Planning for Increased Heat

National Center for Health in Public Housing Regional Meeting
November 15-16, 2015

The National Integrated Heat Health Information System: A Partnership for Decision Support

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http://climate.gov/NIHHIS
NOAA: America’s Environmental Intelligence Agency

NOAA’s environmental data, forecasts, products, and services provide decision makers across multiple sectors the information they need to execute their missions.
Human health is intimately tied to environmental conditions, and NOAA provides key stakeholders in the public health sector with the environmental intelligence they need to mitigate emerging health threats.
To understand and predict changes in climate, weather, oceans, and coasts,
• To share that knowledge and information with others, and
• To conserve and manage coastal and marine ecosystems and resources.
Bringing NOAA Capacity to Health: Start with the End

**NOAA Capacity**
- Data, Observations and Monitoring
- Forecasts and Warnings
- Climate Predictions and Scenarios
- Research and Modeling
- Operations (ie NWS)
- Training and Capacity Building

**Health Focus**
- Ecological Forecasting
- Integrated Information Systems
- Training and Capacity Building
- Federal, State, Local and International Partners
  - USGCRP, GEO, GFCS
- NOAA One Health Working Group
- MOU with CDC
Temperatures are on the Rise

Extreme heat events will be more frequent and more intense in the future....what now seems like an unusually hot day will become commonplace (NCA).

From 1979-2003, excessive heat exposure caused 8,015 deaths in the U.S. During that period, more people died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes combined.
Air Temp over Land - Observed

Image Source: Ken Kunkel
Projected Temperature Change of Hottest Days

Figure source: NOAA NCDC / CICS-NC
Air Temp over Land - Future

Change in # of days/year where Temp > 95

Data Source: NARCCAP
Image Source: Greg Dobson
Global average temperature has increased and this is projected to continue.

Source: National Climate Assessment, 2014 - Recent US Temperature Trends
Impacts-Urban Environment

- Urban Heat Islands
- Vulnerable Populations
- Sporting Events
- Outdoor Workers
- Large Public Gatherings
- Infrastructure-Hospitals
- Electricity/Brown Outs

Image Source: Healthspablog.com
Impacts - Ecological

- Agriculture
  - Workers
  - Food supply
  - Pesticide

- Water Quality
  - Beaches
  - Runoff

- Air Quality/Heat

- Wildfires

- Vector-Borne Disease
Why focus on Heat Waves?

- Extreme heat a **serious and underappreciated problem**.
  - From 1979-2003, excessive heat exposure caused **8,015 deaths** in the U.S.; During that period, **more people died from extreme heat** than from hurricanes, lightning, tornadoes, floods, and earthquakes combined.

- And it is only **expected to get worse**.
  - The IPCC and National Climate Assessment state that episodes of extreme heat will likely increase in intensity, duration, and frequency.

- But **all heat deaths are preventable**.
  - With improved, customized information (at many **time scales**, for many different **types of decisions** in many **different disciplines**) as well as capacity building, planning, and long-term investments to improve resilience, nobody need suffer from extreme heat.
Health Information along the Weather-Climate Continuum

- Climate Outlooks
- Climate Predictions
- Weather Forecasts
- Warnings

Forecast Lead Time:
- Years
- Seasons
- Months
- 2 weeks
- 1 week
- Days
- Hours
- Minutes

Impact-Based Decision Support:
- RECOVERY
- RESPONSE
- PREPARATION
So How Can We Prepare and Prevent?

- What public health decisions should we be making differently to be better prepared and reduce morbidity and mortality?
  - How many cooling centers will we need next year?
  - What are staffing and outreach needs if we have more heatwaves, or longer ones, or they start earlier or they happen later in the season?

- What are the budget and finance decisions and what time do those happen?

- How do we reach the most vulnerable populations in time?

- What are the other heat-related health impacts—air quality, vector-borne, water?

- What should we be predicting—Tmax, Tmin, Heat Index, WGBT? And at what time scale? And for which population?
The National Heat Health Information System (NIHHIS): Reducing Risk, Enhancing Resilience

- 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.
- Pilots in progress
- Seven agencies and many partners
- Focusing on heat-related impacts on many vulnerable groups including the elderly, children, athletes, pets, and outdoor workers.
- NIHHIS is part of an international effort (GHHIN)

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

The National Integrated Heat Health Information System weaves together existing pieces, identifies information needs and helps to develop needed climate services.
The National Integrated Heat Health Information System (NIHHIS) is an integrated system that builds understanding of the impacts of extreme heat, develops decision support tools, and provides evidence-based guidance to protect public health and reduce heat-related mortality. NIHHIS is an interagency partnership that involves international partners and local-regional pilots across the United States and other countries. The network includes the following components:

- **Institutional Capacity and Partnerships**
- **Data and Forecast Products**
- **Heat Parameters and Health Outcomes**
- **Engagement & Communication Strategies**

NIHHIS Framework: core questions for all pilots

NIHHIS Network: international partners and local-regional pilots

NIHHIS interagency web portal (climate.gov/nihhis)
• Develop and coordinate partnerships: networks of practitioners
  • Advance regionally-linked earth system observations and prediction capabilities
  • Construct risk profiles: the role of rates of change in trends, frequency, and magnitude of extremes at different scales
  • Capacity and Coordination: Integrate Research, Observations, and Assessments into integrated information on critical transitions and capacity for response
  • Overcoming impediments
  - Do this for a long time
The National Integrated Heat Health Information System (NIHHIS)

NIHHIS is an integrated system that builds understanding of the problem of extreme heat, defines demand for climate services that enhance societal resilience, develops science-based products and services from a sustained climate science research program, and improves capacity, communication, and societal understanding of the problem in order to reduce morbidity and mortality due to extreme heat. NIHHIS is an interagency partnership.

Quick Start Guide | Understanding the Risk | Heat Health Tools | Reports & Plans | Case Studies | Heat Forecasts | About NIHHIS

Planning for heat waves beyond warnings
Browse by weekly, monthly, seasonal and beyond forecasts.

At Risk Groups
Extreme heat affects everybody, but some populations may be exceptionally vulnerable. Read more about how these at risk groups can adapt to extreme heat to reduce their risk:

- CHILDREN
- EMERGENCY RESPONDERS
- THE ELDERLY
NIHHIS: Managing Increased Heat Risk across time scales

- What populations are at most risk?
- What decisions do you make now that for which advance planning would be useful?
- And is that weeks, days, seasons, years ahead?
- Where do you currently get your information?
- What partnerships and information would be most helpful to you?
Thank you!

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http://climate.gov/NIHHS
Excessive Heat Watch, Warning, & Advisory

Baseline tools used by NWS WFOs to issue heat products

- Heat Index Forecasts (temperature and humidity only)**
- Heat Health Warning System (24 WFOs): Accounts for at least 12 atmospheric variables, including urban structure and demographics such as AC prevalence

<table>
<thead>
<tr>
<th>Excessive Heat Watch</th>
<th>Conditions favorable for an excessive heat event/meet or exceed local heat warning criteria in the next 24 to 72 hrs</th>
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<tbody>
<tr>
<td>Heat Advisory</td>
<td>Heat Index values forecast to meet/exceed local heat advisory criteria for one to two days. North: HI&gt;100  South: HI &gt;105  Min nighttime lows &gt;/=75</td>
</tr>
<tr>
<td>Excessive Heat Warning</td>
<td>HI values forecast to meet or exceed locally defined warning criteria for at least two days North: HI&gt;105  South: HI &gt;110  Min nighttime lows &gt;/=75</td>
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</table>

**Currently investigating the feasibility of adding the WBGT parameter to the NWS National Digital Forecast Database**
Short- to- Medium-Range Forecasts

NOAA/NWS’ Weather Forecast Offices & Weather Prediction Center

- **Forecast Model guidance**
  - NWS Global Forecast System (GFS)
  - North American Mesoscale Model (NAM)
  - EU Centre for Medium Range Weather Forecasts (ECMWF)
  - United Kingdom’s Meteorology Office (UKMET)
  - Meteorological Service of Canada

- **National Digital Forecast Database**
  - Seamless mosaic of gridded forecasts from WFOs of sensible weather elements (e.g., temperature, cloud cover, wind speed, relative humidity, etc.)

- **Heat Index (HI) Forecasts**
  - Temperature and humidity; Issued daily May-Sept
  - Deterministic forecast of max/mean/min HI
  - Probability of exceedance for max/mean/min HI thresholds

- **Forecaster Skill**
Long-Range and Climate Forecasts
NOAA/NWS Climate Prediction Center

- 6-10 & 8-14 day Temperature Outlooks
- Maximum Heat Index Outlooks (April – Sept.)
- Week-2 Temperature Outlook
  - Advanced lead time for high-impact events
  - Potential Hazards for days 3-14
  - Much above normal temperatures: Temperature may approach/exceed the top 1/8 of historical range
  - Excessive heat for Heat Index values greater than 105F
- Monthly and Seasonal Outlooks
- Probability of Exceedance Maps
Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Heat-related illness and death, cardiovascular failure
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Forced migration, civil conflict, mental health impacts
- Respiratory allergies, asthma
- Extreme heat
- Air pollution
- Changes in vector ecology
- More extreme weather
- Severe weather
- Increasing allergens
- Rising temperatures
- Rising CO2 levels
- Increasing sea levels
- Water and food supply impacts
- Water quality impacts
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms
Heat, Urban stormwater and Pathogens

Urban stormwater is collected from streets and roof tops and is released directly into rivers

- Contaminated with sewage from failing infrastructure
- Very high pathogen levels - similar to sewage
- 30% of stormwater outfalls show some level of untreated sewage
Heat Impacts Air Quality: Wildfire Smoke

Wildfire Activity Since 1970

- Western US wildfire season increased by 78 days
- Average duration of fires increased five fold

Westerling et al. Warming and earlier spring increase western U.S. forest wildfire activity Science. 2006 Aug 18;313(5789):940-3
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

Global average temperature has increased and this is projected to continue.

Source: National Climate Assessment, 2014 - Recent US Temperature Trends
National Average Temperature Rank
June 2016
Period: 1895–2016

Map showing the national average temperature rank for June 2016, with the United States divided into color-coded categories indicating temperature anomalies. The map indicates that a large portion of the country experienced record warm temperatures, with the warmth ranking at 122.
Addressing Extreme Heat: National Heat-Health Information System
The Global Heat-Health Information Network

NIHHIS and GHHIN weave together engagements to characterize demand, and existing capacities, to identify information needs and to develop useful weather and climate services.

- NIHHIS was launched by the White House in June of 2015, was designed to inform decision makers in many sectors including urban planning, design, construction, public health, emergency management, and energy.

- GHHIN was launched in June of 2016 to provide a common framework, similar to NIHHIS, to coordinate and facilitate sustained partnership and knowledge sharing on heat health globally. GHHIN is a global network that unites national investments in heat-health and seeks synergies across national systems.

- Toolkit.NIHHIS.gov

NIHHIS and GHHIN, support the Climate Services for Resilient Development (CSRD) partnership by developing an international network of practitioners and information.

NIHHIS and GHHIN will facilitate an integrated approach to providing a suite of decision support services to reduce heat related illness and death.
What is an Integrated Information System?

......Informs early warning to early action across time scales

The systematic development, analysis, and communication of relevant information about and coming from areas of impending risk to:

a) anticipate risk and opportunities and their evolution

b) inform development of strategic responses

c) communicate options to critical actors for the purposes of decision-making and response
NIHHIS Pilots Characteristics and Framework: Seeking a consistent approach

**Common Characteristics of NIHHIS Pilots**

- Well defined heat-health problems or questions
- Institutional buy in and commitment.
- Capacity Building: climate and health data, human resources (time), funding, knowledge and training.
- A process for selecting and evaluating heat health parameters depending upon climate & vulnerability.

**Framework**

All domestic pilots address a shared set of questions in these categories:

<table>
<thead>
<tr>
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<td>Engagement &amp; Communication Strategies</td>
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**NIHHIS FRAMEWORK**

### Institutional Capacity & Partnerships
What institutional partners have you engaged to help define the needs (esp. bridging disciplines: health, env. science, emergency management); is that sustainable and if so, how and why?

### Heat Parameters & Health Outcomes
What heat parameters (tmax, tmin, heat index, etc…) are most important for which specific population and in what geographic conditions?

### Engagement and Communication Strategies
What communication strategies are most effective both during an event and for long lead time planning (seasonal outlooks)?

### Data and Forecast Products
What data and forecast products, indicators, and monitoring is needed (at what resolution & lead time), and what is currently being used by health professionals to make decisions?
NIHHIS is a global network that integrates partners’ knowledge, experience, and activities to effect a coordinated response to heat-health at many levels.

NIHHIS Framework: Network and Domestic Pilots

- **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 Integrates Heat Efforts within Partners’ Regions

NIHHIS Local Engagements

NWS Regional WFOs

NOAA RCSDs

USCRN Stations

CDC BRACE Grantees

NOAA CPO RISAs

DOI Regional Climate Service Centers

USDA Regional Climate Hubs
NIHHIS: US Pilots and International Network

The NIHHIS Network is composed of international knowledge-sharing partnerships and U.S. local pilots, but all address shared questions.
NIHHIS and GHHIN weave together engagements to characterize demand, and existing capacities, to identify information needs and to develop useful weather and climate services.

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Climate Outlook Fora

• The first Climate Outlook Forum (COF) was held in Zimbabwe in 1997. It provided probabilistic precipitation information 3-6 months out based on advances in ENSO observation, understanding, modeling, and prediction.
• They negotiated a single consensus forecast for the region to overcome the issue of trustworthiness.
• The initial results were mixed, with some adverse outcomes due to inaccurate predictions, but these soon improved and economic gains were seen.
• COFs are an initiative of the World Meteorological Organization (WMO), and there are currently ~16 COFs worldwide, three of which are in Asia.
• In 2004, the Malaria Outlook Forum (MALOF) was launched by WHO, IRI, and DMC-Harare.
• Success requires: (1) useful, specific information; (2) institutional cooperation; (3) inclusive communication.

The CariCOF Climate Outlook is prepared by the Caribbean Institute for Meteorology and Hydrology with some regional Meteorological Services.

The RGB Climate Impacts & Outlook newsletter is produced monthly via CLIMAS and the NACSP.

The Border Climate Summary was produced monthly in ‘08 and ‘09 by Gregg Garfin via CLIMAS with IAI and SARP funding.

The CariCOF Climate Outlook Newsletter March to August 2016

BRIEF SUMMARY: NOVEMBER 2015 TO MAY 2016
November 2015 was warmer than usual throughout the Caribbean. After a failure of the wet season in ADC islands and of the secondary wet season in the Guianas, as well as very dry conditions in parts of the eastern Caribbean, many island territories remained in drought. Heavy rains in Belize alleviated drought from March to May 2016. We expect above-normal, relatively uncomfortable temperatures throughout the region. Drought is expected to persist in the eastern and southern Caribbean until April, with less rain deficits of outdoor activities, interesting drought warning water shortages in households and agriculture increases the risk, and neighbors local scarcity in Haiti. However, the wet season may start abruptly end up to one month earlier than usual (April to May), with salted fish potential from their consumers.

Looking back:

Rio Grande Bravo 15-20 (IoD) 15-20

What next:

Rainfall patterns May-April (IoM) 15-20

15-20

SUMMARY

Temperature across the Rio Grande Basin between January 10 and February 7 were variable, deviating from 3°F (2°C) below average in central New Mexico and along the Rio Grande corridor to 9°F (5°C) above the 1981-2010 average in eastern New Mexico and central Texas (Figure 1). The region also received varying precipitation from November 10, 2015 to February 7, 2016. Southeastern New Mexico and southern Texas experienced precipitation 25-50% below average, while central New Mexico and northern Texas experienced precipitation 110-150% above average (Figure 2). Precipitation from January 9-February 6 fell predominantly below average (50-70% of average) for most of the Basin.

The early review of the 2008 NAM

Climate change in the North American Monsoon

The early review of the 2008 NAM featured the North American Monsoon, which is often overshadowed by the passage of tropical cyclones, which sometimes cause severe damage and loss of life. The early review focused on the development of climate impacts and outlooks in the region. Early review noted that climate impacts can be significant impacts on agriculture and forestry. However, according to the National Monsoon Water Consumption (NMWC), the NAM has been recorded in recent years. Early review noted that climate change impacts on agriculture and forestry can be even greater than on water resources. In fact, 77% of annual water resources have already been used. Thus, even without climate change, water availability is a problem that continues to grow. The early review noted that the Border Climate Summary was produced by the National Water Commission (NWCC) and the International Border Water Commission (IBW). Early review noted that the Border Climate Summary was produced by the National Water Commission (NWCC) and the International Border Water Commission (IBW).
A Little More Context

• North American Climate Change and Human Health Partnership
• North American Climate Services Partnership
• Global Framework on Climate Services – Health Pillar
• GHHIN Global Heat Health Information Network Launched 2 weeks ago
• South Asia—Heat Health focus in India, Bangladesh, Sri Lanka, Thailand
• WHO Second Global Conference on Health and Climate Change (Paris last week)
• WMO Strongly engaged
• US Climate and Health Science Needs process
What is **unique** vs. **shared**: RGB’s Exposure and Risk

- The North American **Monsoon** creates a distinct climate for the intermountain southwest.
- The RGB region faces some shared challenges – including the ‘**climate gap**’ and concentrated vulnerability in **colonias**.
- But the region can also take advantage of a diverse set of ideas for addressing these challenges such as **promotoras**.
- And already has an existing network to address imminent heat waves and other issues in the **Extreme Weather Taskforce**, and the **buddy** system.

**NIHHIS** is intended to understand and share these challenges, approaches, and successes, building local-regional and national-international resilience to extreme heat.
Seeking a **consistent approach** to extreme heat
Regional NIHHIS Partners from US Agencies

NWS WFOs

CDC BRACE Grantees

NOAA RCSDs

Regional Integrated Science and Assessments Teams
NIHHIS: Involvement of Partners at Every Level
## NIHHIS and Pilots Timelines

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<td><strong>Pilot Heat-Health Systems</strong></td>
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<td>Establish Pilot Protocol - Eval methods tracking params &amp; effectiveness</td>
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<td>Northeast (NYC) Pilot</td>
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<td>Rio Grande/Bravo Pilot (El Paso, Ciudad Juarez, Las Cruces)</td>
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<td>Western Region (Reno)</td>
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<td>Other domestic and international city pairs</td>
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- Historical Climatology & Vulnerability
- Linkages Between Heat Parameters and Health Outcomes
- Seasonal to Subseasonal Prediction and Outlooks
- Capacity Building and Training
- Communication and Engagement

### NIHHIS

- Organizing Committee
- Focusing Workshop

- Deep Dives
  - Fall '16 CPO-funded
  - Sustained Engagement & Ongoing Assessment
  - Outcome: Robust Research Reqs.
  - NWS Operations
  - CPO Programs
  - Interagency & International