



QUALITY INDICATORS 2017



No. 2 | 2017





QUALITY INDICATORS 2017

Methodological manuals
ISSN 2591-104X

QUALITY INDICATORS 2017
Rudi Seljak

Information:

www.stat.si/eng

T: +386 1 241 64 04

E: info.stat@gov.si

 @StatSlovenia

 @StatSlovenija

Kataložni zapis o publikaciji (CIP) pripravili v Narodni in univerzitetni
knjižnici v Ljubljani
COBISS.SI-ID=292774400
ISBN 978-961-239-373-1 (pdf)

FOREWORD

One of the very important commitments of the Statistical Office of the Republic of Slovenia as the main provider and coordinator of national statistics in Slovenia is to provide high-quality and trustworthy statistical outputs. The high quality of statistical outputs can be provided only with constant and objective measurement of the quality of our processes and outputs. Directly measured quantities presented in specific figures, called quality indicators, have an important role in measuring and monitoring the quality of statistical processes and outputs. Quality indicators enable objective assessment of the achieved quality, following of quality trends in time and a comparison of achieved quality among various subject-matter areas.

A document presenting the methodological bases and procedures for calculating standard quality indicators shown on specific examples was prepared and issued by SURS for the first time in 2011. The main objective of the publication was to set up a clear and transparent standard that all survey managers at SURS have to commit to. In addition, the publication served as a useful guideline for all survey managers who were planning and implementing the calculation of quality indicators in their procedures.

The fact is that in line with rapid development in many areas of official statistics, the area of assessing the quality of statistical processes and outputs is also very rapidly developing and changing. There are many new, innovative approaches both at the level of international organisations and at the level of national producers of official statistics. Therefore, the need appeared for the document on quality indicators to be upgraded in terms of its content, so that it will cover the most important changes in the area in recent years. This upgraded publication is now in front of you and we hope that it will serve its purpose even more than the previous one.

Genovefa Ružić
Director-General



Contents

Foreword.....	3
1 Introduction	7
2 General information on the calculation and release of indicators.....	8
3 Standard Quality Indicators.....	9
3.1 Data completeness rate (U1).....	10
3.1.1 Description	10
3.1.2 Calculation procedure.....	10
3.1.3 Explanation and calculation examples.....	10
3.2 Agreement of the reference dates (U2).....	10
3.2.1 Description	10
3.2.2 Calculation procedure.....	11
3.2.3 Explanation and calculation examples.....	11
3.3 Standard Error (T1).....	11
3.3.1 Description	11
3.3.2 Calculation procedure.....	11
3.3.3 Explanation and calculation examples.....	12
3.4 Selection bias (T1_1).....	13
3.4.1 Description	13
3.4.2 Calculation procedure.....	13
3.4.3 Explanation and calculation examples.....	13
3.5 Unit non-response rate (T2).....	14
3.5.1 Description	14
3.5.2 Calculation procedure.....	14
3.5.2.1 Unweighted rate.....	14
3.5.2.2 Weighted rate.....	14
3.5.3 Explanation and calculation examples.....	15
3.6 Item non-response rate (T3).....	15
3.6.1 Description	15
3.6.2 Calculation procedure.....	16
3.6.2.1 Unweighted rate.....	16
3.6.2.2 Weighted rate.....	16
3.6.3 Explanation and calculation examples.....	17
3.7 Overcoverage rate (T4)	17
3.7.1 Description	17
3.7.2 Calculation procedure.....	18
3.7.3 Explanation and calculation examples.....	18
3.8 Imputation rate (T5)	18
3.8.1 Description	18
3.8.2 Calculation procedure.....	18
3.8.3 Explanation and calculation examples.....	19
3.9 Editing rate (T6)	19
3.9.1 Description	19
3.9.2 Calculation procedure.....	19
3.9.3 Explanation and calculation examples.....	20
3.10 Coherence of data sources (T7).....	20
3.10.1 Description	20
3.10.2 Calculation procedure.....	20
3.10.3 Explanation and calculation examples.....	21
3.11 Timeliness of the first results (PT1).....	21
3.11.1 Description	21
3.11.2 Calculation procedure.....	22
3.11.3 Explanation and calculation examples.....	22
3.12 Timeliness of the final results (PT2).....	22
3.12.1 Description	22

3.12.2	Calculation procedure.....	22
3.12.3	Explanation and calculation examples.....	22
3.13	Punctuality of the first release (PT3).....	22
3.13.1	Description.....	22
3.13.2	Calculation procedure.....	23
3.13.3	Explanation and calculation examples.....	23
3.14	Length of comparable time series (P1).....	23
3.14.1	Description.....	23
3.14.2	Calculation procedure.....	23
3.14.3	Explanation and calculation examples.....	23
3.15	Coherence between provisional and final data (S1).....	24
3.15.1	Description.....	24
3.15.2	Calculation procedure.....	24
3.15.3	Explanation and calculation examples.....	24
3.16	Coherence with the results of reference source (S2).....	25
3.16.1	Description.....	25
3.16.2	Calculation procedure.....	25
3.16.3	Explanation and calculation examples.....	25
4.	Quality indicators in register-based and combined surveys.....	27
4.1	Adjustments of some indicators for register-based surveys.....	27
4.1.1	Item non-response rate.....	27
4.1.2	Overcoverage rate.....	28
4.1.3	Imputation rate.....	28
4.1.4	Editing rate.....	28
5	Process indicators at the macro level.....	29
5.1	Description.....	29
5.2	Calculation procedure.....	31
5.3	Explanation and calculation examples.....	31
6	Automatisation of the calculation of quality indicators.....	32
6.1	Micro-level indicators.....	32
6.2	Macro-level indicators.....	33
7	Standard Quality Indicators defined by Eurostat.....	34
8	Summary of differences with regard to the previous list.....	36
	SOURCES AND REFERENCES.....	37
	APPENDICES.....	39
I.	List of Eurostat quality indicators.....	39
II.	Code lists with key information on data collection and processing.....	41
	Code list with statuses of variables.....	41
	Code list with reporting statuses for enterprises.....	42
	Code list with reporting statuses for persons and households.....	42

1 INTRODUCTION

In the last decade, monitoring of the quality of statistical results and systematic reporting on "perceived" quality as a consequence of such monitoring have become a regular practice of statistical offices and other providers of official statistical activities in the European Statistical System (ESS). The fact that such standardised monitoring and reporting is possible is largely due to the work of a special Working Group on Quality in Statistics, which has been active under the auspices of Eurostat since 1998 and involves all ESS Member States. As part of its work, the Group defined the basic concepts and orientations for more comprehensive and harmonised monitoring of quality.

One of the most important results of the mentioned activities is certainly the development of a standardised method of quality reporting. Methodological documents that define the standard reporting structure, called the *Standard Quality Report*, together with the methodological documents that describe the rules on how such documents should be composed, have thus become the basic tools in quality reporting. These documents define in detail six dimensions of the quality of statistical results: relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability, and coherence. An additional seventh dimension is the cost and burden on the respondent; although this is not an explicit quality dimension, it has a considerable impact on all dimensions.

Another important part of each report is also the quality indicators that express the level of quality of individual dimensions in numeric values. Their purpose is to offer the producers of statistics analytical insight into the statistical procedure as a whole and to provide the users of statistical results important additional information enabling more correct and appropriate application of results. At the end of 2003, Eurostat's working group drafted the first list of standard quality indicators to be integrated into quality reports. Although the list was later slightly modified and adapted, the "core" of these indicators has remained the same.

The Statistical Office of the Republic of Slovenia (hereinafter: SURS) began developing its systematic and standardised approach to quality assessment and reporting on the quality of its products in 2002. Eurostat's documents were the basis for methodological guidelines for drafting quality reports and for the list of standard quality indicators adapted for internal use. Initially, standard quality reports were produced for internal needs and for reporting to Eurostat, while in 2006 SURS also prepared the first reports that were published on its website. Since then, the production and publication of quality reports has been a standard practice of SURS. Two types of reports are produced: a standard quality report and an annual quality report. The first report contains comprehensive descriptions of all quality dimensions and is produced every 5 to 10 years for each survey, while the second is much shorter; it mostly contains the presentation of quality indicators and is published annually.

Practical experience in the production of quality reports in past years as well as methodological updates at the European level have shown that methodological documents serving as guidelines for the production of quality reports need to be reviewed and amended. This is why SURS produced the first edition of the methodological manual *Quality Indicators* in 2011, which contained a description of the standard quality indicators with practical instructions for their calculation. The present document is the second edition of the manual and provides a partly updated and amended description of indicators in comparison to the first edition. The amendments are described in the last chapter of this document.

In addition to the list and description of standard quality indicators, this document contains a further three sections. The first additional section describes the adjustment of indicators in surveys that are based (partly or entirely) on administrative sources, the second additional section contains recommendations on the calculation of quality indicators at the macro level, while the third describes the general application for the calculation of quality indicators developed by SURS in recent years.

2 GENERAL INFORMATION ON THE CALCULATION AND RELEASE OF INDICATORS

The main purpose of quality indicators is to offer the producers of statistical surveys and the users of statistical results insight into the quality of statistical results, the quality of the process via which the results have been obtained, and to a certain extent also into the quality of the entire institutional environment in which the surveys are implemented. Since one of the most important roles of such indicators is to draw attention in due time (prior to release) to possible errors with regard to the implementation procedure as well as with regard to statistical data, it is important that indicators are calculated and made available to producers promptly, if possible immediately after the implementation of a certain phase of statistical processing. In particular with regard to indicators that belong to the component *accuracy*, it needs to be ensured to the highest possible extent that indicator values have already been calculated in the statistical process and are thus available together with statistical results.

With regard to their definition, indicators can also refer to three different objects in the frame of the implementation of surveys: to surveys as a whole, to variables and to statistics (statistical output). In the first case, only one object is considered in dealing with one particular survey, therefore there is no dilemma as to what the indicator value refers. This, however, does not apply to the other two cases, as typically in one survey several variables are measured and several statistics are calculated (estimated). For this reason, indicators from the second and third groups are only released in quality reports for key variables and statistics; these must be defined in the data on surveys and stated in the introduction of the quality report. For reason of the transparency of the reports, there should be no more than five key variables or statistics.

Although the indicators in quality reports are released at the annual (multi-annual) level, in surveys with a periodicity of less than one year (e.g. monthly or quarterly surveys) they should be calculated for each survey implementation. For such surveys, in standard as well as in annual quality reports, all values should be released with regard to the year concerned; at the same time also the yearly average should be submitted.

Where relevant, the values of the indicator – apart from its basic value which refers to the entire observed population – should also be calculated for some important domains. In certain surveys, for example, in addition to the basic value of the non-response rate for the entire sample, it is reasonable to also indicate, for example, the rate by region, gender or age group.

In some cases it is reasonable to show the indicator values by way of a graphic presentation. In particular in the "sub-annual" surveys, such (time) indicator values should be presented in the form of a line chart by which the movement of the indicator value in different periods is presented. The comparison of indicator values between different domains (e.g. regions) should be presented in the form of a bar chart. Charts should mainly be included in the standard quality report; the author or the authors of the report make the final decision whether to include such chart in the report or not.

3 STANDARD QUALITY INDICATORS

SURS defined standard indicators for the first time in 2003 and since then we have included them – as far as possible – in quality reports. Below, there is an upgraded list of indicators from 2017; in drawing up the list, we considered, to the greatest extent possible, changes in the implementation of statistical surveys in recent years. The main change from the previous list is that some indicators have been included which refer in particular to surveys that use administrative sources as the data source. Since different approaches to various types of surveys will be described below; at this point the following terms will be introduced for the purposes of this document: surveys in which a questionnaire is used as the basic instrument on the basis of which the required data are collected through various collection methods will be called *field surveys*; surveys based on the use of registers and administrative sources as direct data sources will be called *register-based surveys*; surveys using a combination of field and register-based data will be called *combined surveys*. Surveys can also be classified with regard to the method of selecting the observation units; in general, the following categories apply to such classification: census, random sample, non-random sample.

Table 3.1 shows an upgraded list of standard quality indicators and below the table there are some additional explanations.

Table 3.1: List of standard quality indicators

Quality Component	Notation	Indicator	Type of survey	Object
Relevance	U1	Data completeness rate	Optional	S
	U2	Accordance of the reference dates	Register-based, combined	Var
Accuracy	T1	Standard error	Random sample	St
	T1_1	Coverage bias	Non-random sample	St
	T2	Unit non-response rate	Optional	S
	T3	Item non-response rate	Field work	Var
	T4	Overcoverage rate	Optional	S
	T5	Imputation rate	Optional	Var
	T6	Editing rate	Optional	Var
Timeliness and punctuality	PT1	Timeliness of the first results	Optional	S
	PT2	Timeliness of the final results	Optional	S
	PT3	Punctuality of the first results	Optional	S
Comparability	P1	Length of comparable time series	Optional	St
Coherence	S1	Coherence between provisional and final results	Optional	St
	S2	Coherence with reference sources	Optional	St

Clarifications:

- **Notation.** Codes are defined with regard to the Slovenian titles of the components. A notation with an underscore (e.g. T1_1) indicates an indicator which in certain types of surveys replaces the basic indicator.
- **Object.** The following codes of objects to which the indicator values refer are used:
 S Survey as a whole
 VarVariable
 St ... Statistics

Below follows a detailed description of all standard indicators. Each indicator includes a short substantive description, the calculation procedure (the only parts of the documents that are strictly mathematical) and additional clarifications with calculation examples.

3.1 Data completeness rate (U1)

3.1.1 Description

The ratio between the number of statistical results disseminated (for a certain statistical area) and the number of statistical results requested (e.g. by decrees, other regulations and agreements). Statistical results which are not relevant for a certain Member State or for which a "derogation" applies are not considered in the indicator calculation.

The indicator value refers to the entire survey.

3.1.2 Calculation procedure

$$U1 = \frac{S_i}{S_0}$$

whereby

S_0 ... is the number of requested statistical results (statistics)

S_i ... is the number of disseminated statistical results (statistics)

3.1.3 Explanation and calculation examples

In this case, statistical output means the statistical output (statistics) for a certain domain. If, for example, a certain regulation prescribes that five statistics need to be disseminated, all of them for the level of the entire Slovenian territory and for the NUTS 3 level (statistical regions), the number of requested statistical results equals $5 + 5 \cdot 12 = 65$. If we further assume that four statistics for the level of Slovenia and for 10 regions have been provided by a relevant survey, i.e. $4 + 4 \cdot 10 = 44$, then the indicator value is as follows:

$$U1 = \frac{44}{65} = 0.68$$

3.2 Agreement of the reference dates (U2)

3.2.1 Description

In field surveys it is usually clear (at least theoretically) already in the data collection phase that the collected data refer to the correct referential period, i.e. the period to which the results of the statistical survey should refer. If data are taken from administrative sources, there is usually no real control over the data collection phase and thus it often happens that the reference period of the administrative source does not fully comply with the target period of the statistical survey. It is important that such differences be recorded and presented through the indicator value.

The indicator value is defined as the difference between the target reference survey period and the referential period to which the administrative source used applies. Where several administrative sources were used, the difference needs to be calculated for every source.

The indicator value refers to the key variable.

3.2.2 Calculation procedure

Let us say that RO_0 is the reference period of the statistical survey, while RO_{ad} is the reference period of the administrative source used. The indicator value is thus calculated (for each source used) as follows:

$$U2 = RO_0 - RO_{ad}$$

In the case of a monthly or quarterly survey, the unit applied should be the number of days, while in the case of a survey with a longer period, the number of months should be applied.

3.2.3 Explanation and calculation examples

Example: Let us assume that three different sources with three different reference dates were used in a survey for three variables (V1, V2, V3). The table below shows values of reference dates and calculated indicator values.

	V1	V2	V3
Reference date of the survey	31 December 2008	31 December 2008	31 December 2008
Reference date of the administrative source	1 December 2008	31 December 2008	1 January 2009
Indicator value	30	0	-1

3.3 Standard Error (T1)

3.3.1 Description

The standard error is the square root of the variance of the estimator. It is to a great extent determined by the sampling error; during the implementation of the survey also other random errors contribute to the standard error. A sampling error occurs in surveys based on a random sample; it is the result of the fact that the entire population is not observed in the survey but only a sample thereof. In general, the size of the random error depends on the estimator and sampling design used.

The standard error is often presented in the form of a coefficient of variation or confidence interval.

The indicator value refers to key statistics.

3.3.2 Calculation procedure

The standard error is thus determined by all random errors in the survey. Although random effects occur in all types of errors (errors due to non-response, measurement errors, etc.), these effects can to a great extent be attributed to sampling procedures in sample surveys. For practical reasons, in the calculation phase of sample surveys standard errors are usually equated with sampling errors. The procedure for calculating sampling errors is defined by the sampling design and the estimator used, therefore no general formulas can be applied. Consequently, at this point only the basic formulas can be stated for the estimate of the population mean in a simple random sample without replacement.

Let us assume that a simple random sample of size n was selected from a population with N units and that we would like to estimate the mean value of the variable Y on the basis of the sample. If the usual unbiased estimator of the mean $\hat{Y} = \frac{1}{n} \sum_{i=1}^n Y_i$ is used as the estimator, the unbiased estimator of the sampling error of this estimate equals:

$$Var(\hat{Y}) = \left(1 - \frac{n}{N}\right) \cdot \frac{s^2}{n}$$

where $s^2 = \frac{1}{n-1} \sum_1^n (\bar{y} - y_i)^2$ is the sample estimation of the population variance of variable Y .

The value of indicator T1 can be presented in different forms; for this purpose the standard error, the coefficient of variation and the confidence interval are most frequently used.

The standard error of the estimate is equal to the square root of the sampling error, i.e.:

$$se(\hat{Y}) = \sqrt{\hat{Var}(\hat{Y})}$$

The coefficient of variation is defined as the ratio between the standard error of the estimate and the estimate itself:

$$cv(\hat{Y}) = \frac{se(\hat{Y})}{\hat{Y}}$$

The coefficient of variation is usually expressed as a percentage.

At a 95% confidence level, the lower (I_{SM}) and the upper (I_{ZM}) limits of the confidence interval can be further calculated as follows:

$$I_{SM} = \hat{Y} - 1,96 \cdot se(\hat{Y}),$$

$$I_{ZM} = \hat{Y} + 1,96 \cdot se(\hat{Y}).$$

3.3.3 Explanation and calculation examples

The estimation of sampling errors of statistical results is a complex and extensive problem from both theoretical and practical standpoints. The simple formulas presented in Section 3.2 only apply in simple random sampling, which is rarely used in practice. By using more complex sampling designs or more demanding (non-linear) estimators, theoretical results are much more demanding and sometimes cannot be expressed in an exact analytical form.

The approaches applied to the calculation of the sampling error can be roughly divided into three groups:

- **Analytical approach.** For the calculation of the sampling error, direct or approximate formulas are used (usually on the basis of a linearisation method).
- **Resampling approach.** A set of subsamples is selected by means of an appropriate procedure; for each subsample an appropriate estimate is calculated; the variability of estimates obtained from different subsamples will then serve for the estimate of the sampling error.
- **Appropriate model approach.** The sampling error is expressed as a function of known parameters (or more easily measured parameters). These parameters may be: the estimate itself, the random error assuming simple sampling, the sampling error for the entire sample – the model provides an estimate for the domain, etc.

Example: Let us say that after we have implemented a statistical survey in which the mean value of variable Y is estimated on the basis of a simple random sampling without replacement, we get the data shown in the table below:

Population size (N)	Sample Size (n)	Mean Estimate (\hat{Y})	Population Variance Estimation (s^2)
10,000	500	800	50,000

In accordance with the above-stated formulas, we then calculate:

$$Var(\hat{Y}) = \left(1 - \frac{500}{10000}\right) \cdot \frac{50000}{500} = 0.95 \cdot 100 = 95$$

$$se(\hat{Y}) = \sqrt{95} = 9.75$$

$$CV(\hat{Y}) = \frac{9.75}{800} = 1.22\%$$

$$I_{SM} = 800 - 1.96 \cdot 9.75 = 780.9$$

$$I_{ZM} = 800 + 1.96 \cdot 9.75 = 819.1$$

Confidence interval: (780.9 ; 819.1)

3.4 Selection bias (T1_1)

3.4.1 Description

A selection bias is an indicator which replaces the *standard error* indicator in the case of a non-random sample. The selection bias measures an error in the statistical estimate caused by the fact that a part of the population was intentionally left out of the observation. Such selection bias also occurs in the case of random sampling, however, on the basis of a sampling frame in the preparation of which a coverage threshold was used. In this case, we can calculate the values of both indicators: T1 and T1_1.

The indicator value refers to key statistics.

3.4.2 Calculation procedure

Let us say that Θ_0 is the population value of the statistic which is being estimated and Θ_1 is the value of this statistic on the "narrowed" population which is the subject of our observation. The value of the indicator for dimensionless statistics (ratios and shares) is equivalent to:

$$T1_1 = \Theta_0 - \Theta_1,$$

while for dimensional statistics it is:

$$T1_1 = \frac{\Theta_0 - \Theta_1}{\Theta_0}.$$

3.4.3 Explanation and calculation examples

In practice, it is much more difficult to estimate a bias than a sampling error, because the survey itself does not provide information on the part of the population that is left out of the observation, which would allow such estimate; moreover, due to the non-random sample selection, we also cannot use procedures for statistical inference regarding the population. However, by using some other sources, such as structural statistics in short-term surveys or different administrative sources, at least a rough estimate of bias can be calculated.

Example: Let us say that in a quarterly survey based on a cut-off sampling (*inter alia*) the index of the *current quarter* is estimated with regard to the *mean of the previous year* and that for the year in question estimates have been obtained which are stated in the table below:

1 st quarter:	2 nd quarter:	3 rd quarter:	4 th quarter:
102.4	104.5	97.2	102.4

Let us further assume that the structural statistics provided information that the *population estimate* of the index of the *current year* equals $I_0 = 102.4$ with regard to the *previous year*. On the basis of the quarterly indices stated in the table, first the annual index $I_1 = 101.6$ is calculated by way of the arithmetic mean. Since this is a dimensionless statistic, the estimate of bias equals:

$$T1_1 = 102.4 - 101.6 = 0.78.$$

3.5 Unit non-response rate (T2)

3.5.1 Description

The value of the indicator is the rate of eligible units for which none of the required data could be obtained or the obtained data were not applicable. We can also calculate the weighted and unweighted indicator value.

The indicator value refers to the entire survey.

3.5.2 Calculation procedure

After the completed data collection, the sample units can be divided into four groups:

- **Ineligible units** (n_{inelig}). Units that were collected in a sample, however it transpired during the data collection phase that they were (no longer) part of the target population being observed. The most frequent reason that these units are part of the set of observational units is that the sources used for the determination of the sampling frame were incomplete and not updated.
- **Non-responses** (n_{nrsp}). Units eligible for the survey, but the required data from these units could not be obtained. This group most frequently includes units that refuse to participate.
- **Units with unknown eligibility** ($n_{eligibilityunknown}$). Units for which we could not obtain the required information and we do not know whether they are eligible for the survey or not. These are mainly non-contacted units.
- **Responses** (n_{rsp}). Units for which at least part of the required information could be obtained. In each individual survey it needs to be determined which amount of information required from a unit is the smallest to be deemed to be a response.

3.5.2.1 Unweighted rate

In view of the categories defined above, the unweighted non-response rate is calculated by the following formula:

$$T2 = 1 - \frac{n_{rsp}}{n_{rsp} + n_{nrsp} + \alpha \cdot n_{eligibilityunknown}}, \text{ where}$$

α is the (estimated) rate of units with unknown eligibility, which are actually eligible.

If there are no strongly justified assumptions for the estimate of parameter α , $\alpha = 1$ is considered, which means that all units with unknown eligibility are deemed to be non-responses.

3.5.2.2 Weighted rate

The weighted rate is calculated by the following formula:

$$T2_{ut} = 1 - \frac{\sum_{rsp} w_j \cdot x_j}{\sum_{rsp} w_j \cdot x_j + \sum_{nrsp} w_j \cdot x_j + \alpha \cdot \sum_{eligibilityunknown} w_j \cdot x_j}, \text{ where}$$

w_j is the sampling weight of the unit,

x_j is the value of the auxiliary variable.

If $X = 1$ is taken as an auxiliary variable, we obtain a weighted rate calculated only on the basis of the sampling weight.

$$T2_{ut} = 1 - \frac{\sum_{rsp} w_j}{\sum_{rsp} w_j + \sum_{nrsp} w_j + \alpha \cdot \sum_{eligibilityunknown} w_j}.$$

Such an approach can be used in surveys of persons and households.

In business and agricultural surveys, a part of the units is much more important than others in terms of their impact on the final results, therefore in such cases, as the auxiliary variable, a variable (known for the entire frame) that defines the size of the unit (e.g. the number of employees in an enterprise) must be taken into consideration. This variable must be strongly correlated to the study variable.

If surveys are not implemented on the basis of a random sample (e.g. cut-off sampling or a census), for each unit $w_j = 1$ and we obtain a special case of a weighted rate:

$$T2_{ut} = 1 - \frac{\sum_{rsp} x_j}{\sum_{rsp} x_j + \sum_{nrsp} x_j + \alpha \cdot \sum_{eligibilityunknown} x_j}.$$

3.5.3 Explanation and calculation examples

Here, a hypothetical survey case is given in which, after the completed data collection procedure, the following categories have been obtained:

Table 3.2: Example of T2 indicator calculation

	Number of units	Sum of the sample weights	Sum of the values of the auxiliary variable of the observation units	Weighted sum of the auxiliary variable
Responses	800	6500	17,800	70,250
Non-responses	200	1720	3850	7530
Eligible	100	1140	2530	6570
Unknown eligibility	60	450	1200	2560
Sample	1160	9810	25,380	86,910

If we suppose that the assumed value of the proportion of eligible units among the units of unknown eligibility equals $\alpha=0.75$, the indicator value can be calculated as follows:

- Unweighted rate

$$T2 = 1 - \frac{800}{800 + 200 + 0.75 \cdot 60} = 1 - 0.77 = 0.23$$

- Weighted rate

- Weighted auxiliary variable

$$T2_{ut} = 1 - \frac{70250}{70250 + 7530 + 0.75 \cdot 2560} = 1 - 0.90 = 0.10$$

- Only sample weight

$$T2_{ut} = 1 - \frac{6500}{6500 + 1720 + 0.75 \cdot 450} = 1 - 0.79 = 0.21$$

- Only auxiliary variable

$$T2_{ut} = 1 - \frac{17800}{17800 + 3850 + 0.75 \cdot 1200} = 1 - 0.82 = 0.18$$

3.6 Item non-response rate (T3)

3.6.1 Description

The rate of units where no data could be obtained for a certain variable although the unit is defined as eligible for that variable. The rate is calculated as the ratio between the number for the variable of eligible units for

which no data could be obtained and the number of all units eligible for this variable¹. In using administrative data, the indicator value calculated is the unsuccessful record linkage rate, which shows the percentage of units which we were not able to successfully link when using one or more administrative sources; consequently, the value of the variable could not be determined.

The indicator value refers to the key variable.

3.6.2 Calculation procedure

Y_{rsp} , Y_{nrsp} and $Y_{elig} = Y_{rsp} + Y_{nrsp}$ should be the number of responses, non-responses and eligible units for the selected variable Y . Then, we calculate the weighted and unweighted values of the indicator as stated below.

3.6.2.1 Unweighted rate

$$T3^Y = \frac{Y_{nrsp}}{Y_{elig}} = 1 - \frac{Y_{rsp}}{Y_{elig}}$$

3.6.2.2. Weighted rate

The weighted rate is calculated by the following formula:

$$T3_{ut}^Y = \frac{\sum_{j=1}^{Y_{nrsp}} w_j \cdot x_j}{\sum_{j=1}^{Y_{elig}} w_j \cdot x_j}, \text{ where}$$

w_j is the final unit weight,

x_j is the value of the auxiliary variable.

Unlike the unit non-response rate, in this case the final weight (and not the sample weight) is used because the observation units deemed to be non-responses (i.e. as units from which we were not able to obtain the relevant data) are usually also included in the procedure for calculating the final weight and therefore they cannot be weighted with this final weight. On the contrary, the partial response belongs to units that have already been weighted by the final weight, therefore the final weight can also be used for the calculation of the item non-response rate.

If we take $X = 1$ as the auxiliary variable, we obtain the weighted rate calculated only on the basis of the final weight:

$$T3_{ut}^Y = \frac{\sum_{Y_{nrsp}} w_j}{\sum_{Y_{elig}} w_j}.$$

In cases where for each unit the final weight is $w_j = 1$:

$$T3_{ut}^Y = \frac{\sum_{Y_{nrsp}} x_j}{\sum_{Y_{elig}} x_j}.$$

¹ For the response of an eligible unit among all responses (n_{rsp}) as defined for indicator T2 (see 3.5).

3.6.3 Explanation and calculation examples

The units eligible for the variable are units for which data should be obtained for that variable. The units eligible for the survey do not need to also be eligible for the selected variable. The difference between the number of eligible units and the number of units that are also eligible for the selected variable is in most cases related to the “skips” in the questionnaire. In determining units that are eligible for a question, we need to exclude those that are likely to skip questionnaire items, thus not providing a response to a particular question.

Example: If the question "Does your household have access to the internet?" is followed by the question "Do you have access to the internet via a personal computer or a desktop computer?" the units eligible for response to the second question are only those units whose response to the first question was "YES".

In order to illustrate the example by way of a calculation, the hypothetical example from 3.5 will be continued: The table states the assumed values for the selected key variable:

Table 3.3: Example of a T3 indicator calculation

	Number of units	Sum of the final weights	Sum of the values of the auxiliary variable of the observation units	Weighted sum of the auxiliary variable
Unit response	800	8,500	17,800	80,000
Eligible units for the key variable	500	6,000	12,000	60,000
Responses to the key variable	400	5,000	11,000	58,000

Unweighted rate:

$$T3^y = 1 - \frac{400}{500} = 0,2$$

Weighted rates:

$$T3_{ut}^y = 1 - \frac{5000}{6000} = 0,167 \text{ (only the final weight is considered).}$$

$$T3_{ut}^y = 1 - \frac{11000}{12000} = 0,083 \text{ (only the auxiliary variable is considered).}$$

$$T3_{ut}^y = 1 - \frac{60000}{58000} = 0,033 \text{ (only the weighted sum of the auxiliary variable is considered).}$$

3.7. Overcoverage rate (T4)

3.7.1 Description

The indicator shows the rate of ineligible units in the frame with regard to the number of all units in the frame. In this case, ineligible units are units (usually due to incorrect or out-dated data) included in the sampling frame although they are not part of the target population. If the survey is implemented on the basis of a sample, the overcoverage rate is estimated on the basis of information from a sample, which means that the weighted indicator value is calculated and presented.

The indicator value refers to the entire survey.

3.7.2 Calculation procedure

If

- N is the number of all units in the frame,
- N_{inelig} is the number of ineligible units in the frame,
- n_{inelig} is the number of ineligible units in the sample,
- $n_{eligibilityunknown}$... is the number of units of unknown eligibility in the sample,
- w_i sampling weight,
- α ... (estimated rate of units of unknown eligibility that are in fact eligible).

In a census or non-random sample, the indicator value is calculated as follows:

$$T4 = \frac{N_{inelig}}{N}$$

In a random sample, the estimate of the indicator value is calculated from the sample data. Apart from the explicitly established ineligible units, also the estimated rate of units of unknown eligibility can be considered for which it is assumed that they are in fact eligible $(1 - \alpha)$:

$$T4 = \frac{\sum_{i=1}^{n_{inelig}} w_i + (1 - \alpha) \cdot \sum_{i=1}^{n_{inelig}} w_i}{N}$$

3.7.3 Explanation and calculation examples

With regard to the data from the table in Section 3.3, the estimate of the overcoverage rate is calculated as follows:

$$T4 = \frac{1140 + (1 - 0.25) \cdot 450}{9810} = 0.128$$

3.8 Imputation rate (T5)

3.8.1 Description

The imputation rate is an indicator that is calculated when part of the value of the variable is imputed by one of the data imputation methods. Data may be imputed due to the missing value or as a correction of the value that was identified as invalid in the process of data editing. The indicator is calculated for key variables and is defined as the ratio between the number of units for which data were imputed (for any reason whatsoever) for the key variable in question and the number of all units for which (after statistical processing) any data are available for the variable. If, for the needs of aggregation, weights are used, the unweighted as well as the weighted indicator values need to be calculated and presented.

The indicator value refers to the key variable.

3.8.2 Calculation procedure

Let us say that V_i is an indicator whose value is 1 for units with the imputed variable value Y , while for other units the value is 0. If p is the number of all units where the data item is available for variable Y (the data item has been either provided or imputed), the unweighted indicator value is calculated as follows:

$$T5 = \frac{\sum_{i=1}^p V_i}{p}$$

If w_i is the final weight, the weighted value is calculated as follows:

$$T5_{ut} = \frac{\sum_{i=1}^p V_i \cdot w_i \cdot y_i}{\sum_{i=1}^p w_i \cdot y_i}.$$

3.8.3 Explanation and calculation examples

In calculating the imputation rate, we must take into consideration only those values which were imputed by way of a relevant statistical (imputation) method. Units which, during the phase of data editing, were corrected by way of re-verification with the reporting unit are not considered to be units with imputed data in this case.

In the table below, "supplementary" data are given for our hypothetical case:

Table 3.4: Example of the calculation of indicator T5

	Number of units	Weighted sum of variable Y
Data for variable Y	500	12500
Imputed data	160	1850

Unweighted indicator value:

$$T5 = \frac{160}{500} = 0.32$$

Weighted indicator value:

$$T5_{ut} = \frac{1850}{12500} = 0.148$$

3.9 Editing rate (T6)

3.9.1 Description

The editing rate for a certain variable Y is the ratio between the number of units for which the values of variable Y were corrected during editing and the number of all units that reported data for variable Y. As the corrected value, each data modification is considered irrespective of whether it has been corrected through administrative ("manual") or automatic editing procedures.

The indicator value refers to the key variable.

3.9.2 Calculation procedure

Let us say that E_i is an indicator whose value is 1 for units with a corrected original variable value Y , while for other units the value is 0. If p is the number of all units with data available for variable Y , the unweighted indicator value is calculated as follows:

$$T6 = \frac{\sum_{i=1}^p E_i}{p}.$$

If w_i is the final weight, the weighted value is calculated as follows:

$$T6_{ut} = \frac{\sum_{i=1}^p E_i \cdot w_i \cdot y_i}{\sum_{i=1}^p w_i \cdot y_i}.$$

3.9.3 Explanation and calculation examples

In counting the units with corrected values in the statistical process, we must take into consideration "manual" corrections undertaken in the phase of administrative editing, as well as automatic corrections undertaken in the phase of statistical data processing.

The table below shows further data for the hypothetical example used in the preceding illustrated examples:

Table 3.5: Example of the calculation of indicator T6

	Number of units	Weighted sum of variable Y
Data for variable Y	500	12500
Corrected data	180	3500

Unweighted indicator value:

$$T6 = \frac{180}{500} = 0.36.$$

Weighted indicator value:

$$T6_{ut} = \frac{3500}{12500} = 0.28.$$

3.10 Coherence of data sources (T7)

3.10.1 Description

This indicator is calculated if data for the selected variable are available for at least part of the units from two different sources and both sources are also used as a data source for this variable. The indicator value shows the coherence of data from two different sources. It can be a comparison of an administrative source with a statistical survey or a comparison of two different administrative sources.

The indicator value refers to a key variable whose values were obtained from different sources.

3.10.2 Calculation procedure

Let us assume that data for the selected key variable are available from two different sources for m observation units; $\{y_1, y_2, \dots, y_m\}$ are data for the variable from the first source (the source with higher priority), while $\{yy_1, yy_2, \dots, yy_m\}$ are values of the variable from the second source (the source with lower priority). The indicator value is then calculated as follows:

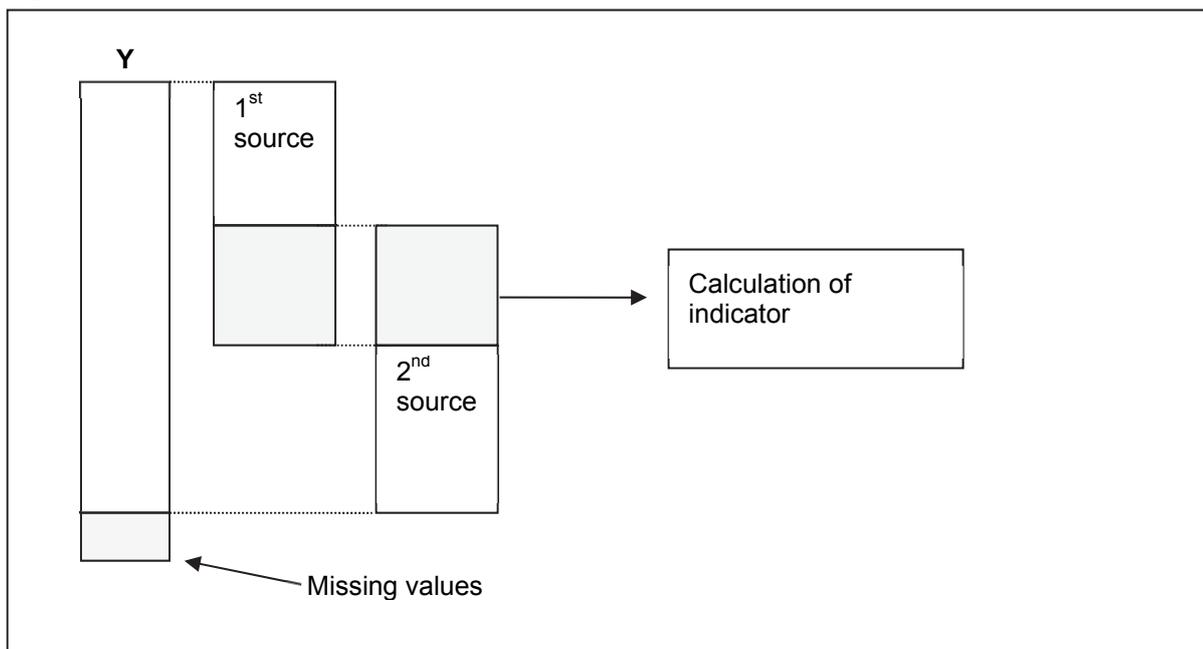
$$T7 = \frac{1}{m} \sum_{i=1}^m \frac{|y_i - yy_i|}{y_i}.$$

3.10.3 Explanation and calculation examples

When data are linked in the survey from different sources, more than two sources can be used for a variable. For reason of simplification and easier definition of the indicator in such case, the coherence of only two sources used should be estimated, i.e. the sources with the highest priorities.

The indicator should only be calculated if both sources are actually used for the determination of the value of the variable and if there is a set of units with data from both sources. Schematically, such a situation is shown in the figure below.

Figure 4.1: Coherence with data from different sources



Example: Let us suppose that data for the variable "the number of employees" for eight units ² have been obtained from two different sources. The table shows the data for both sources with the already calculated (absolute) differences.

Table 3.6: Example of the calculation of indicator T7

y	23	4	230	3	67	109	77	6
yy	21	4	222	2	59	109	79	7
Relative difference	0.0870	0.0000	0.0348	0.3333	0.1194	0.0000	0.0260	0.1667

The indicator value is calculated as the average value of relative absolute differences and we obtain:
 $T7 = 0.0959$.

3.11 Timeliness of the first results (PT1)

3.11.1 Description

The indicator timeliness of the first results measures the time difference between the date of the first release of results and the end of the reference period to which the released results refer.

The indicator value refers to the entire survey.

² The small number of units – which is completely unrealistic for concrete surveys – is only used for easier illustration of the calculations.

3.11.2 Calculation procedure

If the date that designates the end of the reference period is equal to D_0 and the date of the first release = the release of the first results is equal to D_1 , the value of the indicator equals $PT1 = D_1 - D_0$.

3.11.3 Explanation and calculation examples

In "sub-annual" statistics, the value of the indicator, which is the difference between two dates, should be indicated in the number of days, while in annual and multiannual surveys the number of months should be used as the unit. However, in expressing the indicator value, the time unit used should be clearly stated.

Example 1: If the results of monthly surveys which refer to January 2009 are first published on 17 March 2009, the indicator value equals $PT1 = (17.3.2009) - (31.1.2009) = 45$ (days). In accordance with the established (international) practice, it can also be written as $PT1 = T + 45$.

Example 2: If the results of a 4-year research study which refer to the year 2006 are first released on 1 June 2009, the value of the indicator equals $PT1 = (1.6.2009) - (31.12.2009) = T + 29$ (months).

3.12 Timeliness of the final results (PT2)

3.12.1 Description

The timeliness of the final results measures the time difference between the date of release of the final results and the end of the reference period to which the released results refer. The final results refer to the finality in terms of revising the previously released results and the release of more detailed results, which means that final and complete results have been released.

The indicator value refers to the entire survey.

3.12.2 Calculation procedure

If the date that indicates the date of the finality of the reference period equals D_0 , and the date of the first release equals D_1^k , the indicator value is equal to $PT2 = D_1^k - D_0$.

3.12.3 Explanation and calculation examples

With respect to calculating and expressing the result, the same rules apply as with indicator PT1.

Example 1: If the results of a monthly survey which refer to January 2009 are first released on 17 December 2009, the indicator value equals $PT2 = (17.12.2009) - (31.1.2009) = 320$ (days). In accordance with the established (international) practice, it can also be written as $PT2 = T + 320$.

Example 2: If the results of a 4-year research study which refer to the year 2006 are first released on 1 September 2009, the value of the indicator equals $PT2 = (1.9.2009) - (31.12.2009) = T + 32$ (months).

3.13 Punctuality of the first release (PT3)

3.13.1 Description

The punctuality of the first results is calculated as the difference between the announced and actual date of the first release of results. The indicator values should be calculated and expressed in the same way as the values of indicators PT1 and PT2.

The indicator value refers to the entire survey.

3.13.2 Calculation procedure

If the announced date of the first release equals D_N , and the actual date of the first release is D_1 , the indicator value equals $PT3 = D_1 - D_N$.

3.13.3 Explanation and calculation examples

Indicator values are always calculated and expressed in terms of the number of days. If the first results are actually released prior to the announced date of release of the first results, the indicator may also have a negative value.

Example 1: If the announced date of first release is 16 March 2009 and the results were published on 20 March 2009, the indicator value is equal to $PT3 = (20.3.2009) - (16.3.2009) = 4$.

Example 2: If the announced date of the first release is 16 March 2009 and the results were published on 13 March 2009, the indicator value is equal to $PT3 = (13.3.2009) - (16.3.2009) = -3$.

3.14 Length of comparable time series (P1)

3.14.1 Description

Indicator P1 expresses the length of time series from the last break in the time series, or the number of time points in the time series from the last break.

The indicator value refers to key statistical surveys.

3.14.2 Calculation procedure

If T is the last reference period for which results have been released (the last point in the time series) and T_0 is the first period with statistical results that are still comparable (the first time point after a possible break), the indicator value is determined as follows:

$$P1 = T - T_0.$$

If the time series has no breaks, the indicator value expresses the length of the entire time series.

3.14.3 Explanation and calculation examples

The indicator value expresses the number of periods in the time series; this means that the measurement unit depends on the periodicity of the survey. In a monthly survey, the value of the indicator is thus expressed as the number of months, while in a quarterly survey it is expressed as the number of quarters, etc.

The value of the indicator is to a great extent determined by the definition of the break in the time series. The fact is that it is impossible to establish exact criteria by which the break would be identified, which means that usually – at least partly – a subjective assessment is required. In general, we could say that a break in a time series occurs when one or several aspects of the survey change (e.g. in the source of data or the methodology used) and then the final results are no longer comparable. The OECD glossary of statistical terms defines in its original text time series breaks as follows:

Breaks in statistical time series occur when there is a change in the standards for defining and observing a variable over time. Such changes may be the result of a single change or a combination of multiple changes at any time point of observation of the variable.

Example 1: Let us assume that the reference period January 2002 represents the beginning of a comparable time series of a monthly survey. Then, the value of the indicator for the reference period June 2009 is $P1 = (June09 - January02) = 90$ (months).

Example 2: If in a yearly survey the year of the first comparable release of results is 1998, upon the release of the results for 2009 the indicator value is equal to $P1 = 12$ (years).

3.15 Coherence between provisional and final data (S1)

3.15.1 Description

The absolute and the relative differences between the value of statistics upon the first release and the value upon the release of the final data. As revisions, only those corrections are considered which are part of the regular procedure for the repeated releases of statistical results. Corrections due to discovered errors do not apply to this category and are not considered in the calculation of the indicator.

Even if the revision policy determines several versions of (provisional) data for the same reference period, for reason of simplicity, only the difference between the value of the first and the value of final release are calculated.

The indicator value refers to key statistics.

3.15.2 Calculation procedure

Let us say that X_z is the first and X_k the final value of the released statistical result (statistic). The calculation of the indicator is classified with regard to the type of statistical result.

If the released result is a "dimensionless" statistic (e.g. rate, index), the indicator value is calculated as the absolute difference:

$$S1 = |X_k - X_z|.$$

If the released result is a "dimensional" statistic (e.g. sum, average), the indicator value is calculated as the relative difference:

$$S1 = \frac{|X_k - X_z|}{X_k}.$$

3.15.3 Explanation and calculation examples

Instead of the title *coherence between the final and provisional results*, the indicator could also be referred to as *coherence between the most recently released results and the provisional results*. Since we usually calculate the value of indicator S1 after the release of the final results, the most recently released results are also the final results.

In particular in short-term statistics, the results for the same reference period are released several times (sometimes also more than 10 times). In such cases, at each release of results the difference compared to the first released result could be calculated. In order to simplify the calculation and to provide clarity, the indicator is only defined as the (relative) difference between the first and final releases. In such cases, a supplementary indicator can also be calculated and released, for example, the maximum deviation of the last release from the first release, which would be calculated as $\max\{X_i - X_z\}_{i=1}^m$, where m is the number of releases of statistical results (for the same reference period) after the first release of results.

Example 1: In this case, (hypothetical) first and final results in the monthly survey are stated for all months in 2008. Since the results are indices, the indicator value is calculated as the absolute difference. The average (annual) value of the indicator is also given.

Table 3.7: Example of the calculation of indicator S1 – indices

	Jan. 08	Feb. 08	Mar. 08	Apr. 08	May 08	June 08	July 08	Aug. 08	Sep. 08	Oct. 08	Nov. 08	Dec. 08	Average difference
First release	97.2	103.8	96.9	101.5	101.3	96.8	97.8	97.2	104.6	104.4	95.2	96.9	
Final result	97.4	104.0	96.0	100.5	99.4	95.2	98.2	99.1	105.0	102.7	93.2	95.2	
S1 (%)	0.21	0.13	0.90	0.94	1.90	1.60	0.41	1.88	0.48	1.69	1.94	1.69	1.15

Example 2: In the second example, we assume that a quarterly survey in which the result for which the indicator is being calculated is the sum of the variable (e.g. income) expressed in EUR. The indicator value is thus calculated as the relative difference.

Table 3.8: Example of the calculation of indicator S1 – sum

	1 st quarter 09	2 nd quarter 09	3 rd quarter 09	4 th quarter 09	Average difference
First release results	5489215	5821315	6469756	6723362	
Final release results	5675848	5908635	6502105	7025913	
S1 (%)	3.3	1.5	0.5	4.3	2.4

3.16 Coherence with the results of reference source (S2)

3.16.1 Description

The absolute or relative difference with regard to the results of the selected reference survey in which an equal or at least very similar and therefore comparable phenomenon is being observed, which can, however, be observed through a different methodology, or by different periodicity. The results of short-term surveys can thus be compared with the results of the relevant structural surveys, and vice versa. The results of surveys can also be compared with the results of national accounts and other institutions in and outside the country (e.g. mirror statistics in tourism statistics).

The indicator value refers to key statistics.

3.16.2 Calculation procedure

Let us say that X_t is the studied statistical result and X_0 is the comparable result from the reference source. As in the case of indicator S1, the value of this indicator is also calculated differently for dimensionless and dimensional results.

If the released result is a "dimensionless" statistic (e.g. rate, index), the indicator value is calculated as the absolute difference:

$$S2 = |X_t - X_0|$$

If the released result is a "dimensional" statistic (e.g. sum, average), the indicator value is calculated as the relative difference:

$$S2 = \frac{|X_t - X_0|}{X_t}$$

3.16.3 Explanation and calculation examples

The indicator value is largely dependent on the selection of the reference survey, therefore, the values of this indicator are not comparable between individual surveys. The indicator is informative in particular as regards the "internal" analysis of survey results, because very often certain deficiencies or a need for improvement only show up upon comparison to a reference source.

Example 1: Let us say that, in a particular survey, monthly indices, month with regard to the average of the previous year, are such as presented in the table below.

Table 3.9: Example of the calculation of indicator S2 - indices

Jan. 08	Feb. 08	Mar. 08	Apr. 08	May 08	June 08	July 08	Aug. 08	Sep. 08	Oct. 08	Nov. 08	Dec. 08
90.29	94.97	96.997	89.08	103.7	105.4	110.5	101.5	95.5	91.74	97.948	89.66

Let us further assume that the index of the annual growth rate calculated in the referential annual survey (average of 2008 compared to the average of 2007) $I_0 = 99,7$. Since this index is equal to the index calculated as the (arithmetic) mean in the table of given indices, the calculation is as follows:

$$I_t = \Phi(I_{Jan/\Phi07}, \dots, I_{Dec/\Phi07}) = 97.27$$

$$S2 = |97.27 - 99.7| = 2.43$$

Example 2: Let us assume that in two comparable quarterly surveys financial aggregates (in EUR) are being monitored. The table shows results in both the study survey and the referential survey and the relevant value of indicator S2.

Table 3.10: Example of the calculation of indicator S2 – sums

	1 st quarter 09	2 nd quarter 09	3 rd quarter 09	4 th quarter 09	Average value:
X_t	95876	96061	96375	95881	
X_0	98177	97502	97821	102113	
S2 (%)	2.4	1.5	1.5	6.1	2.9

4. QUALITY INDICATORS IN REGISTER-BASED AND COMBINED SURVEYS

In recent years, the use of administrative data as a direct data source has become current regular practice in implementation of the statistical surveys. The main motivation for this is in particular the effort to reduce the reporting burden, on the one hand, and to reduce the costs of the survey implementation, on the other. More intensive use of administrative sources also necessitated changes in the planning and implementation of the statistical process and as a result such changes also included a slightly changed method of quality assessment and reporting.

Among the six basic quality dimensions, the adjustment of the statistical process in the use of administrative sources definitely has the main impact on the dimension *relevance* and *accuracy*. In this case, the component *relevance* has a significantly stronger weight, because different aspects of the relevance of the sources applied determine to a great extent the quality of the final results. In quality assessment, all sources need to be described in detail, in particular their basic source and purpose, the reference period, the selection method and possible statistical processing. This information – which should be included in the quality report – is mainly of a qualitative nature, however, it is in particular the agreement of the target and the actual reference period that also enable a completely quantitative assessment in the form of indicator U2, which was described in Section 3.2.

The component *accuracy* is also an important component in the use of administrative sources, which, however, requires a slightly adjusted approach to field surveys. The adjustment of indicators for such surveys is described in the following section, this section only draws attention to one additional and one "supplementary indicator" for administrative and combined surveys. An additional indicator T7 (see 3.10) has thus been introduced in the final list of standard indicators (apart from the adjustment of the existing lists), which is calculated and included in the quality report only in the case of combined surveys. As a "supplementary" indicator, *selection bias* has been introduced, which in some cases replaces the indicator *sampling error*. However, it needs to be emphasised that this indicator is not directly connected to the data collection method, but to the type of selection of the observed units. As already stated in detail in Section 3.4, the indicator is used if a non-random sample is used as the selection method, and this methodology (in particular, cut-off sampling) is often used in register-based surveys.

4.1 Adjustments of some indicators for register-based surveys

In the first part of the document we introduced and described the list of standard quality indicators, among which are also those calculated only for surveys based on administrative or combined sources. In view of the fact that the definition of other standard indicators which belong to the component *accuracy* is mainly based on the implementation of field surveys, some additional explanations need to be given for these indicators in respect of register-based and combined surveys.

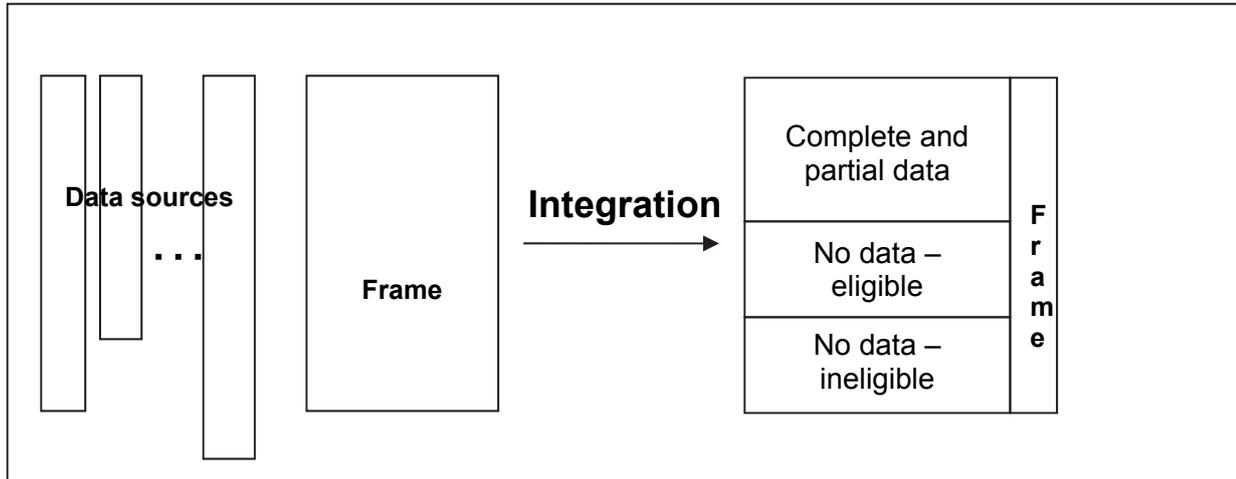
4.1.1 Item non-response rate

Since the use of administrative sources does not include direct data collection, it is required in such surveys that during the process of obtaining and linking administrative sources we replace a non-response concept with the most analogue phenomenon. This can be the phenomenon of unsuccessful data linkage, which can replace item non-response if administrative sources are used. When linking several sources, units can be linked by a direct or indirect linkage method. We talk about direct linkage if in the set of observed units and in the administrative source a common unique identifier is available via which linkage takes place. Units without a unique identifier can be linked via other common variables, such as the name, surname, date of birth, address, etc., which are used in surveys where the target population is individual persons. If in the linkage procedure both approaches are used, apart from the basic indicator value, also the unsuccessful direct linkage rate and the unsuccessful indirect linkage rate need to be calculated and presented separately. In this regard, for each calculated rate in the denominator, only the number of units which we actually tried to connect through a certain approach needs to be considered. At individual stages, direct linkage is carried out first; this means that in the procedure of direct linkage we should take into consideration those units which we previously failed to link successfully; this entails that the value of the denominator is lower than the entire number of the eligible units. Also in this case, the weighted value also needs to be calculated where appropriate.

4.1.2 Overcoverage rate

With regard to the definition in Section 3.7, the overcoverage rate is equal to the rate of ineligible units in the frame. If we wish to apply such definition also to register-based surveys, we first need to assume that the entire procedure is implemented in such a manner that the referential set of observation units (the frame) to which data from heterogeneous sources are linked is defined at the beginning. In this case as well as for the definition of indicators described in the following sections, we assume the situation presented in the following figure:

Figure 4.2: Process of integration of heterogeneous sources



Units for which we were not able to obtain the required data can thus also here be divided into eligible and ineligible units, and then the rate can be calculated according to the same procedures as described in Section 3.5. The problem, however, is how to identify such ineligible units because in field surveys such information is usually obtained from the field, while in this case there is no such contact, or (in combined surveys) the contact is rather limited. We therefore usually need to use information from other surveys or use additional administrative sources.

4.1.3 Imputation rate

As presented in the above figure, in the phase of data integration not all units are linked for all variables (see Section 3.8); in this case, too, we face a problem that corresponds to the problem of unit non-response and item non-response in field surveys. Moreover, in particular in the integration of several heterogeneous sources, there is a high probability that inconsistent records might be created. In register-based surveys, all of the above creates the need for different imputation methods to be used for the estimate of unavailable data, or the estimate for inconsistent data replacement. By using these methods, the value of the indicator is then calculated according to the same procedure as described in 3.8.

4.1.4 Editing rate

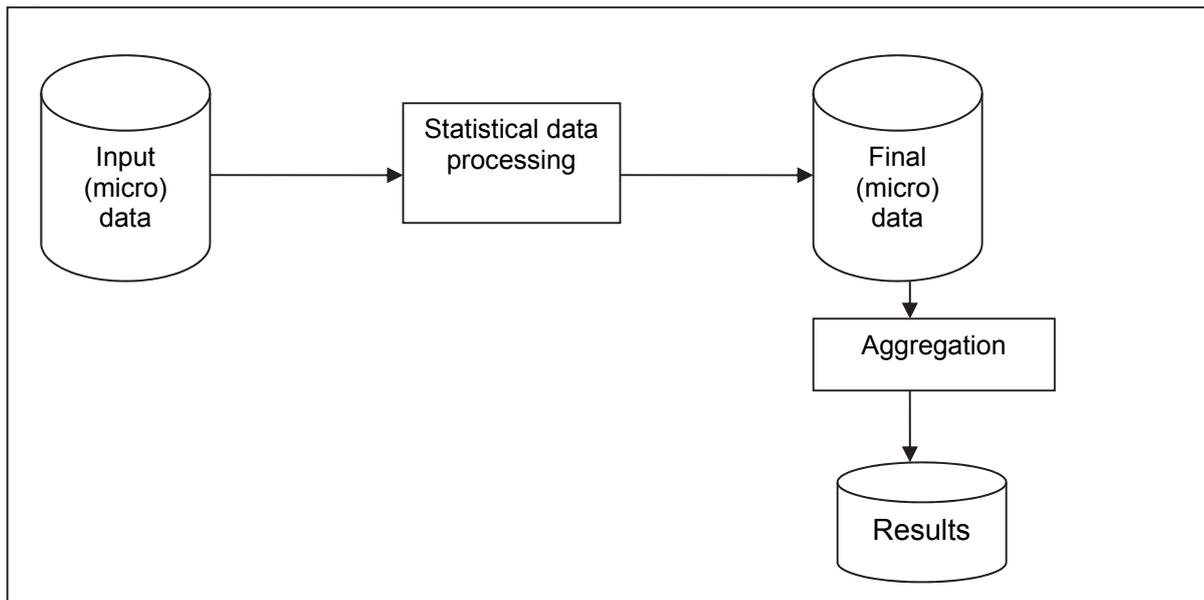
Data validation and data editing are procedures to be implemented in field surveys as well as in register-based and combined surveys. A specific characteristic of register-based surveys (regarding editing) is that editing procedures may be carried out on an individual source (prior to integration) or on an already linked data set (after integration). In calculating the indicator value, we need to consider corrections made prior to and after integration. In short, we take into consideration any correction made during the survey in question. On the other hand, we should not take into account those changes to data that have been made outside the scope of the survey, those undertaken by the data administrator at the SURS, or those undertaken by an external institution.

5 PROCESS INDICATORS AT THE MACRO LEVEL

5.1 Description

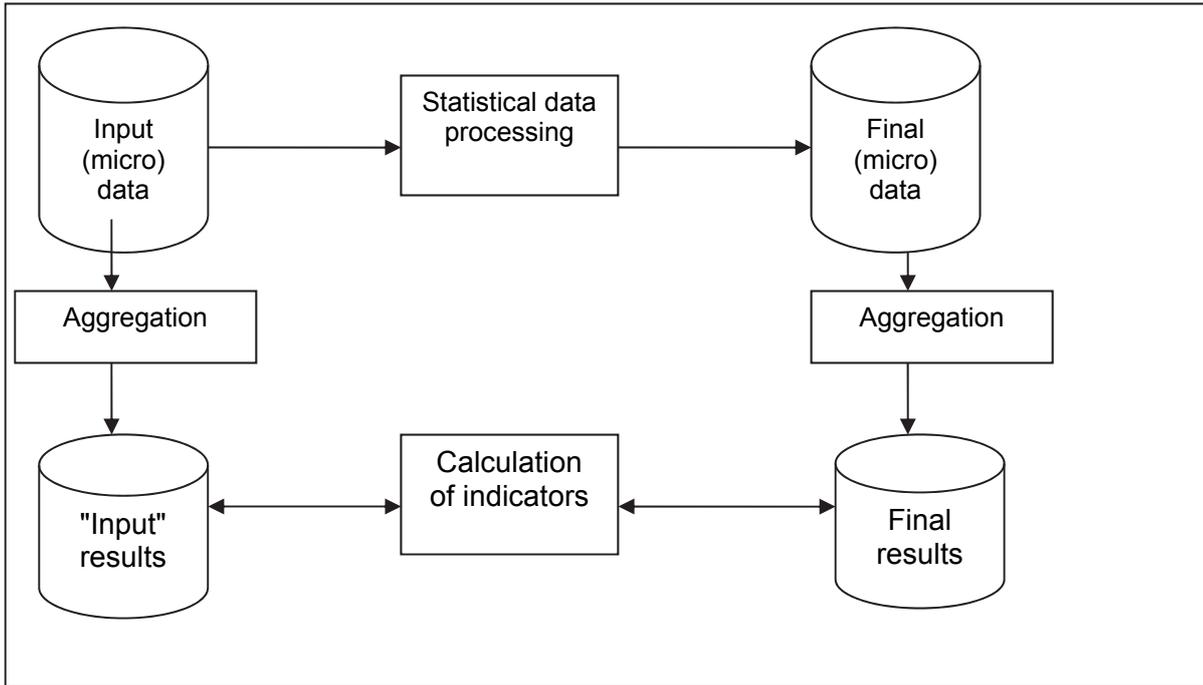
The development of new statistical methods and procedures and the development of computer applications that enable the introduction of such progressive methods has substantially changed the modern process of statistical data processing. Despite the undisputable positive impact, in particular in terms of efficiency and professional consistency, such development also brings consequences which producers in particular have not accepted with great enthusiasm. One of the less positive results of this development is that statistical processing is turning into an increasingly closed system for subject-matter statisticians – a black box, into which they have no insight and can only see the final results "produced" by that box (if things work as they should). In a very simplified way, such a process can be schematically presented as follows:

Figure 5.1: Simplified process of the survey implementation



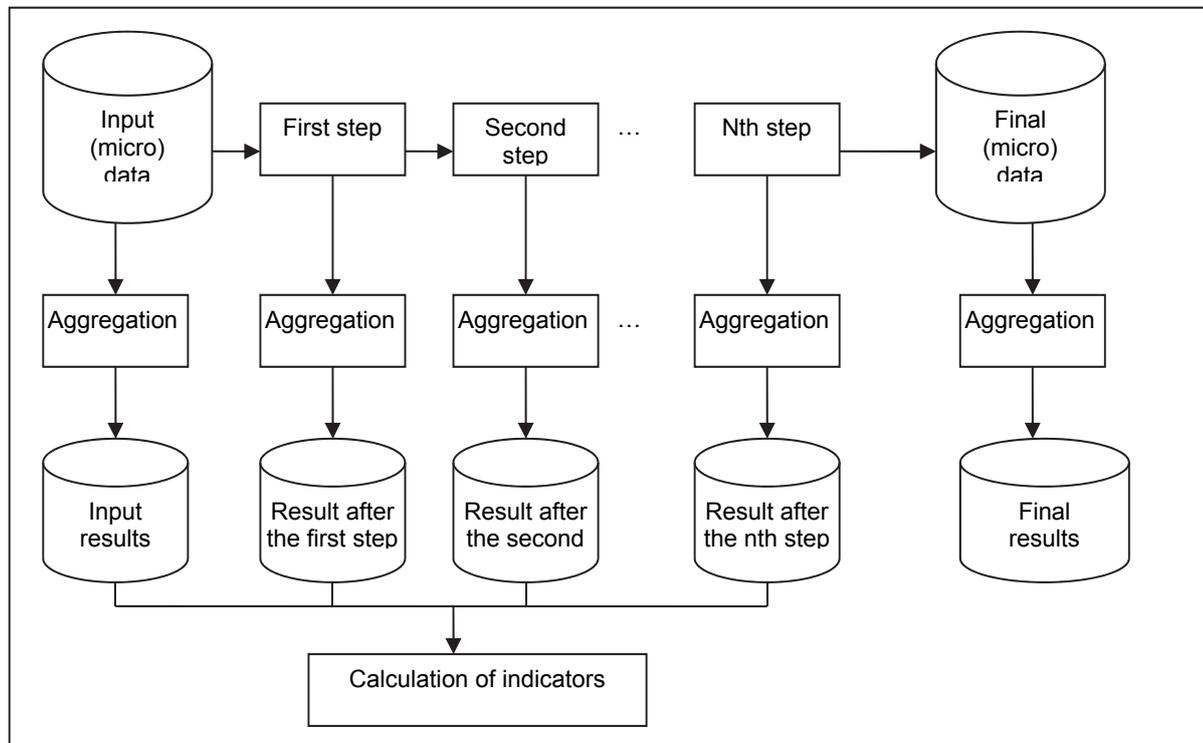
The purpose of process indicators at the macro-level is to provide the subject-matter statisticians with (at least partial) insight into the developments in the so-called black box of the statistical process, in particular, insight into the impact of statistical processing on the final result. For this purpose, we first need to slightly supplement the process presented above, i.e. by carrying out the aggregation already upon data input. The calculation of the indicators is then based on a comparison between the statistical results obtained prior to and after the processing.

Figure 5.2: Quality indicators at the macro level – basic example



If the statistical processing consists of several successive and separable steps (in the process), we can upgrade the above mentioned procedure and carry out the aggregation after each step performed, and then we can calculate the difference between the results obtained by individual steps.

Figure 5.2: Quality indicators at the macro level – monitoring of the entire process



5.2 Calculation procedure

Let us say that X_0, X_1, \dots, X_n are the values of the selected key statistics by sequentially performed steps of the statistical processing. The indicator value is always calculated as the difference compared to the final result. In this case, as in the case of compliance with the reference source, the value of the indicators in dimensional and dimensionless statistical results is calculated in a slightly different manner. If the published result is a "dimensionless" statistic (e.g. rate, index) the indicator values are calculated as absolute differences:

$$I_i = X_n - X_i, \text{ for } i \in \{0, 1, \dots, n-1\}.$$

If the released result is a "dimensional" statistic (e.g. sum, mean), the indicator values are calculated as the relative difference:

$$I_i = \frac{X_n - X_i}{X_n}, \text{ for } i \in \{0, 1, \dots, n-1\}.$$

5.3 Explanation and calculation examples

Let us say that in a survey in which we estimate the average value of variable $Y (\bar{Y})$, statistical processing consists of the following three steps: administrative (manual) editing, automated editing, and the imputation of missing values. The values of target statistics by individual phases of the process are designated as follows:

\bar{Y}_0 ... the value calculated on the basis of raw data

\bar{Y}_1 ... the value after administrative editing

\bar{Y}_2 ... the value after automated editing

\bar{Y}_3 ... the value after performed non-response imputations (final result)

Let us say that the following mean estimates were obtained in the period in question:

\bar{Y}_0	\bar{Y}_1	\bar{Y}_2	\bar{Y}_3
2834	2732	2903	2996

Since we are dealing with dimensional statistics, the values of process macro indicators are calculated as relative differences:

$$I_0 = \frac{2996 - 2834}{2996} = 0.054 = 5.4\%$$

$$I_1 = \frac{2996 - 2732}{2996} = 0.088 = 8.8\%$$

$$I_2 = \frac{2996 - 2903}{2903} = 0.031 = 3.1\%$$

6 AUTOMATISATION OF THE CALCULATION OF QUALITY INDICATORS

One of the key tasks of quality indicators is to provide statistical survey producers with quick insight into the results of statistical processing and draw their attention in due time (i.e. prior to release) to possible errors and deficiencies observed in the survey implementation and deficiencies in input data. It is therefore important that as many indicators as possible be available immediately after the implementation of a certain phase of statistical processing. Where appropriate, it needs to be ensured that indicator values are calculated already in the statistical process and as such are available together with the statistical results. For reason of functionality, SURS included the calculation of quality indicators in the SDP³ system, whose most practical implementation tool is the general user application called MetaSOP. MetaSOP is a modular application that through its modules offers general metadata-based programme solutions for the implementation of individual phases of the statistical process. We therefore have a special module for data editing, aggregation and tabulation, and, as already mentioned, also for the calculation of quality indicators. The application enables the calculation of indicators at the micro level as well as at the macro level.

6.1 Micro-level indicators

The application currently enables automatic calculation of five quality indicators at the micro level, which all belong to the dimension *accuracy*.

Table 6.1: Micro-level indicators included in the MetaSOP application:

Component	Notation	Indicator
Accuracy	T2	Unit non-response rate
	T3	Item non-response rate
	T4	Overcoverage rate
	T5	Imputation rate
	T6	Editing rate

In addition to the listed quality indicators, the application also always calculates the frequencies of observation units with regard to the reporting status (response, non-response, various types of irrelevance). These frequencies provide the user with more detailed insight into the reporting categories into which the units can be classified by the data collection phase and in a certain way supplement the information provided by the indicators *Unit non-response rate* and *Overcoverage rate*.

In order to make an automated indicator calculation based on the general programme, we first need to standardise the data and metadata that are used by the programme for calculations. It is particularly important that common standard code lists of key information from the collection and processing be used in all surveys. To that effect, the three standard code lists stated in Appendix III are of particular importance; at this point, however, they are only briefly described.

The code list of statuses for business entities. The code list for the record of information on the reporting status in business entity surveys. In terms of structure, this is a 2-level code list; at the first level, basic information is stated (response, non-response, non-activity, temporarily not operating, etc.), while at the second level, information is more detailed, for example providing reasons for temporarily not operating (collective leave, illness, season, etc.). The application for the calculation of quality indicators only uses the first level of the code list.

The code list for persons and households. The code lists for the keeping of records of data on the reporting status for surveys on persons and households. By formal structure, this code list is also a 2-level code list with a very similar substantive structure as the code list of statuses for business entities; however, the content of individual categories is adjusted to another target population. In this case, too, the application for the calculation of quality indicators only uses the first level of the code list.

³ Statistical data processing

The code list of variable statuses. The purpose of the code list in the statistical process is to provide simple yet exhaustive records on individual data changes in various phases of the statistical process. In terms of structure, this code list is a 3-level code list consisting of five-digit sign codes in the form xy.zz. The first level (x) tells us how the data were obtained (directly from the reporting unit or in some other way). The second level shows the status of data after the completed statistical process and provides in particular an overview of the data which in the data processing phase changed value and of the data which remained unchanged. The third, two-digit (xx) level is intended for the records on the method by which data whose values changed have been modified.

6.2 Macro-level indicators

In Chapter 5, the content of indicators at the macro level has already been described. It follows from their definition that these indicators are always closely connected with the procedures for statistical processing through which original micro data are changed. In fact, macro-level indicators show the impact of individual procedures on the (key) statistics of the survey.

The basic assumption to be fulfilled for the calculation of macro-level indicators through an automated procedure and general programme is that the data version can be precisely defined by individual processing steps and that the data version is recorded in a standard manner. SURS resolved this problem by using a separate standard variable appearing in all micro databases; it is called "record status". The values of the variable indicate at which step of the procedure an individual data version was created. Unlike the previously described statuses (e.g. the unit status, variable status) used in statistical processing, in this case the values are not related to the common standard code list; instead, the values of the record status are determined in individual surveys.

The automated procedure for calculating macro-level indicators thus results in values of selected statistics by individual steps of statistical processing, and the differences between the value of the statistics in the preceding step. Below, a purely hypothetical example of "made up" survey data is presented involving two steps of statistical data processing: corrections and imputations. Record status 1 thus designates raw data, while record status 2 designates data that were changed in the correction phase, while record status 3 designates data that were changed in the imputation phase. The table below shows an example of a printout of macro-level indicators, the average income per employee in a certain activity (statistics designation POVP_PRIH).

Table 6.2: Illustrative example of a printout of macro-level indicators

STAT_ID	STAT_DESCRIPTION	STATUS_RECORD	Value	Difference
POVP_PRIH	Average income per employee	1	836,345	
POVP_PRIH	Average income per employee	2	1,030,377	1.232%
POVP_PRIH	Average income per employee	3	989,162	0.96%

The table indicates that in the correction phase the statistical value increased by approximately 23%, while in the imputation phase the value dropped by 4%.

7 STANDARD QUALITY INDICATORS DEFINED BY EUROSTAT

The first list of standard indicators to be included in the quality reports at the national and European levels was adopted by Eurostat in 2003. The original list of indicators mainly had the status of a recommendation. We could hardly speak about a generally adopted standard because the quality indicators provided in the quality reports (even European) very often did not match the proposed list. An important step towards improved standardisation in this field was the introduction of the ESMS⁴ and ESQRS⁵ standards. Standard quality indicators to be integrated in (national and European) quality reports have been presented and described in detail in particular for the ESQRS standards. Both standard structures have also been integrated into the web reporting application named Metadata Handler⁶. Via this application, Member States now report the required quality data for different statistical areas to Eurostat.

The EES Standard for Quality Reports Structure (ESQRS) and the quality indicators that occur in this structure were described in detail for the first time in the methodological handbook *ESS Standard for Quality Reports* issued by Eurostat in 2009. In 2014, Eurostat prepared revised methodological documents on quality reporting⁷ and, as part of these documents, also a revised list of standard quality indicators. In 2015, it also upgraded the standards (ESQRS, ESMS); an important novelty in this upgrading process was the introduction of a new SIMS structure⁸, which merged the two existing structures into a single structure. One of the objectives of SURS in drawing up the original list of indicators and in its later adjustments was to harmonise the standards with European practice in order to reduce the possibility of double indicator calculations and releases. Our "domestic" list thus comply to a great extent with the Eurostat list. We, however, have taken into consideration some specifics of the statistical process at the national level; consequently, some indicators were left out while others were added.

The latest list of indicators, which was presented in more detail in the preceding sections, takes into consideration to a certain extent the revised Eurostat list from 2015, however, the coherence between the lists is slightly lower than with regard to the first lists. This is due to the fact that experience so far has shown that the original Eurostat list of indicators in practice actually did not "work" as a standard list because the standard reports for individual areas included indicators that were not on the list. In our opinion, some Eurostat indicators have also not been defined in terms of content and calculation for national purposes.

Below follows a table which shows the correspondence between our list and the list drawn up by Eurostat; it also includes comments and explanations. The entire list of Eurostat indicators can be found in the Appendices.

⁴ EURO-SDMX metadata structure

⁵ ESS Standard for Quality Reports Structure

⁶ <https://webgate.ec.europa.eu/estat/spe/metaconv/>

⁷ ESS Handbook for Quality Reports; ESS Standard for Quality Reports

⁸ Single Integrated Metadata Structure

SURS	EUROSTAT
U1 Statistical data completeness	R1 Data completeness - rate
U2 Agreement of reference dates	
T1 Standard error ⁽¹⁾	A1 Sampling errors - indicators
T1_1 Selection bias	
T2 Unit non-response rate	A4 Unit non-response - rate
T3 Item non-response - rate	A5 Item non-response - rate
T4 Overcoverage rate	A2 Over-coverage - rate
T5 Imputation - rate	A7 Imputation - rate
T6 Editing rate ⁽²⁾	
T7 Coherence of sources ⁽³⁾	A3 Common units - proportion
PT1 Timeliness of first results	TP1 Time lag - first results
PT2 Timeliness of final results	TP2 Time lag - final results
PT3 Punctuality of first release	TP3 Punctuality - delivery and publication
	AC1 Data tables - consultations
	AC2 Metadata - consultations
	AC3 Metadata completeness– rate
P1 Length of comparable time series	CC2 Length of comparable time series
	CC1 Asymmetry for mirror flows
S1 Coherence between provisional and final results ⁽⁴⁾	A6 Data revision - average size
S2 Coherence with the results of reference source	

Comments and explanations:

- (1) Our indicator is only a more general form of the same "phenomenon" because the sampling error is only one of the sources of the random error in a statistical result.
- (2) The latest version of the Eurostat list has left out the special editing indicator, however, it categorises all corrections in an imputation group. At SURS, imputation is only one of the possible methods of data editing (correction). So-called manual corrections are not captured in the imputation category.
- (3) Although both indicators refer to the same phenomenon – where the survey (for at least one unit) includes data from different sources – the definition of the indicator calculation slightly differs (see the definition of Eurostat indicators in the Appendix).
- (4) Our indicator as well as Eurostat's indicator measure the same phenomenon (the difference in the releases of the same result): our indicator is a slightly simplified version of Eurostat's indicator, while Eurostat's indicator measures the average difference in the entire revised time series, our indicator measures only difference at one time point.

8 SUMMARY OF DIFFERENCES WITH REGARD TO THE PREVIOUS LIST

Let us conclude with a brief summary of the differences between the new list of standard quality indicators and the "old" list defined in 2011.

- The indicator designations remain unchanged, only some quality indicator names have changed.
- The indicator *Unsuccessful record linkage rate* was left out, because from now on this indicator will be calculated when administrative data sources are used, i.e. with the indicator *Item non-response rate*.
- The indicator *Applied means of result release* was left out, because information related thereto is included in the methodological explanations of individual quality reports.

SOURCES AND REFERENCES

Printed publications

Biemer, Paul B., Lyberg, Lars E.: Introduction to Survey Quality: John Wiley & Sons, 2003

Wallgren, A., Wallgren, B.: "Register-based Statistics; Administrative Data for Statistical Purposes": John Wiley & Sons, 2007

Cox, Brenda G., et al. – Business Survey Methods: Wiley, 1995

Articles and other sources

Bergdahl, M. and Lyberg, L. (2004): Quality Management at Statistics Sweden. Current Work and the Future. Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2004), Mainz, Germany, 24-26 May 2004.

Brackstone, G. (1999): Managing Data Quality in a Statistical Agency. Survey Methodology 25, pp. 139-149.

Brancato, G., Pellegrini, C., Signore, M., and Simeoni, G. (2004), "Standardising, Evaluating and Documenting Quality: the Implementation of Istat Information System for Survey Documentation – SIDI", Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2004), Mainz, Germany, 24-26 May 2004.

Burg, T. (2004): Quality Reports at Statistics Austria. Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2004), Mainz, Germany, 24-26 May 2004.

Colledge, M. and Dalén, J. (2006): Improving Statistical Quality Assessment in Ten Counties. Paper presented at the European Conference on Quality in Survey Statistics (Q2006), Cardiff, United Kingdom, 24-26 April 2006.

Elvers, E. (2004): Quality and Metadata – Some Connections and Reflections. Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2004), Mainz, Germany, 24-26 May 2004.

Grünewald, W. and Körner, T. (2005). Quality on its Way to Maturity. Results of the European Conference on Quality and Methodology in Official Statistics (Q2004). Journal of Official Statistics, 21, 2005, pp. 747-759.

Hahn, M. and Lindén, H. (2006): The European Statistics Code of Practice for a High Quality European Statistical System. Paper presented at the European Conference on Quality in Survey Statistics (Q2006), Cardiff, United Kingdom, 24-26 April 2006.

ONS (2007), Guidelines for Measuring Statistical Quality, Version 3.1, London.

Osier, G. and Museux, J. (2006) " Variance Estimation for EU-SILC Complex Poverty Indicators Using Linearization Techniques", Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2006), Cardiff, UK, 24-26 April 2006.

Seljak, R. and Zaletel, M (2004), " Measurement of Data Quality in the Case of Short Term Statistics", Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2004), Mainz, Germany, 24-26 May 2004.

Seljak, R. (2006) "Estimation of Standard Error of Indices in Sampling Business Surveys", Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2006), Cardiff, UK, 24-26 April 2006.

Seljak, R. (2008) "Standard Error Presentation and Dissemination at the Statistical Office of the Republic of Slovenia", Paper presented at the European Conference on Quality and Methodology in Official Statistics (Q2008), Rome, Italy, 8-11 July 2008.

Statistics Canada (2003): Statistics Canada Quality Guidelines, 4th edition, October 2003.

Statistics Finland (2007): Quality Guidelines for Official Statistics.

Methodological documents at the European level

Standard Quality Indicators - Producer-oriented: "Assessment of quality in statistics" Working Group, Sixth meeting, Luxembourg 2-3 October 2003

Methodological documents, "How to make a quality report Handbook: "Assessment of quality in statistics" Working Group, Sixth meeting, Luxembourg 2-3 October 2003

Methodological documents, Standard Report: "Assessment of quality in statistics" Working Group, Sixth meeting, Luxembourg 2-3 October 2003

Eurostat (2007): "Handbook on Data Quality Assessment Methods and Tools (DatQAM)", Handbook written by Körner, T., Bergdahl, M., Elvers, E., Lohaus, P., Nimmergut, A., Sæbø, H.V., Szép, K., Timm, U., and Zilhão M.J.

Eurostat (2003): "Handbook on improving quality by analysis of process variables", Handbook written by Aitken, A., Hörngren, J., Jones, N., Lewis, D., and Zilhão, M.J.

Eurostat (2014): "ESS Handbook for Quality Reports", Methodologies and Working Papers, Eurostat, Luxembourg

Eurostat (2009): "ESS Standard for Quality Reports", Methodologies and Working Papers, Eurostat, Luxembourg

Web links

Standard Quality Reports, SURS
http://www.stat.si/metodologija_porocila-kakovost.asp

Eurostat website on quality
<http://epp.eurostat.ec.europa.eu/portal/page/portal/quality/introduction>

OECD website with methodological documents
http://www.oecd.org/findDocument/0,3354,en_2649_34257_1_1_1_1_1,00.html

Conference Q2004 (Mainz)
<http://q2004.destatis.de/>

Conference Q2006 (Cardiff)
<http://www.statistics.gov.uk/events/q2006/default.asp>

Conference Q2008 (Rome)
<http://q2008.istat.it/>

APPENDICES

I. LIST OF EUROSTAT QUALITY INDICATORS⁹

Name	Brief Description
R1. Data completeness - rate	The ratio of the number of data cells (entities to be specified by the Eurostat domain manager) provided to the number of data cells required by Eurostat or relevant. The ratio is computed for a chosen dataset and a given period.
A1. Sampling error - indicators	The sampling error can be expressed: a) in relative terms, in which case the relative standard error or, synonymously, the coefficient of variation (CV) is used. (The standard error of the estimator is the square root of its variance.) The estimated relative standard error (the estimated CV) is the estimated standard error of the estimator divided by the estimated value of the parameter, see calculation formulae below. b) in terms of confidence intervals, i.e. an interval that includes with a given level of confidence the true value of a parameter. The width of the interval is related to the standard error.
A2. Over-coverage - rate	The rate of overcoverage is the proportion of units accessible via the frame that do not belong to the target population (are out-of-scope).
A3. Unit non-response - rate	The ratio of the number of units with no information or not usable information (non-response, etc.) to the total number of in-scope (eligible) units. The ratio can be weighted or un-weighted.
A4. Item non-response - rate	The item non-response rate for a given variable is defined as the (weighted) ratio between in-scope units that have not responded and in-scope units that are required to respond to the particular item.
A5. Imputation - rate	Imputation is the process used to assign replacement values for missing, invalid or inconsistent data that have failed edits. This excludes follow-up with respondents and manual review and correction (if applicable). Thus, imputation as defined above occurs after data collection, no matter from which source or mix of sources the data have been obtained, including administrative data.
A6. Common units - proportion	The proportion of units covered by both the survey and the administrative sources in relation to the total number of units in the survey.
A7. Data revision - average size	The average over a time period of the revisions of a key item. The "revision" is defined as the difference between a later and an earlier estimate of the key item.
T1. Time lag - first results	The timeliness of statistical outputs is the length of time between the end of the event or phenomenon they describe and their availability.

⁹ The list has been taken directly from the website: <http://ec.europa.eu/eurostat/web/quality/quality-reporting>

T2. Time lag - final results	The timeliness of statistical outputs is the length of time between the end of the event or phenomenon they describe and their availability.
T3. Punctuality - delivery and publication	Punctuality is the time lag between the delivery/release date of data and the target date for delivery/release as agreed for delivery or announced in an official release calendar, laid down by Regulations or previously agreed among partners.
AC1. Data tables - consultations	Number of consultations of data tables within a statistical domain for a given time period. By "number of consultations" it is meant number of data tables views, where multiples views in a single session count only once. Some information available through the monthly Monitoring report on Eurostat Electronic Dissemination and its excel files with detailed figures.
AC2. Metadata - consultations	Number of metadata consultations (ESMS) within a statistical domain for a given time period. By "number of consultations" it is meant the number of times a metadata file is viewed. Some information is available through the monthly Monitoring report on Eurostat Electronic Dissemination and its excel files with detailed figures.
AC3. Metadata completeness - rate	The ratio of the number of metadata elements provided to the total number of metadata elements applicable.
CC1. Asymmetry for mirror flows statistics - coefficient	Discrepancies between data related to flows, e.g. for pairs of countries.
CC2. Length of comparable time series	Number of reference periods in time series from last break.

II. CODE LISTS WITH KEY INFORMATION ON DATA COLLECTION AND PROCESSING

Code list with statuses of variables¹⁰

Code	Description
1	Data obtained from the reporting unit
11	Originally obtained (original) data
11.11	Reporting by mail questionnaire
11.12	Computer-assisted telephone interviewing (CATI)
11.13	Telephone interviewing without computer assistance
11.14	Paper-and-pencil interviewing (PAPI)
11.15	Computer-assisted personal interviewing (CAPI)
11.16	Paper-assisted self-interviewing
11.17	Computer-assisted self-interviewing (CASI)
11.18	Computer-assisted web-interviewing (CAWI)
41	Imputation for non-response – original value
41.10	Method of zero values
41.11	Logical imputation
41.12	Historical data imputation
41.13	Mean value imputation
41.14	Nearest neighbour imputation
41.15	Hot-deck imputation
41.16	Cold-deck imputation
41.17	Regression imputation
41.18	Most frequent value (modus) method
41.19	Estimation of annual value based on infra-annual data
41.20	Estimated value on the basis of a bracketed question format
41.21	Stochastic hot-deck (random donor)
41.22	Regression imputation with random residuals
41.23	Multiple imputation
41.24	Structural rate imputation (data structure)

¹⁰ Only a part of the code list is presented. The entire code list is available on the SURS website under Classifications and code lists (KLASJE).

Code list with reporting statuses for enterprises¹¹

Code	Description
1	Response
3	Non-response – known and unknown eligibility
4	Observation unit no longer operates
5	Unit is temporarily not operating
6	Unit is not a part of the target population
7	Demographic change
8	Direct descendant
9	Other reasons – ineligible units

Code list with reporting statuses for persons and households¹²

Code	Description
1	Response
2	Eligible, non-response, refusal
3	Eligible, non-response, non-contact
4	Eligible, non-response, other reasons
5	Unknown eligibility, non-response, non-contact
6	Not eligible: vacant housing unit/non-working number
7	Not eligible: not a housing unit or according to definition of a survey not eligible household/selected person
8	Not eligible: household/selected person not eligible (panel)
9	Family farm (agricultural holding) no longer eligible

¹¹ Only the first code list level is presented; the entire code list is available on the SURS website under Classifications and code lists (KLASJE).

¹² Only the first code list level is presented; the entire code list is available on the SURS website under Classifications and code lists (KLASJE).

