington, DC has 2 medical centers, 7 hospitals, and 47 Federally Qualified Health Centers.
Approximately 52 percent of the population of Washington, DC is within a 10-minute walk of either a cooling center or a health facility. This means that almost half of DC's population - an estimated 323,841 people - are not in walking distance to a facility.
Future Work and Collaboration Opportunities

- Work to improve and expand NIHHIS in US
- Create decision tools for use at different time and spatial scales
- Work with decision makers in other countries to collect data and develop useful information
- Support the Global Heat Health Information Network (GHHIN)-visit GHHIN.org
- Continued collaboration with Esri, NOAA, NIHHIS, and other countries
- Tackle Heat and other health issues (animals, food)

  - Develop Health Tailored Seasonal forecast products
  - Build Capacity to model and predict risk of environmentally sensitive diseases on seasonal time scales
Thank you!

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Thinking in Systems

“The problems we have created in the world today will not be solved by the level of thinking that created them.”

--Albert Einstein

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