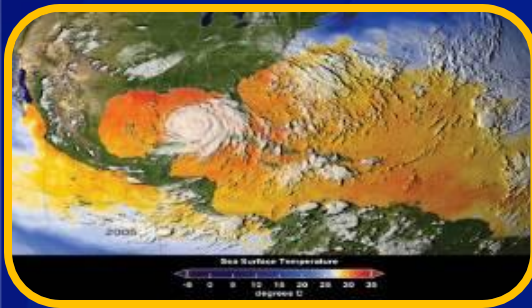


Climate Change and Health



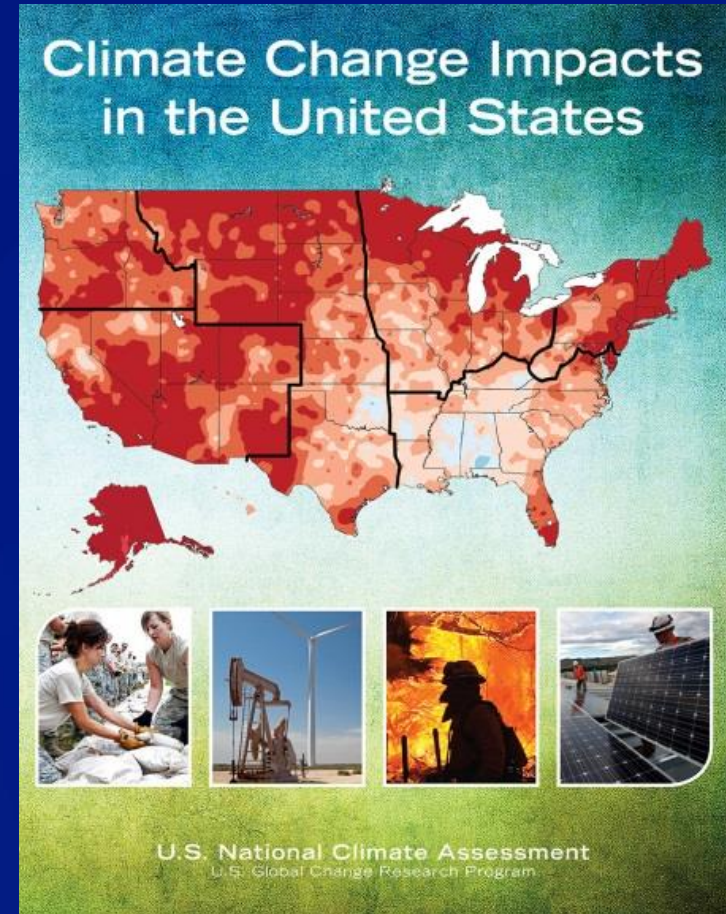
Paul Schramm, MS, MPH

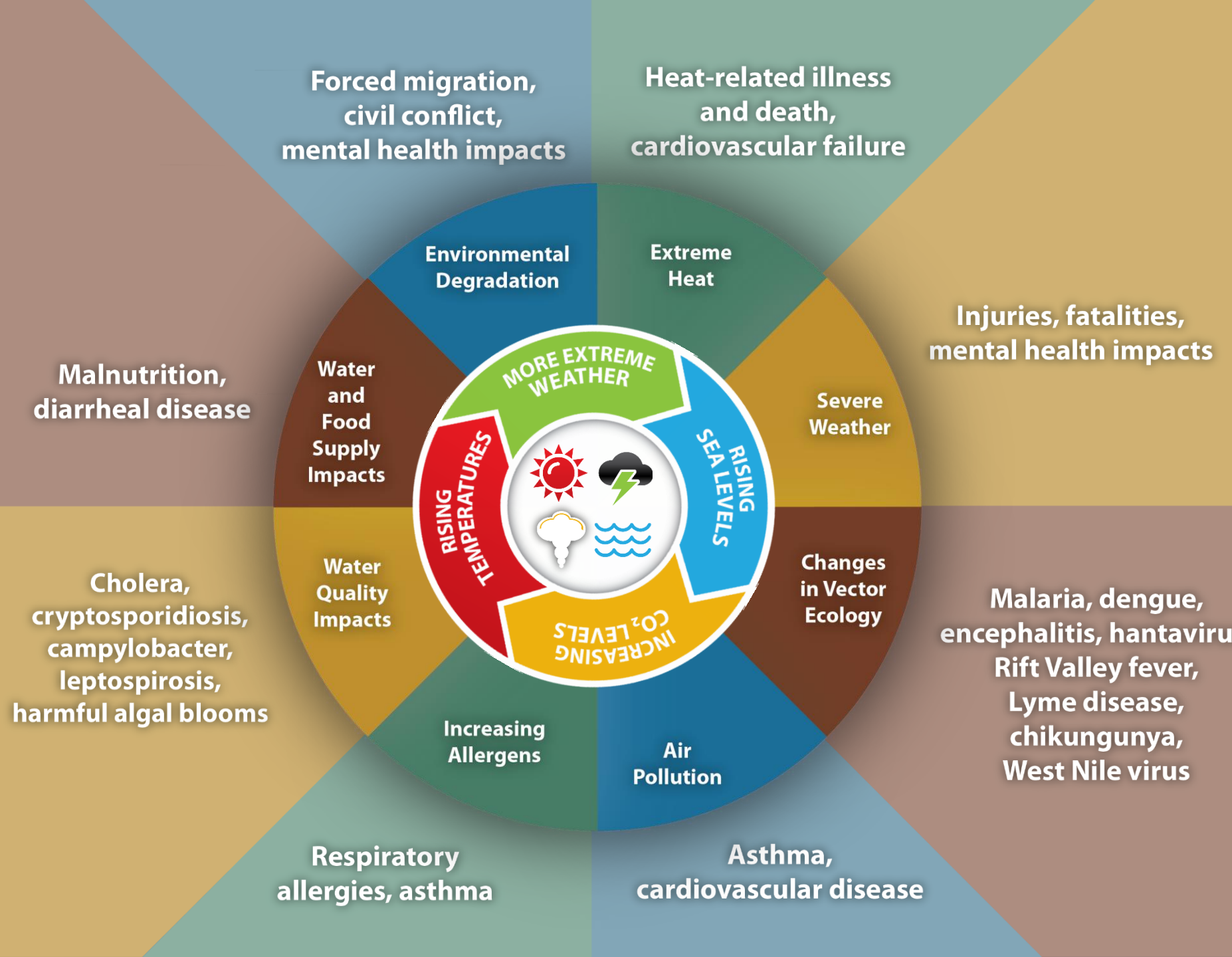
**Health Scientist,
Climate and Health Program**

**National Center for Environmental Health
Centers for Disease Control and Prevention**

3rd National Climate Assessment: Health Key Messages

- ❑ **Climate change threatens human health and well-being**
- ❑ **Will amplify some existing health threats**
- ❑ **Preparedness and prevention can protect people from some of the impacts of climate change**
- ❑ **Responding to climate change presents opportunities**





Heat-related illness and death, cardiovascular failure

Forced migration, civil conflict, mental health impacts

Injuries, fatalities, mental health impacts

Malnutrition, diarrheal disease

Environmental Degradation

Extreme Heat

Severe Weather

Water and Food Supply Impacts

MORE EXTREME WEATHER

SEA LEVELS RISING

RISING TEMPERATURES



Changes in Vector Ecology

Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus

Water Quality Impacts

INCREASING CO₂ LEVELS

Increasing Allergens

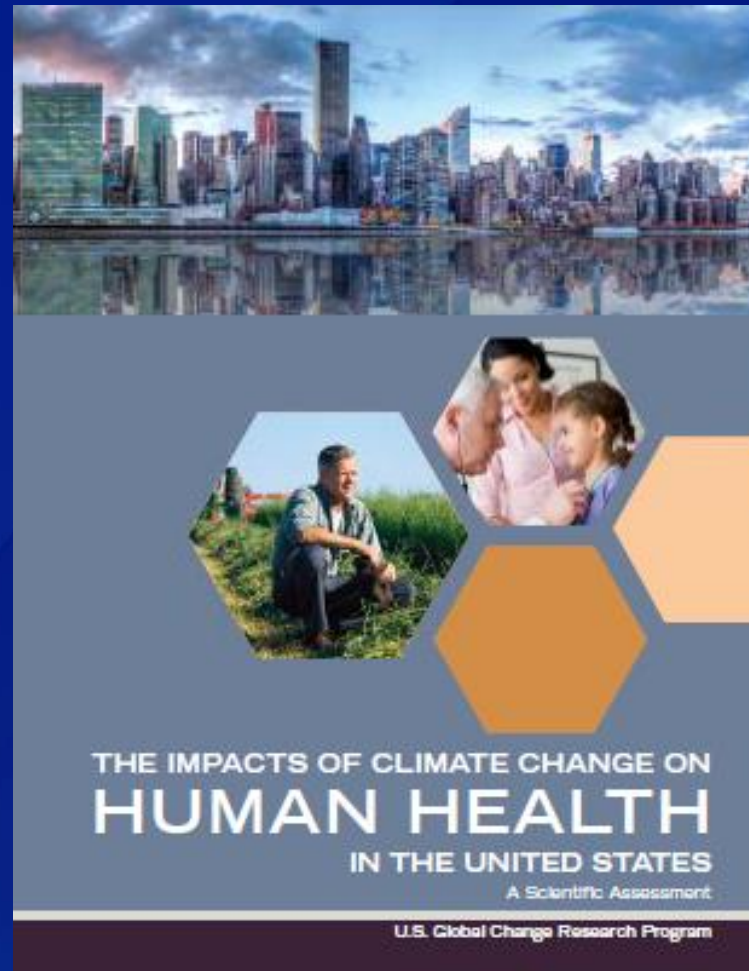
Air Pollution

Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms

Respiratory allergies, asthma

Asthma, cardiovascular disease

2016 Human Health Assessment

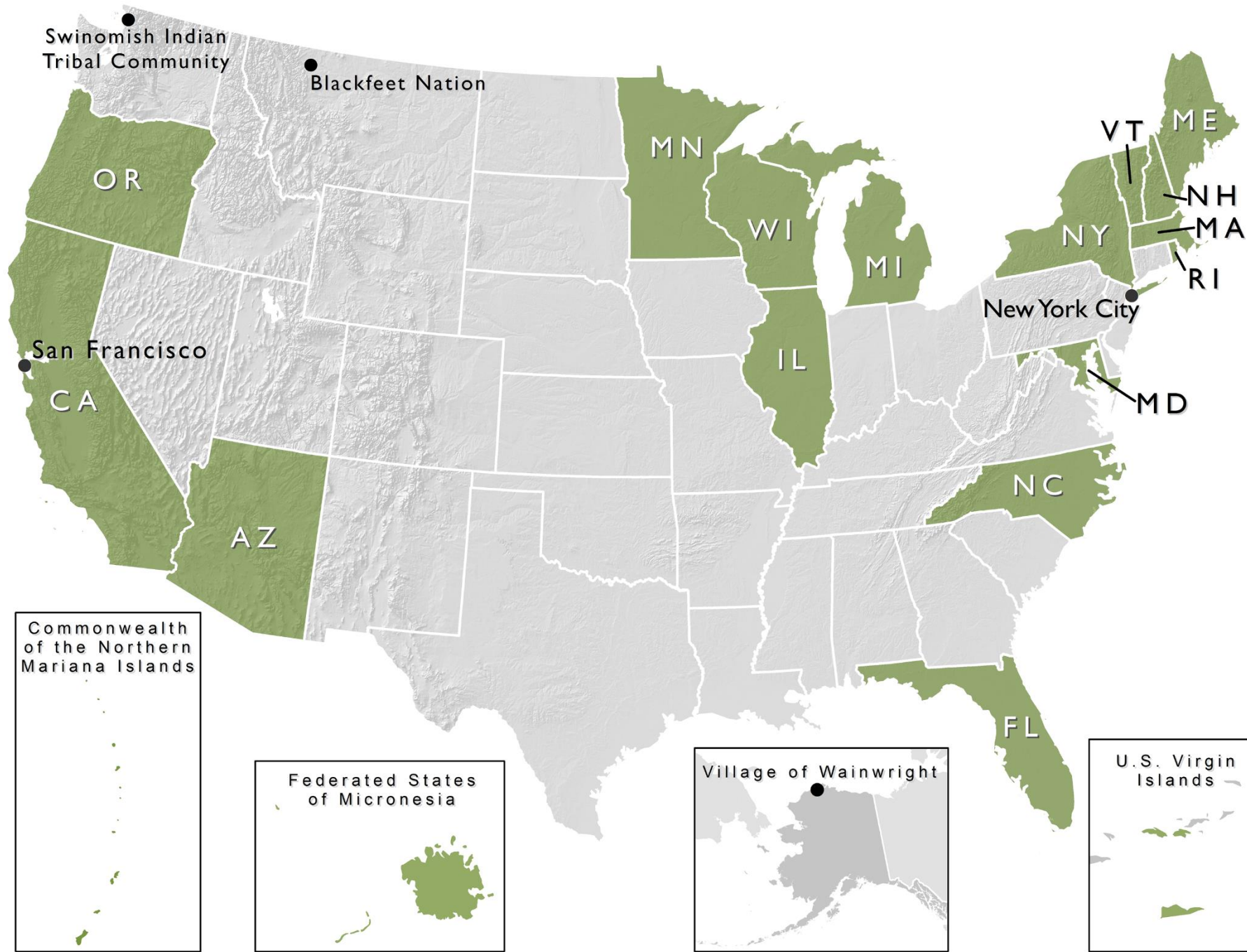


<http://health2016.globalchange.gov/>

What is CDC doing to prepare for health effects of climate change?

- **CDC helps states, cities, tribes, and territories by:**
 - Providing scientific guidance
 - Developing decision support tools
 - Creating partnerships between public health and other sectors





Swinomish Indian Tribal Community

Blackfeet Nation

OR

MN

WI

MI

VT

ME

NH

MA

NY

RI

New York City

San Francisco

CA

IL

MD

AZ

NC

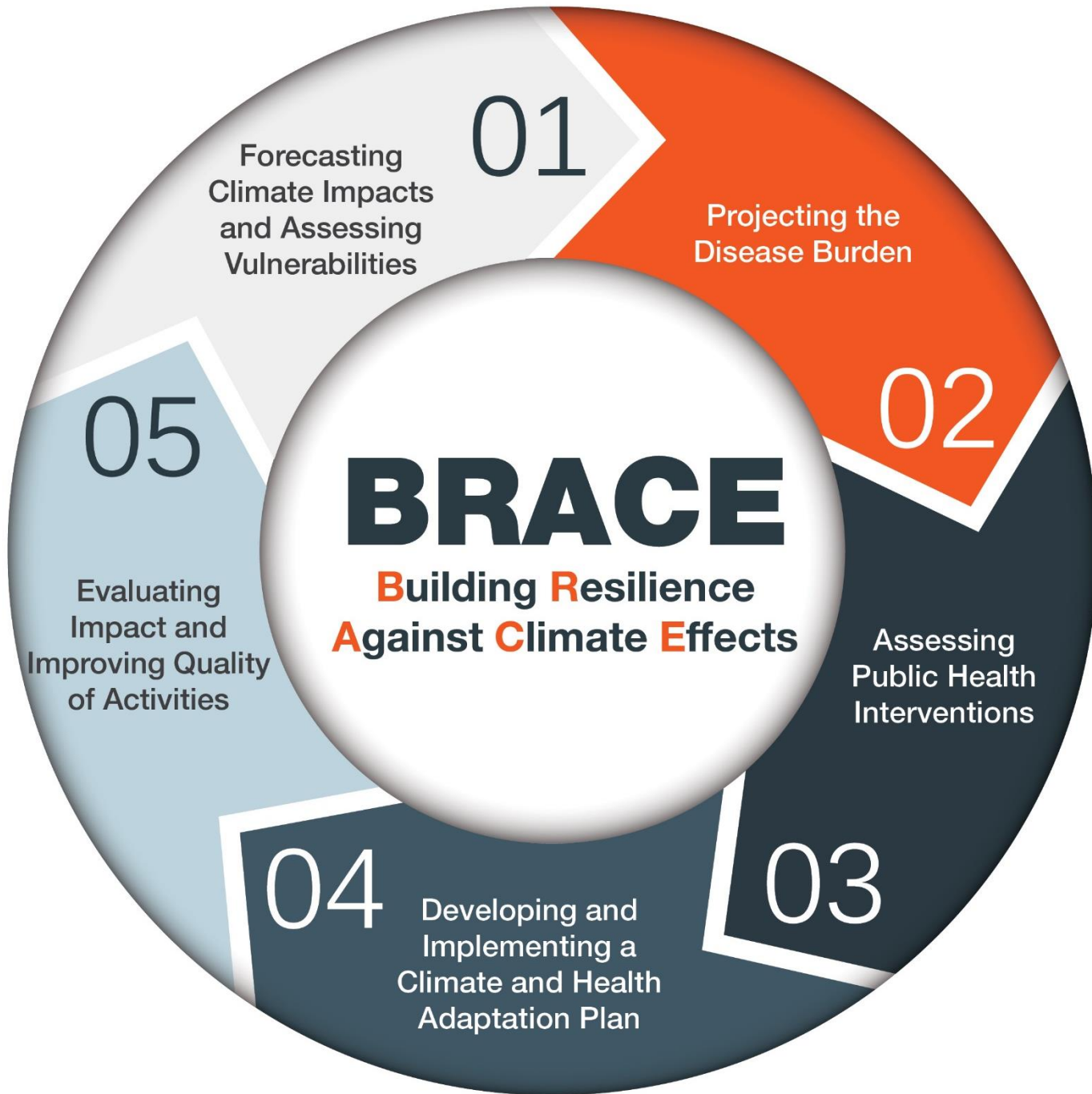
FL

Commonwealth of the Northern Mariana Islands

Federated States of Micronesia

Village of Wainwright

U.S. Virgin Islands



Guidance Documents

Climate Models and the Use of Climate Projections:

A Brief Overview for Health Department



Climate and Health Program
Climate and Health Program, Centers for Disease Control and Prevention

Paul J. Schramm, Christopher K. Uejio, George Luber

¹Climate and Health Program, Division of Environmental Health (NCEH), Centers for Disease Control and Prevention

²Department of Geography, Florida State University, Tallahassee, FL, USA

³Department of Emergency Medicine, Emory University, Atlanta, GA, USA

⁴Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

National Center for Environmental Health
Division of Environmental Hazards and Health Effects

Assessing Health Vulnerability to Climate Change

A Guide for Health Departments



Climate and Health Technical Report Series
Climate and Health Program, Centers for Disease Control and Prevention

Arie Ponce Manangan¹, Christopher K. Uejio², Shubhayanu Saha³, Gino D. Marinucci⁴, Claudia Langford Brown⁵, Jeremy J. Hess⁶

¹Climate and Health Program, Division of Environmental Hazards and Health Effects (DEHHE), National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention

²Department of Geography, Florida State University, Tallahassee, FL, USA

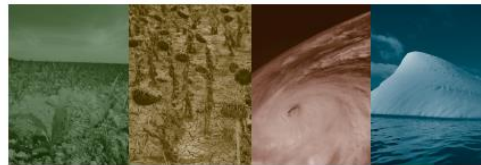
³Department of Emergency Medicine, School of Medicine, Emory University, Atlanta, GA, USA

⁴Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

National Center for Environmental Health
Division of Environmental Hazards and Health Effects

Projecting Climate-Related Disease Burden:

A Guide for Health Departments



Climate and Health Technical Report Series
Climate and Health Program,
Centers for Disease Control and Prevention

Jeremy J. Hess^{1,2*}, Shubhayanu Saha³, Paul J. Schramm⁴, Kathryn C. Conlon⁵, Christopher K. Uejio⁶, George Luber⁷

¹Climate and Health Program, Division of Environmental Hazards and Health Effects (DEHHE), National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention (CDC), Atlanta, GA, USA

²Department of Emergency Medicine, School of Medicine, Emory University, Atlanta, GA, USA

³Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

⁴National Center for Atmospheric Research, Boulder, CO, USA

⁵Department of Geography, Florida State University, Tallahassee, FL, USA

⁶Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

⁷Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

*These authors contributed equally to this work

National Center for Environmental Health
Division of Environmental Hazards and Health Effects



CLIMATE CHANGE and EXTREME HEAT EVENTS

Excessive Heat Events Guidebook

EPA 430-B-06-006 | June 2006



United States Environmental Protection Agency
Office of Atmospheric Programs (6207)
1200 Pennsylvania Avenue NW, Washington, DC 20460



Centers for Disease Control and Prevention
National Center for Environmental Health

www.cdc.gov/climateandhealth/guidance.htm

EPA/CDC Climate Change and Extreme Heat Guidebook

CLIMATE CHANGE and EXTREME HEAT

What You Can Do to Prepare

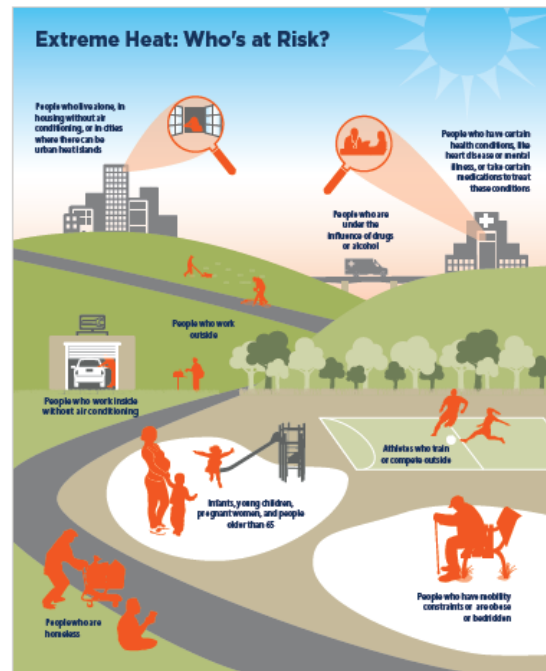


Know the Symptoms of Heat-Related Illnesses

	SYMPTOMS	TREATMENT
HEAT CRAMPS	<ul style="list-style-type: none"> • Heavy sweating • Painful muscle cramps or spasms 	<ul style="list-style-type: none"> • Stop activity for a few hours. • Move to a cooler location. • Drink water, clear juices, or a sports beverage. • Seek medical attention if cramps do not subside within one hour.
HEAT EXHAUSTION	<ul style="list-style-type: none"> • Heavy sweating • Weakness • Fatigue • Headache • Dizziness • Nausea or vomiting • Fainting • Irritability • Thirst • Decreased urine output 	<ul style="list-style-type: none"> • Move to an air-conditioned environment. • Lie down. • Loosen clothing or change into lightweight clothing. • Sip cool, non-alcoholic beverages. • Take a cool shower or bath, or apply cool, wet cloths to as much of the body as possible. • Seek medical attention if symptoms
HEATSTROKE	<ul style="list-style-type: none"> • Very high body temperature • Altered mental state • Throbbing headache • Confusion • Nausea • Dizziness • Hot, dry skin or profuse sweating • Unconsciousness 	

10 | Climate Change and Extreme Heat: What You Can Do to Prepare

Extreme Heat: Who's at Risk?



13 | Climate Change and Extreme Heat: What You Can Do to Prepare

Coastal Flooding, Climate Change, and Your Health

What You Can Do to Prepare



What Can I do to Prepare for a Flood?

Coastal flooding is on the rise, but there are many things you can do now to prepare your family and home for a future flood. These preparations will lessen your risk of becoming injured or ill if a flood occurs. They will also help reduce the risk of flood waters damaging your home and requiring costly repairs. Here are some ideas.

Make an emergency plan that covers topics such as:²⁹

- How will my family get emergency alerts and warnings?
- How will my family get to safe locations during an emergency? Remember you'll need to know how to reach higher ground quickly and on foot, since driving might be dangerous.
- How will my family get in touch if our cell phone, internet, or landline doesn't work?
- How will I let loved ones know I am safe?
- How will my family get to a meeting place after the emergency?
- What will I do with my pets during a flood?

Create an emergency preparedness kit (see the next page for details)

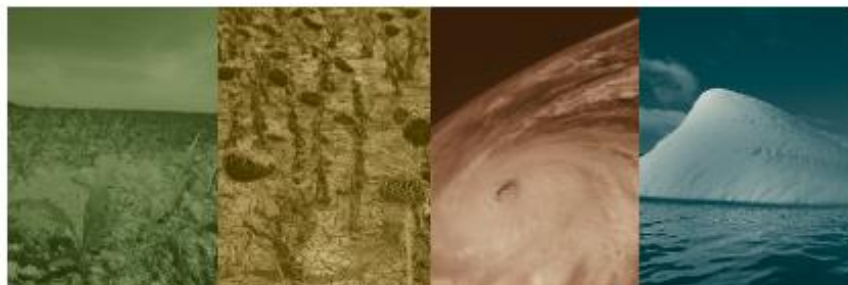


Volunteers prepping sandbags ahead of expected flooding along the Chariton River in Iowa. (photo credit: FEMA)

Source: <http://www.floodsafety.noaa.gov/before.shtml>

Assessing Health Vulnerability to Climate Change:

A Guide for Health Departments



Climate and Health Technical Report Series

Climate and Health Program,
Centers for Disease Control and Prevention

Arie Ponce Manangan¹, Christopher K. Uejiro², Shubhaya Sahai³, Paul J. Schramm⁴,
Gino D. Marinucci⁴, Jemmy J. Hess^{4*}, George Luber²

¹Climate and Health Program, Division of Environmental Hazards and Health Effects (DEHHE), National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention (CDC) Atlanta, GA, USA

²Department of Geography, Florida State University, Tallahassee, FL, USA

³Department of Emergency Medicine, School of Medicine, Emory University, Atlanta, GA, USA

⁴Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

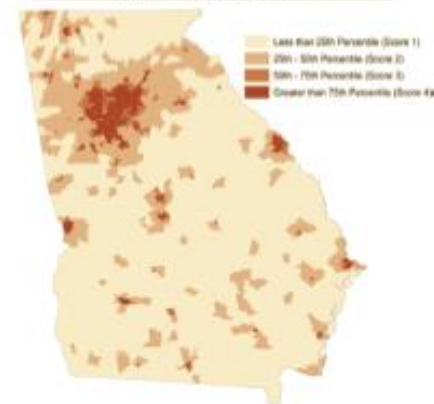
National Center for Environmental Health
Division of Environmental Hazards and Health Effects



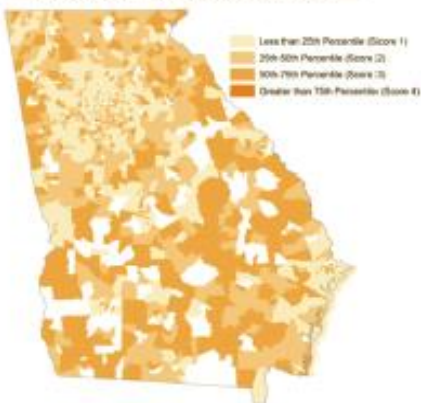
Percent 65 Years of Age or Older Living Alone



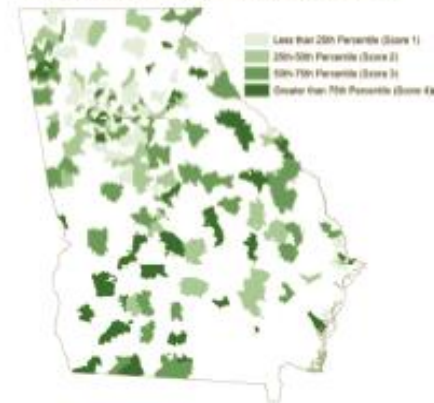
Percent Impervious Surface



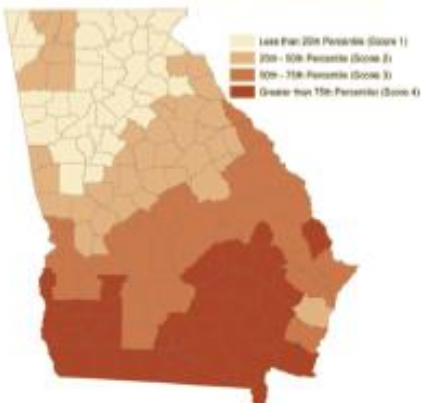
Percent Population Below Poverty Level



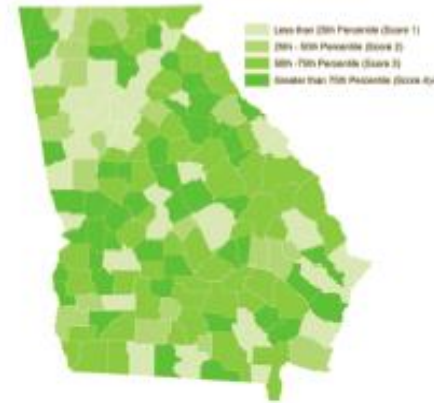
Percent Dialysis Patients Covered by Medicare

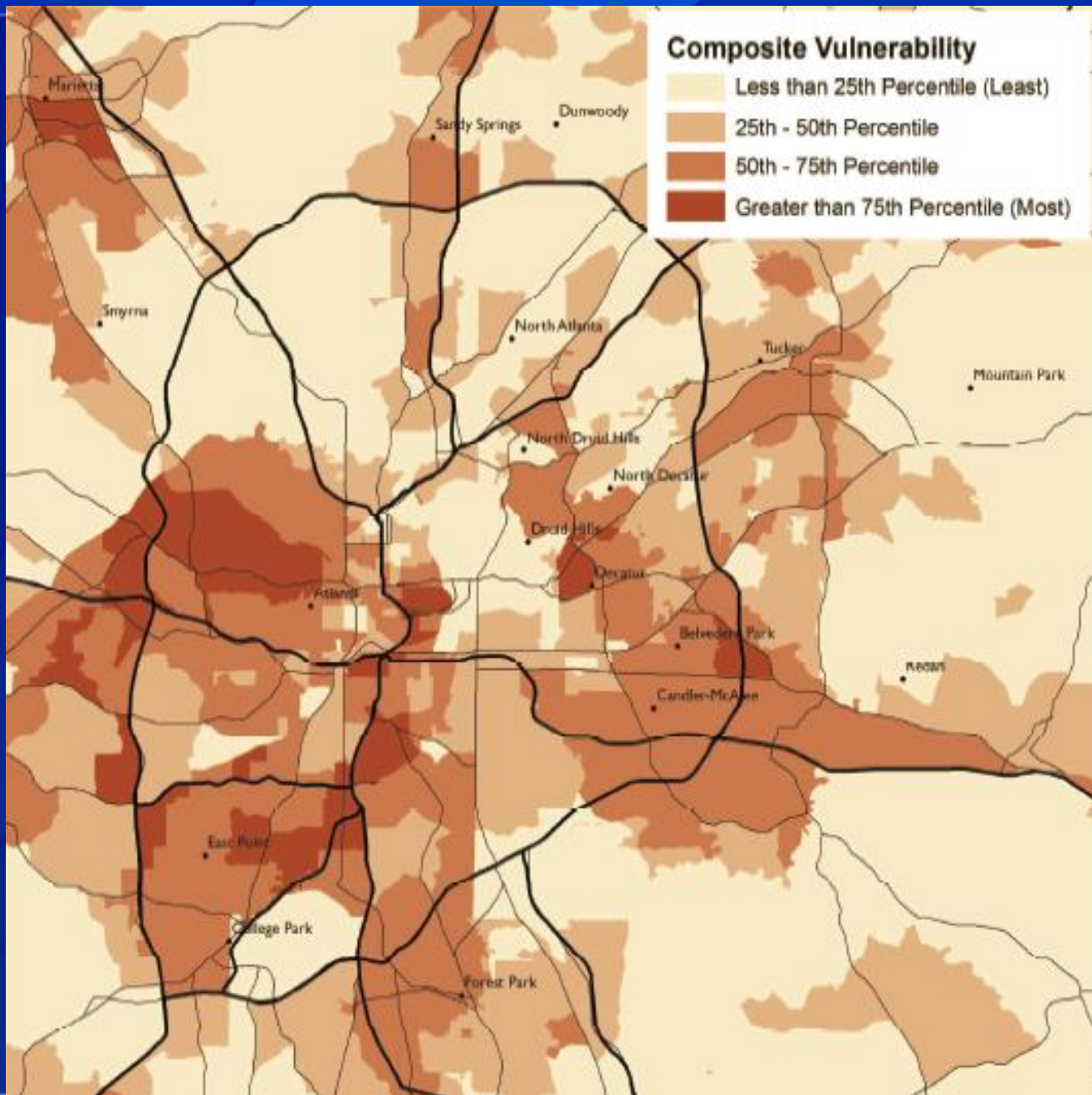


Heat Event Exposure (100° Heat Index, 2-Days)



Hospital Insufficiency





CDC-APHA Fact Sheets

EXTREME RAINFALL AND DROUGHT

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO₂). CO₂ builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra-trapped heat disrupts many of the interconnected systems in our environment.

Increases in precipitation extremes, either heavy rain or drought, cause more water to evaporate, leading to heavier downpours. At the same time, around the planet, meaning drier conditions.

THE CLIMATE-HEALTH CONNECTION

Precipitation extremes create many safety hazards.

- Over the last several decades, we have seen a number of heavy precipitation events in the United States that have contributed to more severe flooding in certain areas, including the deadliest weather-related hazards in the United States.
- Other hazards can appear after a storm has passed. Mold affects indoor air quality. Livestock and people can be affected by health problems. These health respiratory tract symptoms such as cough and lower respiratory tract infections like pneumonia.
- People living in drought conditions may be exposed to dust storms to flash flood conditions. This poor air quality affects people's health, increasing respiratory and cardiovascular health problems. These events result in increased need for treatments for asthma.

EXTREME HEAT CAN IMPACT OUR HEALTH IN MANY WAYS

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States.

We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.



BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO₂). CO₂ builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra-trapped heat disrupts many of the interconnected systems in our environment.

Climate change also affects human health by increasing the frequency and intensity of extreme heat events. Increases in the overall temperature of the atmosphere and oceans associated with climate change contribute to shifts in extreme weather events.

THE CLIMATE-HEALTH CONNECTION

Extreme heat events can be deadly. These events result in increased related illness, as well as cardiovascular health problems.

- Extreme heat events can trigger a variety of heat stress conditions, such as heat stroke. Heat stroke is the most serious heat-related disorder. It occurs when the body becomes unable to control its temperature. Body temperature rises rapidly, the sweating mechanism fails, and the body cannot cool down. This condition can cause death or permanent disability if emergency treatment is not given. Small children, the elderly, and certain other groups including people with chronic diseases, low-income populations, and outdoor workers have higher risk for heat-related illness.
- Higher temperatures and respiratory problems are also linked. One reason is because higher temperatures contribute to the build-up of harmful air pollutants.
- Many cities across the United States, including St. Louis, Philadelphia, Chicago, and Cincinnati, have seen large increases in death rates during heat waves.

CLIMATE CHANGE DECREASES THE QUALITY OF THE AIR WE BREATHE

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO₂). CO₂ builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra-trapped heat disrupts many of the interconnected systems in our environment.

Climate change might also affect human health by making our air less clear. It can lead to an increase in allergens and harmful air pollutants. For instance, pollen seasons – which can increase allergic sensitizations and asthma and school days. Higher temperatures associated with climate change also lead to an increase in ozone, a harmful air pollutant.

THE CLIMATE-HEALTH CONNECTION

Decreased air quality introduces a number of health risks and concerns.

- According to the National Climate Assessment, climate change will affect human health by increasing ground-level ozone and/or particulate matter air pollution in some locations. Ground-level ozone is a key air pollutant that causes many health problems, including diminished lung function, increased emergency department visits for asthma, and increases in prenatally-related health problems.
- More and larger wildfires linked to climate change could also significantly affect human health in a number of ways. Smoke exposure increases a person's risk of illness, respiratory and cardiovascular hospitalizations, and medical emergency department visits for asthma, and increases in prenatally-related health problems.
- Exposure to allergens causes health problems for many people. When exposed to allergens and air pollutants, allergic reactions often occur. These events result in increased need for treatments for asthma.



CLIMATE CHANGE INCREASES THE NUMBER AND GEOGRAPHIC RANGE OF DISEASE-CARRYING INSECTS AND TICKS

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO₂). CO₂ builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra-trapped heat disrupts many of the interconnected systems in our environment.

One way climate change might affect human health is by increasing the risk of vector-borne diseases. A vector is any organism – such as fleas, ticks, or mosquitoes – that can transmit a pathogen, or infectious agent, from one host to another. Because warmer average temperatures can mean longer warm seasons, earlier spring seasons, shorter and milder winters, and hotter summers, conditions might become more hospitable for many carriers of vector-borne diseases.



THE CLIMATE-HEALTH CONNECTION

The potential increase of harmful vectors is related to a number of health risks:

- The development and survival of ticks, their animal hosts (such as deer), and the bacterium that causes Lyme disease are all strongly influenced by climatic factors, especially temperature, precipitation, and humidity. Most occurrences of Lyme disease in the U.S. are in the Northeast, particularly Connecticut. An expansion of the geographic area in which ticks can survive may lead to more people having contact with infected ticks. In regions where Lyme disease already exists, milder winters result in fewer disease-carrying ticks dying during winter. This can increase the overall tick population, which increases the risk of contracting Lyme disease in those areas.
- West Nile virus is another example of a vector-borne disease that may be influenced by climate change. Preventing people from contracting West Nile virus is important, because there are no medications to treat or vaccines to prevent this virus in humans, and recovery from severe disease may take several weeks or months.

WARMER WATER AND FLOODING INCREASE THE RISK OF ILLNESS

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO₂). CO₂ builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra-trapped heat disrupts many of the interconnected systems in our environment.

Climate change also affects human health by impacting the quality and safety of both our water supply and our recreational water. As the earth's temperature rises, surface water temperatures in lakes and oceans also rise. Warmer waters create a more hospitable environment for some harmful algae and other microbes to grow. Climate change can also lead to heavier downpours and floods. Flood waters often contain a variety of contaminants. In some cases, floods can overwhelm a region's drainage or wastewater treatment systems, increasing the risk of exposure to bacteria, parasites, and other unhealthy pollutants.

THE CLIMATE-HEALTH CONNECTION

Warmer waters and flood conditions introduce a number of public health concerns.

- Certain marine bacteria that make humans sick are more likely to survive and grow as oceans get warmer. *Vibrio parahaemolyticus* is responsible for diarrheal illnesses linked with consuming raw or undercooked oysters from the Gulf of Mexico. *Vibrio vulnificus* causes vomiting, diarrhea, and abdominal pain in healthy adults. *Vibrio vulnificus* is more severe than *Vibrio parahaemolyticus* and is responsible for most of the seafood-related deaths in the United States. Both can also cause serious infections through contact with contaminated water while swimming.



CDC's National Environmental Public Health Tracking Network

- Includes data on climate change and heat:
 - Historic temperature distribution and extreme heat days
 - Projected extreme heat days
 - Heat vulnerability
 - Heat ER visits, hospitalizations and deaths

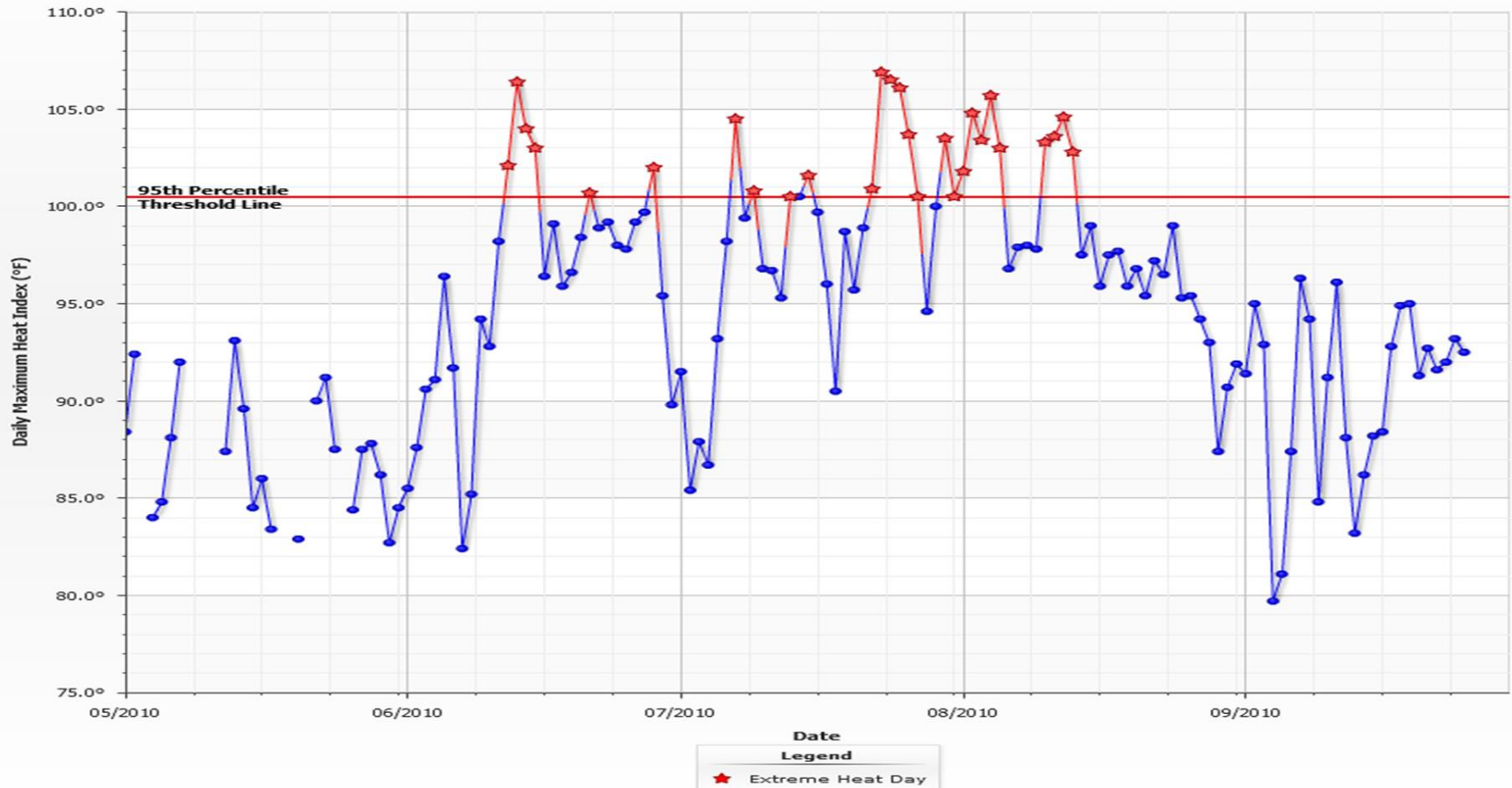
The screenshot displays the CDC's National Environmental Public Health Tracking Network interface, organized into four steps:

- Step 1: Select Your Content**
 - Climate Change
 - Future Projections of Extreme Heat
 - Projected Number of Future Extre...
 - Show only data about children
 - NATIONAL Environmental Public Health Tracking Program logo
- Step 2: Choose Geography & Time**
 - Geography list: Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri
 - Time list: 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084
 - Show Counties
 - Buttons: Clear Geography, Clear Time
- Step 3: Advanced Options**
 - Advanced Options (Required)
 - Emissions Scenario
 - Low Emissions (B1)
 - High Emissions (A2)
 - Advanced Options (Select One)
 - Absolute Threshold
 - Relative Threshold
 - 98th Percentile
 - Buttons: Clear Options
- Step 4: Submit**
 - Run Query

Historic temperature data (EPHTN)

Extreme Heat Days

State: Georgia County: DeKalb Year: 2010



Potential Communications Products



**Modular
Slides for
Presentations**



**Shareable
Graphics**



**Success
Story
Template**



**Communications
Toolkit**



Videos

Climate and Health Program

Division of Environmental Hazards & Health Effects
National Center for Environmental Health
Centers for Disease Control and Prevention

Email: pschramm@cdc.gov
climateandhealth@cdc.gov

Website: <http://www.cdc.gov/climateandhealth/>

For more information please contact the Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: <http://www.cdc.gov>

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

