

Measuring item non-response of diary data in the Harmonised European Time Use Survey Database

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Abstract

National statistical offices often use non-response rates as one measure of data quality. Unit non-response and item non-response rates are reported for individual questions and study variables. Diary data consist of episodes where missing episodes are difficult to observe but some kind of an idea of the item non-response of diaries can be formed by observing the average numbers of episodes and the totals of time used for secondary activities. In the diaries, an episode is defined as a time slot denoted by the same code. Unobserved item non-response arises when a respondent forgets to record an activity in the diary, and this situation occurs when, for instance, a person travels home from work and stops for shopping. If the shopping stop is not recorded then the number of episodes is two episodes too low.

In the Harmonised European Time Use Survey Database (HETUSDB), numbers of activity episodes and totals of simultaneous secondary activities are used as quality measures of diary keeping. Several reasons, such as interviewer effect, respondent's education and motivation to keep a diary, coding, etc., influence the quality of diary data. A large number of episodes and a high total for secondary activities indicate valid diary data. The respondent's time use has an unwanted impact on this measure and, for example, persons with long working hours have usually fewer activities to report, the consequence of which is lowered number of episodes.

The number of episodes has been analysed in more detail by using the diary data from the Finnish Time Use Survey. Comparisons can be made between the fourteen countries which are included in the HETUSDB, but comparisons with other time use surveys, in which different diaries, days, instructions for diary keeping or coding are used, are not valid. Around 20-25 activity episodes are usually regarded as a reasonable value for well filled diaries.

Keywords: Item non-response, quality measure, diary data

1. Introduction

Several European countries have conducted time use surveys following the guidelines of Eurostat (Eurostat, 2000). The data were collected by means of time diaries where respondents recorded their activities at 10 minutes time slots. The first eight countries: Finland, France, Germany, Italy, Norway, Spain, Sweden and United Kingdom were included in the HETUSDB early this year, and the data of the next seven countries will be added to the database by the end of 2007. Statistics Finland has checked and harmonised the national data files and prepared the metadata, and Statistics Sweden will maintain the database. The main measures of the quality of diary filling are the mean of episode counts and the mean of the totals of recorded secondary activities. Other possible measures would be smaller variety of activities, fewer secondary activities or more diary time when activity is missing. The weakness of these indirect measures is that respondents' behaviour and time use affects the values of the indicators. The individuals

noted activities in their own words into the diaries from which the activities were coded to data files. An episode was defined as a time period for which the primary activity code remained constant. The diaries collected data on three variables which were main activity, secondary activity and with whom a respondent was during the activity. Niemi (1983) uses an episode definition where main activity and secondary activity remain constant in a time interval while Rydenstam & Wadeskog (1998) use an episode definition where there were no changes in any of the dimensions measured in the diary. A simpler method, which gives a more stable and therefore a more comparative indicator, is to limit the episode count to primary activities only, which implicitly results in fewer episodes. In the pilot time use surveys, Rydenstam and Wadeskog (1998, p 34) reported variation between all episodes and primary activity episodes between countries, the mean of all countries being 25 for all episodes and 23 for primary activity episodes. In the HETUSDB, the analysis of secondary activities showed large differences between countries (Table 1 and Figure 2) and no reason for this could be identified from the data, wherefore in order to preserve comparativeness only primary activities were studied. Classifications and activity codes were made uniform, which increased the episode lengths compared to those calculated with national codes and the unified codes gave lower indicator values except for the totals of secondary activities on which coding naturally had no effect.

Table 1. Episode counts and total time of secondary activities by the first and second diary days (countries in alphabetic order)

Country	Mean of episodes					
	1st day	2nd day	3rd day	1st day	2nd day	3rd day
Belgium	24.4	22.7	-	229	237	-
Bulgaria	19.9	19.6	-	210	256	-
Estonia	23.5	22.4	-	153	137	-
Finland	26.5	25.1	-	194	170	-
France	18.8	-	-	351		-
Germany	24.7	24.2	23.0	262	250	268
Italy	22.2	-	-	183	-	-
Latvia	20.7	19.9	-	114	150	-
Lithuania	22.7	21.9	-	119	112	-
Norway	26.7	25.6	-	136	130	-
Poland	25.1	24.4	-	200	197	-
Slovenia	21.4	21.1	-	205	202	-
Spain	21.0	-	-	82	-	-
Sweden	27.0	25.7	-	195	187	-
UK	24.2	22.9	-	178	169	-

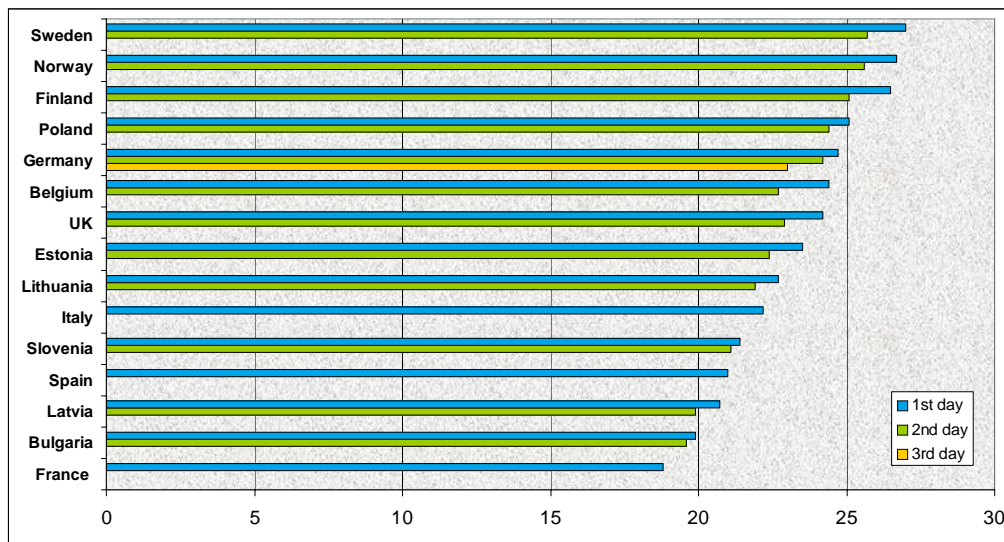
Source: Harmonised data of HETUSDB countries

Sweden, Norway and Finland had the highest values for the means of the primary activity counts. Belgium, Estonia, Germany, Italy and United Kingdom had average values, and Bulgaria and France had the lowest values compared to the other HETUSDB countries. Sweden had the highest number 26.3 of daily episodes. Response burden for keeping diaries was rather high which was seen in nonresponse rates, which were higher than in other surveys, and household surveys suffer in general from higher nonresponse than individual surveys (Väisänen, 2005). The Swedish Time Use Survey differed from other surveys by using the individual sample, which might have positively effected on filling diaries giving the higher number of episodes. In France, the mean was the lowest at 18.8 but the total for secondary activity was the highest at 351 minutes. No exact reason for the aberration was found but the time use survey was conducted first in France at the time when the Guidelines of the HETUS were being drawn up, and national activity codes and instructions for filling in diaries could have dif-

ferred from those of the other countries. As an example of other time use surveys, the number of episodes of the 1998 Canadian Time Use Survey was 21.1 (the mean from the table, Michelson, 2005, p.109) that is on average 1.7 episodes less than the overall mean of 22.8 for the countries of the Harmonised Database.

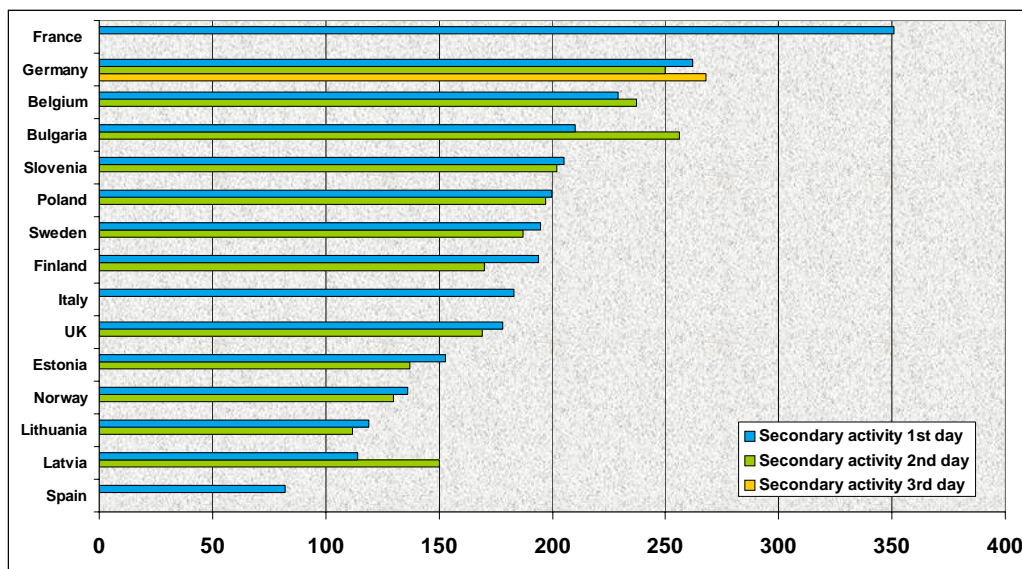
Linear dependence between episode counts and total secondary activities was measured by calculating the correlation for these indicators at the micro data level. Latvia and United Kingdom had the highest correlation, over 30 per cent, while Estonia, Sweden and Italy also had fairly high correlations of between 30 and 27 per cent. Bulgaria and Belgium had a notably lower correlation than the other countries (see Figure 3).

Figure 1. Means of episode counts in HETUSDB countries



Source: Harmonised data of HETUSDB countries

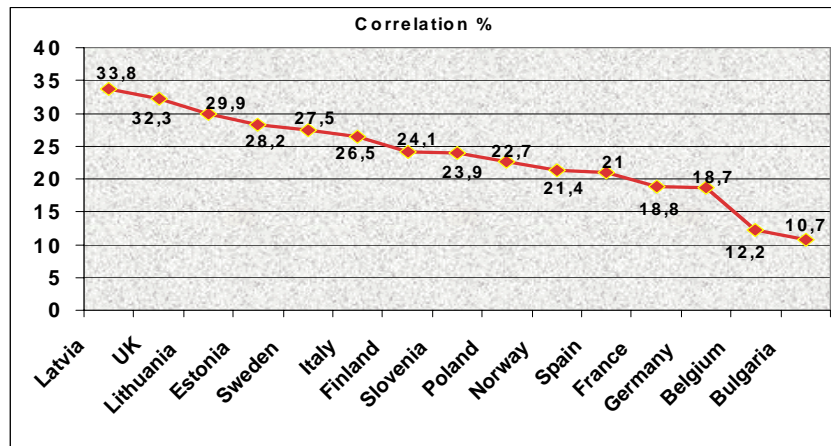
Figure 2. Means of total time of secondary activities in HETUSDB countries



Source: Harmonised data of HETUSDB countries

The relations between episode counts, secondary activities and correlation coefficients were similar in Finland and Sweden. Filling in diaries is rather burdensome which is why respondents had not kept diaries during the second day as well as in the first day, which reflects on the indicators as lower values for the second day. Respondents tire of keeping diaries, and in the second day, some activities were missing. In this case the number of activities measured the quality between the two diaries. In some countries, more secondary activities were recorded in the second diary than in the first one. For instance, in Latvia and Bulgaria, the first diaries were kept during weekdays but the second diaries on weekends when people generally have more activities than during weekdays.

Figure 3. Correlation of episode counts and total time of secondary activity (countries in order of episode numbers)



Source: Harmonised data of HETUSDB countries

2. Quality indicators of diaries observed from the Finnish Time Use Survey data

From the HETUSDB, interview data were not available for more detailed analysis which is why the Finnish Time Use Survey has been used to study episode lengths against the characteristics received from the individual and household interviews of the survey. The sample size was 4,800 households containing 10,978 individuals aged ten or over, and the response rate at the household level was 63.8%, i.e. 3,011 households, where the individual non-response of the responded households was 5.8%. Both diaries were filled in by 51.2% of the sample and the total number of filled diaries was 10,561. The survey covered twelve months from the first of March in 1999 to the end of February in 2000. The data collection consisted of household interviews, personal interviews and diary keeping. In Finland, there were two diaries: one weekday and one weekend day diary, where individuals recorded the events and activities according to time points entering into them at 10-minute accuracy their primary and any possible simultaneous activities (Niemi and Pääkkönen, 2002).

The average number of episodes of primary activity was 26.5 for the first day and 25.1 for the second day. Working days and days off were mixed in the first diary as well as in the second diary, and the respondents' life style or time use did not affect the indicator as much as when working days and days off were analysed separately. There were fewer episodes on working days than on days off as can be seen from the next table. Activities during the time spent at work were not coded in as much detail as during time off, which is one reason for the lower values of episode counts. The average total time of secondary activities was higher in the day off or vacation group. Item non-response is defined as the group who did not answer a question and the non-respondents had fewer episodes and had marked fewer secondary activities than

the individuals who had responded to the question. In this sense the indicator seems to measure the quality of the diaries.

Table 2. Episode counts and total time of secondary activities by type of diary day

	Episode counts	Secondary activity
Ordinary work day	23.3	169
Day off, vacation, on leave	26.8	223
Sick leave day	27.3	163
Not applicable	28.4	173
Item non-response	23.2	95

Source: Time Use Survey of Finland

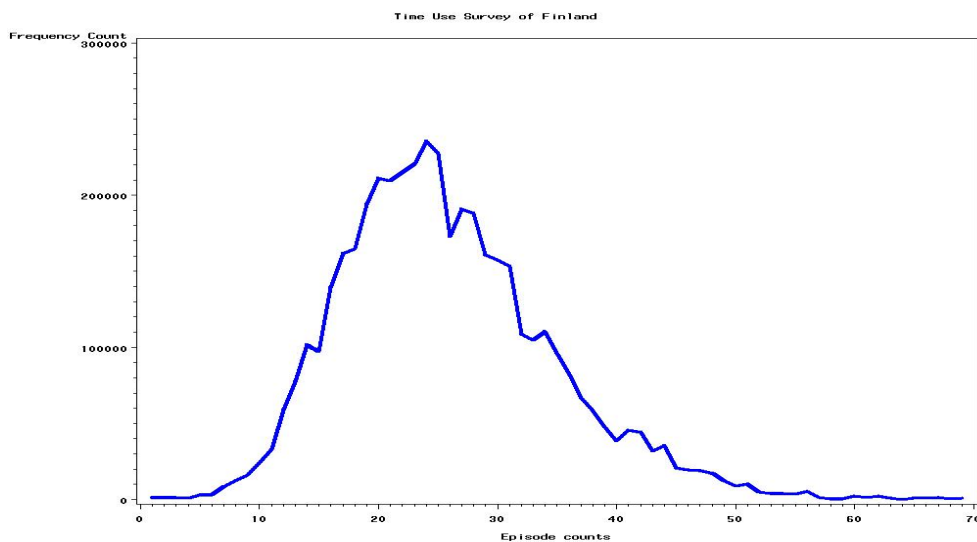
Table 3. Mean of episode counts by working last week

Worked last week	1st diary	2nd diary
Yes	25.5	23.9
No, temporarily absent from work	30.1	28.8
Not working	27.3	26.1

Source: Time Use Survey of Finland

In Figure 4 the highest frequencies had episode counts of 24 (5.3%, 554 diaries) and 25 (5.1%, 533 diaries).

Figure 4. Histogram of means of episode counts.



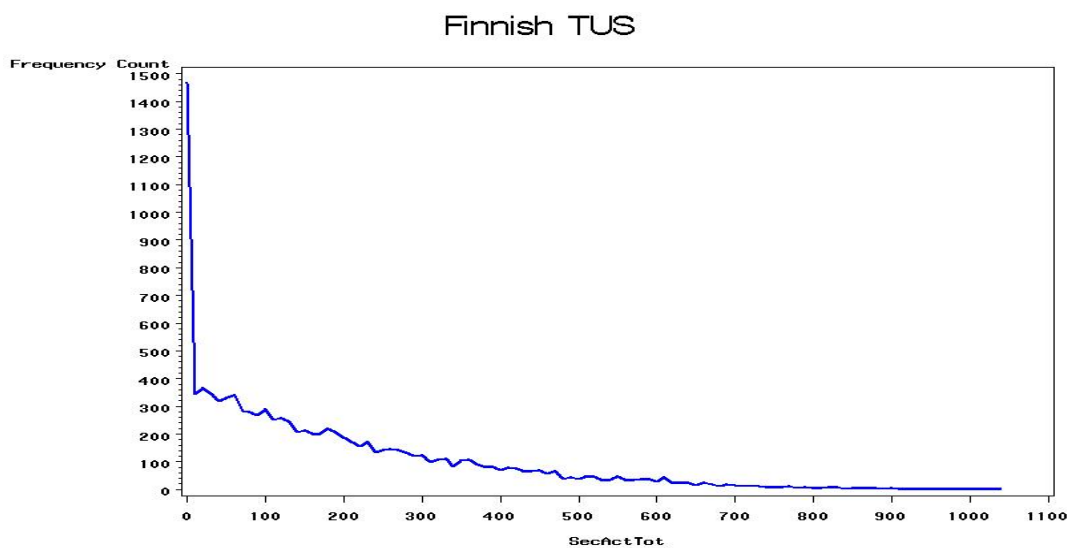
Source: Time Use Survey of Finland

Women had higher episode frequencies than men. The respective episode counts were: men 23.0 and women 28.3. Niemi (1983) also reported a higher number of activity periods for women 30.6 than for men 25.1. Michelson (2005 p.110) analysed episode counts for home-based workers who received 2.7% - 3.1% higher total daily episodes for women.

Young adults, 30 to 39-year-olds, and elderly age groups of 60 to 69 recorded more episodes (27-28 episodes on the average) than other age groups (Figure 6 and Table 5).

In as many as 14% of the diaries secondary activities were not recorded. In these diaries, the number of episodes was lower (20.9) than in the diaries where secondary activities were recorded (26.5). In the set of the diaries, which included secondary activities the average total time was 210 minutes.

Figure 5. Distribution of total time of secondary activities



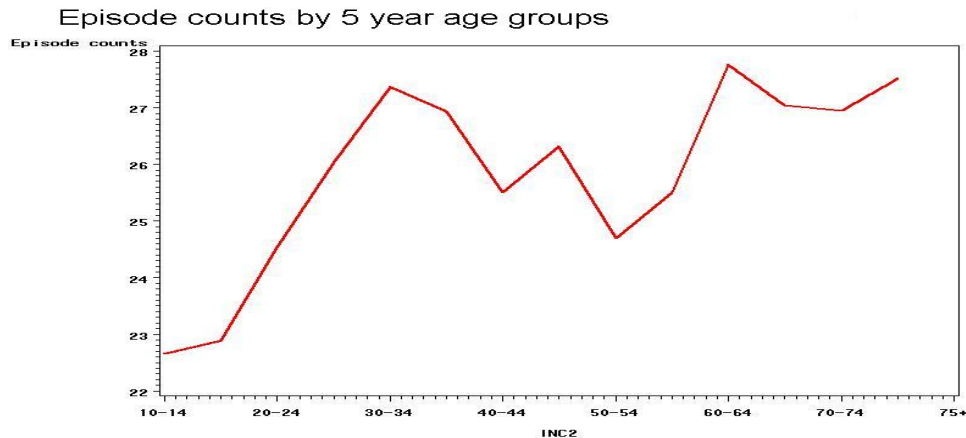
Source: Time Use Survey of Finland

Table 4. Episode counts by type of accommodation

Type of accommodation	N	Mean
Item non-response	2	21.6
Detached single family house	5,817	25.4
Semi detached/terraced single family house	1,756	26.2
Block of flats with up to 10 dwellings	541	26.7
Block of flats with more than 10 dwellings	2,371	26.1
Other type of accommodation	74	23.7

Source: Time Use Survey of Finland

There were not many differences between the days of the week; only the episode count means for Thursday and Friday had one episode more than other days.

Figure 6. Mean of episode counts by five-year age groups

Source: Time Use Survey of Finland

Table 5. Mean of episode counts by five-year age groups

Age groups	N	Mean
10-14	808	22.7
15-19	1,044	22.9
20-24	811	24.5
25-29	692	26.0
30-34	771	27.4
35-39	839	26.9
40-44	875	25.5
45-49	1,062	26.3
50-54	1,021	24.7
55-59	680	25.5
60-64	631	27.8
65-69	453	27.0
70-74	418	26.9
75+	456	27.5

Source: Finnish Time Use Survey

Such groups as persons aged under 45 without children and living in the parents' household or in some other household arrangement had the lowest values of episode counts of 22 to 24, and single parents with youngest child aged under 18 or couples with youngest child aged under 6 had between 29 and 30 episodes.

At higher education level, there were more episodes than in other groups. The same trend applied to diary non-response so that the whole diary was missing from 12.1% of the respondents to the personal interviews at the lower education level compared to 9.3% at the upper secondary level and 5.6% at the tertiary level (Väisänen, 2002).

Table 6. Means of episode counts by level of education (ISCED classification)

Education (ISCED)	N	Mean
Not available	2	21.6
Refusal	70	27.9
Missing	808	22.7
Primary	2,269	25.3
Lower secondary	1,347	24.3
Upper secondary.	3,547	25.9
First-stage of tertiary	1,390	27.7
Second-stage of tertiary	1,128	27.1

Source: Time Use Survey of Finland

Full-time workers had fewer episodes than part-time workers or persons not working.

Table 7. Average episode counts by labour activity status

Employed full-time	24.5
Employed part-time	26.8
On maternity or parental leave	38.8
On leave for other reasons	28.4
Unemployed	27.1
Pupil, student, further training, unpaid traineeship	23.3
In retirement or early retirement or has given up business	26.9
Permanently disabled	26.6
Fulfilling domestic tasks	35.6
Other person	24.7

Source: Time Use Survey of Finland

The feeling of being rushed did not affect the number of episodes but those who did not answer the question had fewer episodes. In all classes, Table 8 showed fewer episodes for the second diary.

Table 8. Number of episodes by how often feels rushed

How often feel rushed	1st diary	2nd diary
Always rushed	27.0	25.3
Sometimes rushed	27.0	25.4
Almost never rushed	26.0	24.9
Non-response	23.3	21.1

Source: Time Use Survey of Finland

Table 9. Number of episodes by proxy and normal personal interview

	1st diary	2nd diary
Proxy interview	21.6	21.1
Normal interview	26.5	24.9

Source: Time Use Survey of Finland

Personal interviews were used to collect data concerning living conditions, income, education and opinions on various things. Some individuals did not want to answer all the questions, which is why there was item non-response in the interview data. All sampled persons were not at home during the household interview which is why it was allowed that some items of the interview data could be collected by so called proxy interviews in which the data were collected by asking them from another household member. In Tables 2, 8 and 9, non-respondents and proxies have fewer episodes than respondents that suggest the relation between the number of episodes and the item non-response of person interviews.

3. Concluding remarks

The number of episodes as a quality indicator belongs to the same category as response rates which are generally reported in surveys. In a way, a low number of episodes indicates missing episodes hiding in the diary data. In questionnaires, we can easily see if there is item non-response but in diary data it cannot be seen directly, and only a more detailed analysis would expose the item non-response of diaries. The number of episodes and the total of secondary activities are problematic quality indicators because the lifestyle and time use of the surveyed individuals influence them, and the structure of the diaries, the recorded time slots and the activity classification affect comparisons of different time use surveys. Both of the indicators depended on each other and in general they measured the episode density and item non-response i.e. how well diaries were filled in.

In the Harmonised European Time Use Database, the national activity codes were transformed to a more general level that decreased the number of episodes but did not affect the total of secondary activity. Events at work on working days were not segregated which resulted in fewer episodes compared to days off. In the Finnish Time Use Survey, respondents who had missing answers in a person interview they had less episodes in diaries.

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Annotation

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