

# Heat wave: a climatic deadly phenomena that can be prevented

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Heat waves are known to cause many deaths with a short period of time<sup>1</sup>. In Spain, various studies have shown a correlation between high temperatures and an excess incidence of deaths<sup>2,3</sup>.

Summer 2003 has been globally extremely warm. In the South of Italy<sup>4</sup>, important heat waves had already occurred in June and July, whereas in Western Europe including the North of Italy the highest temperature levels were recorded between the 1<sup>st</sup> and the 20<sup>th</sup> of August. Portugal, the centre of France, some parts of Spain and the North of Italy have been particularly stricken with a long period of consecutive very high temperature days<sup>5</sup>. In Belgium, England and the Netherlands, this heat wave was shorter and milder even if record temperatures had been registered during August.

First estimations of the consequences of these heat waves are now available. The count in France is 14800 deaths in excess (55%) between the 1<sup>st</sup> and the 20<sup>th</sup> of August compared to the previous years<sup>6</sup>. The Italian Ministry of Health estimated a first impact of 4175 deaths in excess among the persons older than 65 years between the 15<sup>th</sup> of July and the 15<sup>th</sup> of August compared to the previous year. Portugal estimated 1316 deaths in excess between the 31<sup>st</sup> of July and the 12<sup>th</sup> of August compared to the previous two weeks. Rome counted from 1<sup>st</sup> of June to 15<sup>th</sup> of August, 708 deaths in excess compared to the previous years (17,5%)<sup>4</sup>. Between the 4<sup>th</sup> and the 13<sup>th</sup> of August, England<sup>7</sup> estimated 2045 deaths above the average for the last five years (16%) and Netherlands<sup>8</sup> estimated between 1000 and 1400 excess deaths from June to August 2003 compared to the former years. In Spain, the heat wave impact should not differ greatly from what has been observed in Italy or Portugal.

All those estimations are still not very accurate and they are difficult to compare due to the choice of different periods of assessment. Nevertheless the first results show clearly that the heat waves have claimed ten thousands of lives in Europe. They also give interesting information.

Globally the effects seem to have been very quick after the rising of temperature, the excess of deaths coinciding with peaks of temperature or with a lag of one day and going down with a lag of a few days after a long period of very high temperatures<sup>4-6</sup>.

It is likely that the accumulation of consecutive days with extreme temperatures increases the effect of the heat wave

as already reported in former studies<sup>3</sup>. The french study shows clearly an acceleration of the death toll on the 6<sup>th</sup> day of consecutive temperature above 35°C, and a relation in departments between the excess global mortality and the number of consecutive days with maximal temperatures above 35°C<sup>6</sup>.

Even in the countries where the heat wave has been milder, an important burden has been observed. This result is in agreement with former studies that show a graphically V shape relationship between death rate and temperature, with an optimal mean temperature lower in the northern regions than in the southern regions<sup>2</sup>.

Other relevant endpoints for the design of action plans will probably be identified by further analyses of the dataseries such as the threshold temperatures which enhance the impact, or the effect of chronology of the heat waves during a summer<sup>3</sup>.

Several studies have already been launched in order to better understand the main risk factors that caused so many deaths in the elderly and results will be available in the coming year. But some information can be analyzed already.

The excess mortality is observed essentially among the elderly and increases dramatically with age<sup>4,6,9</sup>. In France, the proportion of excess deaths grows up from 20% among the 45-54 years to 70% among the 75-94 years and 120% among the (> 94 years)<sup>6</sup>. In Rome, the excess mortality grows up from 2,5% among the 65-74 years to 40,2 % among the > 85 years<sup>4</sup>.

Epidemiological studies show that health impacts of the heat waves are much larger than just hyperthermia. Global, cardiovascular and respiratory mortality are the indicators most often mentioned to show a significant relationship with high temperatures<sup>1</sup>. Heat related deaths (dehydration, hyperthermia, heatstroke) are rarely quoted. On the one hand, a few deaths are diagnosed clinically as being due to heat and recorded as such. On the other hand, death can be linked to dehydration as well as to overload of already failing heart or pulmonary conditions<sup>10</sup>. In France, the first analysis of the cause of death shows<sup>6</sup> the maximum relative increase for heat related causes of death, followed by illnesses of the genitourinary system, and respiratory diseases. The respective proportion among the global mortality during the heat wave is 28,9% heat related death, 20,6% cardiovascular diseases and 7,7% respiratory diseases.

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In order to better understand the effects of a heat wave and to guide action, it would be also interesting to analyse the relationship between temperature and other health indicators such as hospital admissions or the activity of emergency facilities in various locations. For example, in Barcelona if the excess of death during August 2003 compared to 2002 was 58 %, the excess of activity among emergency facilities was only around 5%<sup>9</sup>. On the opposite, in France the heat wave has been revealed by the explosion of activity of emergency facilities.

Another important environmental issue is to measure the interaction between meteorological conditions and air pollution. Many studies suggest a synergic effect between ozone and/or particulate pollution and heat on deaths and a high contribution of such a pollution on the final toll<sup>1</sup>. The high levels of ozone registered in the Centre and Ile-de-France areas during the heat wave period could be one of the various factors explaining the specific high burden of this heat wave.

More studies should be conducted to specifically delineate the local social characteristics of the victims. A case control study is being performed currently in France to assess the impact of those risk factors. Such knowledge will guide the relevant actions for prevention of the health impacts of future heat waves.

On the opposite of many North American cities, European cities were not prepared to deal with the problem of heat waves. If many European countries claim to have criteria for initiating heat warnings based on the weather forecasts, most of them do not include any intervention apart from issuing a passive warning to the general public or to the local public health agencies. Up to now, only Rome and Lisbon have implemented a real heat watch warning system working in relation with intervention plans.

The principle of such systems is to identify specific meteorological situations found to have a statistically significant effect on mortality in the elderly on the base of the analysis of local daily time series of mortality and a set of meteorological parameters. This work leads to different levels of warning when such situations are forecasted for the next 24-48 h. As soon as an action warning is issued, different actions are initiated with strong implication of a network of stakeholders. In Philadelphia<sup>11</sup>, these activities are based on announcements by the media, activation of a heatline, involvement of neighbours or relatives, home visits by field teams of the Department of health, increasing of medical emergency staffing and facilitation of the access of the elderly to air-conditioned service facilities.

The efficiency of such systems has never been performed completely. But some published results support the hypothesis of their real efficiency at short term as well as the possibility of adaptation of the population to hot temperatures at long term<sup>10,12</sup>.

In conclusion, the first results of summer 2003 have highlighted the importance of heat as a public health issue in Europe that could be more and more prevalent with global warming and ageing of the population. This situation demands clear local, national and European reactions at different levels.

Firstly, an accurate and comparable evaluation of what happened this summer in various localities is needed. This will be possible only if standardized methods are used for comparing precisely the exposition to high level temperatures and the excess of mortality. Such an analysis should be extended during all the year to be able to detect the middle and long term effects of the heat wave.

Secondly, collaboration is also very important in implementing the studies for assessment of the contribution of various risk factors leading to death.

Thirdly, implementation of various local based Heat Health Watch Warning Systems linked to intervention plans is necessary in main cities and regions of Europe. Such systems should be developed with a minimum of deontology including knowledge of the other experiences, clear decision making protocols, clear performance standards and regular performance evaluations.

To achieve those goals, a strong cooperation between experts from different countries is needed through meetings, permanent networks or research programs that should be supported by the national and international authorities.

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