Climate Change as a Priority in Public Health Nursing

Stephanie Chalupka, EdD, RN, PHCNS-BC, FAAOHN, FNAP

Professor, Department of Nursing
Worcester State University

Visiting Scientist
Environmental and Occupational Medicine and Epidemiology Program
Department of Environmental Health
Harvard T. H. Chan School of Public Health
Inform

Engage

Empower
“Climate change is the biggest global health threat of the 21st century… The impacts will be felt all around the world – and not just in some distant future but in our lifetimes and those of our children.”

The Lancet, 2009
Heath Effects of Climate Change

Unique vulnerabilities

Environmental Justice
Carbon Emissions 2015

Note: Africa and Indian Subcontinent
Health Impacts of Climate Change

Note: Africa and Indian Subcontinent

Data from: WHO 2015
Populations of Concern

- Children and pregnant women
- Older adults/elderly
- Communities of Color, Low Income, Immigrants, and Limited English Proficiency Groups
- Indigenous peoples
- Occupational groups
- People with disabilities
- People with pre-existing medical conditions
What Makes Us Vulnerable?

Exposure: Coming into contact with a climate change threat

Sensitivity: Being biologically susceptible to a climate change threat given factors like health status and age

Ability to Adapt: Being able to adjust or respond to a climate change threat

While all Americans are affected by climate change, some groups are disproportionately vulnerable to climate health impacts.
Around 88% of the global disease burden of climate change falls on children under 5 years.
In Africa and South Asia alone, an estimated 250,000 children die every year due to climate change.

Climate change drives child poverty. 175 million children are hit by climate disasters every year.
Vulnerability to the Health Impacts of Climate Change at Different Life Stages

Mothers and babies

Adverse pregnancy outcomes such as low birth weight and preterm birth have been linked to extreme heat events, airborne particulate matter, and floods.

Infants and toddlers

Young children’s biological sensitivity places them at greater risk from asthma, diarrheal illness, and heat-related illness.

School age and older children

The behaviors and activities of older children increase their risk of exposure to heat-related illness, vector-borne and waterborne disease, and respiratory effects from air pollution and allergens.
Extreme Events

- Older adults are more likely to suffer storm and flood-related fatalities.

Superstorm Sandy: Almost ½ of deaths were over age 65
Extreme Events

Evacuation: Older adults have high risk of both physical and mental health impacts

Most vulnerable-people with:
- disabilities
- chronic medical conditions
- living in nursing homes or assisted-living facilities
The World Has Warmed

April was Earth’s 400th warmer-than-normal month in a row
Red-hot planet: All-time heat records have been set all over the world during the past week.

By Jason Samenow
July 5

Simulation of maximum temperatures on July 3 from American (GFS) weather model at two meters above the ground. (University of Maine Climate Reanalyzer)
Summer 2018 Europe Heat Wave

Heat Records Shattered

Madrid 104°
Kitzingen, Germany 104.5°
Berlin 100.2°
Frankfurt 102.2°
Paris 103.5°
Maastricht 100.8°
Earth had a top 3 warmest March on record, climate agencies find

Global average temperature anomalies in degrees Celsius for March 2019 compared to the 1951-1980 average. Image: NASA GISS.
Nowhere but up

The number of days each year above 95° Fahrenheit (35° Celsius) is expected to rise across the United States, and average summer temperatures will reach new heights if greenhouse gas emissions remain high. The maps below compare late 20th century temperatures to projections for the mid-21st century.

Change in number of days above 95° F

Change in average summer temperatures

Additional days per year

Increase in degrees F

0 10 20 30 40

2.0 4.5 6.5

U.S. GLOBAL CHANGE RESEARCH PROGRAM
Weather dangers

Although tornadoes, floods and hurricanes tend to get more attention, U.S. heat fatalities top the list of weather-related deaths in the 30 years since heat-related data were first reported.


Source: National Weather Service
Extreme Temperatures: Heat Waves

Most vulnerable populations:

- Elderly, young children
- People living alone, socially isolated, mentally ill
- Socio-economically disadvantaged
- People lacking access to air conditioning or cooling spaces
- People with chronic diseases
- People who work outside
- People taking certain medications

CDC, 2019
Heat Wave Examples

2006 California heat wave
- Daytime temperatures > 100 degrees for 2 weeks
- Record nighttime highs
- > 1 million people lost electricity
- 10 fold increase in hospital admissions/heat-related illness
- Death toll: estimated >450
- Excess ER visits: >16,000
- Excess hospitalizations: >1,000

(Cal EPA/Cal DPH, 2013)

2003 European heat wave
- Death toll > 45,000

1995 Chicago heat wave
- Death toll: 900
So far— we have only warmed by close to 1°C, or 1.8°F, above preindustrial levels.

On a trajectory to reach 3°C, or 5.4°F, by 2100!
• Increase in allergenic plants e.g., poison ivy and ragweed
• Congenital cataracts, preterm birth & SIDS
Climate Change: Not Just About Warming
Environmental Impacts of Climate Change

- More extreme temperatures
- Sea level increases
- Stronger hurricanes and storm surges
- Increased precipitation and flooding
- Increased droughts and water scarcity
- More frequent wildfires
- Increased ozone concentrations and diminished air quality
- Increased pollen and natural air pollutants
- Increased range for disease vectors
Our Greatest Public Health Challenge

- Increased sea levels
- Decreased access to potable water
- Increased storm activities
- Increased drought / fires
- Increased heat waves
- Critical changes in agriculture / food security
- Environmental refugees
- Increased morbidity and mortality
  - Exacerbation of chronic disease
  - Infectious disease
  - Mental health
Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Heat-related illness and death, cardiovascular failure
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Forced migration, civil conflict, mental health impacts
- Respiratory allergies, asthma
- Extreme Heat
- Severe Weather
- Air Pollution
- Changes in Vector Ecology
- Increasing Allergens
- Rising Temperatures
- More Extreme Weather
- Sea Levels
- Increasing CO2 Levels
- Water and Food Supply Impacts
- Water Quality Impacts
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms
- Environmental Degradation
How Our Health is Harmed by Climate Change: Impacts Differ by Geographic Region
Annual Days with Maximum Temperature Above 90°F

Massachusetts

Data source: US Dept of Interior Northeast Climate Adaptation Center
Annual Maximum Temperature
Massachusetts

Observed
5-yr Mean

Modeled °F
Max
Median
Min

Changes from 1971-2000 for:

<table>
<thead>
<tr>
<th>Year</th>
<th>Change °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 -</td>
<td>3.83 °F</td>
</tr>
<tr>
<td>2049</td>
<td></td>
</tr>
<tr>
<td>2040 -</td>
<td>5.02 °F</td>
</tr>
<tr>
<td>2069</td>
<td></td>
</tr>
<tr>
<td>2060 -</td>
<td>6.14 °F</td>
</tr>
<tr>
<td>2089</td>
<td></td>
</tr>
<tr>
<td>2080 -</td>
<td>6.84 °F</td>
</tr>
<tr>
<td>2097</td>
<td></td>
</tr>
</tbody>
</table>

Data source: US Dept of Interior Northeast Climate Adaptation Center
The rate at which Antarctica is losing ice has tripled since 2007.

The continent is now melting so fast, it will contribute six inches to sea-level rise by 2100.
Sea Level Rise

- Increased risk of coastal flooding during storms and loss of private property
- Loss of coastal wetland ecosystems like salt marshes and mangroves
- Salt water intrusion in ground water supplies, aquifers, rivers, and bays
- Potable drinking water?
Access to safe drinking water and food, increased risk of infectious diseases

Increased risk of exposure to toxins and mold

Extreme Events
Record Flooding in MA

March 8, 2018
Increased Precipitation and Flooding

- Injuries and deaths
- Long term psychological and physical effects
- Increased risk of infectious disease
- Mold
- Contaminated water supplies
Hurricanes and Storm Surges

- Upward trend in intensity and duration of hurricanes since the 1970s.
- Ocean warming.
- Sea level rises as a result of climate change will make coastlines more susceptible to storm surges.

Photos: NASA, FEMA
Water-Borne and Food-Borne Diseases

- Increased air and water temperatures:
  - increase the replication, persistence, survival, transmission and range of some pathogens.

- Heavy rainfall and flooding facilitates rapid transportation of pathogens to water supplies.
Raw sewage: Polluting estuaries and coastal water with human pathogens
Surging floodwater overwhelms hog waste pits - bacteria released into water - algae blooms, death of marine life, contaminates drinking water.
Not just biological hazards-
Flooding the landscape and introduces toxic substances into the water
48 sites in North Carolina and 36 in South Carolina

Manufacturing sites, landfill, mining sites, processing facilities – pose danger to human health (industrial contaminants like PCB, heavy metal, reproductive toxicants, carcinogens)
Every hurricane and flood disaster is also a public health disaster

Extreme disruption to public health and essential services

Miami 2030
100-year Floodplain
BAU Climate

- Hospitals
- Medical Centers
- Federally Qualified Health Centers

Inundation Probabilities
- Median
- 1-in-20
- 1-in-200
Rising temperatures lead to longer allergy seasons and can make air pollution worse. This can increase the risk and severity of asthma attacks and cause more allergies.
Shifts in the timing of threats

Between 1995 and 2011, the **duration** of the ragweed pollen season length has increased by as much as 11 to 27 days.

Increases in temperature and CO₂ result in earlier flowering, but also greater floral numbers, greater pollen production, and increased allergenicity.

Aeroallergen exposure contributes to:
- Asthma episodes
- Allergic rhinitis, sinusitis, conjunctivitis
- Urticaria (hives)
- Atopic dermatitis or eczema
- Anaphylaxis

Ziska et al, 2016
Zoonotic and Vector-Borne Diseases

- Introduction and spread of new diseases
- Increased geographical range and risk of current diseases
- Re-emergence of formerly prevalent diseases
- Prolonged transmission cycles
  - Lyme disease
  - West Nile Virus
  - Dengue Fever
  - Malaria
  - Chikungunya
  - Tularemia
  - Rabies
By 2080, up to 1 billion people could be exposed to disease-carrying mosquitoes for the first time, increasing the risk of developing deadly diseases.

-Ryan, 2019
Shifts in the location of threats

Weather-related variables can determine geographic distributions of ticks

Low minimum temperatures can limit tick population survival

Declines in rainfall and humidity can also limit geographic distribution of blacklegged ticks

Source: CDC, 2019 CDC
West Nile Neuroinvasive Disease

Climate Change: Increased Ozone and Poor Air Quality

- Increased risk of ER visits and hospital admissions for respiratory illness.
- Increased risk of asthma onset and exacerbations, cardiac arrhythmias, myocardial infarction, and total mortality.
OZONE POLLUTION is smog, which is a highly irritating, but invisible gas.

YEAR ROUND PARTICLE pollution is the avg. level of microscopic bits of solids and aerosols in the air.

SHORT TERM PARTICLE pollution are days with spikes in those bits of pollution.

SOURCES OF POLLUTION

AMERICAN LUNG ASSOCIATION®
HUMAN HAIR
50-70 μm (microns) in diameter

PM_{2.5}
Combustion particles, organic compounds, metals, etc.
< 2.5 μm (microns) in diameter

PM_{10}
Dust, pollen, mold, etc.
< 10 μm (microns) in diameter

90 μm (microns) in diameter
FINE BEACH SAND

Image courtesy of the U.S. EPA
Air pollution remains a major danger to the health of children and adults.

Health risks from:
- **OZONE POLLUTION**
- **PARTICLE POLLUTION**

- Premature death
- May cause developmental harm
- May cause reproductive harm
- Asthma attack
- Lung cancer
- Wheezing and coughing
- Shortness of breath
- Cardiovascular harm
- Susceptibility to infections
- Lung tissue redness, swelling

Source: American Lung Association State of the Air, 2019  
https://www.lung.org/our-initiatives/healthy-air/sota/?
The “State of the Air” 2019 report shows, again, that climate change makes it harder to protect human health.

Spike in high ozone days and in unhealthy particle pollution episodes driven by wildfires.

While most of the nation has much cleaner air quality than even a decade ago, many cities suffered increased ozone from the increased temperature and continued high particle pollution from wildfires driven by changing rain patterns.
43.3% of the population, live in counties with unhealthy ozone and/or particle pollution.

20.2 million people (6.2% percent) live in 12 counties with unhealthful levels of air pollution.
Compared to the 2018 report - Massachusetts did Worse!

- More bad air days for ozone.
- The counties of Barnstable, Bristol, Hampden, and Hampshire decreased one or more grades, earning F’s in the 2019 report.
- Dukes, Plymouth, Suffolk, and Worcester also lost grades, earning them C’s and D’s.
- All together, the counties recorded a total of 97 combined "orange" and "red" bad ozone days compared to 59 bad ozone days from 2014-2016.
- The counties of Essex, Franklin, Middlesex, and Norfolk maintained their grades from last year, despite the overall trend of increased bad air days.

Most at risk: Children, older adults and those with asthma and other lung diseases.
Wildfires

- Fires are both a contributor and consequence of climate change
- Fire frequency is expected to increase especially in areas with reduced precipitation and drought
- They increase air pollutants, fine particulates ($PM_{10}$ and $PM_{2.5}$) and ground-level ozone
- Most vulnerable: elderly, children, people with respiratory and cardiac illnesses

Photos: FEMA, Florida Division of Forestry
Carr Fire*

- Engulfed more than 200,000 acres
- Destroyed more than 1,200 buildings
- Eight fatalities
- ? Made ill

* One of 17 fires major fires to hit CA in Summer 2018
Projected Increase in Risk of Very Large Fires by Mid-Century

Increase in Weeks with Risk of Very Large Fires (%)

0 50 100 200 300 400 500 600
Heat records fall in the Arctic as fires erupt in Sweden and Siberia

A scorching heat wave has swept across Scandinavia, breaking all-time heat records into the Arctic Circle. Meanwhile, Sweden is facing a major wildfire outbreak, and the forests of Siberia are ablaze after weeks of extreme heat.
• Food Insucurity
• Low crop yields
• Increased foodborne disease
• Increased crop losses
• Altered nutritional content of food

Food Safety, Nutrition, and Distribution
Farm to Table
The Potential Interactions of Rising CO₂ and Climate Change on Food Safety and Nutrition

- Temperature and precipitation extremes (like flooding) can increase pathogen load.
- Climate can also alter weed, insect, and fungal populations and increase pesticide use.
- Rising carbon dioxide can directly influence nutritional content of foods.
- Warmer temperatures can result in greater food spoilage.
- Extreme climate events can disrupt food distribution.

https://health2016.globalchange.gov/
Sequela of Climate Related Disasters

- Depression: survivors of natural disasters.
- Increased prevalence of suicidal ideation and suicide plans.
- Child abuse increase following extreme weather events.

Mental Health and Well-Being
U.S. Intelligence Officials Warn Climate Change Is Threat to Human Security”

National Intelligence Director Dan Coats and directors of the FBI, CIA and Defense Intelligence Agency testify on the Worldwide Threat Assessment before a Senate committee.

Credit: Saul Loeb/AFP/Getty
Internal climate migrants are rapidly becoming the human face of climate change. By 2050—in just three regions—climate change could force more than 143 million people to move within their countries.

Three regions:
- Sub-Saharan Africa
- South Asia
- Latin America

Abel et al., 2019

- Drought $\rightarrow$ crop failure
- Poor natural resource management

- Conflict
  - Conflict over scarce resources
  - Demographic pressures in destination area

- Internally displaced persons
- Asylum seekers/refugees
- Economic migrants

- Climate

- Migration
Environmental Refugees

- Highly vulnerable to disease
- At risk of spreading communicable diseases to new areas
- Vulnerable to shortages of often limited local resources
- Subject to interruptions in supply chains and access to therapies for chronic medical conditions
- Subject to physical attack and emotional stress
Public Health Action on Climate Change

- Study and predict links between climate change and health
- Track diseases and trends related to climate change
- Investigate infectious water-, food-, and vector-borne disease outbreaks
- Communicate effectively on climate change
- Partnerships with private sector, civic groups, NGOs, faith community, etc.

- Public health workforce prepared to respond
- Heat wave and severe storm response plans; focus on the most vulnerable
• To translate climate change science to inform states, local health departments and communities.

• To create decision support tools to build capacity to prepare for climate change.
Climate-Ready States & Cities Initiative

Currently Funded States and Cities

[Map showing states and cities highlighted in green]
Adaptation Planning
Opportunities to Engage

BECOME A CLIMATE CHAMPION

CONTACT POLICYMAKERS

WRITE EDITORIALS

GIVE TALKS
Thank you!
Medications that increase heat risk
- Anti-psychotics
- Anti-depressants (TCA>SSRI)
- Antihistamines
- Beta blockers
- Diuretics
- Anti-Parkinson’s
- Stimulants
- Sympathomimetics

Mechanisms
- Altered set point
- Impaired thirst
- Impaired sweating
- Dehydration
Opportunities for Action: Framework for Actions to Create Health Co-benefits, and Mitigate or Adapt to the Health Effects of Climate Change

Social Vulnerability Index (SVI)

**Elements**
- SES
- Household composition
- Race/ethnicity/language
- Housing/transportation
2012-2016 ACS demographics are a set of variables derived based on a subset of 2012-2016 American Community Survey data.
YOUTH & COLLEGE ORGANIZING TOOLKIT
FOR
Environmental & Climate Justice

NAACP
Environmental and Climate Justice Program
CLIMATE CHANGE, HEALTH, AND NURSING: A CALL TO ACTION

Laura Anderko, PhD, RN;
Elizabeth Schenk, PhD, RN;
Katie Huffling, MS, RN, CNM;
Stephanie Chalupka, EdD, RN, PHCNS-BC, FAAOHN, FNAP

“Climate Change is a medical emergency.”
Professor Hugh Montgomery, Co-Chair
The 2015 Lancet Commission Report on Health and Climate Change

“Climate Change offers greatest health opportunity of the 21st Century.”
The 2015 Lancet Commission Report on Health and Climate Change
The Health Care Climate Challenge

Opportunities:

• Improve patient/community health outcomes
• Financial savings
• Anchor institutions for community

As the only sector with healing as its mission, health care has an opportunity to use its ethical, economic, and political influence to be a leader in climate solutions.

NoHarm.org
Thank you. Questions?
Cool Neighborhoods NYC

Urban Heat Island: dense urban environment traps and absorbs heat.

Densely built environment results in disparate neighborhood level risks
- South Bronx
- Northern Manhattan
- Central Brooklyn.

Cool Neighborhoods for cooler summers.

$106 million invested to plant more trees, cool roofs, and more.
Reflective white coating:
- that reduces energy use, cooling costs and carbon emissions.
- combats the urban heat island effect.
- supports New York City's goal to reduce greenhouse gas emissions by 30 percent by 2030.
Partners

- Health care institutions
- Environmental groups
- Elected officials
- Community groups
- Faith communities
- Educational institutions
Primary Protection:
Enhancing Health Care Resilience for a Changing Climate
Respiratory Diseases: Asthma
Zoonotic and Vector-Borne Diseases

- Introduction and spread of new diseases
- Increased geographical range and risk of current diseases
- Re-emergence of formerly prevalent diseases
- Prolonged transmission cycles
  - Lyme disease
  - West Nile Virus
  - Dengue Fever
  - Malaria
  - Chikungunya
  - Tularemia
  - Rabies
**Shifts in the location of threats**

Weather-related variables can determine geographic distributions of ticks.

Low minimum temperatures can limit tick population survival.

Declines in rainfall and humidity can also limit geographic distribution of blacklegged ticks.

*Source: CDC, 2019 CDC*
West Nile Neuroinvasive Disease

By 2080, up to 1 billion people could be exposed to disease-carrying mosquitoes for the first time, increasing the risk of developing deadly diseases.

-Ryan, 2019
Rising temperatures lead to longer allergy seasons and can make air pollution worse. This can increase the risk and severity of asthma attacks and cause more allergies.
Shifts in the timing of threats

Between 1995 and 2011, the duration of the ragweed pollen season length has increased by as much as 11 to 27 days.

Increases in temperature and CO₂ result in earlier flowering, but also greater floral numbers, greater pollen production, and increased allergenicity.

Aeroallergen exposure contributes to:

- Asthma episodes
- Allergic rhinitis, sinusitis, conjunctivitis
- Urticaria (hives)
- Atopic dermatitis or eczema
- Anaphylaxis

---

Ziska et al, 2016
Vulnerability to Climate-Related Health Stressors

Climate change related events with health impacts for older adults:

- rising temperatures and heat waves
- increased risk of more intense hurricanes (Cat IV and V)
- degraded air quality
- exposure to infectious diseases
- floods, droughts, and wildfires
- other climate-related hazards

Older adults are vulnerable to climate change-related health impacts for a number of reasons including:

- normal changes in the body associated with aging (such as muscle and bone loss) which can limit mobility
- being more likely to have a chronic health condition that requires medications or treatment
- potentially needing assistance with daily activities
Environmental Hazards

Extreme Heat

• Heat exposure can increase the risk of illness and death among older adults, especially people with chronic health conditions that increase sensitivity to heat (i.e., diabetes)
• Higher temperatures have been linked to increased hospital admissions for older people with heart and lung conditions
• Older adults with limited incomes may not use air conditioning units during heat waves due to the high cost of operating them
Poor Air Quality

• Poor air quality worsens respiratory conditions common in older adults, such as asthma and chronic obstructive pulmonary disease (COPD)
• Air pollution can also increase the risk of heart attack in older adults, especially those who are diabetic or obese
Extreme Events

• Older adults are more likely to suffer storm and flood-related fatalities
• Extreme events can also cause power outages that can affect electrically-powered medical equipment and elevators, leaving some people without treatment or the ability to evacuate.
Illnesses Spread By Ticks or Mosquitoes

- Climate change and increased temperatures will lead to ticks and mosquitoes expanding their ranges and being present for more of the year as warmer seasons last longer.
- Lyme disease, which is spread by ticks, is frequently reported in older adults.
- Diseases spread by mosquitoes (like West Nile and St. Louis encephalitis viruses) pose a greater health risk among older adults with already weakened immune systems.
Illnesses Caused by Contaminated Water

• Climate change increases the contamination risk for sources of drinking water and recreational water.
• Older adults are at high risk of contracting gastrointestinal illnesses from contaminated water; those already in poor health are more likely to suffer severe health consequences, including death.
The Impact of Location

• Depending on where they live, some older adults can be more vulnerable to climate change-related health effects than others.

• The increasing severity of tropical storms may pose risks for older adults living in coastal areas.

• For older adults residing in cities, factors such as the urban heat island effect and urban sprawl, and neighborhood safety may also present risks.

• For older adults and people with limited mobility who reside in multi-story buildings with elevators, the loss of electricity during a storm can make it difficult to get food, medicine, and other needed services.
Older Adult Population (65 and older)

- Will nearly double in number from 2015 through 2050 (48 million to 88 million/19 million will be 85 or older)

- Diverse group with distinct subpopulations that can be identified not only by age but by:
  - race
  - educational attainment
  - socioeconomic status
  - social support networks
  - overall physical and mental health
  - disability status

References:
Older Adults are Vulnerable to Climate Change-Related Health Impacts

- Chronic health conditions, e.g., diabetes requiring medications
- May need assistance with ADLs
- Disabilities in:
  - communication (e.g., seeing, hearing, or speaking)
  - mental functioning (e.g., Alzheimer’s disease or dementia)
  - physical functioning (e.g., limited/no ability to walk, climb stairs, or lift or grasp objects)
Extreme Events

- Older adults are more likely to suffer storm and flood-related fatalities.

Superstorm Sandy: Almost ½ of deaths were over age 65
Extreme Events

Evacuation: Older adults have high risk of both physical and mental health impacts

Most vulnerable—people with:
- disabilities
- chronic medical conditions
- living in nursing homes or assisted-living facilities

Residents at La Vita Bella nursing home in Dickinson, Texas
Timothy J McIntosh/ Twitter
Extreme Events

Health impacts could be made worse by interruptions in medical care and challenges associated with transporting patients, with necessary medication, medical records, and equipment like oxygen.

Power outages:
- Electrically-powered medical equipment
- Elevators: leaving some without treatment or ability to evacuate

*Resilient power systems*
Extreme Events: Heat

Between 1979 and 2004:

5,279 deaths were reported in the US related to heat exposure, with those deaths reported most commonly among adults aged 65 and older.

Phoenix, AZ
June 2017

Extreme Heat Events: Older Adults

- Increase risk of illness and death in those with chronic health conditions\(^1,^2\)
  - Congestive heart failure
  - Diabetes
  - Certain medications e.g., diuretics

- Increased hospital admissions
  - Heart and lung conditions\(^2\)

- Limited income-may not have/or use air conditioning
  - **Shelters**
  - **Wellbeing check**
  - **Organizations already in home e.g., VNA**

---
Extreme Weather Events: Hurricane Sandy

- 90,000 buildings NYC in inundation zone
- 6,500 patients - evacuated from nursing homes and hospitals
- 3 weeks post storm - 4 NYC hospitals closed for inpatients

Post Flood: Lower Manhattan, Brooklyn and Queens

Source: Arup
© Created using data from Federal Emergency Management Agency Modelling Task Force and US Census Bureau
The Impact of Location

- 20% of older adults live in an area in which a hurricane or tropical storm made landfall within the last 10 years

- Manufactured housing/mobile homes

- Urban dweller risks
  - Urban heat island effect
  - Multistory dwelling with elevators (loss of electricity)
  - Neighborhood safety “house arrest”

-Emergency notification by phone (reverse 911) - not social media
Climate Change Worsens Air Quality

- **Warming temperatures**: Higher ground-level ozone, Longer season of aeroallergens season (e.g., ragweed pollen)

- **Increased ED visits and hospital admissions for cardiac and respiratory conditions common in older adults**

---

2. Climate Change And The Health Of Older Adults, EPA 430-F-16-058 May 2016
Infectious Disease

- Increasing geographic range of ticks and mosquitoes
  - West Nile
  - St. Louis Encephalitis
  - Lyme Disease
- Illnesses causes by contaminated water

CDC, 2017
3 C Approach

Recommendations

- Older adults are specifically mentioned in national disaster management and climate policies.
- Older adults have been consulted in the development of national and local disaster and climate risk assessment and their vulnerabilities and capacities included.
- Early warning signals and information are available, accessible, understandable and actionable by older adults.
Recommendations

Evacuation plans at community level have specific actions to ensure older adults can evacuate and are protected during these operations, including actions specific to mobility, sight, hearing and mental impairments and isolation.

Disaster supplies and stockpiles include specialist items, medication and food required by older adults, and are accessible to older people in emergency distributions.

Evacuation centers are age-responsive, with off-floor seating, wheelchair accessible facilities, handrails and privacy for men and women.
Thank You

There is no planet B.
Global Warming’s “Six Americas”

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarmed</td>
<td>18%</td>
</tr>
<tr>
<td>Concerned</td>
<td>34%</td>
</tr>
<tr>
<td>Cautious</td>
<td>23%</td>
</tr>
<tr>
<td>Disengaged</td>
<td>5%</td>
</tr>
<tr>
<td>Doubtful</td>
<td>11%</td>
</tr>
<tr>
<td>Dismissive</td>
<td>9%</td>
</tr>
</tbody>
</table>

Highest Belief in Global Warming
Most Concerned
Most Motivated

Lowest Belief in Global Warming
Least Concerned
Least Motivated

Proportion represented by area

Source: Yale/George Mason, November 2018; N=1,278

March 2018
n = 1,278

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarmed</td>
<td>21%</td>
</tr>
<tr>
<td>Concerned</td>
<td>30%</td>
</tr>
<tr>
<td>Cautious</td>
<td>21%</td>
</tr>
<tr>
<td>Disengaged</td>
<td>7%</td>
</tr>
<tr>
<td>Doubtful</td>
<td>12%</td>
</tr>
<tr>
<td>Dismissive</td>
<td>9%</td>
</tr>
</tbody>
</table>

Highest Belief in Global Warming
Most Concerned
Most Motivated

Lowest Belief in Global Warming
Least Concerned
Least Motivated

Source: Yale/George Mason, November 2018; N=1,278
Experts agree: human-caused climate change is happening

- It’s real
- It’s us (human-caused)
- It’s bad (for people)
- It’s solvable

Support for a societal response

Political & consumer activism

The “big five” are simple clear messages that help people reach appropriate conclusions about climate change.

Sources: Ding-Ding et al., 2012; Lewandowsky et al., 2012; Roser-Renouf et al., 2014; Krosnick et al., 2006
Public Health Response

- Mitigation
- Adaptation
- Resilience
“Resilience is the ability to prepare for, and adapt to, changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents or naturally occurring threats or incidents.”

Resilience: Case in Point
It takes a village...
Healthy and Safe Communities: An Effective Community, Statewide, and National Response
Climate-Ready States & Cities Initiative
Building Resilience Against Climate Effects

01 Forecasting Climate Impacts and Assessing Vulnerabilities
02 Projecting the Disease Burden
03 Assessing Public Health Interventions
04 Developing and Implementing a Climate and Health Adaptation Plan
05 Evaluating Impact and Improving Quality of Activities

BRACE
Building Resilience Against Climate Effects
Framework for actions to create health co-benefits, and mitigate or adapt to the health effects of climate change

Mitigation

- Energy
- Transport
- Agriculture (Forestry, Other land use)
- Industry
- Buildings

Climate-altering pollutants

Adaptation

Direct environmental effects
- Floods
- Heatwaves
- Drought
- Fire
- Storms

Indirect environmental effects
- Air pollution
- Reduction in water quality
- Reduction in crop productivity
- Ecosystem damage

Socially mediated effects
- Population migration
- Conflict
- Poverty
- Health infrastructure
- Age, gender, health

Opportunities for Action

- Health care, promotion, and prevention
- Research and education
- Advocacy
- Health system strengthening

Health co-benefits
- ↓Air pollution
- ↓Noise
- ↑Physical activity
- ↑Nutrition
- ↑Water access and quality

Health effects
- Heat loss
- Heart and lung diseases
- Infectious diseases
- Undernutrition
- Mental illness

Cool Neighborhoods NYC

Cool Neighborhoods NYC

Cool Neighborhoods for cooler summers.

$106 million invested to plant more trees, cool roofs, and more.
NYC °CoolRoofs
The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment

Climate change is a significant threat to the health of the American people. This scientific assessment examines how climate change is already affecting human health and the changes that may occur in the future.

1

Climate Change and Human Health

https://health2016.globalchange.gov

Around 88% of the global disease burden of climate change falls on children under 5 years.
What Makes Children Vulnerable?

**Exposure:** Coming into contact with a climate change threat

**Sensitivity:** Being biologically susceptible to a climate change threat given factors like health status and age

**Ability to Adapt:** Being able to adjust or respond to a climate change threat
Intersection of Social Determinants of Health and Vulnerability

CLIMATE DRIVERS

- Exposure
  - Poverty, Occupation, Racial Discrimination
- Sensitivity
  - Underlying Health Disparities
- Adaptive Capacity
  - Poverty, Education, Social Norms, Governance, Social, Health, and Economic Policy

EXPOSURE PATHWAYS

- People in poorer neighborhoods are generally more likely to be exposed to climate change health threats
- People with chronic medical conditions are more likely to have a severe health problem during a heat wave than healthy people
- People with reduced access to care and preventative services are more likely to have a severe health outcome from their illness

HEALTH IMPACTS

HEALTH OUTCOMES

USGCRP Climate and Health Assessment, 2016
Public Health Messaging: Heat & Pollution

- Anticipate earlier and longer allergy seasons
- Limit athletic activities on hot, high air pollution days
- Consider special heat accommodations for learning disabled students and citizens
- Guide parents and pregnant women to reduce heat exposures; counsel on combined risk from pollens and air pollutants (ozone)
- Advise athletic coaches, employers of children on heat precautions and policies; educate community on changes in pollen seasons and interactions with air pollution
<table>
<thead>
<tr>
<th>Air Quality Index</th>
<th>Outdoor Activity Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>green (GOOD)</td>
<td>Great day to be active outside!</td>
</tr>
</tbody>
</table>
| yellow (MODERATE)| Good day to be active outside!  
Students who are unusually sensitive to air pollution could have symptoms.* |
| orange (UNHEALTHY FOR SENSITIVE GROUPS) | It’s OK to be active outside, especially for **short activities** such as recess and physical education (PE).  
For **longer activities** such as athletic practice, take more breaks and do less intense activities.  
Watch for symptoms and take action as needed.*  
Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy. |
| red (UNHEALTHY)   | For **all outdoor activities**, take more breaks and do less intense activities.  
Consider moving **longer or more intense activities** indoors or rescheduling them to another day or time.  
Watch for symptoms and take action as needed.*  
Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy. |
| purple            | Move **all activities** indoors or reschedule them to another day. |
Climate Resilient Schools

- Drought-tolerant landscapes
- Edible school gardens
- Promotion of resilient energy systems
- Comprehensive classroom
- Community discussions of climate, water issues, sea level rise

Photo courtesy of Broward County.
Heat Illness Prevention School Project

Goal: Educate students, school staff, athletic coaches, and parents regarding heat-related illness and prevention.
Climate Resilient Schools

Ocean Springs, Mississippi
Surveillance and Education: Food, Water and Vector-Borne Disease Risks

- Be alert to shifting timing, locations of diseases
- Food safety
- Ponds and lakes with algal blooms, mosquito/tick precautions
- Outdoor food presentation
- Vector control measures
Protecting Children During Disasters

- Physical harm
- Exploitation and violence
- Psychosocial distress
- Family separation
- Abuses related to evacuation
- Denial of access to quality education
- Emotional impact of disaster
The Emotional Impact of Disaster

Psychosocial programs:

- Rebuild a sense of safety and normalcy
- Express their thoughts and feelings about their experiences
- Strengthen resilience, or coping skills
- Build positive relationships with peers and caregivers
The Emotional Impact of Disaster: Preserving Family Unity

- Survey all children to identify unaccompanied children
- Identification bracelet on the child that matches a supervising adult, *if available*
- Report all unaccompanied children to the emergency operations center and NCMEC (National Center for Missing and Exploited Children)
- Provide a complete list of unaccompanied children to local emergency management officials
- Social and health screening of the child and the supervising adult
Online Courses:
- Planning for the needs of Children in Disasters IS-366
- Multi-hazard Planning for Childcare IS-36
- Introduction to the Incident Command System, I-100 for Schools IS-100.SCA
- Multi-hazard Emergency Planning for Schools IS-362.A
Framework for actions to create health co-benefits, and mitigate or adapt to the health effects of climate change

Mitigation
- Energy
- Transport
- Agriculture
- Forestry
- Other land use
- Industry
- Buildings

Direct environmental effects
- Floods
- Drought
- Heatwaves
- Fire
- Storms

Indirect environmental effects
- Air pollution
- Reduction in water quality
- Reduction in crop productivity
- Ecosystem damage

Socially mediated effects
- Population migration
- Conflict
- Poverty
- Health infrastructure
- Age, gender, health

Opportunities for Action
- Health care, promotion, and prevention
- Research and education
- Advocacy
- Health system strengthening

Health co-benefits
- ↓ Air pollution
- ↓ Noise
- ↑ Physical activity
- ↑ Nutrition
- ↑ Water access and quality

Health effects
- Heat loss
- Heart and lung diseases
- Infectious diseases
- Undernutrition
- Mental illness

NEHA Addressing Climate Change Impacts

https://vimeo.com/291968741?utm_source=Climate+for+Health+-+Newsletter&utm_campaign=6cc96b6333-CFH_Newsletter_10_2018&utm_medium=email&utm_term=0_92c4225a2f-6cc96b6333-198247133&mc_cid=6cc96b6333&mc_eid=43928fc173

4:49 min
Together, we must consider our dietary choices, modes of transport, energy sources, norms of production and consumption, political actions, avenues of community engagement, and models of environmental stewardship.

Physicians, physician assistants, nurses, nurse practitioners, midwives, dietitians, counsellors, traditional healers, and other clinicians can make a difference by encouraging action at the individual and community levels focused on lifestyle modifications and forward-thinking policy, innovation, and adaptation measures.

Join us in safeguarding our health and that of future generations by advancing outreach efforts, collaborating and sharing best practices with an international coalition of clinicians, co-generating patient-focused resources in multiple languages, and engaging in other channels of planetary health activism. To get involved, visit the Clinicians for Planetary Health page on the Planetary Health Alliance website.
- Join Clinicians for Planetary Health by signing on to the email list, through which we'll issue updates and opportunities for engagement.

- Have your organization formally join Clinicians for Planetary Health as a partner, indicating its commitment to planetary health and advancing solutions. Email erikaveidis@g.harvard.edu.
Thank you!
Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Heat-related illness and death, cardiovascular failure
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Forced migration, civil conflict, mental health impacts
- Respiratory allergies, asthma
- Extreme heat
- Changes in Vector Ecology
- Increasing Allergens
- Severe weather
- Increasing CO2 levels
- Rising sea levels
- More extreme weather
- Water and Food Supply Impacts
- Water Quality Impacts
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms
Opportunities for Action

See HEFN Script Word doc

Stephanie M. Chalupka, EdD, RN, PHCNS-BC, FAAOHN, FNAP
Since 1950

- Human population has increased by nearly 200%
- Fossil fuel consumption has increased by over 550%;
- Marine fish capture has increased by over 350%
- Built dams on about 60% of the world’s rivers
- Cleared nearly half of temperate and tropical forests

*Use nearly half of accessible freshwater every year*

*Use about half of the planet’s liveable surface to feed ourselves.*
Our environment is changing.

- Atmospheric carbon dioxide levels are rising at a record pace, with the current levels having increased by about 24% since the 1950s.
- 2016 was Earth's warmest year on record
- 2018 was the warmest one for oceans
  - 30% increase in pH since the Industrial Revolution.
- Pollinators, which are needed for plants and crops to grow, are disappearing worldwide.
- Biodiversity is rapidly being lost as an estimated 150 species become extinct each day, which is 1,000 times higher than the "natural" or "background" rate.
5 minute video

https://vimeo.com/291968741?utm_source=Climate+for+Health+-+Newsletter&utm_campaign=6cc96b6333-CFH_Newsletter_10_2018&utm_medium=email&utm_term=0_92c4225a2f-6cc96b6333-198247133&mc_cid=6cc96b6333&mc_eid=43928fc173