

Drought and Health

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North Carolina State University,
Asheville, NC USA, and
NOAA's National Centers for Environmental Information (NCEI)
Asheville, NC USA

Midwest Drought Early Warning System Kickoff Meeting
Feb. 9-11, 2016



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Outline

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1. My position
2. National vs. International Views on Drought and Health
3. Problems with Determining Drought Impacts on Health
4. Drought Impacts on Health
5. Communication
6. Future Needs



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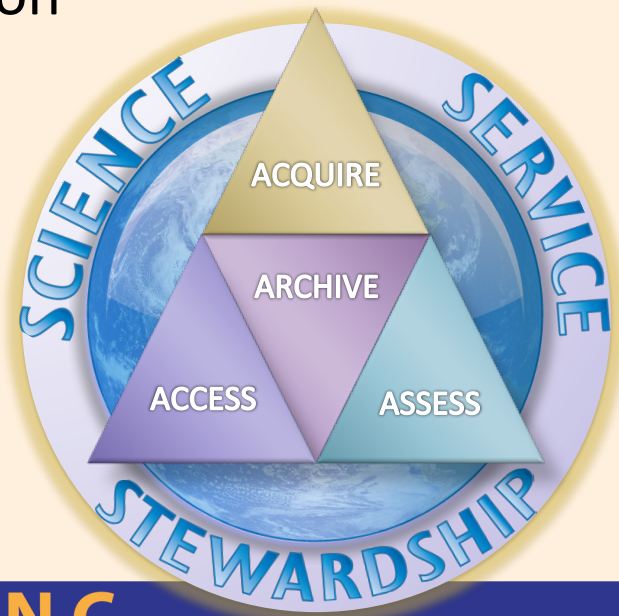
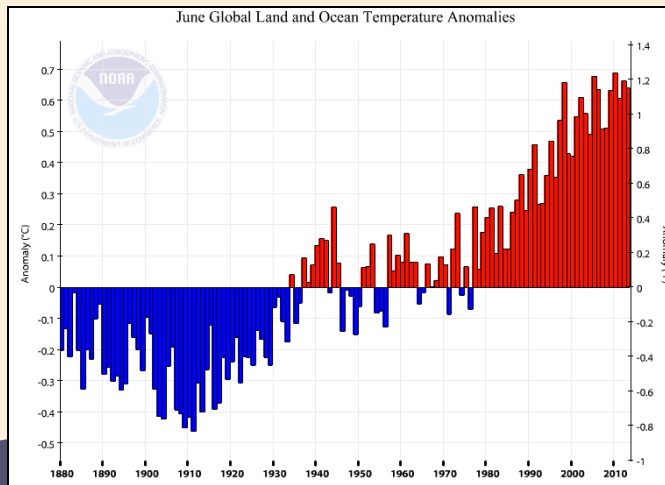
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Climate Data Access

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- Cooperative Institute for Climate and Satellites-NC
 - Academic research institute designed to assist with the outreach and research needs of NOAA
- NOAA's National Centers for Environmental Information
 - Steward of Nation's Climate Information



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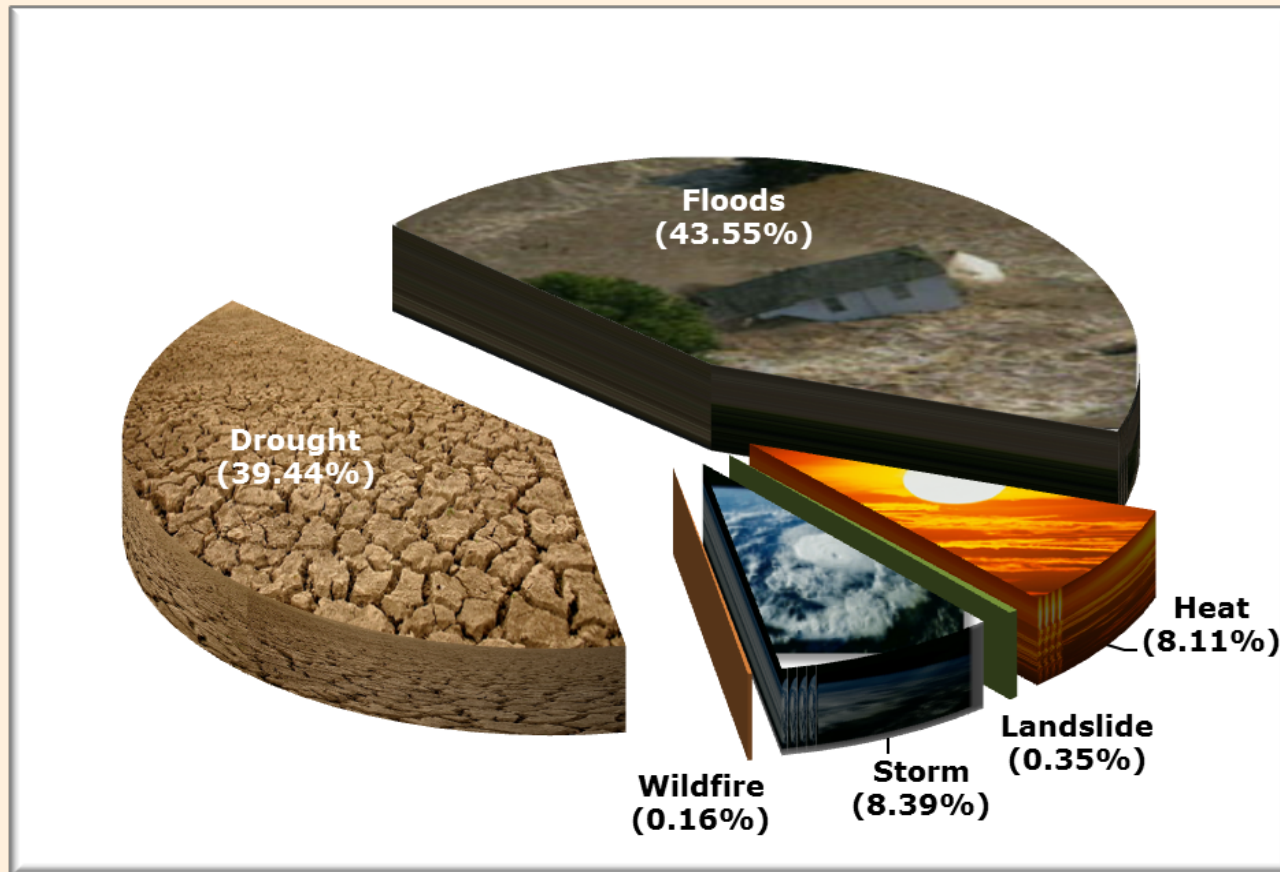
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2. National vs. International Views on Drought and Health

Percentage of people affected worldwide according to each category of climate-related hazard, (1900-2013)

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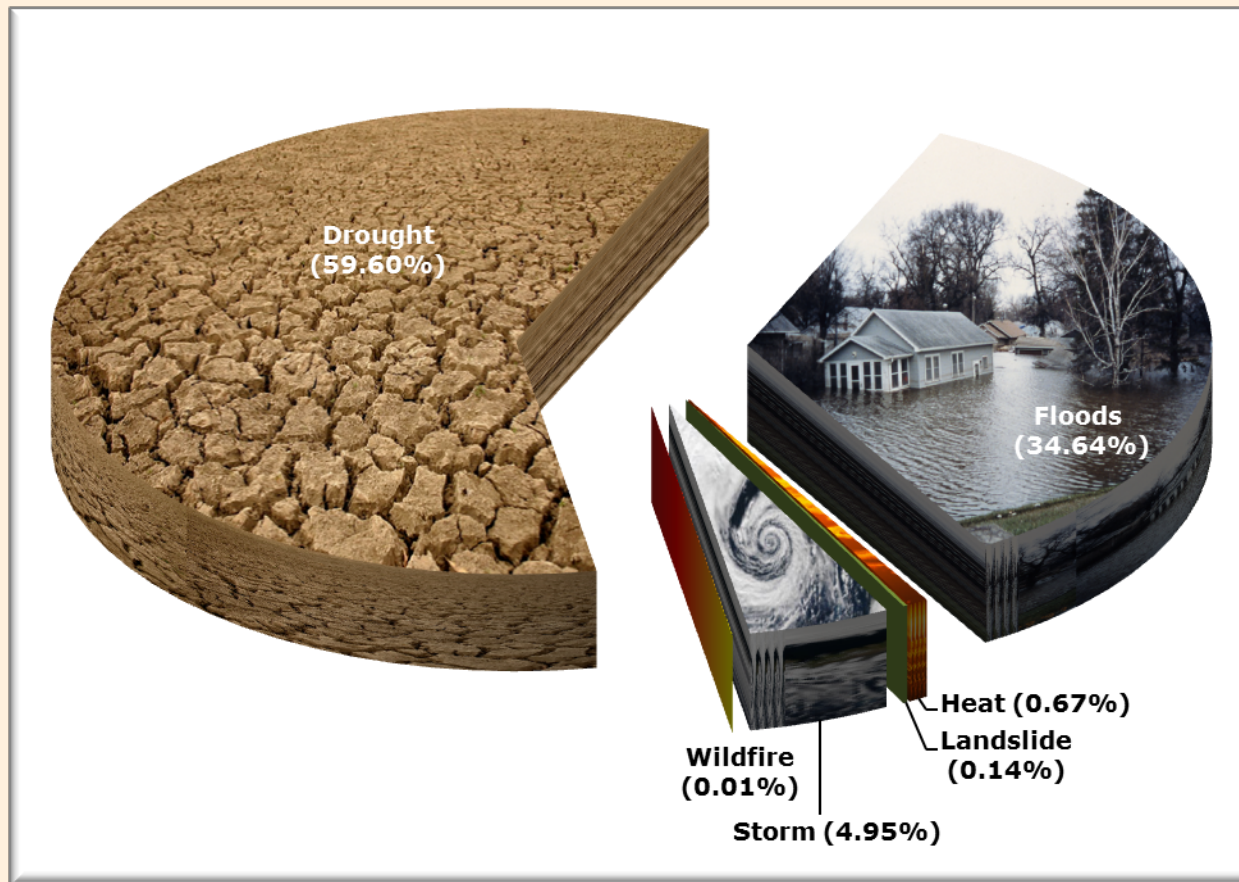


Source: Adapted from EM-DAT: The OFDA/CRED International Database, Belgium 2012

Keim, ME Extreme Weather Events: the role of public health

Percentage of disaster-deaths worldwide according to each category of climate-related hazard, (1900-2013)

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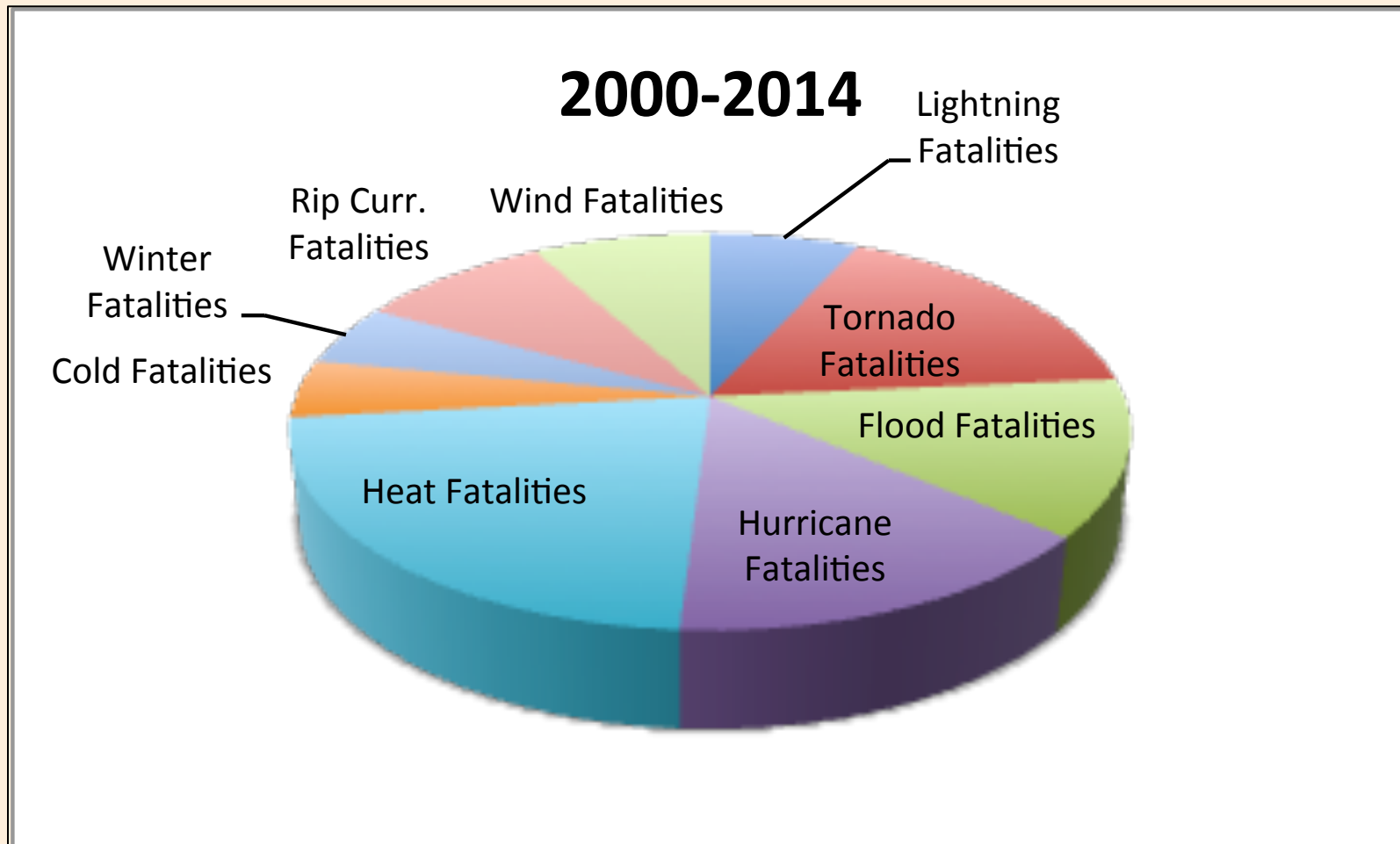


Source: Adapted from EM-DAT: The OFDA/CRED International Database, Belgium 2012

Keim, ME Extreme Weather Events: the role of public health

NWS Weather Fatalities

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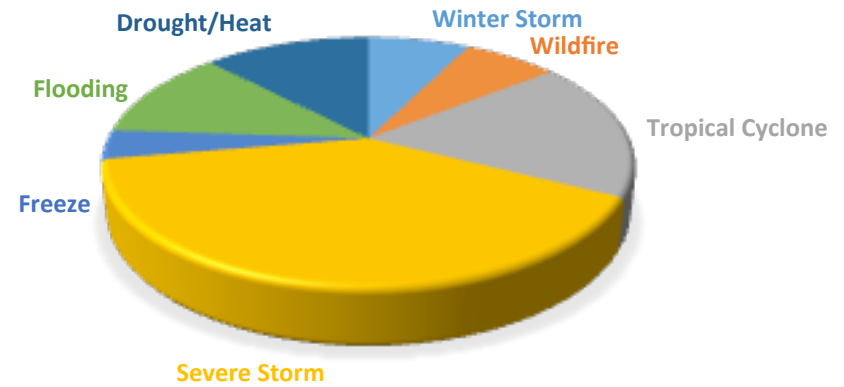
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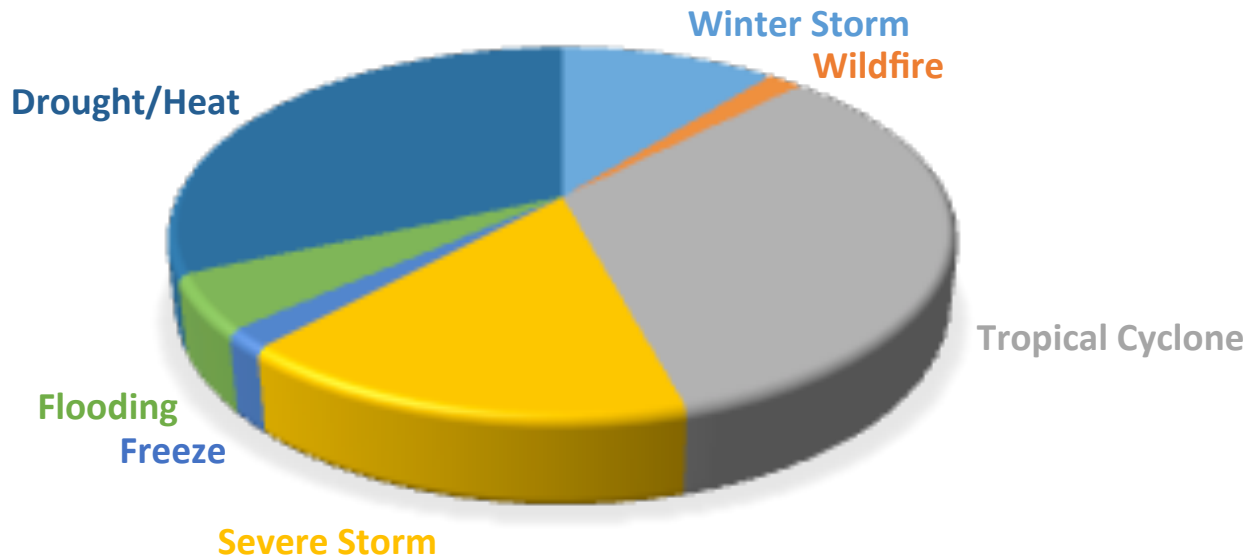
Deaths Associated with NOAA Billion Dollar Disasters

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NUMBER OF EVENTS



DEATHS



3. Problem with Determining Drought Impacts on Health

Health Surveillance Data

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- ✓ Drought can be a slow evolving
- ✓ The impacts are not immediate
- ✓ Can require intermediate steps for health outcomes
- ✓ Surveillance is not designed to connect drought and health
- ✓ Not long enough surveillance to determine outcome



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Engagement

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- CDC's Climate and Health Program
 - Nation's only investment in climate change preparedness for public health sector
 - Climate Ready States and Cities Initiative
 - 16 States and 2 Cities



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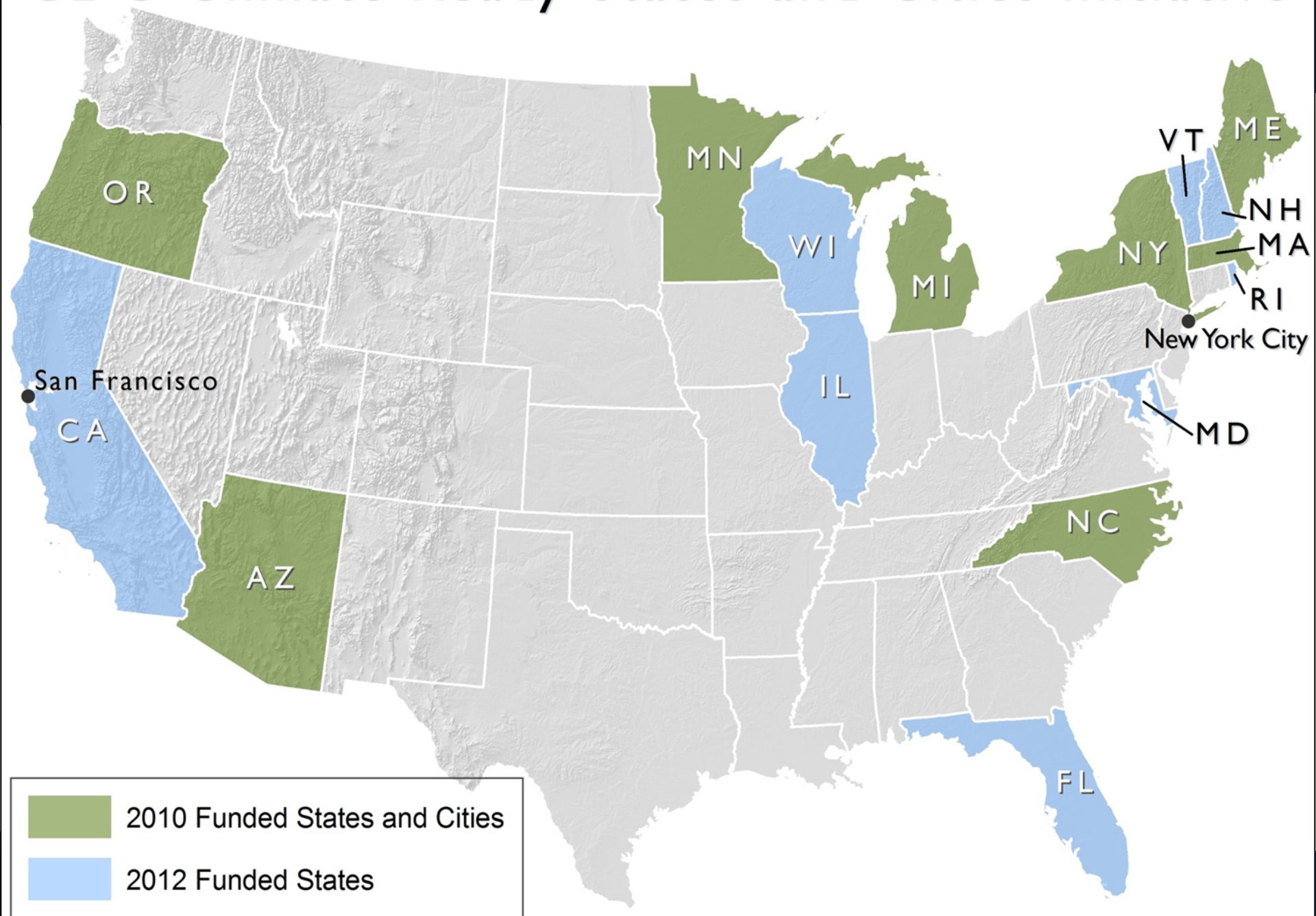


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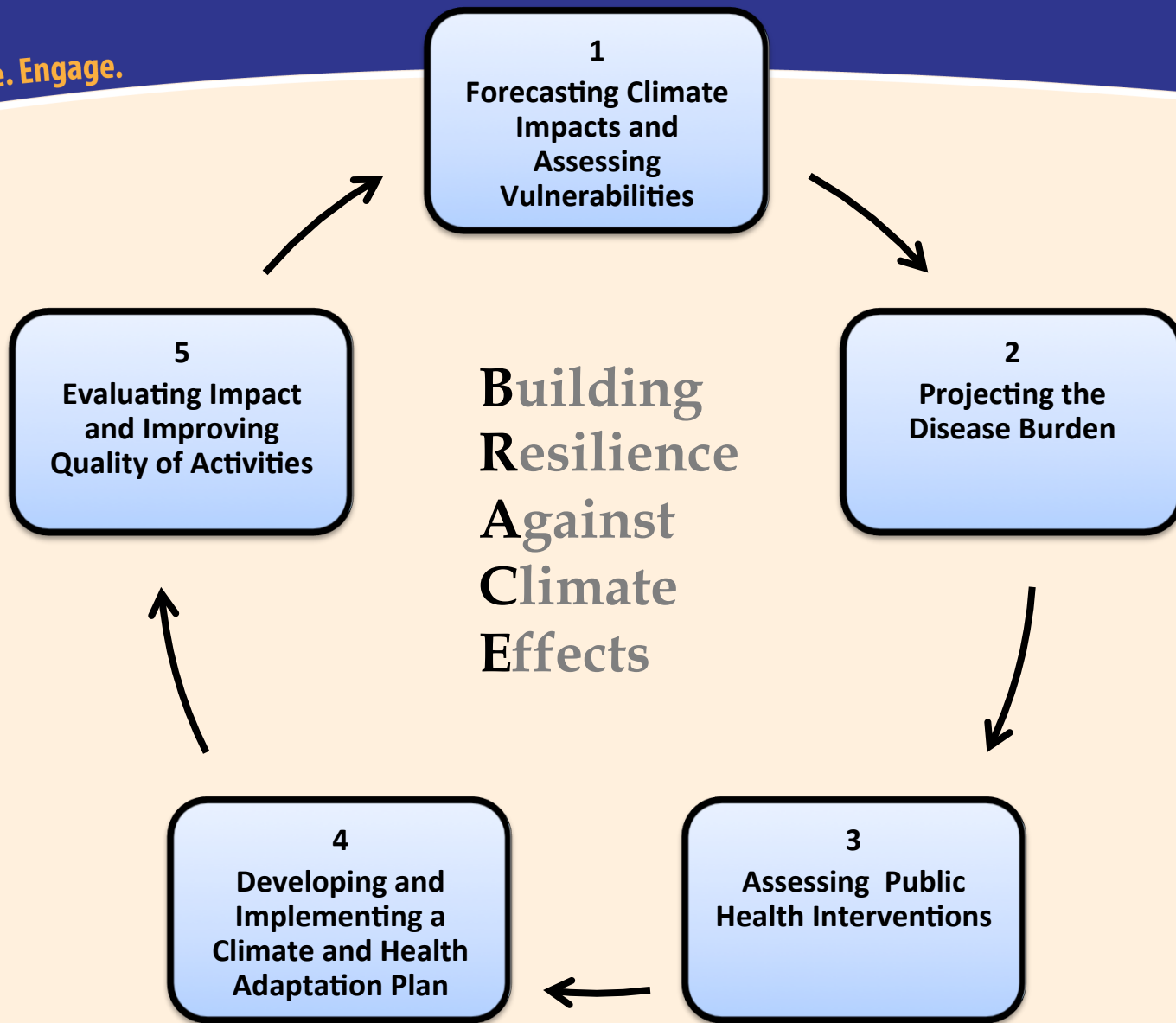
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CDC Climate Ready States and Cities Initiative



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Climate and Health Program, National Center for Environmental Health



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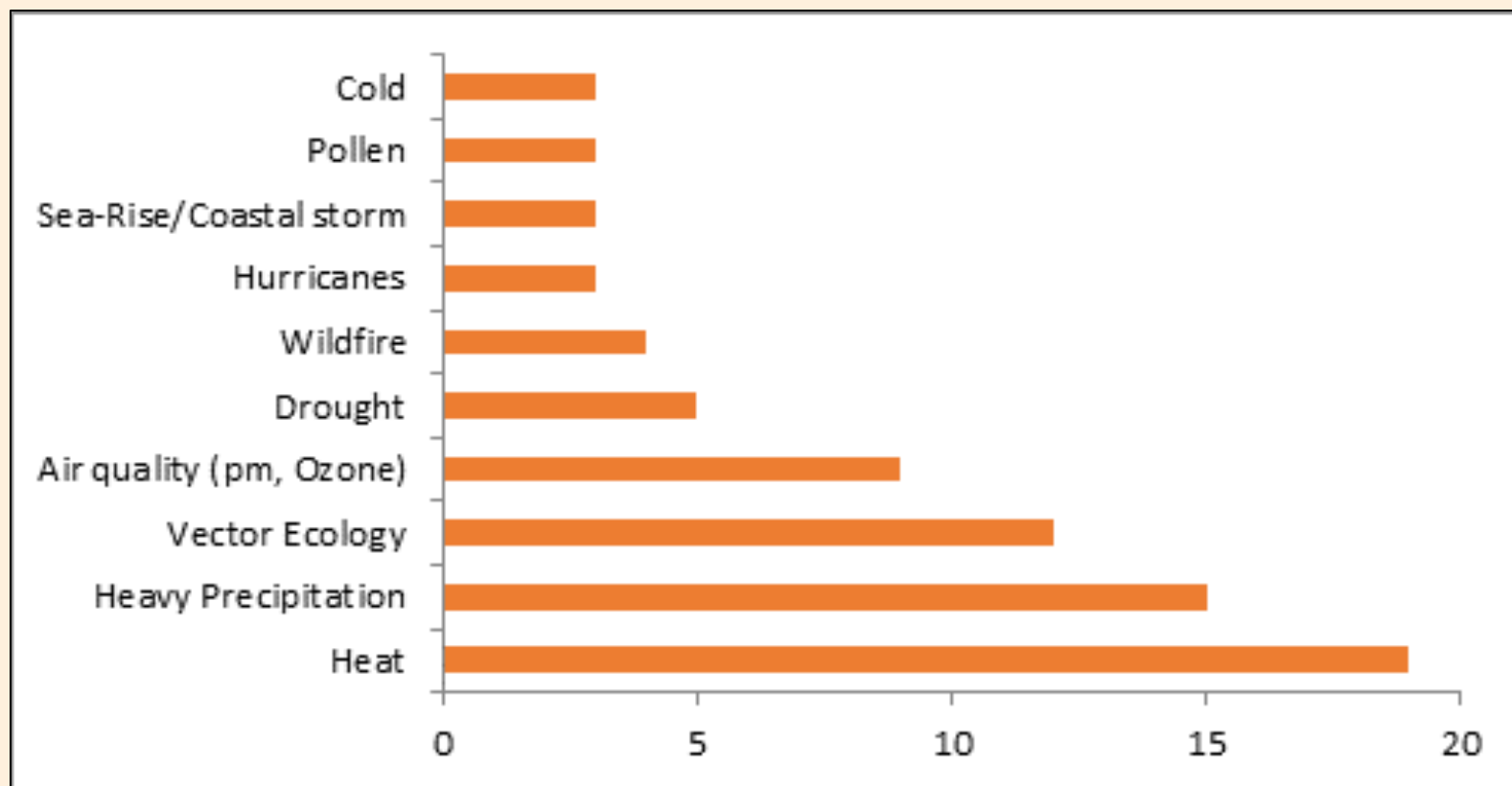
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Topics Covered by CDC Grantees

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4. Drought Impacts on Human Health

Drought: Health Impact

Compromised Quantity and Quality of Water

Surface Water



Courtesy of USGS

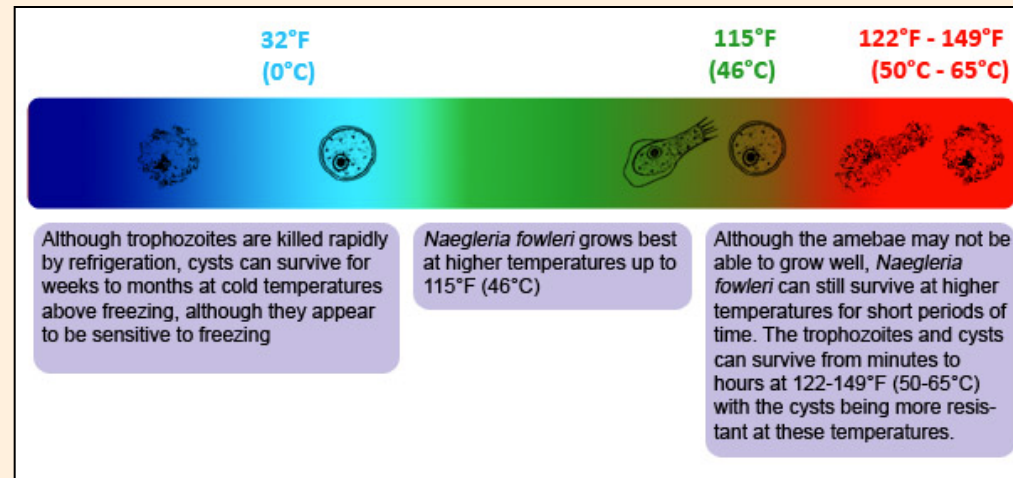
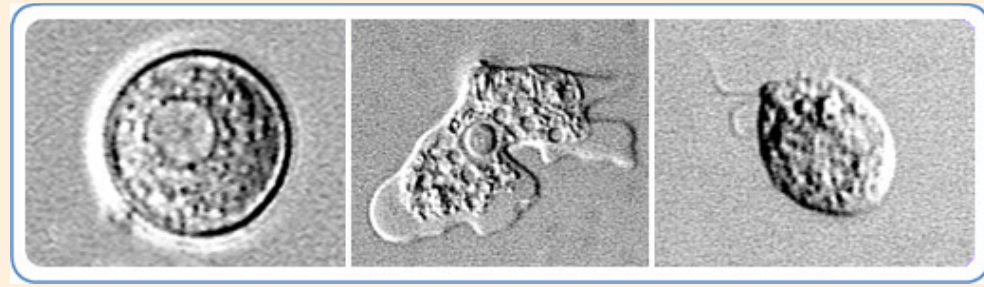
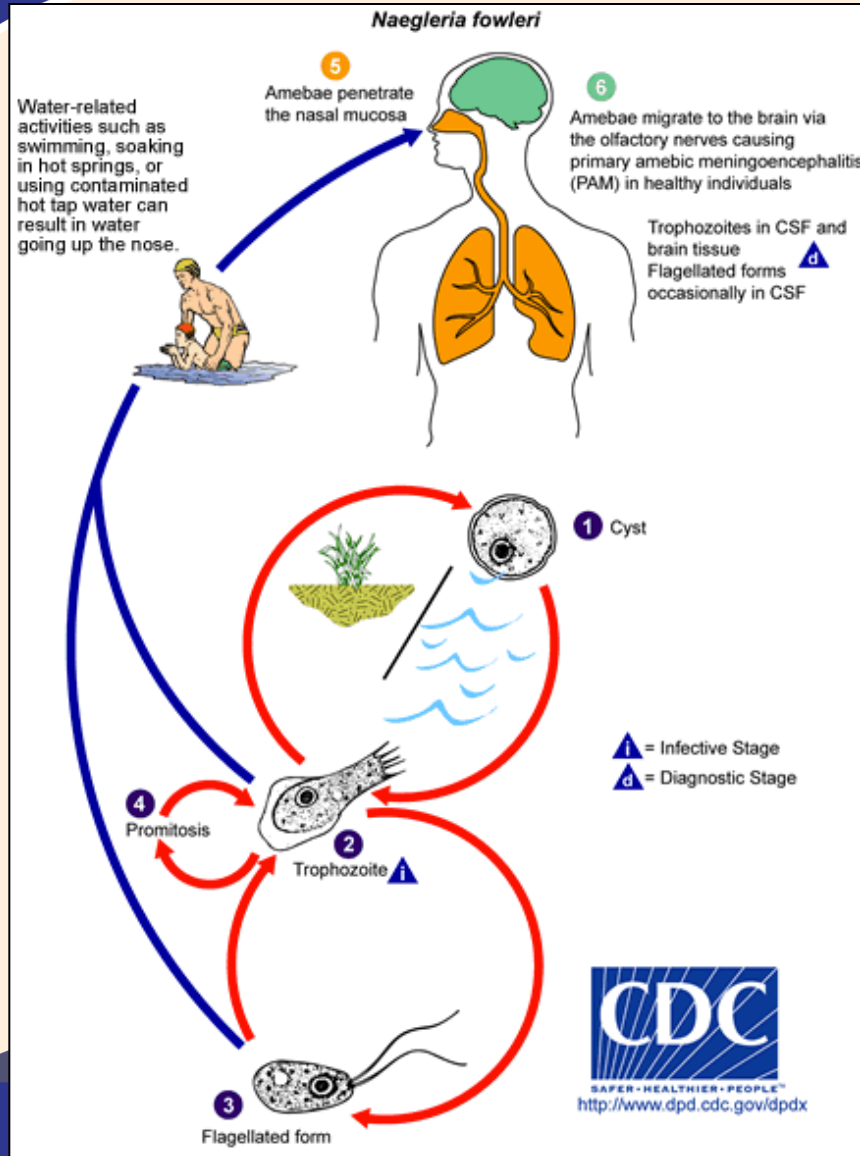
Groundwater



Courtesy of KSDA

Naegleria fowleri ("Brain-eating amoeba")

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- In stagnant water
- Increase in temperature
- Increase in occurrence

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Drought: Health Impact

Secondary/Related Events

- ❑ Extreme heat
- ❑ Wildfires
- ❑ Dust storms/haboobs
- ❑ Rain/storm effects



Courtesy of FCC



Courtesy of NOAA

Courtesy of USGS

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Drought: Health Impact

Compromised Food and Nutrition



Courtesy of USDA



Courtesy of USGS



Courtesy of NOAA

Drought: Health Impact

Diminished Living Conditions

Energy



Courtesy of DOE

Air Quality



Courtesy of USGS

Dust Storms and Health

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- ❑ Greater likelihood of injuries from motor vehicle accidents.
- ❑ Increased risk of asthma related hospitalizations.
- ❑ Increased Indoor and Outdoor Air Pollution ($PM_{2.5}$ and PM_{10})



Kanatani, et al., 2010. Desert dust exposure is associated with increased risk of asthma hospitalization in children. *Am J Respir Crit Care Med*.
Kuo, H. , 2009. Indoor and outdoor $PM_{2.5}$ and PM_{10} concentrations in the air during a dust storm. *Building and Environment*.
Chen, et al., 2010. Ambient Influenza and Avian Influenza Virus during Dust Storm Days and Background Days. *Environ Health Perspect*.



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Drought: Health Impact

- ❑ Sanitation and hygiene
- ❑ Recreational risks
- ❑ Mental and behavioral health



Courtesy of CDC



Courtesy of USACE



Courtesy of House Committee on Agriculture

Mental Health: Post-Disaster

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Drought sees mental health problems rise in North Queensland

By **Harry Crawford**

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Updated Tue at 11:36pm

The number of people seeking help for mental health problems has quadrupled in some parts of North Queensland since the start of the current drought.

Area Manager of The Mental Health Service in North Queensland, Alison Fairleigh, has marked a marked increase in the levels of mental health problems forward, during her visits to the region.

Ms Fairleigh, who won the 2013 Australian of the Year award for her work in mental health services, has made regular visits to the region to offer support as part of the Federal Government's Drought Assistance package.

Despite the rise in cases being reported, Ms Fairleigh says that

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California dairy farmers struggling to survive prolonged drought



The difference between the fields on either side of dairy farmer Tom Barcellos is water. (Tomas Ovalle / For The Times)

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Mental health pressures on rural communities intensifying

New Zealand

DATE USE, 9 October 2014

intensifying

New Zealand (RHÄNZ) have identified mental health issues between people in rural and urban

When it does well, the whole country benefits, so it is in everyone's interest. However, RHÄNZ has identified mental health issues on rural communities from a number of fronts,



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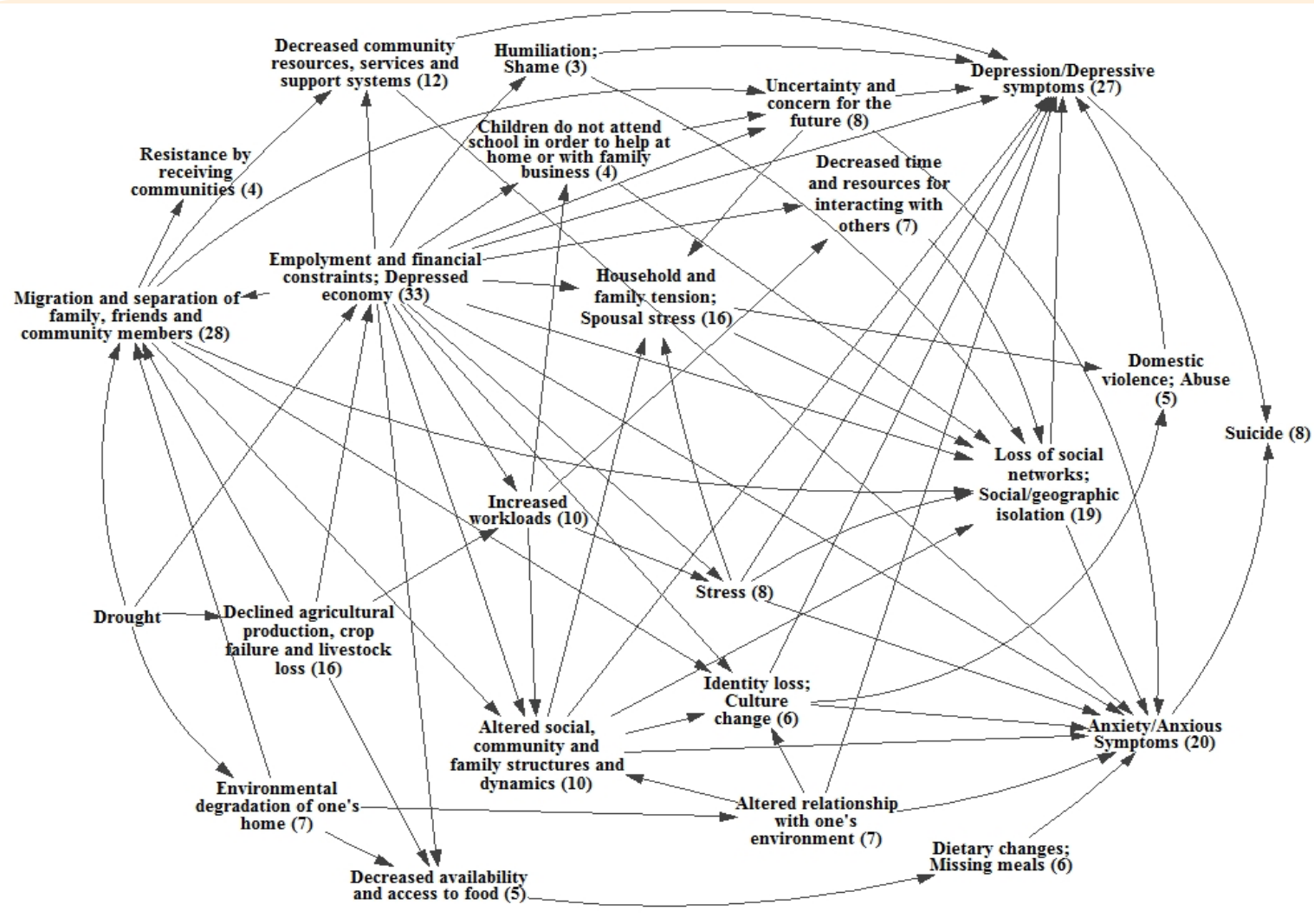
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Causal Process Diagram

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Vins, H., Bell, J., Saha, S., & Hess, J. J. (2015). The mental health outcomes of drought: a systematic review and causal process

diagram. *International journal of environmental research and public health*, 12(10), 13251-13275.

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Drought: Health Impact

Increased Disease Incidence

- ❑ Infectious disease
- ❑ Chronic disease
- ❑ Vectorborne and zoonotic disease



Courtesy of USGS

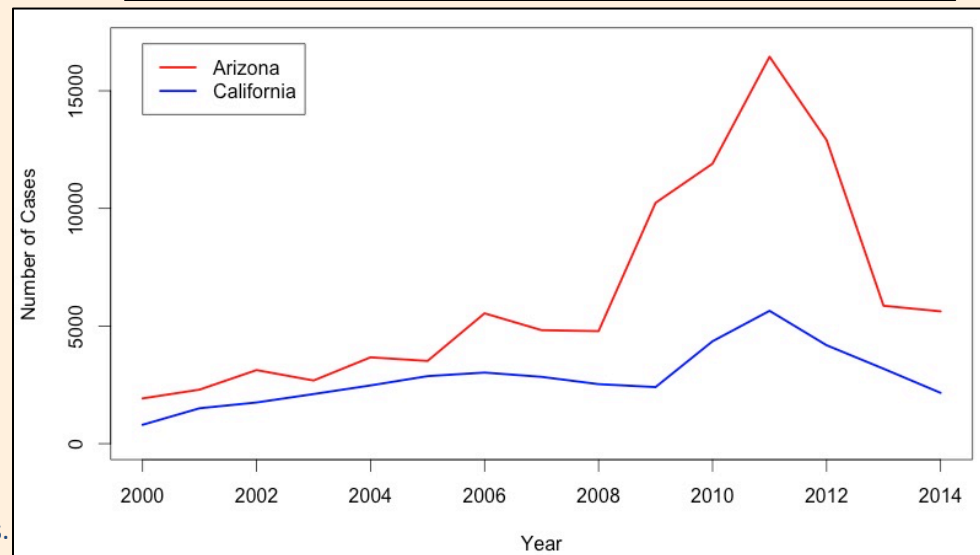
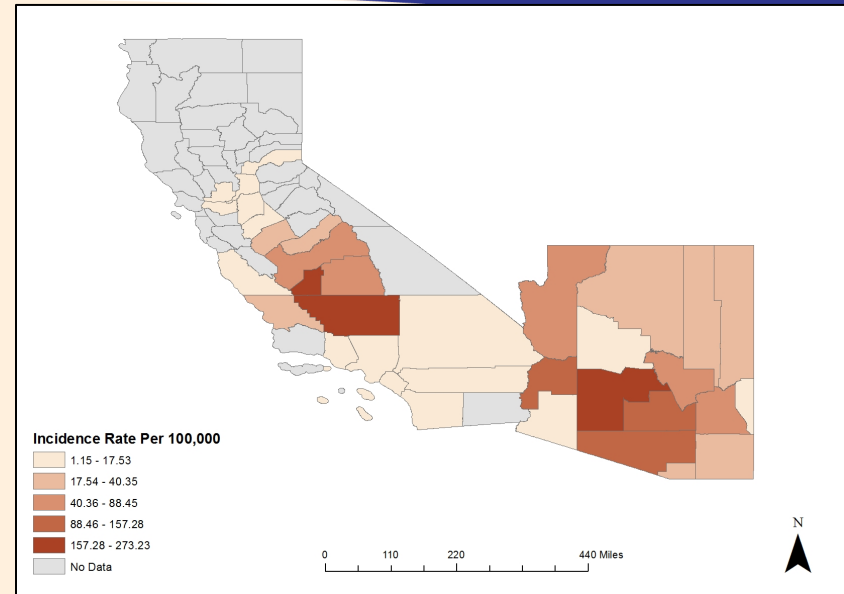


Courtesy of NSF

Coccidioidomycosis (Valley Fever)

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- ❑ ***Coccidioides immitis*** primarily dispersed by wind and dust storms.
- ❑ ***C. immitis*** thrives during wet periods following droughts
- ❑ **Infections occur during dry season**



Source:

Pappagianis and Einstein, 1978. Epidemiology of coccidioidomycosis.

Zender and Talamantes, 2006. Climate controls on valley fever incidence in California and Arizona.



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5. Communication





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When Every Drop Counts: Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals

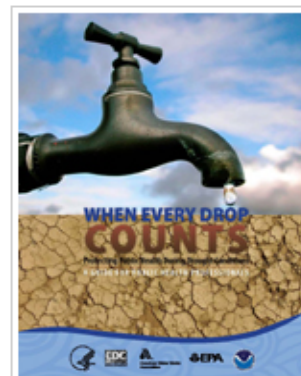
Drought is a natural phenomenon. During a drought, rainfall levels or other precipitation types are lower than average for an extended period, resulting in an inadequate water supply. Although the literature contains many well-researched articles on the aspects and implications of drought itself, the Centers for Disease Control and Prevention (CDC) recognizes much is yet to be learned about how drought affects public health in the United States. With regard to drought preparedness and response, public health experts at all levels operate today with only limited guidance. With regard to how water shortages affect public health at the community level, overall understanding is less than optimal.

In response, CDC's National Center for Environmental Health (NCEH) developed *When Every Drop Counts: Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals*. This publication is intended to assist public health officials, practitioners, and other stakeholders in their efforts first to understand and then to prepare for drought in their communities. It provides information about how drought affects public health, recommends steps to help mitigate the health effects of drought, identifies future needs for research and other drought related activities, and provides a list of helpful resources and tools.

To obtain a copy of or for more information about *When Every Drop Counts: Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals*, please send an e-mail to drought@cdc.gov.

Download the electronic version and fact sheet here:

- [PDF of the full document](#) [5 MB]
- [PDF of a fact sheet about the document](#) [166 KB]

**Contact Us:**

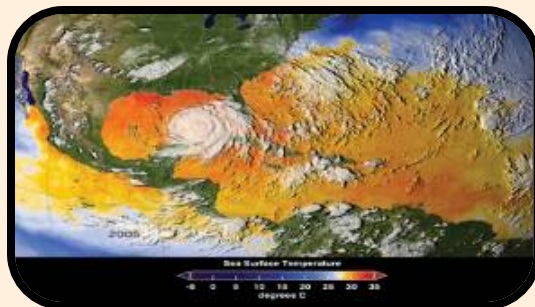
Centers for Disease Control and Prevention
1600 Clifton Rd
Atlanta, GA 30333
 800-CDC-INFO
(800-232-4636)
TTY: (888) 232-6348
 cdcinfo@cdc.gov



Impacts of Climate Change on Human Health in the United States: A Scientific Assessment

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United States
Global Change
Research Program

Coming out in Spring 2016
Impacts of Extremes Events on
Human Health

6. Future Needs



Future Needs:

Drought-Related Research and Initiatives

- ❑ **Still much to be learned about drought and public health!**
- ❑ **Much research is needed in many different areas!**
 - Surveillance data analysis and improvement
 - Environmental monitoring
 - Priority of drought in public health departments
 - Economic impact of drought on public health
 - Lessons learned and best practices



Thank you!

Please send questions or comments to
Jesse Bell
jesse@cicsnc.org

“Floods kill people, but droughts destroy civilizations.”

~U.S. Government Official at a Drought Meeting

Vibrio vulnificus

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FIGURE 3. Primary septicemic skin lesions caused by *Vibrio vulnificus*



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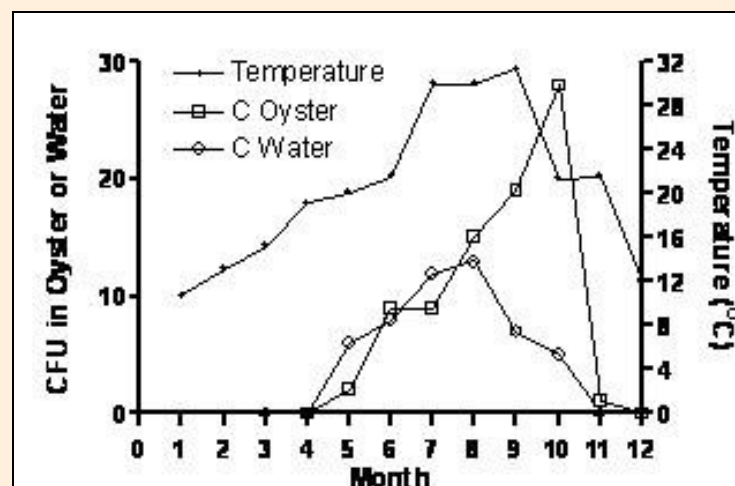


Fig. 1. Seasonal levels of the C-genotype of *V. vulnificus* in water and oysters. This figure shows the lag in appearance of the C-genotype in oysters, which only appears to reach significant levels as the levels in surrounding waters reach a threshold level.

Harmful Algal Blooms (Red Tides)

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Lake Erie
Courtesy of NOAA and NASA

❑ Lack of rainfall

- ↑ Nutrient concentration
- ↑ Stagnant water

❑ Health impacts

- Respiratory: HAB aerosolized toxins (brevetoxin)
- Gastrointestinal: Toxins, PSP, ASP, Ciguatera,

Peat Bog Fires

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- ❑ **More flammable in normally moist areas during extended drought**
- ❑ **June 2008 North Carolina increased ED visits by**
 - 73% for COPD
 - 66% for asthma
 - 59% for pneumonia and acute bronchitis
 - 37% for heart failure



Dare County, NC

Weinhold B. Fields and forests in flames: vegetation smoke & human health. Environ Health Perspect. 2011 Sep;119(9):a386-93.

Rappold AG et al Peat bog wildfire smoke exposure in rural North Carolina is associated with cardiopulmonary emergency department visits assessed through syndromic surveillance. Environ Health Perspect. 2011 Oct;119(10):1415-20.



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