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Associations of temperature variation and mortality in seven Japanese prefectures

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Purpose: Few studies have investigated the mortality effects of temperature variation (TV) in Japan. In this study, we used the newly proposed indicators of inter- and intra-day TVs to assess the TV-mortality associations and compare the associations with the contribution of mean daily temperature.

Methods: We collected daily data for temperature and mortality during 1972-2012 from seven major prefectures in Japan, i.e., Hokkaido, Yamagata, Tokyo, Kanagawa, Aichi, Osaka, and Fukuoka. We performed a quasi-Poisson regression analysis combined with a distributed-lag non-linear model. We separated the effect of inter- and intra-day TVs into cold- and heat-related, by calculating only those below and above the minimum mortality temperature (MMT), respectively. The inter-day TV was defined as the relative change in temperature between the current and previous day. The intra-day TV (diurnal temperature range (DTR)) was calculated as the difference between the daily maximum and minimum temperature.

Results: All prefectures showed significant increases in mortality risk associated with mean daily temperature, with a relative risk (RR) reaching 1.148 (95% confidence interval (CI): 1.108, 1.190) for heat in Aichi and 1.462 (95% CI: 1.295, 1.650) for cold in Yamagata. In contrast, inter- and intra-day TVs were mostly insignificant and the effect size was small, with less than 2% risk. DTR was adversely associated with mortality on hot days in Tokyo (RR 1.014; 95% CI: 1.004, 1.025), and Kanagawa (RR 1.014; 95% CI: 1.000, 1.029), and on cold days in Tokyo (RR 1.005; 95% CI: 1.001, 1.010).

Conclusions: We found that the association between mortality and temperature variation is generally small compared with mean daily temperature, although further research is necessary.

Biography

Chaochen Ma is currently pursuing his PhD in University of Tsukuba, Japan. His major is on environmental epidemiology with an interest in the associations of temperature and mortality or mobility, and quantify the effect.

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