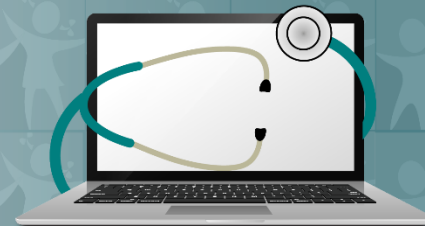




PEHSU NATIONAL CLASSROOM

Pediatric Environmental Health Specialty Units



www.pehsu.net/nationalclassroom.html



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)

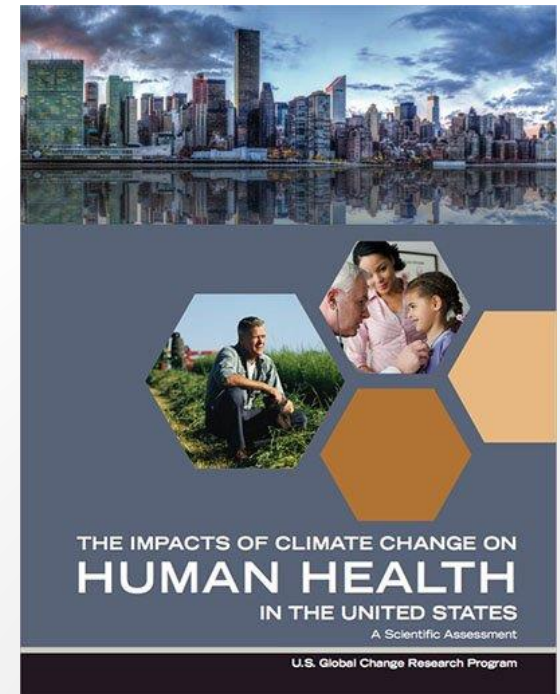
Learning Objectives

- 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

Process and People

What was the process for development?

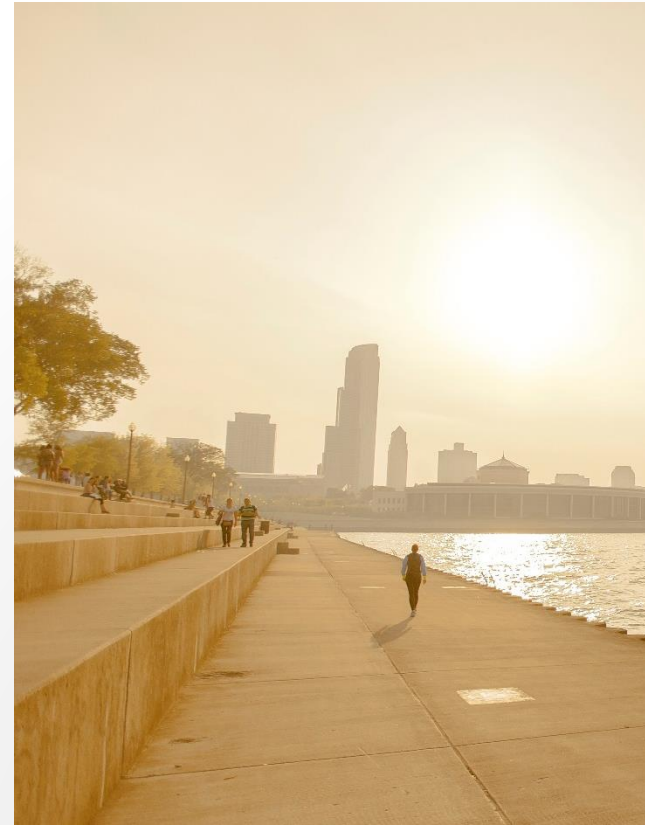
- Driven by the USGCRP Interagency Crosscutting Group on Climate Change and Human Health (CCHHG)
- Coordinated by the EPA
- Written by a team of ~100 Federal employees, contractors, and grantees from eight U.S. Federal agencies: HHS (NIH, CDC, NIOSH, ASPR, FDA, SAMHSA), NOAA, EPA, USDA, NASA, USGS, DOD (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




Health2016.globalchange.gov

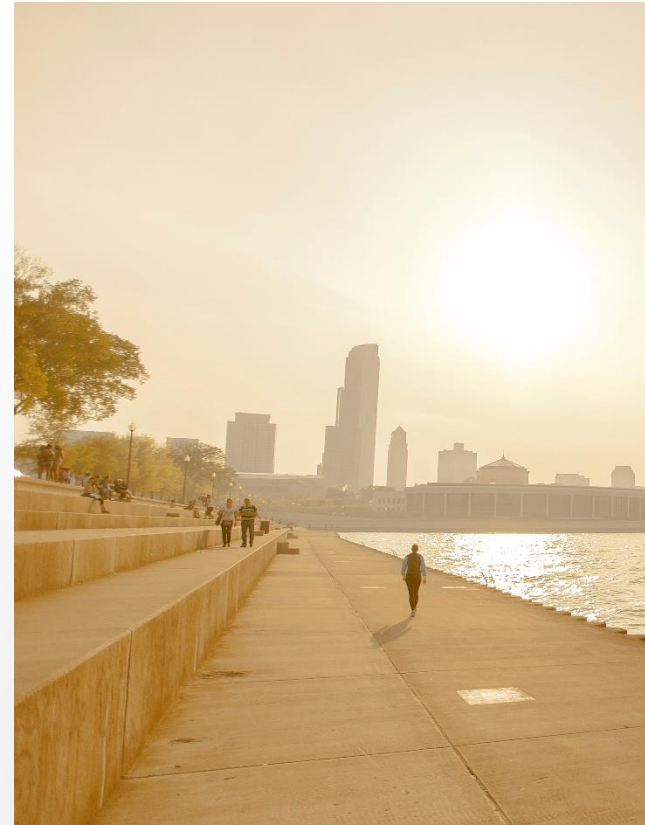
Top Line Messages of the Report

- 
- 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



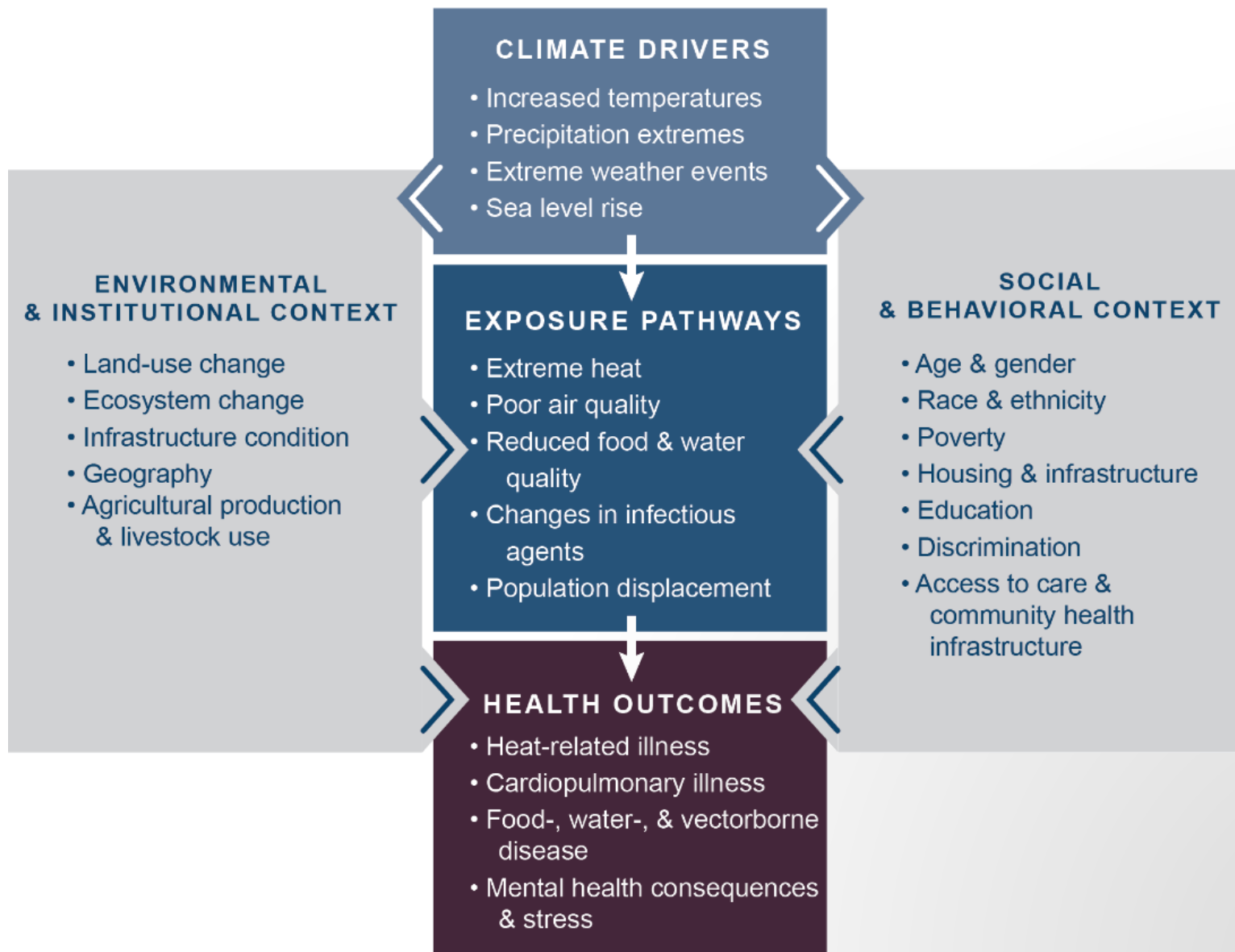
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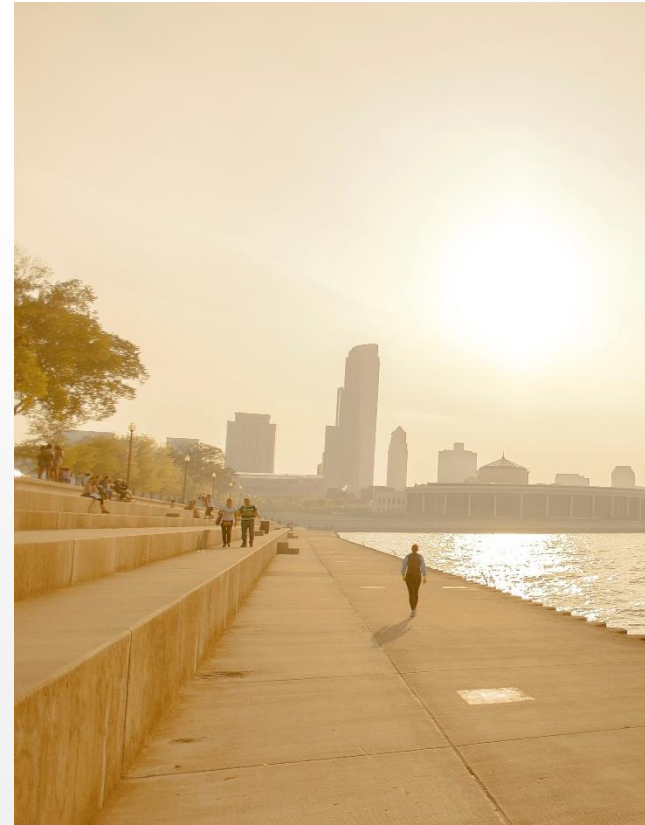
“Climate and health impacts do not occur in isolation, and an individual or community could face multiple threats at the same time, at different stages in one’s life, or accumulating over the course of one’s life.”

Climate and Health Exposure Pathways



Top Line Messages of the Report

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 - **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.

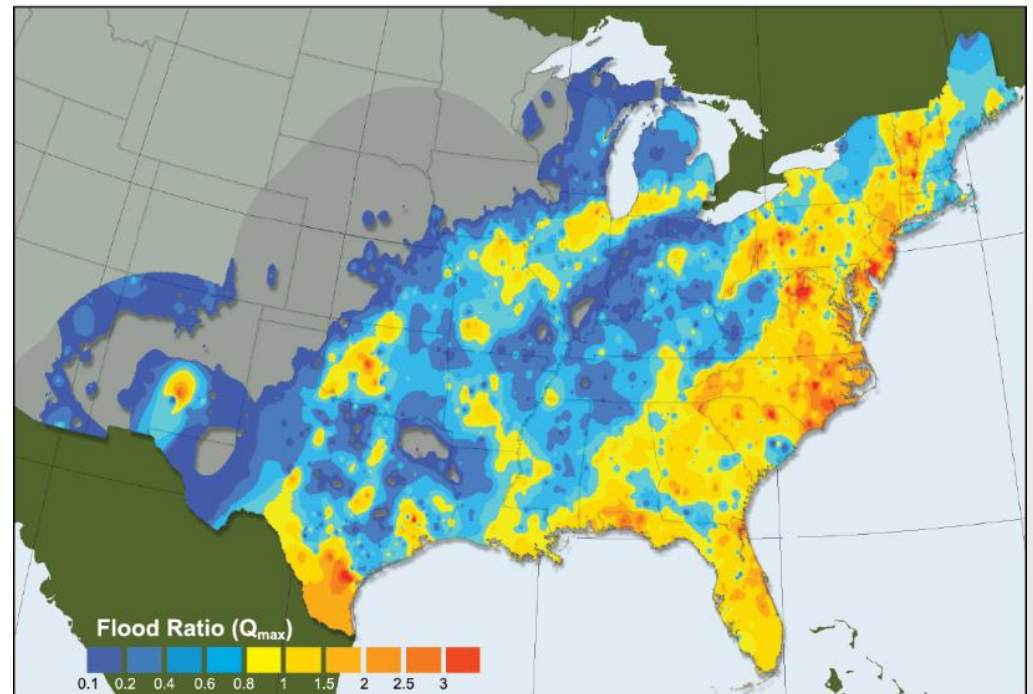


Examples of where climate change exacerbates existing health threats

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

Hurricane-Induced Flood Effects in Eastern and Central United States



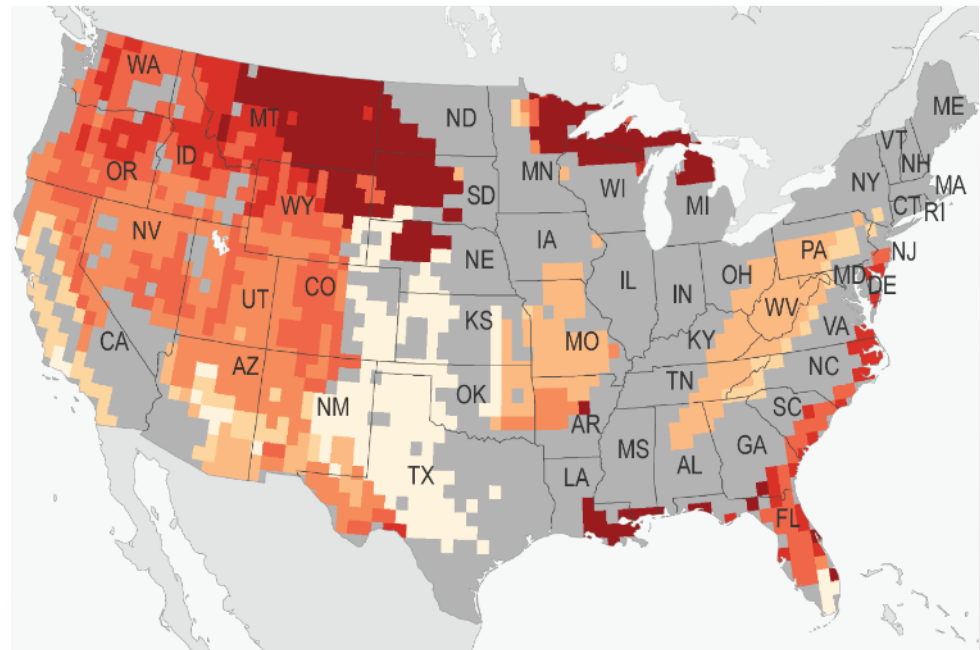
Composite map of floods associated with landfalling hurricanes over the past 31 years, based on stream gauge data

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 Increase in Risk of Very Large Fires by Mid-Century



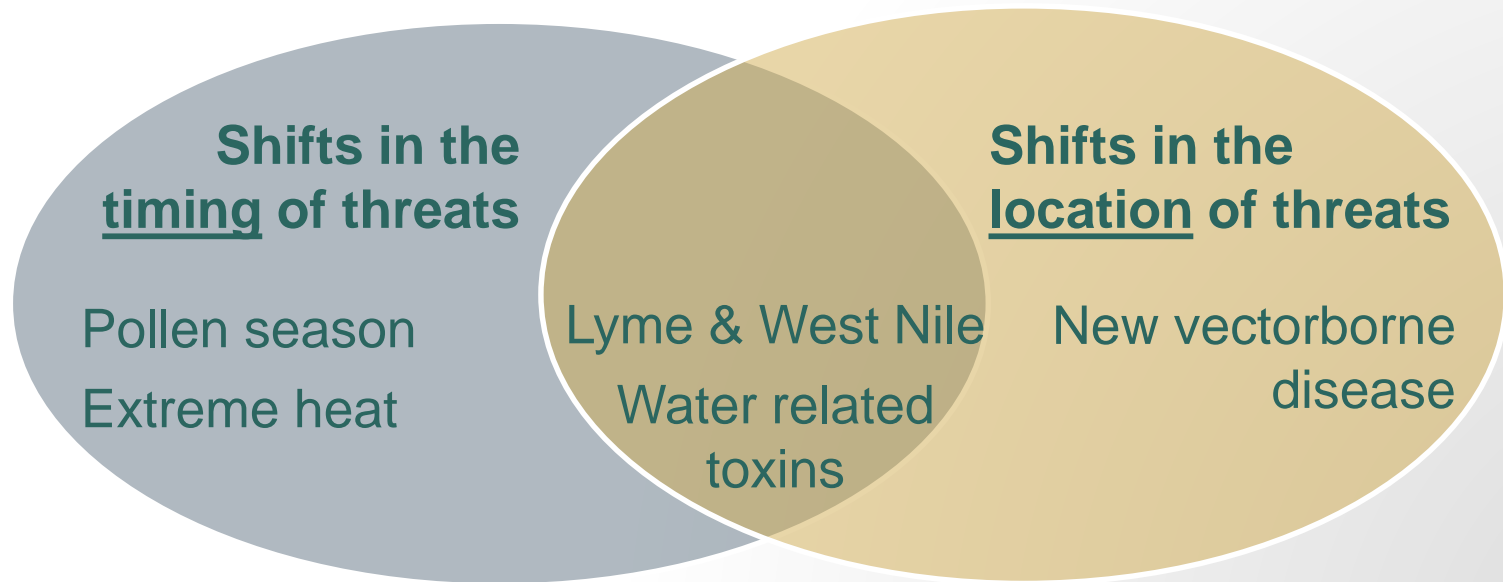
Increase in Weeks with Risk of Very Large Fires (%)



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.”



Examples of where climate change creates new public health challenges

Shifts in the timing of threats

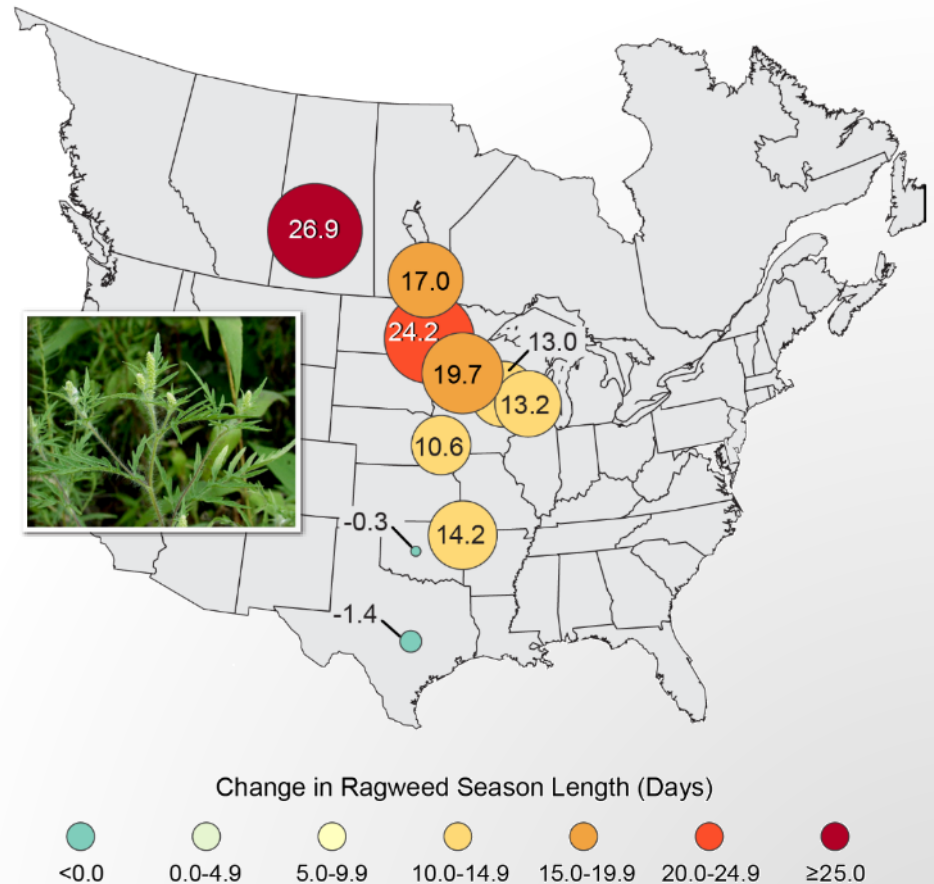
Between 1995 and 2011, the duration of the ragweed pollen season length has increased by as much as 11 to 27 days

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

Ragweed Pollen Season Lengthens



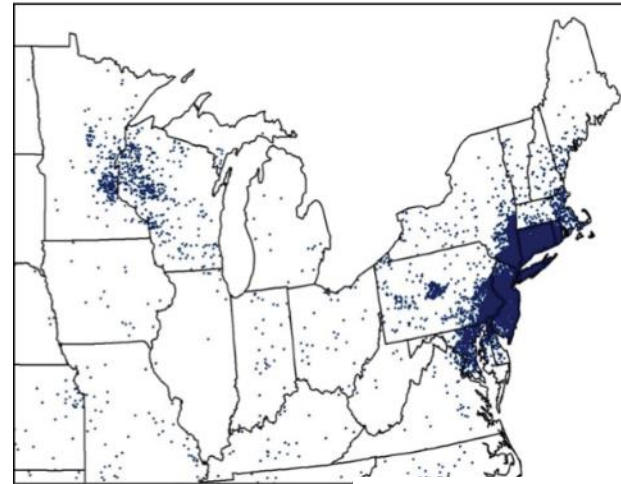
Examples of where climate change creates new public health challenges

Shifts in the location of threats

Weather-related variables can determine geographic distributions of ticks

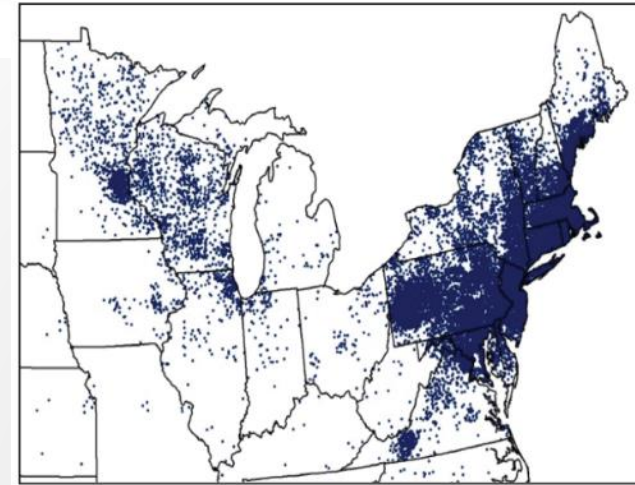
Low minimum temperatures can limit tick population survival

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




2001

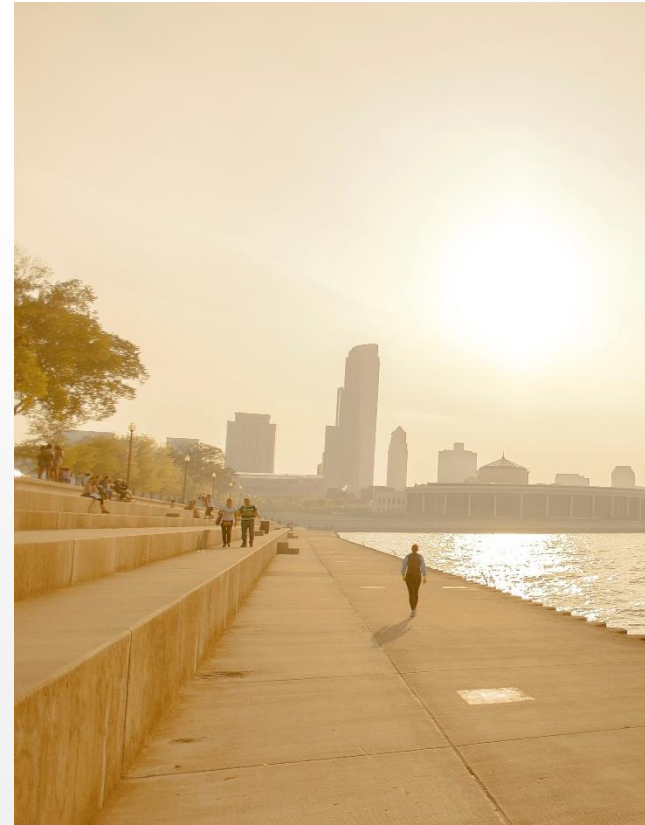
Changes in Lyme Disease Case Report Distribution



2014

Top Line Messages of the Report

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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: 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

Children

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

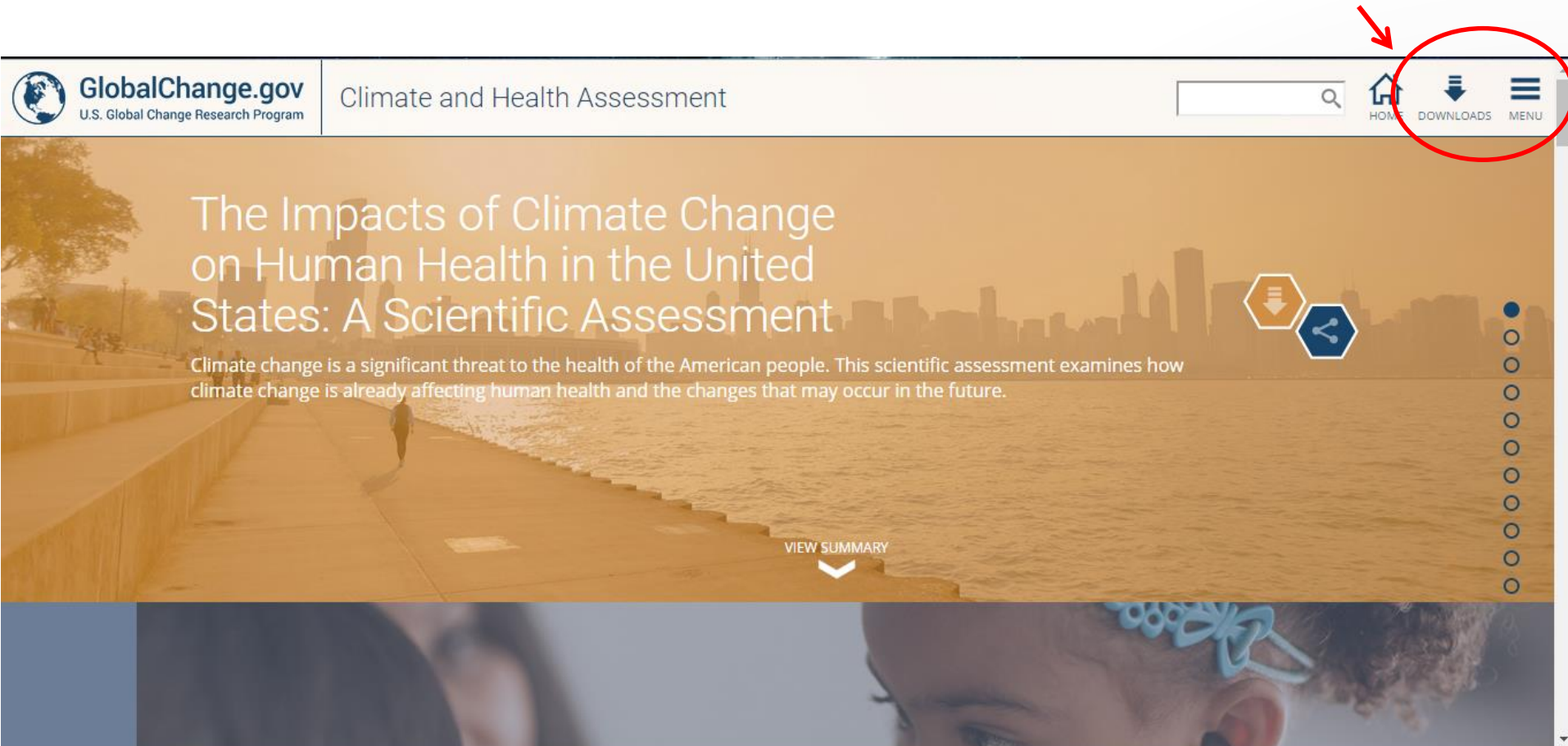
- Lyme disease is most frequently reported among male children aged 5 to 9 years, and a disproportionate increasing trend was observed in all children from 1992 to 2006.
- Rates of diarrheal illness higher in children under age five in the U.S.

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



GlobalChange.gov
U.S. Global Change Research Program

Climate and Health Assessment

HOME DOWNLOADS MENU

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.

[VIEW SUMMARY](#)

Resources: health2016.globalchange.gov

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

10MB25MB

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

ScreenPrintCitationFiguresPresentationBrochure

| | | | | | | |
|--|------|------|------|-------|-----|-------|
| Climate and Health Assessment | 39MB | 98MB | 738B | - | - | - |
| Front Matter | 3MB | 7MB | - | - | - | - |
| Executive Summary | 9MB | 9MB | 682B | 2MB | 4MB | - |
| Ch. 1. Climate Change and Human Health | 3MB | 7MB | 546B | 1MB | 3MB | 600KB |
| Ch. 2. Temperature-Related Death and Illness | 2MB | 4MB | 572B | 614KB | 2MB | 2MB |

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/

Climate Change En Español [Contact Us](#) [Share](#)

You are here: [EPA Home](#) » [Climate Change](#) » [Impacts](#)


Climate Change Impacts



The changing climate impacts society and ecosystems in a broad variety of ways. For example climate change can increase or decrease rainfall, influence agricultural crop yields, affect human health, cause changes to forests and other ecosystems, or even impact our energy supply. Climate-related impacts are occurring across regions of the country and across many sectors of our economy.


Explore the impacts of climate change by region or by sector.

Impacts by Region




[Alaska](#) | [Islands](#) | [Northeast](#) | [Northwest](#) | [Southeast](#) | [Southwest](#) | [Midwest](#) | [Great Plains](#) | [International](#)

Impacts by Sector



[Agriculture](#) | [Coasts](#)
[Ecosystems](#) | [Energy](#)
[Forests](#) | [Society](#)
[Transportation](#) | [Water Resources](#)

Related Links



[Preparing for Change - Adaptation Resources](#) | [National Climate Assessment](#) | [USCRP Climate and Health 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?

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))

or search for: “EPA climate impacts health”

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))

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.

4

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

4/10

Human Health Impacts

[Learn about the health impacts of climate change](#)

[Quiz: How much do you know about the Health Impacts of Climate Change?](#)

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[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>

EPA Resources

A **clickable map** with examples of state impacts and resources to prepare and respond to climate threats

The screenshot shows the EPA website's "Climate Change" section. The main heading is "Climate Change and Human Health Risks in Your State". Below this, there is a paragraph explaining that climate change poses risks to human health and a map of the United States. The state of Indiana is highlighted in green on the map. To the left of the map is a "SELECT A STATE" dropdown menu. The left sidebar contains a navigation menu with links to "Climate Change Home", "Basic Information", "Government: Gas Emissions", "Science", "Impacts", "Adaptation", and "What EPA is Doing". The "Impacts" section is expanded, showing a list of links for various regions and topics, including "Alaska", "U.S. Islands", "Southwest", "Southeast", "Northeast", "Northwest", "Midwest", "Great Plains", "International", "Human Health", "Ecosystems", "Forests", "Transportation", "Energy", "Coasts", "Agriculture and Food", "Society", "Water Resources", "Adaptation", "What EPA is Doing", "What You Can Do", "Newsroom", "Glossary", and "Students' Site".

Human Health Impacts

[Learn about the health impacts of climate change](#)

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[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

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

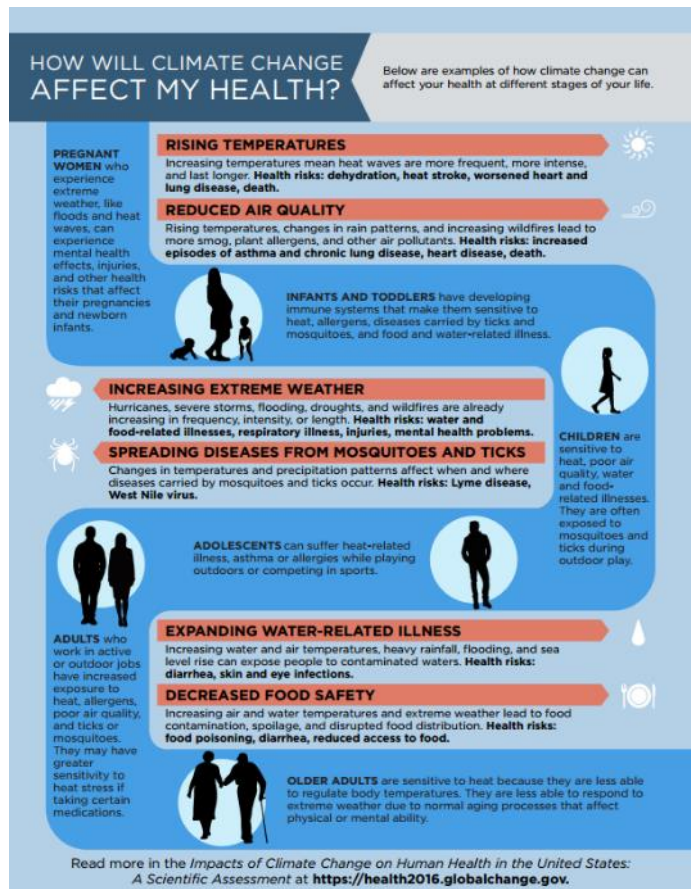
Factsheets: Climate Change, Health, and Populations of Concern

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/factsheets/>

EPA Resources

Graphic on how climate change can affect your health at different stages of your life



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

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<https://www.epa.gov/climatechange/impacts/health/factsheets/climate-health-life-stages.pdf>

THANK YOU!

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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

Photo Credits:

Slide 7: Powerpoint clip art

Slide 8: Photo source: <http://www.timesunion.com/sports/article/Photos-Practices-begin-for-2012-high-school-3786732.php>

Slide 9: Powerpoint clip art

Slide 10: Food- Powerpoint clip art

Mosquito: <http://blogs.cdc.gov/cdcdirector/files/2016/04/zika-mosquito-800x575px.jpg>

Slide 11: <http://www.lsc.gov/lsc-updates-may-6-2011>

Slide 12: Powerpoint clip art

Slide 15: Photo source: <http://www.niehs.nih.gov/news/newsroom/photos/index.cfm>

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.

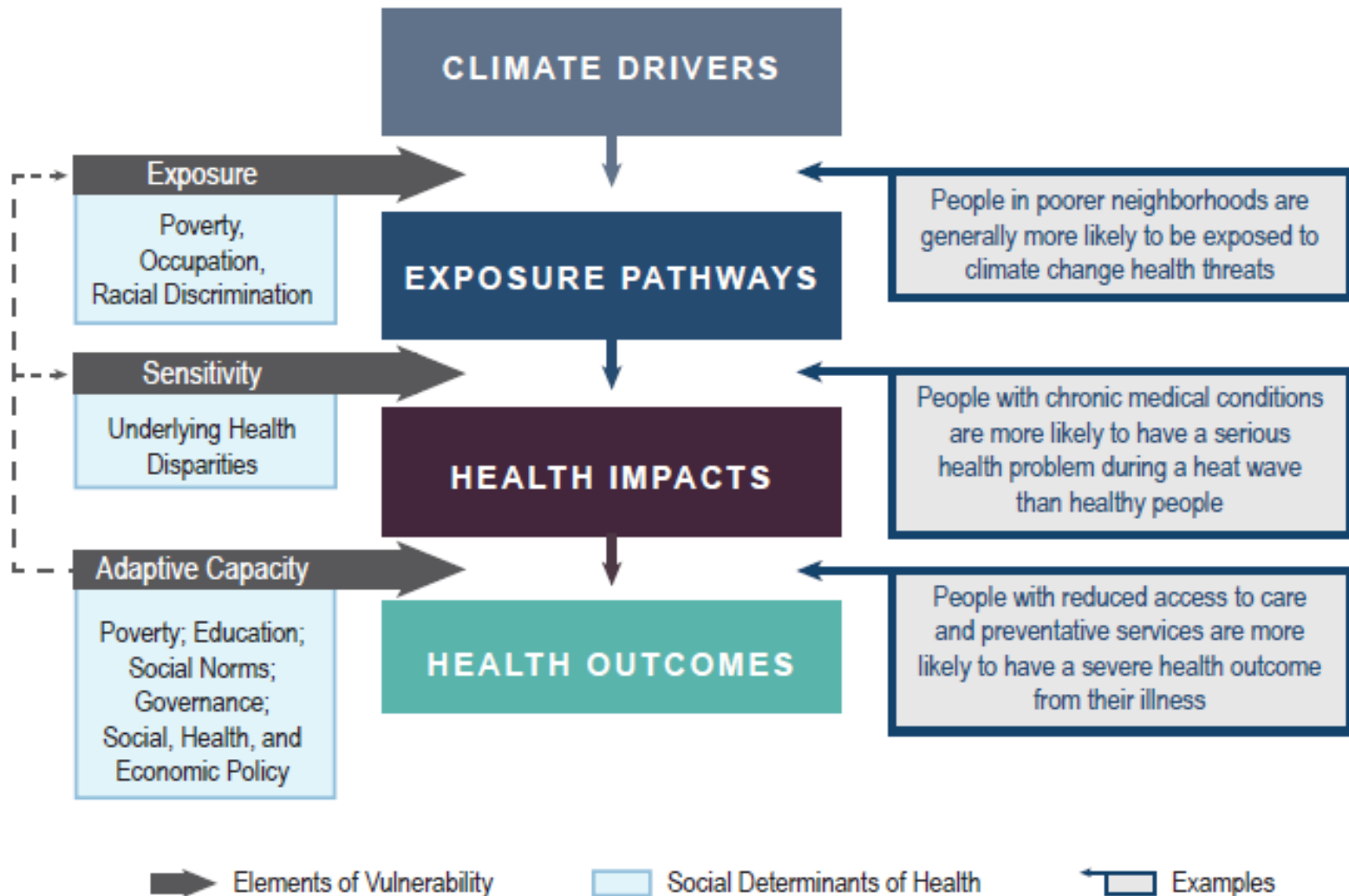
Learning Objectives

- Identify clinical conditions that increase vulnerability
- Identify medications that increase vulnerability
- Describe clinical and other interventions to protect children and pregnant women

Climate change related health hazards for 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



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



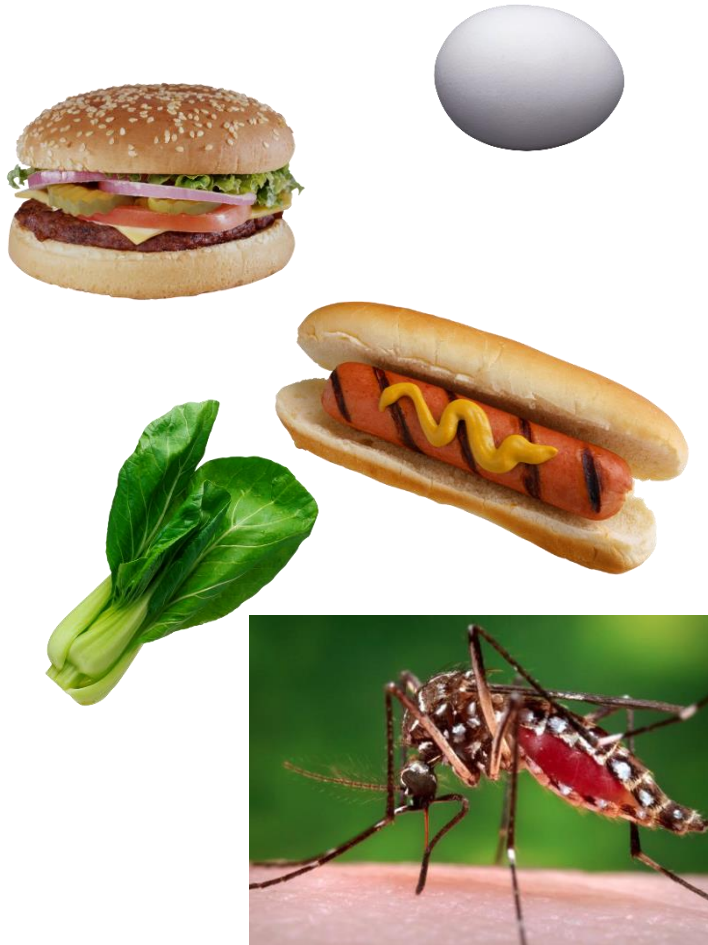
Medications that increase heat risk

- 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

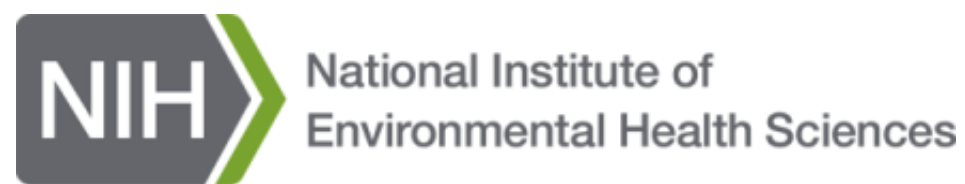
- Climate Change and Children's Health Policy Roundup
 - <http://www.hhs.gov/climate/childrenshealth>
- WH Climate Resilience Tool Kit
 - <https://toolkit.climate.gov/topics/human-health>
- WH Climate Data Initiative
 - <http://www.data.gov/climate/humanhealth/>
- CDC's BRACE framework and guidance documents
 - <http://www.cdc.gov/climateandhealth/default.htm>
- 3rd National Climate Assessment
 - <http://nca2014.globalchange.gov/report/sectors/human-health>
- USGCRP Climate Health Assessment
 - <https://health2016.globalchange.gov/>
- EPA Climate Change Health Impacts
 - <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!

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National Toxicology Program
U.S. Department of Health and Human Services

