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IWR Interdisciplinary Center for Scientific Computing

Global Heat Health Effects

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Deutscher Bundestag
Ausschuss f. Gesundheit
UA GlobG
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21.06.2023

Content

- Minimum mortality temperature and heatwave definition
- Direct heat health effects
  - Vulnerable groups
  - Heat impact on labour capacity
- How are heat health risks distributed globally?
- How has heat related mortality risk developed in the last decade?
- Indirect heat health effects
- Summary

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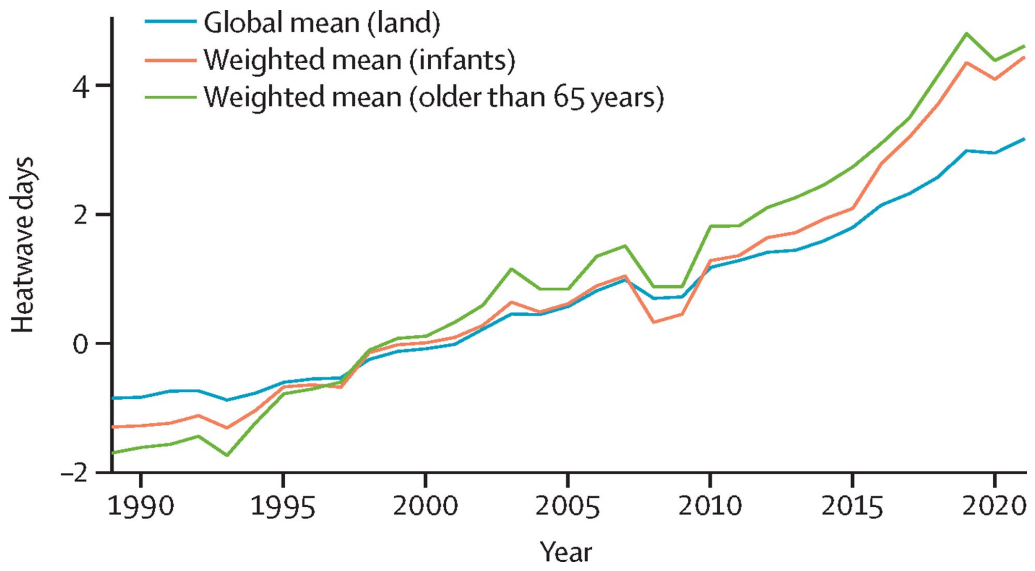
Exposure to heat days globally is increasing



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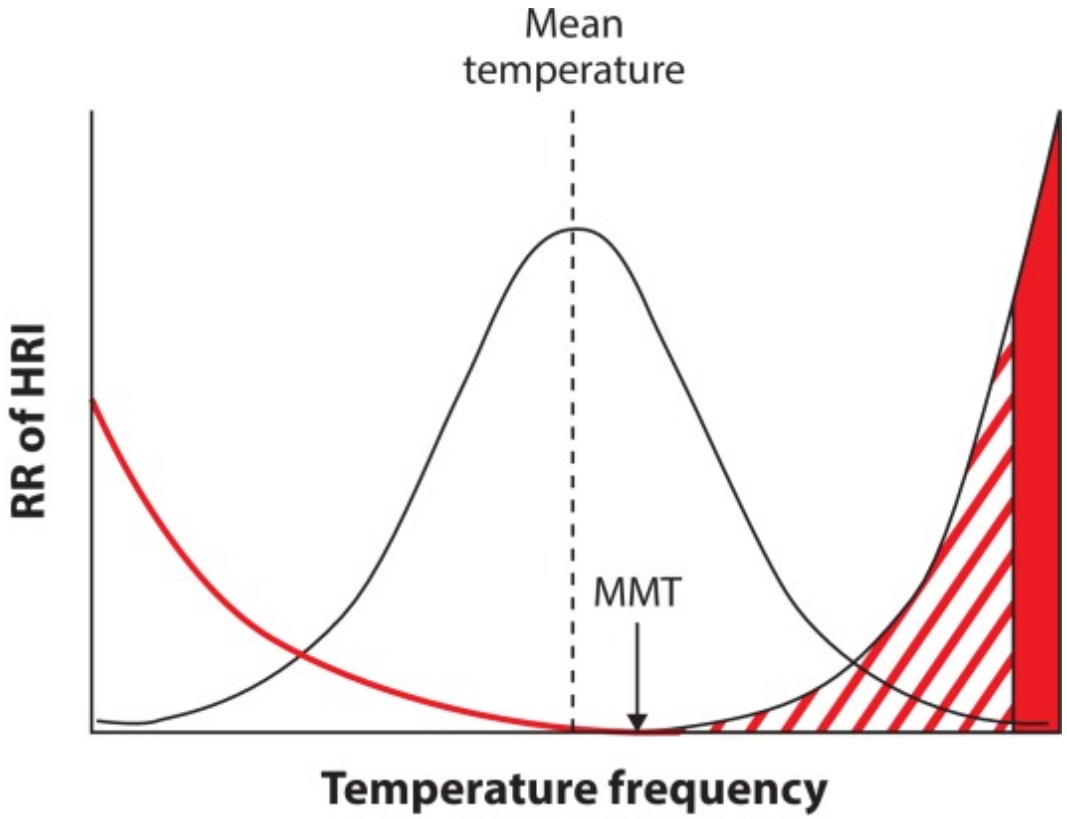
The Lancet 2022 4001619-1654DOI: (10.1016/S0140-6736(22)01540-9)

Minimum mortality temperature (MMT)



Hess JJ, et al. 2023
Annu. Rev. Public Health 44:301–21

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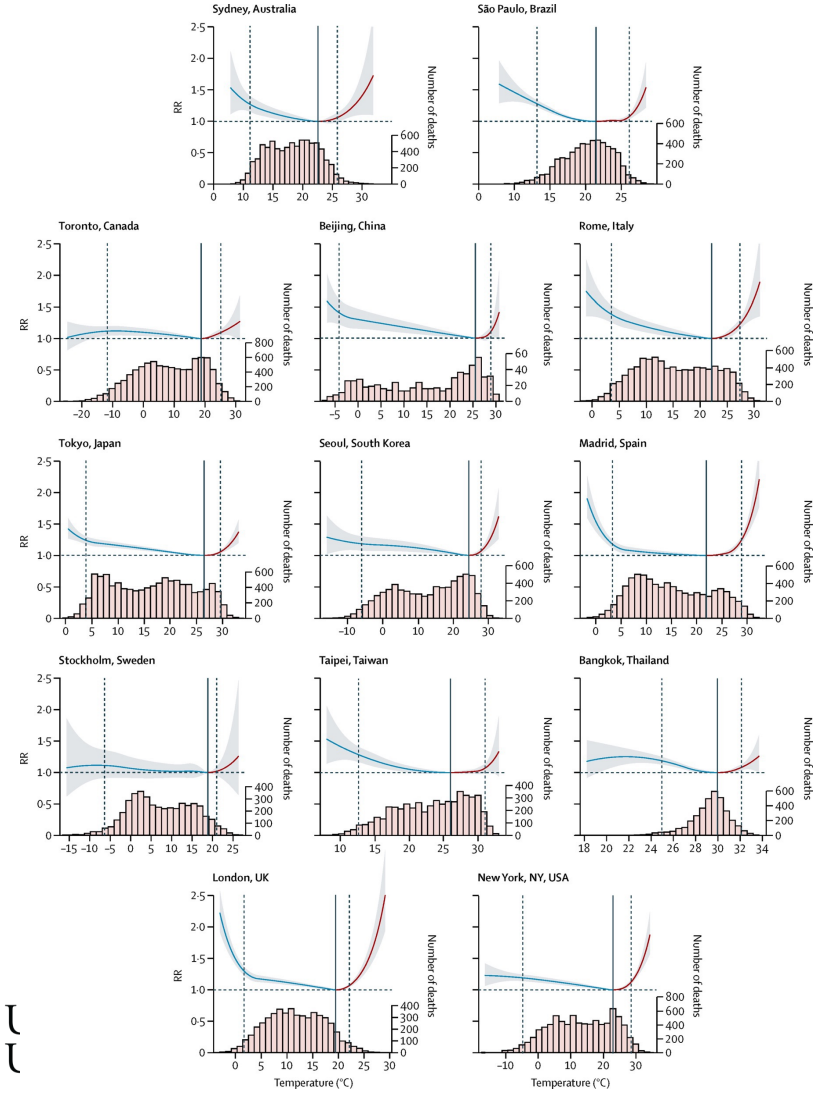
Hess et al. 2023 Annual Review Public Health, DOI: 10.1146/annurev-publhealth-071421-025508

MMT varies globally



- MMT varies between countries globally
  - E.g. Stockholm and London MMT is around 19 degrees, in Tokyo and Tapei around 25 degrees.

- In epidemiological studies the heat days are often defined as 97th, 98th or 99th percentile of the temperature

Gasparrini A. et al. 2015 The Lancet https://doi.org/10.1016/S0140-6736(14)62114-0

Heatwave definitions

- There is no universal definition what constitutes as a heatwave
- Intergovernmental Panel on Climate Change (IPCC) defines heatwave as: "a period of abnormally hot weather" (Matthews, 2018)
- World Health Organization says: "**Heatwaves, or heat and hot weather that can last for several days, can have a significant impact on society, including a rise in heat-related deaths**."

Heat increases risk of mortality

Accidental and non-accidental mortality

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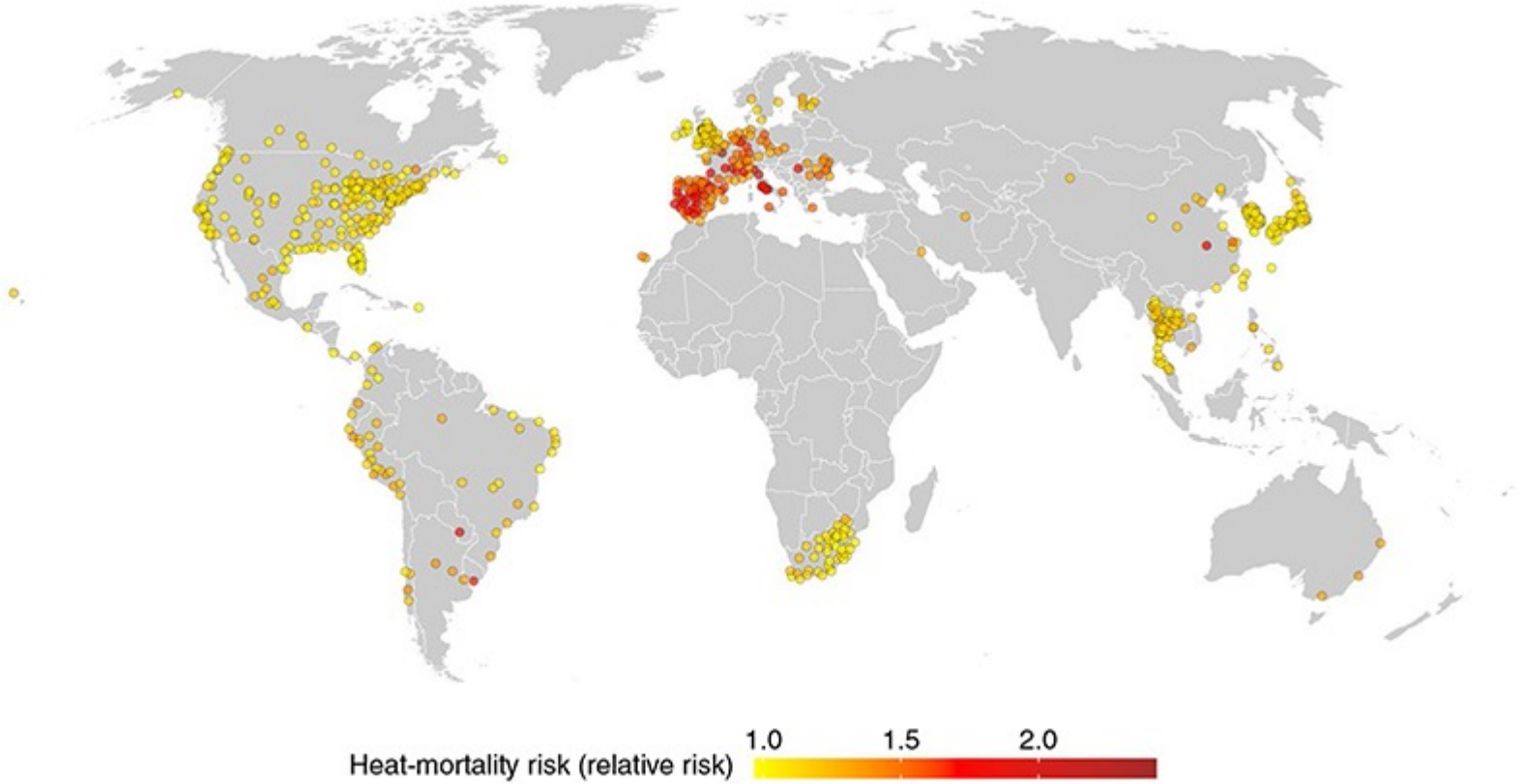
Global distribution of heat mortality risk



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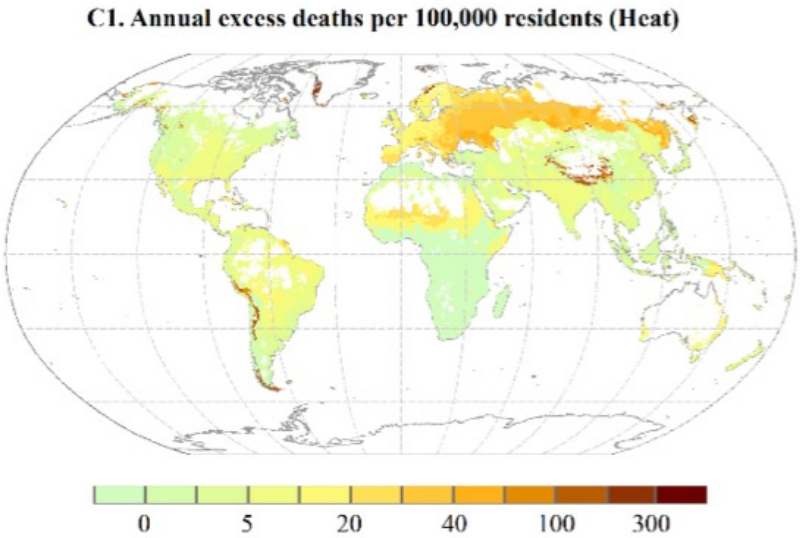
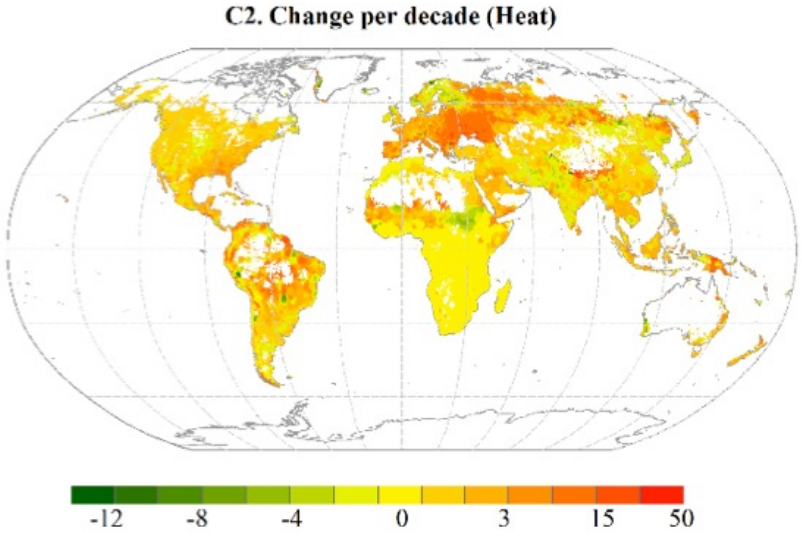
Vicedo-Cabrera et al. 2021, Nat Climate Change, doi: 10.1038/s41558-021-01058-x

Change in decade for heat attributable mortality (2000-2019)





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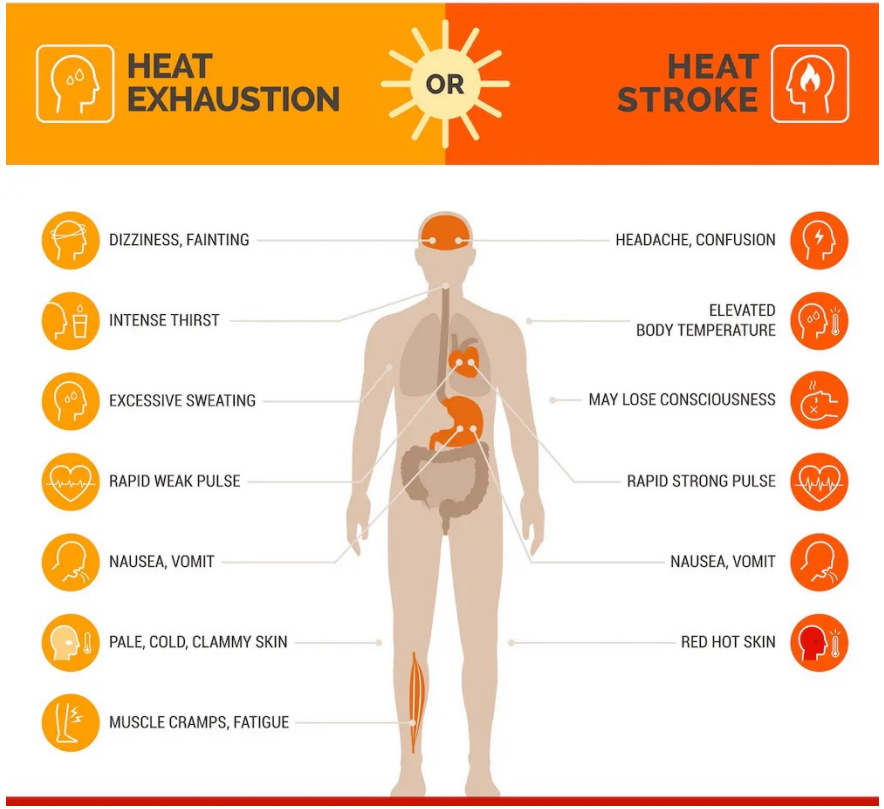
Zhao et al, 2021, Lancet Planerary Health. https://doi.org/10.1016/S2542-5196(21)00081-4

Heat morbidity effects

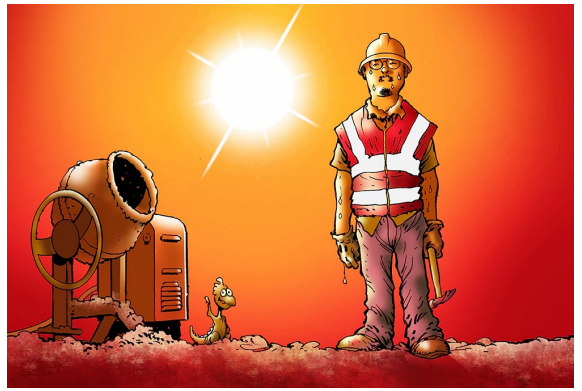
- Morbidity effects
  - Acute kidney failure
  - Heatstroke
  - Adverse pregnancy outcomes
  - Mental health impacts
  - Worsening of underlying cardiovascular and respiratory disease
- Mortality effects
  - Increase in non-accidental and injury related death



The Lancet 2021 398698-708DOI: (10.1016/S0140-6736(21)01208-3)

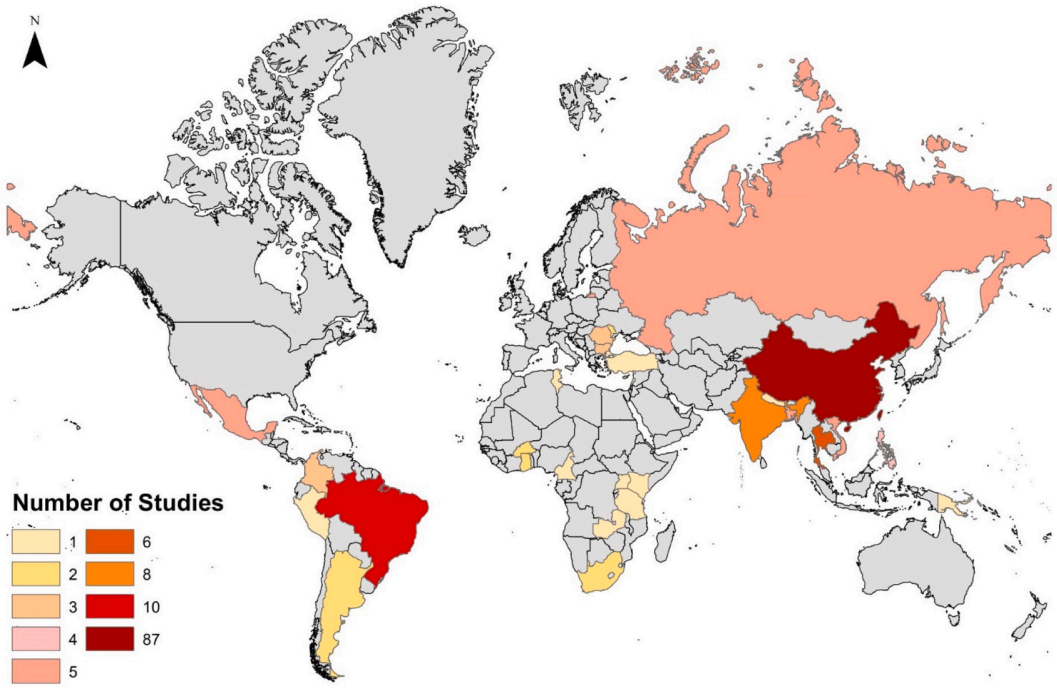
Vulnerable groups to heat health effects

- Elderly (>65 years)
- People with previous chronic diseases (e.g. cardiopulmonary disease, diabetes)
- Pregnant women
- Very young children (0-4 years)
- People of colour
- Outdoor workers
- Homeless people



Hess et al. 2023 Annual Review Public Health, DOI: 10.1146/annurev-publhealth-071421-025508

Heat health effects in low- and middle income countries (LMIC)



- Lack of epidemiological studies on heat health effects on LMIC
- Heat exposure increased the risk of **mortality** and **morbidity**
- Vulnerable groups identified:
  - Elderly
  - Women
  - Low-socioeconomic status

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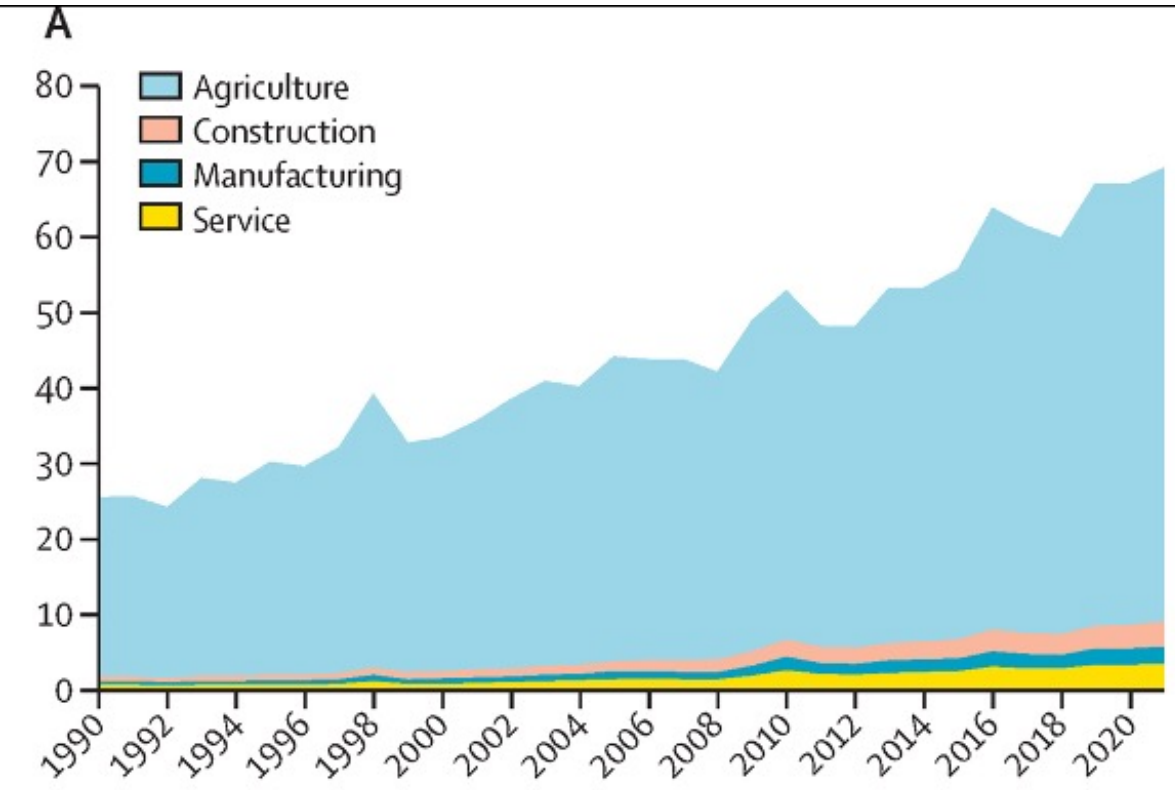
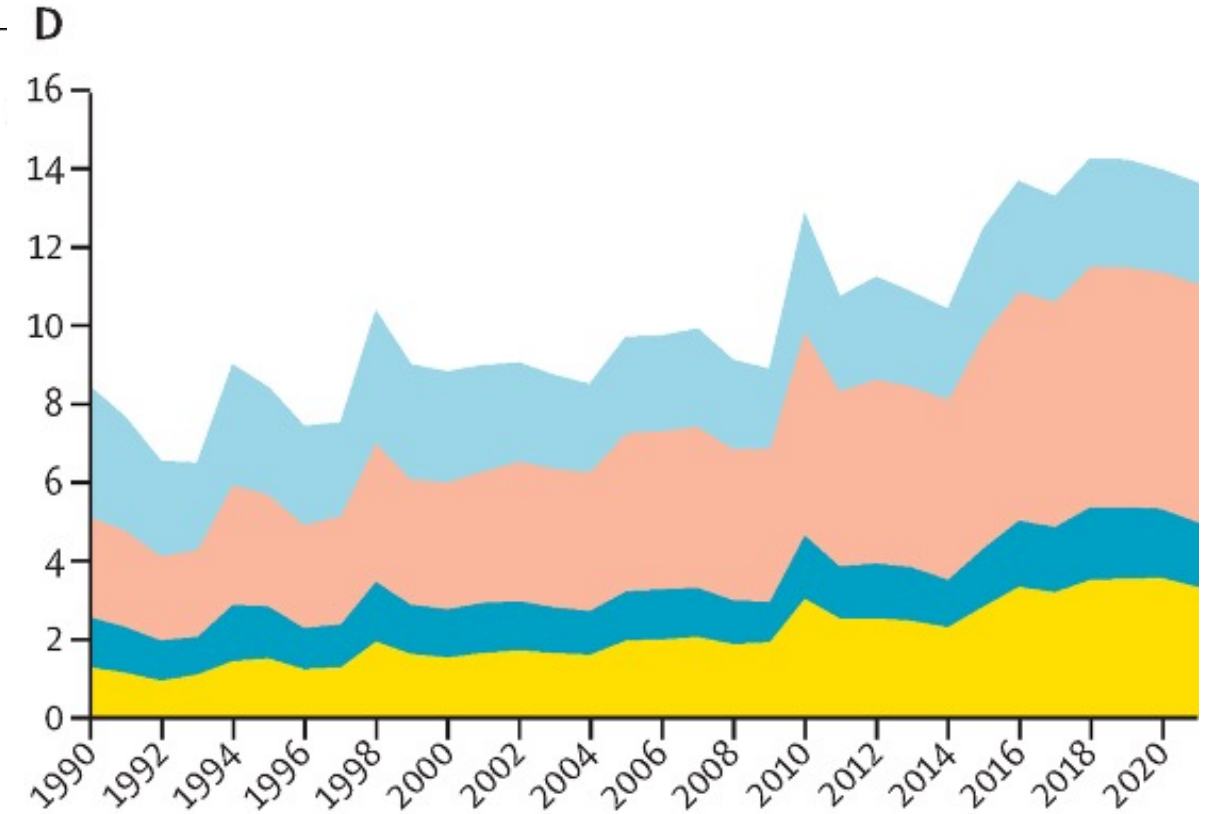
Green et al. 2019 Environmental Research
https://doi.org/10.1016/j.envres.2019.01.010

Heat and decrease of labour capacity





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The Lancet 2022 4001619-1654DOI: (10.1016/S0140-6736(22)01540-9)

Indirect heatwave effects

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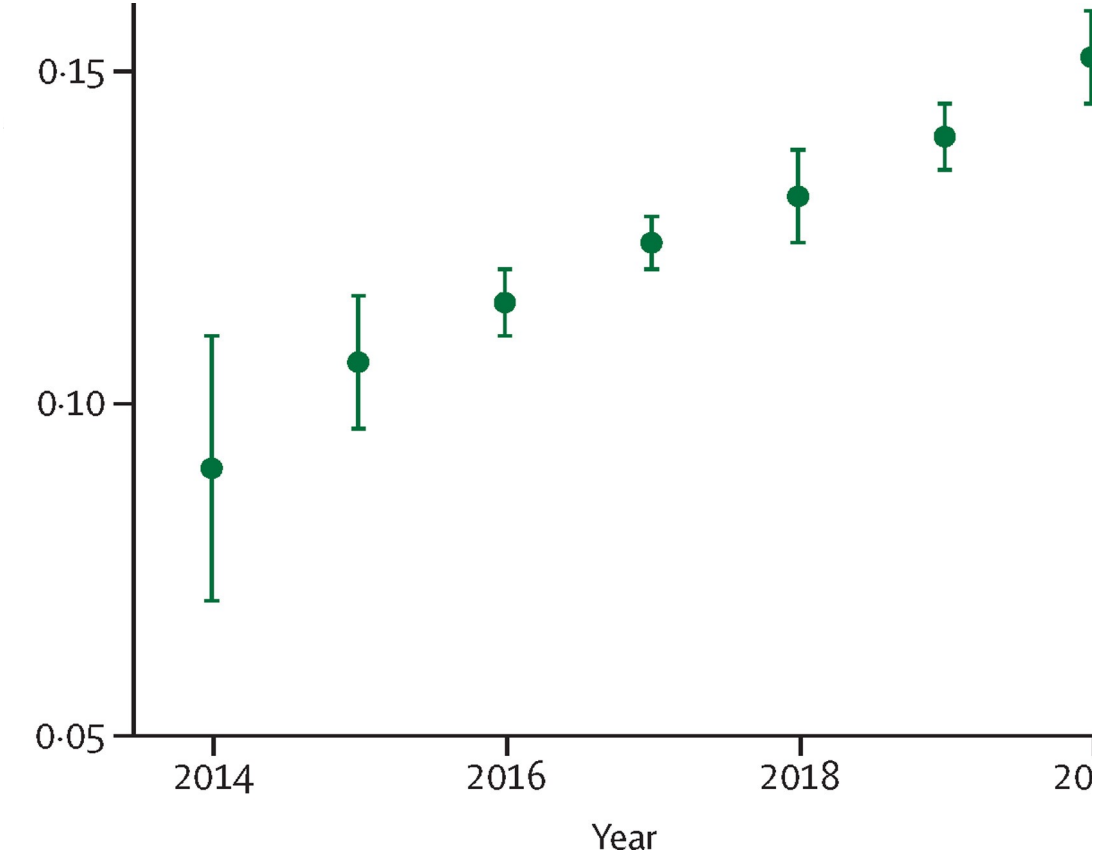
Food security and undernutrition

- Increasing temperature shortens the crop growth season globally
  - 9.3 days for maize
  - 1.7 days for rice
  - 6.0 days for winter and spring wheat

- Increasing number of people globally report moderate to sever food insecurity (e.g. 98 million in 2020)
- Malnutrition increases the risk of infectious disease transmission.



Change in the percentage of people reporting moderate to severe food insecurity because of heatwave days occurring during major crop growing seasons

The Lancet 2022 4001619-1654DOI: (10.1016/S0140-6736(22)01540-9)

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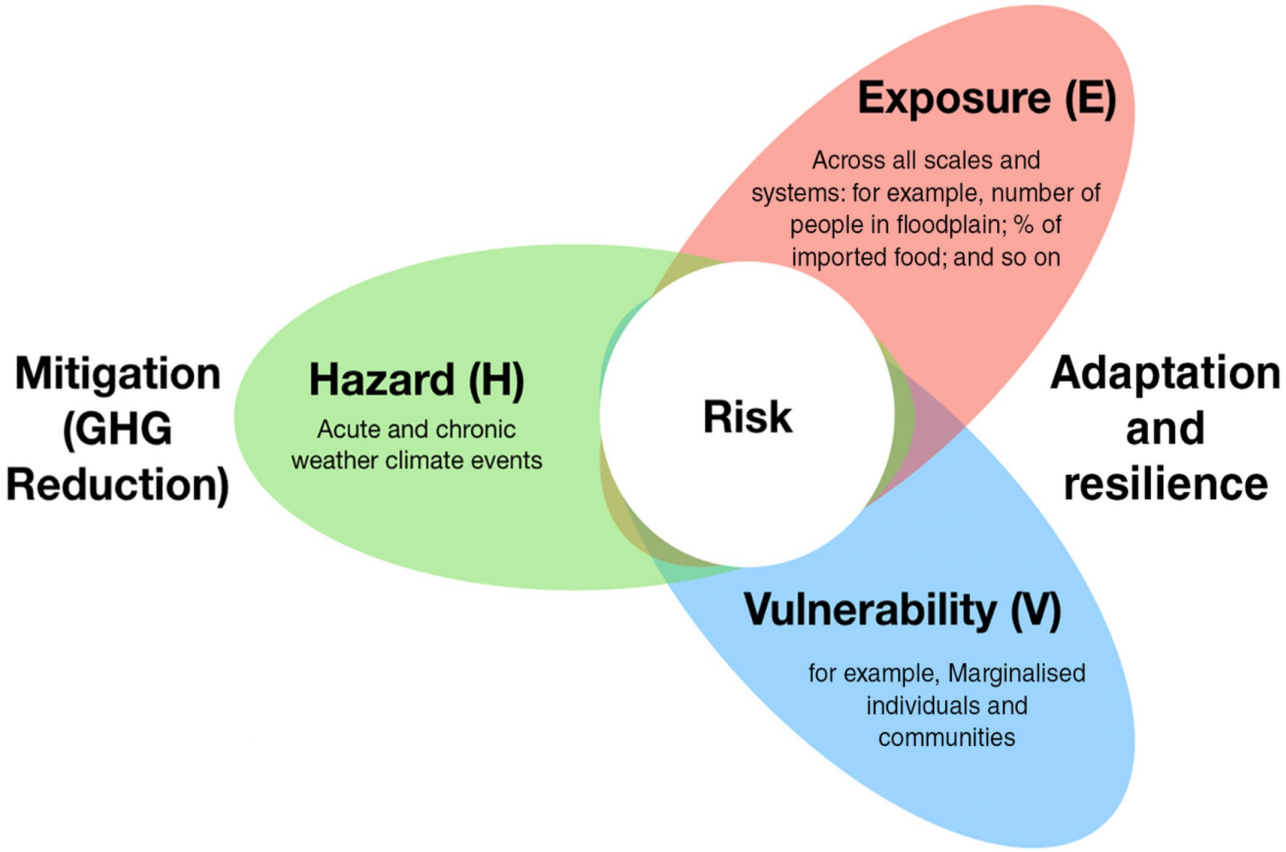
Adaptation and mitigation

- Most heat-related mortality and morbidity effects should be preventable with good preparedness (e.g Heat Health Action Plans) and avoidance of exposure.
- Need to increase the resilience of health systems
- Enhance development of context specific mitigation and adaptation policies



Viner et al. 2020 Atmospheric Science Letter https://doi.org/10.1002/asl.958

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Thank you!

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Health effects of Droughts

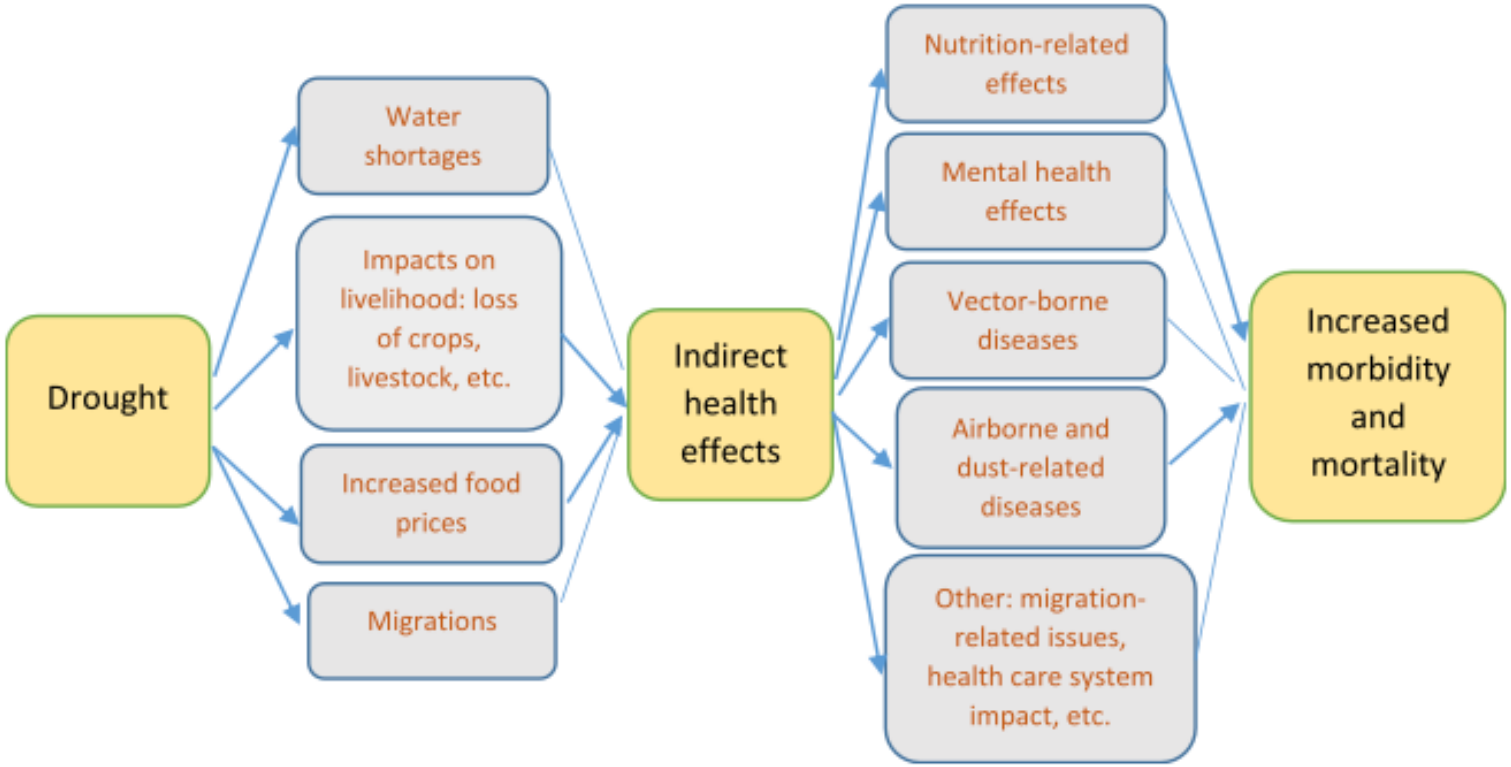

Fig. 1 Impact of drought on health

Bellizzi , S. et al. (2020), https://doi.org/10.1186/s12940-020-00665-z