



Comparison of UTCI with other thermal indices in the assessment of heat and cold effects on cardiovascular mortality in the Czech Republic

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Several studies have compared various human thermal comfort indices as to their applications in evaluating heat-related mortality. Much less attention has been devoted to application of thermal indices in evaluating cold-related mortality. So far, only a few studies have examined performance of the Universal Thermal Climate Index (UTCI), one of the most advanced indicators of biometeorological conditions, in assessing heat- and cold-related mortality. We compare UTCI and other selected thermal indices in analysing heat- and cold-related effects on cardiovascular (CVD) mortality in two different (urban and rural) regions in the Czech Republic during the 16-year period of 1994–2009. Excess mortality is represented by the number of deaths above expected daily values, the latter being adjusted for long-term changes, annual and weekly cycles, and epidemics of influenza/acute respiratory infections. The association between excess CVD mortality and air temperature, UTCI, Physiologically Equivalent Temperature (PET), and Apparent Temperature (AT) is analyzed using Poisson generalized additive models (GAMs). Heat- / cold-stress days are identified by percentiles of (equivalent) temperature distribution in summer / winter.

We found air temperature (as the most widely used proxy for ambient thermal conditions in environmental epidemiology) comparable to thermal indices in assessing heat-related mortality. On the other hand, air temperature provides a weak cold effect in comparison with the thermal indices in both regions and its application may underestimate the magnitude of cold-related mortality. These findings are important when possible climate change effects on heat- and cold-related mortality are estimated. AT and PET appear to be more universal predictors of heat- and cold-related mortality than UTCI when both urban and rural environments are of concern. UTCI tends to select windy rather than freezing days in winter, though these show little effect on mortality in the urban population. By contrast, significant cold-related mortality in the rural region if UTCI is used shows potential for UTCI to become a useful tool in cold exposure assessments.