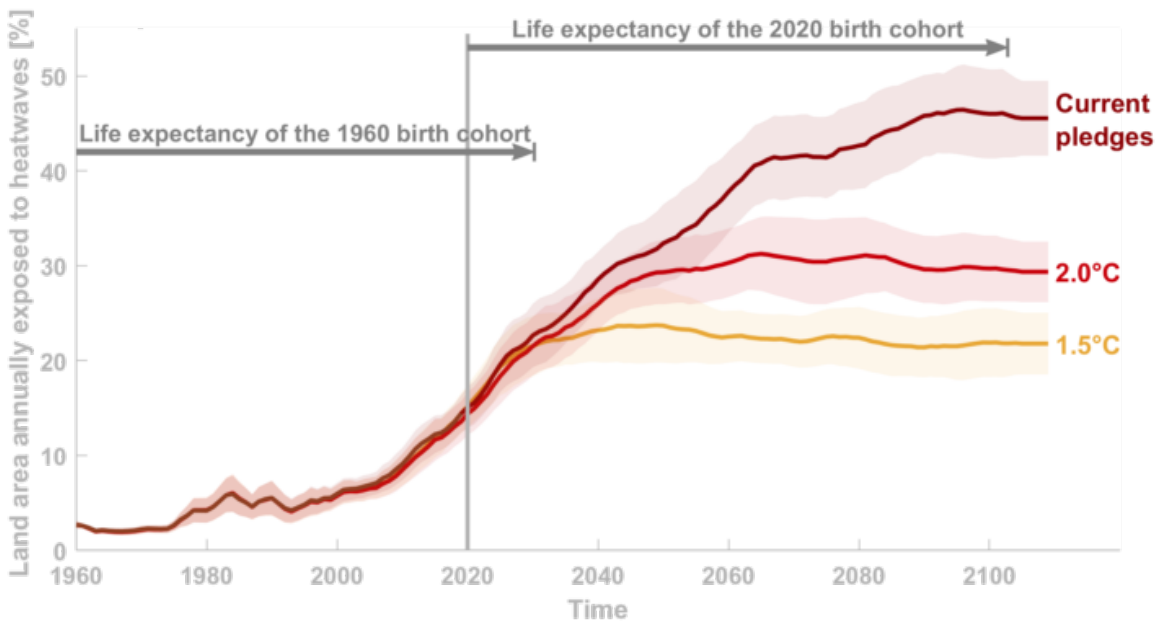
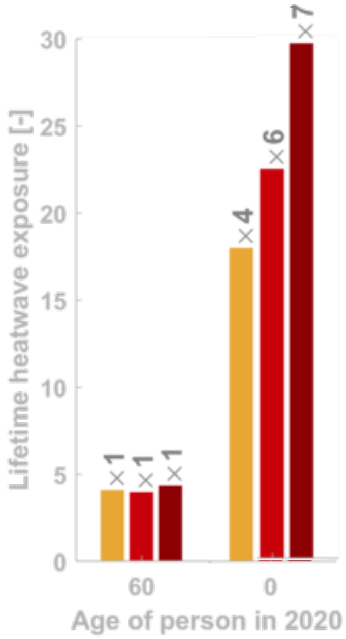
Climate change, extreme events, & climate victims

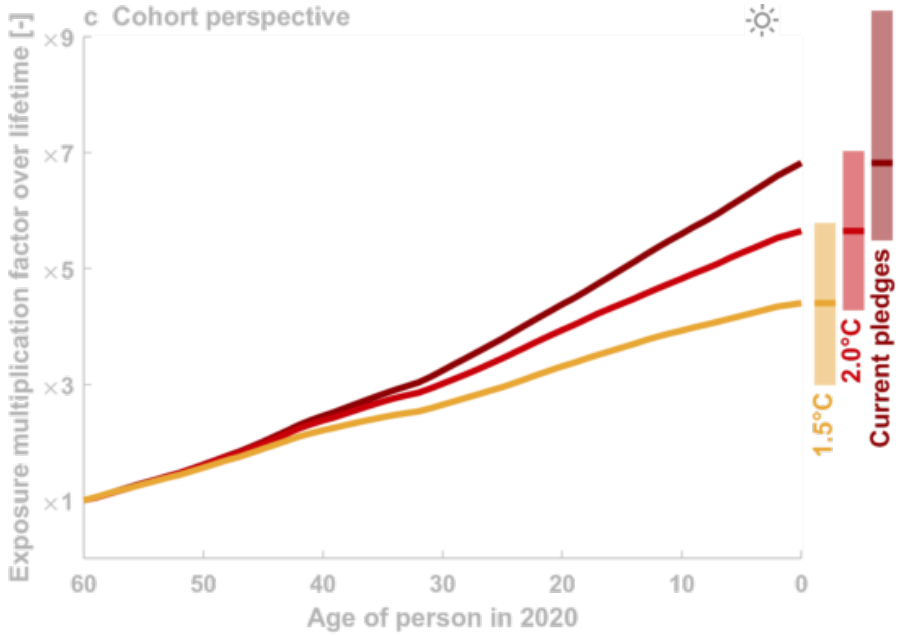
Prof. Dr. Wim Thiery

The idea

Integrate exposure of an ‘average person’ to extreme events across lifetime

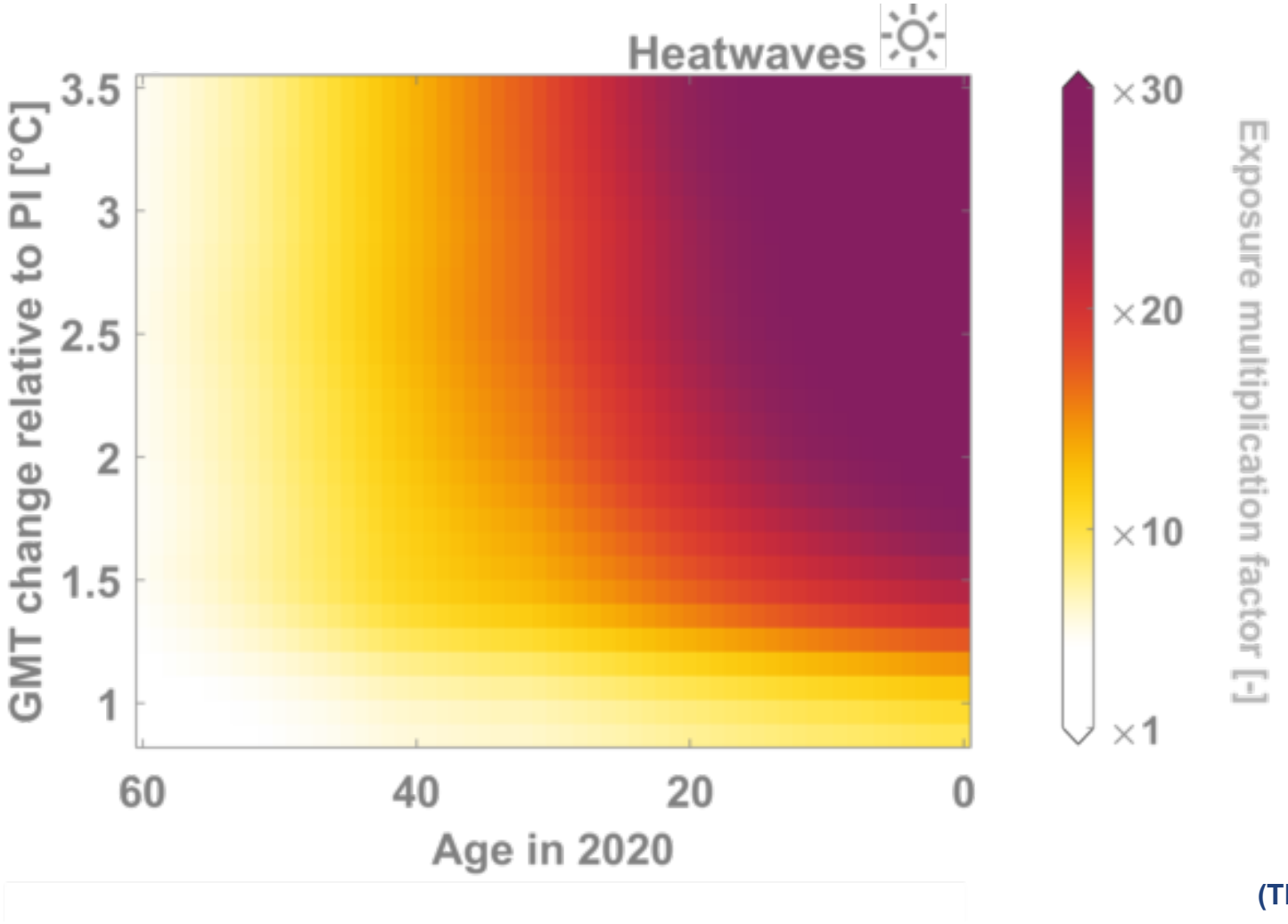






(Thiery et al., 2021 Science)

Burning embers for the kids



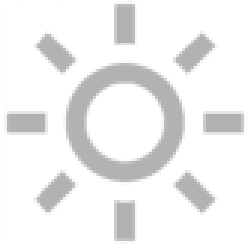
(Thiery et al., 2021 Science)

Six impact categories

15 ISIMIP2b models, 273 global-scale projections

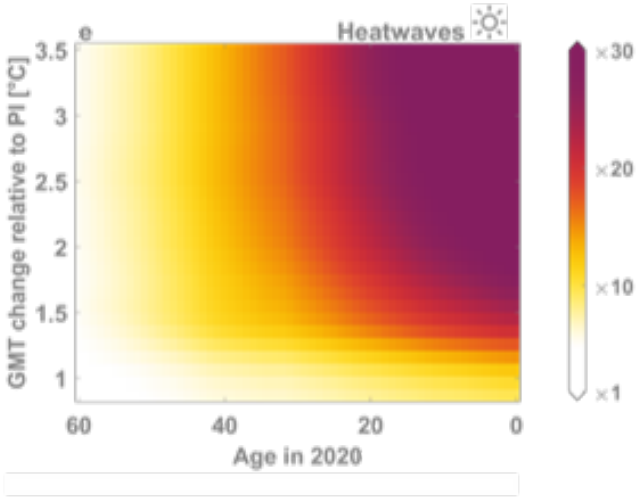







(Lange et al., 2020 EF)

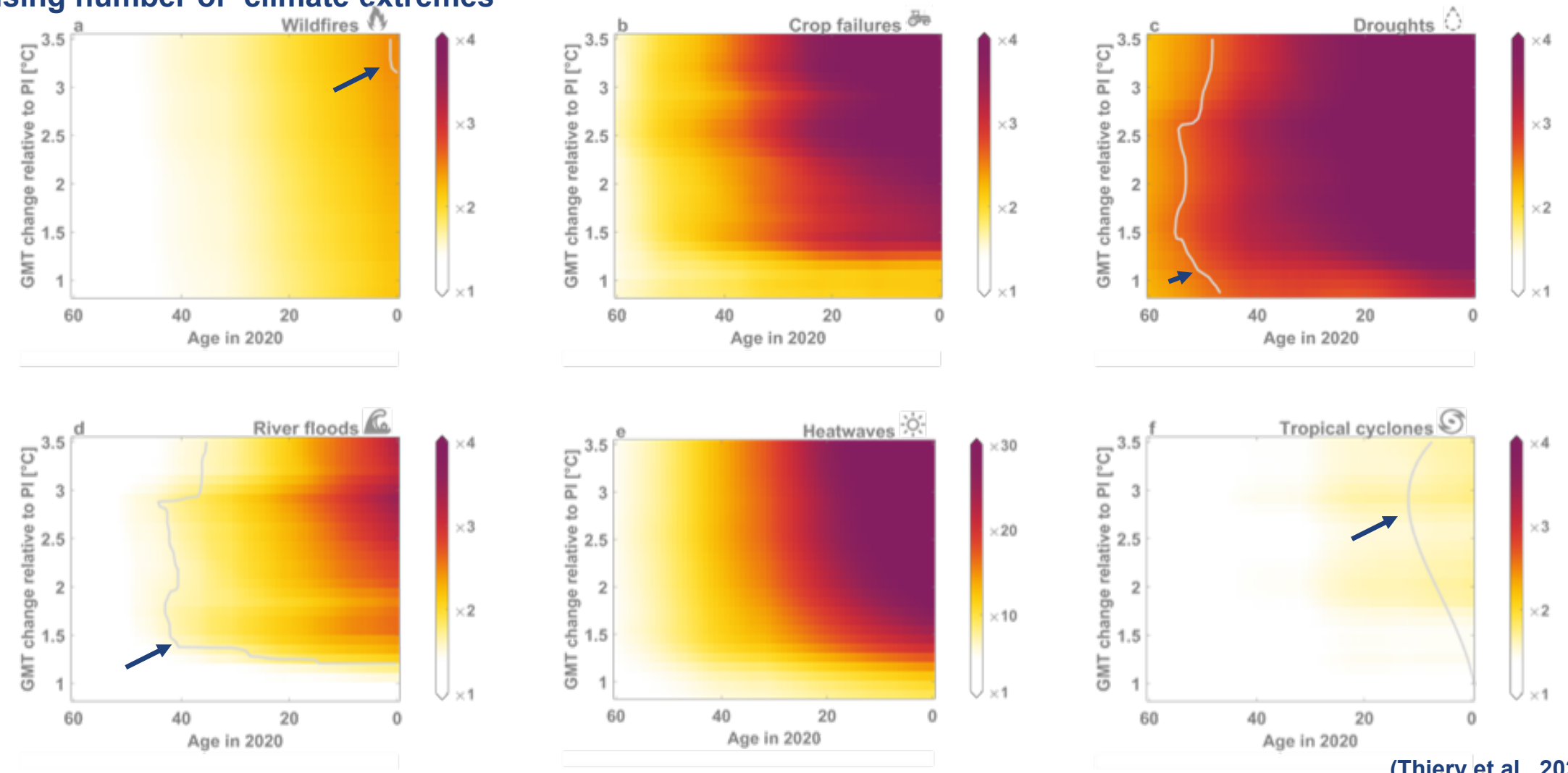
Six burning embers



(Thiery et al., 2021 Science)

Younger generations will be disproportionately exposed

to a rising number of climate extremes



(Thiery et al., 2021 Science)

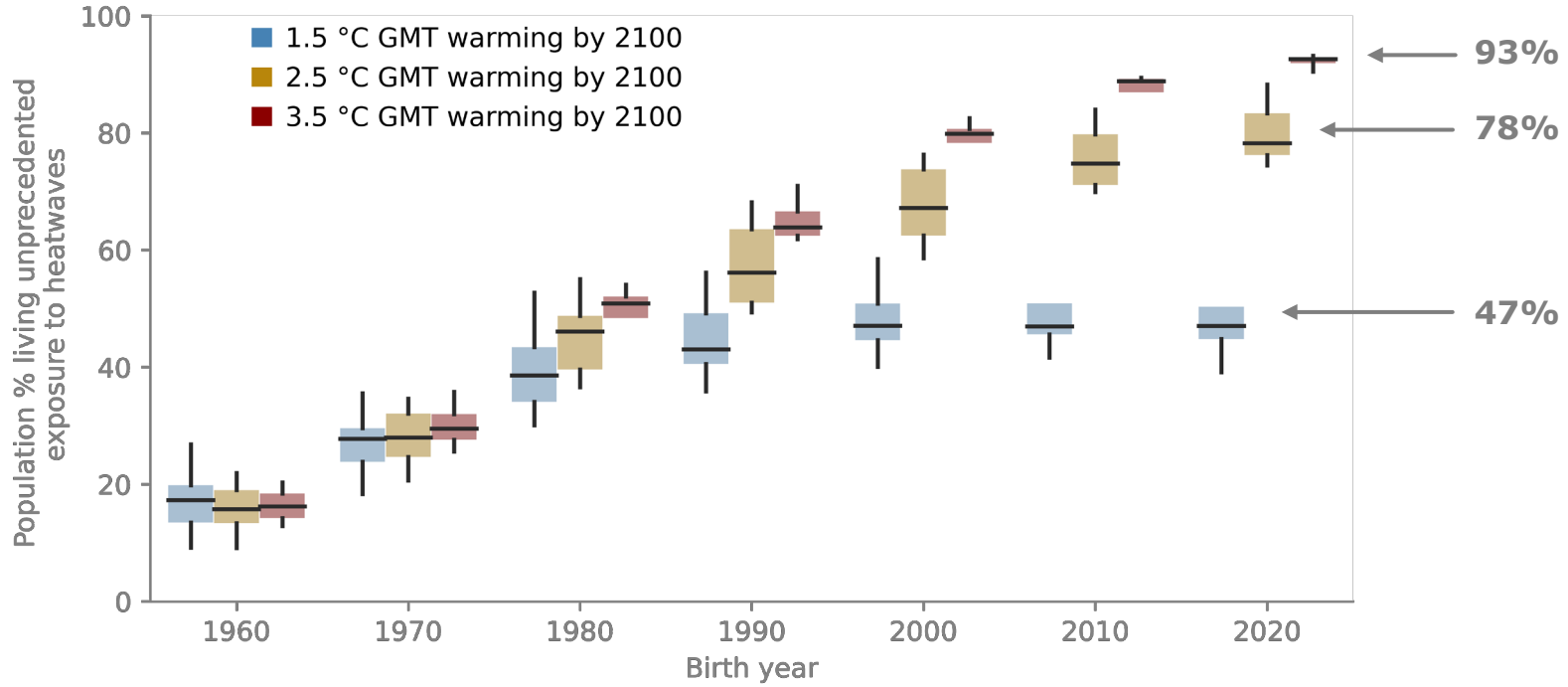
e.g. 6-yr old under 3°C: wildfires/TCs x2; river floods 3x; crop failure x4; droughts x5, heatwaves x36

Results applied to this situation:

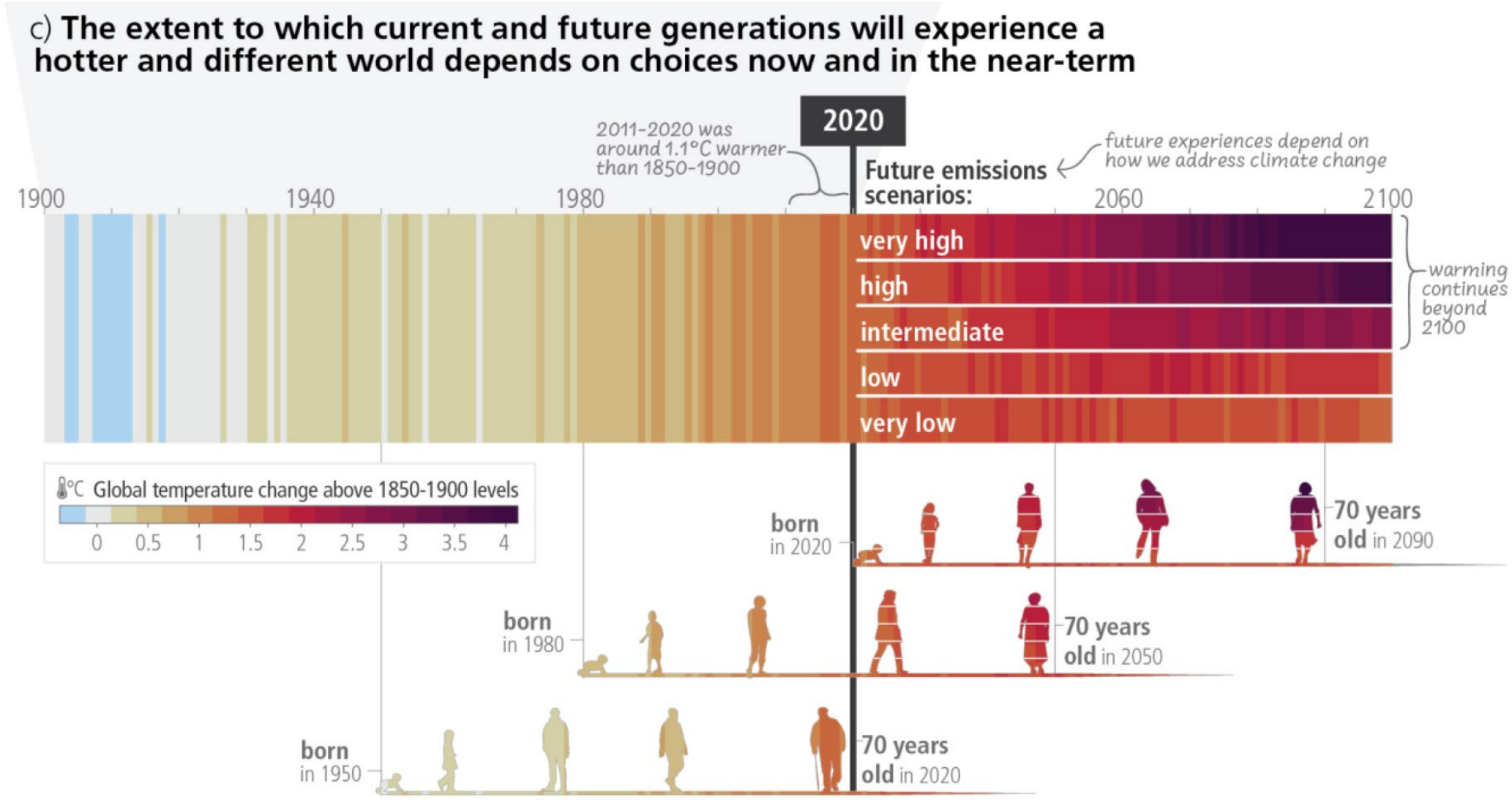
- Per degree of additional warming, children born in 2020 will experience 10,4 additional heatwaves across lifetime (Thiery et al., 2021 Science)
- For a global warming of 0.00023 °C , children born in 2020 will experience 0.0024 extra heatwave across lifetime (i.e. average for every child born that year)
- 131 702 400 Children born in 2020 ➔ On average, 314 370 Children born in 2020 will experience one extra heatwave
- Just one example, Calculation can be repeated for every birth cohort and each of the 6 extreme event categories (all best estimates)

Fraction of global population

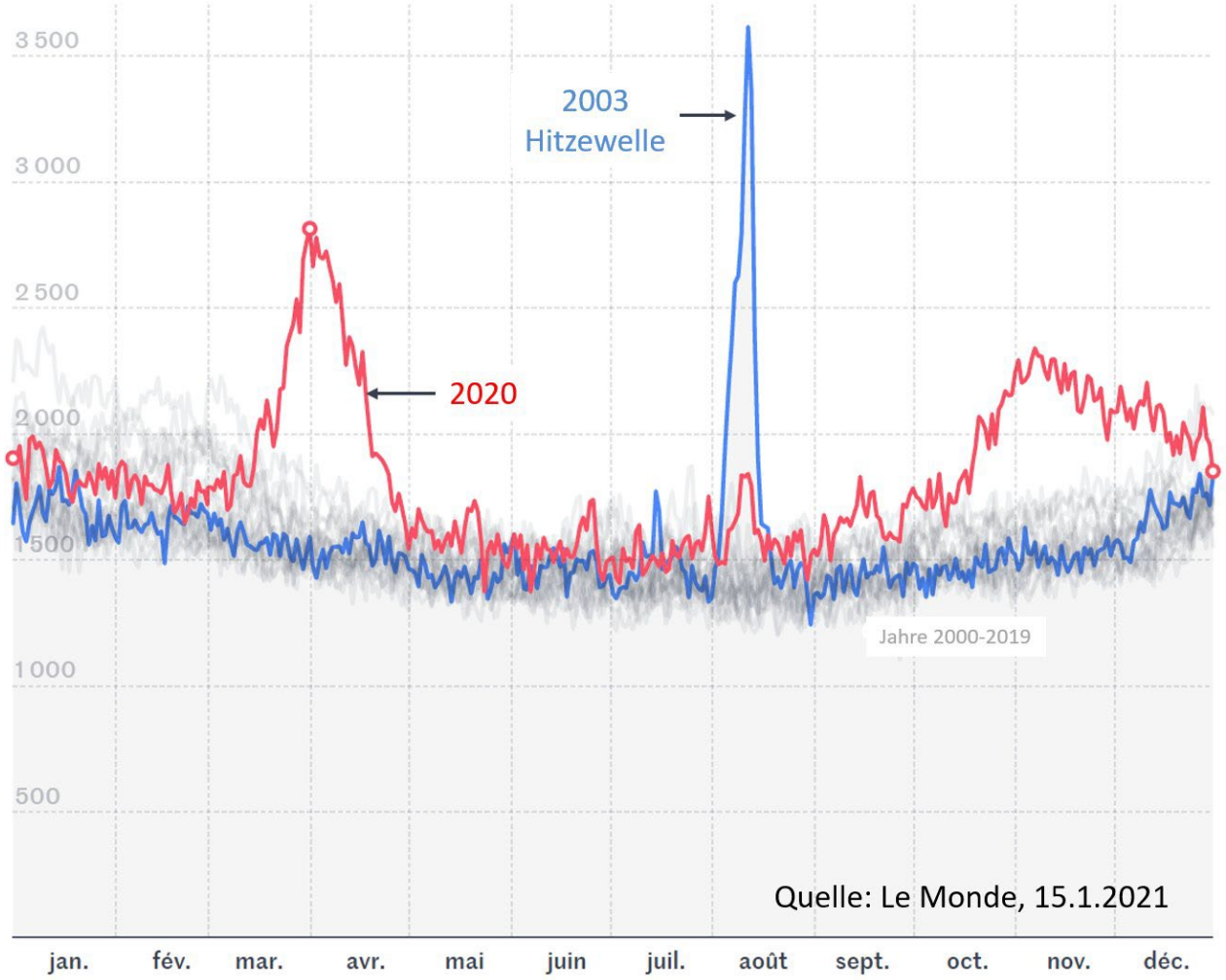
facing unprecedented heatwave exposure



(Grant et al., in review.)

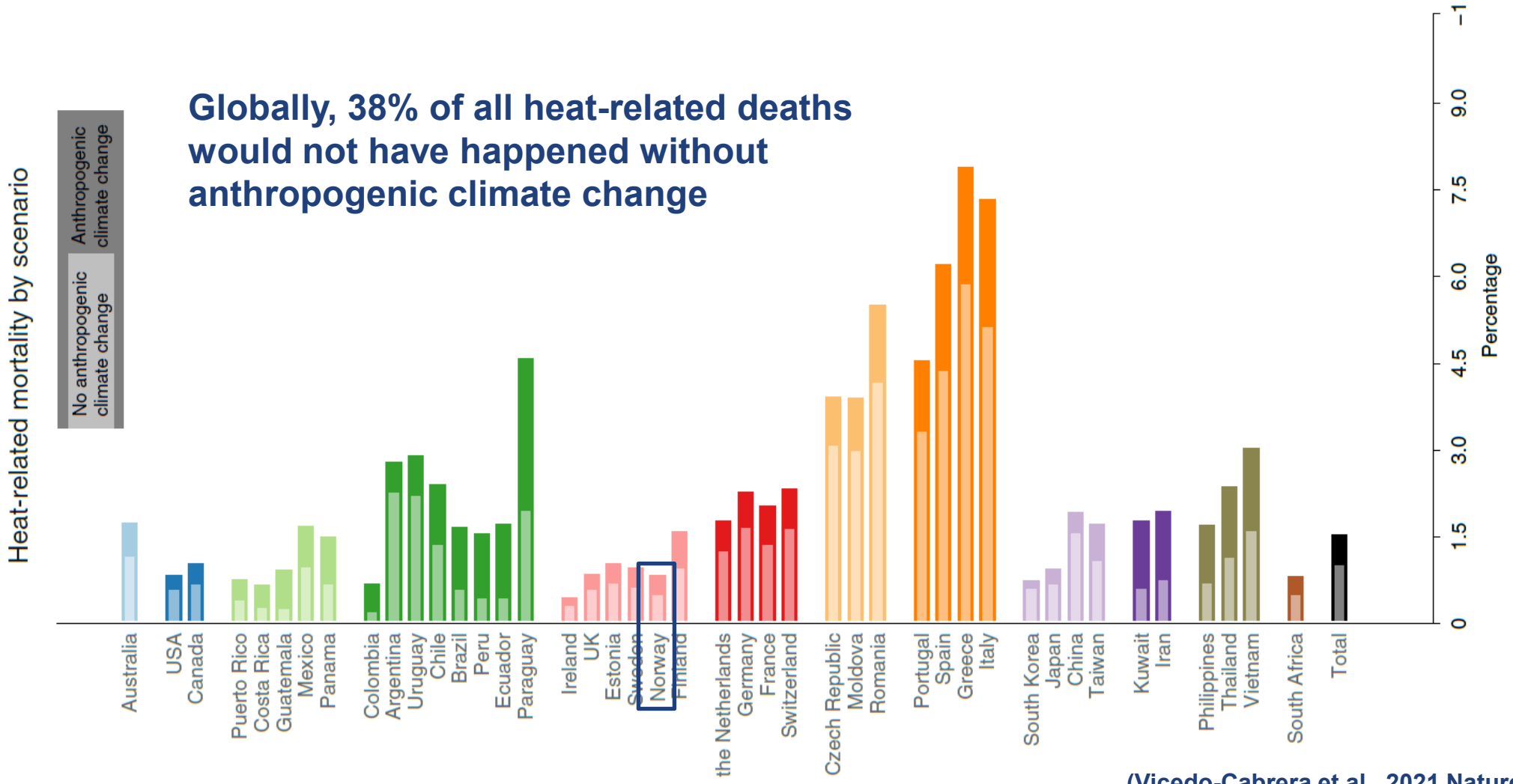

c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term
2020
2011-2020 was around 1.1°C warmer than 1850-1900
future experiences depend on how we address climate change
Future emissions scenarios:
1900
1940
1980
2060
2100
very high
high
intermediate
low
very low
warming continues beyond 2100
°C Global temperature change above 1850-1900 levels
0 0.5 1 1.5 2 2.5 3 3.5 4
born in 2020
70 years old in 2090
born in 1980
70 years old in 2050
born in 1950
70 years old in 2020

Human mortality: 2003 summer heat wave (France)



- "We estimate it is very likely (confidence level >90%)9 that human influence has at least doubled the risk of a heatwave exceeding this threshold magnitude" (Stott et al., 2004 Nature)
- "Out of the estimated ~315 and ~735 summer deaths attributed to the heatwave event in Greater London and Central Paris, respectively, 64 (±3) deaths were attributable to anthropogenic climate change in London, and 506 (±51) in Paris." (Mitchell et al., 2016 Env. Res. Lett.)

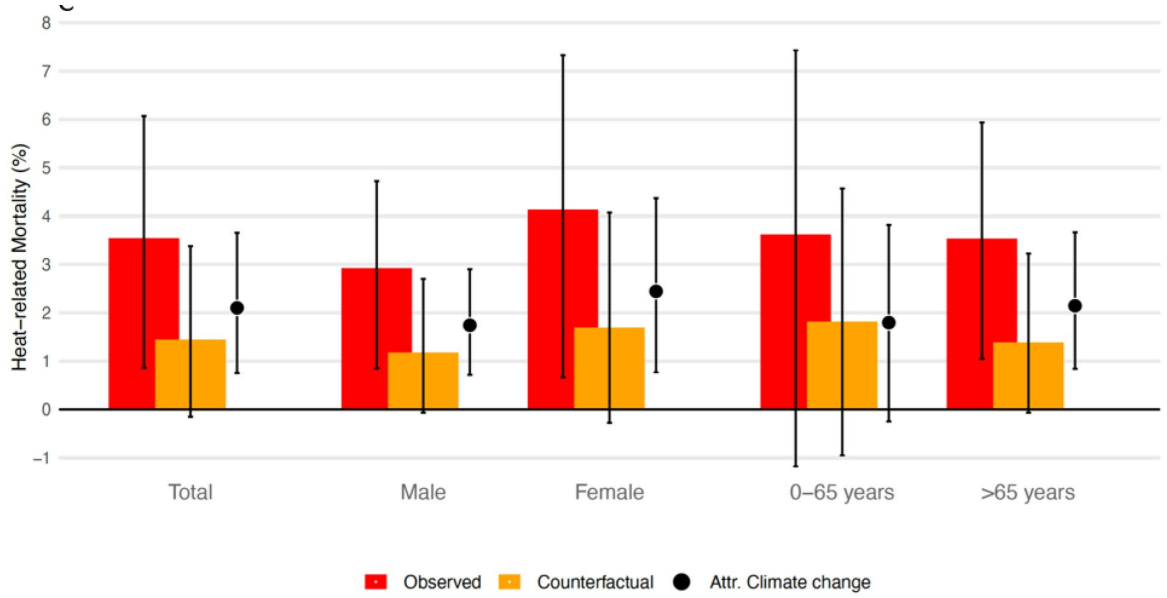
Heat-related deaths, 1991-2018



(Vicedo-Cabrera et al., 2021 Nature Clim. Ch.)

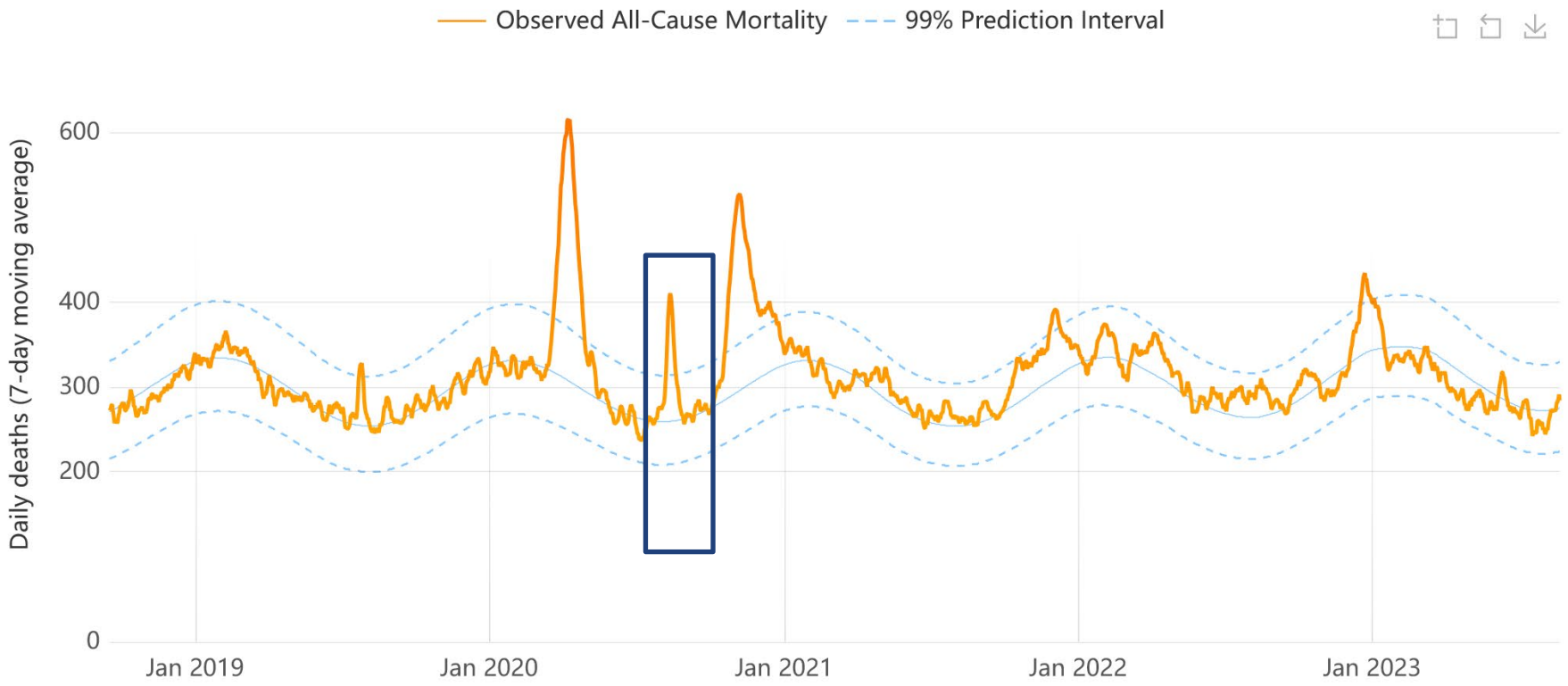
The fraction in recent heatwaves is even higher

- Switzerland, summer 2022
  - “We estimate 623 deaths [151 - 1,068] due to heat between June-August 2022, corresponding to 3.5% of all-cause mortality.”
  - “More importantly, we find that 60% of this burden (370 deaths [133-644]) could have been avoided in absence of human-induced climate change.”

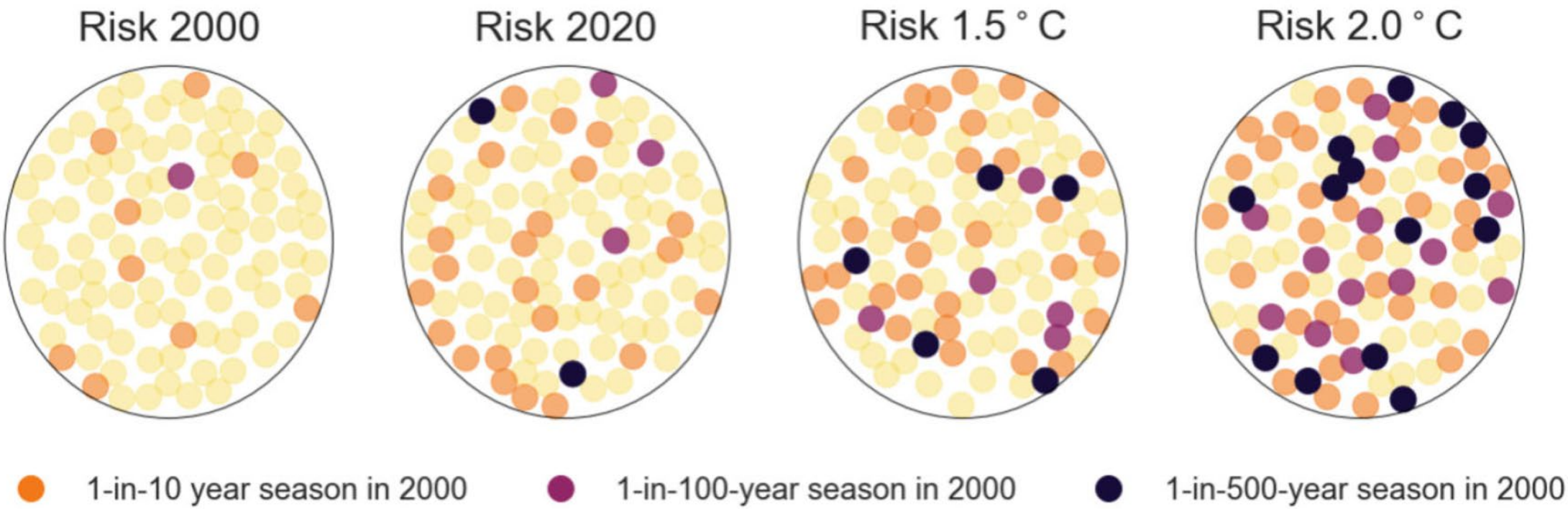


(Vicedo-Cabrera et al., 2023 Env. Res. Lett.)

Belgium


Observed All-Cause Mortality
99% Prediction Interval
Daily deaths (7-day moving average)
600
400
300
200
0
Jan 2019
Jan 2020
Jan 2021
Jan 2022
Jan 2023

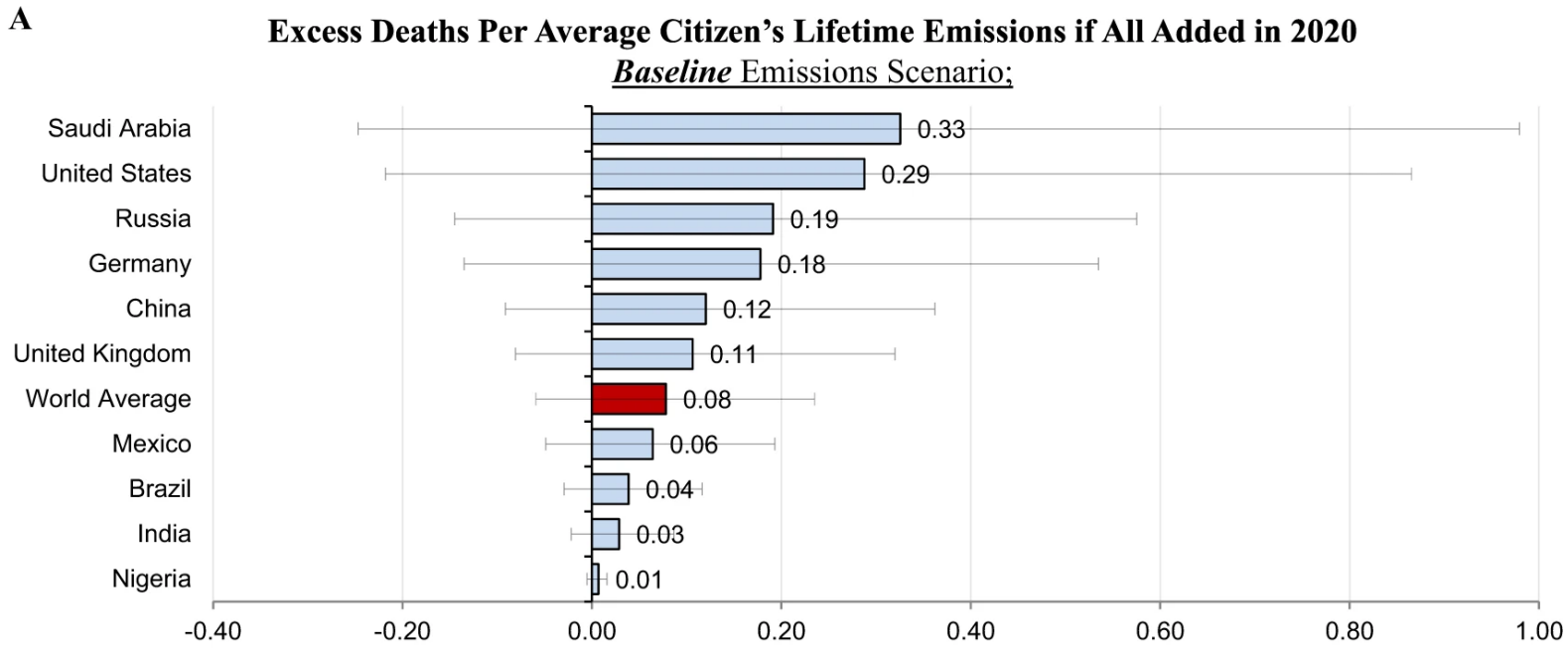
Risk of heat-related mortality is rising rapidly



(Lüthi et al., 2023 Nature Comm.)

The mortality cost of Carbon

"4,434 metric tons of carbon dioxide in 2020 […] causes one excess death globally in expectation between 2020-2100"



Best estimate:

0,4633 GT CO2 eq (Combined) ➔ 104 488 people dying prematurely somewhere in the world between 2020-2100
0,365 GT CO2 eq (Yggdrasil) ➔ 82 318 people dying prematurely somewhere in the world between 2020-2100
0,087 GT CO2 eq (Breidablikk) ➔ 19 621 people dying prematurely somewhere in the world between 2020-2100
0,0113 GT CO2 eq (Tyrving) ➔ 2 548 people dying prematurely somewhere in the world between 2020-2100

(Bressler, 2021 Nature Comm.)

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(Photo: Alexander Radtke)