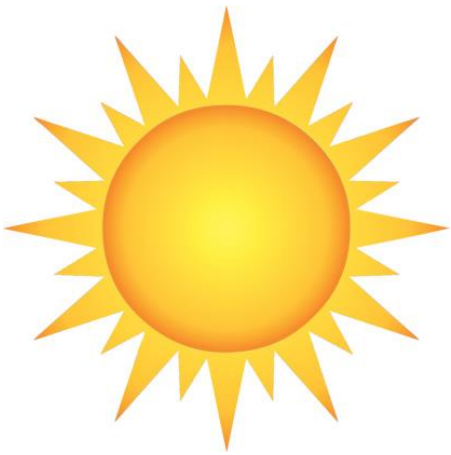
North Carolina Climate and Health Implementation and Monitoring Strategy (IMS) for Heat-Related Illness



This Implementation and Monitoring Strategy (IMS) is a living document. It outlines a plan of action for the North Carolina Division of Public Health to implement adaptations and interventions aimed at disrupting the pathway between extreme heat and its subsequent health outcomes.

The interventions and adaptations outlined in this document were designed following the BRACE framework (Steps 3 and 4), with significant input from and collaboration with local stakeholders. This plan of action requires a description of how each adaptation and intervention will be implemented, communicated, and evaluated. An initial, completed IMS for all selected exposure foci will satisfy performance measures A through H of the CDC-RFA-EH16-1602. Updates to the IMS over time will satisfy performance measure K of the CDC-RFA-EH16-1602.

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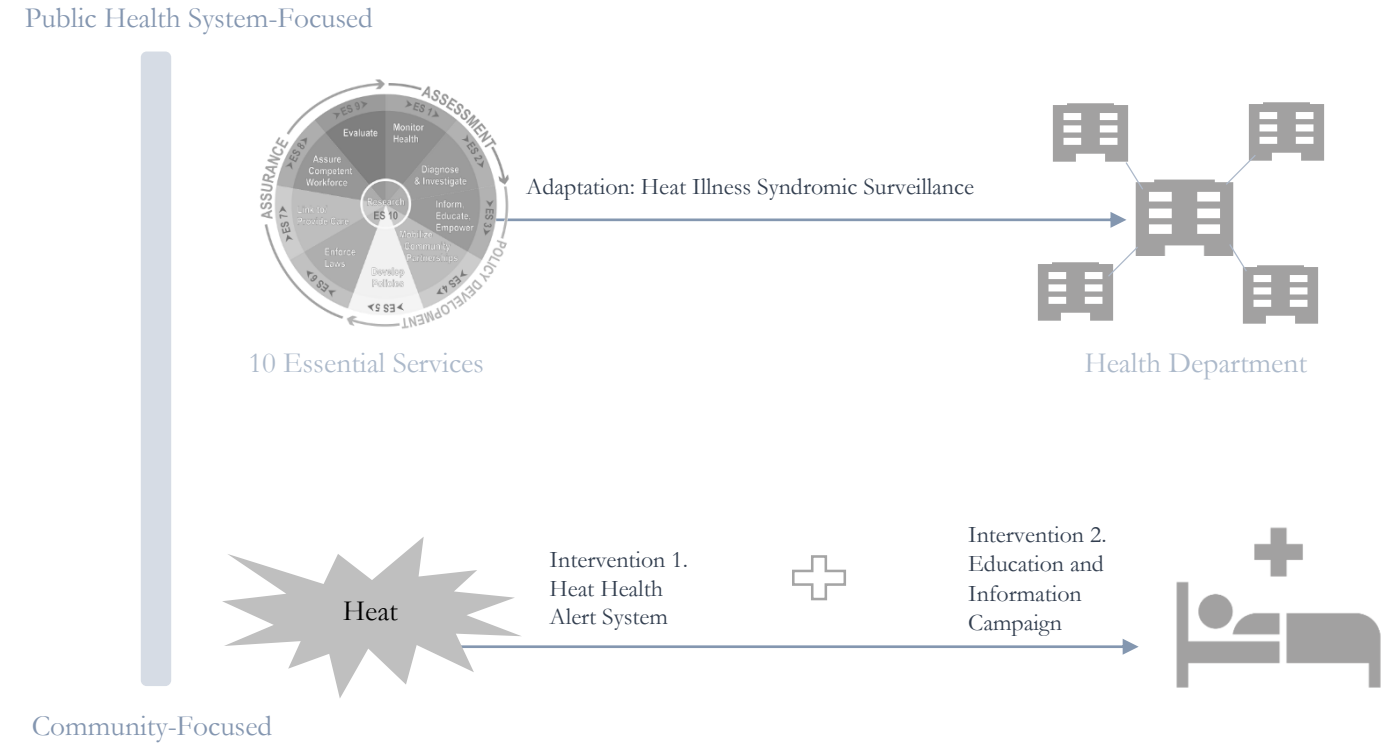
SELECTED EXPOSURE-RESPONSE ADAPTATIONS AND INTERVENTIONS

EXPOSURE – RESPONSE PATHWAY



EXECUTIVE SUMMARY

The North Carolina Climate and Health Program is housed in the North Carolina Department of Health and Human Services, Division of Public Health located in Raleigh, NC. The North Carolina Climate and Health Program was established through CDC's Climate-Ready States and Cities Initiative (CRSCI) in 2010 to address the health impacts of climate. Using the Building Resilience Against Climate Effects (BRACE) framework, North Carolina identified heat-related illness and wildfire health impacts as main priorities[1].

There is widespread scientific agreement that our climate is changing. Some changes will likely include an increase in the frequency and intensity of extreme heat events, heavy precipitation events, flooding, droughts, more intense storms, and air pollution. Each of these changes have potentially negative impacts on public health[2].

While climate's impact on health is a global issue, the effects will vary across geographic regions and populations. In North Carolina, heat-related illness (HRI) is an annual concern. Model projections have suggested an annual increase of 15-20 days with maximum temperatures exceeding 95°F between 2041 and 2070. On average, there are approximately 4,000 emergency department visits for HRI during heat season (May 1 – September 30) in North Carolina. The majority of emergency department visits for HRI are among males, particularly those between the ages of 25-34 years of age. Though anyone can be affected by complications from HRI, older North Carolinians (>65 years) are more likely to be hospitalized for HRI[3, 4, 5] .

Additionally, the impacts of HRI are expected to be felt more in underserved communities of North Carolina where, along with a disproportionate burden of respiratory and cardiovascular disease, residents have limited capacity to adapt to warming temperatures[6, 7].

Within the Coastal Plains region, people over age 65, outdoor workers, youth and high school athletes, those with limited resources, and those living in mobile homes are particularly vulnerable to HRI [5, 8]. Most of the region is rural, limiting access to potential resources such as cooling centers and public transportation, further increasing vulnerability.

The HRI work is focused in Bladen, Robeson, Sampson, and Scotland counties. NC DPH focused on these counties because they had the highest emergency department visits related to HRI.

NC DPH used the Community Readiness Model (CRM) to survey stakeholders[9]. Under this model, community readiness is defined as the degree to which a community is willing and prepared to act on an issue, in this instance, on HRI. For this analysis, NC BRACE has adapted the following dimensions of community readiness:

- Knowledge of the issue – How much does each vulnerable population know about HRI
- Knowledge of existing efforts – How much does each population know about current programs and activities intended to address HRI?
- Community climate – What is each population's attitude toward addressing HRI?
- Resources – What are the resources that are being used or could be used to address HRI

Implementation and Monitoring Strategy (IMS)

In 2010, North Carolina was one of 16 states to receive the Centers for Disease Control and Prevention (CDC) Building Resilience Against Climate Effects (BRACE) grant[1]. The grant program specifies the following five-step process designed to aid health officials in developing strategies and programs to help communities prepare for the impact of climate on health.

1. Anticipate climate impacts and assess vulnerabilities
2. Project the disease burden
3. Assess public health interventions

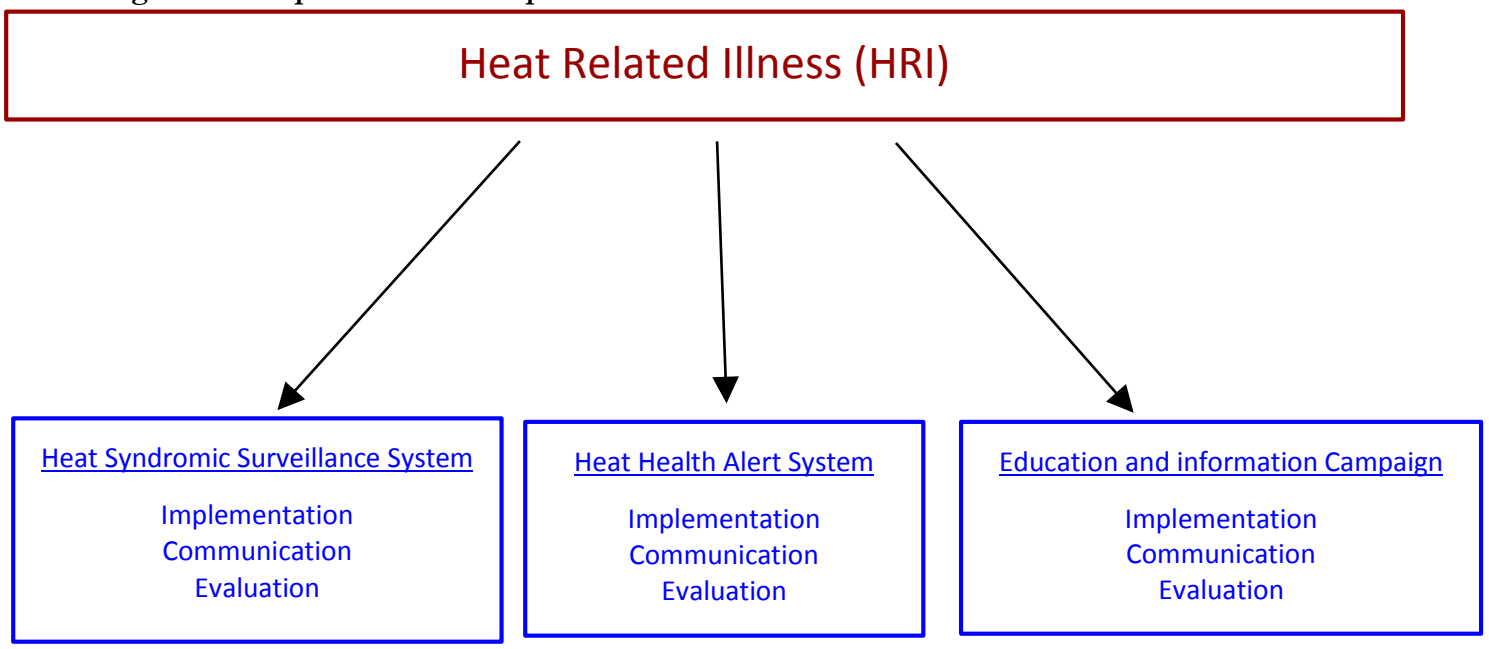
4. Develop and implement a climate and health adaptation plan
5. Evaluate impact and improve quality of activities

Following this framework, the Occupational and Environmental Epidemiology Branch (OEEB) of the North Carolina Department of Public Health (NC DPH) conducted health assessments to determine which climate-related health impacts were most prevalent in North Carolina, and which geographic areas were most affected. Syndromic surveillance of emergency department (ED) visits for heat exhaustion, heat cramps, and heat stroke during summer months indicated that HRI is a major climate-related public health concern[4].

This IMS executive summary will focus on two interventions that have been prioritized by the North Carolina Climate and Health Program working with key stakeholders in vulnerable communities:

1. Adaptation- Heat Syndromic Surveillance System
2. Intervention 1 - Heat Health Alert System
3. Intervention 2 - Education & Information Campaign

Figure 1. Components of an Implementation Plan of Action



Adaptation: Heat Syndromic Surveillance System

Implementation

North Carolina's syndromic surveillance system is called the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT). This system was created by NC DPH and Carolina Center for Health Informatics (CCHI).

The heat syndromic surveillance system is used to describe HRI in North Carolina and disseminates that information to an inter-agency HRI working group regularly. Using the data provided by NC DETECT, NC DPH produces weekly heat syndromic surveillance data during May – October to stakeholders.

The heat syndromic surveillance system communication strategy's primary goal is to promote stakeholder engagement with and utilization of trends of HRI in North Carolina. The purpose of these evaluation indicators and analyses is to determine how successful the heat syndromic surveillance system is.

The Heat Syndromic Surveillance System describes HRI occurring in North Carolina during the summer months. This illness occurs at higher rates among males ages 19-44 in the Coastal Plains region of the state. Risk factors for illness include non-citizenship, living in mobile homes, age over 65, labor intensive fieldwork, and poverty[8].

Intervention 1: Heat Health Alert System

Implementation

A heat health alert system is a response plan prepared by a city, county, or other regional municipality which is activated when the air temperature or heat index reaches or exceeds a predetermined threshold and is deemed dangerous to human health[12]. Successful examples include New York City's heat health alert system and Arizona's Climate and Health Adaptation Plan[2].

- Largest evidence base demonstrated success in similar contexts
- Evidence of health impacts below National Weather Service (NWS) advisory, watch, and warning system levels[5]
- Extreme heat is one of the main causes of mortality related to weather in the United States[13] Negative health outcomes from heat exposure include heat cramps, heat stroke, heat exhaustion, and death[7]
- Each heat health alert system will be context-specific; details will be determined in collaboration with local stakeholders and prevention specialists in each of the four target counties: Bladen, Robeson, Sampson, and Scotland counties.

Populations Addressed

Based on qualitative analysis of this information, NC DPH will tailor the heat health alert system to the following respective populations in each of four counties:

- Bladen County - Agricultural workers
- Robeson County - Low-income people, those living in mobile homes
- Sampson County - Low income and older adults
- Scotland County – Youth

Implementation Methodology

- Meet with contractors and local stakeholders to cultivate a list of prevention specialists who can speak to the needs and priorities of members of each target population in each county, as listed above.
- Work with county prevention specialists to develop specific messages and communication channels for heat alerts
- Tailor Heat Health Alert System major components: community education and engagement, alert protocol, community outreach plan, and communication plan.
    - Community Education and Engagement
      -Identify community needs by conducting a needs assessment, recruit stakeholders in each county, educate the public by training prevention specialists in each county using a health education curriculum, and develop a heat health alert system. Prevention specialists will be able to add their input regarding the health education curriculum.
    - Alert Protocol
      -Develop a trigger alert that will make people aware of high heat days and the precautions they should take on those days. Prevention specialists will use information about epidemiological studies identifying potential, morbidity-centric trigger alert levels. NC DPH will work with prevention specialists to pick a trigger alert level that will work best for the target population in their county, including considering potential message fatigue for the population.
      -Prevention specialists likely understand population capacity for messaging and alerts, and therefore are best prepared to determine trigger alert levels and the resulting number of messages/alerts/communications during the heat season. Trigger alert levels for each county will be decided by March 2018, in time for development of appropriate materials and communications.
    - Community Outreach Plan
      -Create a framework to reach out to vulnerable populations in each county. Prevention specialists will use a curriculum designed by NC DPH and Sustainable Sandhills staff to implement the alert protocol. Prevention specialists will reach the targeted population in their county using different communication methods such as email, meetings, etc. A community outreach plan will be decided by April 2018.
    - Communication Plan

-Develop ways to deliver the heat health alert system in each county through different communication methods and a health education curriculum. Prevention specialists will work with NC DPH to identify ways to effectively communicate the heat health alert system with the targeted population(s).

Communication

The primary objective of this communication strategy is to communicate how the Heat Health Alert System will be implemented through:

- Community meetings
- Stakeholder meetings
- Group trainings
- Train the trainer/educator trainings with prevention specialists

Evaluation

The purpose of this evaluation plan is to improve the heat health alert system, as well as to document successes and identify barriers in the implementation of a heat health alert system. In addition, evaluation will provide data on the efficacy of the heat health alert system.

Cultural Humility

NC DPH staff are aware of the limitations they face regarding the different cultures of the four counties in North Carolina. NC DPH uses cultural humility to not master the culture but to learn more about the culture they are working with to better serve them[10].

NC DPH will work to understand the community that they are working with and make sure that the community's needs are being met in an effective manner. NC DPH and Sustainable Sandhills will work together to build sustainable relationships with various partners in all four counties. These partners will provide valuable feedback to improve the program.

NC DPH and Sustainable Sandhills will consider language and educational level when developing materials. Materials will be easy to understand and be effective in getting out the information to vulnerable populations.

Intervention 2: Education and Information Campaign

Implementation

NC BRACE staff and the stakeholder team will develop informational and educational materials on how to use the heat health alert system as well as on how to identify, treat, and prevent HRI. Messaging and the modes of communication for this information will be tailored to the priority populations identified through the CRM survey and analysis.

The education and information campaign is a set of curricula designed to teach community members about the heat health alert system. A health education curriculum will be developed and utilized for implementation of the heat health alert system in each county. These curricula will be the baseline for all education work. Each county's curriculum will be slightly different, depending on the heat health alert system that best fits each county.

Populations Addressed

Heat illness is an increasing concern in North Carolina and across the Coastal Plains. Local communities vary in their awareness of heat health issues, the type of heat illness prevention programs already in place, and the priority given to those programs. Using a framework adapted from the CRM, NC DPH interviewed key stakeholders in assessing current heat-illness prevention efforts, identify needed resources, and select a target population for piloting a heat health alert system.

Based on qualitative analysis of this information, NC DPH will tailor the heat health education and information campaign to the following respective populations in each of four counties:

- Bladen County - Agricultural workers
- Robeson County - Low-income people and those living in mobile homes
- Sampson County - Low income and older adults
- Scotland County – Youth

Communication

By using the curricula designated for each county, NC DPH will be able to better educate leaders in the community. NC DPH will implement a "train the trainer" program where the prevention specialists will take initiative and be able to lead their county to healthier results.

Evaluation

The purpose of this evaluation is to effectively communicate the heat health alert system and its trigger alert levels to the populations addressed in the four-county region. In addition, this intervention will be used by stakeholders and prevention specialists to educate the populations addressed about heat related illness and protection actions.

Funding

- CDC grant supporting NC BRACE staff
- Stakeholders funding that allows continued involvement, such as local health department or agriculture extension funding

Personnel

- NC BRACE staff (Lauren Thie, Environmental Program Consultant; Lisa Garland, Climate Health Educator; Sarah Shaughnessy, Climate & Health Program Assistant; Mac Ledgerton, Climate and Health Program Consultant; Mina Shehee, Branch Head)

- Sustainable Sandhills staff (Denise Bruce, Climate and Health Program Contractor; contractor works with NC BRACE staff on curriculum development, trigger protocols, and other logistics)
- Community stakeholders (local health departments, Agriculture Extension, local planners, local health directors, local Parks and Recreation staff, EMS, Emergency Management, Farmworker Health Programs, etc.)

Follow-Up

NC DPH will communicate monthly and meet quarterly with stakeholders to provide updates on the progress of program and to discuss next steps.

References

1. Marinucci, G. D., Luber, G., Uejio, C. K., Saha, S., & Hess, J. J. (2014). Building resilience against climate effects-A novel framework to facilitate climate readiness in public health agencies. International Journal of Environmental Research and Public Health, 11(6), 6433-58.

2. Centers for Disease Control and Prevention. Climate and Health. (2017). Retrieved 2017 from https://www.cdc.gov/climateandhealth/default.htm.

3. Luginbuhl RC, Jackson LL, Castillo DN, Loringer KA. Heat-related deaths among crop workers, United States, 1992-2006. Morbidity and Mortality Weekly Report. 2008; 57:649-653.

4. North Carolina Department of Public Health (NC DPH). (2017). Climate & Health. Retrieved December 2017 from http://epi.publichealth.nc.gov/oee/programs/climate.html.

5. Rhea, S., Ising, A., Fleischauer, A. T., Deyneka, L., Vaughan-batten, H., & Waller, A. (2012). Using near real-time morbidity data to identify heat-related illness prevention strategies in North Carolina. Journal of Community Health, 37(2), 495-500.

6. NC Interagency Leadership Team. Climate Ready North Carolina: Building a Resilient Future. (2012). Retrieved 2017 from http://www.climatechange.nc.gov/Climate_Ready_North_Carolina_Building_a_Resilient_Future.pdf.

7. Portier CJ, Thigpen Tart K, Carter SR, Dilworth CH, et al. A Human Health Perspective on Climate: a report outlining the research needs on the human health effects of climate. Environmental Health Perspectives and National Institute of Environmental Health Sciences. 2010. Retrieved 2015 from https://www.niehs.nih.gov/health/materials/a_human_health_perspective_on_climate_change_full_report_508.pdf.

8. Kovach, Margaret, M. (2015). Climate-Human Health Vulnerability: Identifying Relationships between Maximum Temperature and Heat-Related Illness across North Carolina, USA (Doctoral dissertation).

9. The Tri-Ethic Center for Prevention Research (2014). The Community Readiness Model Handbook. Colorado State University.

10. Cynthia Foronda, PhD, RN; Diana-Lyn Baptiste, DNP, RN; Maren M. Reinholdt, MSN, BSN, RN; and Kevin Ousman, MSN-HSM, BSN, RN. (2016). Cultural Humility: A Concept Analysis in Journal of Transcultural Nursing, Volume 27, Issue 3, Pages 210-217.

11. Linnan, L., & Steckler, A. B. (2002). Process evaluation for public health interventions and research. San Francisco: Jossey-Bass.

12. Berry, P., Yusa, A., Morris-Oswald, T., & Rogaeva, A. (2014). Heat alert and response systems in urban and rural communities in Canada. Change and Adaptation in Socio-Ecological Systems, 1(1) doi:10.2478/cass-2014-0009.

13. Fuhrmann, C. M., Sugg, M. M., Konrad II, C. E., & Waller, A. (2016). Impact of extreme heat events on emergency department visits in North Carolina (2007–2011). *Journal of Community Health, 41*(1), 146-156. doi:10.1007/s10900-015-0080-7.

14. Sugg, M. M., Konrad II, C. E., & Fuhrmann, C. M. (2015). Relationships between maximum temperature and heat-related illness across North Carolina, USA. *International Journal of Biometeorology*, 1-13.

15. Lippmann, S. J., Fuhrmann, C. M., Waller, A. E., & Richardson, D. B. (2013). Ambient temperature and emergency department visits for heat-related illness in north carolina, 2007-2008. Environmental Research, 124, 35. doi:10.1016/j.envres.2013.03.009.

16. The National Weather Service, LaCrosse, WI. Heat Index Climatology (2017). Retrieved 2017from https://www.weather.gov/arx/heatindex_climatology.