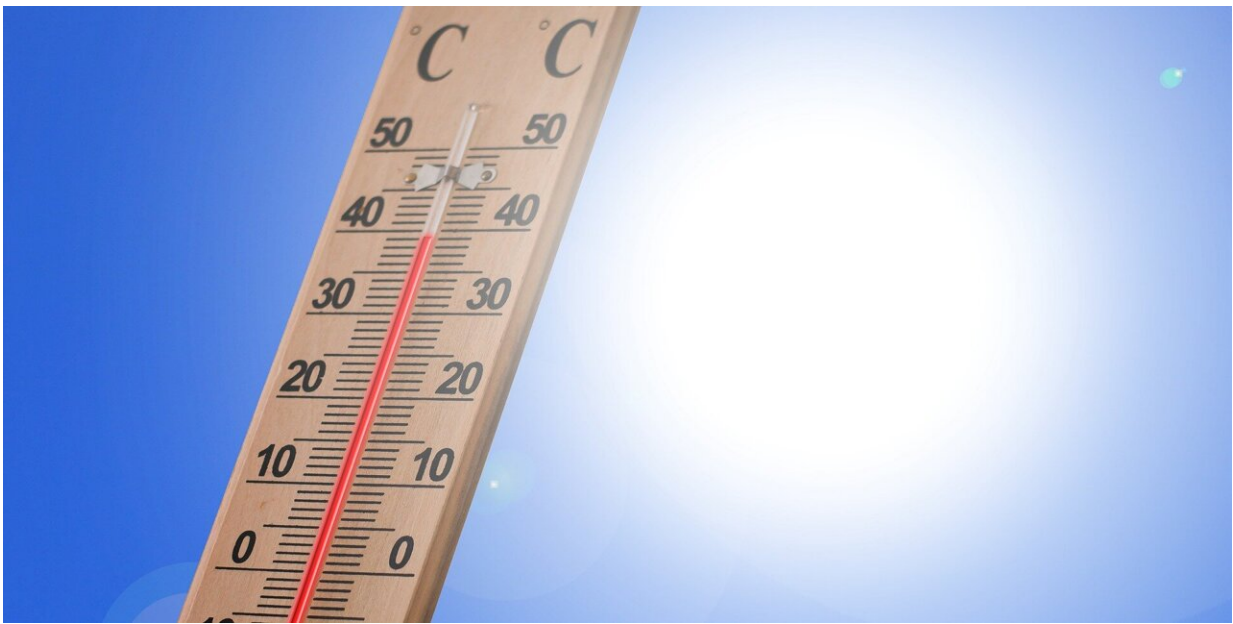


Record-breaking heat in the summer of 2022 caused more than 61,000 deaths in Europe, study finds

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The summer of 2022 was the hottest summer ever recorded in Europe and was characterized by an intense series of record-breaking heat waves, droughts and forest fires. While Eurostat, the European statistical office, already reported unusually high excess mortality for those dates, until now the fraction of mortality attributable to heat had not been quantified.

This is precisely what has been done in a study led by the Barcelona Institute for Global Health (ISGlobal) in collaboration with the French National Institute of Health (Inserm). The analysis, published in *Nature Medicine*, estimates 61,672 heat-attributable deaths between 30 May and 4 September 2022.

The research team obtained temperature and [mortality data](#) for the period 2015–2022 for 823 regions in 35 European countries, whose [total population](#) represents more than 543 million people. These data were used to estimate epidemiological models and predict temperature-attributable mortality for each region and week of the summer period.

The summer of 2022 was a season of unrelenting heat. Records show that temperatures were warmer-than-average during every week of the summer period. The highest temperature anomalies were recorded during the hottest month, from mid-July to mid-August. This coincidence magnified, according to the researchers, heat-related mortality, causing 38,881 deaths between 11 July and 14 August. Within that period of just over a month there was an intense pan-European heat wave between 18 and 24 July, to which a total of 11,637 deaths are attributed.

Most affected countries

In absolute terms, the country with the highest number of heat-attributable deaths over the entire summer of 2022 was Italy, with a total of 18,010 deaths, followed by Spain (11,324) and Germany (8,173).

If the data is ordered by heat-related mortality rate, the top country is Italy, with 295 deaths per million, followed by Greece (280), Spain (237) and Portugal (211). The European average was estimated at 114 deaths per million.

On the other hand, looking only at temperature anomalies, the country with warmest value was France, with $+2.43^{\circ}\text{C}$ above the average values for the period 1991–2020, followed by Switzerland ($+2.30^{\circ}\text{C}$), Italy ($+2.28^{\circ}\text{C}$), Hungary ($+2.13^{\circ}\text{C}$) and Spain ($+2.11^{\circ}\text{C}$).

Data of the 35 countries

This [chart](#) shows the details of the mortality estimates for the 35 countries analyzed.

The study included an analysis by age and sex, showing a very marked increase in mortality in the older age groups, and especially in women. Thus, it is estimated that there were 4,822 deaths among those under 65, 9,226 deaths among those between 65 and 79, and 36,848 deaths among those over 79.

In terms of gender analysis, the data show that heat-attributable mortality was 63% higher in women than in men, with a total of 35,406 premature deaths (145 deaths per million), compared to an estimated 21,667 deaths in men (93 deaths per million). This greater vulnerability of women to heat is observed in the population as a whole and, above all, in those over 80 years of age, where the mortality rate is 27% higher than that of men. In contrast, the male mortality rate is 41% higher in those under 65, and 13% higher in those aged 65–79.

Lessons from the 2003 heat wave

To date, the highest summer [mortality](#) in Europe was registered in 2003, when more than 70,000 excess deaths were recorded.

"The summer of 2003 was an exceptionally rare phenomenon, even when taking into account the anthropogenic warming observed until then. This exceptional nature highlighted the lack of prevention plans

and the fragility of health systems to cope with climate-related emergencies, something that was to some extent addressed in subsequent years," explains Joan Ballester Claramunt, first author of the study and researcher at ISGlobal, who holds a grant from the European Research Council.

"In contrast, the temperatures recorded in the summer of 2022 cannot be considered exceptional, in the sense that they could have been predicted by following the temperature series of previous years, and that they show that warming has accelerated over the last decade," adds Ballester.

"The fact that more than 61,600 people in Europe died of heat stress in the summer of 2022, even though, unlike in 2003, many countries already had active prevention plans in place, suggests that the adaptation strategies currently available may still be insufficient," says Hicham Achebak, researcher at Inserm and ISGlobal and last author of the study.

"The acceleration of warming observed over the last ten years underlines the urgent need to reassess and substantially strengthen prevention plans, paying particular attention to the differences between European countries and regions, as well as the age and gender gaps, which currently mark the differences in vulnerability to heat," he adds.

Europe is the continent experiencing the greatest warming, up to 1°C more than the global average. Estimates by the research team suggest that, in the absence of an effective adaptive response, the continent will face an average of more than 68,000 [premature deaths](#) each [summer](#) by 2030 and more than 94,000 by 2040.

More information: Joan Ballester, Heat-related mortality in Europe during the summer of 2022, *Nature Medicine* (2023). [DOI: 10.1038/s41591-023-02419-z](https://doi.org/10.1038/s41591-023-02419-z).

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