EUROPEAN COMMISSION
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Directorate F: Social Statistics and Information Society
Unit F-3: Living conditions and social protection statistics

Comparative Intermediate EU Quality Report 2007

(Version 5 – October 2009)

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0. LEGAL BASIS

The EU-SILC Framework Regulation (EC N°1177/2003 – Article 16) states the following:

> *1. Member States shall produce by the end of the year N+1 an intermediate quality report relating to the common cross-sectional EU indicators based on the cross-sectional component of year N. […]*
>
> *2. The Commission (Eurostat) shall produce by the end of June N+2 a comparative intermediate quality report relating to the common cross-sectional EU indicators of year N. […]*

The comparative intermediate EU quality report for 2007 aims at gathering and summarizing all the information contained in the 2007 national intermediate quality reports that countries sent to Eurostat. The objective is to evaluate the quality of the instrument from the European point of view, i.e. by establishing between-country comparisons of some of its key quality dimensions.

The outline followed in this document is the one specified in the Commission Regulation N° 28/2004 (Annex IV) about the detailed content of intermediate quality reports to be produced by Eurostat.

This document analyses the national quality reports sent by Belgium, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, The Netherlands, Austria, Poland, Portugal, Slovenia, Slovakia, Finland, Sweden, United Kingdom, Iceland and Norway. The analysis of the 2007 operation in Bulgaria and Romania is less detailed and limited to the analysis of the microdata because of the late delivery of the national quality reports. It excludes the study of the operation in Switzerland because no national quality report has been received from this country.

1. ACCURACY

The concept of accuracy refers to the reliability of estimates computed from a sample rather than the entire population. This section dwells on methodological features of the EU-SILC samples surveyed in each country and intends to draw a picture of their relevance for estimation purposes.

1.1. Sample design

In 2007, the EU-SILC instrument covered 31 countries: seven countries carried out the survey for the fifth time, eight for the fourth time, twelve for the third time and four for the first time[1].

The Framework Regulation calls for the selection of nationally representative probabilistic samples[2]. The observation units are both households and individuals. Households are clusters of individuals and all the members of a selected household are eligible for inclusion in the sample.

The following table summarizes the sampling design by country:

Table 1: Sampling design (2007)

Sampling of dwellings/ addresses	Simple random sampling	Malta
	Stratified simple random sampling	Luxembourg, Austria
	Stratified multi-stage sampling	Czech Republic, Spain, France, Hungary, Latvia, The Netherlands, Poland, Portugal, United Kingdom
Sampling of households	Stratified simple random sampling	Cyprus, Slovakia
	Stratified multi-stage sampling	Belgium, Greece, Ireland, Italy
	Quota plus sampling based on an ACCESS panel	Germany
Sampling of individuals	Simple random or systematic sampling	Denmark, Iceland, Sweden, Norway
	Stratified simple random or systematic sampling	Estonia, Lithuania
	Stratified two-phase sampling	Finland
	Stratified two-stage sampling	Slovenia

Source: National Quality Reports 2007.

Most of the countries have adopted the four-year rotational design recommended by Eurostat, except for Norway and France where longer panel duration (eight and nine years, respectively) is used and Luxembourg and Sweden where a pure panel is supplemented with a new sample each year. In addition, there are some alterations in certain countries.

1.2. Non-sampling errors

Commission Regulation (EC) No 28/2004, Annex II, specifies the information on non-sampling errors which should be presented in national intermediate quality reports. These

[1] As noted before, this report summarizes the information included in the national quality reports, i.e. 27 countries even if other countries also delivered data in 2007. See summary table of EU-SILC countries per year in the annex.

[2] Except Germany that can use quota samples until 2008.

cover a description and provision of numerical indices where possible on various types of non-sampling errors, including the following:

(1) Sampling frame and coverage errors, including a description of the main coverage problems and procedures for updating the sampling frame.

(2) Measurement errors, including a description of different sources, procedures of questionnaire development and interviewing, and special studies undertaken.

(3) Processing errors, including a description of data entry, coding and editing control, and on the extent of errors found and corrected in particular concerning income variables.

(4) Unit non-response and achieved sample size, including standardised computation of response and non-response rates at various stages of the data collection process, substitution of sample cases if allowed, and the achieved sample size for household and personal interviews.

(5) Item non-response, including for each income component collected or compiled at the household/personal level, the proportions of households/persons receiving and reporting the amount received, reporting it partially, and not reporting the amount; the same for the common cross-sectional EU indicators computed from the cross-sectional data.

This section of the report describes the basic methodology and approach followed in the production of this information and in its presentation in the national intermediate quality reports 2007. The objective of the section is to highlight some main results on non-sampling errors in EU-SILC surveys from a comparative perspective. Additional information can be consulted in the annex.

Sampling frames used in EU-SILC surveys

The following table ("Type of sampling units and the sampling frame") shows the type of units used and frame characteristics in EU-SILC surveys. Almost all surveys used a single-stage or a two-stage design.

In multi-stage designs, the whole country is divided into area units such as localities or census enumeration areas (EAs), and a sample of these areas are selected at the first stage. The types of units selected at the first stage are called *primary sampling units* (PSUs). In a two-stage design, in each selected PSU, ultimate sampling units (USUs), which may be dwellings, households or persons, are selected from each sample PSU. In the survey, information may be collected and analysed for the USUs themselves; or for other types of units ('elements') associated with the selected USUs, such as individual persons within sample households, or conversely, in some EU-SILC surveys household associated with selected individuals. Selecting multiple 'elements' associated with a single USU (taking all households within each selected dwelling, or all persons in a selected household, etc.) is a very common design. The converse design is much less common, for example in Estonia "the sample was selected from a geographically ordered list of persons aged 14+. Then the household of each selected person was taken into the sample. This gave a sample of households selected with probabilities proportional to household size".

In single-stage designs, lists are required for the USUs covering the whole country. The requirement of coverage is more stringent here than in multi-stage designs where the lists of USU's within the selected areas can be updated more readily.

It is common to use both single-stage and multi-stage sampling in different part of the country. For example in Hungary, two types of designs are noted: "In type I sample design PSUs are localities, [while USUs] are dwellings. In type II PSUs are dwellings […]. Part II population consists of mostly the bigger localities, Part I consists of the rest".

As shown in the following table ("Type of sampling units and the sampling frame"), countries in the 2007 EU-SILC operation have used different sources for lists. Two main groups are: those using population register; and those using census lists and other sources. Then there are a small number of countries which base EU-SILC on successfully interviewed units in another larger survey.

<u>Registers</u>

Generally, where used, the population registers are believed to be up-to-date, assuming that any modification in the population (both people moving in and people moving out) are reported as quickly as possible. For example, in Belgium "the sampling frame is the Central Population Register. This Register includes all private households and their current members residing in the territory. Persons living in collective households and in institutions are excluded from the target population". In Sweden "every year a systematic sample is drawn from the register of total population (TPR). This is sorted by age and covers the entire population according to the national registration". In Finland "the sample is drawn from the Population Information System maintained by the Population Register Centre of Finland. The register is a continuously updated population register based on domicile. It is updated daily with information on population changes […]".

Some countries use multiple frames for different parts of the sample. An elaborate example is provided by Norway.

<u>Census and other sources</u>

When census and other sources are used for lists, it is essential that the databases are updated so as to represent the units which have come into being after the Census and thus ensure that the sample is representative. For example in Greece "the dwellings in each newly selected Census area are enumerated just before the fieldwork, so coverage errors ought to be minor". In France, "in order to represent the dwellings which came into being after the 1999 Census, the so-called "new" dwellings, the BSLN (Base de Sondage de Logements Neufs) was used together with the 1999 Census". Another example is Cyprus, where "the Statistical Service of Cyprus was provided by the Electricity Authority of Cyprus (E.A.C.) with a list of domestic electricity consumers, which contained all the new connections of electricity between 2001 and 2006". Similarly, in the UK, "households are sampled from the small users Postcode Address File (PAF). This is an up to date list of all addresses maintained by the UK Post Office. The Postcode address file is ordered by postcode sector, which are similar in size to a UK electoral ward."

Table 2: Type of sampling units and the sampling frame

	Type of sampling unit		Sampling frame		
	PSU	USU	source of frame	last update	% 'blanks'
	(1)	(2)	(3)	(4)	(5)
BE	Municipalities (or part thereof in larger ones)	Households	Central Population Register	01/02/2007	7.4%
CZ	CEUs- Census enumeration units	Dwelling	Geographical register	continuously	4.0%
DK	(single-stage sampling)	Individuals 16+	Central Population Register (CPR)	continuously	NA
DE	(single-stage sampling)	Household	DSP (Subsample of the German microcensus)	Each year	NA
EE	(single-stage sampling)	Persons 14+	Population register	Continuously	2.9%
IE	Block	Household	NA	NA	NA
EL	Census areas	Dwellings	Population Census	Just before the fieldwork	NA
ES	Census sections	Dwelling	Municipal Register (population register)	09/09/2006	8.6%
FR	Municipality, or group of them	Dwelling	1999 Census + Sampling frame of new dwellings	End 2005	3.1%
IT	Municipalities	Household	Registers of the municipalities	Continuously	2.8%
CY	(single-stage sampling)	Households	2001 census + supplementary list of new houses	December 2006	NA
LV	Census area	Addresses	Population Census 2000 + Population register	Beginning of 2006	3.6%
LT	(single-stage sampling)	Persons 16+	Residents register (population register)	Regularly	2.2%
LU	(single-stage sampling)	Tax household	Luxembourg Social Security database (IGSS) + Sample of international civil servants	31-12-2006	NA
HU	Localities	Dwellings	2001 Population and housing census	NA	0.7%
MT	(single-stage sampling)	Households	Census of Population and Housing 2005 database	February 2007	7.2%
NL	Municipality	Dwellings	Population register	NA	NA
AT	(single-stage sampling)	Dwellings	Central residence register (ZMR)	31/12/2006	NA
PL	Enumeration areas	Dwellings	Domestic Territorial Division Register (TERYT)	01/01/2006	7.0%
PT	Area of the 2001 Master Sample	Dwelling	Census of Population and Housing 2001	NA	5.0%
SI	Clusters of enumeration areas	Persons 16+	Central Register of Population (CRP)	Just before the fieldwork	NA
SK	(single-stage sampling)	Households	2001 Population and Housing Census	2006	NA

	Type of sampling unit		Sampling frame		
	PSU	USU	source of frame	last update	% 'blanks'
	(1)	(2)	(3)	(4)	(5)
FI	(single-stage sampling)	dwellings	Population register	continuously	NA
SE	(single-stage sampling)	Persons 16+	TRP (Total Population Register)	continuously	NA
UK	postcode sector	Addresses	PAF (Postcode Address File)	(presumably on a regular basis)	NA
IS	(single-stage sampling)	Persons 16+	Population register	December 2006	NA
NO	Municipalities (or groups of)	Persons 16+	1990 Census (FoB90) + Population register	annually + monthly	NA

The previous table also shows the last update of the frame as reported in the national quality reports. Unfortunately, information on frame updating has not been provided in some national quality reports, and in some of these the updates may be rather limited.

Use of respondents to previous (larger) surveys

This can be economical but is likely to increase bias in the sample obtained. Under-coverage comes not only from that which may already exist in the 'parent' sample but also – an perhaps more seriously – from non-response in the preceding survey. Non-response is usually selective.

Examples include The Netherlands, where the EU-SILC sample has been selected from the sub-sample of the responding addresses to Labour Force Survey which are willing to participate to EU-SILC. It should be noted however that more recently, Statistics Netherlands has focused on an increased use of register data instead of survey data in the production process of statistical information; by making efficient use of register data, it intends to improve the accuracy of the statistical information, and, at the same time, to decrease the response burden on households.

The German EU-SILC survey is designed as a rotational panel (4 sub samples). The sample hitherto has quota and a random part, the latter gradually replacing the former (the sample 2007 contains 3 random samples and 1 quota sample). Sample frame for the yearly random sampling of a new sub sample is an access panel (DSP) – containing former participants of the micro census. The 'access panel' refers to the so-called permanent sample of households ready to co-operate with official statistics that was established in German official statistics in 2004. The households in the DSP are 'recruited' on a voluntary basis and hence do not fully meet the requirements of a proper random sample.

Until 2005 also the sample of the Hungarian EU-SILC survey was a sub-sample of another survey, the Income Survey sample which was a sub-sample of the micro census sample. It should be noted however that from 2006 this basis has been changed. The new rotational EU-SILC sample is 'standalone', the frame being an updated database of addresses used in the 2001 Population and Housing census.

The concepts of unit and item non-response

The term non-response encompasses a wide variety of reasons for non-observation. Non-response means failure to obtain a measurement on one or more study variables for one or more sample units. Non-response errors occur when the survey fails to get a response to some or all of the questions. Non-response causes both an increase in variance, due to the decrease in the effective sample size and/or due to the use of imputation and, more importantly, causes bias as the non-respondents and respondents generally differ with respect to the characteristic of interest.

Non-response is a potential source of bias particularly if the missing data mechanism is not what has been termed as 'Missing At Random'. For instance, one might expect persons with high incomes to be more reluctant to give income information in an interview, thus rendering the upper income class under-represented in the sample and the estimates downwardly biased.

Two categories of non-response can be distinguished:

(1) Unit non-response:

> This refers to the type of non-response in which no information is available from eligible sample units for such reasons as: "impossible to contact", "not at home" (in these two cases contact with the selected element is never established), "unable to answer", "incapacity", "hard core refusal", "inaccessible", or "unreturned questionnaire". It may also happen that a person in a household refuses to co-operate although the household interview has been accepted ('individual' non-response).

(2) Item non-response:

> This refers to the type of non-response in which sufficient information has been provided in the interview for it to be retained in the data base, but the required information is missing on some particular items. Often this happens in questions the interviewee does not answer because he/she considers them personal or not easily understandable.

Achieved sample size

The first impact of unit non-response is on the achieved sample size.

The following table ("Achieved sample size") shows the achieved sample size for the cross-sectional component of 2007 EU-SILC, as required by Commission Regulation 28/2004[3]. Column (1) shows the numbers of household interviews completed. Column (2) shows the number of personal interviews completed in 'survey countries', and the number of adults (aged 16+) for which information on income – and also on certain basic characteristics – has been compiled from registers. Column (3) shows the number of completed personal interviews in 'register' countries; these concern non-income variables which cannot be compiled from registers. Since only one such respondent is selected per household – and since a household is accepted as completed only if interview with that selected respondent is completed – the number in column (3) is the same as the number in column (1) for register countries.

The achieved sample size varies from under 4000 households in Iceland, Cyprus and Luxembourg, to 12000-15000 in Spain, Germany and Poland, with nearly 21000 in Italy. In terms of personal interviews, the range is from under 7000 in Iceland to nearly 45000 in Italy.

The second part of the table (columns (4) – (6)) shows the number of household interviews completed for the part ('rotation group') of the sample introduced for the first time in 2007[4]. In the standard design, this new part should account for 25% of the total sample. In France the proportion new is lower because of the use of a different design. In

[3] In order to calculate the number of households and persons 16+ in full cross-sectional sample, the records in H and P files are counted respectively.

[4] For a few countries in the following table information is not provided on the proportion new in the sample, either because breakdown by rotation group is not coded in the data (Luxembourg, Sweden) or because the new among the rotation groups is not identifiable from the data or the national quality report.

the other countries for which information is available, the proportion "new" tends to be higher than 25%. The main reason for this is probably the need to make-up the sample size for higher than expected panel attrition. The proportion of new increased from 25% in Ireland to over 40% in Portugal and Finland (in these countries two new rotation groups have been introduced in 2007).

The last two columns of the table compares the 2007 and 2006 cross-sectional sample sizes in terms of the number of completed household interviews. A significant increase in the achieved sample size (the 2007/2006 ratio over 1.20) is found in Czech Republic.

Table 3: Achieved sample size

	Achieved sample size: cross-sectional sample 2007						Achieved sample 2006	
	Total sample 2007			New sample (households) 2007			Total	ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	households	persons aged 16+	selected respondents	rotation group	households	% of total	households	2007/2006
BE	6348	12322		3	2026	32	5860	1.08
CZ	9675	19384		3	2654	27	7483	1.29
DK	5783	11610	5783	4	1692	29	5711	1.01
DE	14153	26291		3	3611	26	13799	1.03
EE	5146	11971		7	1526	30	5631	0.91
IE	5608	10892		3	1417	25	5836	0.96
EL	5643	12346		4	1673	30	5700	0.99
ES	12329	28656		3	3833	31	12205	1.01
FR	10498	20357		7	1557	15	10036	1.05
IT	20982	44629		3	6115	29	21499	0.98
CY	3505	8470		6	912	26	3621	0.97
LV	4471	9270					4315	1.04
LT	4975	10913		2	1576	32	4660	1.07
LU	3885	7913		na			3836	1.01
HU	8737	18490		4	3148	36	7722	1.13
MT	3477	8344		3	1166	34	3494	0.99
NL	10219	19623	10219	2	3731	37	8986	1.14
AT	6806	13391		3	2124	31	6028	1.13
PL	14286	34888		2	3830	27	14914	0.96
PT	4310	9947		1+2	1987	46	4367	0.99
SI	8707	24730	8707	1	2952	34	9478	0.92
SK	4941	12573		2	1481	30	5105	0.97

Achieved sample size: cross-sectional sample 2007

	Total sample 2007			New sample (households) 2007			Achieved sample 2006	
							Total	ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	households	persons aged 16+	selected respondents	rotation group	households	% of total	households	2007/2006
FI	10624	21773	10624	2+5	5549	52	10868	0.98
SE	7183	14204	7183	na			6803	1.06
UK	9275	17484					9902	0.94
IS	2872	6567	2872				2845	1.01
NO	6013	11706	6013				5765	1.04

Source: Micro-database (April 2009).

(1) Number of household for which an interview is accepted for the database

(2) Number of persons of 16+ who are members of interviewed households who completed a personal interview.

(3) Number of selected respondents who are members of the households who completed a personal interview

IS, LV, NO, UK: information not available in UDB or national quality report.

Unit response and non-response rates

Commission Regulation 28/2004 has defined indicators aimed at measuring unit non-response in EU-SILC as follows:

- Address contact rate (Ra): the ratio of the number of addresses successfully contacted, to the number of valid addresses selected.

- Household response rate (Rh): the ratio of the number of household interviews completed (and accepted in the data base), to the number of eligible households at the contacted addresses.

- Individual response rate (Rp): the ratio of the number of personal interviews completed (and accepted in the data base), to the number of eligible individuals in completed households.

Non-response at the three stages – address contact, household interview and personal interview – is cumulative, so that the overall non-response rates for households and individual interviews are defined as, respectively:

- Overall household interview non-response rate: NRh = 1 – (Ra*Rh)

- Overall personal interview non-response rate: *NRp = 1 – (Ra*Rh*Rp)

These rates are shown in the following table ("Unit non-response"), distinguishing the new part from the total cross-sectional sample for 2007.

It is clear that the main non-response takes place at the household interview stage. On the average, 97% of selected addresses are successfully contacted; and once a household interview has been completed, 99% of the personal interviews in these households are also successfully completed. But only around 80% of the interviews with contacted households are completed on the average. For the new part of the sample (i.e. the rotation group introduced for the first time), the household interview success rate is lower (75%).

Overall non-response rate for the personal interview is a bit under 30% for the new sample, and a little above 20% for the 'whole' sample (those including the units already in the survey in previous waves and the new units). There is considerable variation around this average among the countries, with the non-response rate varying from under 10% in Cyprus to over 40% in Denmark.

It should also be noted that household interview response rate (within contacted addresses) is considerably low in Belgium and Hungary. And finally, in terms of the personal interview response rate (within interviewed households), it is striking the low rate in Poland.

Table 4: Unit non-response: comparison of the new sample with the whole sample

Cross-sectional sample 2007

	Ra		Rh		Rp		Nrh		*NRp		*NRp higher
	(W)	(N)	(W)	(N)	(W)	(N)	(W)	(N)	(W)	(N)	in (N) by %
DK	82	86	71	69	100	100	42	41	42	41	-1
BE	100	99	64	48	99	99	36	52	36	53	16
IE	100	100	70	72	100	100	30	28	30	28	-2
HU	100	100	71	52	100	100	29	48	29	48	19
ES	98	98	77	63	99	99	24	38	24	38	14
SI	99	98	77	73	100	100	24	29	24	29	5
AT	99	100	78	65	100	99	23	35	23	36	13
PL	100	99	84	72	94	93	17	29	22	34	12
PT	97	98	82	88	100	100	20	14	20	14	*
EE	92	84	88	77	99	99	19	35	20	36	16
DE	87	91	94	96	100	100	19	12	19	13	*
CZ	98	96	83	65	100	100	18	38	18	38	20
NL	94	95	88	83	100	100	17	22	17	22	4
FI	100	100	83	75	100	100	17	25	17	25	8
LT	100	99	83	68	100	99	17	32	17	32	15
SK	97	100	88	98	99	100	15	2	16	2	*
GR	100	100	85	76	99	100	15	25	16	25	9
FR	99	99	86	88	99	100	15	12	15	13	-3
IT	99	99	86	81	100	100	15	20	15	20	5
CY	100	100	92	91	100	100	8	9	8	9	1
mean	97	97	81	75	99	99	21	27	22	28	

* Singnificantly better overall response rate in the new part of the sample
(W) Whole cross-sectional sample
(N) New part of the sample

Ra Address Contact Rate
Rh Household Response Rate
Rp Individual Response Rate
*NRp Household Non-response Rate

The following four figures display these rates graphically, comparing the new sample with the overall cross-sectional sample in terms of overall personal interview non-response rate, and the response rates at the three stages which account for the overall result.

Figure 1: Overall personal interview non-response rate (*NRp)

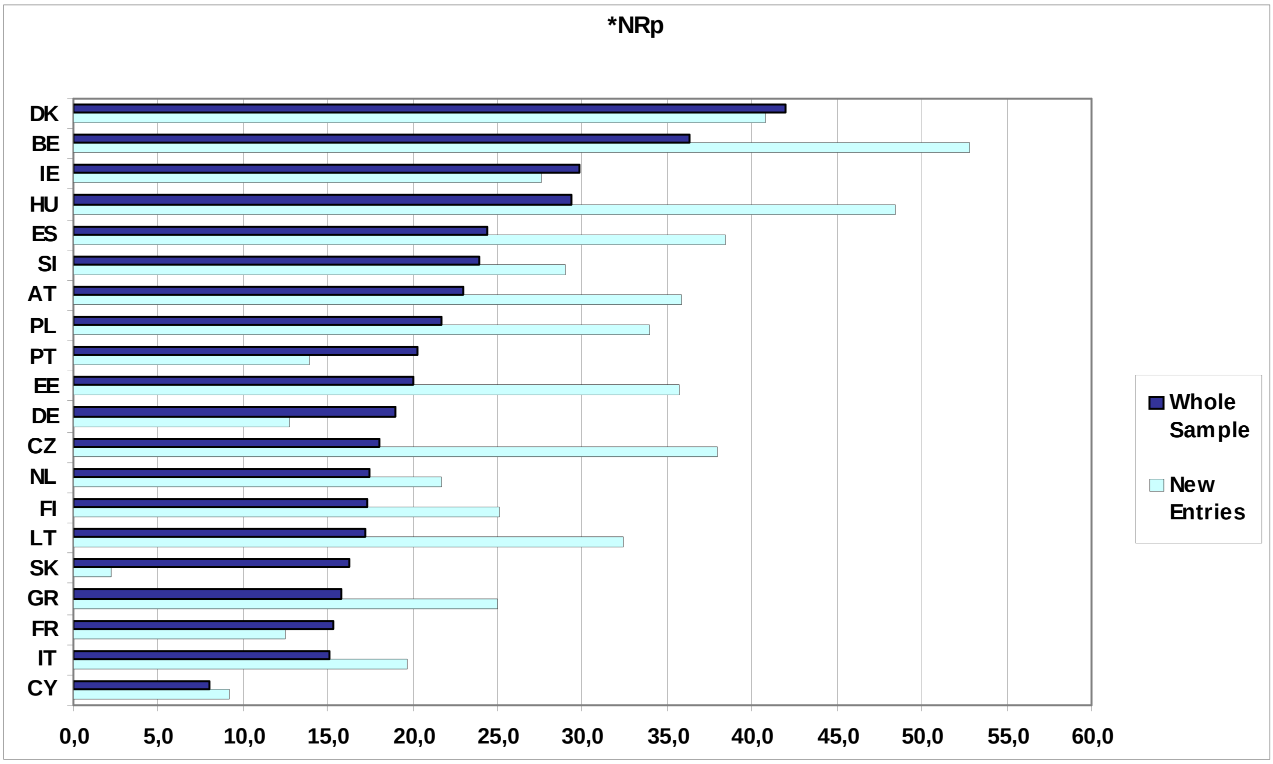


Figure 2: Address contact response rate (Ra)

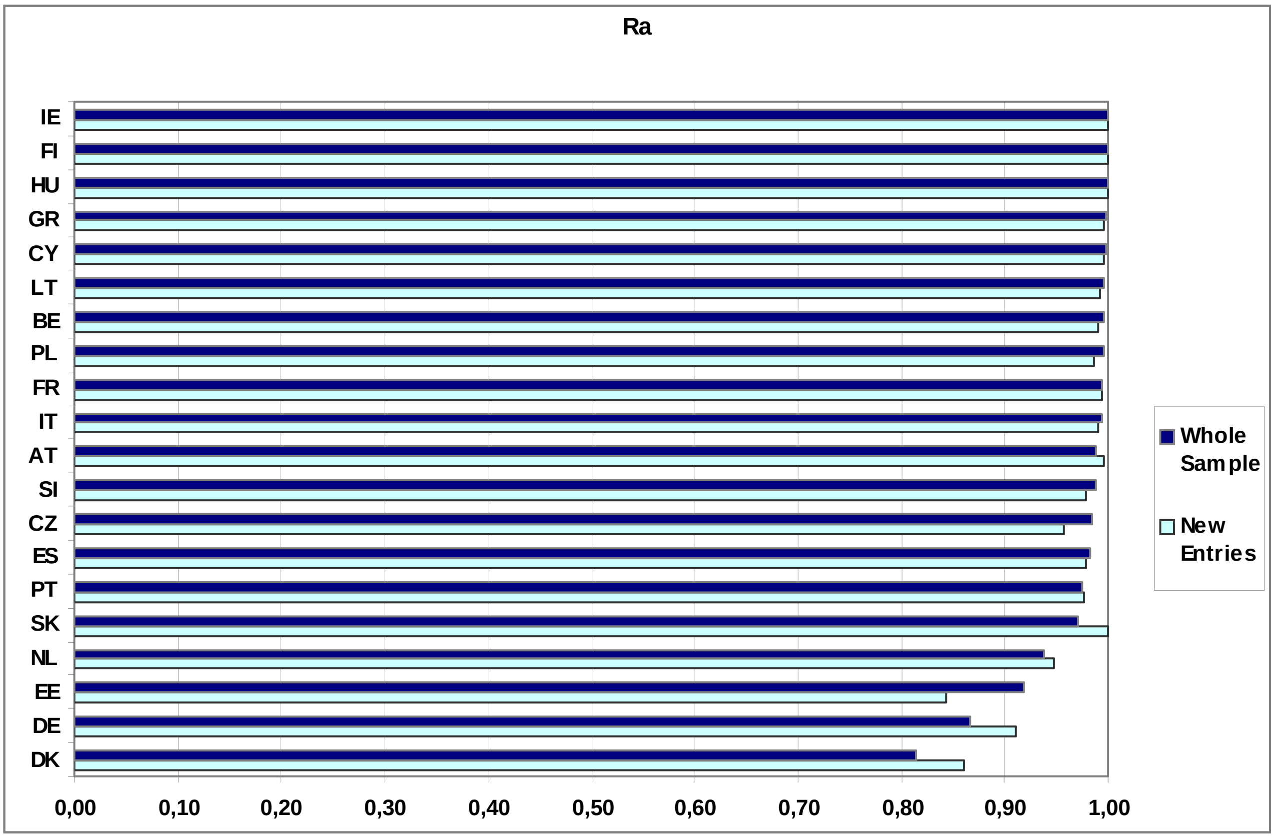


Figure 3: Household interview response rate (Rh) – within contacted addresses

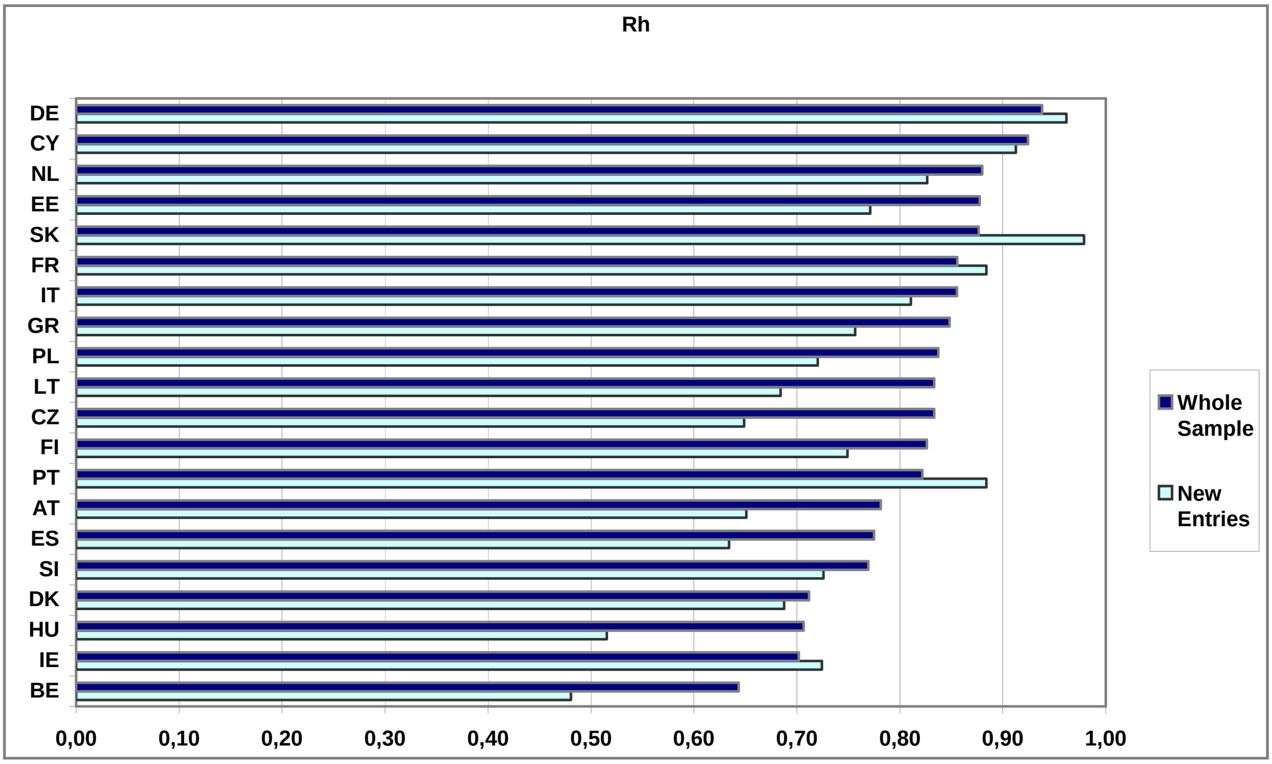


Figure 4: Personal interview response rate (Rp) – within interviewed households

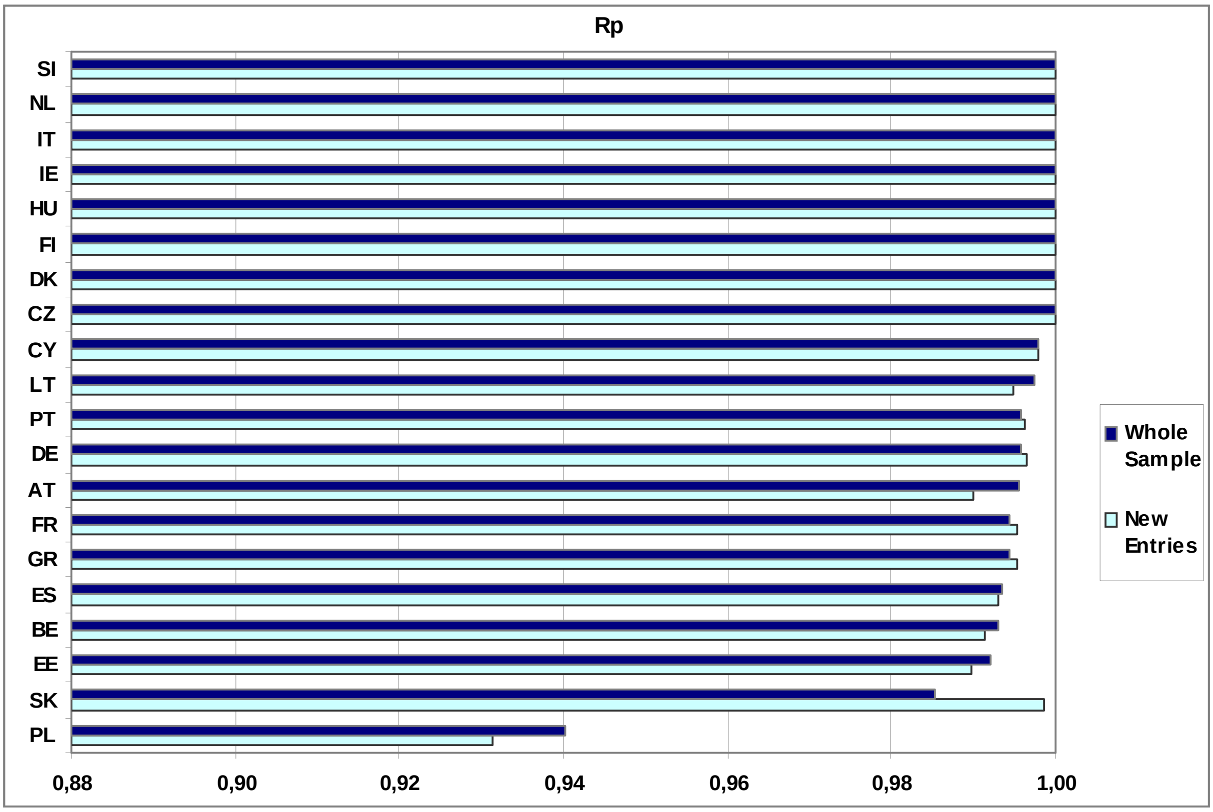


Table 5: Response rates: Comparison of 2006 and 2007 surveys (total cross-sectional sample)

	2006 survey				2007 survey				Change in *NRp	
	Ra	Rh	Rp	*NRp	Ra	Rh	Rp	*NRp	↘	↗
Belgium	100	61	99	40	100	64	99	36	3	
Czech Republic	97	76	100	26	98	83	100	18	8	
Denmark	84	72	100	40	82	71	100	42		2
Germany (1)	99	78	99	24	87	94	100	19	5	
Estonia	92	89	99	19	92	88	99	20		1
Ireland	100	72	100	28	100	70	100	30		2
Greece	100	88	99	13	100	85	99	16		3
Spain	98	73	98	30	98	77	99	24	5	
France	100	84	99	17	99	86	99	15	1	
Italy	99	86	100	15	99	86	100	15		0
Cyprus	100	95	100	5	100	92	100	8		3
Hungary	99	83	100	18	100	71	100	29		12
Malta	96	90	100	14	95	85	100	20		6
Latvia	99	79	99	23	97	78	98	26		3
Lithuania	100	80	100	20	100	83	100	17	3	
Luxembourg	94	75	100	30	96	74	100	29	0	
The Netherlands	97	83	100	19	94	88	100	17	2	
Austria	100	72	100	28	99	78	100	23	5	
Poland	100	87	95	17	100	84	94	22		4
Portugal	98	88	100	14	97	82	100	20		6
Slovenia	99	79	100	22	99	77	100	24		2
Slovakia	91	94	99	15	97	88	99	16		1
Finland	100	83	100	17	100	83	100	17		0
Sweden	91	81	100	26	91	81	100	27		0
United Kingdom	100	77	100	23	98	76	100	26		3
Iceland	100	73	100	27	100	74	100	26	1	
Norway	99	69	100	32	99	67	100	33		1
EU25	98	81	99	21	97	81	99	22		
EU27	98	80	99	22	97	81	99	22		

Ra household contact rate
Rh household interview response rate
Rp within household personal interview response rate
NRh overall household interview non-response rate
*NRp overall individual interview non-response rate
(1) Germany: A part is based on quota sampling - 50% in 2006 reduced to 25% in 2007; response rate is based only on the 'random' part.

The preceding table compares the cross-sectional response rates in 2007 with the preceding year 2006. There have been some significant improvements (e.g., Czech Republic, Austria, Spain), but also some worsening of response rates (Hungary, Portugal, Malta).

Substitution

It is not the normal practice in EU-SILC to permit substitution for sample cases which cannot be enumerated successfully.

However, three countries have reported the use of substitution in the quality reports: Ireland, Spain and Portugal. Information has not been provided on the percentage of cases substituted, except in the case of Spain (35%). Two basic items of information about the substitution procedure are as follows.

	Ireland	Spain	Portugal
Source of substitute units (substitute chosen from the same…)	Block	PSU	Master Sample area
Characteristics controlled in substitutions	NUTS2	PSU	n/a

Some further details provided in the national intermediate quality reports 2007 are noted below.

Ireland

> "The second sampling stage involved the random selection of four independent samples of one original and three substitute households for each survey area. […] The original sample household constituted the quota of co-operating households to be realised in each survey area and the interviewers systematically approached as many substitute households as was necessary to realise their quotas. In this fashion, variations in response by region and town size were controlled.".

Spain

> "The new sample is made of 4,006 households. 1,601 of them were failed to contact and 1,408 of these 1,601 were substituted. Finally, the percentage of substituted households in the sample is 1,408/4,006 = 35%. […] In the new sub-sample, in each section, besides the eight addresses selected originally, a further eight were selected in the section as substitutes in case any problem arose with the addresses chosen originally. Hence the common variable of an address selected originally and its prospective substitute is the census section. There is not other common variable. There have been multiple substitutions in the sense that further substitutions (until the list of eight substitutes is completely used) have been made for failed substitutions". Concerning main characteristics of substituted units compared to the original units, only limited information is available. There are some variables that have been collected using a short questionnaire in field when an original unit has not been accepted, but the non-response rate [among such units] has been very high.

Portugal

> "In each area of the new panel a set of 3 dwellings were selected to substitute the original ones whenever the interviewer was not able to get a response after implementing every perseverance procedure. Dwellings corresponding to secondary residences, vacant, demolished or used for non residential purposes are not

substituted. The substitutes are shown in a sequential way per area. The interviewer selects substitutes using this order or sequence."

Item non-response

Item non-response is the intermediate category between 'errors in measurement' and 'errors in estimation' as defined above. Like other measurement errors, item non-response is subject-matter specific – it occurs to different degrees in different types of questions. At the same time, item non-response is simply additive to the unit non-response in any analysis involving the item concerned. The two together constitute the total non-response level for the item.

As regard to the item non-response, particular attention needs to be paid to the income variables. Missing income data have been dealt by imputation, filling in nearly all missing values by imputed ones. It has to be kept in mind that imputed values are not values actually observed, but are based on some models and assumptions, though trying to make the best use of available data. Imputation can have a significant effect on the overall accuracy; furthermore, variance estimates assuming that imputed values are exact ones will generally be biased.

As noted in the Commission Regulation, it is very important to keep tracks, for each income component collected, of the percentage of household/persons having received an amount, percentage of household/persons with missing values (before imputation) and the percentage of household/persons with partial information (before imputation).

The impact of imputation on the EU-SILC data is difficult to assess, though some useful information has been provided in the 'imputation flags' which have been constructed for each income variable.

Information on item-non-response in national intermediate quality reports

Next table ("Information on item non-response in national intermediate quality reports 2007") summarises the availability of information in national intermediate quality reports. Some further details are provided in the comments below.

From 2007 all income components are reported gross, irrespective of whether they are collected net or gross. Some countries report only gross components, others report net and gross at least for some components.

In some 'register' countries, all income information is obtained from registers, and there is no item non-response by definition, for example as noted in Sweden: "All components necessary to derive Gross total income, disposable income etc. is collected from administrative registers. No imputations have been applied for these indictors". Similarly in Denmark: "Information about income is taken from a register. Against this background, Denmark has no item non-response for income variables". In relation to non-response in other item, the quality report notes that "item non-response is generally very low between 0 and 2 pct. The most striking exception is HS130: Lowest monthly income to make ends meet, where it is 14%"

In some other register countries, some small components may come from other sources, and hence subject to item non-response. Total disposable income variables are usually constructed from collected net components or constructed from gross amounts using micro-simulation. In Finland, for example, the total household income variables HY010 and HY020 have been constructed from gross amounts by gross/net conversion of gross income components on the basis of taxation register data (imputing).

Table 6: Information on item-non-response in national intermediate quality reports 2007

	3.5.1	3.5.1.1	3.5.1.2	3.5.1.3	3.5.1.4	3.5.1.5	3.5.1.6	3.5.1.7	3.5.1.8	3.5.1.9
BE		Y	Y	Y	Y	Y	Y	Y	Y	N
CZ		Y	Y	Y	Y	Y	Y	Y	Y	N
DE		X	X	X	X	Y	N	Y	N	N
DK	C	Na	Na	Na	Na	Na	Na	Na	Na	Na
EE		N	N	N	N	N	N	N	N	N
IE		Y	Y	Y	Y	Y	Y	Y	Y	N
EL		N	Y	Y	Y	N	Y	N	Y	N
ES		N	Y	Y	Y	N	Y	N	Y	N
FR		Na	Y	Y	Y	Na	Y	Na	Y	N
IT	C	Na	Y	Y	Y	Na	Y	Na	Y	N
CY		Y	Y	Y	Y	Y	Na	Y	Na	N
MT		Y	Y	Y	Y	Y	N	Y	N	N
HU		Y	Y	Y	Y	Y	Na	Y	Na	N
LV		Y	Y	Y	Y	Y	Y	Y	Y	N
LT		Y	Y	Y	Y	Y	C	Y	C	N
LU		Y	Y	Y	Y	Y	Y	Y	Y	Na
NL		Y	Y	Y	Y	Y	N	Y	N	N
AT		Y	Y	Y	Y	Y	Y	Y	Y	**Y**
PL		Y	Y	Y	Y	Y	Y	Y	Y	N
PT		Na	C	C	C	N	Y	C	Y	N
SI		Y	Y	Y	Y	Y	Y	Y	Y	N
SK		Y	Y	Y	Y	Y	Na	Y	Na	N
FI	C	Y	Y	Y	Y	Y	Na	Y	Na	**Y**
SE	C	Na	Na	Na	Na	Na	Na	Na	Na	Na
UK		Y	Y	Y	Y	Y	Y	Y	Y	N
IS		Y	Y	Y	Y	Na	Na	Na	Na	N
NO		Y	Y	Y	N	Y	Na	Y	Na	N

Source: National Quality Reports 2007.

3.5 Item non-response (1)
3.5.1 Is the breakdown into full, partial and missing provided for:
3.5.1.1 Total household gross income (HY010)
3.5.1.2 Total disposable household income (HY020)
3.5.1.3 Total disposable household income before social transfers other than old-age and survivors' benefits (HY022)
3.5.1.4 Total disposable household income before all social transfers including old-age and survivors' benefits (HY023)
3.5.1.5 Gross income components at household level
3.5.1.6 Net income components at household level
3.5.1.7 Gross income components at personal level

3.5.1.8 Net income components at personal level
3.5.1.9 Whether the figures are given by rotation group

Y Yes
N No
X Table empty
Na Not applicable (i.e., only gross or only net component collected)
C See comments in the text

In a number of countries, such as Italy, "all income variables at component level are net of taxes and social security contribution at source". Unlike in previous years, total and components are always constructed gross irrespective of the mode of collection. Concerning total net income variables, it is observed in the Portuguese quality report that: "Item non-response is not available for Total disposable income (HY020), Total disposable income before social transfers other than old-age and survivors' benefits (HY022) and Total disposable income before all social transfers (HY023), because it corresponds to the sum of various components (the great majority of them corresponding themselves to the sum of various questions) independently of item non-response pattern. […] [Concerning] gross income components at personal level: only PY021 (non-cash employee income) is given gross".

In some countries, some income components are collected gross, while others as net or as both net and gross. For instance in Lithuania, concerning net household level components: "Employee cash and near-cash income (PY010), self-employment income (PY050), unemployment benefits (PY090), family/children related allowances (HY050), interest, dividends, profit from capital investments (HY090), income received by people aged under 16 (HY110) were collected in net and/or gross. The remaining variables were collected only in gross"; while concerning net personal level components: "Employee cash and near-cash income (PY010), self-employment income (PY050), unemployment benefits (PY090), family/children related allowances (HY050), interest, dividends, profit from capital investments (HY090), income received by people aged under 16 (HY110) were collected in net and/or gross. The remaining variables are not taxed, i.e. gross equals net."

Form of collection and recoding of income components

Income components need to be recorded in the gross form. In situations where they are collected as net, these amounts need to be converted into gross. This is normally done on the basis of some micro-simulation procedure. Micro-simulation has similarity to imputation in that both involve some form of modelling whether explicit or implicit (Micro-simulation tends to be more dependent on external data and relationships, while imputation often depends more on relationships between variables observed in the dataset itself).

Hence the extent of net-gross conversion involved should also be noted in the context of discussion on item non-response.

The following table ("Mode of data collection and recording of self-employment income") shows the form of collection and recording of one important income component, namely self-employment income. The table has three panels. The first panel shows the percentage of individuals receiving self-employment income, missing cases (where it could not be imputed and/or converted to gross amount), and the number receiving and recording the amount. This recording is always in the gross form. The last column of this panel shows the number of cases where the net amount (in some form) has also been recorded.

The second panel of the table shows the distribution of income recorded gross according to the form in which the amount was collected. This indicates the extent and form of net-gross conversion, normally involving micro-simulation.

The third panel shows the form of collection where the net amount has also been recorded. In fact, the net recording can also be in different forms, and this information is also provided in this part of the table.

Table 7: Mode of collection and recording of self-employment income

Cross-sectional sample 2007							Received, and recorded gross						Also net recorded					
							Mode of collection (PY050g_F)(all income recorded gross)						Mode of collection and recording of this income (PY050n_F					
	total persons	not receiving	not stated	received & recorded	%	also net recorded	total	1	2	3	4	5	total	11	22	31	33	41
AT	13,391	12,094		1,297	9.7	1,297	1,297				1,297		1,297	1,297				
BE	12,322	11,554		768	6.2	768	768	1			767		768	767				1
CY	8,470	7,510		960	11.3	4	960				960		4	4				
CZ	19,384	17,914	36	1,434	7.6		1,434	271			1,163							
DE	26,291	24,698		1,593	6.1		1,593				1,593							
DK	11,610	8,921		2,689	23.2		2,689				2,689							
EE	11,971	11,163		808	6.7	808	808	263			522	23	808	263				522
ES	28,656	26,529		2,127	7.4	2,127	2,127				2,127		2,127	2,127				
FI	21,773	17,140		4,633	21.3		4,633				4,633							
FR	20,357	19,477		880	4.3	880	880			880			880				880	
GR	12,346	9,935		2,411	19.5	2,078	2,411	2,411					2,078	2,078				
HU	18,490	16,610		1,880	10.2		1,880			2	1,878							
IE	10,892	9,760		1,132	10.4	1,132	1,132				1,132		1,132	153				979
IS	6,567	5,854		713	10.9		713				713							
IT	44,629	37,210		7,419	16.6	7,419	7,419	7,419					7,419	7,419				
LT	10,913	9,881		1,032	9.5	1,032	1,032	259			768	5	1,032	259				768
LU	7,913	7,520		393	5.0	384	393				393		384	384				
LV	9,270	8,869		401	4.3	401	401	401					401	401				
NL	19,623	17,745		1,878	9.6		1,878				1,878							
NO	11,706	10,396	109	1,201	11.2		1,201				1,201							
PL	34,888	31,199		3,689	10.6	3,109	3,689	3,689					3,109	3,109				
PT	9,947	8,917		1,030	10.4	1,030	1,030	650	198		141	41	1,030	650	198			52
SE	14,204	12,294		1,910	13.4	1,910	1,910			1,910			1,910			1,910		
SI	24,730	20,828		3,902	15.8	3,902	3,902				3,902		3,902	3,902				
SK	12,573	11,952		621	4.9		621				621							
UK	17,484	16,212		1,272	7.3		1,272				1,272							

PY050g_f

Collected (always recorded gross)

1 net of tax on income at source and social contributions
2 net of tax on income at source
3 net of tax on social contributions
4 gross
5 unknown

PY050n_f

Collected (1st digit)

1 net of tax on income at source and social contributions
2 net of tax on income at source
3 net of tax on social contributions
4 gross
5 unknown

Recorded (2nd digit)

1 net of tax on income at source and s
2 net of tax on income at source
3 net of tax on social contributions

Data collection errors

Now we consider the specific category 'measurement errors' relating to the process of data collection. Such errors occur when the response provided differs from the real (unknown) value. These errors originate from various sources:

- the questionnaire (effects of the design, content and wording)
- the data collection method (effects of the modes of interviewing)
- the interviewer (effects of the interviewer on the response to a question, including errors of the interviewer)
- the respondents (effects of the respondent on the interpretation of items)

As already noted such errors may be random or they may result in a systematic bias if they are not random. The occurrence of these errors and their effects is almost unavoidable; however, each country can implement various methods and procedures to reduce such errors.

As regard to the original questionnaire, the basis is provided by the EU-SILC regulations and the EU-SILC doc 65 *Description of Target Variables: Cross-sectional and Longitudinal*. Experience from pilot surveys and/or former EU-SILC waves have been used to identify potential sources of problems, such as concerning questionnaire content and wording. In so far as these procedures have now become established, less emphasis is given to the detailed reporting of these aspects in the national quality reports of subsequent years.

For instance, concerning the questionnaire design and testing, the national Quality Report of Greece recodes that "the questionnaires for the 2007 survey were the same as those of 2004-2006 survey, except for some small changes in the wording. The major changes concern on additional questions using in the net/gross/net conversion model […]".

Concerning the data collection method, it is expected that computer-assisted interviewing (CAPI or CATI) is useful for reducing measurement problems and facilitating data collection. Another advantage of computer-assisted interviewing is that most of the processing errors (inconsistencies and incompatibilities within a household or within an interview) can be identified and corrected during the interview.

To reduce interviewer effects it remains necessary to provide the interviewers with sufficient training and support measures. These training measures help to ensure that all respondents are interviewed under similar conditions as far as possible.

The respondent error tends to increase by proxy responses. This kind of interviewing can result in biased responses, because the proxy generally takes place in the case of selective categories of persons, for example people in employment or self-employment which are less accessible than retired or unemployed persons. That problem can become much more serious in a complex survey like EU-SILC, with complex content. For instance, EU-SILC collects non-monetary income components (e.g., income from private use of company car…) which are difficult to report by proxy. The same applies of course to subjective and personal questions.

Quality control studies (re-interview, record check studies…)

Special quality-control or evaluation studies were undertaken in a few countries. Here are some examples as reported in national quality reports.

Hungary

> "After the fieldwork the inspectors called 5% of the households asked about the interviewer (whether the interviewer visited the households, was he/she polite, etc.)".

Poland

> "After the household and individual interview completion the respondents were obliged to answer a few questions concerning interview performance. On the basis of this material it is possible to state that about three quarters of respondents (80% of those filling in the household questionnaire and 78% of those filling in the individual questionnaire) showed a favourable attitude towards the survey, while about 3% (both in the case of the household and individual interview) were unwilling towards it. In the interviewers' opinion, in about 89% of questionnaires (both household and individual ones) the quality of non-income data collected could be recognised as good or very good and in 1% - as doubtful. The quality of income data was evaluated as slightly worse, mainly because of item non-response. It should also be pointed out that, in our opinion, the quality of data concerning net income categories is much higher than in the case of gross income. The reason is that non-response to the highest degree affected the information on taxes and social and health insurance contributions".

Portugal

> "A questionnaire to evaluate the interviewers' performance was applied by telephone to a sample of 10% respondent households (528 households). Some households refused to co-operate in a new interview, but nevertheless it was achieved a sample of 319 households. Opinion on interviewers' general behaviour and clarity in explanations was good for the majority of these 319 contacted households".

Processing errors

For countries adopting the CAPI/CATI methods of interviewing, the processing errors due to data entry (from a written to an electronic format) are expected to be minimised.

Checking of data quality is an important part of the post-data-collection editing process. Basic principles of this process are standardisation and transparency, in which all relevant tasks are included in a predefined process and data editing rules are generalized for subgroups to avoid single-case solutions. Transparency of changes made to data has to be ensured by documentation such as program code, copies of data files at various stages, flag variables for the identification of the form of information recorded in the substantive variables, and written documentations and descriptions of all the operations.

The information available on records of processing procedures and errors in national quality reports is limited. Nevertheless, in over half the country reports some examples are provided, as the following on whether the main processing errors have been listed.

Slovenia

> "The questionnaire was programmed in Blaise. Data entry controls were built into the electronic questionnaire, and there was less need for post data control. Control of data in the programme was done in various ways. All numeric variables had absolute limits for data entry. We had a lot of syntax checks, one of them were signals (soft errors) which gave a warning to the interviewers if the answer was either unlikely because it was extreme or because it did not correspond to answer given to questions asked earlier. These signals could be overridden if the answer in question was confirmed. And similar hard errors that were impossible to override. We also had a lot of logical checks". The national quality report gives a number of specific examples of syntax checks and logical checks.

By contrast, little quantitative information is available on indicators such as rates of failed edits for income variables.

1.3. Mode of data collection

Information can be extracted either from registers or collected from interviews. For the interview, there are four different ways to collect the data: Paper-Assisted Personal Interview (PAPI), Computer-Assisted Personal Interview (CAPI), Computer-Assisted Telephone Interview (CATI), Self-administrated questionnaire.

The following table presents the different modes of data collection used by the countries for the 2007 operation[5].

Table 8: Mode of data collection (Cross-sectional 2007)

	PAPI	CAPI	CATI	Self-administered
Belgium	0	100	0	0
Czech Republic	99.7	0	0	0.3
Denmark	0	0	94.2	5.8
Germany	0	0	0	100
Estonia	2.2	97.6	0.2	0
Ireland	0	100	0	0
Greece	80.8	14.9	2.1	2.3
Spain	0	92.9	7.1	0
France	0	100	0	0
Italy	100	0	0	0
Cyprus	0	100	0	0
Latvia	11.3	81.2	7.5	0.1

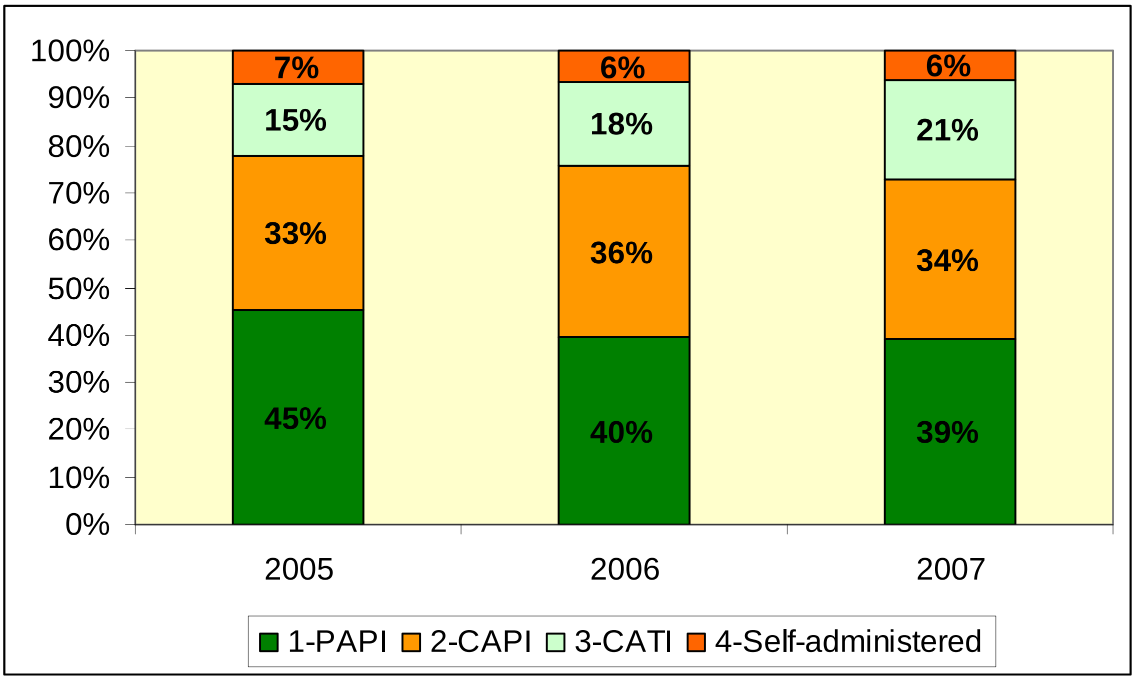
5 Figures are obtained adding up the number of interviews carried out by each mode of data collection by each country and dividing it by the total of interviews carried out in each country. The countries are the EU-27 countries except Bulgaria and Romania plus Iceland and Norway. Detailed percentages for each mode of data collection by country for the 2007 operation can be found in the annex.

	PAPI	CAPI	CATI	Self-administered
Lithuania	95.3	0	3.8	0.9
Luxembourg	100	0	0	0
Hungary	100	0	0	0
Malta	0	100	0	0
The Netherlands	0	0	100	0
Austria	0	94	6	0
Poland	100	0	0	0
Portugal	8	92	0	0
Slovenia	0	44.5	55.5	0
Slovakia	99.4	0	0	0.7
Finland	0	3.4	96.6	0
Sweden	0	0	100	0
United Kingdom	0	100	0	0
Iceland	0	0	100	0
Norway	0	0.6	99.4	0

Source: Micro-database (April 2009).

The evolution in the mode of data collection from 2005 to 2007 (cross-sectional) is showed in the following graph:

Figure 5: Mode of data collection (Cross-sectional 2005-2007)



Source: Micro-database (April 2009).

We can see that over the years the paper assisted interviews had lost weight against the computer assisted ones.

Proxy interviewing is permitted if the proxy rate is kept as limited as possible. Some countries that encountered rather high non-response rates chose to use proxies to ensure a certain degree of accuracy in their data. For instance, in countries that use the selected respondent type of survey, the household respondent (in most cases selected respondent) is asked for information about all household members, therefore, these countries have a high percentage of proxy interviews concerning personal interviews.

The table below presents the percentage of proxies in 2005, 2006 and 2007 (cross-sectional) and the evolution from 2005 to 2007; the last column shows if in 2007 the percentage of proxy interviews has increased in comparison to 2005. Countries are sorted from the lower to the higher percentages of proxies in 2007.

Table 9: Percentage of proxy interviews (cross-sectional)

	2005	2006	2007	2005 ⟶ 2007
Iceland	0%	0%	0%	=
Sweden	3%	4%	4%	↗
The Netherlands	40%	43%	5%	↘
Latvia	6%	7%	5%	↘
Greece	5%	4%	6%	↗
Slovakia	6%	6%	6%	↗
Czech Republic	9%	8%	9%	↘
United Kingdom	11%	10%	9%	↘
Estonia	5%	6%	11%	↗
Belgium	14%	14%	14%	↘
Portugal	14%	14%	16%	↗
Italy	16%	15%	16%	↗
Poland	19%	19%	17%	↘
Cyprus	13%	13%	17%	↗
Austria	25%	20%	20%	↘
Hungary	10%	13%	20%	↗
Lithuania	14%	16%	20%	↗
Germany	12%	21%	21%	↗
Luxembourg	23%	25%	23%	↗
Slovenia	24%	27%	27%	↗
Norway	28%	30%	27%	↘
France	27%	27%	28%	↗
Ireland	31%	33%	31%	↘
Malta	29%	33%	32%	↗
Spain	40%	41%	42%	↗
Finland[6]	51%	51%	44%	↘
Denmark	49%	49%	49%	↗

Source: Micro-database (April 2009).

[6] Proxy respondents % of selected persons in Finland: 2005: 25%; 2006: 21%; 2007: 22%.

1.4. Interview duration

The EU-SILC Framework Regulation states that the total duration of the interview shall not exceed one hour on average. The following table presents the mean interview duration in minutes calculated as the sum of the duration of all household interviews (HB100) plus the sum of the duration of all personal interviews (PB120), divided by the number of household members aged 16 and over whose household questionnaire is completed and accepted for the database (PB030)[7].

Table 10: Average interview duration per individual (cross-sectional)

	2005	2006	2007	2005 ⟶ 2007
Belgium	27	27	23	↘
Bulgaria	Missing	38	33	.
Czech Republic	45	43	41	↘
Germany	54	46	47	↘
Estonia	25	22	21	↘
Ireland	19	21	22	↗
Greece	28	27	27	↘
Spain	26	19	15	↘
France	28	28	27	↘
Italy	32	33	34	↗
Cyprus	17	18	23	↗
Latvia	29	19	36	↗
Lithuania	25	29	28	↗
Luxembourg	26	25	30	↗
Hungary	24	32	32	↗
Malta	17	15	16	↘
The Netherlands	10	10	11	↗
Austria	18	24	18	=
Poland	41	40	38	↘
Portugal	28	29	28	=
Romania	Missing	Missing	33	.
Slovenia	16	28	38	↗
Slovakia	32	32	29	↘
Sweden	Missing	28	27	.
United Kingdom	34	60	54	↗
Iceland	Missing	Missing	21	.
Norway	10	11	29	↗
Denmark	No information on individual interview duration			

[7] If the household interview duration (HB100) or one personal interview duration (PB120) is missing for one member of the household, then the household is excluded from the calculation.

	2005	2006	2007	2005 ⟶ 2007
Finland	No information on individual interview duration			

Source: Micro-database (April 2009).

In the case of United Kingdom, EU-SILC questions are included as part of the General Household Survey questionnaire and there is no information on the interview duration of EU-SILC alone.

2. COMPARABILITY

Comparability is a critical aspect of EU SILC and non-comparability may come from National Statistical Offices choices within the framework. In addition to the information in the national quality reports, some countries have carried out comparability studies.

Spain

One of the aims of the survey is to provide gross income figures broken down into components. Since respondents are often unaware of their gross income, INE (Instituto Nacional de Estadística) had to build a model to convert net figures to gross for the various components.

So far INE has worked, in terms of net to gross conversion, on:

- present monthly wages (years 2004 and 2005);
- all income components (2005).

The methodology used can be checked against a wide range of records, because a percentage of respondents (particularly high for current wages) state both gross and net wages (in the 2005 survey, around 55% of employees stated net and gross figures); therefore the gross amount produced by the model can be compared to the gross amount reported by a respondent.

The procedure to calculate gross pay is based on an iterative method which uses the net pay figures reported by respondents to produce the gross figures where these are left blank in the original questionnaire. INE starts with an initial gross amount G_0 constructed by increasing the stated net amount N by a given percentage (20%). Based on the initial gross amount G_0, INE uses the available information to estimate social security contributions (or equivalent items) and income tax deducted at source, if any, thus obtaining the associated net amount N_0, which generally differs from N. G_0 is modified in proportion to the difference between N and N_0 to obtain G_1. The process is repeated to calculate the associated net amount N_1. The previous step is repeated successively until gross values G are obtained giving net amounts ever closer to N. If the amounts converge, a halting criterion is applied (number of iterations) to obtain the final amount G. In case there are no social contributions or tax withholding at source, and the way to calculate gross from net is applying flat rate conversions, no iterations are needed, since gross is assigned at first step.

Eurostat has drawn up several methodological reports that aim to achieve this goal in a general way, and can be applied to any fiscal system.

The requirements of EU-SILC have led to the development of the Siena Micro-Simulation Model (SM2). Spain has planned to work on this model in order to assess differences with the own model provided. All the improvements that SM2 model can add to our model, will be very important, since the main target is to find the most appropriate algorithm that converts net components to gross.

In order to assess both models, there are certain tests that INE should follow, such as setting up some tables with essential information:

For every income component, INE will focus on:

- Proportion of declared and estimated gross figures;
- Mean rate on declared and estimated gross amounts, by income brackets;
- Income average on declared and estimated gross amounts, by income brackets;
- Income average on declared and estimated gross amounts, by tax region;
- Income average on declared and estimated gross amounts, by Social Security contribution groups; etc.

INE also expects to be able to count on data from Tax Authorities in the short term.

Austria

Two key issues of comparability and quality are subject of this action:

(1) the survey method CATI

(2) imputed rent

The respective studies aim to measure the impact of methodological choices on comparability and quality in EU-SILC in Austria. Both topics are of uttermost relevance from EU-SILC 2007 on and thus have to be analysed in detail.

Finland

The cross-sectional EU-SILC survey of Finland is conducted together with the Finnish Income Distribution Survey, and most of the income information those surveys use is obtained from the registers. In addition the Total Statistics on Income Distribution, which covers the whole population, provides the exact parameter values for many essential income indicators. Some different definitions limit the comparability of the total statistics and the survey. The estimation of the Finnish EU-SILC is based on the effect of the sampling design and especially the calibration, which includes both many demographic variables as well as several income variables from the registers available at the time the weights are calculated. However, regarding especially the indicators of poverty (e.g. at risk poverty threshold) the studies of Eurostat (standard error calculations) and Statistics Finland (some bootstrap standard error calculations) show that the efficiency of the calibration is not at the best level. It clearly seems that most of the register totals used in calibration serves mainly the estimation of the indicators of income levels and dispersion.

The level of using calibration in the EU-SILC varies from one country to another. Because of lacking sufficient register information, many countries have to use (in addition to some demographic variables) only few estimates of essential statistics in calibration. On the other hand, some countries have a lot of calibration constraints in estimation, and e.g. Denmark has included also some poverty measures into the calibration process (e.g. poverty index for the dwelling unit). The exceptional situation of Finland (having some variable values for the whole population via registers) enables a specific test situation, where different calibration strategies can be tested and evaluated considering both the bias and the standard error of some estimators. The test can be extended to some subpopulations as well. The Finnish cross-sectional SILC data 2005 of respondents includes 11 229 households together with 29 112 persons in them. Correspondingly, the register information for the population excluding the people in institutions consists of over 5 million persons. The testing process includes the following phases:

(1) Choosing different calibration strategies for testing (no calibration, calibrating with demographic variables and in addition 3 - 4 calibrations of different level (simple estimates of statistics, possibly more advanced approach, the Finnish version, the Danish version). An essential part of this process is to plan the selection of such income variables which are applied in some EU-SILC countries. Adjusting the strategies to the Finnish data and sampling design situation.

(2) Preparation of the Finnish SILC 2005 data for the tests.

(3) Obtaining the necessary register information and preparing it to the tests.

(4) Adjusting the existing weighting programs and the Eurostat indicator programs into the test situation.

(5) Adjusting the current variance estimation programs (including the Eurostat linearization programs and the Finnish bootstrap application) to the test situation.

(6) Creating the set of programs for carrying out the tests.

(7) Calibrating according to the chosen strategies and calculating the estimates of indicators at the general and the subpopulation levels.

(8) Evaluating the strategies by calculating the standard errors for the estimators. Carrying out some bias studies with the total statistics.

(9) Comparing the sampling strategies in the framework of the Finnish EU-SILC. Analysing the results with conclusions.

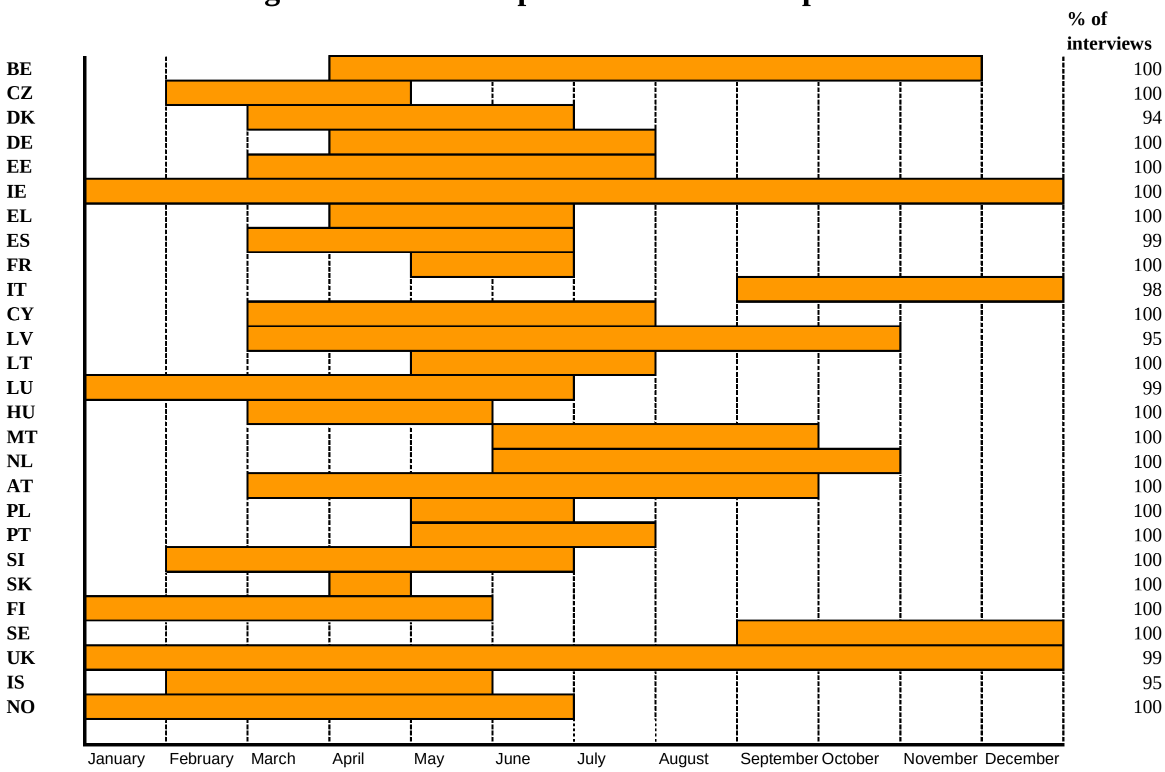
2.1. Basic concepts and definitions

Two summary tables on different aspects that can hamper comparability can be found in the annex. A first table covers the adherence/deviation to the standard definition on the reference population, the private household and the household membership[8]. A second table presents the reference period for income, for taxes on income and social insurance contributions and for taxes on wealth.

The fieldwork in most of the countries lasted between three and five months. The exceptions are three countries with shorter fieldwork duration (Slovakia, France and Poland) and seven countries with a larger duration (Luxembourg, Norway, Austria, Belgium, Latvia, Ireland and United Kingdom).

The following chart summarizes the fieldwork period by country; figures correspond to the information on the month of the household interview (HB050).

Figure 6: Fieldwork period for the 2007 operation



Source: Micro-database (April 2009).

Notes to the figure: (1) Last column presents the percentage of interviews that were carried out in the months presented in this graph by country. (2) In some countries there is information missing on the month of the interview: almost 6% in Denmark, 1.4% in Italy, 4.3% in Latvia, and 4.1% in Iceland. In addition, Ireland and United Kingdom carried out surveys in other years; in November and December 2006 in Ireland and in January and February 2008 in United Kingdom.

It can be concluded that most of the countries finished the fieldwork period by July, with nine exceptions: Belgium, Italy, Latvia, Malta, The Netherlands, Austria and Sweden

[8] The information presented in this table will be reviewed, if applicable, according to the answers received via the ongoing written consultation on this topic.

plus the two countries with a continuous survey, Ireland and United Kingdom. A summary figure on the evolution of the fieldwork period by country from 2005 to 2007 can be found in the annex.

2.2. Components of income

This section focuses on the new income components from 2007. An overview of income components by country can be found in the annex in two tables, one on household income components and one on personal income components.

Information on the non-monetary income components is presented for information and discussion in the Working Group meeting under the item 4.6.4 Impact study of inclusion/exclusion of non-monetary income components and extreme values (see document LC-ILC/33/09/EN). After receiving comments and agreement from the Working Group Delegates, this information will be included in this section of the document.

3. COHERENCE

Coherence is a critical aspect of EU SILC and non-comparability may come from National Statistical Offices choices within the framework. Some countries have carried out coherence studies:

Bulgaria

> The objective is to study the impact on data comparability and reliability of the national characteristics and limitations of the EU- SILC project implementation. The environment of economy in transition will be analyzed in view of assessing the quality of the main variables of the EU-SILC project.
>
> The study focuses on the assessment of relevance, accuracy, coherence and comparability of SILC income data. The impact of conceptual and measurement issues on poverty indicators are assessed and analyzed.
>
> Comparisons of SILC results with those from other sources are done.
>
> Emphasis is placed on all forms of income data.

Greece

- The conditions under which data from two different sources of statistical information are comparable are analysed.
- Factor analysis of correspondence and multiple analysis correspondence applying on data from: EU-SILC 2005 and Household Budget Survey 2004/2005.
- Comparison of the profiles of data from these above different sources.

- Depiction in the surface of the income structure of total population by: section, sex and age groups.

- Comparison and analysis of the income structures of the two sources of statistical information.

- Comparisons of wage and salaries from EU-SILC 2005 with the corresponding data from the HBS 2004/05 data applying t-tests.

- Comparison of social family benefits with administrative and HBS data (social budget).

- Comparison of poverty indicators using the two sources.

Slovakia

The aim is to create a source basis for providing of data on level and composition of poverty and social exclusion on national level. Harmonization is ensured by providing common definitions accompanied by a series of guidelines and recommendations for implementing EU-SILC framework.

The study aim to measure the impact of methodological choices made in the implementation that could increase comparability or quality with respect to EU recommendations.

The study is oriented on analysis and comparison of EU-SILC data and external administrative sources (A part) and analysis and comparison of EU-SILC data with data from other statistical sources (B part). Data from EU SILC 2005 and EU SILC 2006 are used as inputs for evaluation and for comparison.

Part A is oriented on comparison of selected income variables (cash benefits or losses from self-employment, benefits - unemployment, old-age, survivor, sickness, disability, social exclusion not elsewhere classified and others). Part B is oriented on comparison of EU-SILC data with selected results of Households Budget Surveys, National Accounts, ESSPROS and Labour Force Survey (for example inter-household transfer, imputed rent, areas of labour information…). The aim of the study is to extract selected variables from these statistical surveys and sources for the purpose of comparison with EU-SILC data and to evaluate the quality of EU-SILC data and to determine deviation.

4. ANNEXES

Annex 1: EU-SILC countries

Figure 7: EU-SILC countries per year

	2003	2004	2005	2006	2007
Belgium	(✕)	√	√	√	√
Bulgaria					√
Czech Republic			√	√	√
Denmark	(✕)	√	√	√	√
Germany			√	√	√
Estonia		√	√	√	√
Ireland	(✕)	√	√	√	√
Greece	√	√	√	√	√
Spain		√	√	√	√
France		√	√	√	√
Italy		√	√	√	√
Cyprus			√	√	√
Latvia			√	√	√
Lithuania			√	√	√
Luxembourg	√	√	√	√	√
Hungary			√	√	√
Malta			√	√	√
The Netherlands			√	√	√
Austria	(✕)	√	√	√	√
Poland			√	√	√
Portugal		√	√	√	√
Romania					√
Slovenia			√	√	√
Slovakia			√	√	√
Finland		√	√	√	√
Sweden		√	√	√	√
United Kingdom			√	√	√
Switzerland					√
Iceland		√	√	√	√
Norway	√	√	√	√	√
Turkey					√

(✕) Collected variables not in full accordance with SILC Framework Regulation

Annex 2: Basic concepts and reference periods

Table 11: Basic concepts and definitions: are the standard EU-SILC definitions used? (2007)

	Reference population	Private household definition	Household membership
Belgium	F	F	F
Czech Republic	F	F	F
Denmark	F	F	F
Germany	F	F	F
Estonia	F	F	F
Ireland	F	F	F
Greece	F	F	F
Spain	F	F	L
France	F	F	F
Italy	F	L	L
Cyprus	F	F	F
Latvia	F	F	F
Lithuania	F	F	F
Luxembourg	F	F	F
Hungary	F	F	F
Malta	F	F	F
The Netherlands	F	F	F
Austria	F	L	L
Poland	F	F	F
Portugal	F	F	L
Slovenia	F	F	F
Slovakia	F	F	F
Finland	F	F	F
Sweden	F	F	F
United Kingdom	F	L	L
Iceland	F	F	F
Norway	F	F	F

Source: National Quality Reports 2006.
F (fully comparable); L (largely comparable); P (partly comparable); N (not comparable).

Deviation from the standard definition of private household

- Italy: Cohabitants related through marriage, kinship, affinity, patronage and affection constitute the private household.

- Austria: Private households were generally defined as a person living alone or a group of persons living in the same dwelling. All persons at the dwelling form the household as shared expenses were assumed.

- United Kingdom: A household is defined as a single person or a group of people who have the address as their only or main residence and who either share one meal a day or share the living accommodation. A group of people is not counted as a household solely on the basis of a shared kitchen or bathroom.

Deviation from the standard definition of household membership

- Spain: The quality report provides comparative tables to illustrate the differences between the national and the standard definitions of household membership. In short, the following persons, provided they share the expenses of the household and intend to stay at least 6 months, are not considered as household members in the Spanish SILC (but should be under the EU standard definition) so long as they have another address which they regard as their usual residence: resident boarders, lodgers, tenants, visitors or domestic servants (live-in domestic employees, au-pair).

- Italy: Live-in domestic personal (au pairs) are not included as household members. Concerning these persons, only some socio-demographic information is collected (date of birth, sex, marital status, and duration of stay in the household). The number of these persons included in the sample was 35 (0.1% with respect to the total number of households and 0.06% w.r.t. interviewed individuals).

- Austria: Household membership is described as follows: 1. All Persons who are actually living in the dwelling unit. The question whether these residents have their main residence in this particular dwelling, is not relevant. 2. Lodgers, visitors, au-pairs and guests are considered members of the household if they stay or intend to stay 6 months or more in the household, or if they do not have any other home address. 3. Persons who are temporarily away for less than 6 month and are not members of other private households. 4. Household members who are absent for 6 months or more who are not members of other private households and/or are children or partners of actual household members.

- Portugal: Contrary to the EU-SILC concept, persons absent for long periods, but having household ties (persons working away from home) are not considered as household members if the absence is for more than 6 months (the income obtained from them is considered as a private transfer).

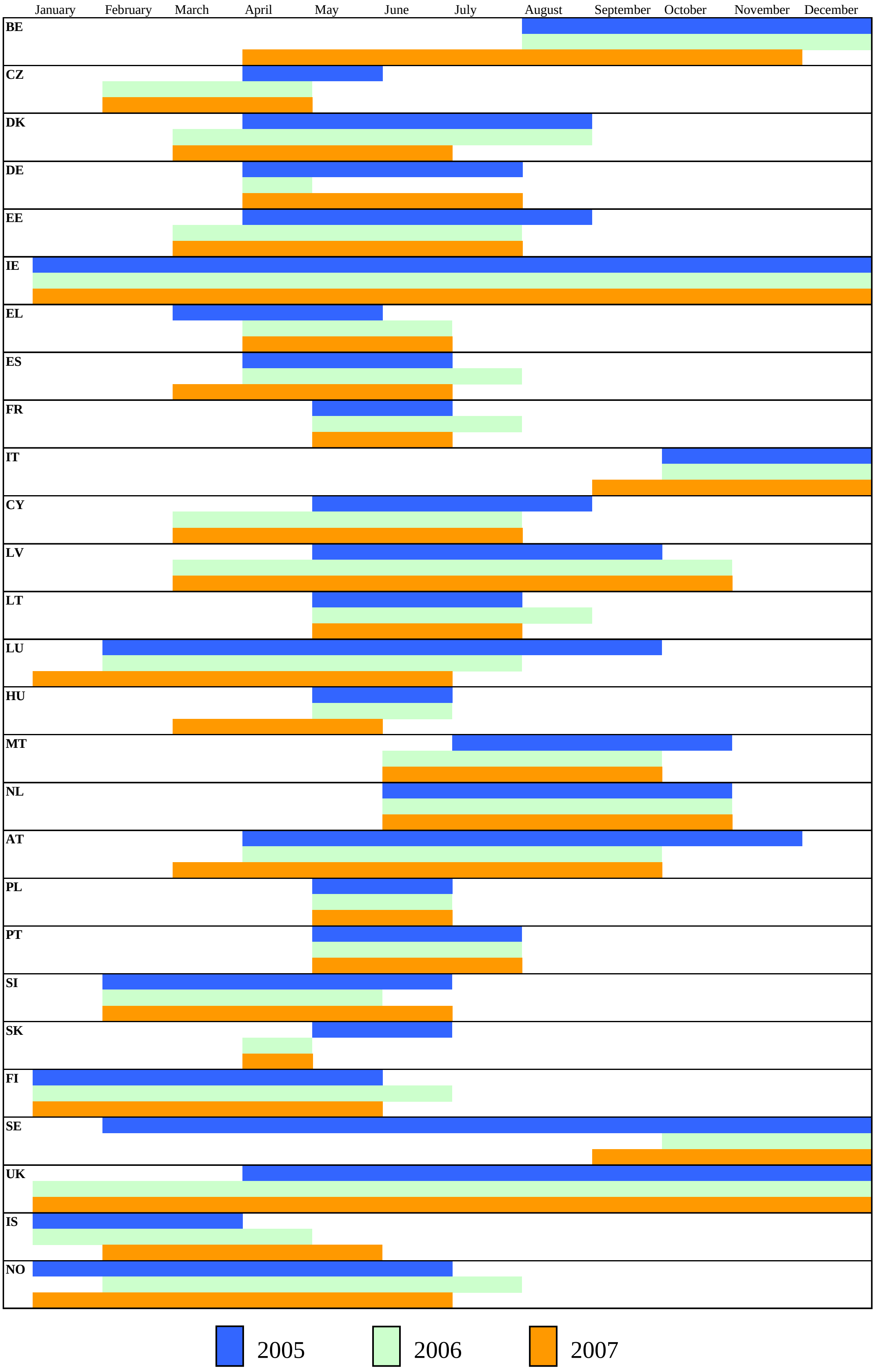
- United Kingdom: A person is in general regarded as living at an address if he or she (or the informant) considers the address to be his or her main residence. There are however, certain rules which take precedent over this criterion. Children aged 16 or over who live away from home for the purposes of either work or study and come home only for holidays are not included at the parental address under any circumstances. Children of any age away from the home in a temporary job and children under 16 at boarding school are always included in the parental household. Anyone who has been away from the address continuously for 6 months or longer is excluded. Anyone who has been living continuously at the address for 6 months or longer is included even if she has his or her main residence elsewhere. Addresses used only as second homes are never counted as a main residence.

Table 12: Reference period (2007)

	Income reference period	Reference period for taxes on income and social insurance contributions	Reference period for taxes on wealth
Belgium	2006	2006	NA
Czech Republic	2006	2006	2006
Denmark	2006	2006	2006
Germany	2006	2006	2006
Estonia	2006	2006	2006
Ireland	12 months prior interview date	12 months prior interview date	NA
Greece	2006	2006	2006
Spain	2006	2006	2006
France	2006	2006	01/01/2006
Italy	2006	2006	2006
Cyprus	2006	2006	2006
Latvia	2006	2006	2006
Lithuania	2006	2006	2006
Luxembourg	2006	2006	2006
Hungary	2006	2006	2006
Malta	2006	2006	NA
The Netherlands	2006	2006	NA
Austria	2006	2006	NA
Poland	2006	2006	2006
Portugal	2006	NA	2006
Slovenia	2006	2006	2006
Slovakia	2006	2006	2006
Finland	2006	2006	2006
Sweden	2006	2006	No information
United Kingdom	Centred around interview date	Centred around interview date	Financial years Apr06 - March07 Apr07 - March08
Iceland	2006	2006	2006
Norway	2006	2006	2006

Source: National Quality Reports 2007.
NA (this tax does not exist in the country).

Figure 8: Fieldwork duration by country (2005, 2006 and 2007)



Source: Micro-database (April 2009).

Annex 3: Sampling errors

Sampling errors: the concept

The particular units that happen to be selected into a particular sample depends on chance, the possible outcomes being determined by the procedures specified in the sample design. This means that, even if the required information on every selected unit is obtained entirely without error, the results from the sample are subject to a degree of uncertainty due to these chance factors affecting the selection of units. Sampling variance (sampling error, standard error) is a measure of this uncertainty.

While survey data are subject to errors from diverse sources, information on sampling errors is of crucial importance in proper interpretation of the survey results, and for the purpose of evaluating and improving the sample design, including sample size. The importance of including information on sampling errors in survey reports cannot be over-emphasised.

Of course, sampling error is only one component of the total error in survey estimates, and not always the most important component. By the same token, it is the lower (and the more easily estimated) bound of the total error: *a survey will be useless if this component alone becomes too large for the survey results to add useful information with any measure of confidence to what is already known prior to the survey*.

Furthermore, survey estimates are typically required not only for the whole population but also separately for many subgroups in the population. Generally, the relative magnitude of sampling error compared to that of other types of errors increases as we move from estimates for the total population to estimates for individual subgroups and comparison between subgroups. *Information on the magnitude of sampling errors is therefore essential in deciding the degree of detail with which the survey data may be meaningfully tabulated and analysed*.

Similarly, sampling error information is needed for sample design and evaluation. While the design is also determined by many other considerations (such as costs, availability of sampling frames, the need to control measurement errors), rational decisions on the choice of sample size, allocation, clustering, stratification, estimation procedures etc. can only be made on the basis of detailed knowledge of their effect on the magnitude of sampling errors of statistics obtained from the survey.

The following sections present a series of useful measures of sampling errors, such as standard errors, design effect, effective sample size, intra-cluster correlation, etc. Various practical methods and computer software have been developed for computing sampling errors, and there is no justification in most situations for the continued failure to include information on sampling errors in the presentation of survey results. Then we describe some useful and practical procedures with particular reference to the Jack-knife Repeated Replication (JRR), which is the methodology recommended by Eurostat. It follows a description of the several components of the design effect and how those components can be estimated in practice. The standardisation of the variance computation procedures and the relative SAS programs are described briefly.

Useful measures of sampling errors - some basic concepts

The magnitude of standard error of a statistic depends on a variety of factors such as:

- the nature of the estimate
- its units of measurement (scale) and magnitude
- variability among elements in the population (population variance)
- sample size
- the nature and size of sampling units
- sample structure; sampling procedures
- estimation procedures

Consequently, the value of standard error for a particular statistic is specific to the statistic concerned. To relate standard error of one statistic to that of another, it is necessary to decompose the error into components from which the effect of some of the above factors has been removed; that is, into components which are more stable or 'portable' from one type of statistic or design to another statistic or design. The standard error of a statistic such as a mean is written in the following equations in several forms, in terms of measures which are more portable in the above sense.

<u>Relative standard error, rse</u>

$$se(\bar{y}) = \bar{y}.rse(\bar{y})$$

This refers to standard error of an estimate, divided by the value of the estimate. It removes the effect on standard error of the magnitude and scale of measurement of the estimate, but still depends on other factors such as sample size and design.

<u>Standard error in an equivalent simple random sample (SRS); population variance</u>

Standard error of a statistic estimated from a complex sample can be factorised into two parts:

(1) sr standard error which would have been obtained in a simple random sample of the same size;

(2) deft the design factor, summarising the effect of design complexities.

$$se(\bar{y}) = deft \cdot sr(\bar{y})$$

The second component (*sr*) is independent of the sample design and relates to the sample size in a very simple way:

$$sr(\bar{y}) = s/\sqrt{n}$$

where *s*, standard deviation, is a measure of variability in the population, independent of sample design or size. (Population variance refers to the square of s.) The scale of measurement can also be removed by considering the coefficient of variation, *cv*:

$$s = \bar{y} \cdot cv$$

Standard deviation and the coefficient of variation are useful and highly portable measures. Furthermore, they can be estimated in a simple way irrespective of complexities of the design in most practical situations. For example for a proportion *p*

$$s^2 = \frac{n}{n-1} \cdot p(1-p) \approx p(1-p)$$

while more generally, for a weighted ratio *r* we have:

$$s^2 = \left(\frac{n}{n-1}\right) \cdot \sum_i w_i z_i^2 / \sum_i w_i \, ; \;\; z_i = (y_i - r \cdot x_i)/\bar{x}$$

where

$$r = \sum_i w_i y_i / \sum_i w_i x_i ; \quad \bar{x} = \sum_i w_i x_i / \sum_i w_i$$

The coefficient of variation is more portable, but it is not so useful when the denominator in its definition is close to zero, as for example may happen for estimates of differences between subclasses. Also, there is generally *no advantage in going from s to cv in the case of proportions; in fact the former is preferable* since it is symmetrical (the same) for a proportion (p) and its complement (1-p). In fact in many social surveys, most statistics of interest are likely to be in the form of *proportions* rather than means or general ratios[9].

The design effect and rate of homogeneity

The *design effect*, *deft*^{2}, (or its square-root, *deft*, which is sometimes called the *design factor*) is a comprehensive summary measure of the effect on sampling error of various complexities in the design. By taking the ratio of actual to simple random sample (SRS) standard error, deft removes the effect of factors common to both, such as size of the estimate and scale of measurement, population variance and overall sample size. However, for a given variable, its magnitude still depends on other features of the design.

A major factor determining the deft value is the size of the sample taken per PSU. When the PSU sample sizes do not vary greatly and the sample is essentially self-weighting, the effect of these sample sizes can be isolated by considering the more portable measure 'roh':

$$\text{deft}^2 = 1 + (\bar{b} - 1).\text{roh}$$

The above can be refined by isolating some other sources of variation. For example, in the presence of variable PSU sample sizes, it is more appropriate to replace their simple average in the above expression by the quantity:

[9] For proportions or percentages, it is important to keep a clear distinction between the error expressed in relative terms (as % of the proportion p), and in terms of *absolute percentage points*. (Example: A poverty rate of 22% differs from a rate of 20% by 10% in relative terms, but by 2 percentage points in absolute terms.) Both forms are relevant. For large proportions, the error is often better expressed in relative terms, while for very small proportions expression in terms of absolute percentage points is often more meaningful. This is also true for measures which are similar to proportions, such as the at-risk-of-poverty rate, which is the main statistics presented in the Intermediate Quality Report. Indeed, the at-risk-of-poverty rate is the central statistic of interest in EU-SILC. This is a complex statistic, but in certain respects it is similar to a simple proportion.

$$\overline{b'} = \overline{b}.(1 + cv^2) = \sum_i b_i^2 / \sum_i b_i$$

Another useful refinement is to isolate the effect on deft of the inflation in variance resulting from arbitrary departures from a self-weighting design, D_w:

$$deft^2 = D_W^2.[1 + (\overline{b'} - 1).roh]$$

In practice, design effect for a statistic is computed by estimating its variance (i) under the actual sample design, and (ii) assuming a simple random sample of the same size. The ratio of these two quantities gives *deft*^{2}. Parameter *roh* can be estimated from this *deft*^{2} and the average number of ultimate units selected per sample PSU, using the formula given above.

Effective sample size

As already noted, sampling precision is determined by size of the sample, as well as by its design, that is, its efficiency or design effect. Both of these factors are specific to the statistic being considered. It is helpful to keep separate the issue of design effect. The precision requirements are more clearly expressed and understood in terms of the "effective" rather than actual sample size. By effective *sample size* of a sample with complex design, we mean the *size of a simple random sample of analysis units which has the same precision as the complex design*. The effective size of a complex sample of size n with design effect deft^2 is:

$$n_{eff} = \frac{n}{deft^2}$$

In place of the value of standard error, the required level of precision is sometimes expressed in terms of the "95% confidence interval", which corresponds to an interval 2 standard errors wide around the estimated value.

It can be easily seen that the effective sample size can also be expressed in terms of *cv*, the coefficient of variation and *rse,* the relative standard error:

$$n_{eff} = \left(\frac{cv}{rse}\right)^2$$

Variance computation procedures

Large scale household surveys are generally based on multi-stage, stratified and otherwise complex designs. A typical survey is multi-purpose in several respects: it involves many types of interrelated variables; many types of estimates such as proportions, means, ratios and differences of ratios, and more complex statistics; various types of units of analysis such as households and individuals; various levels of disaggregation of the sample; and diverse and numerous subclasses (subpopulations) for which estimates of levels, differences and other relationships are required. Practical procedures for estimating sampling errors therefore: (i) must take into account the actual, complex structure of the design; (ii) should be flexible enough to be applicable to diverse designs; (iii) should be suitable and convenient for large-scale application, and for producing results for diverse statistics and subclasses; (iv) should be robust against departure of the design in practice from the ideal 'model' assumed in the computation method; (v) should have desirable statistical properties such as small mean-squared error of the variance estimator; (vi) should be economical in terms of the effort and cost involved; and (vii) suitable computer software should be available for application of the method.

The theory of 'simple replicated variance estimators' provides the basis for most practical approaches to variance estimation, though in application to complex situations, additional assumptions and approximations may be involved. The basic theory may be stated as follows. Suppose that y_j are a set of random uncorrelated variables with a common expectation Y. Then the mean $\tilde{y}$ of n values y_j $\tilde{y} = \sum_j y_j / n$ has an expected value equal to Y, and its variance is given by $var(\tilde{y}) = s^2 / n$, where $s^2 = \sum_j (y_j - \tilde{y})^2 / (n-1)$.

Drawing on this basic idea, two broad practical approaches to the computation of sampling errors may be identified:

(1) Computation from comparisons among estimates for replications of the sample, each of which reflects the structure of the full sample, including its clustering and stratification.

(2) Computation from comparisons among certain aggregates for primary selections or replicates within each stratum of the sample, also known as linearization method.

The Jack-knife Repeated Replication is a commonly used method which belongs to class (1). This is the method adopted and developed for application in EU-SILC at the EU level and also in countries that chose to use it.

Repeated replication procedures

JRR is one of the classes of practical methods for variance estimation in complex samples based on *measures of observed variability among replications of the full sample*. The basic requirement is that the full sample is composed of a number of subsamples or replications, each with the same design and reflecting complexity of the full sample, enumerated using the same procedures. However, as the replications are not independent and special procedures are required in constructing them to avoid bias in the resulting variance estimates.

A replication differs from the full sample only in size. But its own size should be large enough for it to reflect the structure of the full sample, and for any estimate based on a single replication to be close to the corresponding estimate based on the full sample. At the same time, the number of replications available should be large enough so that comparison among replications gives a stable estimate of the sampling variability in practice. The various re-sampling procedures available differ in the manner in which replications are generated from the parent sample and the corresponding variance estimation formulae evoked (such as the Balanced Repeated Replication (BRR) and the bootstrap, apart from JRR).

Compared to the 'linearisation' method, repeated re-sampling methods tend to involve heavier computational work. However, they have the major advantage of not requiring an explicit expression for the variance of each particular statistic. They are also more encompassing: by repeating the entire estimation procedure independently for each replication, the effect of various complexities, such as each step of a complex weighting procedure, can be incorporated into the variance estimates produced.

Jack-knife Repeated Replication (JRR)

The basic model of the JRR for application in the context described above may be summarised as follows. Consider a design in which two or more primary sampling units (PSUs) have been selected independently from each stratum in the population. Within each primary selection (PS), sub-sampling of any complexity may be involved, including weighting of the ultimate units.

In the 'standard' version, each JRR replication can be formed by eliminating one sample PSU from a particular stratum at a time, and increasing the weight of the remaining sample PSUs in that stratum appropriately so as to obtain an alternative but equally valid estimate to that obtained from the full sample.

The above involves creating as many replications as the number of primary units in the sample. The computational work involved is sometimes optimised by reducing the number of replications required. For instance, by grouping PSUs within strata or by forming JRR replications by eliminating a whole group at a time. This is possible only when any stratum contains several units. One situation in which some grouping of units is unavoidable is when the sample or a part of it is a direct sample of ultimate units or of small clusters, so that the number of replications under 'standard' JRR is too large to be practical. Alternatively, or in addition, the groupings of units may be cut across strata. It is also possible to define the replications in the standard way (delete one-PSU at a time Jack-knife), but actually construct and use only a subsample of those.

Briefly, the standard JRR involves the following.

Let z be a full-sample estimate of any complexity, and $z_{(hi)}$ be the estimate produced using the same procedure after eliminating primary unit i in stratum h and increasing the weight of the remaining (a_h-1) units in the stratum by an appropriate factor g_h (see below). Let $z_{(h)}$ be the simple average of the $z_{(hi)}$ over the a_h sample units in h. The variance of z is then estimated as:

$$\mathrm{var}(z) = \Sigma_h \left[(1 - f_h) . g_h . \Sigma_i \left(z_{(hi)} - z_{(h)} \right)^2 \right]$$

A major advantage of a procedure like the JRR is that, under quite general conditions for the application of the procedure, the same and relatively simple variance estimation formula holds for z of any complexity. Normally, the factor g_h is taken as $g_h = a_h / (a_h - 1)$, but for reasons noted below, it is preferable to use $g_h = w_h / (w_h - w_{hi})$, where $w_h = \Sigma_i w_{hi}, w_{hi} = \Sigma_j w_{hij}$, the sum of sample weights of ultimate units j in primary selection i. The latter form retains the total weight of the included sample cases unchanged across the replications created. With the sample weights scaled such that their sum is equal (or proportional) to some external more reliable population total, population aggregates from the sample can be estimated more efficiently, often with the same precision as proportions or means.

The JRR variance estimates take into account the effect on variance of aspects of the estimation process which are allowed to vary from one replication to another. In principle this can include complex effects such as that of imputation and weighting, though in practice often it is not possible to repeat such operations entirely fresh at each replication.

Variance estimation of measures based on subpopulations

Normally, variance estimation for subpopulations does not involve any new procedures: the same formulae apply except that sample elements not members of the subpopulation of interest are simply disregarded. The only complication which sometimes arises is that, considering only the subpopulation members, some strata and PSUs may become empty. This would normally require some re-definition of the sample structure for the purpose of variance estimation. This is true whether the linearisation or the JRR method is being used.

In the context of poverty and inequality, the subpopulation measures of interest are usually of a special type: in these, *all (or some) of the parameters involved in the definition of the measure are estimated from the full sample, while the measure itself is being estimated for the subpopulation concerned*. The most important example is the at-risk-of-poverty rate for a subpopulation, but with an individual's poverty status defined in relation to the poverty line determined from income distribution of the whole population. The JRR methods can be easily adapted for this purpose on the following lines. The JRR replications are constructed for the full sample as usual. For each replication the statistic is re-estimated only for units in the subpopulation of interest. However, the parameters involved in the definition of the statistic are re-estimated using all units in the replication. These features have been incorporated into the standard SAS programs for variance estimation supported by Eurostat.

Note on design effect

As defined above, design effect the ratio of the variance under the given sample design, to the variance under a simple random sample of the same size: $se = se_R \cdot deft$

Proceeding from estimates of sampling error to estimates of design effects (ratio of actual sampling error to that under equivalent simple random sampling, SRS) is essential for understanding the patterns of variation in and the determinants of magnitude of the error, for smoothing and extrapolating the results for diverse statistics and population subclasses, and for evaluating the performance of the sampling design. Computing design effects requires the additional step of estimating sampling errors under simple random sampling. The standard SAS programs provided by Eurostat for variance estimation implement a practical procedure for achieving this using JRR methodology.

Design effect itself can be decomposed into three components.

(1) the effect of sample weights on variance,

(2) the effect of clustering, stratification and aspects other than weighting, and,

(3) if applicable, the effect of clustering of persons within households.

Factor (1) does not depend on the structure of the sample, other than the presence of unequal sample weights for the elementary units of analysis. The main effect is the variability of these weights in the sample. The effect is also influenced by the extent to which the variable being estimated is correlated with the sample weights.

Factor (2) is the design effect resulting from stratification and clustering, i.e. sample structure factors other than the sample weights. For income variables which are of interest, it is normally computed on the basis of comparison of the actual (generally clustered and stratified) sample with the results from a simple random sample of *households*. This is because income is essentially measured at the household level: total household income, even if obtained from incomes of individual members, is then equalised, and the equalised amount ascribed to each member in a uniform way. Note that the above consideration applies also to 'register countries', since in those countries as well, the household remains the basic unit for the collection of the *income variables*.

Factor (3) arises when we consider measures of poverty, inequality and mean income estimated at the level of individual. In the standard (Laeken) indicators concerning income poverty and inequality, which are the indicators for which sampling errors are presented in national intermediate quality reports, generally the individual person is taken as the unit of analysis. Every member in a household is assigned the household equivalised income. This income is identical for all members of a household. For such indicators, the comparison for the purpose of design effect is shifted from a simple random sample of households to a simple random sample of persons. It can be seen from theory that *for income variables* (which are constant for all members of a household) *this additional factor in the design effect approximately equals square-root the average number of persons per household.*

This factor is smaller when particular subgroups of persons are considered, such as a particular age and sex group. It is the average number per household of individuals of the particular category of interest which matters in determining factor (3) affecting the design effect. This applies to the at-risk-of-poverty rates for subpopulations for which sampling errors are included in the intermediate quality reports.

<u>Standardisation of the variance computation procedure</u>

This section describes a standard procedure for the computation of sampling errors in the EU-SILC. The programs implemented provide a standard tool which *can be used unchanged for any country and any survey year* for the statistics specified for the intermediate and final quality reports. The sample design of course varies from one country to another, and can also vary in detail from one survey year to another in the same country. Two steps must be completed before application of the standardised SAS programs for variance estimation. These are:

(1) The definition of the units to be included in the dataset.

(2) Definition for each unit of the 'computational' variables. The definition of computational strata and primary sampling units can be a technically complex task requiring sampling expertise, as well as knowledge of details concerning the sample design, selection and implementation – details which are country- and possibly even wave-specific. The figure shows the overall structure of the recommended variance computation procedure.

Figure 9: Country-specific and standardised aspect of the variance estimation procedure

Country- and application-specific aspects: →

(1) Creation of the data set, comprising of units to be included in the computations

(2) Creation of the sample structure variables (stratum, PSU and sample weight) for each unit (planned report describing basic principals of the procedures)

…forming input to the standard SAS programs, same for all countries and waves:→

(3) 'Creation structure for JRR' program

(4) 'JRR shell' of the SAS programs

(5) Variable-specific macros called from the JRR shell

Note that the 'JRR shells' referred to above are highly standardised: they are not specific to country or to individual variable or statistic. They only require some limited variation from one *class* of statistics to another, such as between the production of the set of statistics required for the intermediate quality reports and those required for the Final Quality Report.

Annex 4: Non-sampling errors

Types of errors in survey data

All statistical data, from whatever source and whatever the manner of their collection, are potentially subject to errors of various types. It is important that the results of surveys are accompanied by descriptions of their quality and limitations.

Firstly, knowledge about data quality is required for their *proper use and interpretation.* This knowledge is essential in determining whether and with what degree of confidence the patterns observed in the results are real, and not merely products of the variability and deficiency inherent in the data. Information on the nature and magnitude of errors can also be useful for making appropriate corrections to the data or adjustments in their interpretation.

Secondly, measures of data quality are important for the *evaluation and improvement of survey design and procedures*. A detailed investigation of the sources, magnitude and impact of errors is necessary to identify how survey design and procedures may be improved and resources allocated more efficiently among various aspects of the survey operation.

Continued monitoring and improvement of data quality is particularly important major continuous or repeated surveys such as EU-SILC.

The objective of a sample survey is to make estimates or inferences of general applicability for a study population, derived from observations made on a limited number (a sample) of units in the population. We can distinguish between two groups of errors affecting this process:

(a) Errors in measurement

> These arise from the fact that what is measured on the units included in the survey can depart from the actual (true) values for those units. Errors in measurement centre on *substantive content of the survey*: definition of the survey objectives and questions; ability and willingness of the respondent to provide the information sought; the quality of data collection, coding editing, processing etc.

(b) Errors in estimation

> These are errors in the process of extrapolation from the particular units enumerated to the entire study population for which estimates or inferences are required. These centre on the *process of sample design and implementation*, and include errors of coverage, sample selection, sample implementation and non-response, as well as sampling errors and estimation bias.

Group (a) concerns the accuracy of measurement at the level of individual units enumerated in the survey: how the value has reported by the respondent, and recorded, coded, edited, corrected, imputed and tabulated by the survey workers, may depart from the actual value for the unit concerned. This group of errors can be studied in relation to the various stages of the survey operation: data collection, processing, analysis etc.

Group (b), which concerns the legitimacy of generalisation from the units observed to the target population, includes sampling variability and various biases associated with sample selection and implementation, such as coverage, selection and non-response errors.

The above categorisation, based on operational considerations, is more fundamental than the distinction usually made between *sampling* and *non-sampling* errors. Each group of errors may be further classified in as much detail as possible to identify *specific* sources of error, so as to facilitate their assessment and control.

Variable error and bias

Some of the conditions under which the survey is taken are 'essential' to the situation. In addition, survey results are also influenced by transient or chance factors. On this basis it is useful in practice to distinguish between two components into which any particular type of error may be decomposed: (i) a *variable component*, and (ii) *bias*. The underlying idea is that of possible repetitions of the same procedure or operation under essentially the same conditions. The result of the repetitions are affected by random factors, as well as by systematic factors which arise from the conditions under which repetitions are undertaken and affect the results of all repetitions in essentially the same way. The *variable component* of an error arises from chance factors affecting different samples and repetitions of the survey differently. *Bias* arises from factors which are a part of the essential conditions and affect all repetitions in more or less the same way.

The distinction between variable error and bias is useful because the two components differ in their sources, methods of assessment and control, and impact on the survey results.

Types of errors in surveys

Errors in measurement

1 conceptual errors

- errors in basic concepts, definitions, and classifications
- errors in putting them into practice (questionnaire design, interviewers training and instructions)

2 response errors

- response bias
- simple response variance
- correlated response variance

3 processing errors

- editing errors
- coding and data entry errors
- programming errors, etc.

Mixed category

4 item non-response

- don't knows
- refusals, etc.

Errors in estimation

5 coverage and related errors

- under-coverage
- over-coverage
- sample selection errors

6 unit non-response

- refusals
- inaccessible
- not-at-home, etc.

7 sampling error

- sampling variance
- estimation bias

Non-sampling errors = 1 to 6

Methods of assessment

Indicators or measures of quality of survey data may be obtained by a variety of methods. Some procedures can yield quantitative information on the magnitude and impact of specific types of error, while others provide only qualitative indicators. Though the appropriateness of a method will depend on the specific source and type of error, the various phases of a survey are closely related. Therefore errors cannot always be attributed to a particular type or source. The same or similar methods of assessment/control may indeed be suitable for measuring more than one type of error, and some of the indicators obtained may provide no more than general or overall measures of data accuracy without being able to identify specific sources and types of error.

Scope of this report

The following sections provide summary information on main components of non-sampling errors in EU-SILC surveys of 2007. Next sub-section deals with coverage and related errors related to the sampling frame. This information tends to be stable over years except in the very rare situation when major changes are introduced in ongoing EU-SILC operations. A major potential source of 'estimation error' (as defined above) remains the high rates of unit non-response, considered in some detail in the following section. Next we consider item non-response in, which is also a major problem, especially concerning income variables in countries where this information is obtained through personal interviews. Relatively limited information has been recorded on measurement errors. These, including data collection and processing errors, are described in the last part of this section on non-sampling errors.

Sampling frame, coverage and related errors

Coverage errors

The target population is the set of elements for which estimates are required while the frame population is composed of the units which are eligible for inclusion through a given sampling procedure. Coverage errors arise from discrepancies between the target and the frame populations, and also from errors in selecting the sample from the frame.

The condition of 'probability sampling' is violated if: (a) the survey population is not fully and correctly represented in the sampling frame; (b) the selection of units from the frame into the sample is not according to procedures specified in the sample design; or (c) not all the units selected into the sample are successfully enumerated.

Coverage error concerns primarily (a), but also (b). Errors of coverage arise in circumstances like the following:

- Some units in the target population are missing from the frame. This is under-coverage: the missed units have no chance of being selected into any sample.
- Some units in the sampling frame are not in the target population. This results in over-coverage, unless such units can be identified and eliminated after selection.
- Some units in the target population appear more than once in the frame ('duplication').

In a multi-stage sample, coverage error can arise at any of the stages. For example, while the list of area units in the frame can be expected to be complete, serious coverage error can arise in the delineation of *boundaries* of area units. New units and units in sparsely populated areas may be left out of the frame. Errors in list of ultimate sampling units arise because of changes in those units. List of addresses are less durable than frames of area units, and lists of households less durable than addresses, dwellings or other structural units, and lists of persons even less so. The most common problem with list frames concerns *under-coverage*. *Over-coverage* can also occur (though less commonly than under-coverage) if (a) some units appear in the list more than once (without being so identified for appropriate correction of selection probabilities); or (b) units out-of-scope of the survey are included, but not identified as such and removed during fieldwork; (c) units outside the boundaries of sample are included.

The bias resulting from under-coverage may be summarised as follows:

1. In estimating population total counts, the effect of coverage error is direct and of similar relative magnitude.
2. In estimating total values, the effect will depend on the relative value of the units missed: it will be proportionately larger if the units with above-average values tend to be missed more often, and vice versa.
3. The effects are usually less drastic when estimating statistics such as proportions, means, rates and ratios: here the resulting bias depends on the differences in characteristics of the units covered and the units not covered.
4. Regarding differences and comparisons between population subgroups, the resulting bias depends on the net algebraic difference in the biases for the groups being compared: biases can cancel out to the extent they are common or similar.

Neither the magnitude nor the effect of coverage errors is easy to estimate because it requires information not only external to the sample but also, by definition, *external to the sampling frame*.

Sample selection and implementation errors are distinguished from coverage errors proper in that the latter concern shortcomings of the frame and what remains outside the frame, while sample selection and implementation errors refer to losses and distortions within the sampling frame. Examples are incorrect application of the selection procedures and selection probabilities, and more importantly, inappropriate substitution of the selected units by others during field work.

Common problems with list frames

Completeness of the frame is a most critical requirement (and perhaps also the most common problem) of list frames. Occasionally it is also important that the list contains pertinent and accurate information on the size and other characteristics of individual units so as to permit efficient stratification and control of the selection process.

Problems can arise in the absence of one-to-one correspondence between listings (which are the units actually subject to the selection process), and the elementary units (obtaining a sample of which with specified probabilities is the actual objective). The lack of correspondence can arise in several forms.

[1] Blanks

'Blanks' mean that a listing represents no real unit, but is blank. The presence of blanks in the list as such does not affect the selection probabilities of the units, but the number of units selected becomes a random variable. If that number is fixed, the probabilities of selection are subject to random variation; and would become unknown if the number of actual units represented in the list is not known. Care must be taken in defining non-response rates in the presence of blanks in the sample lists: they must be correctly identified and eliminated both from the denominator and numerator of the non-response rates. If substitution is allowed, then they must be no substitution for selections found to be blank.

[2] Duplications

'Duplications' mean that the same unit is represented by more than one listing. A unit's probability of selection becomes equal to the sum of probabilities of selection of its listings. Sometimes the problem arises from the nature of the frame: as for example in the selection of households from an electoral roll (listing all eligible voters in each household) or from telephone directories. Much more difficult is the problem of unsystematic duplications in the list, usually resulting from the failure to identify the fact that different listings actually represent the same unit. Eliminating all duplicates is one solution, but it is not always necessary to do so. Alternatively, each selection may be weighted in inverse proportion to the number of listings representing it. *Simply eliminating the duplications which happen to appear in the sample does not solve the problem.*

[3] Clustering of elements

'Clustering of elements' means that more than one unit may be represented by the same listing. As such, this does not distort the selection probabilities, since each unit receives the selection probability of the listing representing it. When such clustering is not too common and the clusters involved are generally small, it usually presents no problem. This represents a common situation in surveys of individuals with certain characteristics, where households are employed as the ultimate sampling unit.

Selecting one unit at random from the clustering is often unnecessary; if done, the results have to be weighted to reflect the changed selection probabilities. If the clustering must be avoided, it is usually better to list all units in a sample of listings, and from that new list select a sample of the required units directly.

[4] Under-coverage

'Under-coverage' refers to units not represented in the frame. This is the most serious and difficult problem and biases the results of many surveys. No simple or cheap solution to the problem of under-coverage exists.

[5] Failure to locate units

'Failure to locate units' refers to the failure to identify which unit(s) a selected listing represents. This is a common problem in the absence of clear and complete description in the frame for identifying units in the field. It can also be caused by insufficient effort by the field workers. The problem is often confused with that of 'blanks' - units not located being indiscriminately reported as non-existing - which among other things, causes difficulty in correctly computing the response rates actually achieved.

[6] Change in units and unit characteristics

'Change in units and unit characteristics' means that the unit itself or characteristics of the unit associated with the listing have changed. In view of mobility of the ultimate units, many surveys use the so-called de facto coverage definition. This means taking the sample selected to be a sample of addresses or location, rather than that of particular households or establishments; whoever is found to be present at the selected location is enumerated in the survey. Similarly, in surveying persons from selected households, household membership is determined on the basis of presence rather than of usual residence. Nevertheless, whatever the coverage rules adopted, mobility of the population often proves problematic at the survey implementation stage.

Errors in measurement

The broad range of 'errors in measurement' refer to the problem that what is measured on the units included in the survey can depart from the true values for those units. These errors centre on substantive aspects such as definition of the survey objectives, formulating questions, ability and willingness of the respondent to provide the information sought, and the quality of data collection and processing. These relate to the accuracy of measurement at the level of individual units enumerated in the survey. This group of errors can be studied in relation to the various stages of the survey operations. From the point of survey operation and methods of assessing and controlling these errors, it is useful to divide them into two categories: the so-called 'measurement errors' concerning the process of data collection, and 'processing errors' concerning the subsequent process of transforming the data in the form of a micro database suitable for analysis. This distinction is made in the Commission Regulation on quality reports.

Despite this operational distinction, the two classes of error have great conceptual similarity. In this section, we first discuss the conceptual basis common to both these classes of 'errors in measurement'. Subsequently, available information on 'measurement' and 'processing' errors in the EU-SILC operation will be reviewed briefly.

Measurement Biases

Measurement biases refer to the more or less systematic errors in obtaining the required information. They arise from shortcomings *affecting the whole survey operation*: basic conceptual errors in defining and making operational the survey content; any incorrect instruction affecting all the survey workers; errors in the coding frame or programs for processing the data, etc. They also arise from inherent difficulties - more or less independent of the specific technical design and procedures of the survey - in collecting certain types of information (such as income in EU-SILC interviews), given the general social situation and the type of respondents involved.

The assessment of measurement biases requires analysis of internal and external consistency of the data, comparison with models and other sources, with measurements using alternative and improved procedures, and in general terms, a thorough understanding of the subject matter and practical conditions of data collection of the survey. The first step in identifying bias is through logical and substantive analysis of consistency and relationships in the data, against external standards and prior knowledge of the subject.

Beyond that, the assessment requires comparison with more accurate data: from some existing external source, and/or collected with special, improved methods. There are several possibilities in connection with such assessment. For instance, the study response bias may involve two interviews on a subsample following the original interview. These would consist of a *re-interview*, which is an independent replication of the original interview and is aimed at measuring response variance; followed in discrepant cases by a *reconciliation interview* aimed at establishing correct responses and identifying biases and their sources.

Measurement Variance

These refer to variable errors in data collection (response or interviewer variance), and similar errors in data processing (coding, data entry etc.). The following discussion in terms of response variance also applies to other sources of measurement variance.

Two components of response variance may be distinguished: *simple response variance*; and *correlated response variance*. The decomposition of the total response error into components is based on the following concept.

(i) A part of the error is common to the work of all interviewers; this is the response bias.

(ii) In addition, each interviewer has his/her own particular bias, which affect the interviewer's whole work load; this is the correlated response variance component. By definition, its expected value averaged over all interviewers (of the type employed in the survey) is zero.

(iii) The third component - simple response variance - is random, not correlated with any particular interviewer.

This distinction is useful because the components differ in nature and method of assessment and control.

As already noted, the bias component is a product of the basic survey design, procedures and conditions.

Correlated response variance

Correlated variance indicates lack of uniformity and standardisation in the interviewers' work. Its high value indicates the need for better training and supervision of survey work.

Its magnitude also depends on the number of interviewers engaged in the survey (just as sampling error depends on the size of the sample). And just like the computation of sampling error, the estimation of its magnitude requires comparisons between different replications of the sample, here the basic unit of comparison being the individual interviewer work loads, just as the sample areas may form the basic components in computing sampling error.

Simple response variance

Simple response variance, by contrast, is an indicator of the inherent instability of particular items in the questionnaire: it indicated that the information obtained is not sufficiently repeatable, hence not reliable. Its measurement requires comparisons between independent repetitions of the survey under the same general conditions. There is no way, in a single survey, to distinguish between variation among the true values of units (which gives rise to sampling error), and the additional variability arising from random factors affecting individual responses. In fact, the usual procedures for estimating sampling error automatically include the full effect of the simple response variance component. Separate estimation of this component requires a re-interview survey, independent of the original survey but under the same conditions and using the same procedures.

Annex 5: Income components

Table 13: Household income components: are the standard EU-SILC definitions used?

	HY010	HY020	HY022	HY023	HY030	HY040	HY050	HY060	HY070	HY080	HY090	HY100	HY110	HY120	HY130
	Total hh gross income	Total disposable hh income	Total disposable hh income before social transfers other than old-age and survivors' benefits	Total disposable hh income before all social transfers	Imputed rent [1]	Income from rental of property or land	Family/ Children related allowances	Social exclusion payments not elsewhere classified	Housing allowances	Regular inter-hh cash transfers received	Interest, dividends, profit from capital investments in incorporated businesses	Interest paid on mortgage	Income received by people aged under 16	Regular taxes on wealth	Regular inter-hh transfers paid
BE	F	F	F	F	P	F	L	L	L	F	F		F	NA	F
CZ	F	F	F	F	P	F	F	F	F	F	F	L[3]	F	F	F
DK	F	F	F	F	P	F	F	F	F	F	L		F	F	F
DE	F	F	F	F	F	L	F	F	F	F	L	NC	F	F	F
EE	F	F	F	F	F	F	F	F	F	F	L		L	F	F
IE	F	F	F	F	P	F	F	F	F	F	F		F	NA	F
EL	F	F	F	F	F	F	F	F	F	F	F		F	F	F
ES	F	F	F	F	L	F	F	F	F	F	F		F	F	F
FR	NC	F	F	F	P	F	F	F	F	L	F		F	F	L

	HY010	HY020	HY022	HY023	HY030	HY040	HY050	HY060	HY070	HY080	HY090	HY100	HY110	HY120	HY130
	Total hh gross income	Total disposable hh income	Total disposable hh income before social transfers other than old-age and survivors' benefits	Total disposable hh income before all social transfers	Imputed rent (1)	Income from rental of property or land	Family/ Children related allowances	Social exclusion payments not elsewhere classified	Housing allowances	Regular inter-hh cash transfers received	Interest, dividends, profit from capital investments in incorporated businesses	Interest paid on mortgage	Income received by people aged under 16	Regular taxes on wealth	Regular inter-hh transfers paid
IT	NC	F	F	F	P	F	F	F	F	F	F		F	F	F
CY	F	F	F	F	P	F	F	F	F	F	F		F	F	F
LV	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
LT	F	F	F	F	F	F	F	F	F	F	F		F	F	F
LU	F	F	F	F	P	F	F	F	F	F	F		F	F	F
HU	F	F	F	F	F	F	F	F	F	F	F		F	F	F
MT	F	F	F	F	F	F	F	F	F	F	F		F	NC	F
NL	L	L	L	L	F	F	L	F	F	L	F		F	NC	L
AT	F	F	F	F	F	F	F	F	F	F	F		F	NA	F
PL	F	F	F	F	F	F	F	F	F	F	F		F	F	F
PT	NC	L	L	L	F	F	F	F	F	L	F		N	F	L
SI	F	F	F	F	F	F	F	F	F	F	F		F	F	F

	HY010	HY020	HY022	HY023	HY030	HY040	HY050	HY060	HY070	HY080	HY090	HY100	HY110	HY120	HY130
	Total hh gross income	Total disposable hh income	Total disposable hh income before social transfers other than old-age and survivors' benefits	Total disposable hh income before all social transfers	Imputed rent (1)	Income from rental of property or land	Family/ Children related allowances	Social exclusion payments not elsewhere classified	Housing allowances	Regular inter-hh cash transfers received	Interest, dividends, profit from capital investments in incorporated businesses	Interest paid on mortgage	Income received by people aged under 16	Regular taxes on wealth	Regular inter-hh transfers paid
SK	F	F	F	F	F	F	F	L	L	F	F		F	F	F
FI	F	F	F	F	F	F	F	F	F	F	F		F	F	F
SE	F	F	F	F	P	F	F	F	F	L	F		F	F	L
UK	F	L	F	F	P	F	F	F	F	F	F		F	F	F
IS	L	F	F	F	F	L	F	F	F	F	F		F	F	F
NO	F	F	F	F	F	F	L	F	L	F	F		F	F(2)	F

Source: Intermediate quality reports (2006).
F (fully comparable), L (largely comparable), P (partly comparable), N (not comparable), NC (Not collected).
(1) Imputed rent: According doc 65, the method used should be Regression/Stratification method or User cost method. If the method used is one of these, it is marked as "F". If the method used is different, it is marked as "P". Information gathered through a questionnaire sent by countries on 28/11/2008.
(2) Included in HY140.
(3) Comment from the country: "If the respondent did not know the amount of interest (from the tax relief claim), we modelled the interest paid on mortgages using a slightly different approximation formula than the one now suggested by Eurostat, but the differences will be negligible".

Table 14: Individual income components: are the standard EU-SILC definitions used?

	PY010	PY020	PY021	PY030	PY050	PY070	PY090	PY100	PY110	PY120	PY130	PY140	PY200
	Cash or near-cash employee income	Other non-cash employee income (1)	Income from private use of company car	Employers' social insurance contributions	Cash profits or losses from self-employment	Value of goods produced for own consumption	Unemploy-ment benefits	Old-age benefits	Survivors' benefits	Sickness benefits	Disability benefits	Education-related allowances	Gross monthly earnings for employees (4)
BE	F	F	F		F		L	L	L	L	L	L	
CZ	F	P	F	L (5)	F	P	F	F	F	F	F	F	NC
DK	F	F	F		F	F	F	F	F	F	F	F	
DE	F	L	F	NC	L	L	L	F	F	F	F	F	
EE	F	F	F		F		F	F	L	F	F	F	
IE	F	L	F		F	F	F	F	F	F	F	F	
EL	F	L	F		F		F	F	F	F	F	F	
ES	F	F	F		F		F	F	F	F	F	F	
FR	L	F	NC		F	F	F	F	F	F	F	F	
IT	F	L	F		F (3)		F	F	F	F (3)	F	F	
CY	F	F	F		F		F	F	F	F	F	F	
LV	F	L	F	F	F	L	F	F	F	F	F	F	NC
LT	F	F	F		F	F (2)	F	F	F	F	F	F	
LU	F	L	F		F		F	F	F	F	F	F	
HU	F	N	F		F		F	F	F	F	F	F	
MT	F	L	F		F		F	F	F	F	F	F	

	PY010	PY020	PY021	PY030	PY050	PY070	PY090	PY100	PY110	PY120	PY130	PY140	PY200
	Cash or near-cash employee income	Other non-cash employee income (1)	Income from private use of company car	Employers' social insurance contributions	Cash profits or losses from self-employment	Value of goods produced for own consumption	Unemploy -ment benefits	Old-age benefits	Survivors' benefits	Sickness benefits	Disability benefits	Education-related allowances	Gross monthly earnings for employees (4)
NL	L	NA	F		F		L	F	F	F	F	F	
AT	L (6)	F	F		F		F	F	F	F	F	F	
PL	L	F	F		L		F	F	F	L	F	F	
PT	F	N	F		F		F	F	F	F	F	F	
SI	F	L	F		L	L	F	F	F	F	F	F	
SK	F	L	F		L	L	F	F	F	F	F	F	
FI	F	F	F	L (8)	F		F	F	F	F	F	F	
SE	F	F	F		F		F	F	F	F	F	F	
UK	F	N	F		F	F (7)	F	F	F	F	F	F	
IS	L	F	F		F		F	F	F	L	F	F	
NO	L	F	F		F	NC	F	L	L	L	L	F	NC

Source: Intermediate quality reports (2006). F (fully comparable), L (largely comparable), P (partly comparable), N (not comparable), NC (Not collected).
(1) Other non-cash employee income: If fulfils: 5 from 5 mandatory components -> "F"; 4 from 5 mandatory components -> "L"; 3 from 5 mandatory components -> "P"; 2 from 5 mandatory components -> "N".
(2) Variable collected but not recorded in microdata file.
(3) Paid sickness leaves of employees are included in the dependent employment incomes; the same holds true for self-employment.
(4) Variable mandatory only for countries that send the gender pay gap.
(5) Comment from the country: "The existing employer's social insurance contributions are fully covered, the amount is not asked to respondents, it is modelled, but the accuracy is high – as it is a frat-rate compulsory payment of additional 35% of gross wage".
(6) Payments in kind other than the one for the private use of a company car are included in PY010.
(7) This component of income is assumed to be zero.
(8) Employers' contributions refer only to legal and mandatory contributions, not to optional contributions.