The predictability of heat-related mortality in Prague, Czech Republic during the summer of 2015 – A comparison of 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. For example, heat warning systems (HWSs) should be used to alert the public of elevated health concerns on days with the highest risk. We compared selected thermal measures in their ability to predict days with elevated mortality due to heat in Prague, Czech Republic during the extraordinarily hot summer of 2015. 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 HWSs. 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 the summer of 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. While the model based on EHF predicted largest excess mortality on days above selected temperature thresholds and its mean predictions above these thresholds were closest to the real observations, the WBGT-based model performed better in the prediction of specific days with an exceptional mortality increase. Although all examined thermal measures seemed to be suitable for a possible HWS in Prague, WBGT was the most consistent predictor of temperature-related mortality, as it ranked among the best variables according to all examined criteria. Results of this study may be useful for the revision and development of HWSs in Central European cities.