

Climate change, extreme events, & climate victims

Prof. Dr. Wim Thiery

- **Research Professor, VUB** (2017-pres.)
- **Forbes 30 under 30** (2017)
- **EGU Arne Richter Award** (2023)
- **FWO Scientific Award Climate Research** (2024)
- **2x IPCC Author** (2019; 2021)
- **122 scientific articles** (GS h-index 49)
- **20 Science/Nature-family articles** in last 5 years
- **Research Interest Score > 99% of ResearchGate members**

Wim Thiery



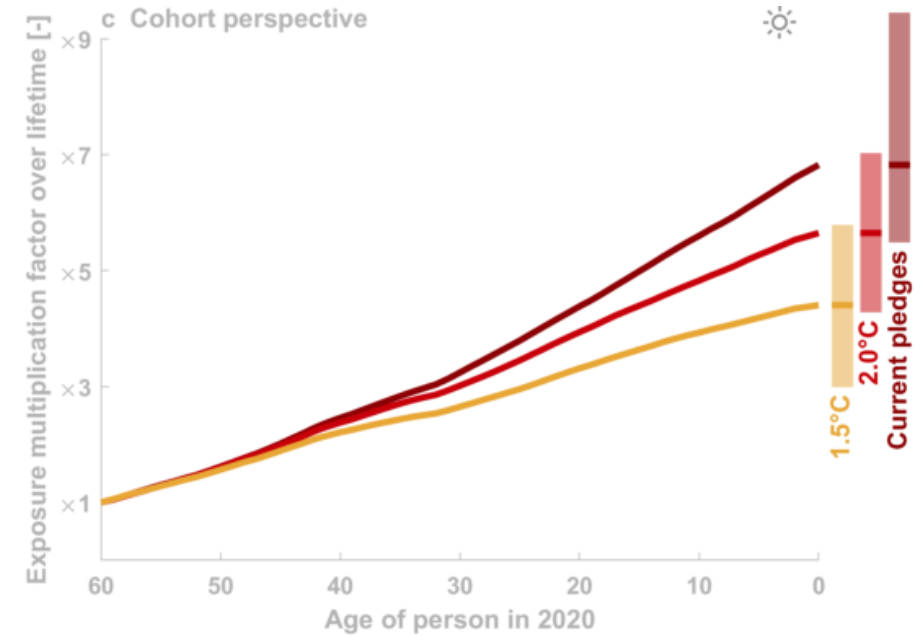
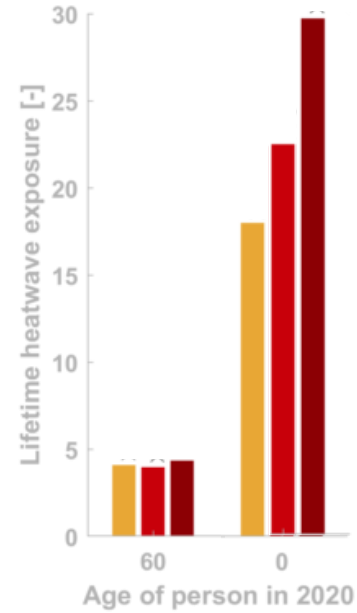
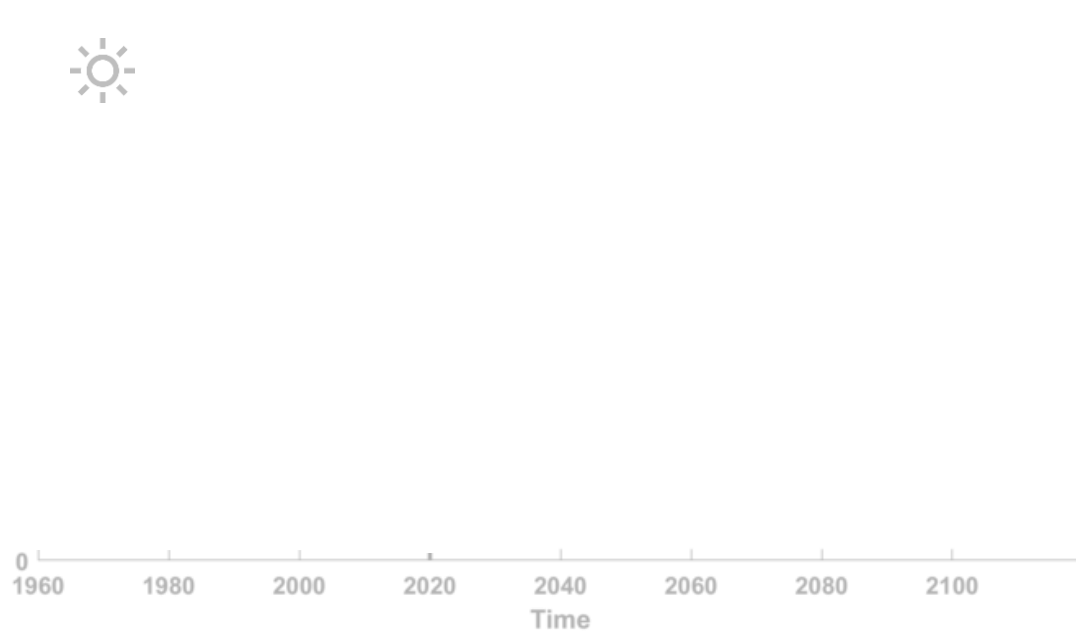
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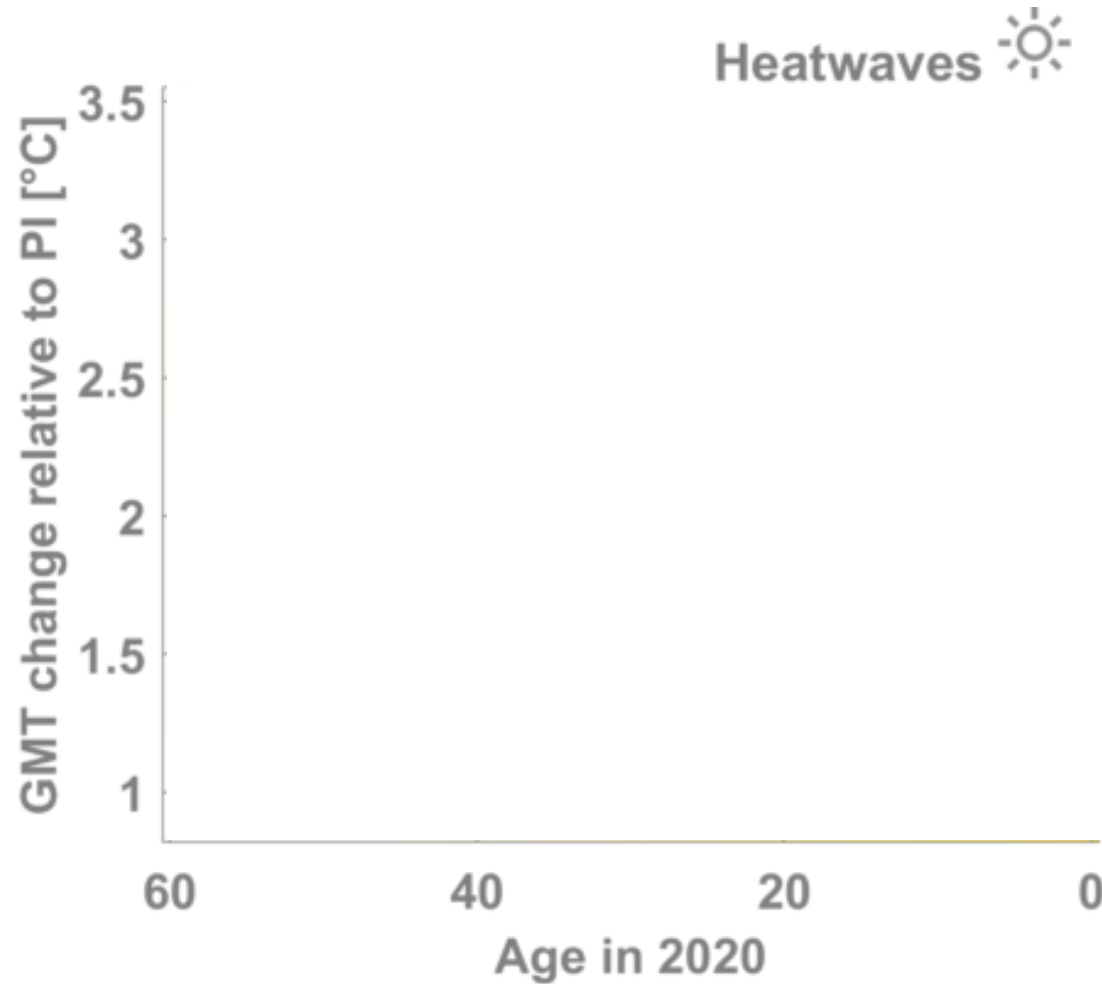
The idea

Integrate exposure of an 'average person' to extreme events across lifetime



(Thiery et al., 2021 Science)

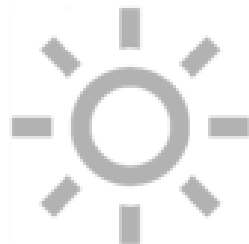
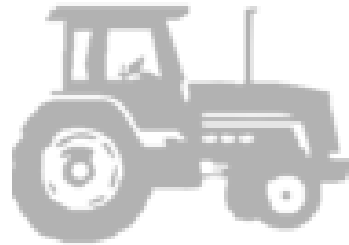
Change in lifetime heatwave exposure



(Thiery et al., 2021 Science)

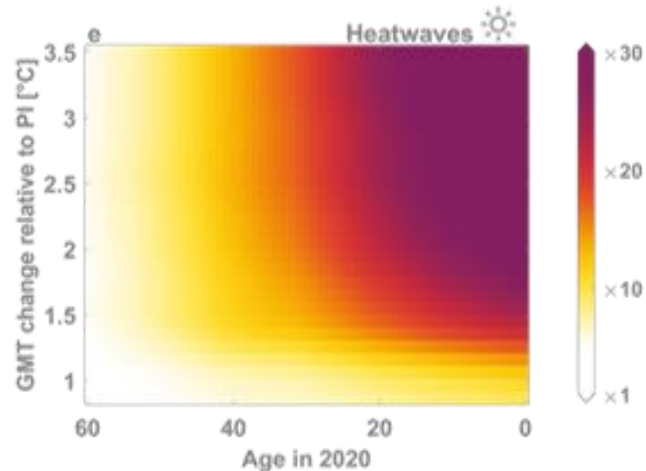
Six impact categories

15 ISIMIP2b models, 273 global-scale projections



(Lange et al., 2020 EF)

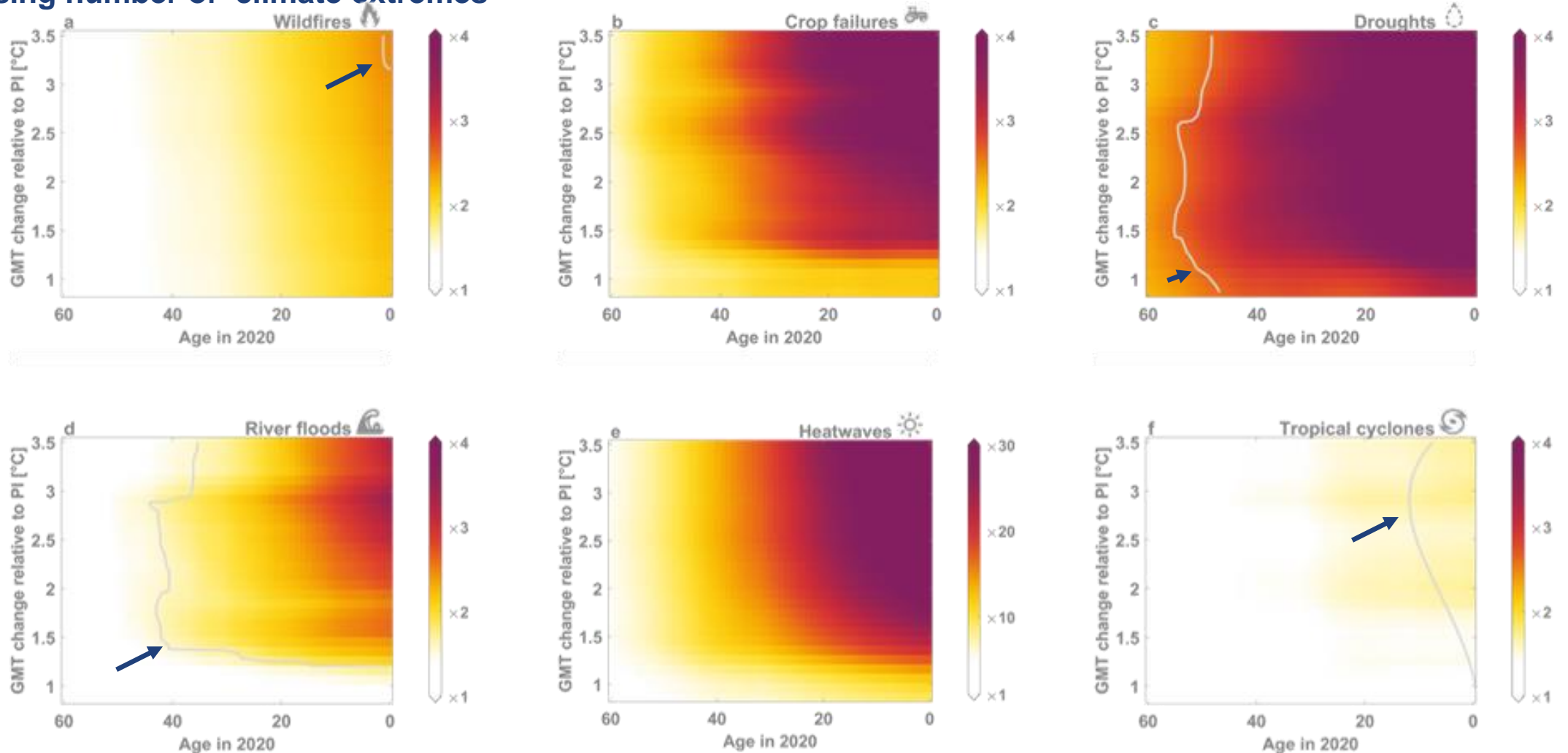
We repeat the analysis of all 6 climate extremes



(Thiery et al., 2021 Science)

Younger generations will be disproportionately exposed

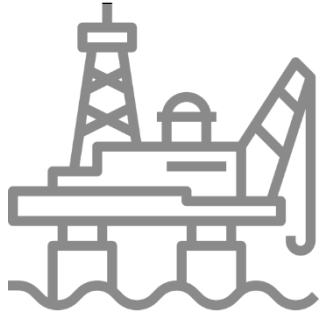
to a rising number of climate extremes



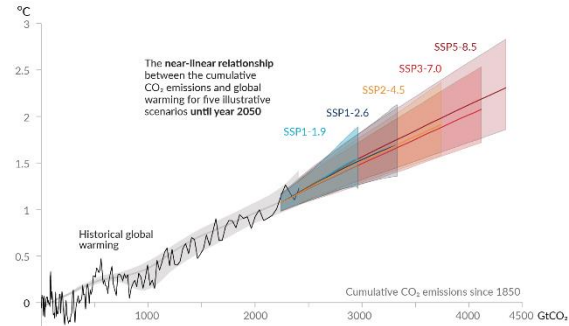
(Thiery et al., 2021 Science)

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

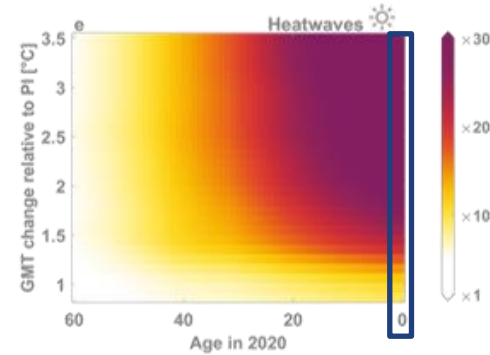
Results applied to this situation



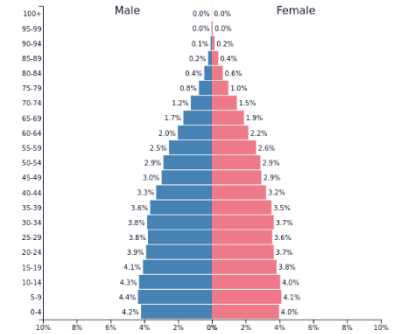
Emissions
(values received)



TCRE
(IPCC, 2021)



exposure slope
(Thierry et al., 2021)



cohort size
(UN, 2021)

$$0.464 \text{ Gt CO}_2 \text{ eq} \times 0.45 \times 10^{-3} \frac{\cancel{\text{Gt CO}_2 \text{ eq}}}{\cancel{\text{Gt CO}_2 \text{ eq}}} \times 10.3783 \frac{\text{heatwaves}}{\cancel{\text{Gt CO}_2 \text{ eq}}} \times 131\,702\,400 \text{ children}$$

On average, 285 397 Children born in 2020 will experience one extra heatwave

Results applied to this situation

- This example calculation represents the ‘best estimate’
- Just one example, calculation can be repeated for different emission values, birth cohorts and climate extremes
- This was done:
 - Tyrving, Breidablikk, Yggdrasil and combined
 - Annual and total values (only totals in this presentation)
 - Birth years 2010-2020
 - 6 climate extremes: heatwaves, droughts, crop failures, wildfires, tropical cyclones, river floods

Results applied to this situation

Number of children facing an additional **heatwave** due to the **total** emissions of

Number of children facing an additional **drought** due to the **total** emissions of

Number of children facing an additional **crop failure** due to the **total** emissions of

Number of children facing an additional **wildfire** due to the **total** emissions of

Number of children facing an additional **tropical cyclone** due to the **total**

Number of children facing an additional **river flood** due to the **total** emissions of

Bi

E

20

2

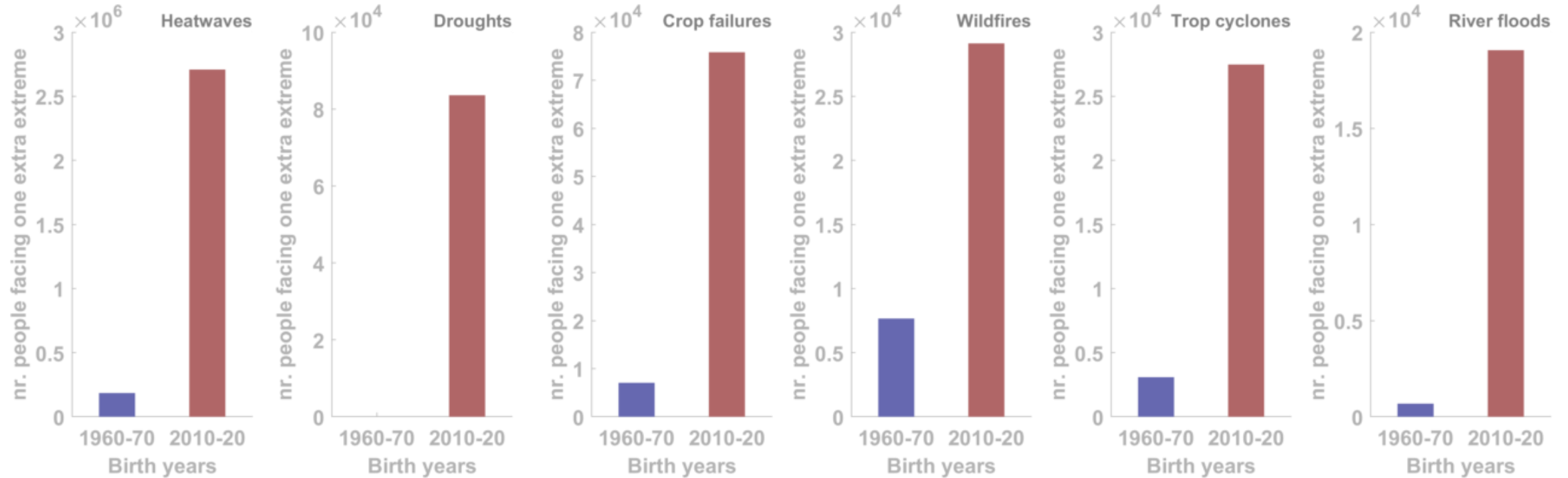
<i>Birth year</i>	Tyrving	Breidablikk	Yggdrasil	Combined
2020	53	389	1633	2077
2019	51	376	1581	2010
2018	49	362	1519	1931
2017	47	347	1458	1854
2016	46	335	1406	1788
2015	44	322	1354	1722
2014	43	312	1310	1665
2013	41	301	1266	1610
2012	39	288	1209	1537
2011	37	275	1154	1467
2010	36	262	1101	1400
2010-2020	486	3569	14991	19061

Results applied to this situation

- For example, 2 708 271 children born in the years 2010 to 2020 are expected to face one additional heatwave in their lifetime due to the total emissions of Tyrving, Breidablikk, and Yggdrasil combined
- Analogously:
 - 83 588 children are expected to face one additional drought
 - 75 822 children are expected to face one additional crop failure
 - 29 122 children are expected to face one additional wildfire
 - 27 478 children are expected to face one additional tropical cyclone
 - 19 061 children are expected to face one additional river flood

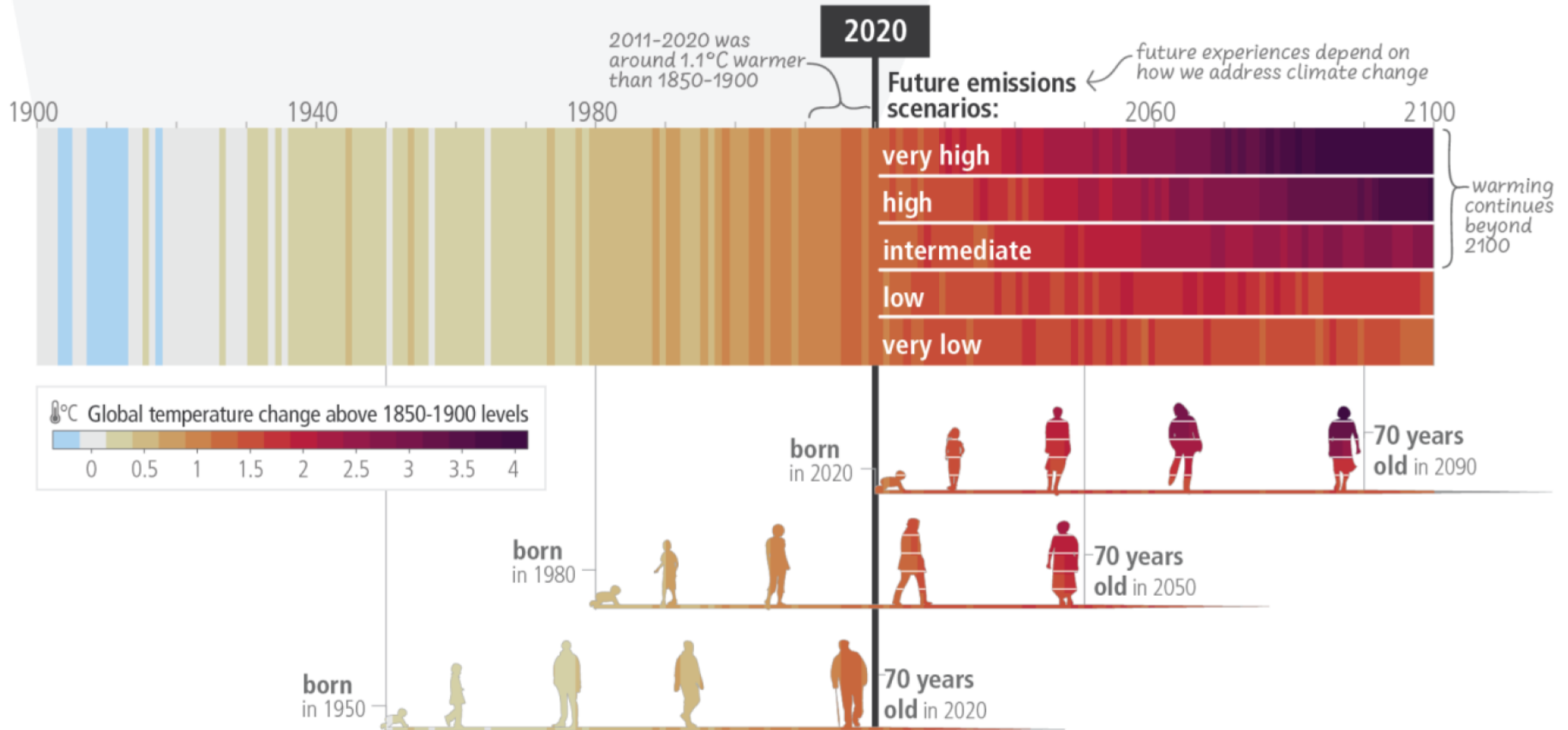
Additional exposure affects young generations disproportionately

as this is a larger group & as they will live more years under a climate affected by near-term emissions



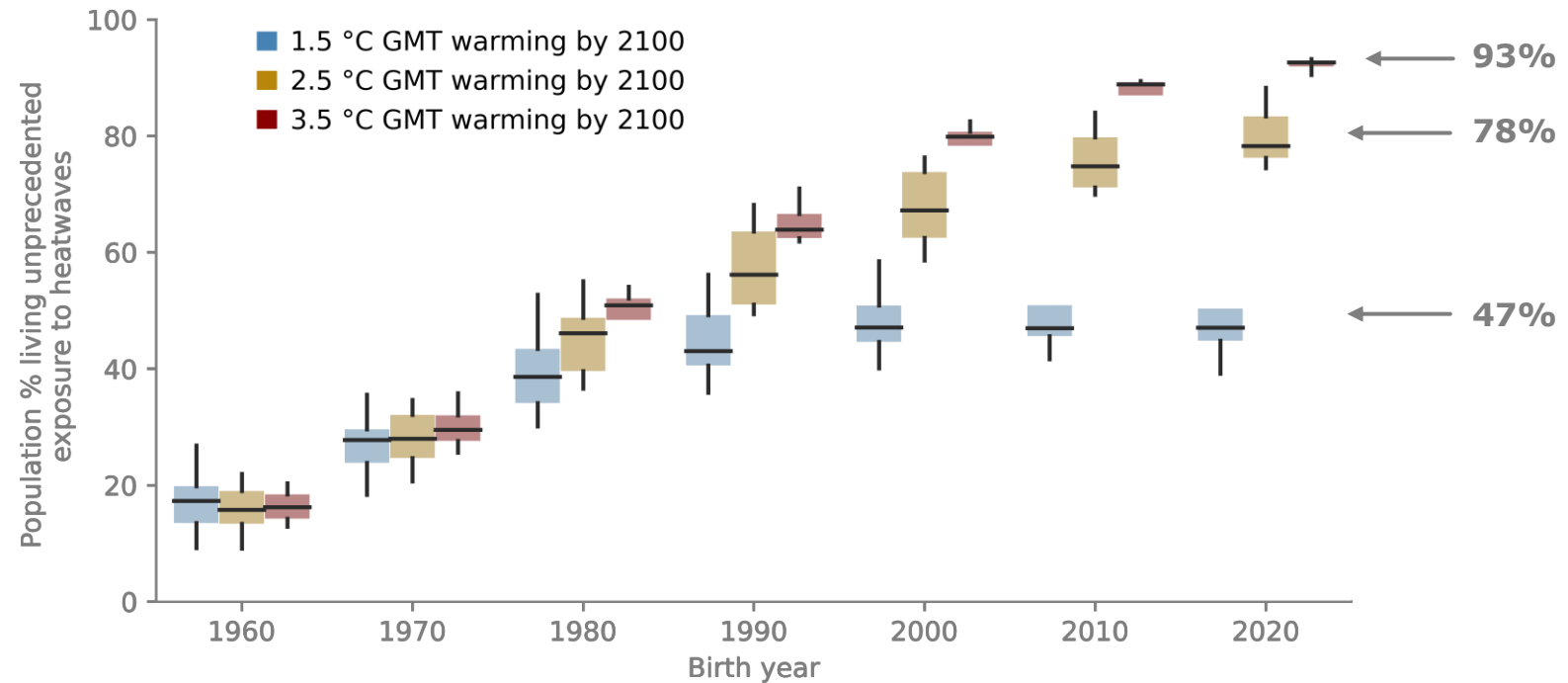
Note the different y-axis ranges

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



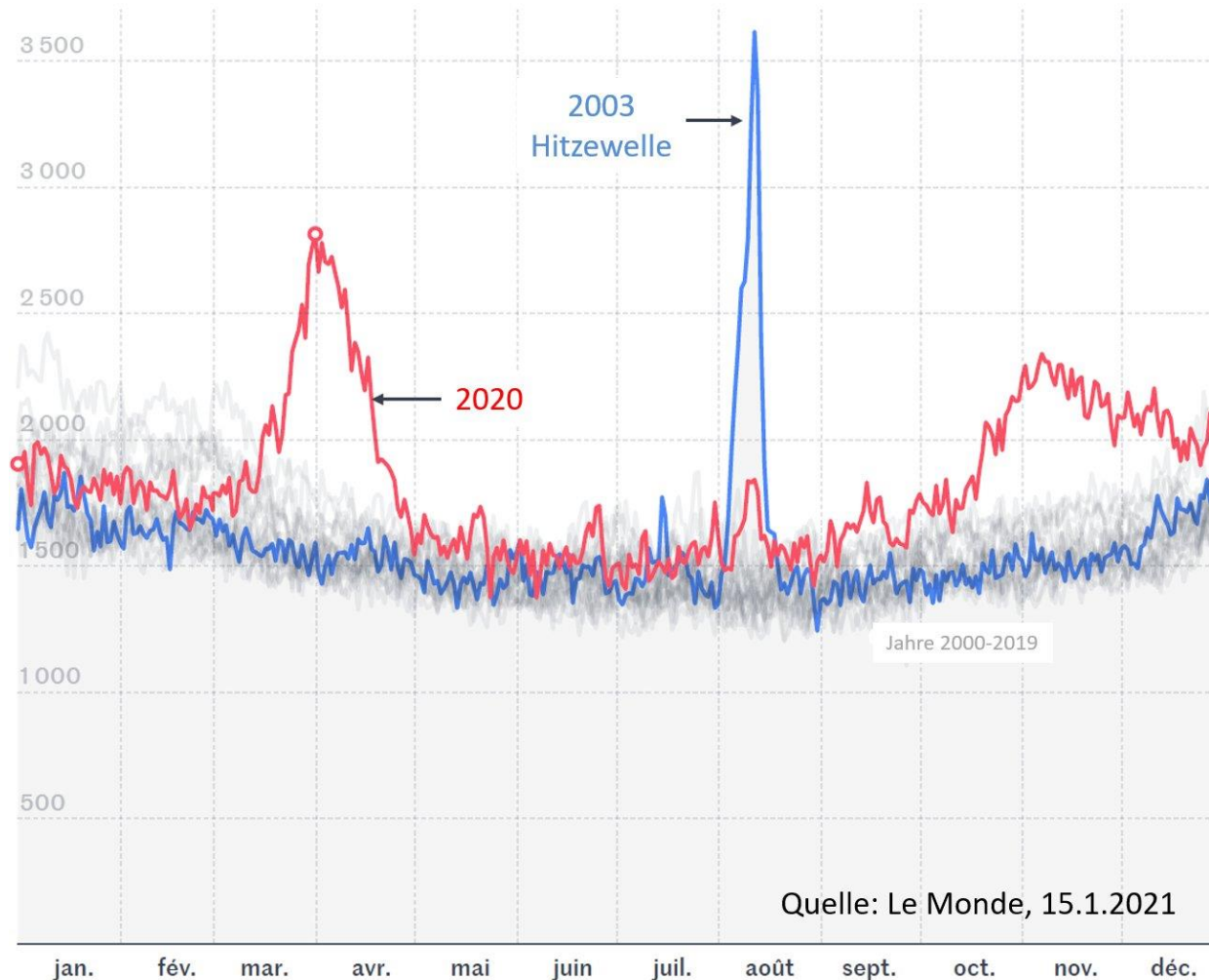
With every increment of warming

an increasing number of young people will experience an unprecedented number of extreme heatwaves



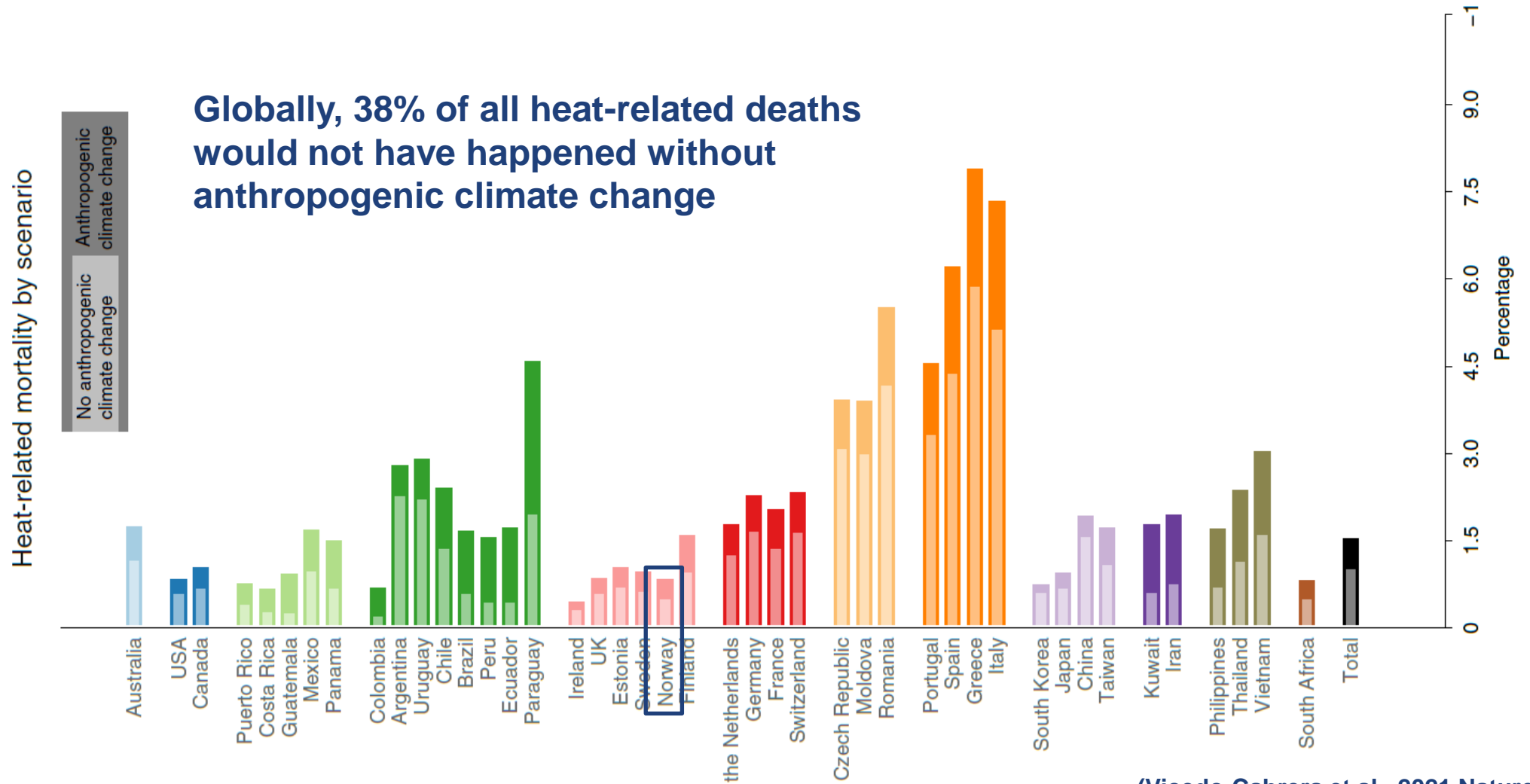
(Grant et al., in review.)

Human mortality: 2003 summer heat wave (France)



- “We estimate it is very likely (confidence level >90%) 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.)

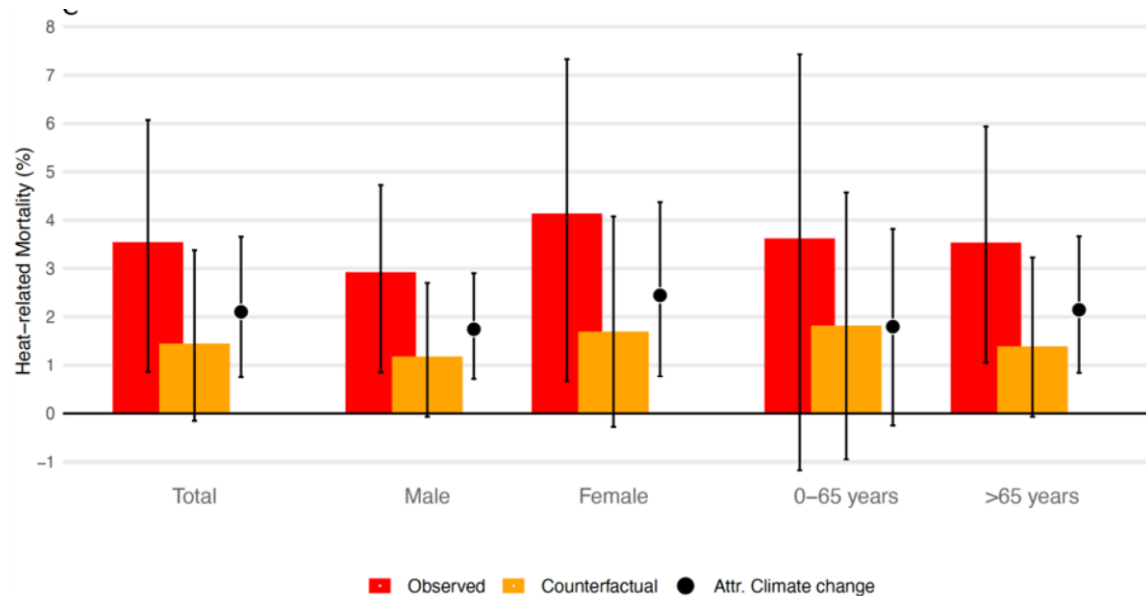
Heat-related deaths, 1991-2018



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

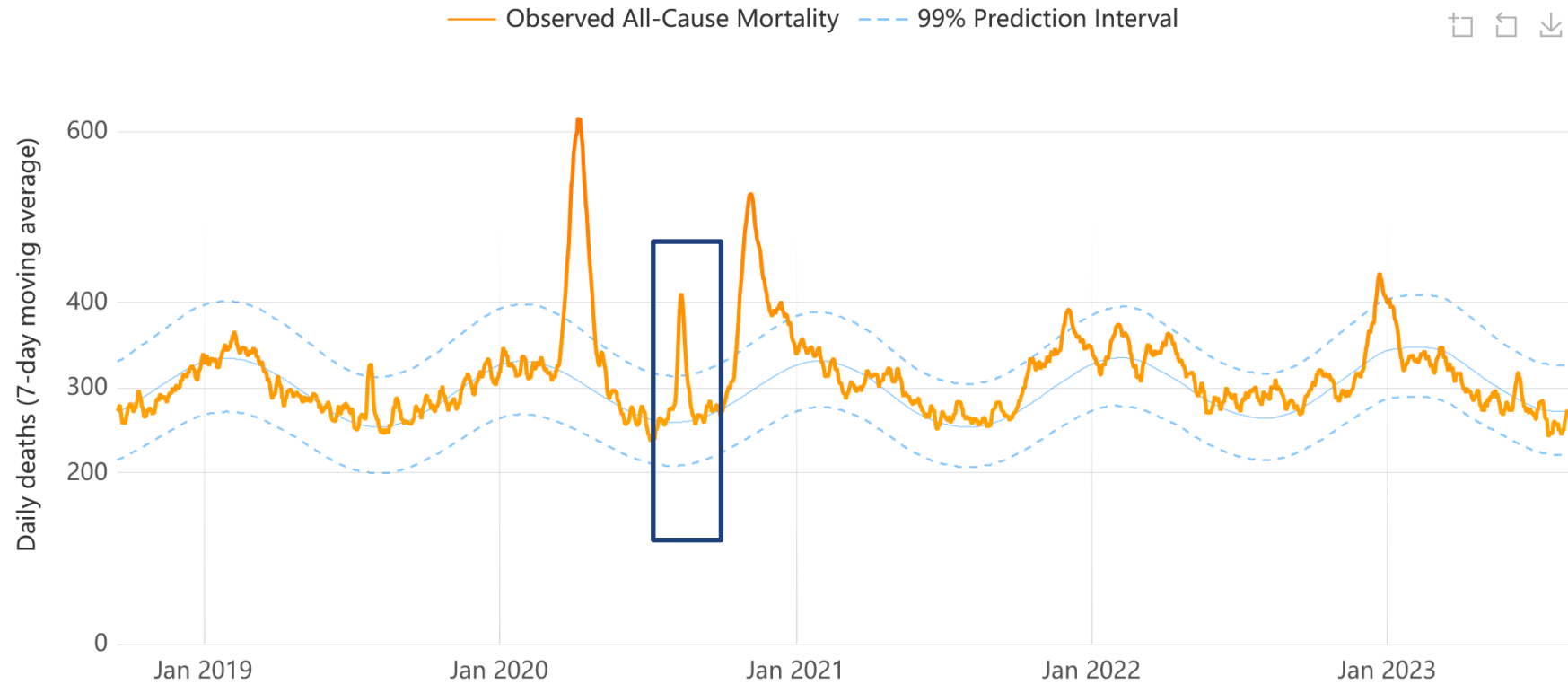
The fraction in recent heatwaves is even higher

- 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



“in the absence of human-caused climate change, almost 70% of this burden could have been prevented” (Tran, 2024)

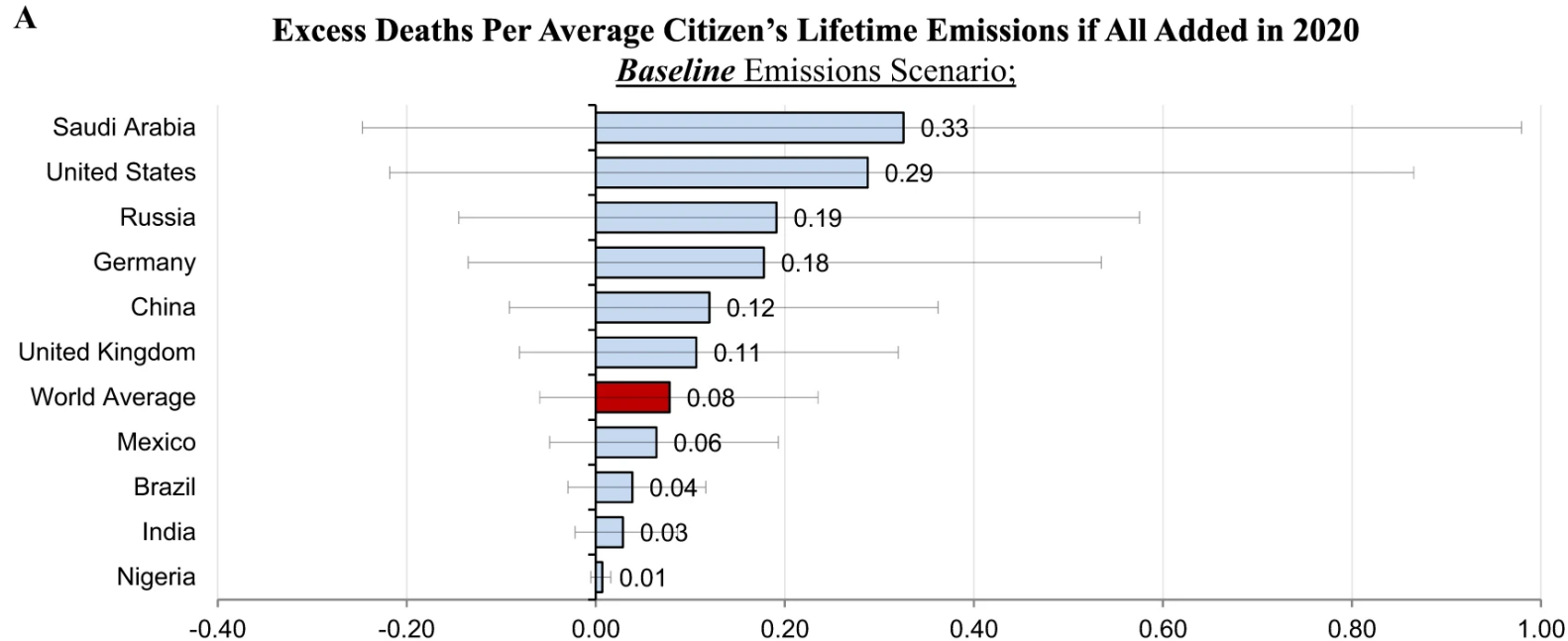
Risk of heat-related mortality is rising rapidly



(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:

- 0,464 GT CO2 eq (Combined) → 104 645 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
- 0,012 GT CO2 eq (Tyrving) → 2 706 people dying prematurely somewhere in the world between 2020-2100

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