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Do heat prevention measures reduce the risk of heat-related mortality in Europe?

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Early heat warning systems and heat-health action plans have been considered as one of the crucial heat prevention measures (HPMs) to prevent heat related mortality. However, previous studies showed that beneficial effects of HWSs are not consistent across cities and more research is needed to assess the efficiency of HPMs.

The aim of this study is to better understand the ability of HPMs to prevent heat-related mortality across Europe. Via MCC network, we obtained daily mortality time series from 267 locations across 16 European countries in the period 1990-2018. Via partners in COST Action PROCLIAS, we collected information about HPMs from selected European countries. Based on the WHO criteria, we developed a classification of HPMs in individual cities and countries, regarding their complexity.

We employed a two-stage longitudinal study design, to assess the temporal changes in heat-mortality in individual countries and to quantify beneficial effects of HPM implementation. In the first stage, we used quasi-Poisson regression models coupled with distributed lag non-linear models to calculate an exposure-response function in each location in each three-year window of the study period. In the second stage, we employed a random effect mixed meta-regression model, to quantify the effects of implementation, methodological updates, and overall complexity of HPMs. Modifying effects of the spatial-temporal variability in heatwave intensity were also considered.

Results suggest that South and Western European countries with the most complex HPMs, that

include detailed heat and health action plans, experienced the largest reduction of the heat-related mortality risk after HPM's implementation. However, the results were sensitive to timing of the main heat wave periods in each region. Findings of this study highlight the need for further development and improvement of heat prevention measures in Europe.