Title:

Behind the temperature-related mortality in a subtropical urban area: a cluster analysis approaching

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Abstract:

Introduction: Past studies of urban areas have shown how human health is affected by outdoor air temperature both in cold and hot weather, and can in extreme cases result in death, especially to vulnerable people with cardiovascular diseases. However, temperature varies both spatially and temporally, which means there may be a spatial influence on temperature-related cardiovascular mortality. The growing evidence shows built-environment and socio-economic conditions are important modifiers of human exposure to local temperature and buildings' quality and utilisation can protect or exacerbate occupants' health. Here, we use clustering to explore the geographical similarity of temperature, neighbourhood and building features across the greater Taipei region and correlations with cardiovascular mortality.

Methods: Datasets of urban climate, death statistics, built-environment and socio-demographic statistics from 40 towns of greater Taipei are used from 2015 and 2016. First, cokriging spatial interpolation is used to estimate the monthly average outdoor air temperature from the monitored data of Taiwan Central Weather Bureau. Second, a combination of monthly total death number and yearly cause of death datasets from Taiwan Ministry of Health and Welfare is used to estimate the monthly cardiovascular mortality. Finally, through using two clustering methods, the geographical influences on cardiovascular mortality are explored.

Results: The analysis shows there are spatiotemporal similarities of cardiovascular mortality among different towns which are not only due to administrative boundaries or seasonal change but also from the built-environment and socio-economic characteristics of each town. Residential density and home energy consumption are shown to have a significant relationship with cardiovascular mortality.

Discussion: This is the first study using clustering to explore the geographical relationship between cardiovascular mortality and potential determinants in East-Asia. The method provides a means to show how each cluster has its own unique combination of characteristics to explain the relationship with cardiovascular disease for a specific period.