

## EDITORIAL

# Health protection and heatwaves: the need for systematic reviews

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Following several major heatwaves in Europe and the USA, there has been an increased interest in health protection measures to reduce the impacts of such extreme weather events on human health. Heatwaves are also an issue for mass gatherings and heatwave planning has been incorporated into the preparation for the Olympics this month. At the same time, concerns about how to adapt to anthropogenic climate change have led to the development of public-health and social strategies that focus on a broader response to increased temperatures (including more frequent and more intense heatwaves), that address increasing the resilience of domestic housing and the hospital infrastructure. The evidence for the health burden associated with heat—and its impact on different age and other high-risk groups—is now compelling. Studies in multiple cities show that mortality rises as the temperature increases above a local threshold.[1] However, there is less evidence for the role of wider determinants (risk factors such as housing type) on heat-related morbidity and mortality. As a result, the various national and local heatwave plans and guidance that have been published are largely built on evidence from physiological and occupational studies, and there are considerable gaps in the evidence.[2]

The Cochrane Review by Gupta and colleagues on the evidence regarding the use of indoor fans [3] is the first Cochrane Review to assess an intervention for alleviating the effects of environmental heat. Anecdotal evidence shows both confusion and inconsistencies regarding advice given during heatwaves, and this was a reason for conducting the Cochrane Review. Gupta's review failed to draw any useful conclusions about the effectiveness of indoor fans during heatwaves, because there were no research papers that met the (broad) inclusion criteria. The wider conclusions are that specific research should be undertaken to fill this knowledge gap, and that more Cochrane Reviews are needed to populate the evidence base and to describe where further research is needed.

Areas for exploration include several important clinical aspects of treatment for heat-related illnesses where there is uncertainty about management. Exertional heatstroke is one example, and has already been the subject of one systematic review.[4] If heatwaves become more common, there is an increasing risk of occupational exposure in adults, and those exercising in hot weather, including children at school. How should such cases be managed? Also, high temperatures can affect mortality via a number of mechanisms, and a range of chronic diseases are

implicated in heat-related mortality. These include respiratory, cardiovascular, endocrine, and musculoskeletal diseases [5][6] and mental health problems.[7] It is well known that people with diabetes are at increased risk of dehydration and emergency hospital admission during hot weather.[8] There are strong arguments for incorporating heat prevention into clinical management of these chronic conditions.

Heat health warning systems are one component of managing heatwaves, and providing people with advice is one part of a wider range of measures in these systems. Most cities in Europe have such systems and it is important that they are evaluated. Process evaluations are as important as outcome evaluations for such complex multi-agency interventions.[9] There has, for example, been some good and useful qualitative research on attitudes to heat and other extreme weather, especially in the elderly and those who care for them. This showed that people who professionals would categorise as vulnerable may not see themselves as being at risk.[10] Evaluation of clinical and mortality outcomes, however, is difficult. A major problem is that the outcome measure of heat-related mortality is not directly observed, but has to be estimated retrospectively. A robust evaluation could be undertaken where heat-related mortality is relatively high (to give sufficient power) and the intervention is undertaken in multiple populations.

There are other difficulties in undertaking evaluations of interventions to reduce the impact of hot weather. There are a range of heat health outcomes that have different social and environmental determinants. For example, the determinants of heatstroke during heatwaves are not the same as the determinants for heat-related mortality (which are measured at the population level). Also, the determinants of heat-related emergency admission may differ from the determinants of heat-related mortality. There are also important cultural differences in the responses to heat between countries that will reduce the generalisability of any findings.

The Cochrane Collaboration is improving its coverage of the evidence base for the socio-economic and environmental determinants of health to improve population health outcomes, exemplified by the establishment of the Cochrane Public Health Review Group. However, the *Cochrane Database of Systematic Reviews* is still poorly populated by reviews for environmental interventions. The health benefits from interventions in housing

and the built environment [11] is an emerging area that offers significant potential in improving health. The benefits may be large and go beyond clinical outcomes to address welfare and environmental outcomes (energy efficiency, decarbonisation and sustainable development). Systematic reviews should be used to improve decision making in public health. It is important that environmental interventions are well supported by good evidence for both health and non-health outcomes.

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### Declarations of interest

The authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available upon request) and declare (1) that SK's institution (London School of Hygiene and Tropical Medicine) has received funding from The European Commission and the Medical Research Council for research on heatwaves. SK receives financial support from the UK Government Department of Energy and Climate Change to contribute to the work of the Intergovernmental Panel on Climate Change. Otherwise the authors are not in receipt of payment or support in kind for any aspect of the article; and they declare (2) no other financial relationships with any entities that have an interest related to the submitted work; (3) that the authors/spouses/children have no financial relationships with entities that have an interest in the content of the article; and (4) that there are no other relationships or activities that could be perceived as having influenced, or giving the appearance of potentially influencing, what was written in the submitted work.

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