Drought and Public Health: A Roadmap For Advancing Engagement and Preparedness

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Drought and Health Roadmap

- Partnership between National Integrated Drought Information System (NIDIS) and University of Nebraska Medical Center (UNMC)
- Culmination of public health engagement efforts from 2019-2022
- Purpose: Inform and direct future efforts and investments in drought and public health
Today’s Webinar

- Overview of Drought and Health
- Drought and Health Outreach Activities
- Key Recommended Actions
- Next Steps
Overview of Drought and Health
“Floods kill people, but droughts destroy civilizations.”
~U.S. Government Official at a Drought Meeting
Dust Bowl of the 1930s
Connecting Drought to Health
Percentage of disaster-deaths worldwide according to each category of climate-related hazard, (1900-2013)

Source: Adapted from EM-DAT: The OFDA/CRED International Database, Belgium 2012
Keim, ME Extreme Weather Events: the role of public health
Drought Impacts

Estimated Deaths and Billion Dollar Losses from Extreme Events in the U.S., 2004–2013

- Heat Waves: $392 Billion
- Tornadoes/Droughts: $78 Billion
- Hurricanes: $46 Billion
- Flooding/Severe Storms: $30 Billion

Bell et al., 2016
Drought & Health

31 Events

$343 Billion Lost

4,413 Deaths

Drought can evolve slowly

The impacts are not immediate

Can require multiple steps for health outcomes

Surveillance is not designed to connect drought and health
Threat Multiplier

An algae bloom has made this area potentially unsafe for water contact. Avoid direct contact with visible surface scum.
Environmental & Institutional Context

Drought Types
- Meteorological Drought
- Agricultural Drought
- Hydrological Drought
- Socio-economical Drought

Social & Behavioral Context

Exposure Pathways
- Increase in Dust and Dust Storms
- More Frequent Wildfires
- Decrease in Water Quality and Quantity
- More Frequent and More Intense Heat Waves
- Change in Vector Habitat and Range
- Loss of Agriculture and Food Security

Health Outcomes
- Respiratory Issues
- Allergy-related Illnesses
- Injuries
- Infectious Disease
- Hunger/Famine
- Heat Illnesses
- Gastrointestinal Illnesses
- Mental Health Consequences

Social Determinants of Health
- Occupation
- Rural/Urban
- Race/Literacy/Age
- Dependence on Caregivers and Medication
**WCHP Research: Increase in Mortality with Drought**

**Drought Mortality in Nebraska**

Significant associations between drought and all-cause mortality for long-term droughts

- **Metro**
- **Non-Metro**

- **Age groups**
  - 25-34 (female) and 45-64 (female and male) in metro counties
  - 45-54 (female and male) in non-metro counties in Nebraska

Abadi et al. 2022 Science of the Total Environment 840(2022)156660
Increased Respiratory Mortality with Drought Events

Respiratory Mortality Outcomes

- Males and Females had increased respiratory related mortality with severe drought.
- Females had a larger effect.

- Respiratory mortality increase in metro and nonmetro areas during severe drought.
- Nonmetro had a larger effect.

The association between drought conditions and increased occupational psychosocial stress among U.S. farmers: An occupational cohort study

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Research Interests

Drought causes stress in farmers

The effect estimate for drought was 4x greater magnitude than people reporting pain in multiple body parts.
Compromised Quality & Quantity of Water

Surface Water

Drought May Lead to Elevated Levels of Naturally Occurring Arsenic in Private Domestic Wells

Release Date: MARCH 18, 2021

An estimated 4.1 million people in the lower 48 states are potentially exposed to arsenic levels that exceed EPA's drinking water standards.

A new U.S. Geological Survey study highlights the importance of homeowners testing their well water to ensure it is safe for consumption, particularly in drought-prone areas. The first-of-its-kind national-scale study of private well water, conducted in collaboration with the Centers for Disease Control and Prevention, showed that drought may lead to elevated levels of naturally occurring arsenic and that the longer a drought lasts, the higher the probability of arsenic concentrations exceeding U.S. Environmental Protection Agency's standard for drinking water.

Researchers estimate that during drought conditions, 4.1 million people in the lower 48 states who use private domestic wells are potentially exposed to unsafe levels of arsenic. This is an increase of 54% from the estimated 2.7 million people exposed to unhealthy arsenic levels in private wells during normal, non-drought conditions.

Arsenic is a metal that can occur naturally in bedrock and sediments around the world and is commonly reported in drinking-water supply wells. However, chronic exposure to arsenic from drinking water is associated with an increased risk of several types of cancers, including bladder, lung, prostate and skin cancers. Other adverse effects include developmental impairments, cardiovascular diseases, adverse birth outcomes and impacts on the immune and endocrine systems.

The study's findings can help public health officials and emergency managers notify well owners in areas potentially affected and further refine their strategies for addressing the issue. The EPA regulates public water supplies, but maintenance, testing and treatment of private water supplies are the

Groundwater
When drought affects a community, its devastating consequences can include food and water shortages, loss of crops, and increased outbreaks of disease. The health impacts of drought can be complex and costly.

Preparing for the Health Effects of Drought

A Resource Guide for Public Health Professionals

Intensively work with water and drought experts to identify water-related health threats and determine specific actions to prevent, contain, or control outbreaks and to protect the public health.

Supporting activities of local, state, and federal health departments, along with the National Oceanic and Atmospheric Administration (NOAA), to identify and mitigate significant risks to public health.

Environmental and health professionals are encouraged to develop and disseminate preparedness resources to support the health of the population during drought conditions.
Drought and Health Outreach Activities
Drought and Health Outreach Activities

- Two-fold purpose:
  - Assess needs and gaps
  - Convene stakeholders

- Approach:
  - National Drought and Health Summit
  - Regional Drought and Health Workshops
  - Health Department Interviews
NATIONAL DROUGHT & PUBLIC HEALTH SUMMIT
June 17-19, 2019 | Atlanta, GA

Thank you to our Summit Planning Partners:
Centers for Disease Control and Prevention (CDC)
National Integrated Heat Health Information System (NIHHIS)
Environmental Protection Agency (EPA)
Natural Resources Defense Council (NRDC)
UNL National Drought Mitigation Center (NDMC)
## Drought and Health Workshops

<table>
<thead>
<tr>
<th>Workshop</th>
<th>When</th>
<th>Where</th>
<th>Attendees</th>
<th>Regional Topics</th>
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</table>
| Midwest Drought and Human Health Workshop     | November 2019 | St. Paul, Minnesota | ~40 attendees | Emergency response  
Mental health  
Water quality/quantity  
Tribal impacts |
| Southwest Drought and Human Health Workshop   | February 2020 | Tucson, Arizona     | ~40 attendees | Extreme heat  
Air quality  
Water quality/private wells  
Vector-borne diseases  
Tribal engagement |
| Carolinas Drought and Human Health Workshop   | September 2020 | Virtual           | ~20 attendees | Vector-borne diseases  
Mental health  
Drought indicators/definitions  
Vulnerable populations |
| Upper Missouri River Basin Drought and Human Health | April 2022 | Bozeman, Montana   | ~40 attendees | Tribal engagement  
Health equity  
Mental health  
Water conservation |
| Pacific Northwest Drought and Human Health Workshop | October 2022 | Portland, Oregon   | ~80 attendees | Environmental justice  
Air quality  
Wildfire  
Tribal engagement |
Health Department Interviews

- From 2021-2022, conducted 16 interviews with state public health departments across U.S.

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<thead>
<tr>
<th>Primary Question</th>
<th>Secondary Question</th>
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<tbody>
<tr>
<td>What impacts has drought had on your region?</td>
<td>N/A</td>
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<tr>
<td>Has drought caused other secondary impacts (such as wildfires, dust storms, heat waves, etc.)?</td>
<td>Specifically, has drought caused human health impacts in your region?</td>
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<td>Is that information available because of surveillance systems that are in place, or because of “one-off” research that has been done?</td>
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<td></td>
<td>What systems or data collection activities would need to be in place for you to answer that question?</td>
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<td>What populations or communities in your region are most vulnerable to the impacts of drought?</td>
<td>What public health/emergency management/other agencies have a close working relationship with those communities?</td>
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<tr>
<td></td>
<td>Do you have a working relationship with them?</td>
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<tr>
<td>Are you currently conducting any drought and human health activities in your region, and if so, what activities are you conducting?</td>
<td>What partners have you worked with regarding issues of drought and human health?</td>
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<td>What sources of funding support your drought and human health activities in your region?</td>
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<td>If you have not yet, would you be interested in conducting drought and human health activities in your region? What activities would you want to see conducted in your region?</td>
<td>What resources would be helpful to you to address the human health impacts of drought?</td>
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<td>What partnerships would help make these activities happen?</td>
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<td>What research do you think needs to be conducted relating to drought and health?</td>
<td>N/A</td>
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Key Recommended Actions
Primary Focus Areas

- Partnership and Collaboration
- Communication and Outreach
- Interdisciplinary Research and Applications
- Planning and Preparedness
Partnership and Collaboration

- Build community of practice
- Expand public health representation at drought-related meetings
- Increase adoption of early warning systems
- Incorporate drought into vulnerability and Community Health Needs Assessments (CHNAs)
Communication and Outreach

- Develop impact-based communication resources
- Tailor communication tools for vulnerable populations
- Increase drought and health resources for health departments
- Utilize federal agency websites to share resources
Interdisciplinary Research and Application

- Improve understanding of drought indicators
- Conduct a comprehensive review of past drought events
- Improve understanding of how drought impacts private wells
- Address barriers to data access
Planning and Preparedness

- Incorporate health impacts into drought vulnerability assessments
- Utilize tabletop exercises for drought events
- Engage with tribal nations
- Create sample drought and health questions for community health needs assessments
Next Steps
Next Steps

- Continuing research looking at health impacts associated with droughts
- Release of *Drought and Health: A Messaging Framework for Public Health Professional & Healthcare Providers*
- Workshop in 2024 on drought and health tool development
- Much more to come!
Thank you!

- Our co-authors:
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  - Britt Parker, NIDIS
  - Sylvia Reeves, NIDIS
  - Amanda Sheffield, NIDIS
  - Molly Woloszyn, NIDIS

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NIDIS
NATIONAL INTEGRATED Drought INFORMATION SYSTEM

THE DAUGHERTY
WATER for FOOD
GLOBAL INSTITUTE
at the University of Nebraska

COLLEGE OF AGRICULTURAL SCIENCES
AND NATURAL RESOURCES
Access the Roadmap

Questions?