



Statistics Sweden

Statistiska centralbyrån

Actual Hours Worked in the Swedish LFS

Four articles

2012:1

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Continued on inside of the back cover!

Background Facts

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Four articles

Labour and Education Statistics 2012:1

**Statistics Sweden
2012**

Background Facts

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Actual Hours Worked in the Swedish LFS

Four articles

Statistics Sweden
2012

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Foreword

The main task of the Labour Force Surveys (LFS) is to measure the total labour supply. In the Swedish Labour Force Survey the presentation of the labour supply, both utilised and not utilised, is offered as both the number of persons and the number of hours. The Swedish LFS describes the labour supply that is utilised, i.e. the employment, so thoroughly that it captures all hours worked during all the weeks of the year.

The variation in weekly and annual working hours between different individuals makes the total number of actual hours worked a better measure than the number of employed persons when the LFS is used in the economic statistics. It is a good indicator of the development of the labour market, and also of the growth in the economy. The Swedish Labour Force Surveys are an important source for the National Accounts and constitute one of several contributions for fiscal and monetary policy. Thus, there are high demands on the quality of the estimates of the number of hours worked.

This report contains four articles; three of them are from the 1990s and have been found only in Swedish in the LFS archive, while the fourth article has been written specifically for the publication of this report.

The first two articles are based on studies conducted in the 1990s on how to measure working hours. They were carried out with financial support from Eurostat. Traditionally, working hours have mainly been measured through two questions in the LFS questionnaire. One is about usual hours worked and the other is about actual hours worked during the reference week.

The study presented in the first article investigates if the order of the questions affects the estimates of the number actual hours worked. The second article presents the result of a study with a more meticulous design of the measurement of the number of actual hours worked. In that study, the respondents are not only asked directly about their actual hours worked, but also about its components, i.e. absence from work and overtime.

The way of measuring the number of hours worked was changed in the Swedish LFS in 2005. The change was based on the two studies mentioned above. The third, newly written article in this report describes the measurement of the number of hours worked in the Swedish LFS from 2005.

The estimates of the number of actual hours worked refer to an average week of the reference month, quarter or year. The National Accounts need access to estimates of the total number of hours worked during a calendar month or quarter. The fourth article accounts for the method used in the Swedish LFS to produce these estimates of the volume of actual hours worked (VHWA) during a calendar month or quarter.

We express our special thanks to Anna Broman who has been in charge of compiling this publication.

Eurostat is continuously working to improve the quality of the LFS. Discussions are now in progress on how to improve the measurement of the number of hours worked, and especially the number of actual hours worked. By translating these reports from the 1990s, we want to support the work that we do together within Eurostat.

Statistics Sweden November 2012

Inger Eklund

Hassan Mirza

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Study of working hours in the LFS – Study of the order of questions concerning working hours¹

Anita Olofsson
Hassan Mirza

1. Background and purpose

Once a year, all Member States of the EU conduct a Labour Force Survey (LFS). Eurostat has prepared a technical guide titled "Labour Force Survey Methods and definitions" to provide guidelines for these surveys. The guide contains a detailed list of questions to be included in the surveys, as well as explanations of the questions that will serve as an aid during the data collection. Furthermore, the key terms are defined in the guide.

Both the EU-LFS and the Swedish LFS include two questions concerning the individual's working hours. One of them provides an answer to how many hours the respondent actually worked during the reference week and the second one concerns the individual's usual weekly working hours. In the Swedish questionnaire, the latter question differs for the self-employed and employees. "Average number of working hours per week" is used for the self-employed, while the employees are asked about the "agreed" weekly working hours. In addition to these two questions on working time, a control question is used in the Swedish LFS for those who stated that their time actually worked during the reference week is the same number of hours as the number of agreed working hours. (See Appendix 1 for the Swedish questions.)

Eurostat recommends that Member States place the question of usual working hours before the question of actual work in the questionnaire. However, Sweden presents the questions in the reverse order. Therefore, Eurostat has given Sweden an assignment to investigate whether the estimate of the actual hours worked is affected by the order in which the questions are asked.

2. Implementation of the study

2.1 Design and sample

The study was conducted during March, April and May of 1997. The LFS sample and sample size during these months were divided into a test group and a control group. The individuals in the control were to answer the questions in the same order as in the regular Swedish LFS, while the other group received the questions in reverse order.

¹ This article was published in Swedish in 1997.

The targeted population of the study was the employed persons in the LFS.

It was decided that the test group was not to be included in the estimates of the annual Swedish LFS.

The size of the test group was decided so that the size of the control group would be big enough in order for the estimates of the regular Swedish LFS to be of acceptable quality. Furthermore, the variance of the difference between the estimates in the test group and the control group was small.

The division into the two groups was conducted so that both groups had the same distribution across the reference weeks and the rotation groups. (See Appendix 2 for the sample schemes.)

A total of just over 6 000 employed individuals were included in the test group, while just over 25 000 individuals were included in the control group.

Table 1
Distribution of employed individuals in the test group and the control group

	March	April	May	Total
Test group	1 997	2 018	2 120	6 135
Control group	8 593	8 240	8 313	25 146

2.2 Estimation

The samples from the control group and the test group, respectively, were calculated to the population size using the same method. The population and the samples were divided into 120 post stratum, and the same variables were used as stratification variables as in the regular LFS. The test group had a sample size that represents about 20% of a quarterly sample of LFS, which in turn represents 60% of a monthly sample. In order to obtain a sufficient number of respondents within each post stratum, the population and the sample were divided in fewer groups than in the regular LFS. Another difference compared to the ordinary estimation procedure was that the measurement period in the study included 13 weeks (five weeks in March and four weeks in April and in May).

An estimation of some total in the control group is obtained from:

$$\hat{T}_c = \sum_{h=1}^{147} \sum_{i=1}^{n_{hc}} \frac{N_h}{n_{hc}} \cdot t_{hi} = \sum_{h=1}^{147} W_h * \sum_{i=1}^{n_{hc}} t_{hi} \quad (1)$$

An estimation of a corresponding total from the test group is obtained from:

$$\hat{T}_e = \sum_{h=1}^{147} \sum_{i=1}^{n_{he}} \frac{N_h}{n_{he}} \cdot t_{hi} = \sum_{h=1}^{147} W_h * \sum_{i=1}^{n_{he}} t_{hi} \quad (2)$$

Where

\hat{T}_c = estimation of a total from the control group, e.g. hours actually worked during the reference period March-May.

\hat{T}_e = estimation of a total from the test group, e.g. hours actually worked during the reference period March-May.

$N_h = \frac{5*N_{3h}+4*N_{4h}+4*N_{5h}}{13}$ = number of individuals in the population who belong to the post stratum h , ($h=1,2,3,\dots,120$ in combinations of gender, age and industry according to the employment register of Statistics Sweden).

N_{3h} = the number of individuals in the population, during March, who belong to post stratum h .

N_{4h} = the number of individuals in the population, during April, who belong to post stratum h .

N_{5h} = the number of individuals in the population, during May, who belong to post stratum h .

n_{hc} och n_{he} = the number of respondents in the control group and the test group during March-May, who belong to post stratum h .

$W_h = \frac{N_h}{n_h}$ = adjustment weight for the objects in post stratum h .

t_{hi} = number of hours during the reference week for the object i in post stratum h , e.g. hours of absence or overtime.

An estimation of the variance of the estimation under (1) is obtained from:

$$\hat{V}(\hat{T}) = \sum_{h=1}^{147} \sum_{i=1}^{n_h} \frac{N_h^2}{n_h} * \frac{(\hat{t}_{hi} - \hat{t}_h)^2}{n_h - 1} \quad (2)$$

An estimation of the difference (\hat{D}) between the study (test group) and the regular Swedish LFS (control group) with respect to the number of working hours exceeding the agreed number of working hours, hours of absence or hours actually worked is obtained from:

$$\hat{D} = \hat{T}_e - \hat{T}_c \quad (3)$$

Where \hat{T}_e and \hat{T}_c is estimated according to (1),

\hat{T}_e = estimation of a total in the test group

\hat{T}_c = estimation of a total in the control group

An estimation of the variance of \hat{D} is obtained from:

$$\hat{V}(\hat{D}) = \hat{V}(\hat{T}_e) + \hat{V}(\hat{T}_c) - 2COV(\hat{T}_e, \hat{T}_c) \quad (4)$$

All calculations of the aggregates and variances have been conducted with the aggregation and variance program CLAN. The calculations are based on the number of respondents in both the regular LFS and

the study. As a result, the estimates in the control group differ slightly from those in the regular LFS.

3. The reactions of the interviewers

A number of interviewers were asked of their perception of how the reverse order of questions worked in practice. Almost all of these interviewers were positive, and thought it was better to pose the question concerning the agreed weekly working time before the question about the time actually worked. The reason was that the person being interviewed often states the agreed weekly working time first, even though the interviewer asks about the time actually worked. When the interviewers notice the misconception, they must repeat the question and emphasise that it refers to time actually worked during the reference week.

4. Results

The number of working hours in the control group and in the test group have been compared regarding the occupational status of the group (self-employed and employees) and the background variables age, gender and industrial classification. For each of the compared estimates, the mean error has been calculated.

Table 2
Comparison between the number of working hours of the test group and the control group. Millions of hours

	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
Total	124.53	0.48	124.77	1.00	-0.23 ±2.17
Women	52.15	0.31	52.09	0.64	0.06 ±1.39
Men	72.38	0.37	72.68	0.76	-0.30 ±1.66
Employees	107.20	0.47	107.64	0.97	-0.44 ±2.11
Self-employed	17.33	0.36	17.13	0.72	0.20 ±1.58

Table 2 shows comparisons between the test group and the control group for the main categories. According to the table there are no significant differences. In addition, no significant differences appear in other comparisons (See Appendix 3).

5. Conclusion

The study of the order of questions concerning actual number of hours worked per week and the agreed weekly working time clearly show that the estimates of the total number of hours worked per week is not affected by the order of the questions, i.e., no significant differences exists. Therefore, Sweden is likely to change the order of the questions, and thus ask about agreed weekly working time before the question about time actually worked. One reason for this was that many interviewers believe that the questions work better when posed in that order.

Appendix 1

Questions regarding working hours for employees in the Swedish LFS

The questions I am now going to ask are about a certain week (number of the week), that is, Monday (date) up to and including Sunday (date).

M1 How many hours did you work during that particular week?

Main job:

M1a How many hours did you work in your secondary occupation/occupations?

M2 How many hours per week are you supposed to work according to your agreement with your employer?

Main job:

M2a How many hours in your secondary occupation/occupations?

.....

M3 This means that you worked the same number of hours as usual (in your main job) this week?

1 Yes --> (interview continues)

No --> CHANGE M1 OR M2

Distribution of the LFS sampl April 97

Ref. week	Random group (pos. 3-4 in sample unit no.)	Rotation group															
		1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
		Panel number (pos. 1-2 in sample unit number)															
		32	36	31	35	24	28	23	27	22	26	21	25	14	18	13	17
1	10	[Black]															
	11	[Black]															
	12	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	13	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	14	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	15	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	16	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	17	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	18	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
2	19	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	20	[Black]															
	21	[Black]															
	22	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	23	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	24	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	25	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	26	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	27	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
3	28	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	29	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	30	[Black]															
	31	[Black]															
	32	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	33	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	34	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	35	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	36	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
4	37	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	38	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	39	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	40	[Black]															
	41	[Black]															
	42	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	43	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	44	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
	45	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
46	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	
47	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	
48	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	
49	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	

Test group
 Control group

Distribution of the LFS sampl May 97

Ref. week	Random group (pos. 3-4 in sample unit no.)	Rotation group															
		1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
		Panel number (pos. 1-2 in sample unit number)															
		62	66	61	65	54	58	53	57	52	56	51	55	44	48	43	47
1	10	Test group															
	11	Test group															
	12	Control group															
	13	Control group															
	14	Control group															
	15	Control group															
	16	Control group															
	17	Control group															
	18	Control group															
	19	Control group															
2	20	Test group															
	21	Test group															
	22	Control group															
	23	Control group															
	24	Control group															
	25	Control group															
	26	Control group															
	27	Control group															
	28	Control group															
	29	Control group															
3	30	Test group															
	31	Test group															
	32	Control group															
	33	Control group															
	34	Control group															
	35	Control group															
	36	Control group															
	37	Control group															
	38	Control group															
	39	Control group															
4	40	Test group															
	41	Test group															
	42	Control group															
	43	Control group															
	44	Control group															
	45	Control group															
	46	Control group															
	47	Control group															
	48	Control group															
	49	Control group															

Test group
 Control group

Appendix 3

Table 1.1

Comparison between the control group and the test group regarding the total number of worked hours by age. Millions of hours

Age	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
16–24	9.03	0.17	9.02	0.36	0.01 ±0.79
25–34	29.47	0.25	30.18	0.52	-0.71 ±1.13
35–44	32.17	0.24	32.13	0.51	0.04 ±1.10
45–54	36.82	0.24	36.89	0.49	-0.07 ±1.07
55–64	17.04	0.19	16.55	0.38	0.50 ±0.83
16–64	124.53	0.48	124.77	1.00	-0.23 ±2.17

Table 1.2

Comparison between the control group and the test group regarding the total number of worked hours for women by age. Millions of hours

Age	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
16–24	3.72	0.11	3.66	0.23	0.06 ±0.50
25–34	11.30	0.17	11.71	0.36	-0.41 ±0.78
35–44	13.32	0.15	13.50	0.33	-0.18 ±0.71
45–54	16.39	0.16	16.21	0.31	0.18 ±0.68
55–64	7.42	0.12	7.02	0.23	0.40 ±0.51
16–74	52.15	0.31	52.09	0.64	0.06 ±1.39

Table 1.3

Comparison between the control group and the test group regarding the total number of worked hours for men by age. Millions of hours.

Age	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
16–24	5.31	0.13	5.36	0.28	-0.05 ±0.61
25–34	18.17	0.19	18.47	0.38	-0.30 ±0.83
35–44	18.85	0.19	18.63	0.39	0.22 ±0.85
45–54	20.43	0.18	20.68	0.38	-0.25 ±0.82
55–64	9.63	0.15	9.53	0.30	0.10 ±0.66
16–64	72.38	0.37	72.68	0.76	-0.30 ±1.66

Table 2.1
Comparison between the control group and the test group regarding the total number of worked hours for employees by age. Millions of hours

Age	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
16–24	8.62	0.17	8.55	0.35	0.07 ±0.76
25–34	26.60	0.24	27.26	0.50	-0.66 ±1.10
35–44	27.13	0.23	27.19	0.48	-0.05 ±1.04
45–54	30.70	0.24	30.99	0.49	-0.29 ±1.06
55–64	14.15	0.17	13.65	0.36	0.50 ±0.78
16–64	107.20	0.47	107.64	0.97	-0.44 ±2.11

Table 2.2
Comparison between the control group and the test group regarding the total number of worked hours for the self-employed by age. Millions of hours

Age	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
16–24	0.41	0.06	0.47	0.14	-0.06 ±0.29
25–34	2.87	0.16	2.92	0.30	-0.05 ±0.67
35–44	5.04	0.20	4.94	0.40	0.10 ±0.87
45–54	6.12	0.21	5.91	0.41	0.21 ±0.90
55–64	2.90	0.14	2.90	0.29	0.00 ±0.63
16–64	17.33	0.36	17.13	0.72	0.20 ±1.58

Table 3
Comparison between the control group and the test group regarding the total number of workers in the principal occupation by industrial classification. Millions of hours

Industrial classification.	Control group		Test group		Difference
	Number of hours	Mean error	Number of hours	Mean error	
Agriculture, Forestry etc	4.32	0.18	4.49	0.38	-0.17 ±0.82
Industry	26.12	0.25	26.00	0.52	0.12 ±1.13
Construction	7.03	0.17	6.82	0.33	0.21 ±1.24
Commerce, communication	24.53	0.28	21.14	0.57	0.39 ±1.24
Business services, financial activities.	14.00	0.22	14.13	0.44	-0.13 ±0.96
Education etc	9.13	0.21	9.36	0.43	-0.23 ±0.94
Health care, Social services	20.82	0.26	19.74	0.54	1.08 ±1.17
Personal services	9.02	0.22	9.61	0.44	-0.59 ±0.96
Public administration etc	6.61	0.18	7.37	0.40	-0.76 ±0.86
Total	121.66	0.47	121.77	0.98	-0.11 ±2.13

Study of working hours in the LFS – Study of absence from work, work in excess of usual working hours and time actually worked²

Anita Olofsson

1. Background and purpose

For a long time, the number of employed persons has been the measure commonly used to describe the employed labour supply in the labour market statistics. Over time however, various forms of part-time jobs and paid leave have entered the labour market. At the same time, overtime has become increasingly common to meet the increased demand for labour. As a consequence, the number of working hours has become a more relevant measure to determine the work performed than the number of employed individuals. Thus, it has become increasingly important to provide high quality estimates of the number of hours worked, the number of hours absent from work and the number of overtime hours in relation to the agreed working time.

In both the Swedish LFS and the EU-LFS there are two questions relating to working hours. The first one refers to the agreed or average weekly working hours, and shall provide the number of hours the respondent usually works every week. The second one refers to the number of hours the respondent actually worked during the reference week³. In the Swedish questionnaire, the first question differs for the self-employed and employees. For the self-employed, "Average number of working hours per week" is used, while the employees are asked about the "agreed" weekly working hours. Individuals whose working hours vary from week to week are to provide their average weekly working hours, e.g. during a month.

The number of hours absent from work and the overtime hours are calculated by comparing the usual working hours per week with the actual number of hours worked during the reference week⁴. This applies to both the EU-LFS and the Swedish LFS. The number of hours actually worked during the reference week in excess of the agreed number of working hours is considered to be overtime hours, while the number of hours actually worked less than the agreed number of working hours are considered to be absence hours. However, during some weeks the respondent may have

² This article was published in Swedish in 1997.

³ The monthly sample in the LFS is divided into four or five weeks. The respondent answers the questionnaire with reference to the week that he or she belongs to in the sample, the reference week.

⁴ Absence/overtime = Actually worked hours – normal working hours.

been both absent from work and worked overtime. In these cases, there is an underestimation of both the hours of absence and of the overtime hours. (The questions in the Swedish LFS concerning hours of work, absenteeism and work in excess of usual working hours can be found in Appendix 1). Statistics Sweden has been assigned by Eurostat to investigate an alternative method to measure the actual hours worked, the number of hours absent from work and the hours of work in excess of usual working hours. The estimates using this alternative method will then be compared to the estimates from the current method.

2. Study design

In order to meet the purposes of this study, it was decided that additional questions about absence and hours worked in excess of usual working hours should be posed more thoroughly than in the current questionnaire. These questions would constitute a supplementary survey to the regular LFS, which means that the questions are asked at the end of the regular interview. This design does not allow the respondents to answer questions more than one time about their actual working hours. In the study, the hours actually worked are calculated as follows:

Hours actually worked = hours usually worked + hours of overtime – hours of absence.

In the implementation of the study, the following has been included:

- Construction of the questionnaire in cooperation with the measurement laboratory of Statistics Sweden
- A test of the added questions
- An evaluation of the test
- The questions in the main study being posed in the addition to the regular LFS
- A comparison of the estimates from the LFS and study regarding the number of absence hours, number of hours in excess of usual working hours and total number of hours worked.

3. Test of the questions

Before the study, the proposed questionnaire was discussed with the measurement laboratory of Statistics Sweden. With reference to these discussions, the questions were designed and tested.

The questionnaire was tested by five interviewers belonging to the measurement laboratory of Statistics Sweden. The questions were posed as an addition after the regular LFS interview. Three different questionnaires were tested, of which two were very similar. In total, 66 test interviews were conducted.

Since the respondents had already answered questions on overtime and absence in the regular LFS, it was of great importance to explain why additional questions were asked. Therefore, a short introduction was made that clarified that these additional questions were there because of a commission from the EU to investigate absence and overtime more thoroughly than in the current Swedish LFS.

The questions in the first questionnaire that were tested were based on whether or not the respondent had been working for more, fewer or the same number of hours as he or she had stated as the average or agreed number of hours. Thus, the questionnaire was divided into three parts. The questionnaire for the self-employed was almost identical to the questionnaire for the employed.

Part 1 of the questionnaire was intended for respondents who in the regular LFS interview had said that they worked the same number of hours as their average or agreed working time. These respondents were given the following introduction: "You said earlier that you during the week of X worked the same number of hours as usual. Sometimes, one works overtime and is absent from work during the same week, so that the hours one works still are as many as usual." After the introduction, the respondent was asked about working overtime/additional hours, any hours entered as flexitime or if the respondent worked more than the average number of hours due to the organisation of working time. After this, a few questions about if the respondent had been absent from work due to e.g. holiday, parental leave, leave of absence, public holiday were posed. Furthermore, questions about leave which is compensated by the employee by work done beforehand or work that will be performed at a later date were posed.

The questions in Part 2 of the questionnaire were answered by respondents who according to the regular LFS interview worked less than usual during the reference week. They were asked if they, despite working less than usual during the reference week, had worked any overtime/additional hours, any hour that was put on the overtime/flexitime or if he or she worked more than the usual working time due to the organisation of the working time.

The questions in Part 3 of the questionnaire were for the respondents who worked more than usual during the reference week. Had they, despite working more than usual, been absent from work due to e.g. holiday, illness, parental leave, or had they had compensatory time off, or worked less than the agreed or average hours for any other reason?

After the interview, the respondents were asked if they thought that the questions were difficult to answer. If they gave affirmative answers they were asked to specify. During the interview, the interviewer recorded the respondents reactions, e.g. if there was any hesitation, if the respondent wanted to have the question repeated or wanted a clarification on the meaning of the question.

An evaluation of the questionnaire was made after about 40 interviews. The evaluation showed that employees with varying weekly working hours had trouble answering the questions. The reason for this was that the LFS computes the average working hours for these individuals. It was then decided that the test interviews should not be based on the information provided earlier from the regular LFS. Hours of absence and overtime should be related to the agreed number of working hours that were scheduled during the reference week. Thus, the division of the questionnaire into three parts could be discontinued.

A new test questionnaire was constructed and evaluated after 12 completed interviews. The questionnaire was working well with the exception of questions concerning the organisation of working time. The respondents did not understand what was meant by "absence or overtime due to the organisation of working time". The organisation of working time essentially means the "absence from work" or the "excessive work" resulting from calculating the difference between average hours and the time the person is scheduled to work during the reference week. It was agreed that the question should be removed from the questionnaire. The question lacked relevance since the concept "average weekly hours" had been discontinued for employees in the study.

Another 13 test interviews were conducted and these worked well. The only exception was that the self-employed were not familiar with the concept of flexitime.

The final questionnaire included the questions from the test questionnaire and three additional questions:

- Did you work any overtime or additional time for which you did not receive compensation in either time or money?
- Did you work more than you were supposed to for any reason?
- Were you absent or free for any other reason?

In addition, the questions on flexitime were removed from the questionnaire for the self-employed. The question about fewer working hours due to public holidays/days before holidays was only posed to respondents whose reference weeks included a public holiday.

After posing the questions, the interviewers were to indicate whether or not the respondent gave the same information as in the regular LFS or if they changed their statements. This was conducted as an additional control in order to see if the information is consistent with the LFS or not. No changes to the responses in the regular LFS were allowed as a consequence of the answers to the questions in the supplementary survey. (See Appendix 2 for the questions in the study.)

4. The implementation of the study

4.1. Population and data collection

The study was conducted as a supplementary survey in the LFS in March and May of 1997. Proxy interviews were not allowed. The data in the LFS was collected through telephone interviews made by the interviewers of Statistics Sweden, who conducted the interviews which were recorded directly into a computer. Most of the interviewers have their place of work in their home located somewhere in the country, while others are situated in Örebro at Statistics Sweden.

The interviews of the LFS are conducted during all the weeks of the year. This means that each survey month contains four or five reference weeks, i.e. the sample is divided into four reference weeks during the first two months of each quarter and five weeks in the third. Thus, March contained five reference weeks and May included four weeks.

Since the aim of the study is to compare estimates of the hours actually worked, the number of hours absent from work and the hours of work in

excess of usual working hours with the estimates from the regular LFS, the survey population consisted of respondents who were at work during the reference week. Only the main job of the respondent was considered. In March, the study comprised 9463 individuals, and in May 9363 individuals.

Before the interviewing process was started, the interviewers had received written instructions for the study, and also had the opportunity to contact the responsible analyst at Statistics Sweden during the entire fieldwork period. The instructions emphasised that the interviewers were not allowed to alter any information in the original interview as a result of any information that was gathered during the supplementary survey.

The respondents were informed about the supplementary survey in connection with the interview. This was the same information that was given at the test interviews, i.e. that Statistics Sweden has an assignment from the EU to investigate absence and overtime more thoroughly than in the current Swedish LFS. The questions in the study were asked immediately after completing the LFS interview.

4.2. Definitions

Working hours that exceed usual working hours include various types. For employees, they are:

- Overtime or additional hours that are ordered by the employer and compensated in either time or money. Generally, the employee is compensated with more hours than he/she performed as overtime.
- Hours put on the flexitime balance that may be used as leave at a later date.
- Additional hours neither compensated in time nor money.

In the study, the interviewers asked employees about all three categories above, and also about "other work outside of usual working hours", i.e. any time that cannot be included in any of the categories. The self-employed were only to answer one question which was about working hours in excess of usual working hours due to work stoppages together with the question about other work in excess of usual working hours.

Absence can also be divided into different categories. As an employee, one might be absent due to one of the following reasons:

- Illness, parental leave, leave of absence. These reasons involve some pay cuts, or even a total pay cut.
- Holiday. This is a statutory leave.
- Public holiday.
- Hours taken from the flexitime balance or compensatory time off. That is, hours that have already been worked beforehand or will be worked at a later date.
- Any other reason.

In the study, all these categories constituted a question each for the employees. The only exception being that the two first categories were answers to the same question. The self-employed were essentially given the same questions as the employees, but were not asked about flexitime etc.

4.3. Estimation

In principle, the estimation procedure in this study was conducted in the same way as in the regular LFS. One deviation is that the reference period includes 9 weeks (5 in March and 4 in May). In the regular LFS, the monthly estimates are based on either 4 or 5 weeks. The estimates of a total are obtained from:

$$\hat{T} = \sum_{h=1}^{143} \sum_{i=1}^{n_h} \frac{N_h}{n_h} * t_{hi} = \sum_{h=1}^{143} W_h * \sum_{i=1}^{n_h} t_{hi} \quad (1)$$

Where

\hat{T} = estimate of a total, for instance the number of hours of absence/overtime during the reference period, i.e. March and May.

$N_h = \frac{5*N_{3h}+4*N_{5h}}{9}$ = number of individuals in the population who belong to the poststratum h , ($h=1, 2, 3, \dots, 143$ in combinations of sex, age and industrial classification according to the register-based employment statistics of Statistics Sweden).

N_{3h} = number of individuals in the population, during March, who belong to poststratum h .

N_{5h} = number of individuals in the population, during May, who belong to poststratum h .

n_h = number of respondents in the sample, during March and May, who belong to poststratum h .

$W_h = \frac{N_h}{n_h}$ = adjustment weight for the individuals in poststratum h .

t_{hi} = number of hours during the reference week for individual i in poststratum h , e.g. hours of absence or overtime.

An estimation of the variance for the estimation for (1) becomes:

$$\hat{V}(\hat{T}) = \sum_{h=1}^{143} \sum_{i=1}^{n_h} \frac{N_h^2}{n_h} * \frac{(\hat{t}_{hi} - \hat{t}_h)^2}{n_h - 1} \quad (2)$$

An estimation of the difference (\hat{D}) between the study (test group) and the regular LFS (control group) concerning overtime hours, absence hours of hours actually worked becomes:

$$\hat{D} = \hat{T}_e - \hat{T}_c \quad (3)$$

Where \hat{T}_e and \hat{T}_c is estimated according to the formula (1).

\hat{T}_e = Estimation of a total in the test group

\hat{T}_c = Estimation of a total in the control group

An estimation for the variance for \hat{D} is given by

$$\hat{V}(\hat{D}) = \hat{V}(\hat{T}_e) + \hat{V}(\hat{T}_c) - 2COV(\hat{T}_e, \hat{T}_c) \quad (4)$$

All calculations of the aggregates and variances have been conducted with the aggregation- and variance program CLAN. The calculations are based on the number of respondents from both the regular LFS and the study. As a consequence, the estimates deviate slightly from the estimations that are presented in the regular LFS for March and May of 2007.

4.4. Assessment of the reliability of the study

The non-response of the study was 13%. It is constituted by the non-response of the regular LFS, non-response due to proxy interviews and non-response only in the supplementary survey. Since we only compare individuals who have provided answers in both the LFS and the study, the additional non-response should not have any effect on the aim of the study, that is, to compare estimates from the LFS and the study.

The questions concerning overtime and absence in the study are placed after the questions about these issues in the regular LFS, which are not as detailed as the questions in the study. It is likely that some respondents are affected by the fact that they already provided information, and therefore are less prone to change their responses. However, 8% of the respondents have stated that they gave incorrect information in the regular LFS.

4.5. Adjustments of the LFS

Some individuals are working a different number of hours each week. For these individuals, the LFS calculates an average, which is considered to be the usual number of working hours. This means that during all the weeks that the respondent works his or her scheduled number of hours, and these deviate from the average, there is a difference between the number of actually worked hours and the average number of worked hours. This difference is registered as absence or work in excess of usual number of working hours due to the organisation of working time. However, the questions in the study were based on the scheduled number of hours during the reference week. In order to be able to achieve comparability between the study and the LFS with respect to overtime or absence, the hours concerning the organisation of working time were removed from the LFS.

5. Results

In the LFS, the number of working hours in excess of the usual number of working hours and the number of absent hours are calculated as the difference between the usual and the actual number of worked hours. The number of hours actually worked during the reference week in excess of the agreed number of working hours are considered to be overtime hours, while the number of hours actually worked less than the agreed number of working hours are considered to be absence hours. Some weeks, the respondent may have been both absent from work and worked overtime. In these cases both the hours of absence and the overtime hours are underestimated. In the study, there is no such underestimation, since direct questions about absence and overtime are included. This might be the explanation to the difference in the estimates of absence and of working

hours in excess of usual working hours in the study and the LFS. Another explanation might be that the questions in the study serve as a reminder.

To understand how the underestimation of the number of hours worked that exceed the usual number hours worked in the LFS, as well as how the direct questions in the study can explain the difference between the study and the LFS, two groups have been analysed:

- a) Respondents with both absence hours and hours in excess of usual working hours in the study.
- b) Other respondents, i.e. respondents who only have hours in excess of usual working hours or hours if absence.

The analysis of group a) essentially gives the answer to how much the LFS underestimates the absence hours and hours in excess of usual working hours. However, the analysis is slightly blurred by the effect that the reminders to the questions may have, since it might add to the difference. The analysis of group b) roughly shows how the direct questions affect the estimates.

The differences between the LFS and the study are shown below, together with the confidence intervals (95%).

5.1. Number of hours in excess of normal working hours

The number of hours in excess of the normal number of working hours was significantly higher in the study than in the regular LFS. In the study, 64% more hours are presented compared to the LFS.

Table 1

The number of hours in excess of the normal number of working hours for men and women in the LFS and in the study. Millions of hours

	LFS	The study	Difference
Men	2.50	3.95	1.46 ±0.10
Women	1.21	2.13	0.92 ±0.08
Total	3.71	6.08	2.37 ±0.13

It is primarily among women that the differences between the study and the LFS are seen. Men's working hours in excess of normal working hours are 58% higher in the study, while the corresponding proportion for women is 76%.

Table 2

The number of hours in excess of the normal number of working hours for employees and the self-employed in the LFS and in the study. Millions of hours

	LFS	The study	Difference
Employee	3.30	5.56	2.25 ±0.12
Self-employed	0.41	0.53	0.12 ±0.04

The difference between the LFS and the study is much greater for the employees than for the self-employed. For the employees, the difference is 68% and only 28% for the self-employed.

Among young people aged 16-24 years there is a smaller difference between the LFS and the study than other age groups. Young people have 29% more hours in excess of normal working hours in the study than in the LFS, the other age groups 60-75% more.

The smallest differences between the LFS and the study are found within the industrial classifications⁵ Personal and cultural services. In these industries, the study shows 41% and 42% more hours than the LFS respectively. The biggest difference, 87%, is found in Health care. In other industries, the study has approximately 50-80% more hours than the LFS.

The differences in estimates between the LFS and the study are because the LFS estimates the absence hours and hours of work in excess of normal working hours are the difference between actual work and normal working hours. This causes underestimates in the LFS, since the difference is in net time. On the other hand, gross time is measured in the study. Another explanation is that the direct questions themselves serve as a reminder, and thus have an effect on the answers.

Table 3
Estimation of reasons for the differences between LFS and the study in number of worked hours in excess of usual working hours by professional status (millions of hours)

	LFS	The study	Difference
Underestimation			
In the LFS			
Employees	0.34	1.85	1.51 ±0.09
Self-employed	0.01	0.06	0.05 ±0.02
Total	0.35	1.91	1.56 ±0.09
Reminding effect of the questions			
Employees	2.96	3.71	0.75 ±0.08
Self-employed	0.40	0.47	0.07 ±0.03
Total	3.36	4.17	0.82 ±0.09

For the employees, the difference in the number of hours in excess of usual working hours between the LFS and the study is mainly due to the underestimation in the LFS. For the self-employed on the other hand, the differences between the LFS and the study are much smaller. A slightly larger part of the difference is explained by the reminding effect from the questions in the study than from the underestimates in the LFS.

⁵ Industrial classifications according to Statistical Classification of Economic Activities in the European Community, Rev. 1 (NACE Rev. 1)

Table 4
Estimation of reasons for the differences in number of worked hours in excess of usual working hours (millions of hours) between the LFS and the study, by sex

	LFS	The study	Difference
Underestimation In the LFS			
Men	0.25	1.22	0.98 ±0.07
Women	0.11	0.68	0.58 ±0.05
Reminding effect of the questions			
Men	2.25	2.73	0.48 ±0.07
Women	1.11	1.45	0.34 ±0.06

It is the underestimation in the LFS that is the main cause for the difference between the LSF and the study for both men and women, although to a lesser extent for women.

Table 5
Differences between the LFS and the study regarding different types of working hours in excess of usual working hours for employees. Millions of hours

	LFS	The study	Difference
Overtime/additional hours	2.15	3.35	1.21 ±0.10
Without compensation	0.72	1.12	0.40 ±0.08
Flexitime etc.	0.36	0.89	0.53 ±0.07
Other	0.07	0.18	0.11 ±0.05

For employees, the most common form of work in excess of usual working hours is overtime/additional hours. Next comes work without compensation followed by work put on the flex balance. Out of these three types, it is the hours on flex balance that provide the greatest difference between the LFS and the study, 146% more hours in the study than in the LFS. This shows that many believe that one is not supposed to take these hours in account in the LFS. Additionally, one might forget these hours when there is no direct question. Also for the categories overtime/additional hours and hours worked without compensation there are considerably more hours in the study than in the LFS, namely 56% more hours.

According to the study, the self-employed had worked 4.56 million hours more than usual due to peaks in the workload. That is 35% more hours than shown in the LFS.

5.2. The number of absence hours

In the study, the number of absence hours was 8% greater than in the LFS.

Table 6
Number of absence hours for men and women in the LFS and the study.
Millions of hours

	LFS	The study	Difference
Men	7.95	8.54	0.59 ±0.12
Women	6.10	6.60	0.50 ±0.09
Total	14.05	15.14	1.09 ±0.15

The difference between the LFS and the study is essentially the same for men and women.

Table 7
Number of absence hours for employees and self-employed in the LFS and the study. Millions of hours

	LFS	The study	Difference
Employees	12.40	13.53	1.13 ±0.14
Self-employed	1.65	1.61	-0.04 ±0.06

The difference in absenteeism between the LFS and the study are going in different directions for the employees and the self-employed. While the study shows 9% more absence hours than the LFS for employees, it shows a small negative difference for the self-employed. However, the latter is not significant.

In all the age groups, the number of absence hours is higher in the study than in the LFS. The biggest difference is in the age group 16-24 years and 25-34 years where it is 10%. The smallest difference is in the age groups 55-64 years at 5%.

Similar to the analysis of the hours worked in excess of usual working hours, a rough estimation can be made of how much of the difference in the number of absence hours can be explained by the underestimation in the LFS and the reminding effect of the direct questions in the study.

Table 8
Estimation of reasons for the differences in number of absence hours
(millions of hours) between the LFS and the study, by professional status

	LFS	The study	Difference
Underestimation In the LFS			
Employees	2.60	3.75	1.15 ±0.09
Self-employed	0.04	0.07	0.03 ±0.02
Total	2.64	3.82	1.18 ±0.09
Reminding effect of the questions			
Employed	9.80	9.78	-0.02 ±0.11
Self-employed	1.61	1.54	-0.07 ±0.06
Total	11.41	11.32	-0.09 ±0.12

The entire difference between the LFS and the study is explained by the underestimation in the LFS. On the other hand, the direct question has not led to an increase in the number of absence hours in the study.

Table 9
Estimation of reasons for the differences in number of absence hours
(millions of hours) between the LFS and the study, by sex

	LFS	The study	Difference
Underestimation In the LFS			
Men	1.52	2.26	0.75 ±0.07
Women	1.12	1.56	0.44 ±0.05
Reminding effect of the questions			
Men	6.43	6.28	-0.15 ±0.10
Women	4.98	5.04	0.06 ±0.08

In addition, it is the underestimation in the LFS that explains the entire the difference between the LFS and the study when broken down by men and women.

Table 10
Difference between the LFS and the study regarding different reasons for absence. Millions of hours

Reason for absence	LFS	The study	Difference
Holiday, illness, parental leave, leave of absence	3.54	3.72	0.18 ±0.11
Public holiday	8.37	9.06	0.70 ±0.11
Flex/compensatory time off	1.70	1.88	0.19 ±0.07
Other reasons	0.42	0.48	0.06 ±0.08

All the causes of absenteeism show more hours in the study than in the LFS. With the exception of "Other reasons", all the differences are significant. The biggest difference is in the category flexitime or

compensatory time off, and the study shows 11% more hours than the LFS. The smallest difference, 5%, is for the category Holiday, illness, parental leave and leave of absence.

5.3. The number of actually worked hours

In the study, the number of actually worked hours has been calculated for each respondent as the number of usual working hours according to the LFS plus the number of hours in excess of the usual number of hours according to the study minus the number of absence hours according to the study.

Table 11
The number of actually worked hours for employees and self-employed in the LFS and the study. Millions of hours

	LFS	The study	Difference
Employees	92.57	93.69	1.12 ±0.16
Self-employed	15.50	15.65	0.16 ±0.07
Total	108.07	109.35	1.28 ±0.18

The calculation shows that the number of actually worked hours in the study is 1.2% more than in the LFS. The difference is essentially the same for employees and the self-employed.

Table 12
The number of actually worked hours for men and women in the LFS and the study. Millions of hours

	LFS	The study	Difference
Men	63.85	64.72	0.86 ±0.14
Women	44.22	44.63	0.42 ±0.11

There is a bigger difference in the actually worked hours between the study and the LFS for men than for women. 1.4% more hours for men and 0.9% for women.

Young people aged 16-24 years have the smallest difference between the LFS and the study, only 0.4% more hours. The biggest difference is found for those aged 35-44, 1.5%.

When it comes to industrial classifications, the biggest differences between the LFS and the study are found in education and research and in public administration with 1.8% and 1.7% more hours respectively in the study than in the LFS. The least differences, only 0.6% more hours in the study than in the LFS, are found in the health care sector.

6. Suggestions for the design of the questionnaire and for continued studies

This study shows that the number of hours in excess of usual working hours and the number of absence hours are underestimated when using the current method of the LFS. In addition, the study shows that hours in excess of usual working hours are often “forgotten” when there are no direct questions about them.

Measuring working hours is meticulous. Further studies should be done, and preferably in association with the regular production of the LFS. This could be done by using the questions of this study on a smaller proportion of the LFS sample. (See the report *Study of working hours in the LFS*.)

Study of the order of questions concerning working hours, A. Olofsson, H. Mirza. In light of the results obtained in this study and in the study regarding the order of questions, the following is a proposal for questions and their order in a pilot study. The number of hours should be specified for each of the reasons for absence and work in excess of usual working hours, respectively, which is consistent with the respondent’s situation during the reference week.

How many hours per week are you supposed to work during a normal week (alternatively, according to your agreement with your employer)?

Did you, during that week, work any overtime

– for which you received compensation in time or money?

– that was put on your flexitime balance?

– that you did not receive any compensation for either in time or money?

– Other: describe

Were you absent at all during the that week due to

– holiday

– illness

– parental leave; type of parental leave

– Leave of absence; type of leave of absence

Were you absent due to holidays/days before holidays?

Were you absent due to flexible working hours or compensatory leave, i.e. leave due to having worked extra beforehand or taking hours from the flexitime balance?

Other; describe

How many hours did you work during the week?

The number of hours actually worked is calculated automatically during the interview by taking the usual working hours plus hours in excess of usual working hours minus absence hours. If there is a difference between the calculated hours and the hours the respondent stated, the respondent is asked about the cause.

Before the pilot study starts, usual working hours, working hours in excess of usual working hours and absence should be well defined. Examples of issues to be discussed are: Should the hours put on the flex balance or taken from it be accounted for as working more than usual or absence, respectively? Should overtime cancel out compensatory time off during the same week? One should also define the different types of work in excess of usual working hours and absence for employees and self-employed.

7. Summary

In the LFS, the working hours are measured using two questions. The first one refers to the agreed or average weekly working hours, and shall provide the number of hours the respondent usually works every week. The second one refers to the number of hours the respondent actually worked during the reference week. The number of hours absent from work and the overtime hours are calculated by comparing the usual working hours per week with the actual number of hours worked during the reference week. If the number of actually worked hours is lower than the usual working hours, the reason for the absence is investigated. If the number of actually worked hours is higher than the usual working hours, the reason for the work in excess of usual working hours is investigated. If an individual was both absent and worked overtime, there is an underestimation of both the absence and the number of hours worked in excess of usual working hours.

In this study, direct questions on absence and work in excess of usual working hours were used. The respondent was asked whether he/she had been absent or worked more than usual for some reason.

The study shows 64% more hours in excess of usual working hours and 8% more absence hours than the LFS. This means that the study shows 1.2% more hours actually worked.

Roughly, the study shows that the differences between the study and the LFS are due partly to underestimations in the LFS, and partly to a reminding effect from getting direct questions. However, this reminding effect might also contribute to parts of the differences that are primarily explained by the underestimations in the LFS. When it comes to working hours in excess of usual working hours, the underestimation explains about two-thirds of the difference between the study and the LFS, and the direct questions explains the remaining part. The difference in absence from work is entirely due to the underestimations in the LFS.

The conclusions drawn from this study are as follows:

- The method used in the Swedish LFS and the EU-LFS in the calculations of hours of absence from work and work in excess of usual working hours is not satisfactory. Direct questions about absenteeism and work in excess of usual working hours should be used in order to improve these estimates and the estimates of the actual number of hours worked.
- A careful review of the definitions, primarily in relation to usual working hours, working hours in excess of usual working hours and absenteeism should be conducted.
- Further studies should be performed, preferably in association with the regular production of the statistics in the LFS.

Appendix 1

Questions regarding working hours in the Swedish LFS

The questions I am now going to ask concern work, studies and desire to work. I will begin by asking about a certain week (number of the week), that is, Monday (date) up to and including Sunday (date).

How many hours did you work during that particular week?

Main job:

How many hours in your second job/second jobs?

How many hours per week are you supposed to work according to your agreement with your employer? (employees)

How many hours do you on average work per week? (self-employed)

Main job:

How many hours in your second job/second jobs?

(If actually worked hours = usually worked hours:)

This means that you worked the same number of hours as usual (in your main job) this particular week?

What was the main reason for why you worked "xx" hours less than your agreed number of hours during that particular week (in your main job)?

20 reasons are listed for employees and 15 for the self-employed.

Is there more than one reason?

What was the second most important reason?

20 reasons are listed for employees and 15 for the self-employed.

How many hours were due to the reason according to the first question?

This means that xx hours were due to the reason in the second question?

What was the main reason for why you worked xx more hours than your agreed number of hours during that particular week (in your main job)?

7 reasons are listed for employees and 4 for the self-employed.

Appendix 2

SUPPLEMENTARY QUESTIONS ABOUT OVERTIME AND ABSENCE FOR PERMANENTLY AND TEMPORARILY EMPLOYED

INTRODUCTION

We have an assignment from the EU to study absence from work and overtime in further detail than we do today. I will ask you a few questions about absence from work and overtime/extra time and maybe repeat some question that you have already answered. These questions still refer to the week..... The questions refer to your main job.

- E1 Did you work any overtime/extra time during that particular week?
1 Yes -----> How many hours?
- 2 No
- E2 Did you work any hours that were placed on your flexitime balance?
1 Yes -----> How many hours?
- 2 No
- E3 Did you, during that week, work any overtime or additional time for which you did not receive compensation in time nor money?
1 Yes -----> How many hours?
- 2 No
- E4 Did you work overtime for any other reason?
1 Yes -----> How many hours?What reason?
- 2 No
- E5 Were you absent during the particular week due to holiday, illness, parental leave or some other leave of absence?
1 Yes -----> How many hours?
- 2 No
- E6 Was the working week shortened due to any holidays/days before a holiday?
1 Yes -----> How many hours?
- 2 No

E7 Did you take any hour from your flexitime balance or were you on compensatory leave?

- 1 Yes -----> How many hours?
- 2 No

E8 Were you absent/on leave for any other reason?

- 1 Yes -----> How many hours? What reason?
- 2 No

E9 For the interviewer:

- 1 The answers on actual and agreed working time are correct
- 2 The answer on actual working time is wrong Describe
- 3 The answer on agreed working time is wrong Describe....
- 4 Both answers are wrong Describe

SUPPLEMENTARY QUESTIONS ABOUT OVERTIME AND ABSENCE FOR THE SELF EMPLOYED AND UNPAID FAMILY WORKER

INTRODUCTION

We have an assignment from the EU to study absence from work and overtime in further detail than we do today. I will ask you a few questions about absence from work and overtime/extra time and maybe repeat some question that you have already answered. These questions still refer to the week... The questions refer to your main job.

E11 Did you work any overtime/extra time during that particular week due to work stoppages?

- 1 Yes -----> How many hours?
- 2 No

E12 Did you work more than your average working hours for any other reason?

- 1 Yes -----> How many hours? What reason?
- 2 No

E13 Were you absent during the particular week due to holiday, illness, work shortage, parental leave?

- 1 Yes -----> How many hours?
- 2 No

E14 Was the working week shortened due to any holidays/days before a holiday?

- 1 Yes -----> How many hours?
- 2 No

E15 Were you absent/on leave for any other reason?

- 1 Yes -----> How many hours? What reason?
- 2 No

E16 For the interviewer:

- 1 The answers on actual and average working time are correct
- 2 The answer on actual working time is wrong Describe
- 3 The answer on average working time is wrong Describe.....
- 4 Both answers are wrong Describe

Appendix 3

Table 1

The number of hours worked in excess of usual working hours for individuals at work in the LFS and in the study by age. Millions of hours

Age	LFS	The study	Difference	Significance-limit 95%
16–24	0.35	0.45	0.10	0.03
25–34	0.99	1.59	0.60	0.06
35–44	0.94	1.61	0.68	0.06
45–54	1.04	1.74	0.70	0.07
55–64	0.39	0.68	0.29	0.05
16–64	3.71	6.08	2.37	0.13

Table 2

The number of hours worked in excess of usual working hours for individuals at work in the LFS and in the study by industrial classification. Millions of hours

Industrial classification	LFS	The study	Difference	Significance-limit 95%
Agriculture, Forestry etc	0.10	0.14	0.04	0.02
Industry	0.78	1.40	0.62	0.06
Construction industry	0.15	0.24	0.08	0.03
Commerce and communication	0.80	1.24	0.43	0.05
Financial activities, Business services	0.63	0.94	0.32	0.05
Education, research	0.29	0.53	0.24	0.04
Health care	0.38	0.72	0.33	0.05
Personal and cultural services	0.35	0.49	0.14	0.03
Public administration	0.22	0.38	0.16	0.03
Total	3.71	6.08	2.37	0.13

Table 3

The number of absent hours for individuals at work in the LFS and the study by age. Millions of hours

Age	LFS	The study	Difference	Significance-limit 95%
16–24	0.80	0.88	0.07	0.04
25–34	3.37	3.71	0.35	0.07
35–44	3.64	3.90	0.26	0.08
45–54	4.17	4.47	0.31	0.08
55–64	2.08	2.19	0.11	0.05
16–64	14.05	15.14	1.09	0.15

Table 4
Number of absence hours for individuals at work in the LFS and in the study
by industrial classification. Millions of hours

Industrial classification	LFS	The study	Difference	Significance-limit 95%
Agriculture, Forestry etc	0.29	0.27	0.02	0.03
Industry	3.26	3.56	0.29	0.07
Construction industry	0.97	0.98	0.01	0.04
Commerce and communication	2.46	2.68	0.22	0.06
Financial activities, Business services	1.85	2.00	0.15	0.05
Education and Research	1.32	1.41	0.09	0.04
Health Care	2.00	2.25	0.24	0.06
Personal and Cultural services	0.88	0.92	0.04	0.05
Public administration	1.00	1.06	0.06	0.03
Total	14.05	15.14	1.09	0.15

Table 5
Number of hours actually worked for individuals at work in the LSF and the
study by age. Millions of hours

Age	LFS	The study	Difference	Significance-limit 95%
16–24	7.95	7.98	0.03	0.05
25–34	25.45	25.71	0.25	0.08
35–44	27.86	28.28	0.42	0.09
45–54	32.12	32.52	0.39	0.09
55–64	14.68	14.87	0.19	0.07
16–64	108.07	109.35	1.28	0.18

Table 6
Number of hours actually worked for individuals at work in the LFS and the
study by industrial classification. Millions of hours

Industrial classification	LFS	The study	Difference	Significance-limit 95%
Agriculture, forestry etc	4.04	4.10	0.06	0.03
Industry	23.50	23.83	0.32	0.08
Construction industry	6.54	6.62	0.08	0.04
Commerce and communication	21.98	22.19	0.21	0.07
Financial activities and Business services	12.91	13.08	0.17	0.06
Education and research	8.57	8.72	0.15	0.05
Health care	16.07	16.16	0.09	0.08
Personal and cultural services	8.40	8.50	0.10	0.05
Public administration	6.01	6.11	0.10	0.04
Total	108.07	109.35	1.28	0.18

Measurement of usual and actual working hours in the Swedish LFS

Krister Näsén

Introduction

This description of how the number of working hours are derived refers to the period of April 2005 and onwards in the Swedish LFS. The changes are based on the results of the "Study of working hours in the LFS" by Anita Olofsson and a number of other experiments and tests. Before the introduction of this approach, there were in principle two questions regarding the measurement of working hours – 1) hours usually worked, and 2) hours actually worked during the reference week.

The benefits of the new approach, presented below, are primarily that hours actually worked can be measured in a better way by asking about the subcomponents absenteeism and overtime before the question on the number of hours actually worked

How the number of hours worked are derived in the Swedish LFS

This document contains the questions used in the Swedish Labour Force Survey to derive the number of hours worked. The first part focuses on hours usually worked in the main job, that is, how many hours does a person work when actually at work or how many hours is a person supposed to work according to agreement with the employer.

The second part focuses on the hours actually worked in the main job, that is, how many hours the respondent actually worked during the reference week.

The third part is the number of hours worked, both actual and usual, in the second job.

Hours usually worked in the main job

The following questions are used to derive the number of hours usually worked in the main job, whether it be permanently employed, temporarily employed, self-employed or unpaid family workers.

The first question is used to categorise whether a person has full-time or part-time employment.

Hu 16 Do you work full-time or part-time?

- 1 Full-time
- 2 Part-time

In the case a person works part-time a follow up question is used to determine the percentage of a full-time job. This is then multiplied by 40 to get an estimate of the number of hours usually worked.

Hu 17 What percentage of full-time is your part-time job?

..... percent

For persons working full-time or who have full-time employment but are currently working part-time, the question Hu30 is used to determine the number of hours usually worked.

Hu 30 How many hours per week are you supposed to work according to your agreement with your employer?

Hu 18 =1: For persons working part-time but who are actually employed on a full-time basis, the agreed part-time work done at present applies here.

Hu 24 =1: Calculate an average of a working cycle/schedule period

..... number of hours →

777 Have no agreement on working hours →

In case there is no set schedule or a person is working irregular hours, question Hu31 is used to determine the usual hours worked. If the hours are very irregular, an average of four weeks is calculated.

Hu 31 How many hours do you on average work per week?

If hours vary considerably, calculate the average over the last 4 weeks

Hours actually worked in the main job

The following set of questions are used to answer how many hours a person has actually worked during the reference week. Only employees answer this section while self-employed and unpaid family workers get a different set of questions.

To get an estimate on the number of hours employees are absent this question is used. Only persons who were absent for part of the week are asked this question. For those who were absent the entire week the number of hours absent is equal to the number of hours usually worked.

At 3 How many hours were you absent?

..... hours →

Questions At 6-10 are for employees at work during the reference week if they worked any paid or unpaid overtime.

Full-time

At 6a Did you, during that week, work any overtime for which you received compensation in time or money?

Part-time

At 6aa Did you, during that week, work any overtime or additional time for which you received compensation in time or money?

Irregular hours

At 6aaa You have no agreed working hours, but did you still have some overtime during that week that you received compensation for?

Standard compensation that is not calculated by the hour should be included here. Hours within a flexitime system should not be included

1 Yes

2 No

At 7 How many hours?

..... hours

pb →

Full-time

At 9a During the week, did you have any overtime that you *did not* receive any compensation for?

Part-time

At 9aa During the week, did you have any additional time or overtime that you *did not* receive any compensation for?

1 Yes

2 No

At 10 How many hours?

..... hours

pb →

This question is used to estimate the number of hours actually worked in the main job during the reference week. Previous answers are used for checking whether the answer is plausible or not.

At 13a How many hours did you work during that particular week?

If in training during reference week

At 13aa How many hours did you work during that particular week? Hours for training should also be included.

..... hours

If the reference week is during the turn of the month these two questions are asked to find out how many hours were worked each calendar month.

At 14 That week is at the turn of the month. Did any of your working hours take place on "days of week and date"?

- 1 Yes
- 2 No

At 15 How many hours did you work on that day/those days (in your main job)?

..... hours

For self-employed and unpaid family workers a shorter set of questions are asked. They are used in the same way as for employees.

FAt 3a How many hours did you work during that particular week?

If in training during reference week

FAt 3aa How many hours did you work during that particular week?
Hours for training should also be included.

..... hours

If the reference week is during the turn of the month these two questions are asked to find out how many hours were worked each calendar month.

At the turn of the month

FAt 4 That week is at the turn of the month. Did any of your working hours take place on "days of week and date"?

- 1 Yes
- 2 No → FAt 6/Bi 3a pb → FAt 6/Bi 3a

FAt 5 How many hours did you work on that day/those days (in your main job)?

Number of hours worked in the second job(s)

First the number of hours usually worked are estimated in the second job or jobs. The first question is answered by people who work according to a schedule or set number of hours as agreed with the employer and the second is asked respondents working irregular hours.

Bi 10 How many hours per week are you supposed to work according to your agreement with your employer in your second job? (total hours of your second jobs)

Shift work: Calculate an average of a working cycle/schedule period

Bi 11 How many hours do you usually work per week?

If hours vary considerably, calculate the average over the last 4 weeks

Then the actual number of hours are asked in relation to the second job or jobs.

Bi 12 How many hours did you work during the week of <<ref. week>>?

Just as with the main job, if the reference week is during the turn of the month, two questions are asked about how many hours were actually worked during the days that belong to the coming calendar month.

At the turn of the month

Bi 13 That week is at the turn of the month. Did any of your working hours take place on “days of week and date”?

1 Yes

2 No → Omb 1

pb → Omb 1

Bi 14 How many hours did you work on that day/those days?

..... hours

Volume of actual hours worked in the LFS⁶

Hassan Mirza

Background

During the meeting of the reference group for labour statistics 1994-12-07, it was decided that an additional question should be added to the questionnaire. The question should be used when the reference weeks overlap two months. The purpose of the question is to capture the number of hours actually worked during the portion of the reference week that falls within the "new" month. A copy of the documents supporting the decision can be found in Appendix 1.

Supplementary survey

We started out at the end of 1994/beginning of 1995 with the last reference week of December, since this week goes into January by one day. The questions constitute a supplementary survey to the regular LFS; if the trial is successful it is relevant to place them in direct connection to the questions M1/M11 in the regular LFS. After the first quarter, the results from the supplementary survey are evaluated and possible improvements are to be made. During the evaluation period, the questions are asked as planned. The following reference weeks of the first half of 1995 have been affected by the supplementary survey.

LFS month	Reference week
December 94	52 (1 day in January)
January 95	not affected
February	5 (2 days in January)
March	9 (2 days in February) 13 (2 days in April)
April	not affected
May	not affected
June	22 (3 days in May) 26 (2 days in July)

The questionnaire regarding reference week 52 is found in Appendix 2.

Non-response

Statistical surveys are associated with certain sources of error. During the discussions about starting this supplementary survey, it was feared that the partial non-response would be large. Furthermore, there was concern that the data gathered would be flawed due to things such as memory issues on the part of the respondent.

⁶ This article was published in Swedish in 1995.

Table 1 shows the results of the fieldwork study regarding the supplementary survey for the affected reference weeks during the first half of 1995. The table shows that the partial non-response is low, and that the initial fears did not materialise. It is worth noting that non-response during the reference weeks 5, 9 and 22 is higher than for the other affected reference weeks. Weeks 5, 9 and 22 are all the first reference weeks for the respective reference months. Thus, the higher non-response of these weeks might be explained by the fact that the respondents who are interviewed late during the reference month find it hard to break down their actual hours worked during the reference week between the two months.

Table 1
Respondents affected by the supplementary survey distributed over the results from the interview

Week	Respondents		Non-response		Total	
	Number	%	Number	%	Number	%
52/1994	1 470	99.66	5	0.34	1 475	100
5/1995	2 233	98.67	30	1.33	2 263	100
9/1995	2 042	98.65	28	1.35	2 070	100
13/1995	1 899	99.69	6	0.31	1 905	100
22/1995	2 045	97.94	43	2.06	2 088	100
26/1995	1 493	98.42	24	1.58	1 517	100

Estimation

Currently, the LFS only presents estimations of the total number of hours worked per week (or more accurately per week on average during the reference month). These estimations are arrived at:

$$\hat{t} = \sum_{h=1}^{147} \sum_{i=1}^{n_h} \frac{N_h}{n_h} \times t_{hi} = \sum_{h=1}^{147} \sum_{i=1}^{n_h} W_h \times t_{hi} \quad (1)$$

Where

\hat{t} = estimation of the average total number of hours worked per week during the reference month.

N_h = number of individuals in the population who belong to post stratum h , ($h=1, 2, 3, \dots, 147$ in combinations of sex, age and industrial classification according to the Register-based labour market statistics/ not the Register-based labour market statistics)

n_h = number of respondents in the monthly sample who belong to post stratum h

$W_h = \frac{N_h}{n_h}$ = weighting for the objects in post stratum h

t_{hi} = number of hours worked during the reference week for object i in post stratum h .

Note that the estimation above makes use of the entire month sample, i.e. the sample for all the reference weeks of the month.

In order to estimate the volume of hours worked during the reference month or the calendar month weekly estimates are required. That is, the upward adjustment to the population level is conducted for each reference week. Such an estimation is arrived at:

$$\hat{T}_j = \sum_{g=1}^G \sum_{h=1}^H \sum_{i=1}^{m_h} \frac{M_{gh}}{m_{gh}} \cdot t_{ghi} = \sum_{g=1}^G \sum_{h=1}^H \sum_{i=1}^{m_h} W_{gh} \cdot t_{ghi} \quad (2)$$

Where

\hat{T}_j = estimate of the total number of hours worked during the reference month j .

G = number of weeks of the reference month ($G = 4$ or 5).

M_{gh} = number of individuals in the population during reference week g , ($g = 1, 2, \dots, G$) who belong to post stratum h , ($h = 1, 2, 3, \dots, H$ in combinations of sex, age and industrial classification according to the Register-based labour market statistics/ not the Register-based labour market statistics).

m_{gh} = number of respondents during reference week g who belong to post stratum h

W_{gh} = Weighting for the objects i in reference week g who belong to post stratum h .

A complication due to the weekly estimation in (2) is that the number of respondents in each stratum in the LFS's existing post stratum is too few. In order to live up to the condition that the number of respondents in each stratum is sufficient (at least 25), fewer post strata ought to be constructed, estimated to be about 25 strata. As a consequence, the precision of the estimate of the number of hours worked per week, according to (2), will probably be lower than if done according to (1). Another consequence is that the LFS will have two different upward adjustment systems for the employed. One will be used for the estimate of the number of employed and hence at work, the other one will be used for the estimations of the number of hours worked. This way, the consistency between the parameters of the persons at work and the number of hours worked will be lost.

In order to maintain the consistency between the number of persons at work and the total number of hours worked, one should use the existing upward adjustment system presented in (1). The weights are adjusted so that an estimator for weekly estimates is obtained. Such a procedure gives:

$$\hat{T}_j^* = \sum_{g=1}^G \sum_{h=1}^{147} \sum_{i=1}^{n_h} \left[\frac{\sum_{h=1}^{147} \sum_{i=1}^{n_h} W_h}{\sum_{h=1}^{147} \sum_{i=1}^{n_h} W_h \times I_{ghi}} \right] \times W_h \times t_{ghi} \quad (3)$$

Where

\hat{T}_j^* = estimation of the total number of hours worked during the reference month j .

I_{ghi} = indicator variable (1 if object i in post stratum h belongs to reference week g , 0 otherwise)

$\sum_{h=1}^{147} \sum_{i=1}^{n_h} W_h = N =$ The population during the reference month (16-64 years)

$\sum_{h=1}^{147} \sum_{i=1}^{n_h} W_h \times I_{ghi} =$ estimation of the part of the population that corresponds to the sampled individuals during reference week g .

Where: $\sum_{g=1}^G \hat{N}_g = N$

After the estimation of the total number of hours worked during reference month j (\hat{T}_j^*) the estimation for the calendar month cj is easily provided by:

$$\hat{T}_{cj}^* = \hat{T}_j^* + \hat{T}_{kj}^* + \hat{T}_{jl}^* \quad (4)$$

Where

\hat{T}_{cj}^* = estimation of the total number of hours worked during calendar month j .

\hat{T}_j^* = estimation of the total number of hours worked during reference month j .

\hat{T}_{kj}^* = estimation of the total number of hours worked during the intersect of reference month k and calendar month j . $k \neq j$

\hat{T}_{jl}^* = estimation of the total number of hours worked during the intersect of reference month j and calendar month l . $j \neq l$

An approximation of the estimated variance of \hat{T}_{cj}^* is given by:

$$\hat{V}(\hat{T}_{cj}^*) = \left[\frac{\hat{T}_{cj}^*}{\hat{t}} \right]^2 \times \hat{V}(\hat{t})$$

Where:

$\hat{V}(\hat{t})$ is the estimated variance for the average total number of hours worked per week during the month. It is calculated on a regular basis in connection to the monthly estimate of the LFS.

Results

In tables 2 and 3, the number of hours worked is presented according to different estimation procedures for March and June of 1995 respectively.

Table 2
Total number of hours worked per month and week according to different estimation procedures, by industrial classification (rough level). Employees. March 1995

Number of hours worked (tens of thousands)

SNI code (Swedish equivalent of NACE code)	Industrial classification	LFS' sample period during the month			ratio	Volume calendar- Month acc. to (5)
		Monthly volume according to (3)	per week	per week acc. to (1)		
Column no.	2	3	4=3/ number of weeks	5	6=5/4	7
01,02,05	Agriculture, forestry etc.	805.9	161.18	161.32	1.001	753.50
10-37,40-41	Industry	12 660.10	2 532.02	2 535.82	1.002	11 472.30
45	Construction industry	3 119.40	623.88	623.99	1.000	2 845.10
50-52	Commerce	6 365.50	1 273.10	1 272.95	1.000	5 842.80
60-64	Communication	3 823.50	764.70	764.71	1.000	3 480.00
65-67,70-72,74	Financial activities & Business services	5 787.00	1 157.40	1 158.05	1.001	5 249.20
73,8	Education, research	5 284.80	1 056.96	1 055.55	0.999	4 909.00
85	Health care	11 873.50	2 374.70	2 375.08	1.000	10 855.30
55,90-93,95	Personal and cultural services	3 518.80	703.76	702.72	0.999	3 211.70
75,99	Public administration	3 482.90	696.58	696.15	0.999	3 204.60
	No information available	15.60	3.12	3.17	1.016	15.60
	Total	56 737.00	11 347.40	11 349.49	1.000	51 839.00

The third column in table 2 shows the number of hours worked during the reference month March. In these estimations, the estimator of (3) has been used. By dividing these estimates by the number of reference weeks, 5, of the month, the fourth column is obtained. The fourth column shows an average number of hours worked per week during the reference month.

This column is then compared to the regular estimates of the LFS shown in column 5. In column 6, one can see that the deviation between the two different estimation methods is small and lacks relevance. Finally, the last column presents the number of hours worked during the calendar month.

The corresponding estimates for June 1995 are presented in table 3. In this table, the deviation between columns 4 and 5 that is presented in column 6 is larger than in March 1995.

This deviation is explained by:

The non-response in the LFS is not distributed evenly over the weeks in the reference month. It is normally higher for the last reference week of the month. This relation results in a lower weight for the last reference week than the other weeks, according to the estimator in (1).

If the number of hours worked are not distributed evenly over the reference weeks, which is the case when there is a major holiday during the reference month, the uneven distribution of the non-response will cause some skewness in the estimates according to (1).

Table 3
Total number of hours worked per month and week according to different estimation procedures, by industrial classification (rough level). Employees.
June 1995

Number of hours worked (tens of thousands)

SNI code (Swedish equivalent of NACE code)	Industrial classification	LFS' sample period during the month				Volume calendar- ratio	Month acc. to (5)
		Monthly volume according to (3)	per week	per week acc. to (1)			
Column no.	2	3	4=3/ number of weeks	5	6=5/4	7	
01,02,05	Agriculture, forestry etc.	927.20	185.44	186	1.003	831.70	
10-37,40-41	Industry	11962.40	2392.48	2403	1.004	10236.80	
45	Construction industry	3353.60	670.72	671	1.000	2861.20	
50-52	Commerce	6188.60	1237.72	1237	0.999	5465.50	
60-64	Communication	3605.40	721.08	721	1.000	3083.30	
65-67,70-72,74	Financial activities & Business services	5513.90	1102.78	1105	1.002	4714.90	
73,8	Education, research	3291.40	658.28	668	1.015	2687.30	
85	Health care	10671.90	2134.38	2146	1.005	9247.40	
55,90-93,95	Personal and cultural services	3808.50	761.70	761	0.999	3336.40	
75,99	Public administration	2971.60	594.32	597	1.005	2551.80	
	No information available	16.60	3.32	3	0.904	16.60	
	Total	52311.20	10462.24	10499	1.004	45033.10	

Appendix 1

Volume of actual hours worked in the LFS (VHWA)

VHWA is an important variable for many important users.

- The National Accounts and the Consumer Price Index need to use the quarterly VHWA.
- It is a main variable in the productivity calculations
- The Swedish Work Environment Authority and Statistics Sweden's Work Environment Unit need the volume of actual hours worked during a calendar year and a period of 12 months respectively (the reference period in the statistics over work-related disorders). In order to describe how the "risk" of work-related disorders varies between different industrial classifications or professions in a relevant manner, these should be related to VHWA. These are currently related to the number of employees.

The National Accounts use a model based estimate of VHWA/quarter in different industrial classifications. The average working hours/week during the quarter is used as input in the model.

New conditions in the LFS

- 1) The new estimation procedure implemented in January of 1993 has led to more precise estimates of employment on the industry level.
- 2) Due to the new continuous reference weeks, the LFS can produce estimates of the volume of hours actually worked in different industrial sectors during 4 or 5-week periods (reference period in the Swedish LFS). On the other hand, such estimates cannot be done without making certain assumptions. The reason is that the weeks around the turn of the month almost always overlap two months.

Proposal

In order to avoid using calculations based on models on the industrial level, and thus also avoid the uncertainty that comes with calculations based on models with respect to the length of the reference period, an experiment should be conducted as follows:

- 1) An extra question regarding the reference week is asked when the reference week overlaps two calendar months. As a consequence, 1/4 or 1/5 of the sample is asked this question. The aim of the question is to capture the number of hours actually worked (in main job and second job) for the part of the reference week that is part of the "new month".
- 2) The question is asked during one quarter. An assessment of the quality of the quarter estimate of VHWA is to be done in close relation with the National Accounts. Then, a decision can be made about whether such a question should be used in the future or not.

Appendix 2

Questionnaire

The questions are given to those respondents who have worked during the reference week. First, a question about if they have worked at all during the day/days in question, and then, how many hours were distributed over the main job and the second job.

Introduction

The week 26 December -1 January is at the turn of the month. We would like to present the number of hours worked per calendar month.

VHWA1

You said earlier that you worked x hours (of second job: y hours in your main job and z hours in your second job/jobs) during that week. Did any of your working hours take place on Sunday January 1st, that is, New Year's Day?

- 1 Yes —> VHWA 2
- 2 No —> end/other supplementary surveys

VHWA 2

How many hours did you work on that day (in your main job or second job respectively)?

.....Hours in the main job

.....Hours in the second job

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