Climate variability and change and health

Kristie L. Ebi, Ph.D., MPH

2019 US CLIMAR Summit
7 August 2019
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
- Environmental Degradation
- Increasing Allergens
- Severe Weather
- Water and Food Supply Impacts
- Increasing CO2 Levels
- Water Quality Impacts
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms

Slide courtesy of Dr. George Luber, CDC
Climate change affects the health of all Americans

The health and well-being of Americans are already affected by climate change, with the adverse health consequences projected to worsen with additional climate change.
Exposure and resilience vary across populations and communities.
BRACE
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
Cases of reported *Vibrio* infections

Vezzulli et al. 2016
Vibrio cases in the Baltic Sea

Baker-Austin et al. 2016
Daily sea surface temperature anomalies

Center time of the day: 2014-08-09 00:00:00

NOAA CoastWatch/AOML, ECDC, CEFAS, University of Bath and University of Santiago de Compostela

Data Min = -3, Max = 12
2014

• Hottest year in Sweden since observations began in 1860, with a mean annual temperature 0.18°C higher than the preceding record in 1934
• Second warmest year on record in Finland and 1.6°C warmer than the long-term average for the period 1981–2010
• In July and August, the SST in the northern part of the Baltic exceeded historic records; in some areas the SST exceeded the long-term average by approximately 10°C
Vibrio cases 2014

• Across the Baltic Sea, 89 cases of Vibrio infections were recorded in Sweden and Finland alone.
  – Cases were also detected in the north of Scandinavia in the subarctic region that was affected by the 2014 heatwave

• Maximum SST explained a significant amount of the variance

• SST anomalies correlated with the spatial and temporal distribution of Vibrio cases

Ebi et al. 2017
“Pull out, Betty! Pull out! ... You’ve hit an artery!”
Biophysical influences on dengue ecology showing the interactions between climate variables, vectors, and the virus

Morin et al. 2013
Map shows the range of the *Aedes aegypti* mosquito for present-day (1950-2000) and future (2061-2080; RCP8.5) conditions. Larger cities have higher potential for travel-related virus introduction and local virus transmission. Adapted from: Monaghan et al. (2016)
Mosquito species capable of carrying Zika virus found in Ontario

23 Aug 2017
Risks maps for autochthonous Chikungunya virus transmission in Canada

Ng et al. 2017
How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed, and human systems.

Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high
How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed, and human systems.

Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high.
Adaptation reduces risks and improves health

Proactive adaptation policies and programs reduce the risks and impacts from climate-sensitive health outcomes and from disruptions in healthcare services. Additional benefits to health arise from explicitly accounting for climate change risks in infrastructure planning and urban design.

NCA4: Human Health