The PHEWE Project:

Assessment and prevention of acute health effects of weather conditions in Europe

PHEWE was the first large-scale European study, including 30 million citizens living in areas with differing climatic conditions on this topic. The study applied a standardised scientific approach to provide better knowledge on the health effect of cold / hot temperature and on the role of several effect modifiers.

Objectives

The general aim of this project was to assess the acute health effects of extreme weather, during the winter and summer season, in 16 European cities characterised by different climatic conditions, and to propose preventive strategies to reduce the health impact of weather conditions. Specific objectives were to:

- investigate the association between weather, daily mortality, and hospital admissions (total, cardiovascular, cerebrovascular and respiratory causes) through city-specific and pooled analysis, using a time series approach;
- examine the form of the dose-response curve, identify threshold levels above which an effect is observed, the latency time between exposure and effect, and the effect of cumulative exposures;
- analyse the synergy between weather and air-pollution variables on mortality and morbidity;
- develop heat/health watch warning systems (HHWWS) in a subgroup of cities to predict potentially oppressive weather conditions that could negatively affect health;
- develop a framework of preventive strategies and public health interventions to minimise adverse health effects in Europe.

Key findings and conclusions

- The effect of temperature on mortality showed a significant association of mortality to both low and high temperatures in all cities. During summer, a J-shaped relationship between maximum apparent temperature and mortality was observed in most cities. The threshold level above which the increment of mortality was observed showed a large heterogeneity among cities (from 21.5°C to 32.7°C). The effect of heat was immediate (lag 0-3). The percent variation in mortality was higher for respiratory and cardiovascular mortality and the effect increased with age. During winter, the temperature-mortality relationship had a linear negative trend, showing an increase in mortality as temperatures decline. The effect of cold has a longer lag (0-15). The pooled analysis showed a statistically significant effect for total and cardiovascular causes of death in all age groups while for respiratory and cerebrovascular mortality a statistically significant effect was observed only for the elderly. In both winter and summer the strongest effects were observed in the Mediterranean cities;
- The analysis of the effect of temperature on hospital admissions was not always consistent with results on mortality. During summer, no effect of high temperatures was observed on cardiovascular and cerebrovascular causes for all age groups considered, while for respiratory disease a significant positive effect of high temperatures was observed especially in the 75+ age group. During winter a significant effect of low temperatures was observed for respiratory admissions on all ages, while cardiovascular admissions had an effect only on the elderly. No effect was found for cerebrovascular admissions;
- Analysis on the confounding and interactive effects of air pollution on mortality showed a minimal confounding effect in both winter and summer; adjusting for air pollution reduced the effect. Significant interactive effects were seen in summer, with ozone showing the strongest effect;
- Finally, years of life lost due to heat were estimated with the greatest effect detected among the elderly, and experimental HHWWS were implemented in pilot cities.

Relevance and contribution to EU Policy

The findings of the PHEWE project were milestones with respect to international and EU environmental policy requests concerning the protection of human health in the light of climate change. In the context of the 5th Framework Programme, the project specifically addressed the general objectives identified in Key Action 4: "Analysis and quantification of the impact of environmental factors on human health" through city-specific and pooled analysis, and health impact assessment; "Assessment of the relative importance of, and the interactions between, factors impinging on health" through the analysis of confounding and effect modification of air pollution; "Development of an integrated approach to risk management taking into account environmental and public health aspects" through the development of heat/health watch warning systems. Furthermore, this project, through the dissemination process and importance for the European policy agenda, promoted exchanges between public health experts and other stakeholders such as Ministries of Health.

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Project acronym
PHEWE

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