Health detection and attribution

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IPCC 2022

Increasing Levels of Carbon Dioxide and Short-Lived Climate Pollutants

Rising Temperature

Rising Sea Levels

Increasing Extreme Weather Events







Demographic, Socioeconomic, Environmental, and Other Factors That Influence the Magnitude and Pattern of Risks

Geography Ecosystem change Baseline air and water quality Agricultural and livestock practices and policies

Warning systems Socioeconomic status Health and nutritional status Access to effective health care

EXPOSURE PATHWAYS

Extreme Weather Events

Heat Stress

Air Quality Water Quality and Quantity Food Supply and Safety

Vector Distribution and Ecology

Social Factors

EXAMPLES OF HEALTH OUTCOMES



Injuries

effects

Fatalities

· Mental health









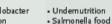
- other respiratory diseases Respiratory allergies
 - Cardiovascular disease





- Cholera
- Cryptosporidiosis
- Harmful algal blooms
- Leptospirosis





- poisoning and other foodborne diseases
- Mycotoxin effects





- Dengue
- Encephalitis
- (various forms) · Hantavirus infection
- Lyme disease
- Malaria
- Rift Valley fever
- West Nilevirus infection
- Zika virus infection



Physical and mental health effects of violent conflict and forced migration (complex and context-specific risks)

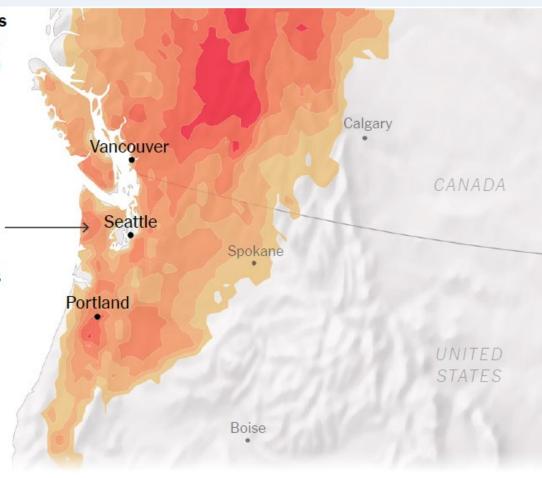


https://www.worldweatherattribution.org

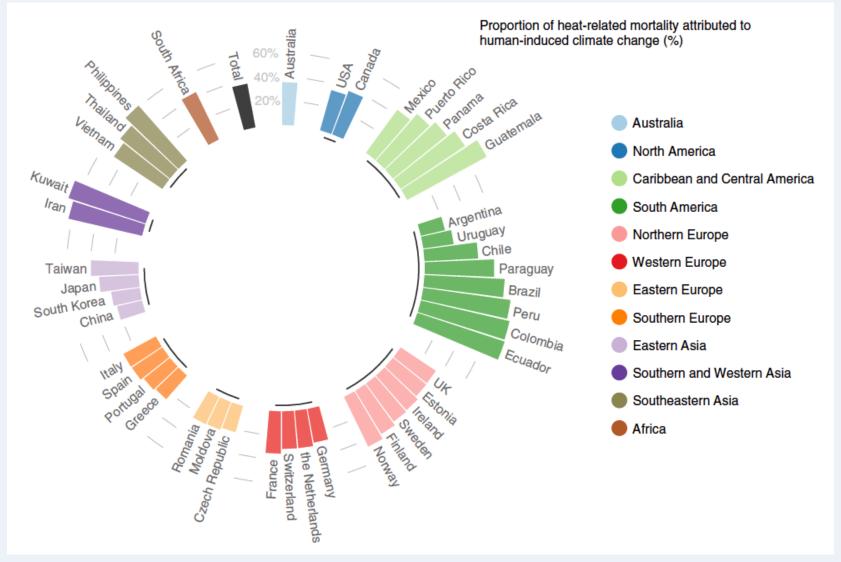
By how much the record was broken in June compared to the highest temperatures in 1950-2020

4°F 6 8 10 12

This year's historic heat wave in the Pacific Northwest broke previous records by more than 10 degrees.

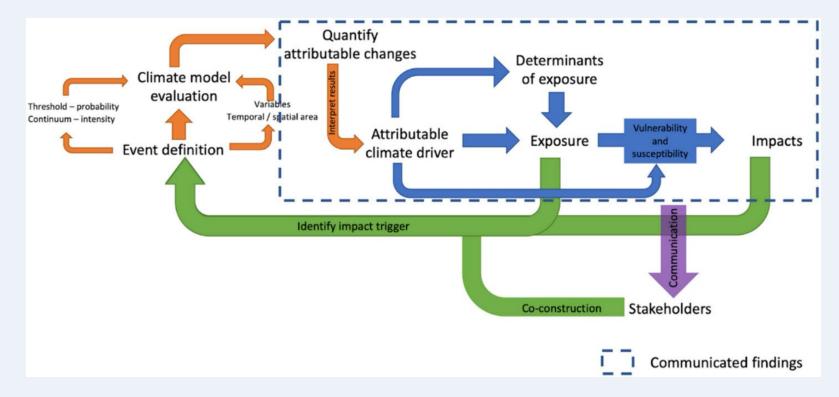


Source: ERA5 reanalysis (Copernicus/ECMWF) by Geert Jan van Oldenborgh.

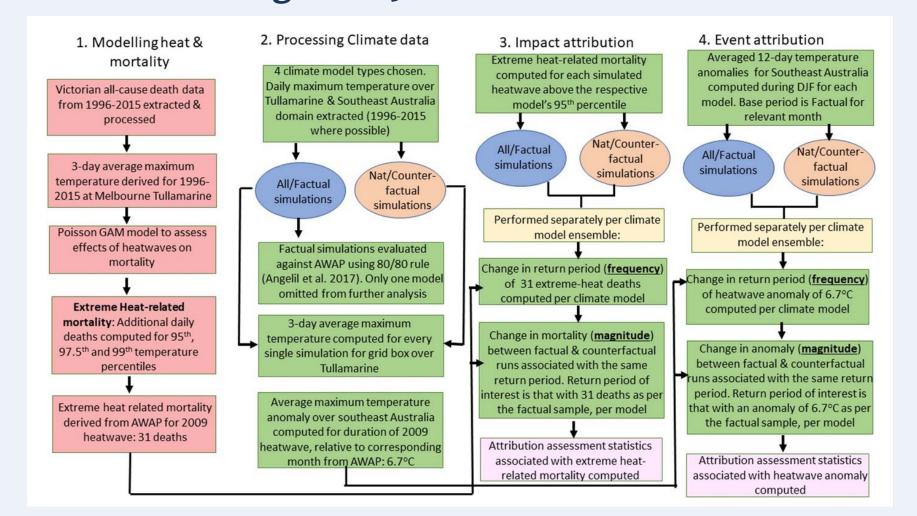


Draft framework for attributing health impacts of extreme events to climate change

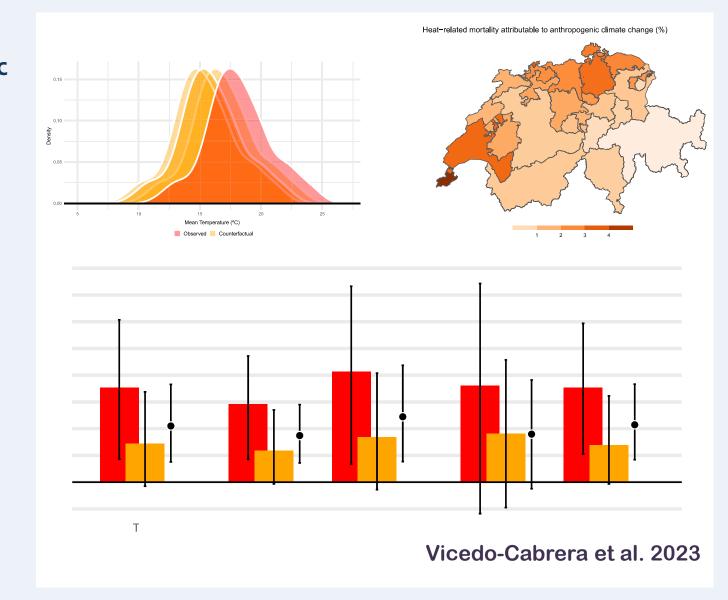
Different colors denote the different disciplines required for a successful impact attribution assessment



Steps in attributing heatwave-related mortality to climate change: 2009 Victorian heatwave Kirkpatrick et al. 2025

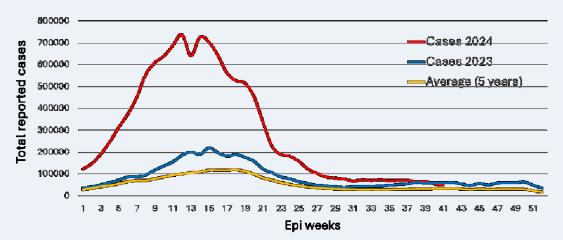


Footprint of anthropogenic climate change on heatrelated deaths in summer 2022 in Switzerland (A) Probability distribution of the observed and counterfactual daily mean temperature; (B) Cantonspecific heat-related mortality attributed to climate change, expressed as mortality fraction; (C) heat-related mortality expressed as fraction in observed and counterfactual scenarios

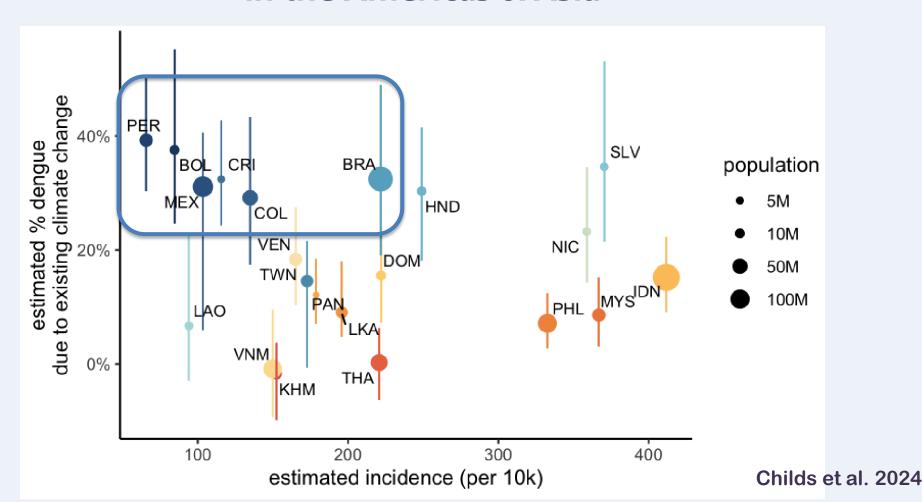


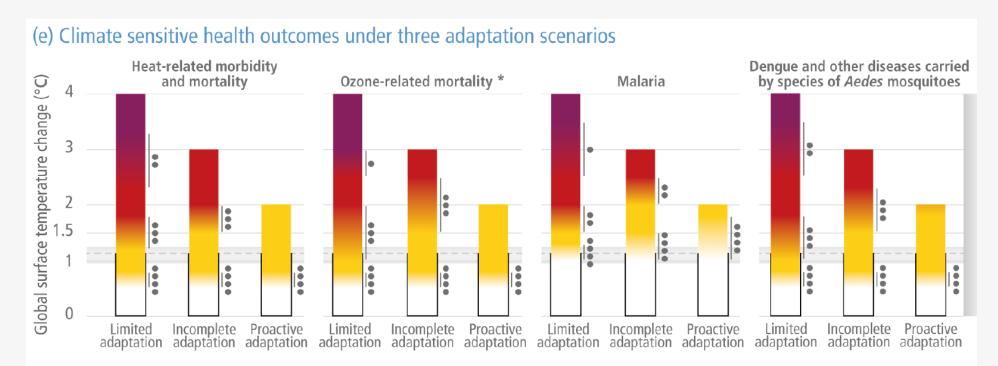
Dengue situation Americas, as of 31 October 2024

- Total of >12.2 million suspected cases
 - 209% increase compared to the same period in 2023
 - Annual high of 4.6 million cases in 2023 was a record
 - In Feb, the forecast for Brazil was 4 million cases
 - 387% increase compared to the average of the previous 5 years
 - 7,292 deaths
 - States of emergency in Honduras, Peru, and >17 Brazilian cities



Estimated % of dengue due to existing climate change in the Americas & Asia





^{*} Mortality projections include demographic trends but do not include future efforts to improve air quality that reduce ozone concentrations.

Scenario narratives

Limited adaptation: Failure to proactively adapt; low investment in health systems Incomplete adaptation: Incomplete adaptation planning; moderate investment in health systems Proactive adaptation: Proactive adaptive management; higher investment in health systems

