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The predictability of heat-related mortality in Prague, Czech Republic during summer 2015 - A comparison of various thermal measures

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Development and innovation of measures protecting populations against meteorological and climatic hazards are among the priorities of biometeorological research. Understanding the meteorological factors that are most closely associated with health risks can help refine and improve these measures. Heat warning systems (HWS) should be used to alert the public of elevated health concerns on days with the highest risk. Aim of this paper was to compare various temperature measures in their ability to predict heat related mortality in Prague, Czech Republic during the extraordinary summer 2015, based on the temperature-mortality association over the period 1994-2014. Relatively novel thermal measures - Universal Thermal Climate Index and Extreme Heat Factor (EHF) - were compared with the more traditional ones (Apparent Temperature, Wet-Bulb Globe Temperature (WBGT), Physiologically Equivalent Temperature) to evaluate their suitability for heat warning systems. After adjusting mortality for long-term trend and seasonality, relationships between thermal measures and all-cause mortality deviations were estimated by Generalized Additive Models for summer months during 1994–2014. Resulting models were applied to predict mortality deviations in summer 2015 based on observed meteorology, and the mortality estimates by individual models were compared.

All models showed a clear and strong association between thermal conditions and mortality deviations. Although the WBGT model was generally best in modelling temperature-mortality relationships as well as in identification of heat-alert days with increased risk of heat-related death, the EHF model seemed to be a better tool for identification of the main heat waves within a season, with respect to their heat intensity, and the magnitude of their heat-impacts on mortality. Our findings suggest that different approaches may be suitable for different purposes and combination of more techniques within a potential HWS could be useful for a proper understanding of the heat-impact risks on human health.