



## **Heat related mortality during heatwaves in urban and rural areas in two regions of Poland**

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A number of studies in Europe and in Poland confirm that in last decades the number, durability and intensity of heat waves has increased (Della-Marta 2007). Since the beginning of the nineties of the 20th century there were at least 5 especially intense and long lasting heat waves in Poland. In the most affected regions of the country the 7 day anomaly of maximum daily air temperature in the summer of 1994 and 2015 exceeded 12 oC and the 14 day anomaly reached almost 10 oC. This effected with a significant increase of the number of fatalities in the largest towns. In the year of 1994 the number of additional fatalities in the 10 largest urban areas of Poland (which is inhabited by 16.25% of the whole population of Poland) exceeded 1000, and during the warmest days the number of fatalities due to cardiovascular diseases doubled and in some towns even tripled. Researches from other countries indicate that the problem of increased mortality because of heat waves refers also to smaller towns and rural areas (but to bit lesser extent) (Gabriel et al. 2011). The present study are an attempt to calculate how forms the risk of increased mortality during especially intense and long lasting heat waves in towns of different number of inhabitants and in rural areas. Analysis focuses in data referring to the reason of mortality (according to the ICD classification), the age and place of deceased from two regions of Poland with a similar number of inhabitants (over 3.5 million) – Wielkopolska and Małopolska regions. Apart the similarities of these two regions there are some significant differences like i.e. population density or the urbanisation factor. A different orography also is an important issue for the analysis. The Wielkopolska region is entirely located on lowlands, and the Małopolska region is on highlands, partially foothill. In literature regarding the subject attention is drawn to existence of two issues: 1) so called lag which is a shift between occurrence of high temperature exposure and the time of mortality (mostly one to three days); 2) the harvesting effect, so the death occurrence acceleration of people already ailing, who even without the harmful factor would have lived for some more days. Therefore the calculations have been done for two periods: days during heatwaves and the period between the first day of occurrence of the first heat wave and the 30th day after the last heat wave has finished, which probably corresponds more accurately to the right number of mortality increase. The results confirm that during the most severe heat waves an increase in fatalities occurs also away from large towns. In some cases it is even the same, including proper proportions, i.e. during the heat wave of 1994 in Poznań (581 thousand of inhabitants) there were additional 200 fatalities, and in the neighbouring municipality of Swarzędz (34.6 thousand of inhabitants) the number was 12 (additional 3.45 death per 10 thousand inhabitants for both towns).