

Spatial impacts of heat waves in mortality. Evaluating current risks and future threats

H. Andrade (1), P Canario (2), and H Nogueira (3)

(1) (henr.andr@gmail.com) Centre of Geographical Studies, University of Lisbon, Faculdade de Letras, Alameda da Universidade, 1600-214, Lisboa, Portugal, tel: + 351 21 7940218 / 21 7965469 Fax: +351 21 7938690, (2)

(pmscanario@gmail.com) Centre of Geographical Studies, University of Lisbon, Faculdade de Letras, Alameda da Universidade, 1600-214, Lisboa, Portugal, tel: + 351 21 7940218 / 21 7965469 Fax: +351 21 7938690, (3)

(helenamarquesnogueira@hotmail.com) FACULDADE DE LETRAS DA UNIVERSIDADE DE COIMBRA Largo da Porta Férrea - 3004-530 Coimbra - Portugal TEL: +351 239 859900 FAX: +351 239 836733

Impacts of heat waves in morbidity and mortality are largely known. Climate Change is expected to increase the climate health impacts in summer while the winter will be probably favored.

The health impacts of extreme thermal events are mainly studied at a national or regional level, considering macro or mesoscale thermal features. But it can be assumed that local variations in mortality must exist, associated, in one hand, with local climatic differences, due to features such as land use and urbanization and, in other hand, with vulnerability factors (depending on demographic and socioeconomic characteristics of populations). A model of hazard – vulnerability – risk was developed, to analyze the spatial variations of mortality in extreme thermal events, at the level of city district, in the Lisbon metropolitan area (Portugal). In that model, risk is considered as the product of hazard and vulnerability. Daily mortality data by sex, age and cause of death was supplied by the Health National Authority. The research is yet on-going.

In our model, hazard is represented mainly by temperature and air pollution (the influence of other atmospheric variables that affect the human energy balance, such as solar radiation and wind speed should be tested too). Small scale variation of meteorological features, in extreme thermal events, were simulated with a Regional Atmospheric Model (Brazilian Regional Atmospheric Modeling System) and the results were validated and calibrated using observation data from an urban network of termo-higrometers placed in sites with different urban characteristics. Vulnerability is a result on personal sensitivity and exposure. Personal sensitivity is assessed considering individual constitutional and demographic factors as well as socio, cultural and economic variables. Daily mobility determines the population exposure to heat. Since many of these variables are redundant, a set of indicators, including a multiple deprivation index, was used.

A first step consists in the modelling of the current relationship between hazard factors, vulnerability and mortality with the aim to explain the variations in mortality, at the city-district scale. In a second step, changes in hazard and vulnerability factors will be simulated. In the changes in meteorological conditions, IPCC and SIAM II scenarios were considered, as well as previsions of urban development and land use changes in the studied area. Demographic and socioeconomic changes should be simulated too. The pretended result with this risk assessment methodology is a prevision of future impacts (intensity and patterns) of the heat waves on mortality.