Geophysical Research Abstracts
Vol. 12, EGU2010-1585, 2010
EGU General Assembly 2010

Modeling regional and gender impacts of the 2003 summer heatwave in excessive mortality in Portugal

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This work evaluates the impact of the 2003 European heatwave on excessive human mortality in Portugal, a country that presents a relatively high level of exposure to heatwave events. To estimate the fortnight expected mortality per district between 30 July and 15 August we have used five distinct baseline periods of mortality. We have opted to use the period that spans between 2000 and 2004, as it corresponds to a good compromise between a relatively long period (to guarantee some stability) and a sufficiently short period (to guarantee the similarity of the underlying population structure).
Our findings show a total of 2399 excessive deaths are estimated in continental Portugal, which implies an increase of 58% over the expected deaths for those two weeks. When these values are split by gender, it is seen that women increase (79%), was considerably higher than that recorded for men (41%). The increment of mortality due to this heatwave was detected for all the 18 districts of the country, but its magnitude was significantly higher in the inner districts close to the Spanish border. When we split the regional impact by gender all districts reveal significant mortality increments for women, while the impact in men's excess deaths is not significant over 3 districts.
Several temperature derived indices were used and evaluated in their capacity to explain, at the regional level, the excessive mortality (ratio between observed and expected deaths) by gender. The best relationship was found for the total exceedance of extreme days, an index combining the length of the heatwave and its intensity. Both variables hold a linear relationship with r = 0.79 for women and a poorer adjustment (r = 0.50) for men. Additionally, availability of mortality data split by age also allowed obtaining detailed information on the structure of the population in risk, namely by showing that statistically significant increments are concentrated in the last three age classes (45–64, 65–74 and 75 or more). A finer approach is relevant for prevention strategies, since it allows identifying better the target population of any preventive strategy regional and national authorities may be interested to implement.

Trigo, R.M., et al. (2009), Evaluating the impact of extreme temperature based indices in the 2003 heatwave excessive mortality in Portugal. Environ. Sci. Policy doi:10.1016/j.envsci.2009.07.007