

Heatwaves' Impact on Cardiovascular Health: A Plan that Fails the Most Vulnerable in London

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Introduction

Historically, the climate in the United Kingdom has been temperate; in recent years, they have experienced more heatwaves. Heatwaves have become more intense and more frequent due to climate change caused by humans (WMO, 2023)

The highest daily temperature record in the UK was 40.3°C in 2022. The years become warmer, with 2024 being one of the fourth-warmest years on record in the UK (Met Office, 2022; NCAS, 2025). The increasing frequency of heatwaves poses a challenge to cardiovascular health due to the creation of urban heat islands (metropolitan areas that experience much higher temperatures compared to surrounding rural areas or when certain regions within the city experience higher temperatures than the rest (Arup 2024, Kolokotroni & Giridharan 2008; EPA, n.d) The risk of cardiovascular mortality and morbidity rises significantly, additionally, ischaemic heart disease and myocardial infarctions with the exposure to heatwaves (Nukala et al., 2023).

This urban heat island effect is particularly strong in London, leading to a temperature increase of up to 10 °C compared to its rural surroundings (Arup, 2024). The characteristics of London's built environment are one of the reasons for the increase in temperature. The urban island effect affects mostly neighbourhoods with reduced vegetation cover and a higher proportion of hard, impermeable surfaces made of materials like concrete (Arup, 2024). In addition, high plan and fabric density ratios are key contributors to the creation of urban heat island hotspots (Kolokotroni & Giridharan, 2008).

Climate change is an enormous problem across all areas, including public health, as the temperature continues to rise year by year. Heatwaves are becoming more intense and prolonged and are no longer an anomaly but rather a seasonal hazard. Consequently, this can lead to health issues, in particular an increase in heat-related cardiovascular mortality and morbidity in the UK (Liu et al., 2022) Public health responsiveness and the preparedness of the country are not adequate; consequently, this negatively affects the cardiovascular health of the population, particularly the most vulnerable ones, such as the 65+ population, those with pre-existing heart conditions, and those with a lower socioeconomic status and lower quality housing (Howard Boyd et al., 2024). Therefore, this article aims to explore the effect of rising temperatures and heatwaves on cardiovascular health, what the current heat-health related policies in the UK are, and how recommendations can be made for the country to strengthen its responses, preparedness and reduce the negative impact on cardiovascular health.

Heatwaves & cardiovascular mechanisms

The human body temperature is about 37 °C, and it is maintained by a process called homeostasis (Kenney & Jay, 2025). Deviations from this range cause the body to generate physiological responses to return to its normal, stable temperature 37°C (Desai et al., 2023; Kenney & Jay, 2025; Marchand et al., 2021. (Gagnon et al., 2025). For instance, if our body is too hot, our temperature control centre will command specific responses such as vasodilation and sweating to decrease the body temperature.

Nonetheless, if temperatures are too high for a prolonged time, these regulatory processes become dangerous (Meade et al., 2025). For instance, to keep adequate blood flow, the workload of the heart must be increased, which causes the heart to beat faster and to pump more blood. This increases cardiovascular system strain and the risk of cardiovascular disease (Meade et al., 2025; Desai et al., 2023). Moreover, excessive sweating leads to dehydration and electrolyte imbalance and can trigger haemoconcentration (Jacobsen & Homøe, 2022; Desai et al., 2023). Together, these can cause the blood to become more viscous, increasing the risk of thrombosis and vascular dysfunction (Jacobsen & Homøe, 2022).

All these changes put a significant amount of strain on the cardiovascular system (Singh et al., 2024). These factors significantly increase the risk of myocardial infarction (MI), stroke, arrhythmias, and decompensation of heart failure and cardiovascular hospitalisations (Singh et al., 2024; Meade et al., 2025).

Heatwaves & Cardiovascular Mortality

Mortality associated with cardiovascular issues due to heatwaves has significantly increased in the last few years in the United Kingdom, and several epidemiological studies and national surveillance data have shown that older adults above age 65 are the group most impacted by the temperature increase. In 2022, there were 2,985 excess deaths, mostly of people aged 65 and older (UKHSA, 2023). This number has been decreasing, and in 2024, there were 1,311 excess deaths. Despite the decline in deaths because of lower heat episodes and lower temperatures related to heat cardio issues, this is still a very high and concerning number, showing the dangerous effects of heatwaves (UKHSA, 2024; UKHSA, 2025). This stresses the necessity for action and the urgency for targeted heat-health policies.

Ageing population at higher risk

The older population in London, those aged 65 and above, are the ones at higher risk for the effects of heat-induced cardiovascular problems. Currently, around 1,043,400 of the London population is aged 65 or above, making a 12% of the entire London population (ONS, 2021). By 2030 is estimated that the number of 65+ people in London will rise to 1.4 million (ONS, 2021). These people are more

vulnerable to the heatwaves as ageing reduces the thermoregulatory mechanisms such as sweating efficiency, vasodilation, and perfusion (Kenney & Jay, 2025). Moreover, older adults have higher morbidity and other diseases, which contribute to their risk factor profile (Ndlovu & Chungag, 2024). In addition, socioeconomic status also affects their vulnerability; those in economic disadvantage might reside in poor-quality housing and have restricted access to cooling or ventilation options (GLA, 2023). Consequently, it amplifies their risk of heat-related cardiovascular issues.

Current policies in the United Kingdom and their failures

In 2023 Adverse Weather and Health Plan (AWHP), together with the Heat-Health Alerting (HHA) system, replaced the Heatwave Plan (UKHSA, 2023). The Heat-Health Alerting (HHA) system is a partnership between the UKHSA and the Met Office that aims to ensure the safety of the population when temperatures increase (UKHSA, 2023). The system operates by giving early warnings to multiple entities such as NH, emergency responders, local authorities and the public so the appropriate response is taken to tackle the impact of the heat expected (UKHSA, 2023). The system is colour-coded (Green, Yellow, Amber, and Red) (UKHSA, 2023). Green indicates that no alert will be emitted, and conditions are unlikely to have an impact in healthcare, whilst red, at the end of the spectrum, indicates emergency, and this triggers an alert, requires escalation and the need for immediate response. Nonetheless, a defined action is not specified in the policy and action cards provided by the government; recommendations are suggested, and the local authorities and organisations decide and coordinate responses (UKHSA, 2024).

Despite the implementation of this new Heat-Health Alerting system, the number of deaths related to heat was 1311, and according to UKHSA, this was 282 more deaths than predicted (UKHSA, 2025). The mortality rate was highest among people aged 65+, specifically those above 85 and followed by people aged 75 to 84 (UKHSA, 2025). This demonstrates that despite the framework update, health-related deaths are still a concern for public health, and the existing plan is failing.

Heat-associated mortality rate by age group and heat episode, England, summer 2024

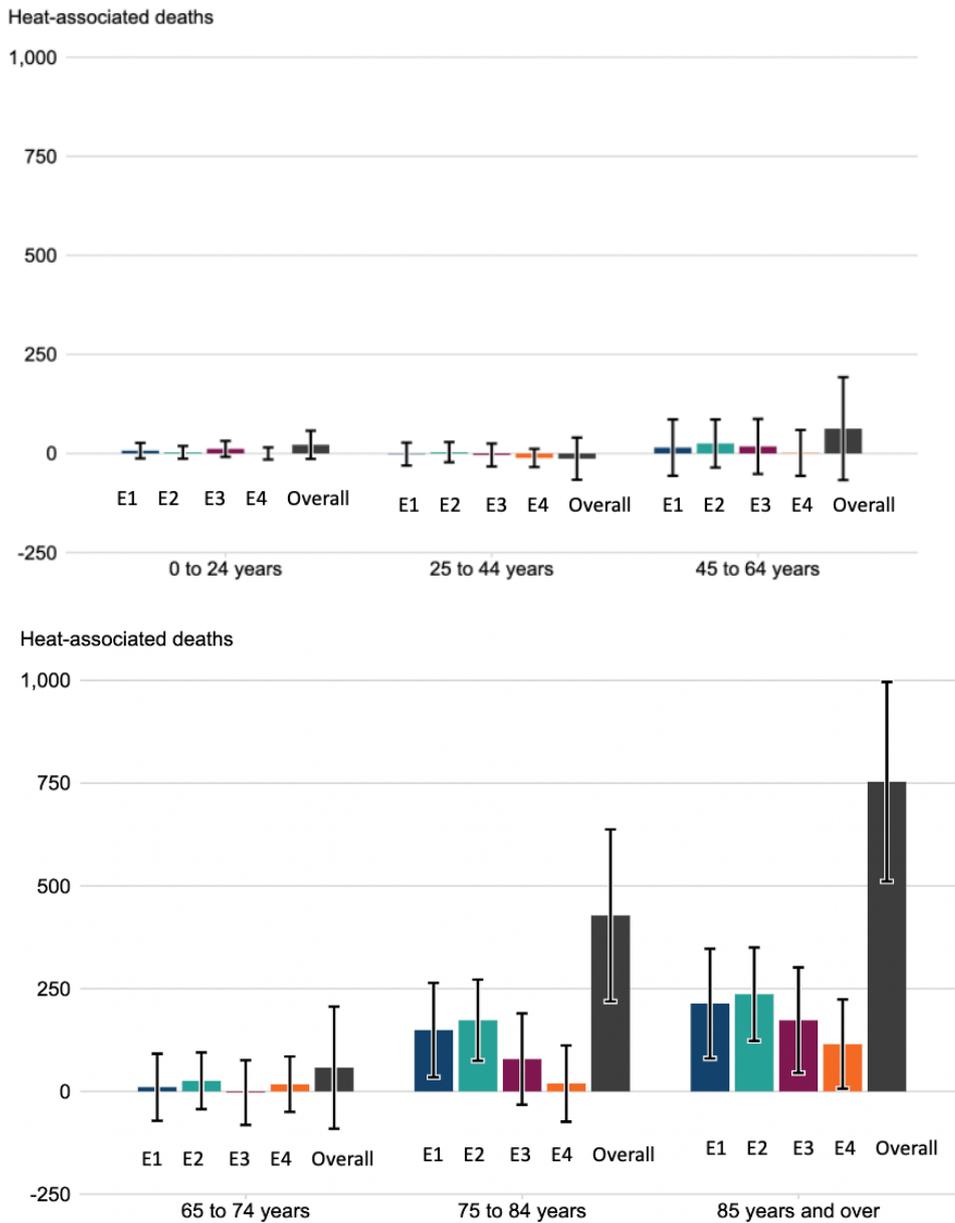


Figure 1: Association of heat-related mortality rate by age group and heat episode (“amber heat-health alerts in at least one region, or when the mean Central England Temperature (CET) is at least 20 degrees Celsius (°C)”) in England during the summer of 2024. E1–E4 represent the four major heat episodes recorded during that period. Overall” represents total heat-associated deaths across all episodes. Error bars indicate 95% confidence intervals for heat-associated mortality estimates.

Source: Image adapted from UK Health Security Agency (2025), Heat Mortality Monitoring Report: 2024.

Possible reasons for the failure of the redesigned plan to address the deaths due to heat-induced cardiovascular conditions are the following:

- **The plan is advisory rather than statutory:** the UKHSA issues alerts, and these are published on official channels; however, it is still voluntary for organisations (i.e. NHS Trusts, integrated care systems, care homes, local authorities) and individuals to register to receive the alerts. Additionally, there isn't a specific set of actions that are required to be in place when alerts are issued, and the Heat-Health Alert Action Cards are only recommendations, not mandatory responses. This implies that each region, each borough, and each local authority will have different actions which can generate major inequalities. For instance, areas more deprived may not be able to spend as much on ventilation systems as compared to wealthier areas.
- **Inaccessibility for the older population:** current registration for the Weather-Health Alerting system is voluntary; those who want to receive the alerts must fill out a form online; therefore, those who have a lower digital literacy, which is commonly the case for elderly people, might have difficulty registering and reading emails. The most vulnerable population, those aged 65+, may not receive the alerts, thus they might not be aware of what to do during a heatwave, for example, to keep hydrated. This can have serious consequences, such as dehydration and haemoconcentration, which are risks for cardiovascular conditions (Liu et al., 2023).
- **There is no identification of the most vulnerable population.** Nowhere in the plan is mention made of who is at a higher risk of having consequences from heat, thus no target population and no target actions are associated with the plan. People with already pre-existing conditions and older adults have a lower thermoregulatory capacity, making them a more vulnerable and at higher risk group (UKHSA, 2023).
- **London, in contrast with all the regions in England, is the only one with different (higher) temperature thresholds.** This means that at a certain temperature, all regions will receive alerts, but London won't unless the temperature is even higher. This can pose a dangerous risk to the population, as it assumes that London residents can tolerate more heat than those in other regions (UKHSA, 2025).

Table 1 Heat-Health Alert temperature thresholds

Region	Impact level	Percentage increase in mortality above expected levels	Maximum daytime temperature	Night-time temperature
London	Very low	Not applicable	<28.0°C	95th percentile or higher*
	Low	10%	28.0°C to 31.9°C	
	Medium	20%	32.0°C to 39.9°C	
	High	50%	40.0°C<	
All other regions	Very low	Not applicable	<27.0°C	95th percentile or higher*
	Low	10%	27.0°C to 29.9°C	
	Medium	20%	30.0°C to 37.0°C	
	High	50%	38.0°C<	

* Top 5% of night-time temperature. The 95th percentile indicates evenings on which the nighttime temperature is higher than 95% of all other summer nights. Only the top 5% of evenings in any summer are likely to fall within this upper range of night-time temperatures.

Source: UKHSA, Met Office, 2025 User guide Weather-health alerting system

In addition, studies have shown that the urban heat effect is larger (up to 4.5°C warmer at night) in London than in the surrounding regions (Arup, 2024; Kolokotroni & Giridharan, 2008; UKHSA, 2025). Moreover, London has a dense built environment, with 5,701 people per square kilometre, and no other English region matches this number (ONS, 2020). Indoor overheating and the risk of nighttime cardiovascular events increase in high-density areas.

Recommended policies

Recommendation 1: Make the heat-health plan statutory

The UK Heat-Health plan is advisory and doesn't have a clear indication of specific responses for each authority. Portugal operates a legally binding national heat where each authority has a specific role and pre-defined actions. In contrast to the UK, when alerts are issued, all authorities must take action by following a structured plan, ensuring consistent and uniform responses, such as activation of local contingency plans and coordinated communication. If this is adopted in the UK plan, this will enable the reduction of inequalities across the country and across different boroughs of London, protecting those at higher risk of having heat-induced cardiovascular issues (DGS,2023).

Recommendation 2: Require mandatory identification & outreach to vulnerable groups

Portugal's system mandates outreach lists and proactive welfare checks on the most vulnerable population. The outreach action is carried out by existing primary healthcare, public health, and social care services, that use care records for identification to help identify the high-risk population, such as individuals aged 65 and above and those with pre-existing heart conditions who are more susceptible to heat-cardio issues, and plan targeted actions for them (DGS, 2023; Liu et al., 2023).

Recommendation 3: Enhance the communication approach

Use of multichannel communications to disseminate information and alert the population. The use of screens in the underground, automated phone calls or SMS, would particularly benefit those who don't have access to the internet to see public announcements, as it would ensure they are reached, informed, and prepared (Comunidad de Madrid, 2025; EEA, 2024). According to the Madrid heat plan, alerts are sent directly to health and social care professionals, since these professionals have already identified and are in contact with the vulnerable population. Adopting this is especially important in London, as temperatures are more elevated in specific boroughs, thus the professionals on those areas can lead local targeted action (Comunidad de Madrid, 2025).

Recommendation 3: Enhance the communication approach

Use other communication strategies to alert about heatwaves, for instance, multi-channels communications, automated calls, helplines and community outreach. This would ensure that those who are less digitally literate are reached and can be informed and prepared (EEA, 2024).

Recommendation 4: Integration of long-term urban design / green-blue infrastructure

Nighttime temperature increase has a negative association with cardiovascular mortality. London's environment causes a strong urban heating effect and increases the indoor overheating (Arup, 2024). By adding more vegetation around buildings, using more reflective construction materials for both buildings and pavements and green-blue infrastructure like Misting systems, the heat exposure would be reduced. As this would create shading, reflective surfaces rather than black bodies that trap heat (Arup, 2024). These would protect the vulnerable community and reduce heat-induced cardiovascular events in the long term (DGS, 2023; Howard Boyd et al., 2024).

Conclusion

Heatwaves are a growing public health concern, and they pose a serious risk to cardiovascular mortality in the United Kingdom. Ambient temperature, specifically night temperature, significantly increases the risk of heat-induced cardiovascular conditions such as strokes, arrhythmias, and myocardial infarction.

Regions with a strong urban heat island effect, a large population aged 65 or above, and dense built environments amplify the risk of cardiovascular events. An example in the United Kingdom is London, which possesses all those characteristics. The revised Heat-Alert plan, implemented in 2023 by the government, reflects an effort to reduce heat-related cardiovascular mortality; however, it still needs adjustments, as the number of deaths remains very high. Based on evidence, it is recommended that statutory requirements, identification of the most vulnerable groups, enhanced communication channels, community outreach, urban cooling systems and construction of green-blue infrastructure are considered and implemented. These suggestions strengthen the Heat-health Alert plan and ensure that the higher-risk group in London is protected from the increase in ambient temperature, which is a significant factor contributing to cardiovascular mortality.

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