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Optimizing Heat Stress Indicators for Protecting Human Health: From Generic Metrics to Localized Solutions

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Heat stress is an escalating global public health concern, especially as climate change intensifies the frequency, duration, and severity of extreme heat events. Accurate identification of hazardous heat exposure is essential for the development of effective heat-health warning systems (HHWS) and the timely issuance of public alerts.

Traditionally, air temperature (Tair) has been used as the primary metric for triggering heat alerts. However, a growing body of evidence highlights the critical role of humidity in intensifying heat stress and increasing health risks. As a result, integrated heat stress indicators (HSIs)—which incorporate multiple meteorological factors such as temperature, humidity, solar radiation, and wind speed—are gaining attention.

In 2021, Japan updated its national HHWS by replacing Tair with Wet Bulb Globe Temperature (WBGT), a more comprehensive index that accounts for multiple variables. However, the effectiveness of this change, and the broader applicability of various HSIs in predicting heat-related morbidity and mortality remain insufficiently explored.

In this presentation, we synthesize recent research evaluating the performance of multiple HSIs in modeling heat-related health outcomes across Japan and other regions. By comparing various health outcome datasets, we assess how well different HSIs capture population-level vulnerability to heat.

Furthermore, we demonstrate how data-driven techniques can move beyond one-size-fits-all indicators. By leveraging local health datasets, we show how it is possible to fine-tune HSIs to reflect regional population sensitivities, ultimately enhancing the accuracy and effectiveness of heat-health warnings at the local level.