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Mortality burden in 35 European countries attributed to anthropogenic warming during the record-breaking summer of 2022

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More than 61,000 heat-related deaths were associated with the record-breaking temperatures in Europe during the summer of 2022. In this study, we quantify the number of heat-related deaths that would have been avoided in the absence of anthropogenic warming.

For this study, we utilize epidemiological models calibrated for the period 2015–2019 to estimate the heat-related mortality burden in the summer of 2022 for the factual and counterfactual scenario. We derive a counterfactual scenario by removing the regional summer mean warming that arises in response to rising global mean temperatures from the factual temperatures. We use ERA5-Land temperature data and mortality counts from the Eurostat database to estimate the heat-related deaths across 823 distinct administrative regions spanning 35 European countries.

At 1.15 °C of global warming since pre-industrial times, we obtain a population-weighted median increase over all regions in Europe of more than 2 °C in summer mean temperatures, with the Mediterranean regions being most affected by the increase. By comparing the factual and counterfactual heat-related mortality, we estimate that approx. 70% [95th CI 53.33%– 82.17%] of the total heat-related deaths would not have occurred without anthropogenic warming. Southern Europe has been the most affected by dangerous heat and consequently features the highest number of heat-related deaths attributable to climate change [64.19% of the climate change-attributable deaths]. In relative terms, however, the impact of anthropogenic warming is strongest in Central Europe where approx. 78% of the heat-related deaths are attributable to anthropogenic warming.