

Confronting heat-related illnesses and deaths at mass gathering religious and sporting events



A large number of mass gatherings (religious events, sporting events, festivals, etc) are held at regular intervals globally, and millions of attendees and event participants face a range of public health threats.^{1,2} Among non-communicable disease threats, heat-related illnesses (including heat hyperpyrexia, heat stroke, and death) have become of increasing concern over the past decade.²⁻⁶ Heatwaves have occurred in cities around the world and have increased in frequency, intensity, and extent.⁵ July, 2023, was the hottest month in Europe, and recent predictions of heat waves in Europe have raised heat-related illnesses as a priority concern for organisers of the Paris 2024 Olympic Games.⁷ Apart from high ambient temperatures, athletes have the additional risk of exertional stress and rising body temperatures. A 2023 review of weather and environmental hazards at mass gatherings⁸ showed that a 1°C increase in ambient temperature (from 20°C to 21°C) resulted in an 11% increase in the number of individuals requiring medical attention.

The recent annual Hajj pilgrimage in Saudi Arabia in June, 2024, attracted a total of 1.83 million pilgrims, 1.6 million of whom were from 182 other countries. The Hajj was held during peak Saudi Arabian summertime when temperatures reached a record of 51°C, and 1301 pilgrim deaths due to heat-related illnesses were reported by the Saudi authorities. This unprecedented number of deaths has focused the attention of global public health authorities since the deaths occurred despite Saudi Arabia's extensive range of carefully planned structural, operational, educational, and preventive measures, which have been developed over many years, to reduce the health risk of high ambient temperatures.¹ Saudi Arabia has also developed extensive surveillance systems to monitor health events at the Hajj but many deaths appear to have been compounded by large numbers of informal or unauthorised attendees who arrived on visitor rather than Hajj visas and were not authorised to perform the Hajj. These attendees walked long distances under direct sunlight without adequate shelter or comfort. Lessons from this tragedy need to be learnt and the information gained needs to be used for forthcoming recurring religious pilgrimages, which

can attract between 10 million and 50 million pilgrims, such as the Kumbh Mela in India, the Arba'een in Iraq, and the Grand Magal in west Africa. Heat-related illness and deaths at mass gatherings could be prevented with strategic planning, preventive and remedial services, and greater education of attendees. Other variables such as the effects of climate change on environmental temperature over time will require more long-term strategic planning.

The record high temperatures recorded in Makkah, Saudi Arabia, during the Hajj in June, 2024, were not entirely unexpected. Previous landmark studies had predicted that the Arabian Gulf Region is a regional hotspot where the effects of climate change, in the absence of substantial global mitigation measures, are likely to severely impact human health both in the long term⁹ and also specifically at the Hajj.¹⁰ The recent Europe report of the *Lancet* Countdown⁵ and analysis for the Global Burden of Disease Study 2021⁶ on health and climate change across all continents highlight escalating global warming that requires novel bold actions. Global heat-related direct and indirect deaths are projected to increase by 370% if action is not taken to curtail the growing effects of global warming. Over a third of the world's heat-related deaths are directly attributed to climate change, with notable excess mortality seen in older people and children. Within the context of international sporting events, the globalisation of sport has, for a variety of financial and geopolitical reasons, seen a trend in more of the large events being held in the Middle East, where the risk of extreme heat events appears to be greater.

For these reasons, reducing the risk of heat-related illnesses and deaths at the numerous mass gatherings held annually must remain an urgent global priority. The heat-related deaths during the 2024 Hajj are a grim reminder that, apart from global climate change and increased ambient temperatures, a multitude of other factors will have played a role, and defining these factors remains important. These deaths also remind us that extensive planning cannot itself guarantee success, but can make success more probable. Event organisers and the host countries of mass gatherings now need to

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For more on the reported heat-related deaths see <https://saudigazette.com.sa/article/643790/SAUDI-ARABIA/Saudi-Arabia-reports-1301-deaths-during-Hajj-season>

For more on Saudi Arabia's guidelines for the management of heat illnesses see <https://gcmgm.moh.gov.sa/en/HajjUmrah/Pages/003.pdf>

incorporate a focus on climate change and its long-term effects in their planning and generate an evidence base of risk factors and prevention methods for heat-related illnesses. They should develop common guidelines and have specific monitoring in place that accounts for participants who are not formally registered.

Sources of advice are already available, including the Heat Action Platform developed by the World Economic Forum's Global Commission on Biodiverse Cities by 2030, which provides cities with a roadmap to address extreme environmental temperatures. Suggestions include urban greening (ie, enhancing efforts to grow plants on the walls, roofs, and corridors of buildings and planting more trees around host cities) and installing white-coloured reflective roofs and continuous shade-covered walkways. In anticipation of the Olympic Games in Paris, the International Olympic Committee published a consensus statement on sports events in the heat and has proposed a range of mitigation measures to safeguard the health of attendees, including reducing the risk of heat-related disorders.⁷ The Olympic Village in Paris is being used to test new technologies such as geothermal cooling and outdoor air filters, which might reduce the impacts of high ambient temperatures.

As global temperatures continue to rise, climate change should become increasingly important in the planning of mass gatherings and should be viewed as an existential threat to all mass sporting, artistic, and religious events. As such, planners and organisers of these events need to start to bring together research, ideas, and technology that can reduce future risks of severe heat-related illnesses and deaths.

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For more on the Heat Action Platform see https://www3.weforum.org/docs/WEF_BiodiverCities_by_2030_2022.pdf