Hot temperatures and morbidity: A systematic review and meta–analysis

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Background

Extreme temperatures have been shown to have a detrimental effect on health. Hot temperatures in particular can increase the risk of mortality, particularly in relation to cardiorespiratory diseases. Given the onset of climate change, it is critical that the impact of temperature on health is understood, so that effective public health strategies can correctly identify vulnerable groups within the population. However, while effects on mortality have been extensively studied, morbidity has received less attention. This study applied a systematic review and meta–analysis to examine the current literature relating to hot temperatures and morbidity.

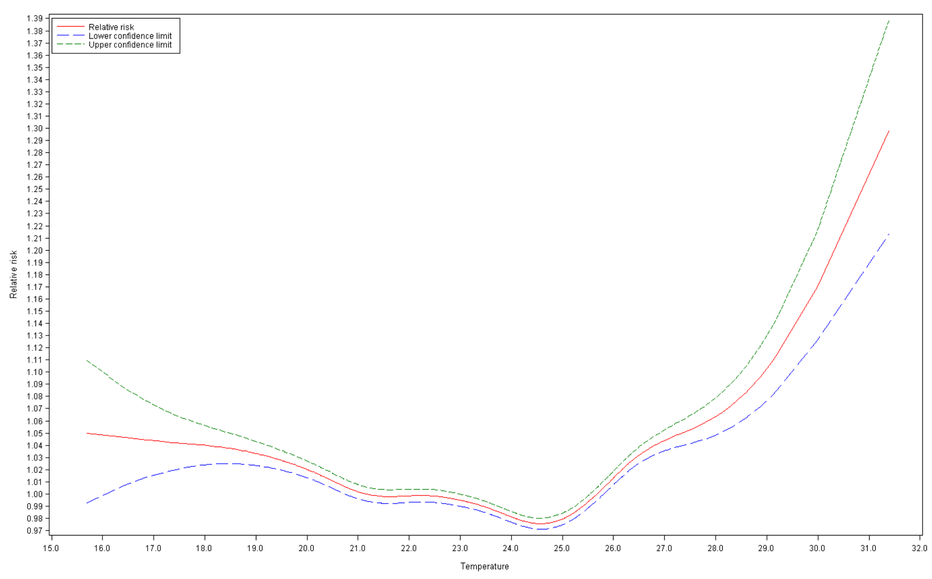

Figure 1: Health effects observed to increase with increasing temperature

Methods

We performed an extensive literature review to identify all relevant studies investigating the association between temperature and morbidity. Included studies were required to report a change in daily hospitalisation counts for a change in temperature, reported as either a relative risk or % change. After identifying the final set of studies for inclusion, we extracted the quantitative estimates of the effects of hot temperatures on all–cause and cardiorespiratory morbidity. Pooled effect estimates were calculated using a Bayesian hierarchical approach that allowed for the consideration of multiple study results, particularly latitude and different lag periods. Studies were analysed for both respiratory and cardiovascular morbidity, in total and also according to the temperature relationship considered (linear or non–linear).

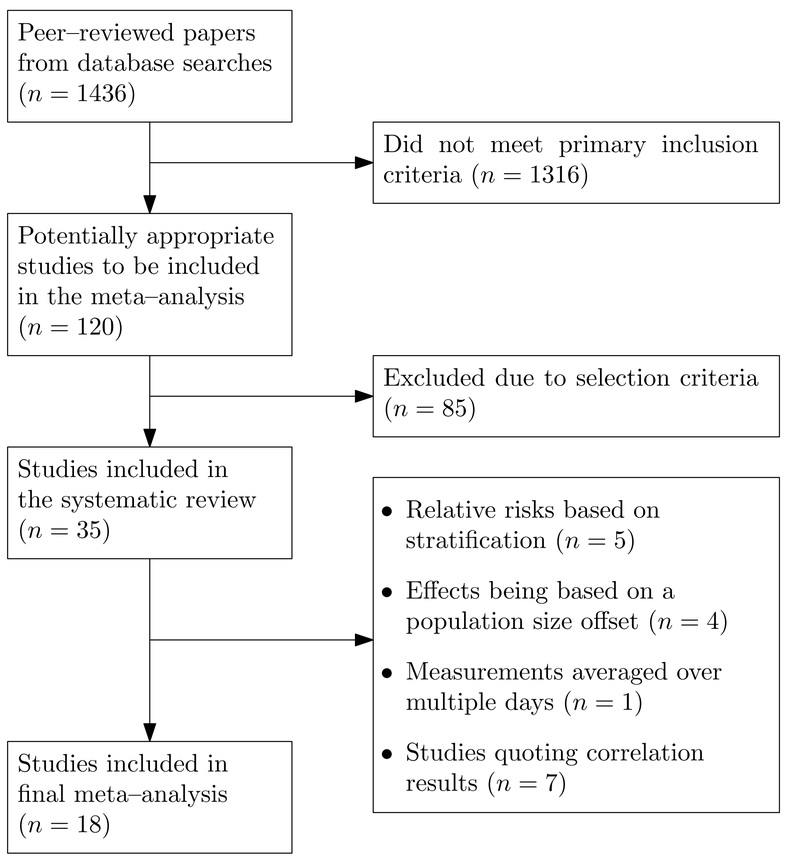

Figure 2: Literature search strategy and results

Results

Eighteen relevant studies were included in the final meta-analysis, covering both respiratory and cardiovascular morbidity. The meta-analysis results showed a non-significant increasing effect on respiratory morbidity due to a $1\,^{\circ}\mathrm{C}$ increase on hot days.

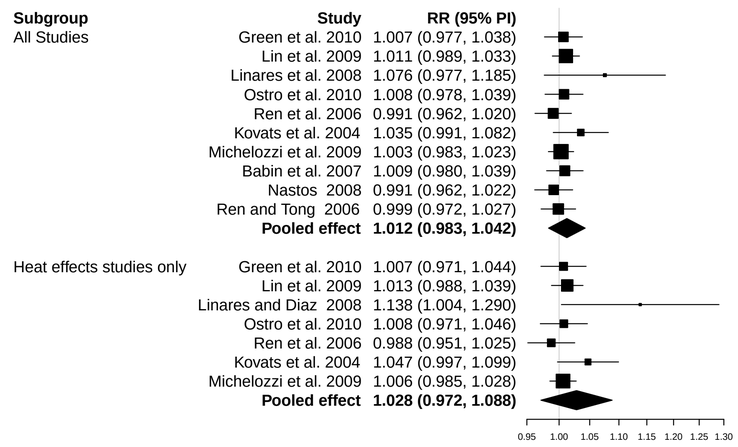

Figure 3: Pooled results for respiratory morbidity

No association was observed between temperature and cardiovascular morbidity.

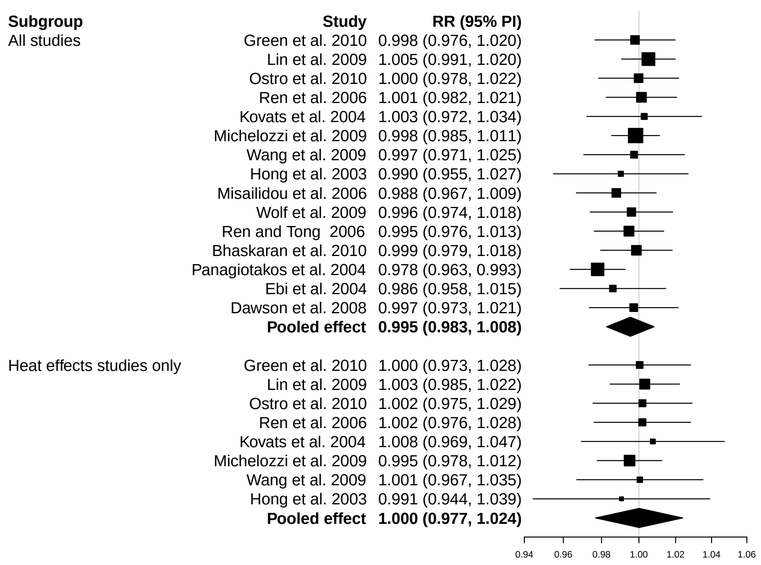

Figure 4: Pooled results for cardiovascular morbidity

The length of lag period had mixed effects on the risk of respiratory and cardiovascular morbidity, while study latitude had no effect. The effect was seen to increase when only those studies considering non–linear temperature relationships were examined.

Conclusion

This meta–analysis found that the effects of temperature on cardiorespiratory morbidity appeared to be smaller and more variable than previous findings related to equivalent mortality effects. The results provide supporting evidence of a heat effect on respiratory morbidity, but indicate no apparent effect on cardiovascular morbidity. Additionally, lagged effects differed in direction between respiratory and cardiovascular morbidity. Further research is needed into the differences of the temperature effect between respiratory and cardiovascular morbidity.

Acknowledgments

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