Unusual periods of high temperatures were observed in France between August 4th and August 12th, 2003, thus being the warmest year over the last 53 years. The following figure (source: French weather bureau-Meteo France) shows daily minimum and maximum temperature from June 28th to August 17th, 2003. From August 1st to August 5th, temperatures began to increase steadily and remained high until August 13th.

Throughout the country, 2/3 of the meteorological stations recorded temperatures above 35°C, sometimes above 40°C in 15% of the main cities in France. In Paris, the temperature exceeded 35°C for as long as 10 days, including 4 days in a row between August 8th and 11th, 2003, a situation never observed since 1873. On August 11th and 12th, 2003, a minimal temperature of 25.5°C was recorded in Paris during the night. This is the absolute record for minimal temperatures ever measured in Paris.

The continuing high maximum and minimum temperatures were unusual compared to other European cities as shown in the following figures (source: French weather bureau-Meteo France).
In addition, the high temperatures and the sunshine causing the emission of pollutants significantly increased the atmospheric ozone level. The impact of air pollution will therefore have to be taken into account by the InVS when evaluating the health impacts caused by the heatwave.

The Institut de Veille Sanitaire developed several epidemiologic studies in order to assess the health impact of the August 2003 heat wave. A progress report on August 28th with the first results of these studies is available in French on www.invs.sante.fr.

The heatwave of August 2003 had a severe health impact on public health in France, with a mortality largely affecting the elderly people. On August 13th, 2003, data allowed to conclude that a large-scale outbreak was to happen. An excess mortality of 3 000 cases was estimated by the InVS based on the data provided by the Pompes Funèbres Générales (France’s largest funeral parlour).
A more complete analysis of the excess mortality for August 2003 was then conducted, based on the death certificates passed on by the town councils to the county health offices (DDASS). By comparing the number of deaths registered between August 1st and 15th, 2003 in France (32,065 reported deaths) and the expected number of deaths (i.e. estimated on the basis of the mortality in 2000, 2001 and 2002 corrected by the variations of the population’s structure by age) for the same period (20,630 expected deaths), the excess mortality was estimated at 11,435 additional deaths with the data collected until August 26. This is equivalent to a total mortality increase of 55% between August 1st and 15th, 2003. Yet, this analysis will have to be further developed.

The following figure shows, with the data collected until August 26th, the excess mortality between August 1st and 15th, 2003 compared to the mean number of deaths for the same period between 2000 and 2002. The excess mortality seems to be higher in the northern and centre regions of France. This figure has to be updated with the data collected after August 26th and taking into account the variations of the population’s structure by age of each county.
Another survey conducted by the InVS referred to the deaths caused by heatstroke in public and private healthcare facilities. On August 24th, 2003, 2,417 deaths caused by heatstroke between August 8th and 19th, 2003 were reported. The first results of this still incomplete study underline the vulnerability of the elderly, especially the ones above 75 years old (81% of the deaths). Among the persons who died before they could reach 60 years old, the high frequency of mental diseases suggests that the latter might be a risk factor together with obesity and related pathologies. An excess mortality of 13% among men compared to women was also observed. However, this study does not allow to highlight specific risk factors or to know how long the victims would have survived if there had not been any heatwave.

A survey conducted on emergency interventions between May 25th and August 19th, 2003 shows an increase in these emergency interventions during the heatwave. The data given by emergency services allow a regular monitoring of highly sensitive indicators (number of
interventions for discomforts, emergency interventions for people over 80…). Some signals were perceived from August 5th, 2003, and sometimes later depending on the regions. These elements will have to be included in the development of a warning system that will rely on a large network of computerized emergency services.

**Firemen interventions in Paris in 2003 compared to 2002**

A survey on the mortality in 13 of the largest urban areas in France shows significant differences between these cities, some of them experiencing a distinct increase in mortality during the heatwave (Paris, Lyon) and others being less affected (Lille, Nice, Rennes…). These preliminary observations will have to be completed, in particular with a more precise analysis of the correlation with the meteorological and pollution data.

In order to detect possible delayed heatwave-related effects, a warning system was set up with the help of emergency units. Indeed, several pathologies can occur after the heatwave. On August 26th 2003, no significant evolution in the occurrence of these pathologies was detected. This study will be continued between August 21st and September 1st, 2003.

The health impact of the heatwave and its management in surrounding countries have been conducted and updated weekly. On August 27th, 2003 none of the nine countries contacted were able to give a thorough assessment. However, the effects of the heatwave seem to be significant in Portugal, Spain and the United Kingdom. The contacts that have been established for this study should allow the creation of a network to compare the studies and their results at a European level.

A research programme initiated by the InVS together with the mission conducted by MM. Denis Hémon and Eric Jougla of the INSERM will allow to continue the current research.