

Extended data - figures & tables

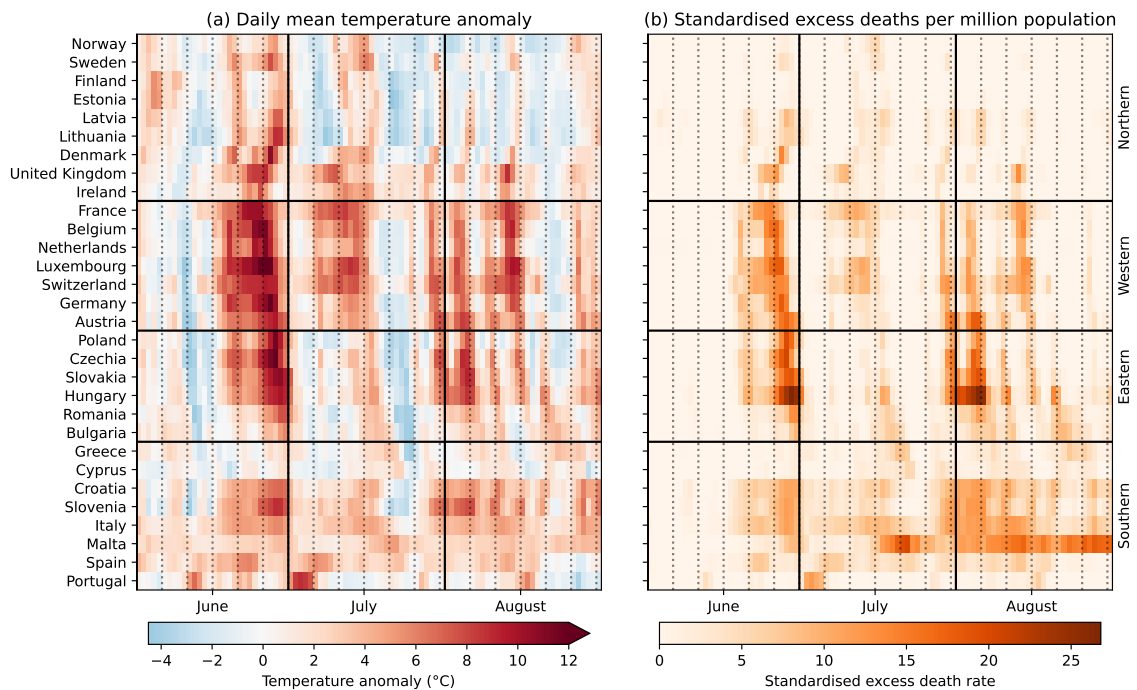


Fig. 1 Daily temperature exposure and mortality burden across 30 European countries. Heatmaps of (a) daily mean temperature anomaly and (b) standardised excess deaths per million population between June and August 2026, averaged over all cities in each country.

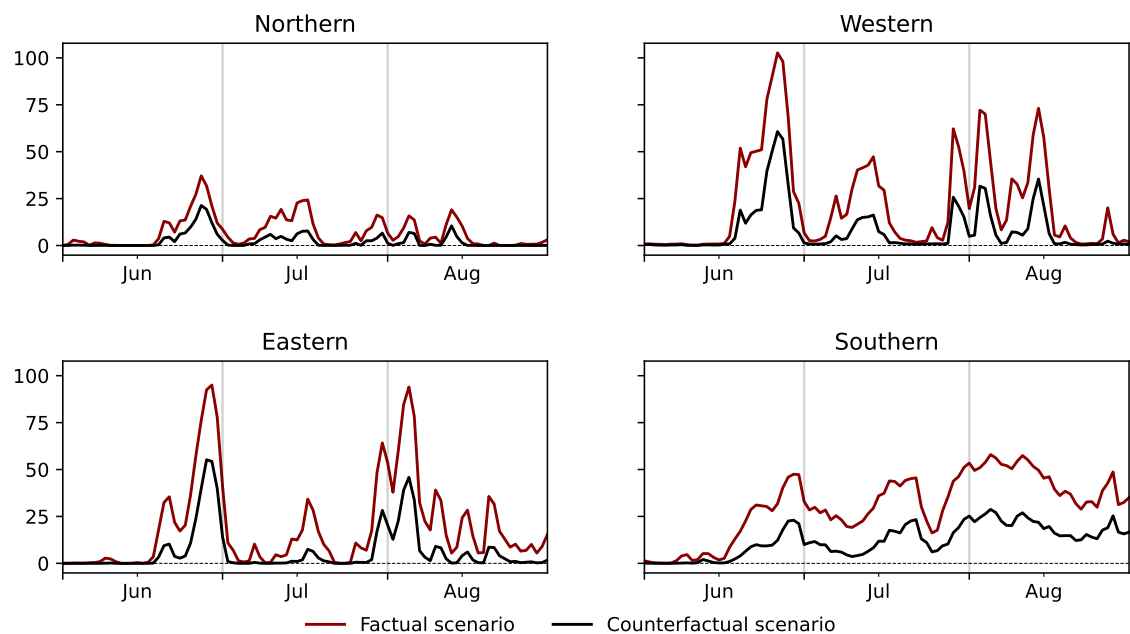


Fig. 2 Varying regional patterns of heat mortality throughout the summer. Standardised daily heat-related excess deaths per million population under the factual and counterfactual scenarios, aggregated over all cities within each region (see Extended Data Table 1 for details of regions)

Table 1 List of countries in each region with number of cities used in the study; mean and maximum daily summer temperature and anomaly with respect to 1991-2020, averaged over all cities (ERA5-Land); mean attributable warming of June-August temperatures averaged over all cities in each country/region, with 95% empirical confidence interval given in parentheses. All temperatures in °C.

Region	Country	N. cities	Mean / max JJA temp	Mean / max JJA anomaly	Attributable warming
Northern	Norway	4	13.8 / 19.0	0.2 / 5.2	1.7 (1.1 - 2.4)
Northern	Sweden	14	17.3 / 23.6	1.0 / 7.7	1.9 (1.1 - 2.6)
Northern	Finland	9	16.4 / 22.1	0.4 / 5.5	2.0 (1.2 - 2.8)
Northern	Estonia	3	17.2 / 22.3	0.4 / 5.6	2.0 (1.2 - 2.9)
Northern	Latvia	10	17.6 / 23.9	0.3 / 7.1	2.1 (1.4 - 3.0)
Northern	Lithuania	6	17.9 / 26.0	0.3 / 8.9	2.2 (1.5 - 3.0)
Northern	Denmark	4	17.6 / 26.6	1.1 / 10.8	1.7 (1.1 - 2.3)
Northern	United Kingdom	135	18.0 / 24.9	2.5 / 9.0	1.8 (1.1 - 2.5)
Northern	Ireland	5	16.6 / 22.5	1.8 / 7.7	1.2 (0.5 - 2.0)
Northern	Northern	190	17.7 / 22.9	2.0 / 7.4	1.8 (1.2 - 2.4)
Western	France	72	23.0 / 29.3	3.8 / 10.4	2.7 (1.9 - 3.5)
Western	Belgium	15	20.3 / 28.8	2.8 / 11.4	2.4 (1.6 - 3.3)
Western	Netherlands	47	19.7 / 28.1	2.3 / 11.2	2.2 (1.6 - 2.8)
Western	Luxembourg	1	20.8 / 29.7	3.4 / 12.2	2.7 (1.9 - 3.5)
Western	Switzerland	12	21.4 / 27.1	4.0 / 9.5	2.9 (2.2 - 3.6)
Western	Germany	127	20.6 / 29.8	2.5 / 12.0	2.5 (1.8 - 3.2)
Western	Austria	6	20.9 / 27.5	3.1 / 9.6	3.1 (2.2 - 4.0)
Western	Western	280	21.1 / 28.3	2.9 / 10.2	2.5 (1.9 - 3.2)
Eastern	Poland	68	19.5 / 29.4	1.1 / 11.5	2.6 (1.9 - 3.2)
Eastern	Czechia	18	20.4 / 29.8	2.2 / 12.2	2.8 (2.1 - 3.6)
Eastern	Slovakia	8	21.5 / 29.7	2.4 / 10.7	3.0 (2.1 - 3.9)
Eastern	Hungary	19	24.3 / 31.4	2.9 / 9.9	2.9 (1.8 - 3.9)
Eastern	Romania	35	22.4 / 28.4	1.3 / 7.8	2.9 (2.0 - 4.0)
Eastern	Bulgaria	18	23.0 / 27.1	1.3 / 5.8	2.8 (1.9 - 3.8)
Eastern	Eastern	166	21.2 / 28.4	1.6 / 9.3	2.8 (2.0 - 3.5)
Southern	Greece	14	25.2 / 28.8	0.9 / 3.7	2.1 (1.4 - 3.0)
Southern	Cyprus	3	28.5 / 32.3	0.3 / 2.7	2.1 (0.2 - 3.8)
Southern	Croatia	7	24.9 / 29.4	2.6 / 6.9	3.1 (2.1 - 3.9)
Southern	Slovenia	2	22.6 / 28.9	3.0 / 8.8	3.2 (2.0 - 4.3)
Southern	Italy	87	26.3 / 29.3	3.2 / 5.8	2.7 (1.8 - 3.6)
Southern	Malta	1	27.3 / 30.7	2.6 / 5.1	0.9 (-1.8 - 3.5)
Southern	Spain	90	25.2 / 28.3	2.6 / 6.1	2.6 (1.9 - 3.3)
Southern	Portugal	14	21.8 / 28.5	1.2 / 8.8	1.8 (1.1 - 2.5)
Southern	Southern	218	25.4 / 28.1	2.6 / 5.1	2.6 (1.9 - 3.2)
Europe	Europe	854	21.5 / 26.1	2.4 / 7.3	2.5 (1.9 - 2.9)

Table 2 Modelled mortality per age group: population, median number of expected heat-deaths in the factual scenario, absolute number of deaths attributable to human-caused warming, and proportion of deaths attributable to human-caused warming during June-August 2026 in 854 European cities, aggregated per age group. Numbers in parentheses indicate 95% empirical confidence intervals.

Age	Population	Heat deaths	Difference	Proportion
20-44	71,616,048	833 (628, 1,053)	419 (283, 559)	0.50 (0.39, 0.62)
45-64	56,935,376	5,189 (4,452, 5,832)	3,126 (2,487, 3,755)	0.61 (0.49, 0.70)
65-74	22,676,014	7,646 (6,861, 8,346)	4,848 (3,924, 5,667)	0.64 (0.51, 0.72)
75-84	15,482,080	14,182 (12,979, 15,203)	9,181 (7,333, 10,732)	0.65 (0.53, 0.73)
85+	6,008,162	22,502 (20,620, 24,414)	14,984 (11,829, 17,634)	0.67 (0.54, 0.76)
Total	172,717,680	50,391 (46,026, 53,878)	32,619 (26,078, 38,237)	0.65 (0.53, 0.73)

Table 3 Daily mean/max temperature and temperature anomaly (relative to 1991-2020 climatology for each day of the year) over all 854 cities during selected heat periods, along with modelled number of heat-related excess deaths, absolute number of deaths attributable to human-caused warming, and proportion of deaths due to human-caused warming.

Period	Mean/max daily temperature	Mean/max daily anomaly	Excess deaths	N. attributable	Prop. attributable
05-21 – 05-31	19.5 / 21.6	4.1 / 6.1	1,508 (1,305, 1,725)	1,017 (644, 1,282)	0.67 (0.43, 0.82)
06-17 – 07-01	23.7 / 26.1	5.3 / 7.3	14,539 (13,349, 15,592)	8,262 (6,145, 10,198)	0.57 (0.42, 0.68)
07-05 – 07-18	22.6 / 23.5	3.1 / 3.8	9,314 (8,582, 10,091)	6,437 (4,723, 7,673)	0.69 (0.51, 0.81)
07-28 – 08-06	23.7 / 25.2	3.0 / 4.5	9,400 (8,481, 10,162)	6,001 (4,559, 7,191)	0.64 (0.49, 0.75)
08-08 – 08-18	23.0 / 24.6	3.0 / 4.9	9,082 (8,336, 9,768)	6,108 (4,612, 7,341)	0.67 (0.51, 0.79)

Table 4 Annual mortality estimates across the 854 cities for the five years from 2000–2025 with the highest estimated heat mortality, reproduced from [?].

Year	Factual	Counterfactual	N. attributable	Prop. attributable
2022	29,480 (26,643, 32,006)	12,116 (9,121, 15,963)	17,215 (13,570, 20,173)	0.59 (0.46, 0.68)
2003	28,462 (25,709, 31,199)	16,588 (13,673, 19,832)	11,867 (9,172, 14,180)	0.42 (0.33, 0.50)
2024	26,005 (22,858, 28,737)	8,860 (6,003, 12,810)	17,111 (13,188, 20,055)	0.66 (0.52, 0.76)
2025	24,572 (22,064, 26,867)	7,760 (5,385, 11,004)	16,768 (13,620, 19,321)	0.68 (0.56, 0.77)
2015	23,673 (20,946, 25,841)	11,101 (8,420, 14,457)	12,537 (9,361, 15,049)	0.53 (0.40, 0.63)

Table 5 Comparison of our mortality estimates with other reported numbers. Reported regional estimates of heat-related mortality for specific periods, and our estimates over the same region and period. ‘Coverage’ denotes the approximate proportion of each region’s population represented within the study region. *RKI report covers calendar weeks 15 (April 6th) to 36 (September 6th).

Sources:

1. ?];
2. <https://www.santepubliquefrance.fr/en/press/5764-excess-deaths-france-during-heat-wave-june-17-july-2>;
3. <https://www.gov.uk/government/publications/interim-heat-mortality-monitoring-report-england-may-and-june-2026/>;
4. Robert Koch Institute [?];
5. https://momo.isciii.es/panel_momo/.

Region	Period	Reported	Our estimate	Coverage
Europe ¹	22/06–28/06	20,390	9,585 (8,815, 10,310)	40%
France ²	17/06–02/07	5,764	2,305 (1,990, 2,606)	30%
UK ³	21/06–28/06	2,124	1,375 (1,122, 1,611)	50%
Germany ⁴	01/05–31/08*	16,000	6,477 (5,478, 7,314)	30%
Spain ⁵	01/06–31/08	5,123	6,824 (5,744, 7,984)	40%