

# Implementing Standard Quality Indicators of MERCOSUR at the NSI of Uruguay

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## **ABSTRACT**

*The National Statistical Institutes (NSI) produce statistics that are used by the government to make up policies of socioeconomic development and other users to make decisions based on NSI's statistics, due to this it is necessary include indicators to express the quality of those statistics.*

*For this reason, since some years ago the NSI of Uruguay seeks to generate quality indicators for the continual improvement, to offer more transparency to users as well as to making of decisions by the responsible of these statistical operations.*

*Likewise, the use of a Standard Quality Report has been implemented to evaluate the quality of the statistical operations which are being performed therein. The quality indicators of this Report were built based on a combination of the key questions of the DESAP questionnaire and quantitative indicators of the document "Standard Quality Indicators" from Eurostat.*

*On the other hand, in the framework of the project "Cooperation in Statistics CE-MERCOSUR II" the workgroup "Total Quality in Statistics" has elaborated a Minimum Set of Standard Quality Indicators to be applied in the MERCOSUR's NSIs (Argentina, Brazil, Paraguay and Uruguay) to harmonize quality measurement of statistical operations.*

*Furthermore, it is important to emphasize that these Quality Indicators are key pieces of the metadata of the statistical operations. Therefore, they are published on the official website using software which provides a structured format (international standards DDI and Dublin Core). Thus, it is enabling the users to do historical queries.*

*The NSI of Uruguay has implemented the Minimum Set of Standard Quality Indicators above-mentioned, in several of its statistical operations and a number of difficulties have being found. All these difficulties, their causes and possible solutions are being deeply analyzed in this paper.*

**Keywords:** *Quality indicators, Quality report, Metadata*

## **Introduction**

For many years public statistics produced by the National Statistical Institutes around the world, have been gaining great importance due to its use as tool for making up socioeconomic development policies as well as an input for a great number of organizations, either public and private enterprises, to assist in decisions making.

It is necessary to rely upon additional information regarding the quality of the statistical operations in order to achieve a beneficial use of them. It is for this reason that the National Statistical Institutes

throughout the world are working to generate indicators which will express the quality of the data spread out.

Such is the situation of the NSI of Uruguay who has been working over the last years in the development of quality indicators for continual quality improvement, thus offering greater transparency and more consistent arguments in decisions making to its users.

As a part of this process -development of indicators- a Standard Quality Report was made up by the NSI of Uruguay to evaluate the quality of statistical operations which are being performed thereat. The Quality Report has been built up based on a combination of key questions from the DESAP questionnaire and some quantitative indicators of the document: "Standard Quality Indicators" from Eurostat.

The Quality Report is divided into four main parts. The first one provides an introduction of the statistical operation, a second part dealing with outputs quality dimensions, the third one concerning quality dimensions of the statistical process and the last one which includes other indicators indirectly related to quality (costs, burden of respondents and confidentiality).

The first part includes a brief history of the statistical operation, its main outputs, and the reference period of the report information. The purpose of this section is to make it easier to understand the other technical parts of the quality report.

The outputs quality dimensions are dealing in a separated section which includes six of the Eurostat quality dimensions of statistical operations outputs. These dimensions are relevance, accuracy, timeliness and punctuality, coherence and comparability. To measure them have been used several questions from the DESAP questionnaire. For example to measure the misclassification errors the II-8 question of the DESAP questionnaire is used.

The quality dimensions of the statistical process have been considered in the third part of this report. The dimensions covered in this part include the measuring of the planning process, the sample and statistical outputs designing processes, the data-collection and data-processing phases, the coding, editing and imputation processes, the weighting system, the data-processing phase and at last the processes of analysis and spread of data.

Finally, the last part of this Quality Report gathered information about other indicators indirectly related to quality, such as cost, burden of respondents and confidentiality. The cost includes direct and indirect costs. To measuring the respondents' burden three components are considered: the time required to compile the information necessary to fulfil the questionnaire, the questionnaire design and how often the sample is changed over the waves of the same survey and among different surveys.

The NSI of Uruguay has not only made single efforts looking for quality improvements in this subject, but has also worked jointly with the other country members of the Southern Common Market, MERCOSUR (Argentina, Brazil and Paraguay) in the development of a minimum set of standard quality indicators to be applied in the MERCOSUR to harmonize the quality measurement of the statistical operations.

In the framework of the project "Cooperation in Statistics CE-MERCOSUR II", a workgroup called "Total Quality in Statistics – GT8" was formed, integrated by experts of the NSIs of the countries members of the MERCOSUR (INDEC - Argentina, IBGE - Brazil, DGEEC - Paraguay and INE – Uruguay), which began to work in 2007.

After reaching a diagnosis of the status of each of the MERCOSUR member countries, and bearing in mind the experience gained by several Europe and Latin American countries as well as based on the knowledge acquired by international consultants on this subject, the workgroup decided to rely on the Eurostat "Standard Quality Indicators" document to adopt the quality dimensions proposed therein.

Furthermore, to define a minimum set of indicators for the dimensions mentioned above.

The aim of this set of indicators is to offer a tool to measure the quality of the statistical operations that these institutes are carrying out. In addition to being an input to the analysis of the quality progress of these statistics as time elapsed.

It is worth pointing out that this minimum set of indicators is reduced as its name implies, but its application does not affect at all the implementation of any other indicators that allow a more detailed analysis of the quality of the data that are being spread.

### **Dimensions and quality indicators contemplated in the minimum set of standard quality indicators to be applied to MERCOSUR.**

During the creation of the minimum set of standard quality indicators to be applied at MERCOSUR, the following quality dimensions have been taken into account: Relevance, Accuracy, Timeliness and Punctuality, Accessibility and transparency, comparability and coherence.

Once the quality dimensions used as the framework of the minimum set of standard quality indicators were outlined, the quality indicators which describe each of these dimensions were then defined.

Every indicator according to the dimensions described (table I) are shown hereunder. It should be noted that not all the indicators will be applied immediately, due to different difficulties for their implementation have been observed. Anyway without prejudice to the above stated, each NSI according to its situation might carry out immediately the implementation of outstanding indicators which will be applied in a second phase.

<b>Quality Dimensions</b>	<b>Indicator descriptors</b>
<b>Relevance</b>	R1 - User satisfaction Index R2 - Rate of available Statistics
<b>Accuracy</b>	A1 - Coefficient of variation. A2a - Unit Response rate (un-weighted). A2b - Unit Response rate (weighted). A3a - Item response rate (un-weighted). A3b - Item response rate (weighted). A4a - Imputation rate of the main variables. A4b - Imputed proportion of the estimation of the main variables. A5 - Over-Coverage rate. A6 - Misclassification rate.
<b>Timeliness and Punctuality</b>	OP1 – Punctuality of time schedule of effective publication. OP2 – Time lag between the end of reference period and the date of first results.
<b>Accessibility and Clarity</b>	AT1a – Level of accessibility to information. AT1b– Web accessibility. AT2 – Rate of completeness of metadata information for released statistics.
<b>Comparability</b>	C1 – Length of comparable time-series.
<b>Coherence</b>	CO1 – Statistics coherence between different periodicity. CO2 – Statistics coherence in the same socioeconomic domain.

**Table I – Standard Quality Indicators to be applied at MERCOSUR**

- **Relevance:** is the degree in which the statistics fulfil the needs of current and potential users. To measure this dimension is indispensable to consult the users, it is for this reason two indicators have been defined: the **User satisfaction index (R)** which directly measures the degree in which the statistics satisfy the user's requirements and on the other hand the **Rate of available statistics (R2)** which indirectly measures the relevance as the level of the statistics consultations at the NSI's official web site.
- **Accuracy:** defined as the difference between the estimate value and the corresponding real unknown value. This dimension could be determined indirectly as total measurement errors which are divided in two groups: sampling errors and non-sampling errors such as procedure errors, coverage, response, non response, among others.

- Sampling errors only occur when the statistical operations are sample surveys, and it is possible to control them by a sampling theory, its measurements also being possible.

The indicator defined to measure the sampling errors is the **Coefficient of variation (A1)**. It is a measurement of the dispersion of the estimates, defined as the ratio between square root of the estimate of the sampling variance and the estimated value. The estimate of this indicator requires knowing the description of the sampling design adopted in the survey, the estimator used as well as the methodology applied for the variance estimate.

$$A1 = cv(\hat{\theta}) = \frac{\sqrt{V(\hat{\theta})}}{\hat{\theta}}$$

Where

$\hat{\theta}$  is the estimate of the parameter.

$V(\hat{\theta})$  is the variance of the estimate considering the sampling method adopted in the survey.

$cv(\hat{\theta})$  is the coefficient of variation of the estimate.

All statistical operations are liable to the occurrence of non-sampling errors. Following is a detail of the indicators defined to measure this kind of errors.

The non-response errors can be separated into two groups: total non-response errors and partial non-response errors. When it is impossible to collect all the information from an eligible unit this is an example of a non-response unit. However, when incomplete information is obtained from a chosen unit we are facing a question non-response error. Furthermore these errors can be measured for the investigation or can be transferred to all the target population.

For this kind of errors the following indicators were defined: **Unit response rate (un-weighted) (A2a)**, **Unit response rate (weighted) (A2b)**, **Item response rate (un-weighted) (A3a)**, **Item response rate (weighted) (A3b)**, which are calculated according to the following formula:

$$A2a = \frac{\text{Number of respondent units used in estimation}}{\text{Number of in-scope units} + \text{number of eligibility unknown units}} \cdot 100$$

$$A2b = \frac{\text{weighted number of respondent units used in estimation}}{\text{Weighted number of in-scope units} + \text{number of weighted eligibility unknown units}} \cdot 100$$

$$A3a = \frac{\text{number of units with a value for the item}}{\text{Number of units in-scope for item}} \cdot 100$$

$$A3b = \frac{\text{weighted number of units with value for the item}}{\text{Weighted number of units in-scope for item}} \cdot 100$$

To calculate the indicators mentioned above it is necessary to have information about the definitions for the different unit categories, as well as to know the adopted sampling design if it is a sampling survey, the imputation and re-weighting methodology used and also if the units will be replaced or not.

Procedure errors are those that occur after the data collecting phase. The following indicators were established to measure this kind of errors: **Imputation rate of the main variables (A4a)** defined by the following formula,

$$A4a = \frac{\text{number of imputed records in a determined variable}}{\text{Total number of records}} \cdot 100$$

and **Imputed proportion of the estimation of the main variables (A4b)** defined as:

$$A4b = \frac{\text{Estimated total considering only the imputed registers}}{\text{Estimated total considering all registers}}$$

It is necessary to know the adopted sampling design, to have information regarding the imputation and weighing methods used and to identify records that have been imputed to calculate these indicators.

Finally among non-sampling errors, the coverage errors occur due to differences between the sampling framework and the target population. These can be grouped into over-coverage, under-coverage and misclassification. To measure them two indicators were defined: the **Over-coverage rate (A5)** and the **misclassification rate (A6)**, which are calculated as follows:

$$A5 = \frac{\text{number of out-of-scope units}}{\text{Number of in-scope units} + \text{number of out-of-scope units}} \cdot 100$$

$$A6 = \frac{\text{number of units misclassified but still in-scope}}{\text{Number of in-scope units}} \cdot 100$$

- The time lag between the data reference period and the moment of data spread is denominated **Timeliness**, whereas **Punctuality** refers to the compliance of the spread time, in other words the time lag between the real spread date and the expected date for the same.

The following indicators have been defined to measure these dimensions, **Punctuality of time schedule of effective publication (OP1)**, as the difference in days between the expected publication date and the real date of publication and the **Time lag between the end of reference period and the date of the final results (OP2)**, defined as the difference in days or months (depending on the type of statistical operation) between the end of the referenced period and the date of definitive spread results.

**Accessibility**, this dimension refers to the conditions in which the users have access to the data, the availability of the same, as well as the time and cost of delivery, whereas **Clarity** refers to the access facility to metadata and other related documentation.

In order to measure these dimensions three indicators were created. Two of which **Level of accessibility to information (AT1a)** and **Web Access (AT1b)** are used to follow the accessibility and the third one **Completeness Information rate of metadata for available statistics (AT2)** to evaluate the transparency.

- **Comparability** this dimension measure the effect produced by the difference between concepts and definitions when they are compared in fields such as temporal, for example to analyze at different times the results of statistical operations, in geographic spheres i.e. to compare data from different geographic areas, which is very important for aggregated statistics at regional level. Finally, the comparability in non-geographic domains, such as to confront data from different household types, two different kinds of comparability can be seen: the comparability at the estimate level and the comparability of concepts such as population, definitions, classifications, etc.

To measure this dimension the following indicator **Length of comparable time series (C1)** was established, defined as the number of time period since the last cut of the time series, for the main variables derived from the investigation.

- Finally, **Coherence** is a dimension that covers the integration between different statistics. The statistics can have different periodicities or come from different processes, for this reason they may not be coherent if it is taken into account that they are based on different methodologies, classifications or approaches. In this sense, coherence describes the statistics capability to correctly combine the different modes and their different uses.

The indicators defined to evaluate this quality dimension are, **Statistics coherence between different periodicities (CO1)** and **Statistics coherence in the same socio-economic domain (CO2)**.

### **Findings occurred during the implementation of the minimum set of standard quality indicators.**

The first pilot implementation of MERCOSUR's quality indicators experiences were performed with the following statistical operations: Construction Cost Index 2007, Construction Cost Index 2008 and the Annual Survey of Economic Activity 2007. Afterwards, this experience was extended to other statistical operations reaching until this moment the application of these indicators in the Continual Household Survey 2008 and in other seven economical surveys.

This implementation process has not been an easy way, as several problems have been detected which in a greater or lesser extent could be solved. It should be pointed out that in the areas where a quality culture has been already created, for example throughout the implementation of a quality management system; it is easier to calculate the quality indicators. Such is the case of the area of Construction Cost Index which is certified according to the International Norms ISO 9001:2008 and ISO 20252:2006.

One of the first problems detected was that the statisticians responsible of the different statistical operations, especially conjuncture surveys, failed to understand the importance of quality measurements of the generated data, as their sole aim was to deliver data on time.

This problem does not have only one cause that produces this situation, as it is a cluster of situations that generates this kind of problems, such as the continuous pressure upon by the person responsible of the survey in reaching the spread data due date, the lack of an Institutional Policy of quality measurements for the statistical operations, the lack of comprehension regards the use of quality indicators and finally but not least important the lack of compromise for the implementation of quality indicators.

The databases of the statistical operations are not adequately tailored to calculate quality indicators,

especially databases of household surveys; it is a fact that greatly hampers the implementation of this set of quality indicators.

In respect to the indicators that measure accuracy there are a lot of difficulties to calculate the coefficient of variation, due to the fact that there not always exist an easy access to the microdata, as well as some of the information systems developed by the NSI do not have any algorithm for an automatic calculation.

As the data found is not in the most adequate way to supply a computer system to automatically calculate the different indicators this provokes an increase in time for its calculation or else requires an increase in human resources available to carry out the task.

The lack of formal instructions concerning quality measurements results in the existence of more than one way to obtain the data (indicator), thus the associated responsibilities are not clearly defined. Consequently, the time required to calculate the indicators increases considerably. Another cause of this problem arises from the lack of properly documented requirement specifications to calculate the indicators at the moment of designing the information system.

Other serious problem that has been detected is the lack of a systematic register process, for example there is not a systematic register of the non-response by question, nor the units that are edited or imputed. Regarding to the frameworks and samples, the reporting unit classification changes as occupational status, class of activity among other surveys are not registered.

Finally, the importance and usefulness to calculate the indicator “imputed proportion of the estimation of the main variables” generally is not understood by the responsible staff of the different statistical operations.

The causes of the above mentioned problems among others are the lack of conscience about the impact caused by the failure to record these items, the lack of knowledge relative to the concepts which compose quality indicators. This in turn provokes that during the planning process of the development of these statistical operations, i.e. when the instruments for the data collecting are being planned, the editing and processing methods have not met the requirements necessary to calculate de indicators.

### **Action plan drawn up to eliminate the causes of the problems that have been detected.**

After analyzing in several instances the problems detected during the implementation of the minimum set of quality indicators to be applied in the MERCOSUR, a working plan was established to carry out at large in the NSI of Uruguay.

One of the most important activities scheduled in the NSI working plan was the creation of an institutional policy which expressed the importance of quality measurement of statistical products produced by the NSI. In that policy, the Quality Indicators and the Quality Report are established as a part of the statistical product.

Looking for eliminate the causes that have originated the problems mentioned above, the internal dissemination of the quality report and the minimum set of standard quality indicators was enhanced, emphasizing the importance of producing them. This process of organizational socialization is aimed at all NSI's staff.

Likewise, all the statistical operation leaders were trained regarding the concepts in which quality indicators were based, on how to calculate the indicators and the importance to record the items necessary for those calculations. Seeking in this way, to generate the necessary awareness among the staff that calculate the quality indicators is another natural output of these statistical operations instead of being considered an

extra job for them.

Quality Management Dept. jointly with the responsible of each statistical operation have developed the working plans for the short, medium and long term. Wherein are clearly enumerated the necessary steps to obtain the best outputs of the statistical operation performed therein. Besides, it establishes the people responsible for each step and also the period to carry out them. Focusing on the importance of include the quality measurement as another step of the outputs of the statistical production process. Thus, to organize the steps, the resources and time required by each step induce to decrease of the problems due to the pressures to fulfil with the dissemination schedule.

As well as, it has worked on the importance to include from the beginning in the planning steps of the statistical operations all the required information to calculate the quality indicators.

In order to eliminate the problems of microdata access an internal microdata management policy was created. This policy tries to establish the necessary guidelines regarding the access to the microdata by the responsible department to calculate the indicators. The dissemination of this document to all involved staff facilitates to eliminate the obstacles that exist for access to the microdata. Likewise, is very important the creation of required specifications of the indispensable information for the automatic calculation of the indicators. These specifications are used as an input for the software development, for example to calculate automatically the coefficient of variation of the statistical operations by the Computer Department.

Once the minimum set of standard quality indicators was implemented and the Quality Report was made, the internal dissemination of the statistical operations outputs is carried out. This spread is carried out in two different organization levels, the first one is focused on the person responsible of each statistical operation and the other one is oriented to the staff that performs them.

Furthermore, generating meetings where the General Director of the NSI and the statisticians responsible of each statistical operation participate jointly analyzing the outputs obtained could be very useful for making awareness of the importance of the quality indicators. As well as, to implement improvements in the processes which are performed at the NSI of Uruguay.

Finally but not less important, the spread of quality indicators to the users of the statistical operations was carried out. Through that dissemination the NSI of Uruguay aims at offering greater transparency over the activities which have been undertaken therein and however improving the quality of the spread information to users. That dissemination is fulfilled by the publication of an indicators set summary on the NSI of Uruguay official website.

### **How is the dissemination of the quality indicators carried out?**

The indicators which are part of the minimum set of standard quality indicators to be applied in the MERCOSUR are important key pieces of the statistical operations metadata that are carried out by the NSI.

As mentioned earlier the NSI of Uruguay, as an institution, is convinced of the need to provide to government organizations, academy sectors and users in general, the largest and most comprehensive statistical information on the operations the Institute performs.

For this reason, the software named National Data Archives (NADA) has been installed and published into the NSI's web site thanks to the support of the Accelerated Data Program (ADP). It was developed by the International Household Survey Network (IHSN) to the World Bank. This software allows the dissemination in the official web site of the Uruguayan NSI as a catalogue, the different statistical operations in a structured format according to international standards such as the Data Documentation Initiative (DDI) format for metadata of the statistical operations and the Dublin Core format for the external documents

related with the metadata.

This allows users to make historical queries of the statistics, comparisons of values of one or more indicators among operations, to request access to the available microdata files as well as to download them.

In this way publication and dissemination becomes more efficient and the access to information is managed in a more organized and efficient manner.

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