



# CAROLINAS INTEGRATED SCIENCES & ASSESSMENTS

## about cisa

The Carolinas Integrated Sciences & Assessments (CISA) is 1 of 10 NOAA-funded Regional Integrated Sciences & Assessments teams. CISA works in North Carolina and South Carolina to integrate climate science into decision-making processes and improve society's ability to respond to climatic events and stresses.

CISA supports a North Carolina climate outreach and integration specialist to help engage decision makers and stakeholders in addressing the impacts of climate variability and change on public health.

## cisa connects climate and health science to decision making through

- » Applied research to produce relevant climate information
- » Assessments of climate impacts
- » Processes to support and inform community planning
- » Fostering climate networks and climate communities of practice

## climate and health partners

- » Climate Ready NC, a CDC Building Resilience Against Climate Effects (BRACE) program
- » North Carolina Department of Health and Human Services
- » State Climate Office of North Carolina

## FOCUS AREA: CLIMATE AND HEALTH

### how does climate affect human health?

It is important to distinguish between people's vulnerability versus exposure to climate events. Often the severity of a climate impact depends upon both of these factors.

**Vulnerability** refers to the predisposition to suffer adverse effects when exposed to a climate event. Vulnerability is rooted in many social, economic, demographic, and geographic factors. For example, an individual's vulnerability to heat-related illness depends upon factors such as age, weight, and how much they are acclimated to the heat. This vulnerability would not vary if they were exposed to the same level of heat in one location or another (a rural or an urban area, for example).

**Exposure** refers to the degree of contact. Increasing magnitude and frequency of extreme events, such as hurricanes or high heat days, increases an individual's exposure thereby increasing the risk of adverse health effects. While exposure and vulnerability often work together to influence the impact of a climate event, it is not necessary to be both highly exposed and vulnerable to be affected. For example, an otherwise healthy person exposed to high temperatures may suffer from heat-related illness even though he or she would not be considered "vulnerable."

### climate impacts to public health

- » Temperature
  - › Rising temperatures
  - › Hotter and longer heat waves
- » Extreme Weather Events
  - › Increased heavy rain and flooding
  - › More severe impacts
- » Deterioration of air quality
  - › Increased length and severity of allergy seasons
- » Changes in Vector Habitat
  - › Increased length of warm seasons
  - › Changes in precipitation regimes
  - › Expanded ranges of vector habitat



Source: George Herron

### vulnerable populations in the Carolinas

- » The elderly due to income limitations, pre-existing chronic health conditions, and social isolation
- » Outdoor and manufacturing workers (agriculture, natural resources, construction, or manufacturing) who are more likely to become dehydrated and suffer from heat-related illness
- » Student athletes who play or practice outdoors during high heat months, particularly when the humidity is also high, interrupting the body's normal cooling mechanisms
- » People without sufficient access to air conditioning, especially during prolonged periods of high heat when temperatures remain elevated overnight
- » Those who live in low-lying coastal areas or flood plains and are vulnerable to flooding from more frequent or intense extreme precipitation, hurricanes, and storm surge events
- » People who suffer from chronic illnesses such as diabetes or respiratory diseases such as asthma may experience higher vulnerability to extreme heat due to a diminished capability to regulate the body's temperature as well as higher vulnerability to poor air quality, which can trigger negative respiratory responses.

# CISA CLIMATE AND HEALTH PROJECTS

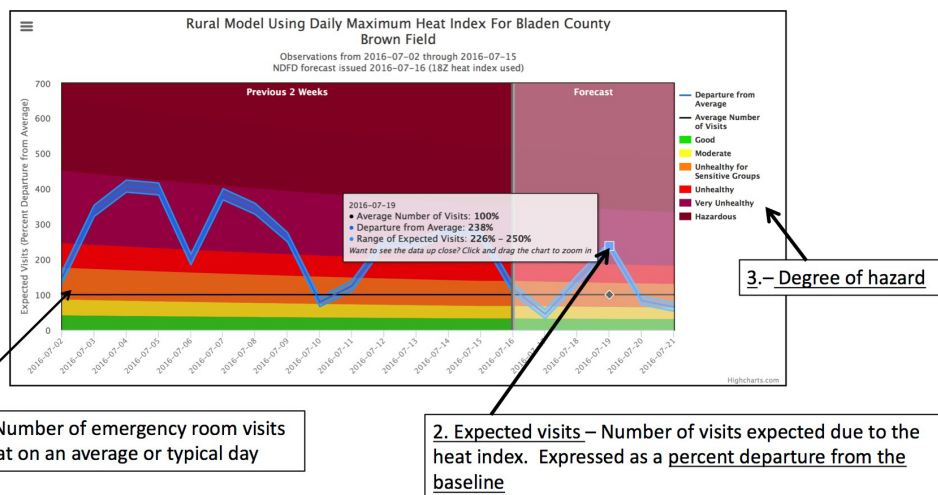
## HEAT-HEALTH RESEARCH

This work focuses on questions to better understand which demographic groups and regions are most vulnerable to heat stress and how to convey predicted risk to inspire preventative action or improve response:

- » Which temperature variables (e.g., daily maximum or minimum temperature, daily maximum heat index) provide the strongest and most robust relationships with the number of emergency department visits across different regions and demographic groups?
- » How do these relationships vary with respect to time (e.g., differences between weekdays and weekends), seasons (e.g., early or late summer), and types of activities that might contribute to vulnerability (e.g., outdoor labor or recreational activities)?
- » What methods and sources of information do stakeholders use to make various decisions related to heat? How might this inform the development of tools to predict rates of heat-related illness and provide meaningful and readily understandable information to different stakeholder groups?

### Heat Health Vulnerability Tool

The Heat Health Vulnerability Tool (HHVT) is a web-based tool that predicts the daily number of emergency department visits for heat-related illness across North Carolina. The tool inputs 5-day National Weather Service point forecasts of daily maximum heat index and employs empirical relationships to translate these values into useful information regarding the probability of emergency department visits due to the heat. It is geared towards public health officials and emergency management personnel across the state of North Carolina. The current, updated version of the tool incorporates important feedback gained from engagements with stakeholders. Access the tool at [www.sercc.com/hhvt](http://www.sercc.com/hhvt).



**Above:** The HHVT predicts the expected number of visits to the emergency room for heat-related illness and visualizes the percent departure from the baseline (solid black line) along with the degree of hazard, represented by the color scheme in the background of the graph. The degree of hazard indicates a community-level warning based on the nature of the community's population.

## WATERBORNE DISEASE RESEARCH

This work focuses on investigating the geographic variations of waterborne disease, their relationship with hydroclimate patterns, and areas of vulnerability:



- » What are the seasonal differences and relationships between waterborne disease incidents and precipitation patterns?
- » What are the relationships between antecedent patterns of precipitation and waterborne disease?
- » Are there regional differences or patterns that indicate water system infrastructure vulnerabilities (e.g., municipal facilities that treat surface water v. ground water wells)?
- » What role does heavy rainfall play, particularly in respect to length of dryness prior to a heavy rainfall event?



## working to reduce vulnerabilities to climate-related health impacts

CISA seeks to better understand climate-health relationships and the interacting stressors that shape these relationships to improve the prediction of public health impacts of weather and climate events, the communication of risks (e.g., heat advisories and warnings) and the adoption of long-term strategies to reduce risk.

### contact information

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### other ways to connect

CISA publishes a quarterly newsletter, the Carolinas Climate Connection, and manages the Carolinas Climate Listserv in order to share up-to-date information about climate research, upcoming events, funding opportunities, or other relevant news.

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