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ASSESSMENT OF THE QUALITY IN STATISTICS

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Room Quetelet, BECH-building

Item 4. of the agenda

Definition of quality in statistics

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Introduction

This paper lists the major subjects that should be included in a report on quality. The details to be included in the report are contained in document 'Standard quality report'

1. DEFINITION OF QUALITY

Quality is defined in the ISO 8402 - 1986 as: "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs". This could be analysed in the framework of Total Quality Management. We will adopt a more restricted approach, concentrating initially on the "products" rather than on the process as a whole. An exception will be made: timeliness is related to dates, which are process information. One can also noted that relevance component is a valuation made by final users, which the report is not directly final user-oriented.

Quality of statistics can be defined with reference to several criteria:

- relevance of statistical concepts;
- accuracy of estimates;
- timeliness and punctuality in disseminating results;
- accessibility and clarity of the information;
- comparability of statistics;
- coherence.

Although not a measure of quality, the resources available for the production of statistics act as a constraint on quality. When assessing the ability of a Member State to comply with quality guidelines, it is necessary to take account of the resources available.

Relevance of statistical concepts

The statistical concepts used for statistics are relevant if they meets users' needs. The identification of users and their expectations is therefore necessary.

Accuracy of estimates

Accuracy is defined as the closeness between the estimated value and the (unknown) true population value. Assessing the accuracy of an estimate involves analysing the total error associated with the estimate.

Timeliness and punctuality in disseminating results

Most users want up-to-date figures, which are published frequently and on time at pre-established dates.

Accessibility and clarity of the information

Statistical data have most value when they are easily accessible by users, are available in the forms users desire and are adequately documented. Assistance in using and interpreting the statistics should also be forthcoming from the providers.

Comparability of statistics

Statistics for a given characteristic have the greatest usefulness when they enable reliable comparisons of values taken by the characteristic across space and over time. The comparability component stresses the comparison of same statistics between countries in order to evaluate the meaning of aggregated statistics at the European level.

Coherence

When originating from a single source, statistics are coherent in that elementary concepts can be combined reliably in more complex ways. When originating from different sources, and in particular from statistical surveys of different frequencies, statistics are coherent insofar as they are based on common definitions, classifications and methodological standards. The messages that statistics convey to users will then clearly relate to each other, or at least will not contradict each other. The coherence between statistics is orientated towards the comparison of different statistics, which are generally produced in different way and for different primary uses.

Completeness

Domains for which statistics are available should reflect the needs and priorities expressed by the users of the European Statistical System.

About Cost

There is clearly a strong link between the quality of statistics and the resources available to produce them. An assessment of costs should be kept in mind during the quality evaluation process.

2. RELEVANCE OF STATISTICAL CONCEPTS

The statistical concepts (statistical measure, variable, population, units, domains and time of reference) from which statistics are built should be those users need.

A basic concept of statistics is the statistical characteristic, which is defined by the following operation: a given *statistical measure* is applied to summarise the values of a *variable* for the *units* in a specified group. The entire group of units is usually called the *population*. Often, different subgroups, *study domains*, are of interest. Population, units, and variables all have a *time of reference*, a point or a period in time.

To answer questions on a subject-related issue, there is a set of suitable statistical characteristics, the characteristics of interest. Sometimes these are difficult to make operational in a statistical survey. The survey is directed towards targeting characteristics that are feasible from the survey point of view and close enough to the interests.

3. ACCURACY

This aspect of quality has been extensively studied in many statistical agencies and by academics. Accuracy focuses on an analysis of errors, divided into sampling and non-sampling errors.

Errors can be classified as follows:

2.1. Sampling errors
2.2. Non-sampling errors
    2.2.1 Coverage errors
    2.2.2 Measurement errors
    2.2.3 Processing errors
    2.2.4 Non-response errors
    2.2.5 Model assumption errors

Groves (1989), Lessler and Kalsbeek (1992), Särndal, Swensson and Wretman (1992), Biemer and Fesco (1995), Quality Measurement Model of the BLS (1995), Statistics Canada (1998) use similar classifications.

Until now, statisticians have focused mainly on sampling errors. Estimates of accuracy published by statistical agencies usually cover only sampling errors[1]. However, research into non-sampling error is developing rapidly, and some methods are now available for a first assessment of such errors. For instance, see Biemer et al. (1991).

4. TIMELINESS AND PUNCTUALITY

Users generally require that statistical information takes a minimum amount of time to produce, is released as soon as it is available, and where appropriate is available on a regular basis. Keeping production times to a minimum implies efficient production techniques, often at great expense. The whole process of data collection, editing, imputation, estimation and dissemination has to be kept under control in order to minimise the processing period. A partial solution to the problem is to provide early estimates, based on a sub-sample of respondents. Care needs to be taken over the presentation of these early estimates, and also with the subsequent dissemination of the revised information.

There is sometimes competition between (often private) statistical information, produced and disseminated very rapidly but with less reliability, and slower, but more accurate, statistics from government agencies. The trade-off between timeliness and accuracy has some very visible consequences for certain users. This challenges statistical agencies to improve the timeliness of their statistics with no reduction in the high standards of quality.

5. CLARITY AND ACCESSIBILITY OF STATISTICS

Dissemination is a vital step in the information chain. It is not sufficient to have “good statistics” stored somewhere inside the statistical office. They have to be made available to all potential users, in an appropriate form. Firstly, users should be in a position to know easily which kind of statistics is available. Secondly, physical access to the statistics should be convenient. Thirdly, the statistics should be accompanied by the necessary information on concepts and methods. Different levels of explanation should sometimes be envisaged, in order to differentiate between those who are subject specialists and those who are not. Finally, analysis of the statistics may emphasise the service dimension of statistical products.

[1] In fact, the estimated variance depends in practice on response rates and certain non-sampling errors - e.g. random measurement errors - but it does not account for all non-sampling errors. In particular, most systematic errors are not included in this measure of accuracy.

6. COMPARABILITY

There may be a difference between national concepts and European definitions. Comparability is not limited to the comparability within the EU: Eurostat should be in a position to assess the comparability of EU statistics with the statistics of other countries or groups of countries (USA, Japan).

When comparing statistics between domains, differences in concepts are all the more altering the comparison when the sub-populations corresponding to the domains are surveyed separately. The effects of such differences should be considered.

Comparability should also exist over time: changes due to modification of the reference concept or of the measurement process should be documented and the impact of these changes assessed. In the same way, changes in society in general (e.g.: new legislation) having an impact on continuity should be taking into account.

7. COHERENCE

Where similar statistics from various sources[2] exist, they should be identified and any differences should, if possible, be quantified. A discrepancy between two sets of statistics produced by different surveys may be due to differences in the data collection process or differences in reporting units resulting in different estimates. The situation may be improved by benchmarking (for instance monthly or quarterly statistics on annual results) or by combining different survey results. In any case, misunderstanding by users should be prevented by the use of different wording for the different concepts.

In addition, statistics estimating complex concepts (ratios, elasticity, etc.) should be based on coherent elementary statistics (with compatible definitions of the reference population(s), characteristic, reference period, and statistical unit).

8. COMPLETENESS

Strategical users, mainly political actors and media define the needs and priorities. The European Statistical system answers to their needs by adapting or creating concepts which should be measured at the European level. The implementation takes time and depends on available budget. Therefore completeness component has to measure how far the European statistical system as a whole answers to the needs and priorities by globally comparing the users' demands and the available statistics and taking account of the relevance of statistical concepts, and of the time-lag to produce the statistics needed.

9. RELATED INFORMATION: COST CONSTRAINT

Quality is associated with costs. Information on the resources available to survey managers allows an assessment of how to optimise the budget they receive. The resources available to a Member State should be taken into account when assessing their likely ability to satisfy quality

[2] : "Sources" mean here surveys or statistics calculated from administrative data at the national level by the Official Statistical System.

measures. Two components of cost can be considered*: the cost to the statistical office* and *the burden to the reporting units* (enterprises or parts of enterprises, households, individuals). Costs for a new survey may be much higher than the costs for an existing survey when the sample for existing surveys is only partially from one wave to the following. The use of administrative data drastically reduces the burden on statistical units. However, the cost supported by NSI for planning and setting up surveys based on the use of administrative sources are not negligible. The burden on enterprises may be measured as costs; on the contrary for individuals or households.
Costs are more a constraint for quality improvement than a component of quality itself.

Note 1: There is a trade-off between the different components of quality, especially:

timeliness/accuracy
accuracy/comparability through space[3]
relevance/comparability over time
relevance/accuracy
coherence for large domains/relevance for sub-domains.

[3] : Because comparability through space may impose common concepts that are more difficult to measure than national - but non-comparable - concepts.

Note 2: The above breakdown of quality into components is not unique. Other organisations have proposed other breakdowns for the joint use of statistics:

1) *United Nations (1983).* Nine points overall, including:
- 'Comparability over time'
- 'Comparability with other statistics'

2) *Statistics Canada (1992).* Nine points overall, including:
- 'Comparability over time'
- 'Comparability with data from other sources'

3) *Beekman and Struijs (1993)*; three main categories including:
- 'compatibility of statistical output'; compare or combine statistics from one statistics with those of others with the aspects comparability in time (continuity of time series) and compatibility of simultaneous statistics

4) *Statistics Netherlands (1995).* Section II.2. on 'The need for coherence' lists seven aspects:
- additivity of statistics referring to different areas of economic activity, e.g. fixed capital formation in trade and manufacturing industry;
- comparability of statistics on different subjects, e.g. employment data from labour surveys and turnover statistics from production statistics;
- consistency of the outcomes of short-term statistics with those of annual statistics;
- consistency of the outcomes of regional statistics with those of national statistics;
- continuity of the outcomes for period t with those for period t+1;
- comparability of national statistics with international statistics;
- conformity of concepts and outcomes of business statistics with the System of National Accounts (SNA) and the European System of Accounts (ESA).

5) *Statistics Sweden (1994):* four components are singled out: Content, Time, Reliability, Accessibility. Content includes comparability with other statistics and Time includes comparability over time. A very user-oriented approach with great importance attached to a quality declaration. However, E. Elvers and B. Rosén, in their contribution (1997) to the Encyclopedia of Statistical Sciences, Wiley and Sons, propose a decomposition into 5 components similar to the first 6 components of Eurostat but grouping coherence and comparability.

References

Biemer, P., Groves, R.M., Lyberg, L.E., Mathiowetz, N.A. and Sudman, S. (eds) (1991) *Measurement Errors in Surveys*, New York: Wiley

Beekman, M. M. and Struijs, P. (1993*).* *The quality of economic concepts and definitions.* Statistical Journal of the United Nations ECE 10, 1-15.

Biemer, P.P. and Fesco R. S. (1995) *Evaluating and controlling measurement error in business surveys*, in Cox and al. (eds) Business Survey Methods, New York: John Wiley, pp.257-281

Bureau of Labor Statistics (1995), Quality Measurement Model, presented at the International Conference on Survey Measurement and Process Quality, Bristol (UK)

Elvers, E. and Rosén, B. (1997), Quality Concept for Official Statistics, Entry in the forthcoming update of the Encyclopedia of Statistical Sciences, Wiley & Sons

Groves, R.M. (1989) *Survey Errors and Survey Costs*, New York: John Wiley

Lessler, J.T. and Kalsbeek, W. D. (1992) *Nonsampling Errors in Surveys*, New York: John Wiley

Lyberg L., Biemer P., Collins M., De Leeuw E., Dippo C., Schwarz N., Trevin D. (eds) (1997). *Survey Measurement and Process Quality*. Wiley.

Särndal C.E., Swensson B. and Wretman J.(1992) *Model Assisted Survey Sampling*, New York: Springer-Verlag

Statistics Canada (1992). *Policy on Informing Users of Data Quality and Methodology*. Policy manual, Statistics Canada, April 7, 1992.

Statistics Canada (1998) Quality guidelines. Third edition. October 1998

Statistics Netherlands (1995) *Reference Manual on Design and Implementation of Business Surveys*. Koeijers, E. and Willeboordse, A. (editors). First draft, on request of Eurostat.

Statistics Sweden (1994) Quality definition and recommendations for quality declarations of official statistics (authors: Chris Denell, Eva Elvers and Bengt Rosén).

United Nations (1983) *Guidelines for quality presentations that are prepared for users of statistics*. Statistical Commission and Economic Commission of Europe, Conference of European Statisticians, Meeting on Statistical Methodology, 21-24 November 1983.