

# Cardiopulmonary mortality costs of future heat spells in Europe and interactions with air pollution management

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## Abstract

We present integrated projections from the H2020 project EXHAUSTION for the welfare economic costs of premature cardiopulmonary mortality in Europe, based on the SSP245 middle-of-the-road scenario for global warming. Exposure-response functions for heat and air pollution related cardiopulmonary mortality in urban areas have been derived from daily death registrations against average daily temperatures and concentrations of fine particles from a total population >30 million in eight cities. They reflect that citizens in northern Europe are more sensitive to heat stress than people in the south.

We find that average annual heat-related premature cardiopulmonary fatalities more than double by mid-century. Moreover, welfare economic costs of mortality in designated heatwave years are found to triple, relative to the 2015-22 average, while they quadruple for west-Balkan and Türkiye. In Denmark fatalities and costs of mid-century heatwaves are found to increase by a factor 15.

Due to the interactive effects of heat and air pollution, the accumulated number of heat-related cardiopulmonary fatalities would be about 45 per cent higher (about 150,000 cases over the next 25 years) with 2021 levels of air pollution maintained, compared with rapid reductions of air pollution exposures in urban areas. Air pollution abatement can thus be considered an important adaptation strategy for reducing heat-related mortality.