Webinars
Series of scientific webinars that provide a forum for discourse on scientific issues.
Live and On-Demand
Case Conferences
Journal Clubs
Grand Rounds
CE Available

Online Courses
Evidence-based online courses on a variety of children’s environmental health topics.
Interactive and Self-Paced
CE Available

Resource Catalog
Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals
Topics included: Air Quality, Pesticides, Natural Disasters, BPA, Mold, Lead, Mercury
Overview of the U.S. Climate & Health Assessment

Allison Crimmins & Lesley Jantarasami
U.S. Environmental Protection Agency
PEHSU– 07/26/2016
The presenters have no disclosures.

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- Slides 27-30: epa.gov/climatechange/impacts/health.html (graphics in public domain)
Learning Objectives

- Recognize the different pathways by which climate change can affect health outcomes
- Identify the populations that are most vulnerable to climate impacts on health and what characteristics contribute to their vulnerability
- Describe risks to pregnant women and children
- Know where to look for further resources
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.
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.
“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.”
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
• 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.
Examples of where climate change exacerbates existing health threats

People in flood-prone regions are expected to be at greater risk of exposure to flood hazards due to climate change

- Drowning
- Falls, cuts, puncture wounds, sprains, burns, hypothermia, animal bites, blunt trauma
- Gastrointestinal illness; skin, eye, ear, nose, and throat infections
- Preterm birth, low birth weight
- Post-traumatic stress disorder (PTSD), depression, and general anxiety

Composite map of floods associated with landfalling hurricanes over the past 31 years, based on stream gauge data
Examples of where climate change exacerbates existing health threats

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

- Exposure to
  - Acute and exacerbated respiratory problems
  - Risk of cardiovascular disease and premature death
  - Low infant birth weight
- 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)
Examples of where climate change creates new public health challenges

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.”

- Lyme & West Nile
- Water related toxins
- New vectorborne disease

Shifts in the **timing** of threats
- Pollen season
- Extreme heat

Shifts in the **location** of threats
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 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
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

Changes in Lyme Disease Case Report Distribution
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.
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

*Social determinants of health, such as those related to socioeconomic factors and health disparities, may amplify or otherwise influence climate-related health effects*
Pregnant Women

Pregnant women are at increased risk of:

- Respiratory illness from air pollution
- Dehydration and renal failure during extreme heat events
- Poor nutrition and diarrhea from contaminated water or food or an increase in exposure to toxins and mold after heavy rains and floods.
- Disruptions to medical care during or after extreme events, esp. ones that require evacuation
- Severe stress and other negative mental health outcomes
Prenatal and Pregnancy Outcomes

Climate change can worsen environmental hazards that threaten the health of pregnant women and increase health risks for the baby, such as low birth weight or pre-term birth.

Exposure to Extreme Weather Events
- Extreme heat has been associated with adverse birth outcomes such as low birth weight, preterm birth, and infant mortality, as well as congenital cataracts.
- Flood-related health outcomes include maternal risk of anemia, eclampsia, and spontaneous abortion.

Exposure to Air Pollution
- Inhalation of particulate matter has been associated with negative birth outcomes.
Children

Extreme Heat
- Children have a higher risk of becoming ill or dying due to extreme heat
- Observed effects include heat illness, fluid and electrolyte imbalances, and asthma exacerbations.
- Risk factors include time spent outdoors or in non-climate-controlled indoor settings like homes and schools

Mental Health
- Many children display emotional resilience, but exposure to extreme weather disasters has been linked to mental health impacts that, if left untreated, can extend into adulthood
- Observed effects include adverse impacts to children’s cognitive development, capacity to regulate emotions, and academic performance. Can result in diagnoses of PTSD and other psychiatric disorders (such as depression, anxiety, phobia, and panic).
- Risk factors include time spent in risk-prone locations, access to support networks and timely treatment
Degraded Air Quality

- Increased sensitivity due to lung development, airway size, physical activity, and body weight.

- Minority children bear a disproportionate asthma burden as measured by emergency department visits, lost school days, and overall poorer health status.

- Observed effects of children’s exposure to ground-level ozone and particulate matter include increases in asthma episodes and other adverse respiratory effects, decreases in lung maturation.

- Exposure to aeroallergens/pollen affects asthma and other allergic respiratory diseases

- Risk factors include proximity to already polluted areas or areas affected by wildfires; time spent outdoors; time spent indoors and status of indoor air quality of children’s homes, childcare centers, and schools.
Children

**Water-Related Illness**
- Children are more likely than adults to develop serious diarrheal illness from contaminated water.
- Observed association between heavy rainfall and increased acute gastrointestinal illness in children.
- Children comprised 40% of *Vibrio alginolyticus* infections (1997–2006) and 66% (ages 1–19) of those seeking treatment for illness associated with harmful algal bloom toxins (2009–2010).
- Risk factors include higher recreational exposure due to children swallowing twice as much water as adults while swimming; power outages or displacement after extreme weather event(s)

**Food Safety and Security**
- Children more susceptible to severe infection or complications from E. coli infections, such as hemolytic uremic syndrome.
- Extreme weather can threaten availability and access to safe and nutritious food, esp. for the nearly 16% of households with children in U.S. that are food-insecure.
- Risk factors include economic status, geographic location/vulnerability to extreme weather, power outages.

**Vector-borne Disease**
- Certain vector-borne diseases disproportionately affect children such as La Crosse encephalitis and Lyme disease.
- Risk factors include location and duration of time spent outdoors.
Children’s Vulnerabilities Can Vary by Life Stage

Vector and Water-borne Disease
- Lyme disease is most frequently reported among male children aged 5 to 9 years, and a disproportionate increasing trend was observed in all children from 1992 to 2006.
- Rates of diarrheal illness higher in children under age five in the U.S.

Heat-Related Illness
- Children under age four experience higher hospital admissions for respiratory illnesses during heat waves.
- High school athletes are particularly at risk for heat illnesses. About 9,000 children are treated for heat illness (such as heat stroke and muscle cramps) related to athletic activity each year.
- Between 1997 and 2006, emergency department visits for all heat-related illness increased 133% and youth made up almost 50% of those cases.
- From 2000 through 2013, the number of deaths due to heat stroke doubled among U.S. high school and college football players.
Resources: health2016.globalchange.gov

Quick links to downloads and chapters
The PDF is the official version of the Climate and Health Assessment.

### File Sizes

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Spanish translated Executive Summary also available.

Download page has report, chapters, citations, figures, PowerPoint presentations, and 2-pg summaries.
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

Submit

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

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-quiz.html
A clickable map with examples of state impacts and resources to prepare and respond to climate threats

EPA Resources

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

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

[Image of a graphic showing how climate change affects health at different life stages]

**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)]

THANK YOU!

Allison Crimmins
crimmins.allison@epa.gov

Lesley Jantarasami
jantarasami.lesley@epa.gov

USGCRP resources: health2016.globalchange.gov
EPA resources: www.epa.gov/climatechange/impacts/health.html
Maternal and child health vulnerability to climate change: clinical considerations

John Balbus, MD, MPH
National Institute of Environmental Health Sciences
PEHSU Webinar- July 26, 2016
Thank you to Drs. Samantha Ahdoot, Aparna Bole, Allison Crimmins, and Perry Sheffield for feedback on this presentation.

This article is the work product of an employee of the National Institutes of Health (NIH), however, the statements, opinions or conclusions contained therein do not necessarily represent the statements, opinions or conclusions of the NIH, its component Institutes and Centers, or the United States government. The author declares he has no actual or potential competing financial interests.
Learning Objectives

- Identify clinical conditions that increase vulnerability
- Identify medications that increase vulnerability
- Describe clinical and other interventions to protect children and pregnant women
Heat and other extreme weather conditions
Air quality, including allergens
Water and food borne infectious agents
Water and food borne toxins
Vector borne and zoonotic diseases
Altered nutritional quality of food crops
Mental health stressors
Intersection of Social Determinants of Health and vulnerability

![Diagram showing the intersection of social determinants and health outcomes.]

USGCRP Climate and Health Assessment, 2016
Roles of pediatricians

- Diagnosis and treatment
- Medical decision maker
- Patient advocate
- Anticipatory guidance
- Community advisor
- Practice manager
Clinical Aspects of Heat and Air pollution

- Consider medication adjustments during heat waves; anticipate earlier and longer allergy seasons
- Limit athletic activities on hot, high air pollution days; need to add allergy medications in asthmatic pts
- Consider special heat accommodations for learning disabled patients
- 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
Medications that Increase Heat Risk

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
Clinical Aspects of Food, Water, Vector-borne Disease Risks

- Be alert to shifting timing, locations of diseases
- Inform parents about food safety issues; avoid exposures to ponds and lakes with algal blooms; mosquito/tick precautions in risk areas
- Caution organizations and citizens about outdoor food presentation during heat waves; support vector control measures; where relevant, advise on nutritional content
Clinical Aspects of Mental Health Impacts

- Be alert for anxiety, depression, PTSD after extreme events; be alert to reactions to media and other exposures
- Consider medication adjustments or cautions for patients on TCAs, anti-psychotic, or other medications that alter heat risk
- Alert parents to potential impacts of media exposures; provide balanced messages
- Inform citizens and communities about impacts of CC related psychological stressors on children and parents
Climate Change Mitigation and Pediatric Health Care

Inform yourself and patients about connections between greenhouse gas reduction measures and health: improved air quality; active transportation; plant-based diets

Serve as community information resource

“Green” your practice: efficiency and waste reduction; food purchasing; renewables; active transportation

And look for new chapter in next AAP “Green” Book!!

http://www.mygreendoctor.org/
https://practicegreenhealth.org/
Federal Resources on CC and Health

- Climate Change and Children’s Health Policy Roundup
  - [http://www.hhs.gov/climate/childrenshealth](http://www.hhs.gov/climate/childrenshealth)
- WH Climate Resilience Tool Kit
  - [https://toolkit.climate.gov/topics/human-health](https://toolkit.climate.gov/topics/human-health)
- WH Climate Data Initiative
- CDC’s BRACE framework and guidance documents
  - [http://www.cdc.gov/climateandhealth/default.htm](http://www.cdc.gov/climateandhealth/default.htm)
- 3rd National Climate Assessment
- USGCRP Climate Health Assessment
- EPA Climate Change Health Impacts
  - [https://www3.epa.gov/climatechange/impacts/health.html](https://www3.epa.gov/climatechange/impacts/health.html)
Conclusions

- The US GCRP Climate Health Assessment has expanded and better supported the range of linkages between climate change and maternal/children’s health.
- Pediatricians have multiple roles to play; clinical practice is already needed to account for changes.
- Federal agencies are working to provide practical and useful information.
THANK YOU!

John M. Balbus, M.D., M.P.H
Senior Advisor for Public Health
National Institute of Environmental Health Sciences
John.balbus@nih.gov