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Evaluation of an early warning system for heat wave related mortality in Europe: implications for sub-seasonal-to-seasonal forecasting and climate services

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Heat waves have been responsible for more fatalities in Europe over the past decades than any other extreme weather event. However, temperature-related illnesses and deaths are largely preventable. Reliable sub-seasonal-to-seasonal (S2S) climate forecasts of extreme temperatures could allow for better resource management within heat–health action plans, to protect vulnerable populations and ensure access to preventive measures well in advance. The objective of this study is to assess the extent to which S2S climate forecasts could be incorporated into heat–health action plans, to support timely public health decision-making ahead of imminent heat wave events in Europe. Forecasts of apparent temperature at different lead times (e.g. 1 day, 4 days, 8 days, up to 3 months) were used in a mortality model to produce probabilistic mortality forecasts up to several months ahead of the 2003 heat wave event in Europe. Results were compared to mortality predictions inferred from using observed apparent temperature data in the mortality model. In general, we found a decreasing transition in skill between excellent predictions when using observed temperature, to predictions with no skill when using forecast temperature with lead times greater than one week. However, even at lead-times up to three months, there were some regions in Spain and the United Kingdom where excess mortality was detected with some certainty. This suggests that in some areas of Europe, there is potential for seasonal climate forecasts to be incorporated in localised heat–health action plans. In general, these results show that the performance of this climate service framework is not limited by the mortality model itself, but rather by the predictability of the climate variables, at S2S time scales, over Europe.