Atlas of mortality in Europe

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Introduction
In 1993 a corporation was started between the World Health Organisation (WHO), the statistical Bureau of the United Nations (UN-ECE), the Central Bureau of Statistics Netherlands (CBS) and the National Institute of Public Health and the Environment of the Netherlands. The goal of this project was to produce an atlas of mortality on subnational level for Europe. Previously most atlases that were available about mortality were made on a national level. Only for some selected causes of death(e.g. cancer) also atlases on a subnational level were available.

Subnational data on mortality are of great importance when studying mortality patterns over de borders of the countries. Because most registrations that are available are based on national data it is impossible to distinguish whether observed differences in mortality are caused by real differences or on differences in the registration.. With subnational data it is possible to observe whether patterns within a country are continued after the borders of the country.
Another goal of the project was to study changes in mortality between 1980’s and the 1990’s.

Project design
The project comprised the following 5 stages
1. Data collection
2. Data cleaning and validation
3. Data processing and production of atlas
4. Making the data base available
5. Production of WEB page

1. Data collection
The UNSO requested participating countries (35) to provide pertinent data. Requested data included population by age and sex and cause, age and sex specific mortality. All data had to be made available for countries as a whole and by region for 1980, 1981, 1990 and 1991. The total number of European regions was approximately 450.

2. Data cleaning and validation
The Dutch CBS was responsible for this aspect of the project. Checks were carried out for both obvious coding errors, such as inconsistent table margins and for plausibility of data, such as consistency among countries and monotonicity of mortality with age. After cleaning all data were considered usable.

3. Data processing and production of atlas
The RIVM was responsible for this stage of the project. All calculations were carried out using SAS. The figure below shows the production process of the atlas.
Before processing, data had to be read into SAS. As data was made available sequentially, this was also done sequentially and results on checks were reported back to CBS. This resulted in corrected SAS data sets. These were used to calculate standardised mortality rates and changes in these rates over the 10-years period. Additionally, population density and age distributions were calculated. These figures, together with area boundary files were required for map production. At RIVM these boundary files are available in ARC/INFO format. These files could be exported to a SAS readable format. SAS was then used to produce map. In addition, graphs showing country and region specific standardised mortality were designed. For both map production and graph design extensive use was made of the annotate facilities of SAS and of PROC GREPLAY. A single macro was used for all cause specific maps. Output of this macro consisted of photo printer readable postscript files. Thus, maps could be produced from data in approximately 4 hours, so data could be altered at any time without causing delays.

SAS facilities used for atlas production were
- datatstep (input, merge, several functions, etc.)
- procedures (means, gplot, gmap, greduce, gremove, gdevice, greplay etc.)
- annotate (design of graphs)
- macro-language (one big macro)

4. Making the data base available
In addition to the atlas the project yielded a data base of mortality in Europe. These data were exported from SAS format to ASCII using the PUT statement.

5. Production of WEB page
The last product of the project was a WEB-page on Internet. Via this page all the information presented in the atlas could be accessed. Because all the data and boundary files were available as SAS-files, it was relatively easy to produce pictures of the maps in GIF-format and the accompanying text with the SAS program. With PROC GDEVICE a device was
defined with the right pixel size. All the different HTML-files were produced in the datastep with the FILEVAR option.

Conclusions
As regards SAS the following conclusions seem important:
1. Most activities (e.g. reading, processing and exporting of data, map and graph design) were possible within a single (SAS) platform.
2. The use of Postscript for typesetting yielded high quality output. With another device the same pictures were available as GIF files to produce WEB-pages.
3. SAS has excellent lay-out facilities (using annotate and Proc Greplay)
4. Annotate can be used for highly flexible graph design. However, this requires computer programming skills.
5. Last but not least, the use of a single platform resulted in cost reductions.