Climate variability and change and health

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Impact of Climate Change on Human Health

Injuries, fatalities, mental health impacts

Asthma, cardiovascular disease

Heat-related illness and death, cardiovascular failure

Severe Weather

Air **Pollution**

> Changes in Vector **Ecology**

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

Forced migration, civil conflict, mental health impacts

Environmental Degradation

Extreme

Heat

Increasing Allergens

Respiratory allergies, asthma

Water and Food Supply Impacts

Water **Quality Impacts**

Malnutrition, diarrheal disease

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.

CLIMATE DRIVERS

Climate Change and Health

- 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

HEALTH OUTCOMES

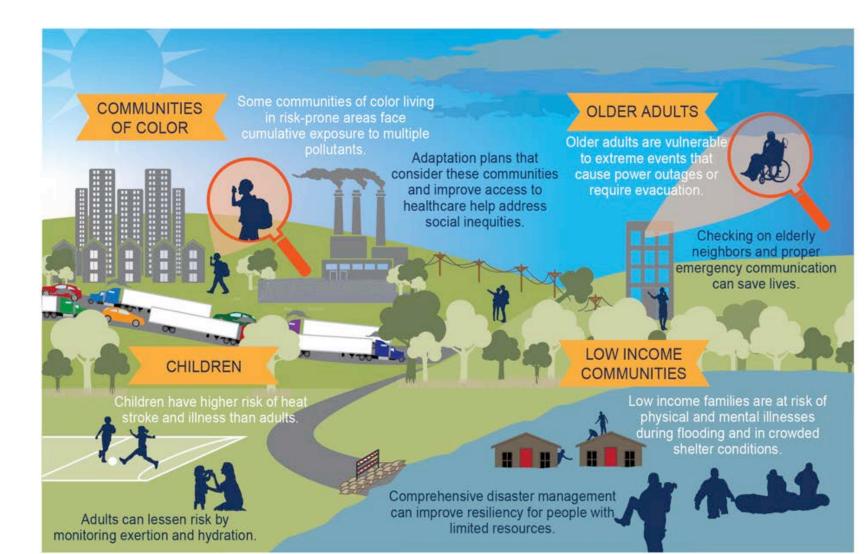
- Heat-related illness
- Cardiopulmonary illness
- Food-, water-, & vector-borne disease
- Mental health consequences
 & stress

SOCIAL & BEHAVIORAL CONTEXT

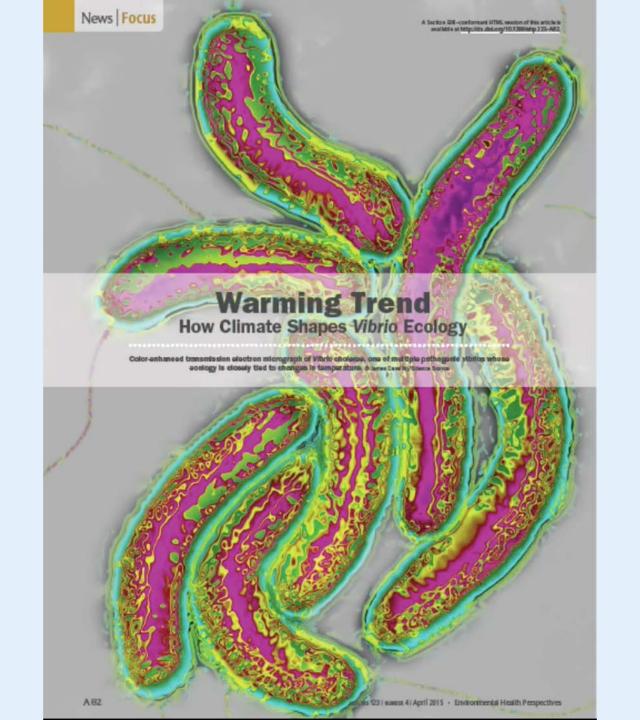
- Age & gender
- Race & ethnicity
- Poverty
- Housing & infrastructure
- Education
- Discrimination
- Access to care & community health infrastructure
- Preexisting health conditions

NCA4: Human Health

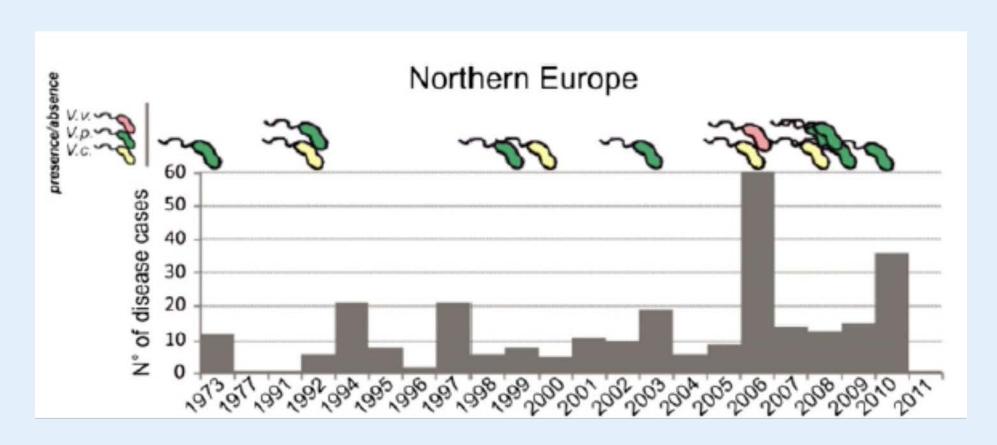
Exposure and resilience vary across populations and communities

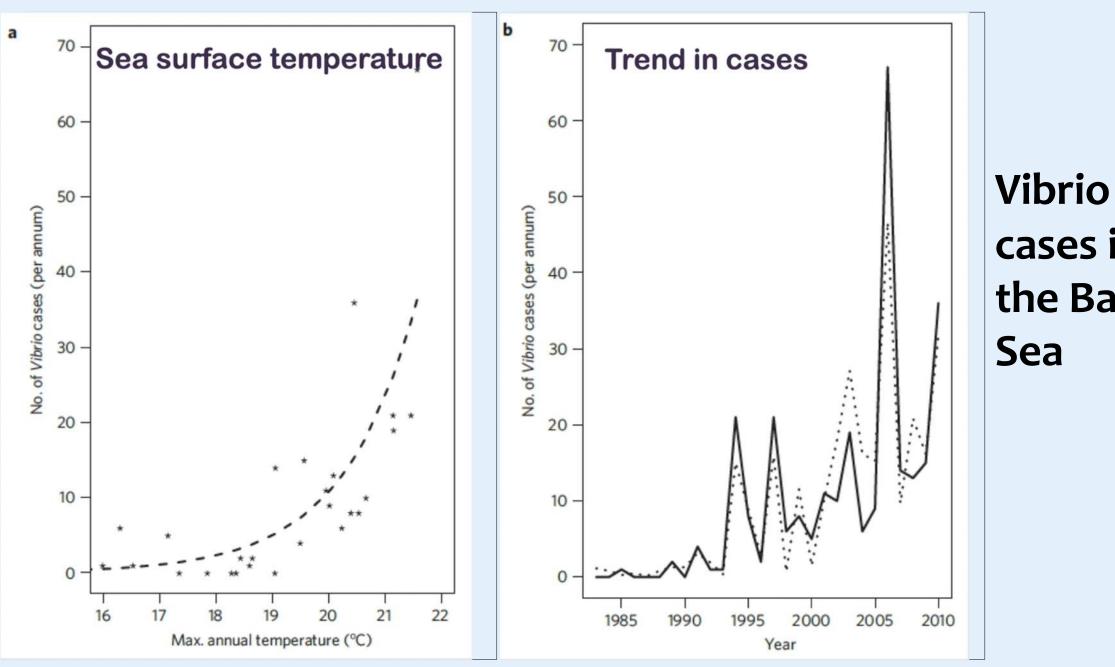






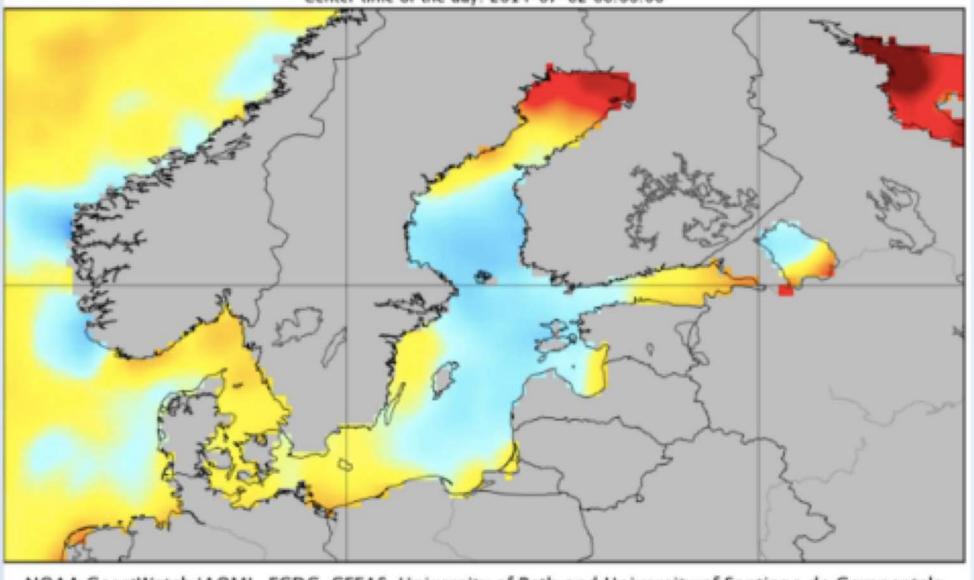
Cases of reported Vibrio infections





cases in the Baltic Sea

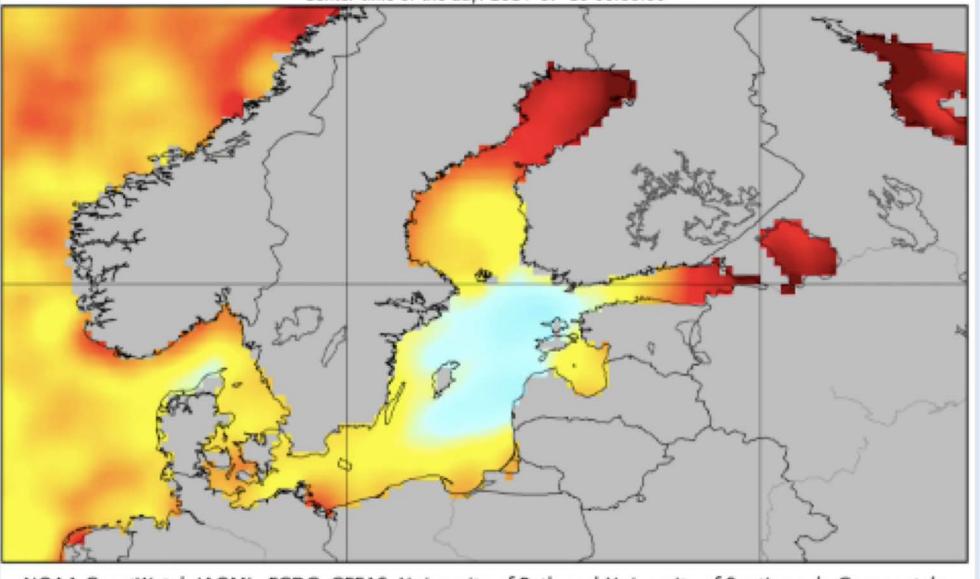
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NOAA CoastWatch/AOML, ECDC, CEFAS, University of Bath and University of Santiago de Compostela

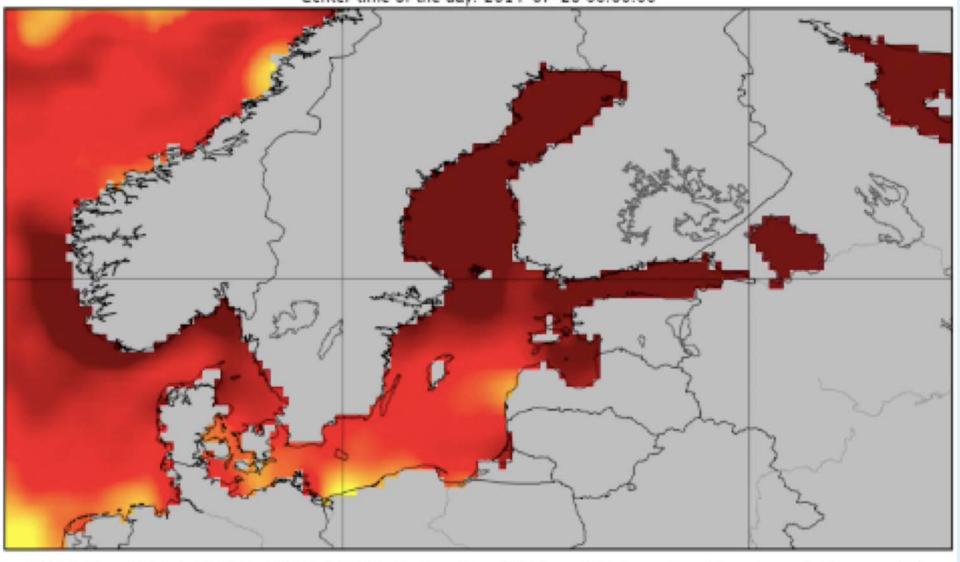
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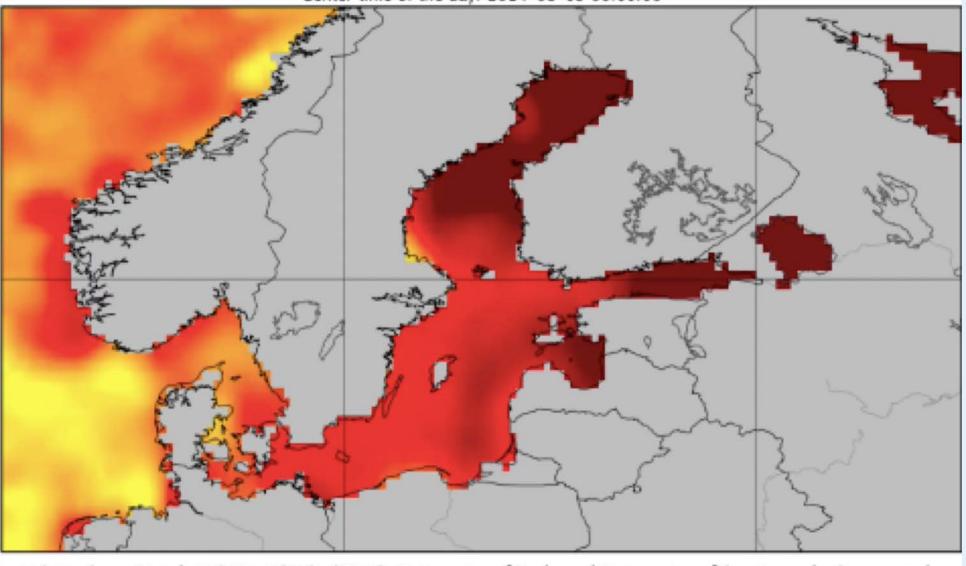
NOAA CoastWatch/AOML, ECDC, CEFAS, University of Bath and University of Santiago de Compostela

Center time of the day: 2014-07-26 00:00:00



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

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



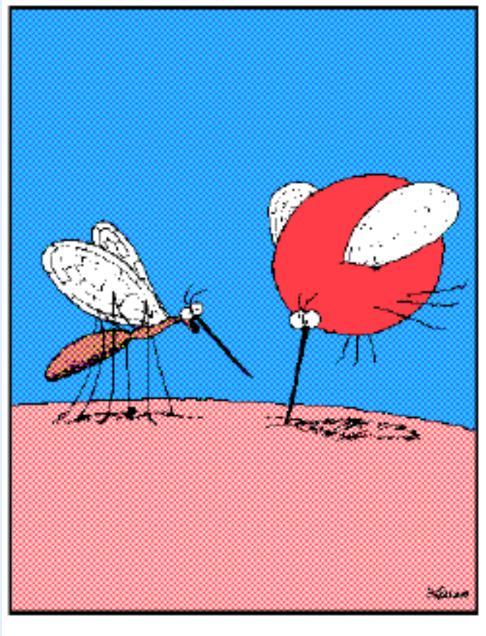
NOAA CoastWatch/AOML, ECDC, CEFAS, University of Bath and University of Santiago de Compostela

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

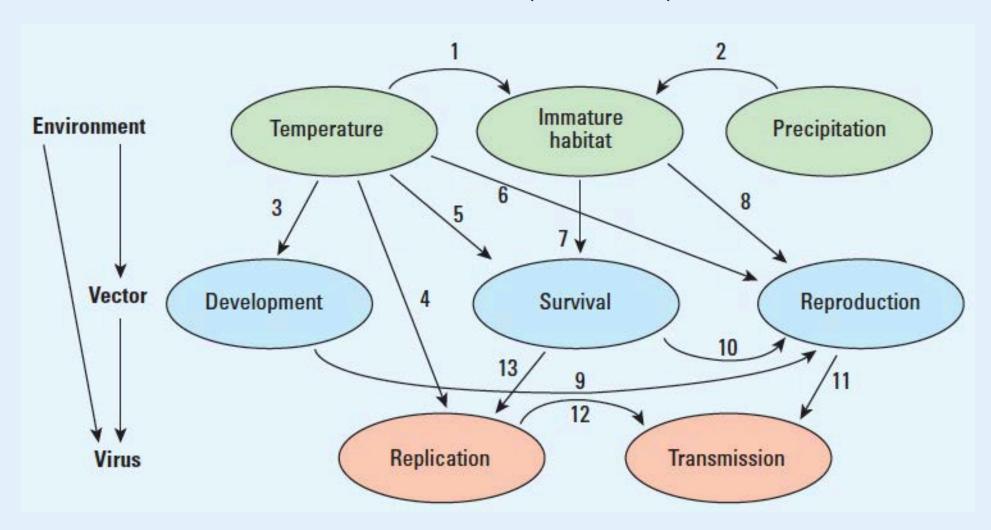
Vibrio cases 2014

- 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

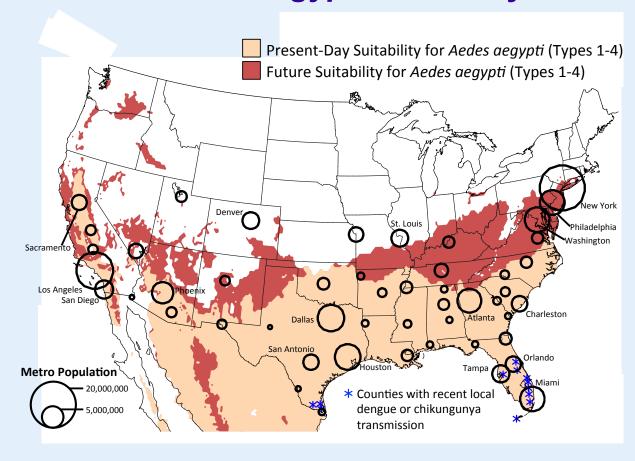


"Pull out, Betty! Pull out! ...
You've hit an artery!"

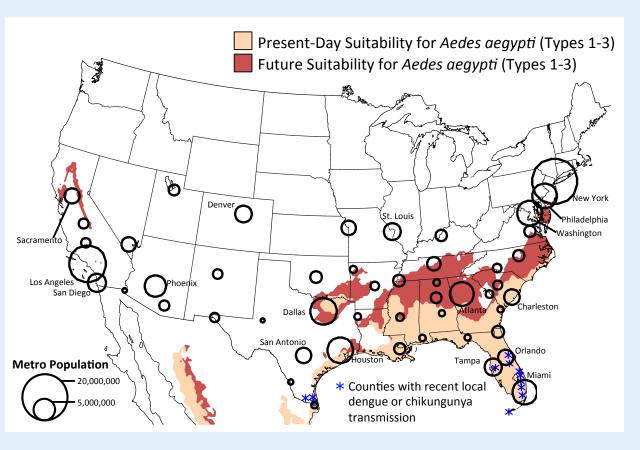
Biophysical influences on dengue ecology showing the interactions between climate variables, vectors, and the virus



Ae. aegypti suitability



Ae. aegypti transmission suitability

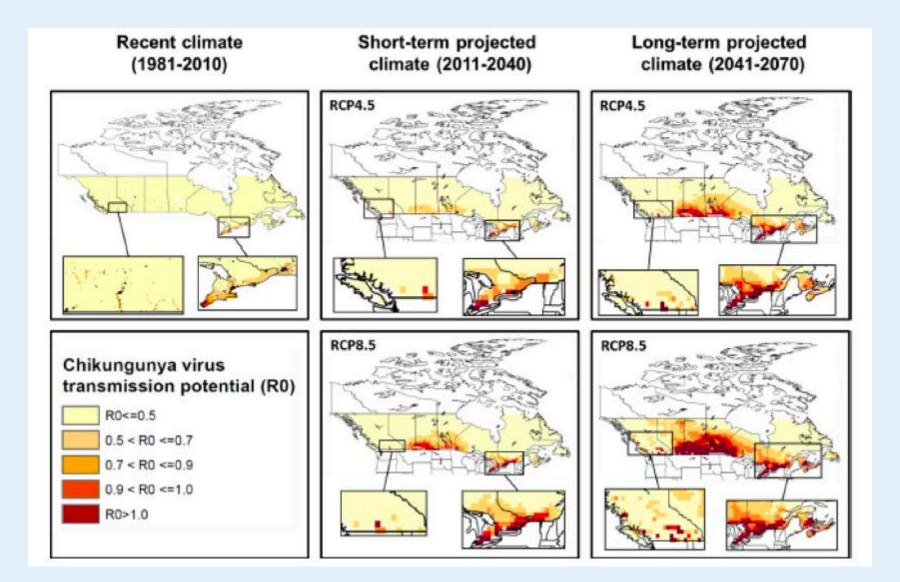


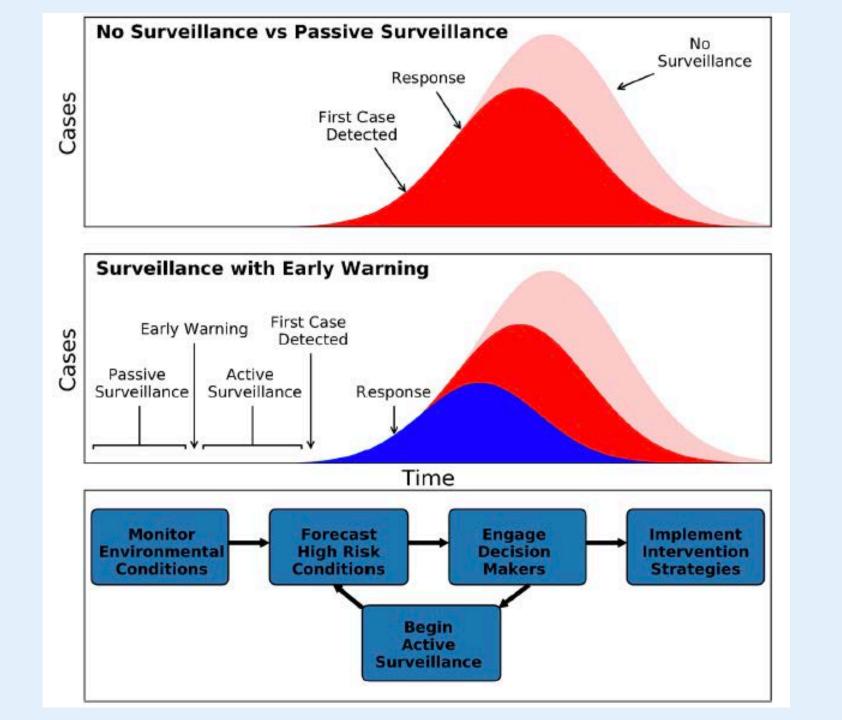
Map shows the range of the *Aedes aegypti* mosquito for present-day (1950-2000) and future (2061-2080; RCP8.5) conditions. Larger cities have higher potential for travel-related virus introduction and local virus transmission. Adapted from: Monaghan et al. (2016)

Mosquito species capable of carrying Zika virus found in Ontario 23 Aug 2017



Risks maps for autochthonous Chikungunya virus transmission in Canada

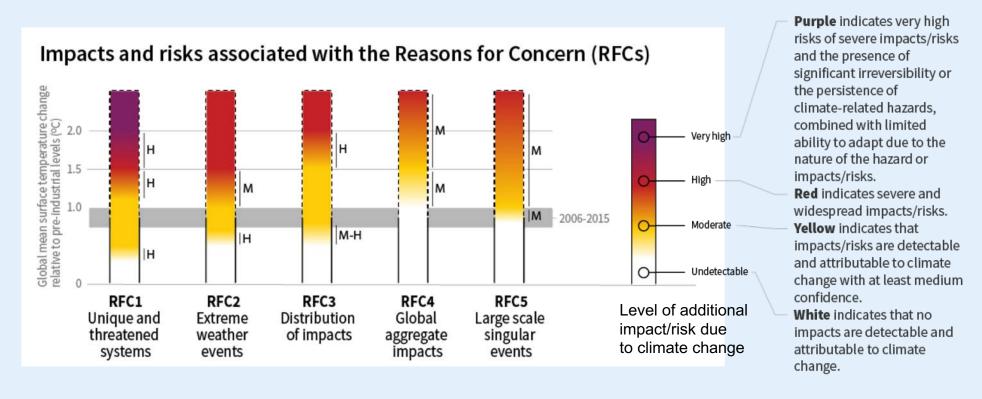




Morin et al. 2018

SPM2

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

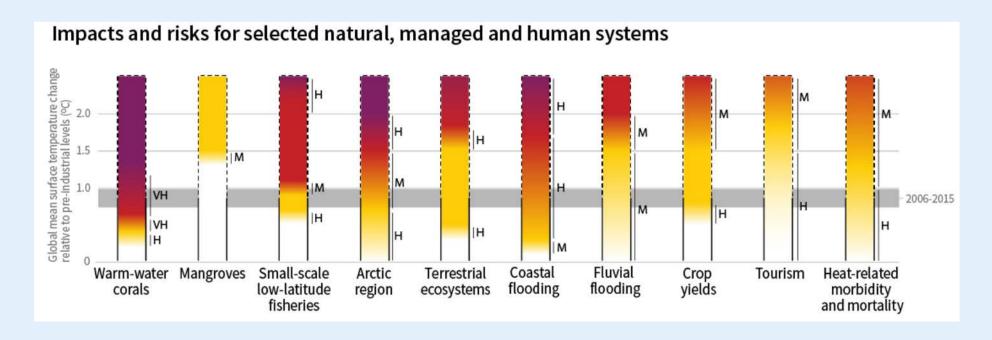






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Adaptation reduces risks and improves health

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.

