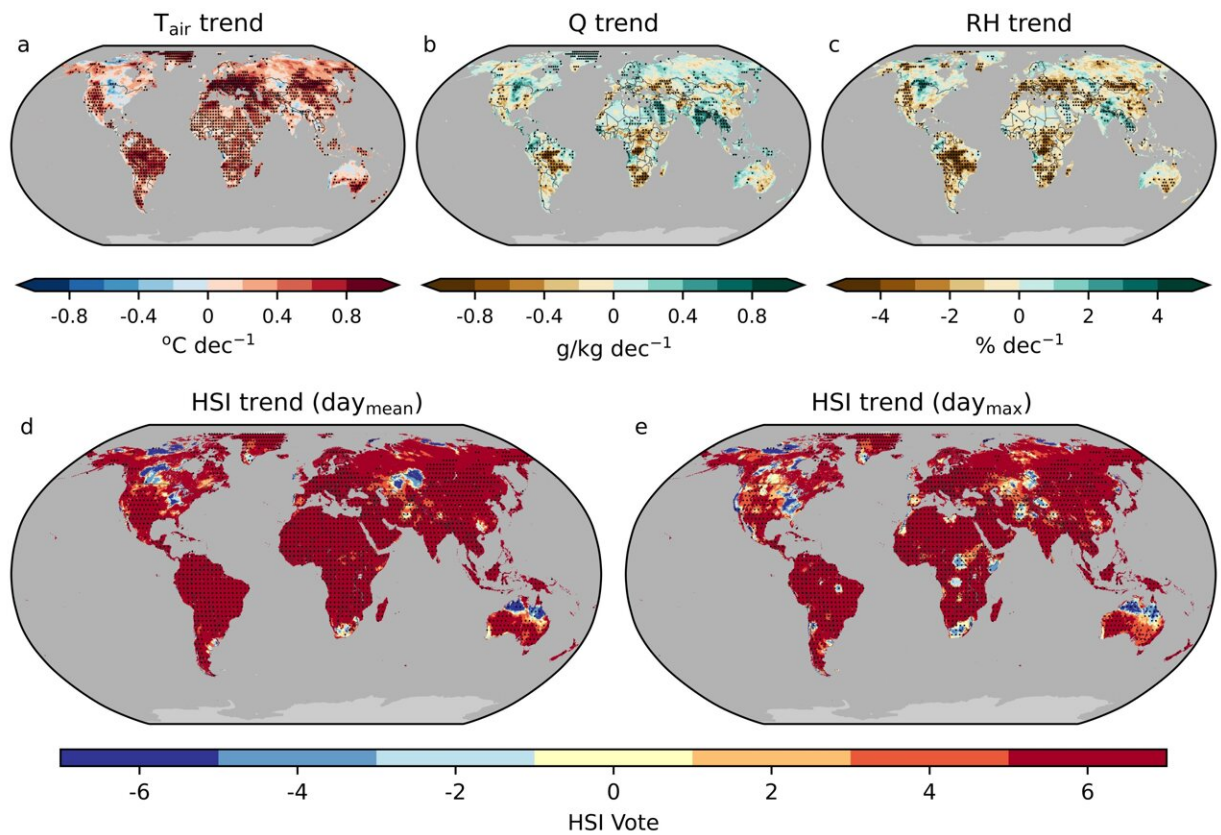


The underrated impact of humidity in predicting heat-related deaths

August 21 2024



These maps show different regions of the world overlaid with a range of heat stress data over the long term, between 1980 and 2019. (a) shows air temperature, (b) shows specific humidity, (c) shows relative humidity, (d) shows daily mean of six different HSIs and (e) shows daily maximum of six different HSIs. Credit: 2024 Guo et al. CC-BY-ND

Governments, medical institutions and other bodies require accurate models on health-related matters in order to better organize their activities.

Climate change has measurable impacts on society, including on human mortality. However, current models to assess the health impacts of [climate change](#) do not account for every environmental parameter, especially [humidity](#), which could influence [heat stress](#) perceived by the human body, leaving room for improvement.

For the first time, researchers, including those from the University of Tokyo, successfully incorporated humidity data from hundreds of cities into so-called heat stress indicators (HSIs) and assessed their performance in predicting heat-related deaths. The work has been published in *PNAS Nexus*.

Climate change used to be called global warming for good reason. Broadly, temperatures the world over are rising. However, there are other concerns beyond just air temperature; one of these which is incredibly important in some parts of the world is humidity, the amount of water in the air.

It's important as humidity can affect our ability to cool ourselves down through sweating, when water evaporates from our skin. In high humidity environments, this evaporative cooling is less effective and, after a point, it becomes impossible.

"I'd been investigating the effect of irrigation around [urban areas](#) on heat stress, and how it is related to [human health](#)," said research fellow Qiang Guo from the University of Tokyo's Department of Global Health Policy.

"Depending on what HSIs you looked at, the results and implications

appeared quite different. This discrepancy pushed my team and me to look for the best combination of temperature and humidity which would most accurately estimate human-perceived heat stress. And we wanted to make sure this method would apply to different environments."

Guo and his team gathered daily human death and [climate data](#), which included air temperature, relative humidity, [wind speed](#) and incident solar radiation, for 739 cities in 43 countries or territories.

They calculated eight different HSIs based on the climate data. Most HSIs use air temperature and humidity as inputs, while others also include wind speed and solar radiation.

By using sophisticated models called distributed lag nonlinear models and [machine learning](#), the team found the key factor responsible for the performance of HSIs in different locations is the relationship between daily temperature and humidity.

"The effectiveness of HSIs incorporating humidity varies according to geography. We detected locations where humid heat is a more accurate predictor to model [heat-related deaths](#), including coastal and large lake areas of the U.S., Peru, South Korea and Japan. Utilizing HSIs in these regions, such as wet bulb globe [temperature](#), which mimics how humans feel heat, could improve accuracy of heat-health alert systems," said Guo.

"Of course, there are many other factors to consider: for example, socioeconomic issues. Due to data availability, our study mainly focused on the developed regions, and many developing regions under severe heat stress are not included in our analysis.

"Because of this, in the future we plan to collect additional data and conduct analyses for regions in the Global South. Our goal is to better

assist people in developing economies in reducing the health impacts of severe heat stress."

More information: Qiang Guo et al, Regional Variation in the Role of Humidity on City-level Heat-Related Mortality, *PNAS Nexus* (2024).

[DOI: 10.1093/pnasnexus/pgae290](https://doi.org/10.1093/pnasnexus/pgae290)

Provided by University of Tokyo

Citation: The underrated impact of humidity in predicting heat-related deaths (2024, August 21) retrieved 22 August 2024 from <https://phys.org/news/2024-08-underrated-impact-humidity-deaths.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.