



Institute reports and analytical notes

Real-time forecast of heat-related excess mortality during the 19- 22 June 2025 heatwave in England and Wales

2025

Written by:

Dr Garyfallos Konstantinoudis, Grantham Institute for Climate Change and the Environment, Imperial College London

Assistant Professor Malcolm Mistry, Environment & Health Modelling Lab, London School of Hygiene and Tropical Medicine

Professor Antonio Gasparrini, Environment & Health Modelling Lab, London School of Hygiene and Tropical Medicine

* the authors contributed equally to the report.

Summary

It is well established that extreme heat increases the risk of mortality. During the exceptionally hot summer of 2022, an estimated 61,672 heat-related deaths occurred across 35 European countries,¹ including approximately 3,000 excess deaths due to heatwaves in England.² As the climate continues to warm, periods of extreme heat are becoming more frequent and intense.

In this report, we estimate the expected excess deaths from exposure to heat during the first heatwave of 2025 in England and Wales, specifically between 19-22 June at small geographic scales.

We applied a previously published methodological framework to estimate mortality associated with heat exposure.^{3,4} The approach consists of two main steps:

1. retrieving published estimates of the relationship between temperature and mortality,³ and
2. applying this relationship to recent weather forecasts to predict the expected mortality burden due to elevated temperatures.⁴

Step 1: We retrieved published risk estimates that are based on daily all-cause mortality data from the Office for National Statistics between 1 January 2000 and 31 December 2019, and daily mean temperature data at a 1×1 km resolution from the UK Met Office.³ The association was allowed to vary by age group and small census areas to account for differences in population vulnerability.

Step 2: We obtained high-resolution temperature forecasts from the European Centre for Medium-Range Weather Forecasts (ECMWF) Integrated Forecast System, consistent with previous analyses.⁴ The latest forecast data was retrieved on Thursday, 19 June 2025, for the forecast issued at 0000h UTC and covering 19-22 June. We then applied the temperature–mortality relationship derived in Step 1 to forecasted temperatures for the period 19–22 June 2025, estimating the expected number of excess deaths attributable to heat during this period.

Results

We predict a total of 570 (95% eCI: 435 to 673) excess deaths due to heat exposure across England and Wales from Thursday to Sunday (June 19-22). Saturday is expected to see the highest daily toll, with over 250 excess deaths anticipated, Table 1.

The analysis reveals that older populations are disproportionately affected, with an estimated 314 (233 to 384) excess deaths among people older than 85 years. Regionally, the impact is also uneven: the West Midlands and London are projected to experience nearly double the excess mortality rates of other regions, Table 1 and Figure 1. Specifically, we estimate:

- 17.8 (13.6 to 20.9) excess deaths per 1,000,000 population in the West Midlands, and
- 14.3 (10.9 to 17.4) per 1,000,000 in London.

This is because the temperature forecasts were highest for these regions, Figure 2.

Comparison with the heatwave during 17 and 19 July 2022

Based on previously published figures,⁴ the total mortality toll during the extreme heatwave of 17–19 July 2022 was estimated at nearly 1,100 deaths. In comparison, the mortality burden observed in our analysis is approximately half that figure, reflecting lower forecast temperatures for June 2025 relative to those recorded in July 2022. Nonetheless, both analyses highlight the heightened vulnerability of older individuals in London and the West Midlands region.

Limitations

- The published exposure–response curves do not consider the potential temporal attenuation of the temperature effect, which has been reported in some previous studies and may be attributable to improved policies and infrastructure addressing the increasing burden of heat.⁵ However, a prior study using data up to 2011 found limited evidence of temporal adaptation to heat in England.⁵
- Our study is focusing on the adverse effects of heat exposure on mortality. We have not considered other health outcomes such as hospital admissions, which are also expected to be elevated.^{7,8}

Table 1. Population in year 2020, mean and 95% uncertainty intervals of the number of excess deaths and number of excess deaths per 1,000,000 population due to heat in England and Wales.

Stratification	Population	Excess deaths	Mortality rate
Total	59,719,724	570 (435 to 673)	9.5 (7.3 to 11.3)
Date			
19-Jun-25	59,719,724	114 (92 to 136)	1.9 (1.5 to 2.3)
20-Jun-25	59,719,724	152 (111 to 186)	2.6 (1.9 to 3.1)
21-Jun-25	59,719,724	266 (195 to 318)	4.5 (3.3 to 5.3)
22-Jun-25	59,719,724	37 (29 to 45)	0.6 (0.5 to 0.7)
Age groups			
0-64	48,587,115	82 (25 to 132)	1.7 (0.5 to 2.7)
65-74	5,960,269	49 (-7 to 95)	8.2 (-1.2 to 16.0)
75-84	3,680,770	125 (58 to 185)	34.0 (15.7 to 50.2)
≥85	1,491,570	314 (233 to 384)	210.5 (155.9 to 257.8)
Regions			
East Midlands	4,865,583	41 (26 to 54)	8.5 (5.4 to 11.1)
East of England	6,269,161	38 (26 to 49)	6.0 (4.2 to 7.8)
London	9,002,488	129 (99 to 156)	14.3 (10.9 to 17.4)
North East	2,680,763	22 (3 to 37)	8.4 (0.9 to 13.9)
North West	7,367,456	52 (34 to 68)	7.1 (4.6 to 9.2)
South East	9,217,265	81 (52 to 107)	8.8 (5.7 to 11.6)
South West	5,659,143	40 (24 to 54)	7.1 (4.3 to 9.5)
Wales	3,169,586	18 (8 to 26)	5.7 (2.4 to 8.3)
West Midlands	5,961,929	106 (81 to 124)	17.8 (13.6 to 20.9)
Yorkshire and The Humber	5,526,350	41 (26 to 53)	7.5 (4.8 to 9.7)

Figure 1. Heat-related mortality rate per 1,000,000 population by date and Lower Layer Super Output Areas (LSOA) in England and Wales.

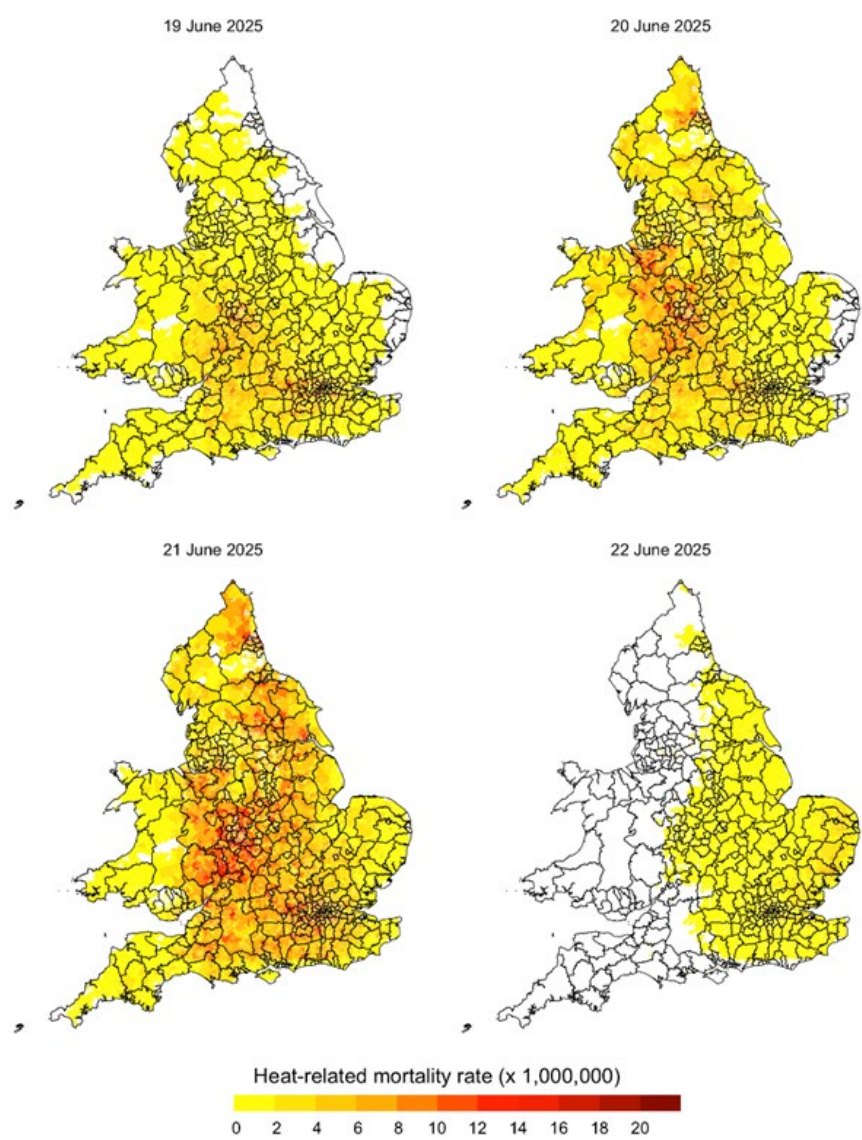


Figure 2. Daily mean temperature (°C) assembled using the 3-hourly temperature forecast issued at 0000h UTC on June 18, 2025, by the ECMWF Integrated Forecasting System (IFS) system (<https://www.ecmwf.int/en/forecasts/datasets/open-data>).

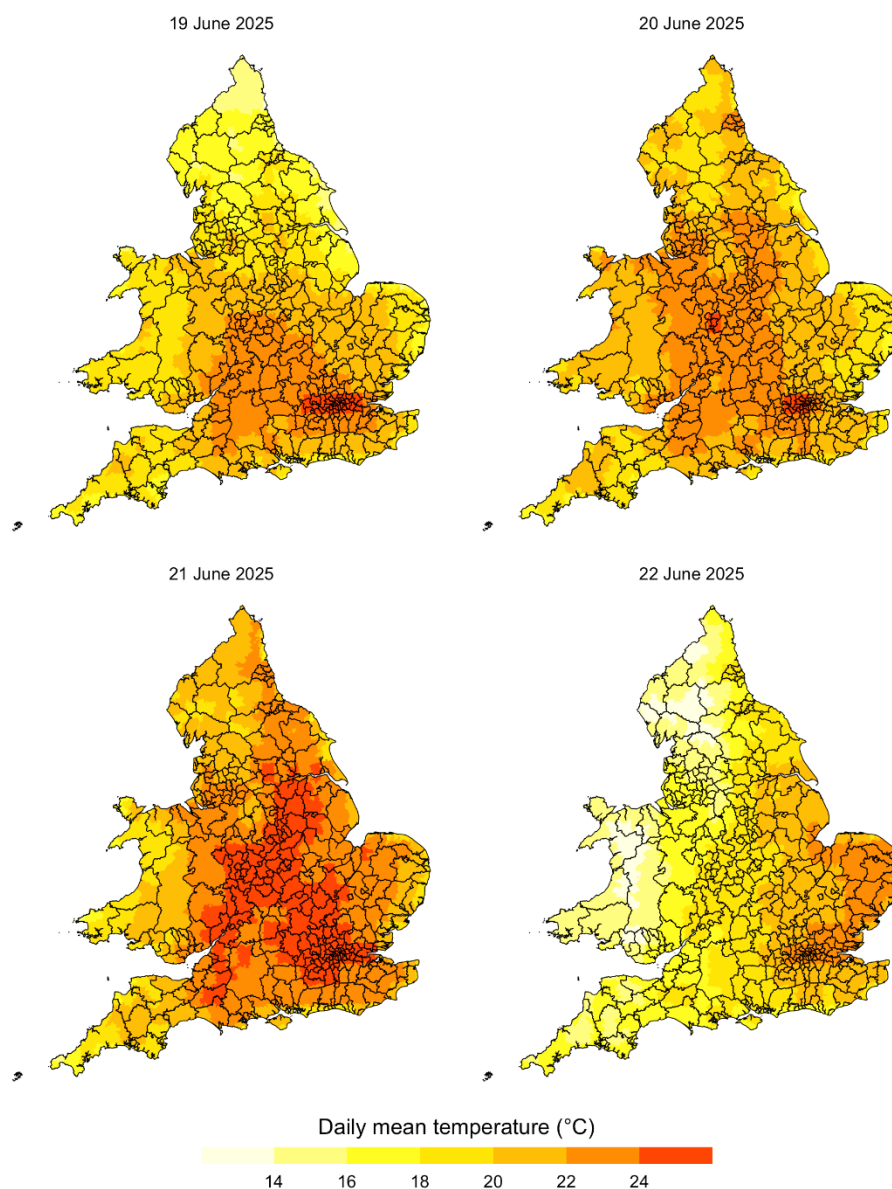
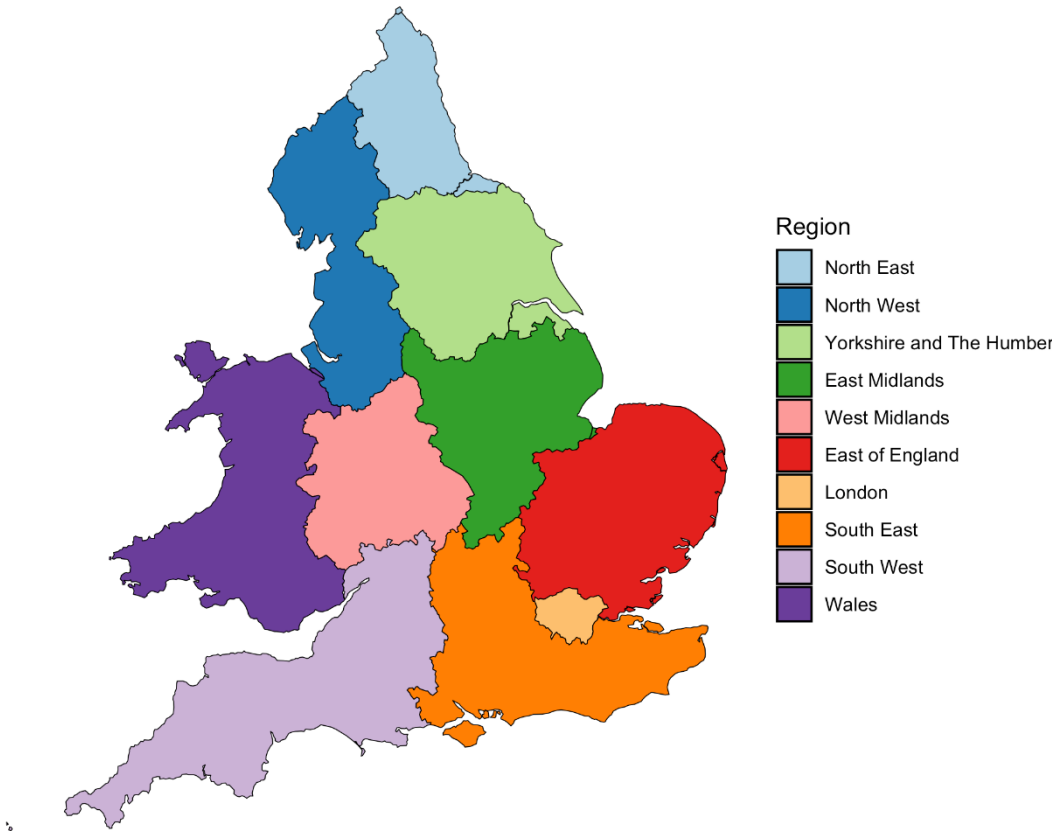


Figure 3. Regions in England and Wales used for aggregating population and excess-deaths in Table 1.



References

- 1 Ballester, J., Quijal-Zamorano, M., Méndez Turrubiates, R. F., Pegenaute, F., Herrmann, F. R., Robine, J. M., ... & Achebak, H. (2023). Heat-related mortality in Europe during the summer of 2022. *Nature medicine*, 29(7), 1857-1866.
- 2 UK Health Security Agency. Heat mortality monitoring report: 2022 (<https://www.gov.uk/government/publications/heat-mortality-monitoring-reports/heat-mortality-monitoring-report-2022>)
- 3 Gasparrini, A., Masselot, P., Scortichini, M., Schneider, R., Mistry, M. N., Sera, F., ... & Vicedo-Cabrera, A. M. (2022). Small-area assessment of temperature-related mortality risks in England and Wales: a case time series analysis. *The Lancet Planetary Health*, 6(7), e557-e564.
- 4 Mistry, M. N., & Gasparrini, A. (2024). Real-time forecast of temperature-related excess mortality at small-area level: towards an operational framework. *Environmental Research: Health*, 2(3), 035011.
- 5 Vicedo-Cabrera, A. M., Sera, F., Guo, Y., Chung, Y., Arbuthnott, K., Tong, S., ... & Gasparrini, A. (2018). A multi-country analysis on potential adaptive mechanisms to cold and heat in a changing climate. *Environment international*, 111, 239-246.
- 6 Office for National Statistics. Statistical geographies: An overview of the statistical geographies in the four countries of the UK. (<https://www.ons.gov.uk/methodology/geography/ukgeographies/statisticalgeographies>)
- 7 Konstantinoudis, G., Minelli, C., Vicedo-Cabrera, A. M., Ballester, J., Gasparrini, A., & Blangiardo, M. (2022). Ambient heat exposure and COPD hospitalisations in England: a nationwide case-crossover study during 2007–2018. *Thorax*, 77(11), 1098-1104.
- 8 Konstantinoudis, G., Minelli, C., Lam, H. C. Y., Fuertes, E., Ballester, J., Davies, B., ... & Blangiardo, M. (2023). Asthma hospitalisations and heat exposure in England: a case–crossover study during 2002–2019. *thorax*, 78(9), 875-881.

Please cite as

Konstantinoudis, G., Mistry, M., and Gasparrini. (2025). Real-time forecast of heat-related excess mortality during the 19-22 June 2025 heatwave in England and Wales. Grantham Institute report.

This work is licensed under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License.



