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| **Use Case Name** | ***Heat wave health impacts #3***– Evaluation of the possible use of sub-seasonal-to-seasonal in heatwave early-warning system |
| **Sector** | Health |
| **Reference** | SEC-HEA-UCT-005 |
| **Scope of decision-making** | Assess the extent to which sub-seasonal-to-seasonal climate forecasts could be incorporated into heat-health action plans, to support timely public health decision-making ahead of imminent heat wave events in Europe. |
| **Actor** | Name: Dr. Rachel Lowe (1), Dr. Markel Garcia (2) and (3) James Creswick  Name of organisation: (1) London School of Hygiene & Tropical Medicine, (2) Predictia and (3) WHO - Europe  Job title: (1) Assistant Professor, (2) Scientist and programmer and (3) Technical Officer  Country: (1) United Kingdom, (2) Spain and (3) Europe |
| **ECV/CII** | Apparent temperature (function of air temperature and dew point temperatures at 2 metres). |
| **Data source** | Reanalysis and seasonal forecast hindcasts. |
| **Type of required product** | Raw data in NetCDF or Grib2. |
| **Application** | Assess the extent to which sub-seasonal-to-seasonal climate forecasts could be incorporated into decision-making processes related to heat-health action plans. |
| **Current sources** | ECMWF (ERA-interim, System4 and ECMWF sub-seasonal forecast system products) |
| Key characteristics of the climate information | |
| **Timeliness** | Lead times 1, 4, 8, 11, 15 and 18 days (retrospective analysis) |
| **Frequency of update** | Daily |
| **Horizontal spatial resolution** | NUTS2 region scale resolution |
| **Horizontal Spatial coverage** | Europe (climate data available globally) |
| **Vertical spatial resolution** | Surface data |
| **Vertical spatial coverage** | Surface data |
| **Temporal resolution** | Daily |
| **Temporal coverage** | From 1998 to 2003 to calibrate the mortality model (ERA-Interim data and mortality data). From 1-15 of August of 2003 for climate forecast version 4 (System 4) and ECMWF sub-seasonal forecast system. |
| Normal flow of events - The typical flow of events from user request, to successfully obtaining the climate data, to using the data. Document the step-by-step chain of activities. | |
| **Internal or external processing** | Internal |
| **Details on data processing / manipulation** | Apparent temperatures (calculated using air temperature and dew point temperature at 2 metres) from 1998 to 2003 across 16 countries in Europe at 54 regions in Europe (grouped regions at level NUTS2) are used as climatological input to a mortality model. Data is smoothed using filters and threshold to define range of temperature into warm and cold tails. The model is used to fit temperature-mortality curves using a Bayesian probabilistic framework.  Climate forecast System4 and ECMWF sub-seasonal forecast system (at daily scale and biased corrected) is used as input to the mortality model. Then, the daily mortality forecasts are aggregated over 15 days. The results are compared with results from the mortality model using reanalysis climate data (ERA-interim),and observed mortality data.  The skill of the forecast is assessed for different lead times using ROC curves. |
| **Tools for data processing** | Spatial and temporal aggregation, filters, threshold, fitting model parameters using Bayesian probabilistic framework. Skill assessment using ROC (Receiver Operator Characteristic) curves and the corresponding AUC (Area Under the Curve) measures. |
| User requirements in relation to accessibility and visualisation | |
| **Accessibility** | The users would like that the CDS would consider sharing the publications that use CDS data. In this study has been published here <http://www.mdpi.com/1660-4601/13/2/206> |
| **Visualisation capabilities required** | Being able to combine climate variables to create climate impact indicators relevant to the specific context, and make plots of them averaged for specific regions would be desirable. |
| Quality requirements - What information do users require about the quality of climate information in order to use the climate information. Essentially ECMWF wants to know what is the minimum ‘quality’ that is required in order for the user to decide whether or not to use the dataset. | |
| **Level of skilfulness** | The minimum skill would depend on the specific final end user. The skill is found to be clearly decreasing as lead-time increases. The skill for Europe is in general very low at seasonal scales but there are some areas with some potential. |
| **Validation of data** | Not particular validation required. |
| **Meta data** | Not particular validation required. |
| **Stability** | Not particular validation required. |
| **Uncertainty representation** | Confidence (credible) intervals, ROC analysis, comparing hit rates and false alarm rates incorporate the whole ensemble of climate forecasts in probability distribution of mortality, skill maps for assessing quickly which regions (for example for a given season) have skill. |
| **Other** |  |