Climate and Human Health Responders Course for Health Professionals

Extreme Weather Hazards

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Extreme Weather Hazards

Learning Objectives

● Describe the ways in which climate change increases the risk of extreme events such as hurricanes, floods and droughts

● Identify short-term and long-term health threats to patients impacted by extreme weather events and steps that health professionals can take to reduce these risks

● Define the roles of disaster risk reduction, public health communication, early warning and regional cooperation in the prevention of the health impacts of extreme weather events

● Explain how the health impacts of climate change will vary within and among different communities by applying concepts of vulnerability, resilience and adaptive capacity
How is climate linked to our health?
Long History Between Climate and Health

- Hippocrates wrote about epidemics in 400 B.C.E. and noted the change in weather.

- 1814 Dr. James Tilton, Surgeon General of the Army, directed all hospital surgeons to keep weather records.
“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.
Climate is Affecting Your Health

Direct

Affecting Health Directly

Extreme Heat
Air Pollution
Extreme Weather

Indirect

Spreading Disease

Diseases Spread by Insects, Ticks, and Rodents
Contaminated Water
Contaminated Food

Destroying & Disrupting Food Supplies

Hunger and Malnutrition

Disrupting Well-Being

Mental Health Problems
Conflict and Displacement
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
Costs of Extreme Events

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

- Heat Waves: $392 Billion
- Hurricanes: $78 Billion
- Tornadoes/Severe Storms: $46 Billion
- Floods: $30 Billion
- Wind Storms
- Lightning
- Cold Waves
- Winter Storms
How Puerto Rico's death toll climbed from 64 to 2,975 in Hurricane Maria

By Ray Sanchez, CNN

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

Puerto Rico revises Hurricane Maria death toll 01:39

(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.
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 I provides additional information.
Estimate of People Displaced by Hurricane Maria

Source: CNN analysis, Federal Emergency Management Agency
Climate-driven Natural Disasters
Weather vs. Climate

*Climate is what you expect, weather is what you get.*

~attributed to Mark Twain
What is climate?

- **Weather** is the current conditions of the atmosphere
  - Extremely variable
  - What is it like outside?

- **Climate** is the behavior of the atmosphere over long time periods
  - Is a Nebraska summer warmer than a Nebraska winter?
  - Florida vs. Nebraska
  - This year vs. a previous year
Climate Change vs. Climate Variability

- **Climate change** is a long-term continuous change in the average
  - Average = Climate Normal (e.g. 30 years average)
- **Climate variability** is fluctuation above or below the long-term average
- **Extreme Weather** are weather phenomena that are outside the usual historical distribution (flooding rains, heat waves, droughts, etc.)
EL NIÑO CLIMATE IMPACTS
December-February

June-August
What Do We Know?
Historical Temperature and Precipitation Changes
Future Temperature Change

Mid-21st Century

Lower Scenario (RCP4.5)

Higher Scenario (RCP8.5)

Late 21st Century

Lower Scenario (RCP4.5)

Higher Scenario (RCP8.5)

Change in Temperature (°F)

-1 0 1 2 3 4 5 6 7 8
Future Precipitation Change

Late 21st Century, Higher Scenario (RCP8.5)

Winter

Spring

Summer

Fall

Change in Precipitation (%)

-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Projected Changes in the Hottest/Coldest and Wettest/Driest Day of the Year

Coldest Night of Year

Hottest Day of Year

Temperature Change (°F)

Temperature Change (°F)

Wettest Day of Year

Annual Longest Dry Spell

Precipitation Change (%)

Change in Number of Days

3 4 5 6 7 8 9

3 4 5 6 7 8 9

3 6 9 12

0 1 2 3
Major U.S. Climate Trends

Rising Temperatures
U.S. average temperature has increased by 1.3°F to 1.9°F since record keeping began in 1895. Warming has been the greatest in North and West while some parts of the Southeast have experienced little change.

Wildfires
Wildfires in the West start earlier in the spring, last later into the fall, and burn more acreage.

Heat Waves
Heat waves have become more frequent and intense, especially in the West.

Drought
Drought has increased in the West. Over the last decade, the Southwest has experienced the most persistent droughts on record.

Cold Waves and Winter Storms
Cold waves have become less frequent and intense across the Nation. Winter storms have increased in frequency and intensity since the 1950s and their tracks have shifted northward.

Extreme Precipitation
Heavy downpours are increasing nationally, especially over the last three to five decades. The largest increases are in the Midwest and Northeast.

Floods
Floods have been increasing in parts of the Midwest and Northeast.

Hurricanes
The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest (category 4 and 5) hurricanes, have all increased since the early 1980s.

Sea Level
Sea levels along the Mid-Atlantic and parts of the Gulf Coast have risen by about 8 inches over the last half century.
Some Extremes are Changing in a Warmer World

Strongest scientific evidence shows human-caused climate change is increasing heat waves and coastal flooding.
Will changes in our climate impact our health?
Executive Summary

Climate change is a significant threat to the health of the American people.

Every American is vulnerable to the health impacts associated with climate change.
Climate Change and Health

CLIMATE DRIVERS
- Increased temperatures
- Precipitation extremes
- Extreme weather events
- Sea level rise

ENVIRONMENTAL & INSTITUTIONAL CONTEXT
- Land-use change
- Ecosystem change
- Infrastructure condition
- Geography
- Agricultural production & livestock use

EXPOSURE PATHWAYS
- Extreme heat
- Poor air quality
- Reduced food & water quality
- Changes in infectious agents
- Population displacement

SOCIAL & BEHAVIORAL CONTEXT
- Age & gender
- Race & ethnicity
- Poverty
- Housing & infrastructure
- Education
- Discrimination
- Access to care & community health infrastructure
- Preexisting health conditions

HEALTH OUTCOMES
- Heat-related illness
- Cardiopulmonary illness
- Food-, water-, & vector-borne disease
- Mental health consequences & stress
Populations of Concern

**COMMUNITIES OF COLOR**
Some communities of color living in risk-prone areas face cumulative exposure to multiple pollutants.

Adaptation plans that consider these communities and improve access to healthcare can address social inequities.

**OLDER ADULTS**
Older adults are vulnerable to extreme events that cause power outages or require evacuation.

Checking on elderly neighbors and proper emergency communication can save lives.

**CHILDREN**
Children have higher risk of heat stroke and illness than adults.

Adults can lessen risk by monitoring exertion and hydration.

**LOW INCOME COMMUNITIES**
Low income families are at risk of physical and mental illnesses during flooding and in crowded shelter conditions.

Comprehensive disaster management can improve resiliency for people with limited resources.
The Impacts of Climate Change are Now
Extreme Heat

- Increased temperatures, higher humidity, longer and more frequent heat waves
- Heat stroke, dehydration, and heat-related illness
- Vulnerable populations: Outdoor workers, student athletes, people in cities, people without air conditioning, people with chronic diseases, pregnant women, older adults, and young children
2003 European Heatwave

70% Deaths in Paris and 20% Deaths in London

Extreme Weather

- Increased frequency and severity of heavy downpours, floods, droughts, and major storms
- Injury, illness, displacement, and death
- Vulnerable populations: People who lack access to evacuation routes and people who can’t use stairs when elevators are out of service, people in wheelchairs, older adults, the poor, and people with disabilities, particularly if they are unable to access elevators and evacuation routes
Billion-Dollar Disasters are Increasing
2019 March Flooding

- At least 2 hospitals sustained damage
- At least a dozen long term care facilities were evacuated
- Lack of access to care
  - Flooded roads
  - Damaged infrastructure
Spreading Disease: INSECTS, TICKS, AND RODENTS

- Higher temperatures, changes in rain patterns, and disrupted ecosystems
- Lyme disease, West Nile disease, etc.
- Vulnerable populations: People who spend more time outdoors in places where these insects and other disease-carriers live
Spreading Disease: Contaminated Food and Water

- Higher water temperatures, heavier downpours, rising sea levels, more flooding, increasing temperatures, humidity, and extreme weather events
- Gastrointestinal illness, diseases from toxins in swimming areas and drinking
- Vulnerable populations: Children, the elderly, people with weakened immune systems, people in remote or low-income communities with inadequate water systems, and people in communities that are dependent on fish and shellfish
Air Quality

- Increased wildfires, smog, pollen, and mold
- Asthma, respiratory, and allergy issues
- Vulnerable populations: People with heart and respiratory conditions such as heart disease, asthma, or chronic lung disease
Climate Change Impacts Air Quality: Wildfire Smoke

Wildfire Activity Since 1970

- Since 1970
  - Western US wildfire season increased by 78 days
  - Average duration of fires increased five-fold
Mental and Behavioral Health

- Increased frequency and severity of extreme weather events
- Stress, depression, anxiety, PTSD, and suicidal thoughts
- Vulnerable populations: Children, older adults, pregnant and postpartum women, people with mental illnesses, the poor, homeless people, first responders, and people who rely on the environment for their livelihood
Local

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

By: Emily Younger

Posted: May 21, 2019 09:34 AM CDT
Updated: May 21, 2019 09:54 PM CDT

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

2 minutes left

Farmer’s recovery from depression which led to two suicide attempts shows cost of drought at family level

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 MORPHET

The Sunday Telegraph  JULY 1, 2018  1:00AM

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

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.

That saved him in 2015, but those lonely moments last year...
Causal Process Diagram

The effect estimate for drought was 4x greater magnitude than people reporting pain in multiple body parts.
Displacement and Conflict

- Increased frequency and severity of extreme weather events
- Stress, depression, anxiety, PTSD, and suicidal thoughts
- Vulnerable populations: Children, older adults, pregnant and postpartum women, people with mental illnesses, the poor, homeless people, first responders, and people who rely on the environment for their livelihood
Syrian Conflict

- Estimated that over 400,000 people killed (UN)
- Over 5.5 million refugees (UNHCR)
Climate Change is Local
Why Should Healthcare and Public Health Care?
“Do no harm”

- Hospitals can lead America’s effort to transform the energy system
  - Transitioning to renewable energy can improve the health of our communities
- Health and health-related sectors should invest in preparedness for climate change
  - Protect vulnerable communities
- Educating and training the next generation of health professionals
  - Invest in continuing education
Prepare Public Health Agencies

Educate public about the public health harms of climate change and what they can do

Create early warning systems that help people prepare for climate-influenced events

Educate the Public

Enhance Monitoring

Contribute to Public Dialogue

Research

Inform stakeholders about climate-related health harms and how those harms will be experienced locally

Use research to better understand health harms and effective responses
Climate Change is a Significant Health Threat

- All people are vulnerable… some more at risk than others
- Costs are Increasing
- Multiple relationships between climate and health
- Lots to be gained by combining expertise

Multiple opportunities to address this issue
THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES
A Scientific Assessment
U.S. Global Change Research Program
Disclosure Information

No disclosure