



## **Impacts of extreme temperature events on mortality: analysis over individual seasons**

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Extreme temperature events influence human society in many ways, including impacts on morbidity and mortality. While the effects of hot summer periods are relatively direct in mid-latitudinal regions, much less is known and little consensus has been achieved about possible consequences of both positive and negative temperature extremes in other parts of year. The study examines links between spells of hot and cold temperature anomalies and daily all-cause (total) mortality and mortality due to cardiovascular diseases in the population of the Czech Republic (central Europe) in individual seasons (DJF, MAM, JJA, SON). The datasets cover the period 1986-2006. Hot (cold) spells are defined in terms of anomalies of average daily temperature from the mean annual cycle as periods of at least 2 successive days on which the anomalies are above (below) the 95% (5%) quantile of the empirical distribution of the anomalies. Excess daily mortality is established by calculating deviations of the observed number of deaths and the expected number of deaths, which takes into account effects of long-term changes in mortality and the annual cycle. Periods when mortality is affected by influenza and acute respiratory infection outbreaks have been identified and excluded from the datasets before the analysis. The study is carried out for several population groups in order to identify dependence of the mortality impacts on age and gender; in particular, we focus on differences in the impacts on the elderly (70+ yrs) and younger age groups (0-69 yrs).

Although results for hot- and cold-related mortality are less conclusive in the other seasons outside summer, significant links are found in several cases. The analysis reveals that

- the largest effects of either hot or cold spells are observed for hot spells in JJA, with a 14% (16%) increase in mortality for the 1-day lag for all ages (70+ yrs);
- much smaller but still significant effects are associated with hot spells in MAM;
- the impacts of hot spells are more direct than those of cold spells, with shorter lags; women are more sensitive to high temperatures than men;
- cold spells are associated with excess mortality in DJF and to lesser extent in SON and MAM;
- the lag with the largest impacts in DJF is longer in the elderly (70+ yrs; around 10 days) than younger population (0-69 yrs; 4 days), which may point to different prevailing physiological effects; the same pattern of longer lags in the elderly is preserved in SON and MAM, too;
- largest mortality deficits appear during and after cold spells in JJA; they are much more pronounced in the elderly than younger age groups.

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