THE IMPACTS OF CLIMATE CHANGE ON
HUMAN HEALTH
IN THE UNITED STATES:
A SCIENTIFIC ASSESSMENT

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U.S. Environmental Protection Agency
PNW Tribal Climate Change Call– 08/17/2016
What was the process for development?

- Driven by the USGCRP Interagency Crosscutting Group on Climate Change and Human Health (CCHHG)

- Coordinated by the EPA

- Written by a team of ~100 Federal employees, contractors, and grantees from eight U.S. Federal agencies: HHS (NIH, CDC, NIOSH, ASPR, FDA, SAMHSA), NOAA, EPA, USDA, NASA, USGS, DOD (USUHS), VA

- Extensively reviewed by the public and experts, including a committee of the National Academies of Sciences and the 13 Federal agencies of the USGCRP; draws from a large body of scientific peer-reviewed research
Top Line Messages of the Report

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

• This assessment significantly advances what we know about the impacts of climate change on public health, and the confidence with which we know it.

• Climate change exacerbates some existing health threats and creates new public health challenges.

• Every American is vulnerable to the health impacts associated with climate change.
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Scope of the Climate and Health Assessment

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**Scientific Advancements**

1. Improved quantification of projected illnesses or deaths
2. Better described the connections between climate impacts on exposure and risk
3. Highlight some well-studied but not well-known impacts
Chapter 2: Temperature-Related Death and Illness

Key Finding 1: Future Increases in Temperature-Related Deaths
Based on present-day sensitivity to heat, an increase of thousands to tens of thousands of premature heat-related deaths in the summer are projected each year as a result of climate change by the end of the century.

**KF2:** Even Small Differences from Seasonal Average Temperatures Result in Illness and Death

**KF3:** Changing Tolerance to Extreme Heat

**KF4:** Some Populations at Greater Risk
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Climate and Health Exposure Pathways

**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

**HEALTH OUTCOMES**
- Heat-related illness
- Cardiopulmonary illness
- Food-, water-, & vectorborne disease
- Mental health consequences & stress
Chapter 6: Water-Related Illnesses

Key Finding 1: Seasonal and Geographic Changes in Waterborne Illness Risk

*Increases in water temperatures associated with climate change will change the seasonal windows of growth and the habitat range for freshwater and marine toxin-producing algae as well as certain naturally occurring Vibrio bacteria. These changes will increase the risk of exposure to waterborne pathogens and toxins that can cause a variety of illnesses.*

**KF2:** Runoff from Extreme Precipitation Increases Exposure Risk

**KF3:** Water Infrastructure Failure
### Scope of the Climate and Health Assessment

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Chapter 7: Food Safety, Nutrition, and Distribution

**KF1:** Increased Risk of Foodborne Illness  
**KF2:** Chemical Contaminants in the Food Chain  

**Key Finding 3: Rising Carbon Dioxide Lowers Nutritional Value of Food**

The nutritional value of agriculturally important food crops, such as wheat and rice, will decrease as rising levels of atmospheric carbon dioxide continue to reduce the concentrations of protein and essential minerals in most plant species.

**KF4:** Extreme Weather Limits Access to Safe Foods
Scope of the Climate and Health Assessment

“Climate and health impacts do not occur in isolation, and an individual or community could face multiple threats at the same time, at different stages in one’s life, or accumulating over the course of one’s life.”

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Examples of where climate change **exacerbates** existing health threats

Climate change is projected to increase the frequency and intensity of large wildfires, with associated health risks projected to increase in many regions:

- Exposure to smoke (carbon monoxide, ozone, toxic chemicals, fine and coarse particulate matter)
  - Acute and exacerbated respiratory problems, such as shortness of breath, asthma, and COPD
- Risk of cardiovascular disease and premature death
- Low infant birth weight
- Motor vehicle deaths and injuries
- Burns and injuries to first responders
- Post-traumatic stress disorder (PTSD), depression, and general anxiety

Projected percentage increases in weeks with risk of very large fires by mid-century (2041-2070) compared to the recent past (1971-2000)
Climate change creates “unprecedented or unanticipated health problems or health threats in places where they have not previously occurred... Some of these health threats will occur over longer time periods, or at unprecedented times of the year; some people will be exposed to threats not previously experienced in their locations.”
Examples of where climate change creates **new** public health challenges

**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 CO$_2$ 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

![Ragweed Pollen Season Lengthens](image)
Examples of where climate change creates new public health challenges

**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

**Shifts in the timing of threats**

The onset of the Lyme disease season is projected to arrive a few days earlier by mid-century and approximately 1-2 weeks earlier by the end of the century
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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**

Low-income populations may be exposed to climate change threats because of socioeconomic factors. For example, people who cannot afford air conditioning are more likely to suffer from unsafe indoor air temperatures.

**SENSITIVITY**

Pregnant women are sensitive to health risks from extreme weather such as hurricanes and floods. These events can affect their mental health and the health of their unborn babies by contributing to low birthweight or preterm birth.

**ABILITY TO ADAPT**

Older adults may have limited ability to cope with extreme weather if, for example, they have difficulty accessing cooling centers or other support services during a heat wave. Heat-related deaths are most commonly reported among adults aged 65 and over.

Social determinants of health, such as those related to socioeconomic factors and health disparities, may amplify or otherwise influence climate-related health effects.
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.
Download page has report, chapters, citations, figures, PowerPoint presentations, and 2-pg summaries.

The PDF is the official version of the Climate and Health Assessment.

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Spanish translated Executive Summary also available.
Resources: health2016.globalchange.gov

Figure 7.1: Farm to Table: The Potential Interactions of Rising CO₂ and Climate Change on Food Safety and Nutrition

Icons let you download figures, view metadata, and share through social media.
EPA Resources

www.epa.gov/climatechange/impacts/
or search for: “EPA climate impacts health”
10-question online quiz with social media sharing options

Quiz: How Much Do You Know About the Health Impacts of Climate Change?

Understanding the threats that climate change pose to human health can help us work together to lower risks and be prepared. Take this quiz to see how much you know about the health impacts of climate change.

Which illness does NOT increase in frequency along with higher temperatures?

- A. Dehydration
- B. Arthritis
- C. Kidney stones
- D. Legionnaires' disease

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

https://www.epa.gov/climatechange/impacts/health-assessment-quiz.html
A clickable map with examples of state impacts and resources to prepare and respond to climate threats

Human Health Impacts

- Learn about the health impacts of climate change
- Quiz: How much do you know about the Health Impacts of Climate Change?
- Climate Change and Human Health Risks in Your State
- Factsheets: Climate Change, Health, and Populations of Concern
- How Will Climate Change Affect My Health? (PDF, 1 pp, 1 MB) [Text version](PDF, 2 pp, 551 KB)

https://www.epa.gov/climatechange/impacts/health-assessment.html
Eight factsheets covering issues related to populations especially vulnerable to the health impacts of climate change

1. Indigenous/tribal
2. Environmental justice (e.g., low income, minority, immigrants)
3. Occupational groups
4. Older adults/elderly
5. Children
6. Pregnant women
7. People with disabilities
8. People with pre-existing medical conditions

EPA Resources

https://www.epa.gov/climatechange/impacts/health/factsheets/
Graphic on how climate change can affect your health at different stages of your life

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