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DATA QUALITY IN NATIONAL STATISTICAL INSTITUTES

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1. Introduction

For many years now, countries have considered quality to be an essential aspect of the organization of institutions wishing to meet their clients' needs and ensure their own survival.

This has been a concern of the National Statistical Offices, which have worked to develop different quality-control strategies in an effort to earn the trust of users of the statistical information they produce.

These strategies vary widely in scope and application, so they may simultaneously affect different processes. They may be geared towards production, users/clients and staff, or they may be designed to measure performance.

Statistical offices have traditionally emphasized accuracy, a key aspect of quality. Most publications showing results of statistical surveys have included references to sampling and non-sampling errors, in order to enable users to apply the data properly.

At present, however, countries with more sophisticated statistical services have extended the traditional idea of quality to include generally accepted attributes or domains that are important in measuring ongoing progress in statistical activities and products. Thus, the broader concept of quality includes aspects such as relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability, coherence and completeness.

It would therefore seem advisable for National Statistical Offices to consider producing standard quality reports relating to the aforementioned domains. Such reports would include an assessment of quality improvements as they are introduced, through a series of quantitative and qualitative indicators tailored to the domain and type of statistical product concerned. This would make it possible to provide users with more detailed reports on the quality of the statistical information provided, thus enabling them to make better use of it.

In addition to standard quality reports, which serve as the vehicle for adopting and systematically monitoring quality programmes, several other steps can also be taken. Several countries have already adopted some such measures for use in specific situations. They can be applied simultaneously by different units at different stages in the statistical process and in relations with suppliers and users of data.

2. Quality improvement actions or instruments recommended for National Statistical Systems

In the European Union, representatives of National Statistical Offices of member countries and of the Statistical Office of the European Commission (EUROSTAT) have for several years been studying instruments for improving the efficiency and quality of the European Statistical System, with a view to adopting those that work best.

Many of these efforts have to do with improving the quality of the national statistical data which the countries supply to EUROSTAT. The idea is to facilitate the adoption of such measures in the production of European statistics.

The different types of quality-improvement actions can be implemented gradually by the countries in the institutions and agencies that make up the National Statistical Systems.

Following is a brief summary of the measures in question, in the hope that the information will prove useful in other regions that might wish to take action in some of these areas.

(a) Preparation of standard quality reports. The specific details of this instrument are discussed separately below. Suffice it to say that standard quality reports make it possible to identify different qualitative and quantitative indicators in previously defined quality domains and to measure or report on improvements in the quality of statistical products, in a systematic fashion.

(b) Use of quality measurement models in National Statistical Offices. This instrument allows for systematic measurement of improvements in quality and performance. The European Union recommends use of the EFQM Excellence Model to improve the management system. This method is also recommended in Spain by the Ministry of Public Administration. The EFQM Excellence Model provides a non-prescriptive framework that is based on the assumption that an organization can consistently achieve excellence through different approaches.

(c) Improvement of relations with reporting units. It should be borne in mind that, on the one hand, the accuracy of the data supplied by reporting agencies is one of the most important components of quality. On the other hand, reporting units are now being asked to provide more and more data, with greater detail and frequency. It is therefore essential to facilitate their task; at the same time, much of the burden of response can be reduced through the use of information from other sources, such as administrative records.

(d) User satisfaction surveys. These instruments help identify different groups of users, with a view to determining what their needs are and ensuring that the different statistical projects meet those needs.

(e) Producer-user forums. Efforts should be made to facilitate these contacts on a regular basis, so as to take into account the new information requirements of different social groups in different geographical areas and to enable users to approach producers to obtain information about their resources, techniques and methods and the types of information that are generated.

(f) Training manuals. The National Statistical Offices should develop handbooks to enable new recruits or staff who have been transferred from other positions to learn about subjects such as "best methods used", "good practices in the preparation of official statistics" and "identification of key variables in process, measurement and analysis".

(g) Checklists. A general checklist might be drawn up for simple self-assessment programmes to be used by persons in charge of surveys. These checklists help avoid problems caused by the routine nature of the work.

(h) Audits. Audits conducted at different levels and for different purposes —internal, external, short-term, ongoing— help bring to light potential shortcomings in the different stages of a statistical research project; they also help determine the causes of such problems and the limitations that must be faced

(i) Documentation describing the institution's mission statement, as well as its policies regarding dissemination and quality, should be prepared and made available to the public.

(j) It is important to determine how the staff perceives quality and to train them in this regard. Training programmes should be developed for different categories and levels of staff.

The fact that these quality improvement actions are described here does not mean that they are not already a part of the regular work of the National Statistical Offices. Indeed, they are already being implemented in many countries. The problems is that they are applied only occasionally, in specific cases, but not systematically, and there is no reporting on actual implementation. These actions should be an integral part of the work programme and should be monitored over time.

3. Preparation of standard quality reports

Standard quality reports are needed in order to measure performance and quality and enable National Statistical Offices to have standardized information on their main weaknesses and determine what is happening at the different stages in the production of official statistics. Such reports also provide information on user acceptance and make it possible to monitor progress over time.

Following is a description of the different dimensions and subdimensions of quality, including the main areas in which quality indicators should be identified and established.

The main features of a suggested prototype standard quality report are discussed. This information is partly based on the work done by EUROSTAT and some member countries and may be used as a framework for discussing the viability of such reports in any country.

Some countries believe it is important to have standard quality reports, within a reasonable period of time, for all official statistics. This is considered essential for the country's own Office and to make it possible to better meet the priorities and requirements of users.

However, it will take some time to implement standard quality reporting on a large scale, as is the case with all important measures that have such far-reaching implications, especially as regards the work of individual staff members. Such an effort entails ensuring transparency and calls for a thorough knowledge of working procedures, as well as for supervision and ongoing evaluation.

In this new millennium, the National Statistical Offices are determined to take up the challenge of adapting this prototype standard quality report to the different categories of statistics they produce.

4. Dimensions and subdimensions of data quality. Proposed standard quality indicators

EUROSTAT has developed the following dimensions of data quality for the European Statistical System:

Relevance
Accuracy
Timeliness and punctuality
Accessibility and clarity
Comparability
Coherence
Completeness

(a) Relevance

Statistics are relevant when they meet user needs.

Relevance requires the identification of the following:

- Types and classification of users
- Description of their needs
- Main results of user satisfaction surveys
- Monitoring and evaluation of user satisfaction

Quality indicators

No quantitative indicators have been identified for this domain. Qualitative indicators could be developed by conducting user satisfaction surveys. This would entail identifying different groups of users, finding out what their needs are, assessing whether they are satisfied with the information available and following up on new needs as they arise.

(b) Accuracy

Accuracy is defined as the closeness between the estimated value and the unknown true value of the population. Accuracy has also been defined as the reverse of total error, including bias and variance (Kish, 1965).

The following information is needed in order to determine the accuracy of an estimate:

- Sampling errors
- Non-sampling errors, including:
    - Coverage errors
    - Measurement errors
    - Processing errors
    - Non-response errors
    - Associated-model error

Quality indicators

Sampling errors

- Variation coefficient for the main variables

Non-sampling errors

- Coverage errors: overcoverage rate; undercoverage rate; classification error rate
- Measurement errors: bias in the main variables caused by measurement errors
- Processing errors: codification error rates; editing error rates; imputation error rates
- Non-response errors: non-response rates; partial non-response rates; assessment of bias due to non-response
- Associated-model errors: updating of auxiliary variables; calibration

(c) Timeliness and punctuality

Timeliness refers to the time elapsed between delivery of results and the reference period.

Punctuality has to do with the difference between the date on which results actually become available and the date on which they should have been available, according to a pre-established timetable.

The following information is needed in order to assess timeliness and punctuality:

- The percentage of statistics that have not been made available punctually according to an established timetable
- The average time period involved in delays in production of data
- The maximum delay recorded
- Causes of delays: bottlenecks in the production phase, disaggregation, worker strikes, others
- Ways in which timeliness could be improved when necessary
- Average timeliness of data compared with that of other data published in the past

Quality indicators

Punctuality

- Difference between the date on which results actually become available and the date on which they should have been available, according to a pre-established timetable

Timeliness

- Average difference between the end of the reference period and the date on which provisional results become available
- Average difference between the end of the reference period and the date on which final results become available

(d) Accessibility and clarity

Accessibility refers to the physical conditions in which users have access to data: where and how data may be requested; time it takes for delivery; clear pricing policy, forms used, others.

Clarity refers to supplementary information provided with the data: explanatory texts, documentation, graphs, maps, others.

The following information is needed in order to assess accessibility and clarity:

- A descriptive summary of conditions for accessing data
- A descriptive summary of supplementary information accompanying data
- A descriptive summary of assistance made available to users
- A description of possible improvements compared with previous situations

Quality indicators

- Number of media used in disseminating statistics
- Types of media used in disseminating statistics

(e) Comparability

Comparability has to do with measuring the impact of differences in the application of statistical concepts and definitions when data are compared across geographical regions, domains or reference periods.

Comparability can be assessed in the following areas:

(i) Geographic comparability

- Brief descriptions of all the concepts and methods used that might affect the comparability of data
- Explicit reference should made to differences between national practices and those used in the country or countries with which data are to be compared
- In the case of mirror statistics, discrepancies should be discussed

(ii) Comparability over time

- Reference periods of the survey that has caused problems
- Differences in concepts and measurement methods between the most recent reference period and previous ones
- Description of the differences (changes in classification, statistical methodology, population studied, data treatment methods, others)
- Quantitative evaluation of the magnitude of the effect caused by the change

(iii) Comparability across fields

- Review of inclusions or exclusions in the definitions applied for each survey or source of information and report on the differences
- Report on collection methods: data from the same survey, from different surveys, censuses, administrative records
- Reference population and framework used in each survey, as well as sampling methods, sampling units for individual surveys, others
- Quantitative evaluation of the magnitude of the effect caused by the change

Quality indicators

Geographic comparability

- Number and percentage of statistical products that show evidence of differences in concepts or measurement units with respect to those applied in other areas
- Skewnesses in flows of mirror statistics

Comparability over time

- Length of comparable time series
- Number and percentage of statistical products that show evidence of changes in time series that affect comparability over time

(f) Coherence

Statistical data are coherent when they can be combined reliably in different ways and for different purposes, regardless of whether they originate from a single source or from different types of statistical research studies:

- Coherence between provisional and final results
- Coherence between conjunctural and annual results
- Coherence between results in the same socio-economic field
- Coherence with results of National Accounts

Quality indicators

- Differences between conjunctural and annual statistics

(g) Completeness

In the European Statistical System, completeness refers to the difference between statistics that are available and those that should be available in order to meet the requirements of Community legislation or other agreements.

- Percentage of statistics that are available with respect to those that should be available
- References to important documents, should they exist at the national level
- Reasons for non-compliance and prospects for solutions

Quality indicators

- Rate of statistics supplied (ratio of the number of values provided in a specific set of data to the number of fields in the tables for which information should have been supplied)

In brief, the purpose of this paper is to provide a working framework that can be used to guide the preparation of quality reports in the countries and to enable individual countries, or the region as a whole, to identify standard series of quality indicators, with a view to:

(a) Enabling National Statistical Offices to evaluate over time the results of their own activities and the degree to which they meet the growing and changing demand for information on the part of users;

(b) Comparing the quality of statistics within the National Statistical System, encouraging them to join broader systems, such as the System of National Accounts;

(c) In the case of countries belonging to the European Union or some other supranational organization ―MERCOSUR, Andean Community, others—, enabling them to improve the quality of integrated statistics, given the requirement that statistical information should be accompanied by certain quality indicators.

5. The experience of the National Statistical Institute of Spain

For many years now, Spain, like most countries, has been taking steps to evaluate and improve the quality of its statistics.

In recent publications on survey results, the National Statistical Institute of Spain (INE) has often included information on sampling and non-sampling errors, as well as on results of evaluation surveys, whenever they are conducted (censuses).

The National Statistical Plan and the annual Programmes are important instruments for assessing quality. On the one hand, this effort helps organize official statistical work, given that all the statistical services of the ministerial departments and of the Bank of Spain take part in the exercise, and on the other, it provides users with a description of the statistics to be produced, along with information on objectives, scope, units, periodicity, the body responsible for producing the statistics, among other things.

The National Statistical Institute also develops products such as nomenclatures, classifications, concepts, definitions, statistical units, territorial units, population records and directories of enterprises and establishments, as well as the statistical infrastructure needed to enhance the comparability and coherence of the information it produces.

The Institute recently completed the third version of a document entitled *Buenas prácticas en la realización de estadísticas oficiales* ("Good practices in the production of official statistics"). This

document, which is based on the experience of the Statistical Office of Canada, was adapted to the customs and working methods of Spain. It is an open document, so that the experiences and suggestions of different units can be added to it. It has been well received by the Institute staff and should be very useful for new recruits and for personnel who have been transferred from different jobs.

Two internal audits have also been carried out, the first on the annual industrial survey of enterprises and the second, on the permanent survey of family budgets. The officials in charge of the two surveys, the units involved and the staff participating in the different stages of the statistical process all cooperated satisfactorily with the working group responsible for conducting the audits. However, the "statistical culture" needs to be changed with a view to enabling the units responsible for surveys to conduct self-assessments of their own work.

Efforts are currently being made to systematically set up quality assessment and follow-up programmes in the Institute.

The Directing Council has decided that a prototype standard quality report should be developed and that it should be applied, in parallel fashion, to the current survey of the active population. In other words, in addition to the prototype, the first quality report of a specific survey would be prepared.

The goal of the Institute is to ensure that a standard quality report will be available for all official statistics within a reasonable period of time.

A summary of guidelines for a checklist to be used in such work is shown in annex 1.

Annex 1

GUIDELINES FOR A QUALITY CHECKLIST

1. Need for information. Relevance

1.1 Objectives. Reason for the operation
1.2 Users. Identification-list of main users
1.3 Description of user needs by class of user
1.4 Results of user-satisfaction interviews
1.5 Changes over time in users' needs for information

2. Concepts, variables and definitions

2.1 Harmonization, comparability with other sources. International comparability
2.2 Dissemination of definitions and classifications

3. Sampling framework

3.1 Reference population
3.2 Sampling framework used
3.3 Quality checks of the framework. Periodicity

4. Sampling

4.1 Type of sampling
4.2 Criteria and variables used in designing the sample. Stratification

5. Maintenance/monitoring of the sample

5.1 Sample rotation scheme. Selection criteria
5.2 Comparison between actual sample and ideal or theoretical sample. Evolution
5.3 Checking representativeness of the sample with respect to the characteristics of the target population

6. Questionnaires

6.1 Information for survey respondents
6.2 Prior testing. Results
6.3 Adaptation of the questionnaire to the interview method
6.4 Adaptation of the questionnaire to the information available to the respondent
6.5 Flexibility in the time allowed for response

7. Data collection

7.1 Timetable-collection plan
7.2 Collection methods
7.3 Training of staff involved in data collection
7.4 Handbooks for field personnel: simplicity, clarity, ease of use
7.5 Follow-up and monitoring of data collection
7.6 Monitoring of non-responses
7.7 Monitoring of framework incidence
7.8 Development, establishment and monitoring of contingency plans for unexpected situations
7.9 Codification-editing in the field. Clarity of handbooks

8. Data processing: editing-imputation

8.1 Procedures. Documentation of procedures
8.2 Validation, consistency, atypical data. Analysis of interviewer influence
8.3 Indicators of extent of editing-imputation
8.4 Original forms versus final forms. Incidence of editing-imputation

9. Data processing: estimation-expansion

9.1 Expansion method. Expansion factors
9.2 Monitoring-analysis of expanded data
9.3 Methods for reweighting and balancing samples
9.4 Indicators of defects in representativeness of samples obtained through estimation

10. Analysis of results prior to publication

10.1 Related sources of information
10.2 Coherence of changes over time
10.3 Presentation of results to other units (summary statistics)

11. Publication-presentation of results

11.1 Forms for dissemination of results
11.2 Information summaries

12. Sampling errors

12.1 CV for the main variables and subdomains
12.2 CV for estimates of levels
12.3 CV for rates of change

13. Non-sampling errors: coverage errors

13.1 Overcoverage rate. Undercoverage rate. Classification error rate

14. Non-sampling errors: measurement errors

14.1 Data-collection error rates
14.2 Assessment of bias in main variables caused by measurement errors

15. Non-sampling errors: processing errors

15.1 Error rates for different types of error
15.2 Assessment of incidence of processing errors in main variables

16. Non-sampling errors: non-response

16.1 Total non-response rates by type of non-response
16.2 Fatigue rates in repeated surveys
16.3 Partial non-response rates for main variables
16.4 Assessment of bias caused by non-response

17. Non-sampling errors: errors in formulating the estimation model

17.1 Accuracy of auxiliary variables used in the estimation and calibration process. Updating such variables
17.2 Weighting used in index numbers

18. Punctuality and timeliness

18.1 Difference between planned date of publication and actual date (punctuality)
18.2 Time elapsed between reference date and date of publication (timeliness)
18.3 Difference between dates of preliminary and final results

19. Accessibility and clarity

19.1 Information on how users can gain access to information
19.2 Clarity in metadata. Additional assistance available to users

20. Comparability

20.1 Across countries
20.2 Over time
20.3 Across domains

21. Coherence

21.1 Between provisional and final results
21.2 Between structural and conjunctural results
21.3 Between mirror statistics across countries
21.4 With National Accounts

22. Response cost-relationship with respondents