Why Drought Matters to Human Health

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“Floods kill people, but droughts destroy civilizations.”
~U.S. Government Official at a Drought Meeting
Dust Bowl of the 1930s

Dust Storm 3/26/35, Naponee, Nebr.
2012 Drought

U.S. Drought Monitor
August 7, 2012
(Released Thursday, Aug. 9, 2012)
Valid 8 a.m. EDT

Author:
Mark Svoboda
National Drought Mitigation Center

Drought Impact Types:

- Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g., agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g., hydrology, ecology)

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu/
Percentage of disaster-deaths worldwide according to each category of climate-related hazard, (1900-2013)

- Drought (59.60%)
- Floods (34.64%)
- Wildfire (0.01%)
- Heat (0.67%)
- Landslide (0.14%)
- Storm (4.95%)

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

<table>
<thead>
<tr>
<th>Event Type</th>
<th>10-year Total Fatalities</th>
<th>Billion Dollar Losses from Disasters (2004-2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Waves</td>
<td>1,200</td>
<td>$392 Billion Hurricanes</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>1,000</td>
<td>$78 Billion Heat Waves/Droughts</td>
</tr>
<tr>
<td>Hurricanes</td>
<td>1,100</td>
<td>$46 Billion Tornadoes/Severe Storms</td>
</tr>
<tr>
<td>Floods</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>Wind Storms</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Lightning</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Cold Waves</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Winter Storms</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

$30 Billion Flooding/Severe Storms
1980-2018* NOAA Billion-Dollar Drought Disasters (CPI-Adjusted)

25 Events
$241 Billion Lost
2,993 Deaths

Health Surveillance Data

- 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
Fig. 1. 1963–2012 U.S. Atlantic tropical cyclone indirect deaths distributed by primary factor present. Note that power problems, beyond being the primary antecedent in the incidents having a purple shading, also occurred in another 2–3% of the other factors shown. Vehicle accidents where traffic lights had lost electricity are an example. To avoid double-counting these cases, they only contribute to the totals of those other factors. Table 1 provides additional information.
How Puerto Rico's death toll climbed from 64 to 2,975 in Hurricane Maria

By Ray Sanchez, CNN

1 Updated 2:56 PM ET, Wed August 29, 2018

Puerto Rico revises Hurricane Maria death toll

(CNN) — Puerto Rico's true death toll from Hurricane Maria remains elusive as the storm's one-year anniversary approaches.

The island government raised the official death toll to 2,975 on Tuesday after maintaining for months that 64 people had died as a result of the storm.
Health Outcomes

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 & Behavioral Context
- Social Determinants of Health
- Occupation
- Rural/Urban
- Race/Literacy/Age
- Dependence on Caregivers and Medication

Environmental & Institutional Context
- Water Supply
- Local Environmental Conditions
- Preparedness of Health Departments
- Agricultural Management Practices
- Power, Transportation, Communication and Healthcare Infrastructure

Drought Types
- Meteorological Drought
- Agricultural Drought
- Hydrological Drought
- Socio-economical Drought
**EXPOSURE**
Exposure is contact between a person and one or more biological, psychosocial, chemical, or physical stressor, including stressors affected by drought and climate variability.

**SENSITIVITY**
Sensitivity is the degree to which people or communities are affected, either adversely or beneficially, by drought and climate variability.

**ADAPTIVE CAPACITY**
Adaptive capacity is the ability of communities, institutions, or people to adjust to potential hazards, to take advantage of opportunities, or to respond to consequences.

**VULNERABILITY** of Human Health to Drought

**HEALTH IMPACTS**
Injury, acute and chronic illness (including mental health and stress-related illness), and death
Compromised Quantity and Quality of Water

Surface Water

Groundwater

Courtesy of USGS

Courtesy of USDA
Vibrio vulnificus

- Coastal Drought Causes Change in Salinity

© 2005, Logical Images, Inc.
Secondary/Related Events

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

Courtesy of FCC

Courtesy of USGS

Courtesy of NOAA
Extreme Heat and Drought

Heat Wave Index: 4-day, 1-in-5yr

Dust Bowl

Graph showing the number of heat wave events per station per year from 1895 to 2015.
Compromised Food and Nutrition

Courtesy of USDA

Courtesy of USGS

Courtesy of NOAA
Increased Disease Incidence

- Infectious disease
- Chronic disease
- Vectorborne and zoonotic disease
Zika Virus

2016

NOAA

Palmer Drought Severity Index

extreme drought

Palmer Drought Severity Index

extreme moisture

More rain than normal

Less rain than normal

Warmer than normal

Colder than normal

Munoz et al. 2016

Sinclair Stammers/Science Photo Library

WHO

Barcellos et al. 2016
Additional Health Risks

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

Kansas farmer on alarming suicide rate: 'Nothing gets farmers more down than a drought'

By: Emily Younger

Posted: May 21, 2018 09:34 PM CDT
Updated: May 21, 2018 11:34 PM CDT

Farmers are sowing crops into barren land in hope of rain.

Steve Germon left a suicide note on the porch and set about putting down calves he couldn’t feed before turning the gun on himself. Then a ute screamed towards him, his 17-year-old daughter at the wheel.

JACK MORRPHET

DAIRY farmer Steve Germon knows what it’s like to be on the brink of suicide. He has been there twice in the past three years.

He saved him in 2015, but those lonely moments last year
Syrian Conflict

- Estimated that over 400,000 people killed (UN)
- Over 5.5 million refugees (UNHCR)
DROUGHT AND PUBLIC HEALTH IN THE U.S.

Why drought matters

Drought affects communities in devastating ways that can include decreased

- Water availability and quality, and increased risk of
- Vector-borne diseases, and
- Disease outbreaks.

Drought, 2005–2011

- Drought outbreak at a
- Suspected area.

Drought Impact on Public Health

Plants, animals, and the environment can be

- Affects plant and
- Safety.
- Air and
- Producers of
- Water, and
- Dust, and
- Diseases.

- Increases
- Buffer zones
- Dust.
- Buffer zones
- Increase the
- Buffer zones
- For Public Health Professionals

PREPARING FOR THE
HEALTH EFFECTS OF DROUGHT
A RESOURCE GUIDE
FOR PUBLIC HEALTH PROFESSIONALS

WHEN EVERY DROP COUNTS
Protecting Public Health During Drought Conditions
A GUIDE FOR PUBLIC HEALTH PROFESSIONALS

- the at-risk populations living within the affected area, and
Drought Data on CDC’s National Environmental Public Health Tracking Network

Data released on Tracking Network Download Datasets earlier this year:

https://ephtracking.cdc.gov/download
Future Needs:

- Still much to be learned about drought and public health
  - What do public health departments need?
  - Who else should be at the table?
- Research is needed in many different areas:
  - Analysis of surveillance data
  - Improved environmental monitoring
  - Role of public health departments
  - Economic impact of drought on public health
  - Lessons learned and best practices
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