

## The Eurostat Project on Harmonising Time Use Statistics.

### Harmonisation by definition of statistics and estimators

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*This paper is a report on a work that has just about started. So far there are few solutions or recommendations but the more questions. My hope is that the participants of the IATUR meeting will help to find out whether the questions are relevant and, if so, help transforming them into what might be solutions and recommendations in favour of future harmonised time use statistics in Europe.*

### 1 Background

The objective of the Eurostat project on harmonising time use statistics is to increase the comparability of time use statistics in the European Union. To make this possible, methodological and other differences in previous national time use surveys have been identified and common solutions for the future have been suggested and tested in a series of pilot surveys. The proposal for common solutions primarily concerns design elements that, often unintentionally differ between survey designs, but are regarded as crucial to the survey results.

The harmonisation approach is a mix of input and output harmonisation. On the input side, a diary format, some procedures for the data collection and a common activity coding list are strongly recommended. The time diary is self-administered with fixed 10-minute intervals to be filled in during randomly designated diary days. The respondents record the activities in own words. Furthermore, a set of common questions are recommended for the interview questionnaires to make possible the break down of the national populations into the same domains for analysis of the time use. Most of these questions have previously been used in other surveys, e.g. LFS and ECHP.

Other aspects of the survey design and survey realisation are left open for the NSIs to design. This will give the opportunity to use the best possible practices for the survey organisation and data collection efforts at the national level. However, some restraints are essential in order to bring about survey data on which similar and comparable statistics can be estimated.

There are various ways to do comparisons of international statistics. How to do it depends on the purpose, it could be carried out at different levels, with different demands on accuracy, etc. For the comparisons of future time use statistics two feasible, supplementary courses could be distinguished.

One concerns the accumulation of statistical reference tables on time use. Whenever a time use survey is carried out in accordance with the harmonised design, a set of standardised<sup>1</sup> tables could be compiled and stored in a database. As more countries conduct time use surveys, the database will grow, containing an increasing number of comparable tables. Tables could be extracted from the database to be printed or used otherwise for various purposes. To achieve this certain measures need to be taken.

The other course of action is to prepare for merging national micro data files into a common micro database to be used for extended comparative analysis. To achieve this other measures need to be taken.

This paper is a first attempt to outline what needs to be defined and specified, and which measures must be taken to make possible for NSIs to calculate the same set of comparable statistical reference tables. A precondition is that the data are collected by means of surveys for which the harmonised design is applied. The necessary requirements for setting up a common micro database will not be dealt with here.

## 2 Reference tables

A number of points need to be sorted out before guidelines can be set up for the calculation of the common reference tables. Some of these are outlined below. The answers are not self-evident and should be evaluated against the main purposes of the exercise. Other basic condition is that calculation of estimates needs to be “simple” and robust. Furthermore, it must be taken into consideration that there are differences between countries in which kind of samples that could, and will be drawn.

The basic reference tables discussed here will not necessarily replace or be the same as the tables produced for various national purposes. The latter might hold ‘the best possible’ estimators utilising different sorts of national help-information, calibration, imputation, etc., i.e. techniques that can not be recommended for the reference tables.

Even if the reference tables primarily are set up for comparative purposes, other purposes should not be overlooked. One of these is to serve as basis for the checking for possible errors in the tables.

The basic questions concern:

- Population, sample and unit
- Which are the statistics?
  - Analysis variables
  - Statistical measures
  - Population groups (Domains)
- How to estimate the statistics?
  - Basic principal
  - Handling of non-response
  - Other aspects
- Required meta-information
- Organisation

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<sup>1</sup> In contrast to ‘best possible’ tables for META-analysis

## 2.1 Population, sample, unit

It is a general presumption for comparability that the estimates reference to well defined and corresponding populations and population domains.

Most of the estimates in the reference tables will concern individuals. It is agreed that the survey samples should be representative to the population (10- years and older, or as a minimum 15- years or older) of the countries. Persons in institutions and military service are excluded.

National samples will not be uniform. In some countries households will be sampled. Provided that the household members are 10 years or older they are included in the sample. In other countries the sampling unit is the individual, and the sample is drawn from population registers. The other members of the sampled persons' households may or may not be included in the sample.

To survey entire households offers an 'extra' unit for (very interesting) analysis. However it seems uncertain whether the household will be the unit in any of the high priority reference tables.

Time is a second sampling dimension. Not only households/individuals but also days are sampled. It has been agreed that the sampled days should cover 'a year'. The meaning of this is somewhat ambiguous and need to be clarified. As suggestion, 'the year' is equivalent to 12 months, starting any day of the year. It is however unrealistic to hope for an even coverage and an even quality in the measurement of all days and seasons throughout the year. It will probably be particularly difficult to obtain a good measurement and representativity of the actual time use during e.g. Christmas, New Year, Holiday seasons, etc. Possible actions are:

- Exclude certain days (a move towards 'normal' time use)
- Reweight to obtain an even (but presumably biased) representation
- Calculate separate estimates for supposedly problematic days
- Other?

Which way to go is an open question!

## 2.2 Which statistics?

Need to be defined in terms of:

- Analysis variables
- Statistical measures
- Population groups (domains, unit.)

### 2.2.1 Analysis variables

The analysis variables consist of various transformations and combinations of characteristics of the episodes recorded in the time diary, particularly primary activity, secondary activity, information on 'with whom' and 'where'. Duration, frequency, and sequence of episodes also form possible analysis variables.

A key question here is which activity level to aim at. The activities will most likely be coded into a hierarchical system with 150 - 200 activities on the most detailed, the 3-digit level. Would this level of detail be adequate in the tables on main activities, or would it be better to reduce the number of activity categories? On the 3-digit level many activities will be empty, i.e. the mean time spent on these will be close 0. One argument for using the most detailed activity level is that it might help detecting errors in the tables.

The same activity coding list will be used for primary and secondary activities. Probably there is no very strong reason to account for detailed secondary activities in the tables, though some 3-digit level activity categories might be required for specific purposes.

The 'where' and 'with whom' variables can be used as they are coded or appear in the diaries.

### 2.2.2 *Statistical measures*

A very tentative first draft! Please comment!

First priority measures:

- *Mean time for main activities*, separate estimates for weekdays (Monday – Friday), weekend days (Saturday – Sunday), weeks (Monday – Sunday).
- *Percentage of 'doers'*, i.e. the proportion of respondents who perform the respective activities during a weekday, a weekend day or a day of the week. These measures correspond to the means and offer some information on the distribution of the time spent on respective activities.
- *Standard errors* for mean time and percentage of "doers".  
Question: How to aggregate activities?
- *Corresponding measures for secondary activities* (however on a more aggregated activity level), 'where' and 'with whom'. Cross-tabulated with main activities at 1-digit (?) level.

Second priority:

- *Percentage of 'doers' at different hours of the day*, by day of the week (somehow aggregated days). Question: How to aggregate activities?
- *Mean time, activities for 'doers'*, by day of the week (somehow aggregated days).  
Question: How to aggregate activities?

Third priority:

- *Distribution of time for some classes of main activities*. Question: How to aggregate activities?

Fourth priority:

- Mean duration and frequency of episodes of some aggregate main activities.
- Association between time used for different main activities.

### 2.2.3 Domains

Unit: Individual (with reference to general, non-household background variables and to household variables)

No regard to sample sizes is taken here.

1. Sex
2. Age and sex
3. Household type and sex (Difficult, considerable heterogeneity in Europe. Search for a solution, adjusted towards family cycle which include age directly or indirectly)
4. Number of children and sex
5. Education level and sex
6. Labour market position and sex
7. Working hours and sex
8. Total workload in households, sex and children
9. Socio-economic group and sex

## 2.3 How to estimate the statistics?

General purposes, robustness, simplicity, and access to corresponding information direct the course of action.

### 2.3.1 Basic approach

1. 'Straight forward' (HT-estimator)?
2. Standardised, model based, etc.?

It is suggested to calculate 'straight forward' estimates, i.e. where the weights are defined by the sampling probabilities.

Analysis, in which differences in population composition and other variables are held constant, have to be carried out in some other context, e.g. on the basis of a common micro data file. Multivariate techniques necessarily cause problems that can not be handled on a general basis.

### 2.3.2 Handling of non-response

#### *a Object non-response*

There are several options to handle non-response, e.g.

- Post-stratification
- Calibration
- Imputation

Statistical ambition speaks for advanced techniques, using various sorts of help information. Uncertain access to extensive, corresponding help information in the countries and striving for simplicity and robustness speak against that ambition.

The solution to this problem can not depend on any of the information on the non-response, as there are great international variations in the prospects to obtain it.

It is suggested to adjust weights by post-stratification according to a simple model, utilising a few variables (e.g. sex, age and region of some kind, e.g. degree of urbanisation, distinguishing (big?) cities from the countryside) subdivided in a few categories. The idea is to re-weight the responding objects so that the age-sex-region numbers in the population will be obtained.

#### ***b Partial non-response***

There are two basic alternatives. One is to assume that the partial non-response is equally distributed as the response and therefore not explicitly accounted for in the tables. The alternative would be to account for it explicitly by including 'NA' categories in the tables,

#### ***c Other aspects***

A main issue here is if, and that case how to weight together days, seasons, etc. It is not quite the same question as in section 1, above.

In many estimates weekdays will be separated from weekend days. In weighting together weekdays, or weekend days, there are alternative approaches. An average for weekdays can be estimated by the sum over all weekdays, regardless of which weekday it is, divided by the number of days. An alternative is to calculate estimates for each weekday, and weight them together with equal weights.

There is probably no general best choice. Which estimator is the best depends on several factors, e.g. how evenly the days of the week are distributed within a domain, and the magnitude of the difference in the time use between days. Small variance could be associated with large bias, and vice versa. Minimising the MSE might lead to different measures in different contexts and in different countries.

What to do?

Another issue concerns variance calculation? It is unrealistic to generally ask for anything but approximate estimates. What sorts of approximations would be acceptable? Is it equally important to calculate variances for all estimates?

## **2.4 Required meta-information**

Meta-information defining the surveys, needs to be attached to the reference tables. This information should be sufficient for understanding how surveys relate to one another and to the guidelines/recommendations. Could be collected by a questionnaire, containing questions on all strategic points. Remains to be worked out.

## **2.5 Organisation**

Conducting a time use survey, i.e. designing the survey, organising the fieldwork, training of interviewers and coding personnel, collecting data, coding, data entry, cleaning the data and calculating estimates for the reference and other tables, etc. is not an elementary task. Mistakes are likely to occur at some stage in the process and there are no guidelines in the universe that could foresee and suggest solutions for every possible situation. To somewhat reduce the risk of unintentional deviance from the

recommended survey design and to gather experiences of conducting surveys and finding solutions to problems, etc., it could be advantageous to appoint a group of people to co-ordinate and, if necessary, give support. This would also support uniform calculation of the reference tables. Previous experiences indicate that this is of great importance.