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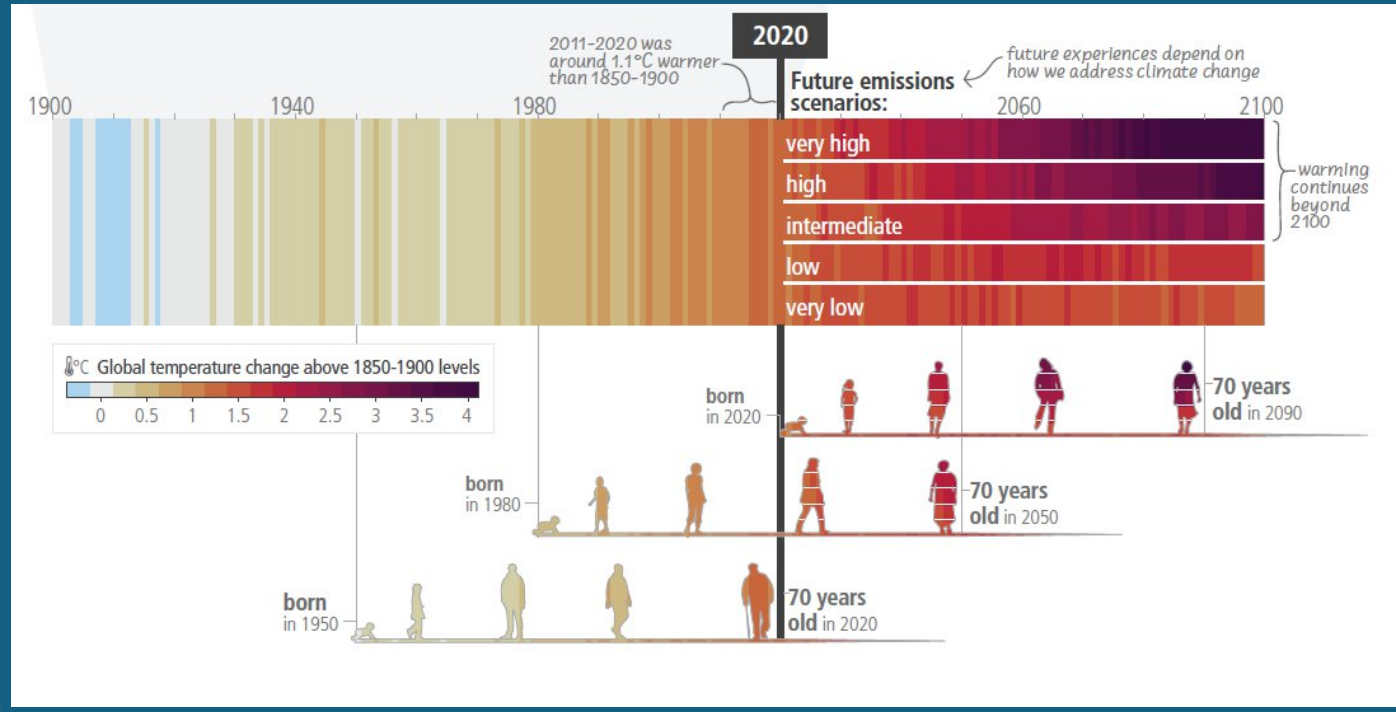
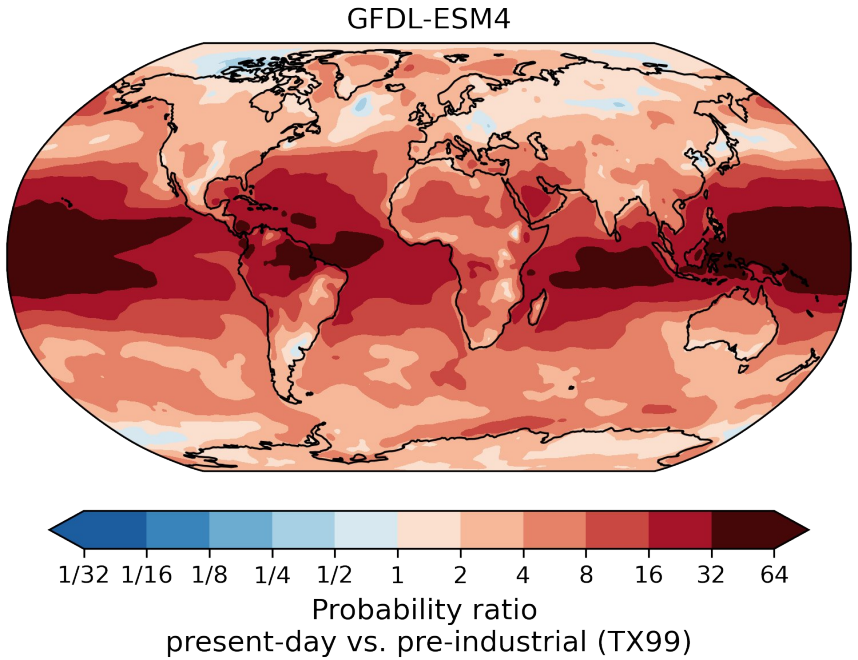
Children will be disproportionately exposed to climate extremes because they **will live into the future**



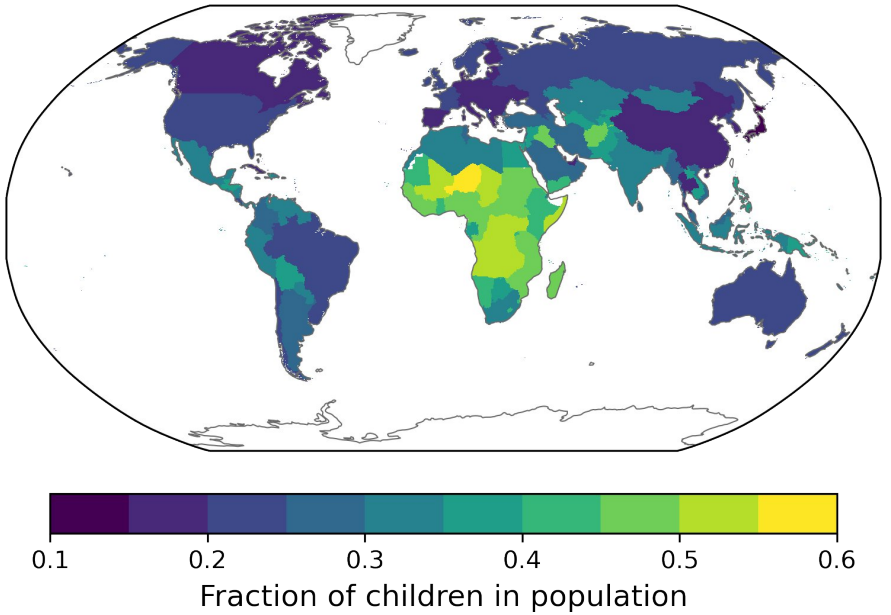
IPCC AR6 SYR Fig. SPM.1 (2023)

But are **children** already disproportionately exposed to attributable extremes **today**?

Previous studies show attributable hot days clustered in low-latitude low-income countries...



…These are also countries where a large part of the population is young



Relevance?
Children are…

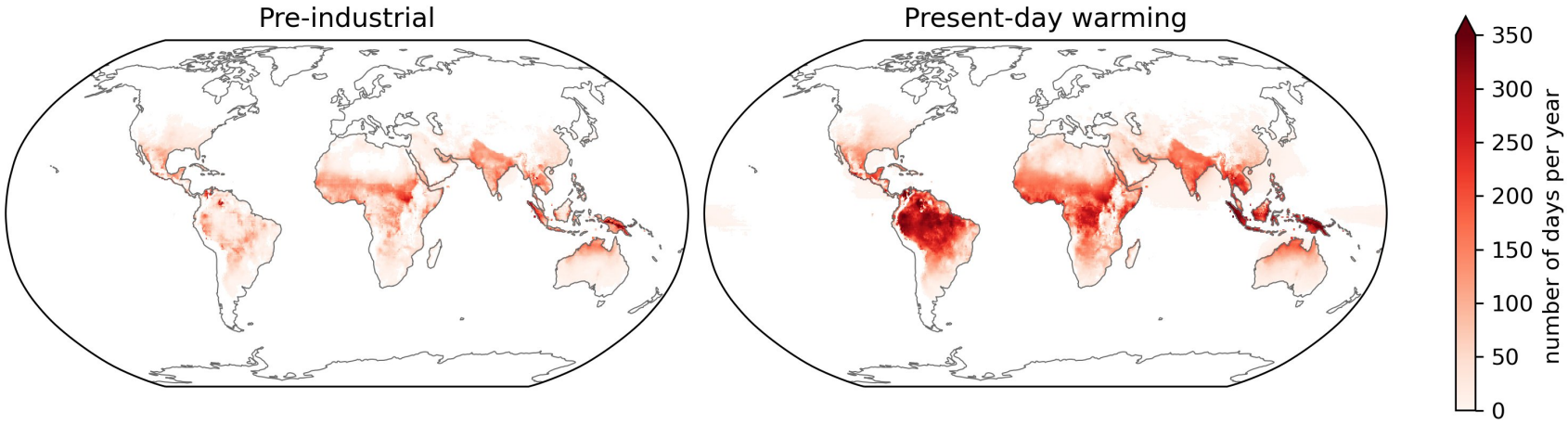
- Considered a **vulnerable category** in social sciences, disaster risk reduction, health, law

- Powerful spokespeople for the **rights of future generations**

- **Less responsible** for historical emissions

Are children disproportionately exposed to **attributable heat stress**?

- Fixed magnitude threshold **WBGT 28ºC**
- **Frequency change** between pre-industrial and present-day warming
- Quantify **additional (attributable) number of days** per year



Number of days per year crossing WBGT 28ºC
in pre-industrial (1850-1900) and at present-day warming
(CanESM5)

Climate data

- CMIP6-ISIMIP3b GCMs
- Change in threshold exceedance frequency and intensity

Number of additional days

$nAHD = n_{days} * (p1 - p0)$

Probability ratio

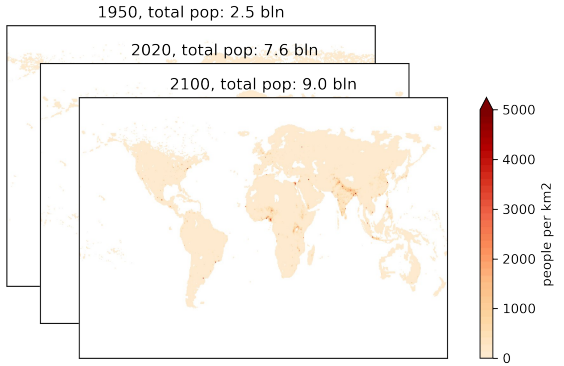
$PR = p1/p0$

Intensity change

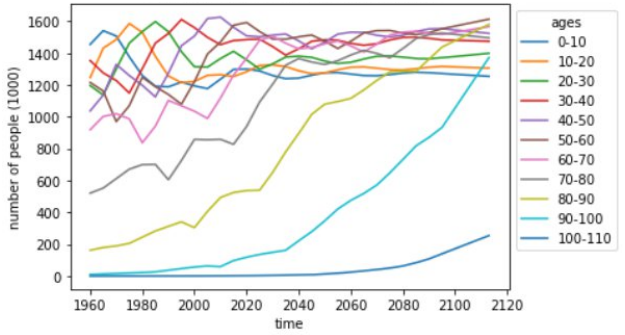
$\Delta I = I_{p0}^{pres} - I_{p0}^{pi}$

Demographic data

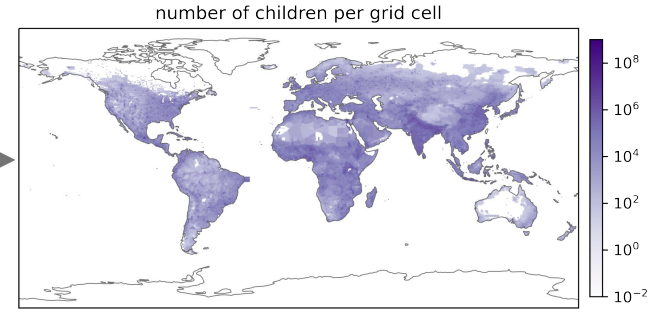
Gridded population 1850-2100 (ISIMIP)



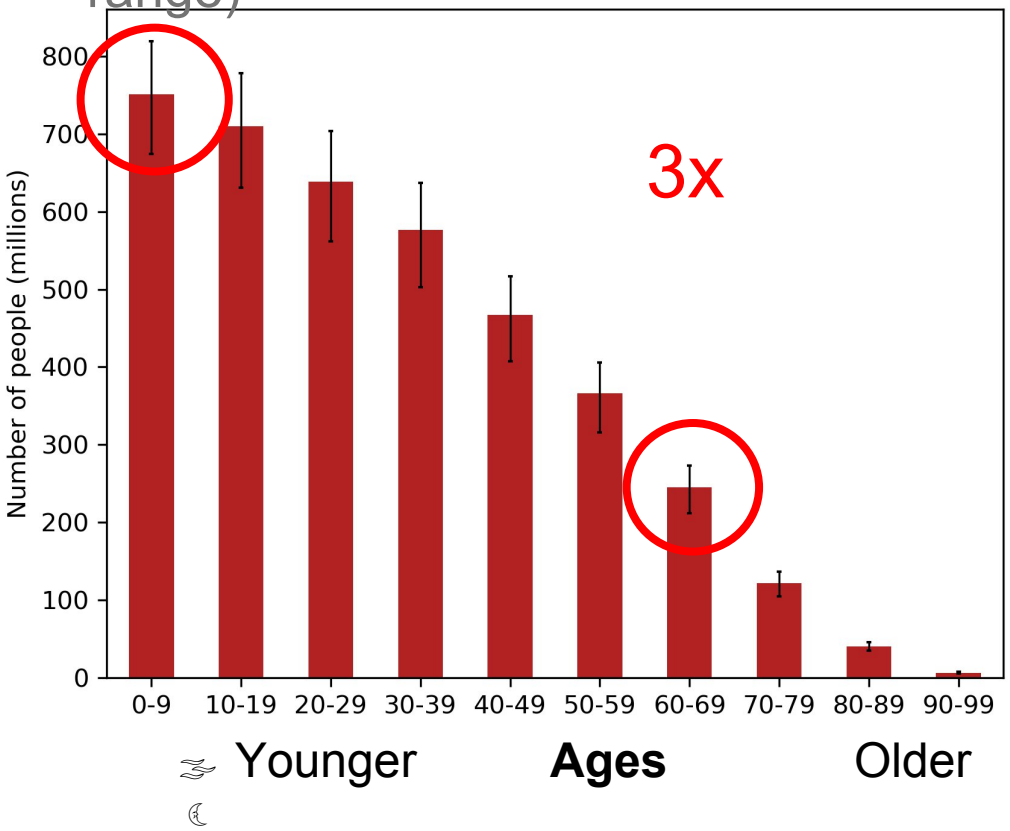
Cohort sizes 1950-2100
(Wittgenstein Capital Data Explorer)



Gridded demographic dataset



Number of people in each age cohort experiencing **at least 20 attributable hot-humid days per year** crossing WBGT 28ºC (multi-model mean and range)

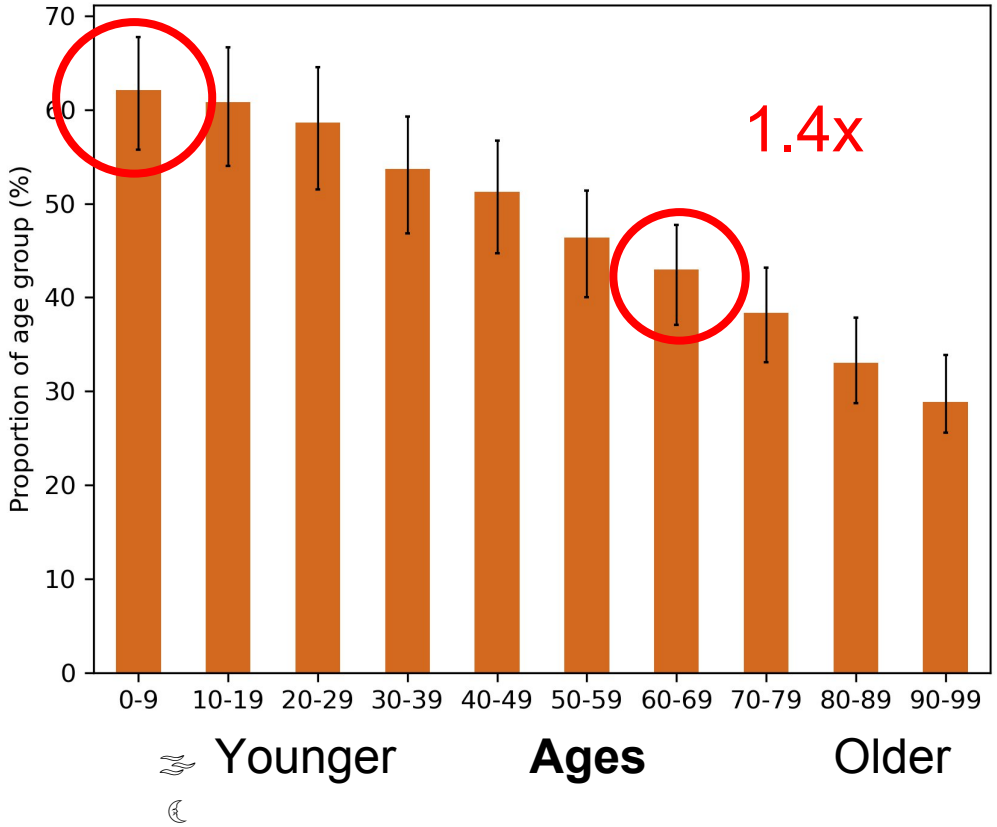


- 0-9 year olds: 750 (670-820) million people
- 60-69 year olds: 250 (210-270) million people

But there are more 0-9 y.o. than 60-69 y.o. in the world…

What about the **proportion of the age group**?

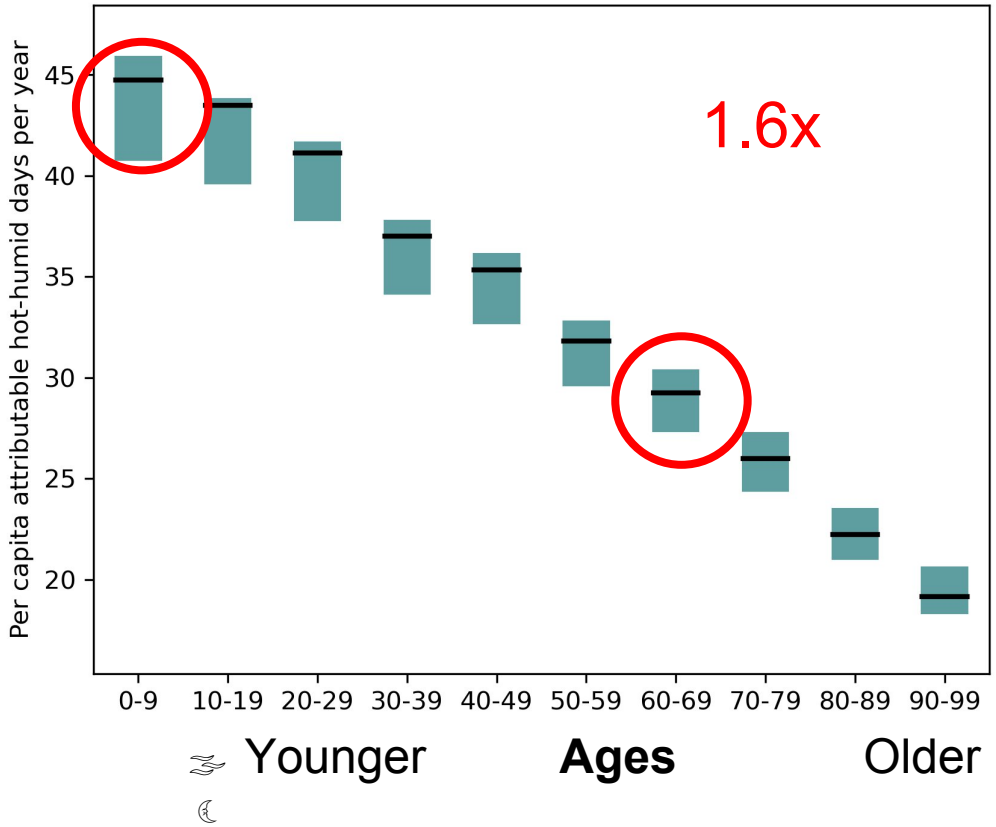
Proportion of age cohort experiencing
at least 20 attributable hot-humid days per year
crossing WBGT 28ºC (multi-model mean and range)



- 0-9 year olds: 62% (56-68%)
- 60-69 year olds: 43% (37-48%)

How many **attributable hot-humid days per year** are different age groups experiencing **on average per capita**?

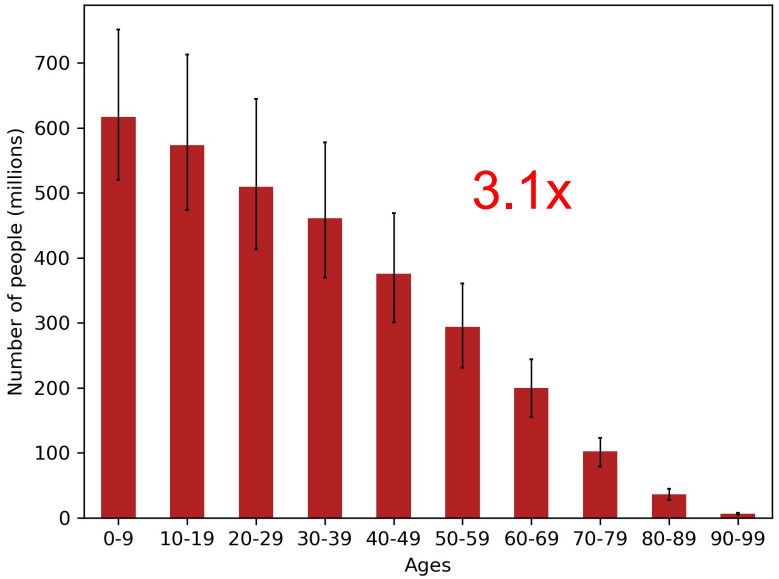
Number of **attributable hot-humid days per year** crossing WBGT 28ºC experienced by an average member of each age group (median and IQR)



- 0-9 year olds: 45 days (40 – 46 days) per year
- 60-69 year olds: 29 days (27 – 30 days) pear year

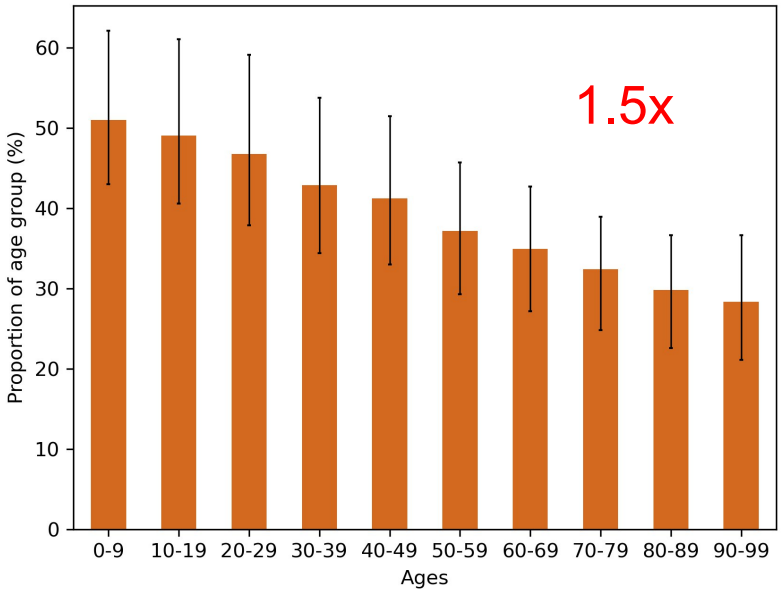
Pattern holds for **different definitions** of hot and hot-humid extremes

TX99



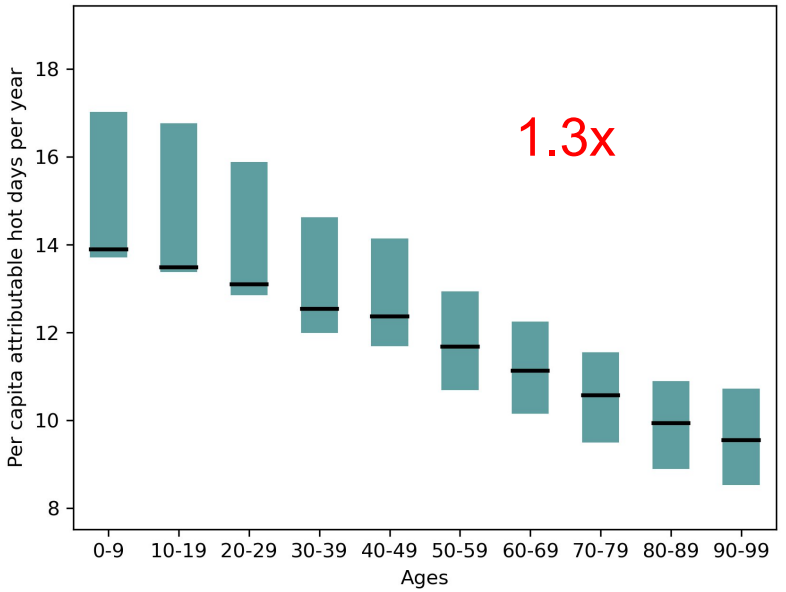
Number of people experiencing **at least 10 attributable hot days per year** crossing TX99

0-9 year olds: 620 (520-750) million people
60-69 year olds: 200 (155-240) million people



Proportion of age group experiencing **at least 10 attributable hot days per year** crossing TX99

0-9 year olds: 51% (43-62%)
60-69 year olds: 35% (27-43%)



Average number of **hot days per year** crossing TX99 experienced **per capita** per age goup

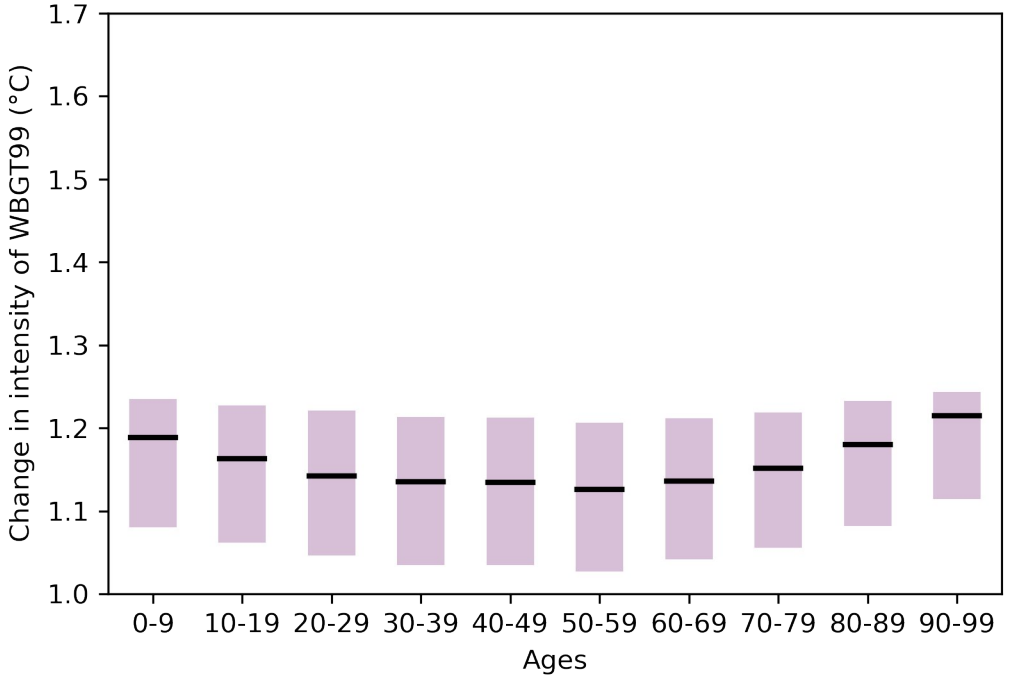
0-9 year olds: 14 (14-17) days
60-69 year olds: 11 (10-12) days

Pattern holds for **different definitions** of hot and hot-humid extremes

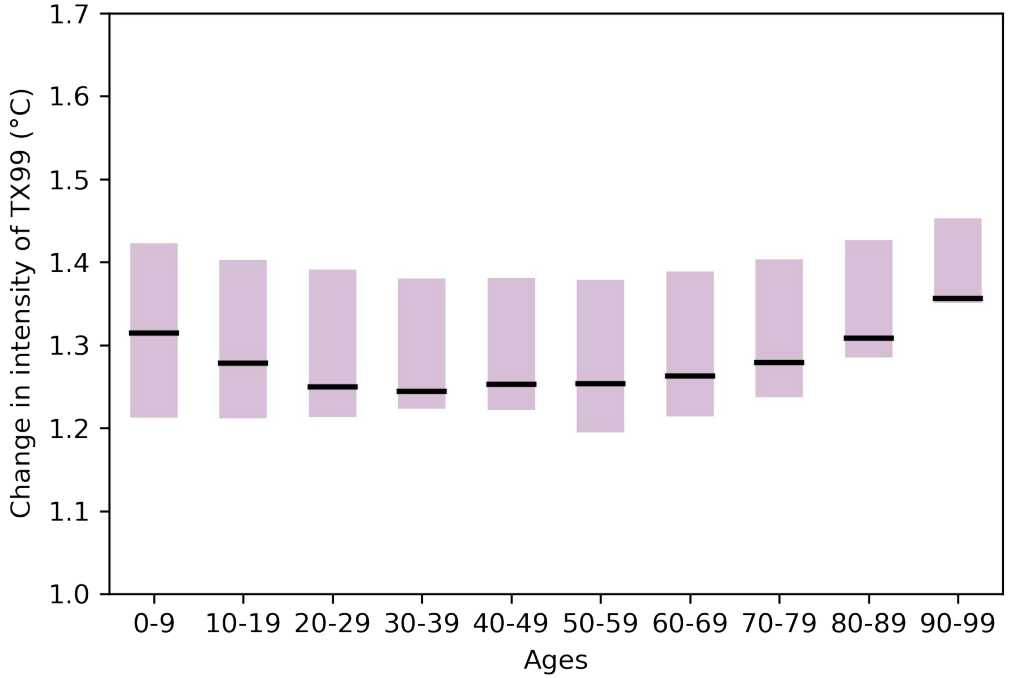
- WBGT 28ºC, 30ºC, 33ºC
- 99th percentile of WBGT in pre-industrial
- TX90, TX95, TX99

What about **changes in intensity** of a fixed percentile?

WBGT99



TX99



Key takeaways & implications

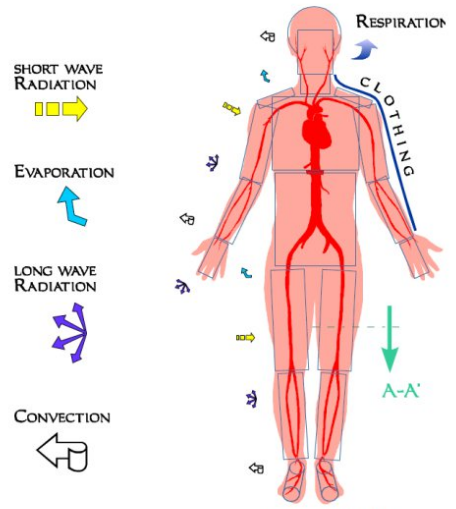
- At a global level, **children** disproportionately exposed to **attributable increase in frequency** of hot(-humid) extremes

- **Demographic patterns** of young populations in low-latitude countries overlapping with **higher attributability**

- **Adds additional dimension of age** to disproportionality of responsibility versus exposure/impacts of climate change **today**

Outlook

- Develop **attributability** framework
  - Observational line of evidence
  - Model evaluation & synthesis
    - Non-stationary distribution GMST covariate
- **Regional and country-level** analysis
  - GDP, vulnerability indices, national historical emissions
- Need for child-specific research
  - **Metrics** relevant for e.g. health and educational impacts
  - Child-specific **vulnerability**
  - Impact attribution



Fiala et al. (1999)

Thank you!

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