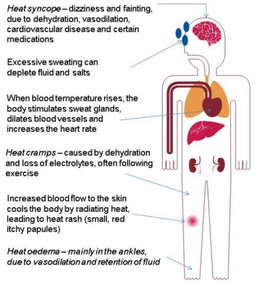
Development of a heat mortality surveillance approach for England

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INTRODUCTION

England's unprecedented temperatures in 2022 and 2023 highlighted the severe risks of rising global temperatures on public health. This study considers the impact of heatwaves on mortality, for the overall population in England and for subgroups by age, gender and geographical region.



Hot weather affects us all, and can cause heat-related illnesses such as cramps, rashes, heat oedema, heat exhaustion and heatstroke.

But the key drivers of mortality in England are the effects on the **cardiovascular and respiratory systems**, which can lead to heart attacks, strokes, and kidney failure.

Figure 1 (left): Health impacts of heat on the body.

Aims

a. Quantify the impact of heat on mortality in England in 2022 and 2023
b. Explore the variation in heat mortality impacts related to factors other than temperature
c. Support the development of UKHSA's Weather Health Alerting system, to protect health from adverse weather harms

METHOD

Death registrations data was obtained from the ONS, and daily temperature data from the Met Office via the UKHSA Environmental Public Health Surveillance System.

Firstly, heat-associated mortality for each heat episode was estimated by comparing observed daily mortality values with the expected baseline of daily deaths (the 14 days before and 14 days after the heat episode).

Secondly, the historic temperature-mortality relationship in England was established using a distributed lag non-linear model, using temperature and mortality data at regional level from the previous 5 years.

Finally, modelled estimates of heat-associated excess mortality were generated based on the historic temperature-mortality relationships and the actual temperatures observed, to assess any difference between observed and modelled estimates.

RESULTS

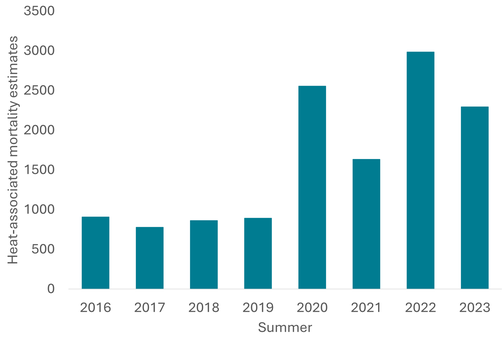


Figure 2: Heat-associated deaths in UKHSA's annual heat mortality monitoring, 2016 to 2023.

- 2022 saw 40 heat episode days and **2,985 (95% CI: 2,258 to 3,712) heat-associated deaths**. These were the highest figures since reporting began in 2016.
- 2023 was a generally cooler summer with only 28 heat episode days, but still saw **the third-highest number of heat-associated deaths** (2,295; 95% CI: 1,681 to 2,910).

Results by age

- **Older age groups had more heat-associated deaths** than younger age groups, with 2,117 (95% CI: 1,552 to 2,683) deaths in those aged 65 and over in 2023, and 2,839 (95% CI: 2,170 to 3,508) in 2022.
- The 2023 report included a calculation of Years of Life Lost for the first time. The highest figure was seen in those aged 75 to 84 years.

Results by sex

- The 2023 report included a breakdown by sex for the first time.
- Heat-associated deaths in 2023 were **close to equal between men** (1,117; 95% CI: 682 to 1,552) **and women** (1,178; 95% CI: 744 to 1,613).

Results by region

- Out of the nine regions of England, the **South East had the highest rate of heat-associated deaths** per million population (50, 95% CI: 22-79) in 2023.
- In 2022, the highest rates were seen in the **East Midlands** and **Yorkshire and the Humber**.
- The North East was the only region to not see significant heat-associated mortality in either year.

Observed vs modelled in 2022

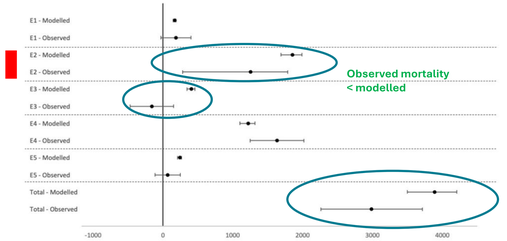


Figure 3: Modelled and observed estimates of heat-associated deaths by heat episode in 2022.

- In 2022, **observed deaths were lower than predicted** by modelling of the previous 5 years, particularly for the record-breaking heat episode 10th-25th July (E2), which saw the first 40°C temperatures.
- **High levels of public awareness and preparation** may have played a role in reducing mortality compared to expected.

Observed vs modelled in 2023

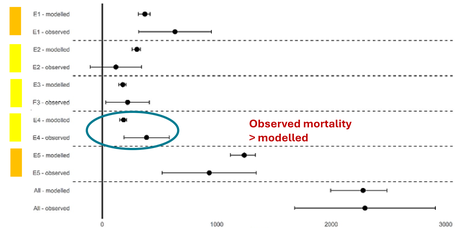


Figure 4: Modelled and observed estimates of heat-associated deaths by heat episode in 2023, with Heat Health Alert level indicated by yellow and amber bars.

- In 2022, **observed deaths were overall similar to predicted** by modelling of the previous 5 years
- However, for a short heat episode in August (E4), observed deaths were significantly higher than predicted.
- This is prompting ongoing work with Evaluation and Behavioural Insights to **understand response to Yellow Heat Health Alerts**.

CONCLUSIONS

It's not all about the extremes: significant heat-associated deaths have been seen even during Yellow Heat Health Alerts.

➔There is a need for action to protect the most vulnerable when Yellow alerts are issued.

Heat-associated mortality has different effects across different population groups, with **older people being more vulnerable**. Patterns are less clear for sex and region.

➔ More evidence is needed to understand how risk varies according to other demographics and health equity groups.

Mortality surveillance and comparisons with modelled predictions are informing the **continuous improvement of the Weather Health Alerting System**.

➔Heat mortality surveillance approach provides evidence for public health action action in future adverse weather events.

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