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**Record-breaking Heat in the Summer of 2022 Caused more than 61,000 Deaths in Europe**

*An epidemiological analysis published in Nature Medicine estimates that 63% more women than men died due to heat, with the highest incidence in the Mediterranean region*

**Barcelona, XXX, 2023 (EMBARGOED)**-. The summer of 2022 was the hottest summer ever recorded in Europe and was characterised 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 a study led by the Barcelona Institute for Global Health (ISGlobal), a centre supported by the "la Caixa" Foundation, has done. 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 heatwave 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°C above the average values for the period 1991-2020, followed by **Switzerland** (+2.30°C), **Italy** (+2.28°C), Hungary (+2.13°C) and Spain (+2.11°C).

**Table 1. The 10 European countries with the highest mortality rate (deaths per million) attributable to heat in summer 2022.**

Country	Attributable Rate (deaths per million)			Attributable Rate (deaths per million)		
	Overall	Women	Men	0-64	65-79	80+
Italy	295	379	211	21	244	3,290
Greece	280	367	153	20	198	2,977
Spain	237	295	181	21	222	3,273
Portugal	211	222	166	24	219	2,036
Bulgaria	176	182	157	20	384	2,271
Croatia	172	213	104	10	244	2,209
Malta	147	166	160	34	189	1,895
Lithuania	128	99	138	34	199	1,334
Estonia	123	157	61	26	167	885
Romania	122	110	135	30	273	1,400
<b>Europe</b>	<b>114</b>	<b>145</b>	<b>93</b>	<b>16</b>	<b>160</b>	<b>1,684</b>

**Table 2. Top 10 European countries with the highest number of heat-attributable deaths in summer 2022.**

Country	Attributable Deaths (number)		
	Overall	Women	Men
Italy	18,010	11,917	6,268
Spain	11,324	7,190	4,250
Germany	8,173	3,925	2,771
France	4,807	2,424	2,584
United Kingdom	3,469	<i>Not Available</i>	<i>Not Available</i>
Greece	3,092	2,076	822
Romania	2,455	1,130	1,323
Portugal	2,212	1,227	828
Bulgaria	1,277	678	556
Poland	763	559	259
<b>Europe</b>	<b>61,672</b>	<b>35,406</b>	<b>21,667</b>

The **following link** shows the details of the mortality estimates for the 35 countries analysed.

### **63% higher mortality in women**

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 heatwave

To date, the highest summer mortality in Europe was registered in 2003, when over 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 (<https://www.early-adapt.eu/>).

"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.

## EARLY-ADAPT project

The study has been carried out in the context of the **EARLY-ADAPT project** (<https://www.early-adapt.eu/>), funded by the European Research Council, and aimed at studying how populations are adapting to the public health challenges triggered by climate change.

## Reference

Joan Ballester, Marcos Quijal-Zamorano, Raúl Fernando Méndez Turribiates, Ferran Pegenaute, Xavier Basagaña, Cathryn Tonne, Josep M. Antó, Hicham Achebak. Heat-related mortality in Europe during the summer of 2022. *Nature Medicine*, 2023.

## About ISGlobal

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the "la Caixa" Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that

has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. Its working model is based on the generation of scientific knowledge through Research Programmes and Groups, and its translation through the areas of Training and Analysis and Global Development. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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