# Quality indicators

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## Quality indicators (QIs)

"Quality indicators are **statistical measures that give an indication of output quality**. Examples are estimated standard errors and response rates, which relate specifically to the accuracy of the output. Quality indicators differ from process variables, which give an indication of the quality of the process. However, some quality indicators can also give an indication of process quality. Response rates are an example of this" (Jones and Lewis, 2003).

- product/output quality measures (e.g. timeliness indicator, CV…)
- process indicators (e.g. response rate)
- areas may overlap

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## Main characteristics of QIs

- Not expensive and easy to calculate

- Alarm bells for further investigations

- Represent a first level of quality assessment

- Defined following quality dimensions

- Are usually included in quality reports

- Can be defined ad-hoc for specific purposes

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## Which indicators?

- **ESS Quality and Performance Indicators (ESS QPIs)**: the standard set of indicators shared at European level to be included in Standard quality reports (SIMS)

- Quality indicators for statistics based on **administrative data**

- Quality indicators for GSBPM

A limited selection will be presented

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## Timeliness

**Timeliness of information reflects the length of time between its availability and the event or phenomenon it describes.**

How can we measure timeliness?

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## Timeliness indicators (ESS QPIs)

**Timeliness: Time lag – first results**

The number of days (or weeks or months) from the last day of the reference period to the day of publication of first results.

$T_1 = d_{frst} - d_{refp}$

$d_{frst}$ Release date of **first (preliminary)** results;

$d_{refp}$ Last day (date) of the reference period of the statistics

**Timeliness: Time lag – final results**

The number of days (or weeks or months) from the last day of the reference period to the day of publication of complete and final results.

$T_2 = d_{finl} - d_{refp}$

$d_{finl}$ Release date of **final** results

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# Timeliness: Practice

## Turnover in services ◄» LISTEN

The Services turnover index measures the quarterly change recorded in sales at current prices by enterprises belonging to the domain of services. Starting from the first quarter of 2013 the indices are calculated with reference to the base year 2010 using the Ateco 2007 classification (Italian edition of Nace Rev. 2).

In the second quarter of 2016 the Services turnover index increased by 2.0% compared to the second quarter of 2015. In particular, the index increased by 3.5% for Wholesale trade, trade and repair of motor vehicles and motorcycles, by 0.9% for Information and communication, by 0.4% for Professional, scientific and technical activities and by 0.1% for Transport, Warehousing and support activities. The index decreased by 1.0% for Accommodation and food service activities and by 0.2% for Administrative and support service activities.

In the second quarter of 2016 the seasonally adjusted Services turnover index increased by 1.0% compared to the previous quarter. In particular, the index increased in Air transport (+3.0%), in Postal and courier activities (+1.9%), in Maintenance and repair of motor vehicles (+1.3%), in Information and communication (+0.6%) and Wholesale trade (+0.2%). The index decreased only in Water transport (-1.0%).

**Reference period**
Second quarter 2016

**Date of publication**
30 August 2016

**Next release**
25 November 2016

» Full text
(pdf 221 KB)

**Salvatore Filiberti**

Source: http://www.istat.it/en/archive/189947

Time lag first results II quarter 2016: 30/08/2016-30/06/2016 = 61 gg

Time lag final results I quarter 2016: 30/08/2016-31/03/2016 = 152 gg

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# Timeliness: other indicators

Users are mainly interested to overall timeliness of a statistical output, but for producers also the timeliness of the subprocesses of the production process can be very useful to identify where efforts for improvements can be addressed.

For example, the time lag devoted to data collection and data processing can be taken into account.

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## Punctuality

**Punctuality is to the time lag between the actual delivery of data and the target date on which they were scheduled for release as announced in official release calendar or previously agreed among partners.**

How can we measure punctuality?

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## Punctuality: delivery and publication (ESS QPIs)

**Punctuality**

$P = d_{act} - d_{sch}$

$d_{act}$ Actual date of the effective provision/dissemination of the statistics
$d_{sch}$ Scheduled date of the effective provision/dissemination of the statistics

The target value for this indicator is 0.

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## Comparability

**Comparability measures the extent to which differences between statistics can be attributed to differences between the true values of the statistical characteristics.**

How can we measure comparability?

## Comparability: Length of comparable times series (ESS QPI)

Indicator of Over Time comparability.
Number of reference periods in time series from last break.
Breaks in statistical time series may occur when there is a change in the definition of the parameter to be estimated (e.g. variable or population) or the methodology used for the estimation. Sometimes a break can be prevented, e.g. by linking.

The reference periods are numbered

$CC_1 = J_{last} - J_{first} + 1$

$J_{last}$ number of the last reference period with disseminated statistics.
$J_{first}$ number of the first reference period with comparable statistics.
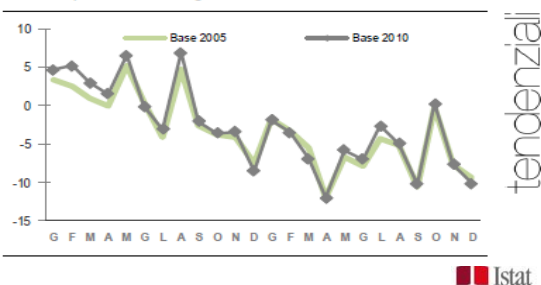
## Length of comparable times series: practice

Italian Industrial Production Index.
Monthly indices with base year 2005=100 stop at December 2012.
They are available backwards from January 2006. Thus CC1 = 84
reference periods
Indices with reference to the base year 2010 started from January
2011. Next graph presents a comparison on of the two series for the
overlapping period

GRAFICO 1. INDICE DELLE PRODUZIONE INDUSTRIALE,
CONFRONTO TRA LA DINAMICA IN BASE 2005 E BASE 2010
Gennaio 2011-dicembre 2012, variazioni percentuali sullo stesso mese
dell'anno precedente, dati grezzi.



## Length of comparable times series

Example

| 15.2. Comparability - over time | | |
|---|---|---|
| Length of comparable time series: | | |

| Variable | Length | Note |
|---|---|---|
| Total Production | from 01/1996 to today | |
| Sold production (volume) | from 01/1996 to today | |
| Sold Production (value) | from 01/1996 to today | |

An extensive revision of NACE in 2007 has resulted in changes to PRODCOM estimates for the 2008 survey onwards.
Every 5th year, there is a revision of the HS (Harmonized System) which will lead also to more significant changes to CN and Prodcom. The latest major revision was in 2012.
Revision in NACE will also affect Prodcom. Prodcom data from 1995 to 2007, based on NACE Rev.1.1, have been backcasted to NACE Rev.2 by Eurostat.

Source: PRODCOM ESMS Italy

## Relevance

**Relevance is the degree to which statistics meet current and potential users' needs. It refers to whether all statistics that are needed are produced and the extent to which concepts used (definitions, classifications *etc*.) reflect user needs.**

How can we measure relevance?

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## Relevance

A desirable measure of relevance is the **user satisfaction index** that can be obtained by means of the user satisfaction survey. However:

- It is needed to make an ad-hoc survey to calculate it, so it is costly.
- A standard formula is not available, so it is not comparable among countries or among domains.
- Even when it is available it is not usually referred to a specific statistic.

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## Relevance

Since the concept of relevance includes the concept of completeness, indicators on completeness are used as indirect indicators of relevance, but a "reference" is needed to calculate completeness: when do the data are complete? e.g.: when all what is asked by Regulation is produced.

Indicators of accessibility could also be considered relevance indicators.

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## Accessibility

**Accessibility refers to the set of conditions and modalities by which users can obtain data**

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## Data tables - consultation (ESS QPI)

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.

AC2 = #CONS

The frequency of collection of the figures for this indicator should be monthly.
It is interesting to monitor the trend of this indicator over time. It could be done producing a graph with the months in the horizontal axis and the number of consultation on the vertical axis.
This indicator contributes also to the assessment of the relevance of subject matter domains

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## Data tables - consultation: example

"In 2013 there was the following number of consultation in each areas:
Livestock: 4397
Agricultural holdings and holders: 1406
Use of agricultural land:3515
Labour force: 330

For January-March 2014 there was the following number of consultations:
Livestock: 886
Agricultural holdings and holders: 278
Use of agricultural land:830
Labour force: 88

In each area there are a number of different tables to consult. 7 different for livestock, 2 for agricultural holdings and holders, 5 for use of agricultural land and 4 for labour force."
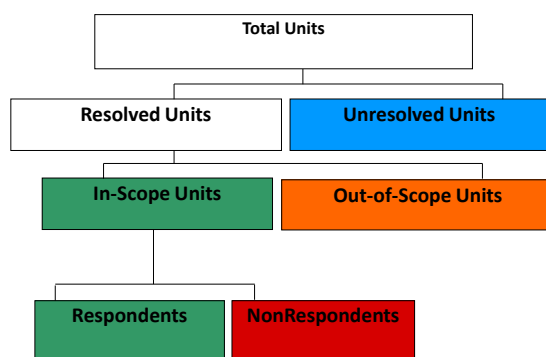**Source: Farm structure ESQRS, Sweden**

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## Accuracy

**Accuracy is the closeness of computations or estimates to the exact or true values.**

- The difference among the estimate and the true value is the ERROR.

- To assess accuracy is necessary to measure error sources

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## Over-coverage rate and Unit non-response rate

**Standard outcome classification**

Total Units

Resolved Units | Unresolved Units

In-Scope Units | Out-of-Scope Units

Respondents | NonRespondents

Adapted from Hidiroglou et al. (1993).

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## Accuracy: Over-coverage rate and Unit non-response rate

**Standard outcome definitions**

Total units: total number of units belonging to the survey of interest. For sample surveys, it corresponds to the number of sampling units

Resolved Units: it has been possible to ascertain their eligibility status (vs unresolved)

In-Scope Units: units belonging to the population of interest for the survey

Out-of-Scope Units: units not belonging to the population of interest for the survey, although included in the frame

Nonrespondents: units for which it has not been possible to obtain information

Respondents: units for which it has been possible to obtain information

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## Over-coverage rate (ESS QPI)

**Definition:** The rate of over-coverage is the proportion of units accessible via the frame that do not belong to the target population (are out-of-scope).

$$\frac{\text{outofscope units} + (1-\alpha) \cdot \text{unresolved units}}{\text{total units}} \cdot 100$$

$\alpha$ = the estimated proportion of cases of unresolved units that are actually in-scope. It should be set equal 1 unless there is strong evidence for assuming otherwise

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## Unit non-response rate (ESS QPI)

**Definition:** The ratio of the number of units with no information or not usable information to the total number of in-scope units.

$$\frac{\text{Non respondents}+\alpha\cdot\text{unresolved units}}{\text{Respondents}+\text{Non respondents}+\alpha\cdot\text{unresolved units}}\cdot 100$$

$\alpha$ = the estimated proportion of cases of unresolved units that are actually in-scope. It should be set equal 1 unless there is strong evidence for assuming otherwise

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## Over-coverage rate: example

| [S] - Household Budget Survey | | |
|---|---|---|
| INDICATORS ON COVERAGE | Edition: 31/12/2014 | |

Italy | Geographical detail | Time series - data | Time series - charts

| Relevant metadata | | |
|---|---|---|
| Reference unit | Households | |
| Archive | Municipality population registers | |
| Data collection mode | Computer Assisted Personal Interviewing (CAPI) | |
| Periodicity of data collection | Monthly | |
| Eligibility criteria | - | |
| Note | - | |

| Indicator | Value | U.M. |
|---|---|---|
| Total Units | 10006 | |
| Resolved Rate | 97,39 | % |
| Frame Error Rate | 6,55 | % |
| Out of Scope Rate | 1,93 | % |
| Non Existent Rate | 1,31 | % |
| Change in Status Rate | 0,15 | % |
| Out of Target Rate | 0,46 | % |
| No Contact Rate Due to Frame Errors (Referred to Resolved Units) | 4,62 | % |
| Over-Coverage Rate (Eurostat) | 4,49 | % |

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# Over-coverage rate: example

**[S] - Multipurpose survey on households: safety of women**

INDICATORS ON COVERAGE   Edition: 03/10/2006

Italy | Geographical detail | Time series - data | Time series - charts

### Relevant metadata

| | |
|---|---|
| **Reference unit** | Households, Women aged 16-70 |
| **Archive** | |
| **Data collection mode** | Computer Assisted Telephone Interviewing (CATI) |
| **Periodicity of data collection** | Occasional |
| **Eligibility criteria** | - |
| **Note** | - |

| Indicator | Value | U.M. |
|---|---|---|
| Total Units | 54295 | |
| Resolved Rate | 86,01 | % |
| Frame Error Rate | 25,36 | % |
| Out of Scope Rate | 25,36 | % |
| Non Existent Rate | 0,08 | % |
| Change in Status Rate | 0 | % |
| Out of Target Rate | 25,29 | % |
| No Contact Rate Due to Frame Errors (Referred to Resolved Units) | 0 | % |
| Over-Coverage Rate (Eurostat) | 21,82 | % |

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# Unit nonresponse rate: example

**[S] - Small and medium enterprise survey -SME (including professional and artistic activities)**

INDICATORS ON UNIT NON RESPONSE   Edition: 31/12/2015

Italy | Geographical detail | Time series - data | Time series - charts

### Relevant metadata

| | |
|---|---|
| **Reference unit** | Enterprises |
| **Archive** | Italian Statistical Business Register (ASIA) |
| **Data collection mode** | Self-administered data collection by e-questionnaire (Computer Assisted Web Interviewing-C [...] |
| **Periodicity of data collection** | Yearly |
| **Eligibility criteria** | - |
| **Note** | - |

| Indicator | | Value | U.M. |
|---|---|---|---|
| Total Units | | 100553 | |
| Resolved Rate | | 32,2 | % |
| Unit nonresponse rate (Eurostat) | | 68,27 | % |
| Unit Nonresponse Rate | $\alpha = 1$ | 68,27 | % |
| Response Rate | | 31,73 | % |
| Unit Nonresponse Rate excluding No Contacts Due to Frame Errors that compromise the contact | | 68,27 | % |
| Unit Nonresponse Rate referred to In Scope Units | $\alpha = 0$ | 0,74 | % |
| Refusal Rate | | 0 | % |
| No Contact Rate | | 0 | % |
| No Contact Rate Due to Frame Errors (referred to In Scope Units) | | 0 | % |
| No Contact Rate Due to Other Reasons | | 0 | % |
| Other Reasons Nonresponse | | 0,74 | % |

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## Accuracy: other indicators

Further quality indicators on reasons for nonresponse could be useful to address improvements
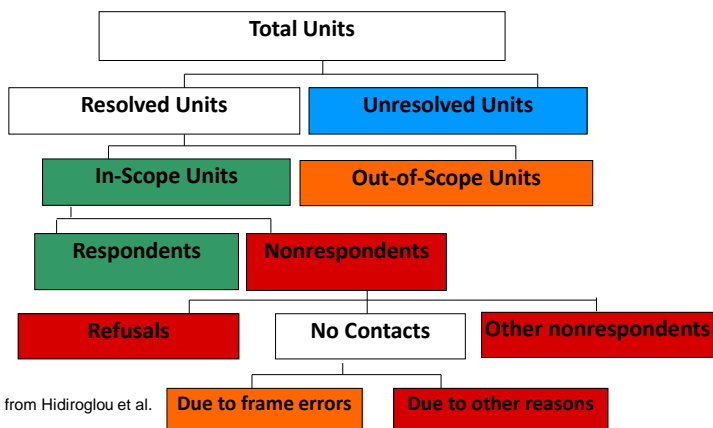
**Standard outcome classification**



Adapted from Hidiroglou et al. (1993).

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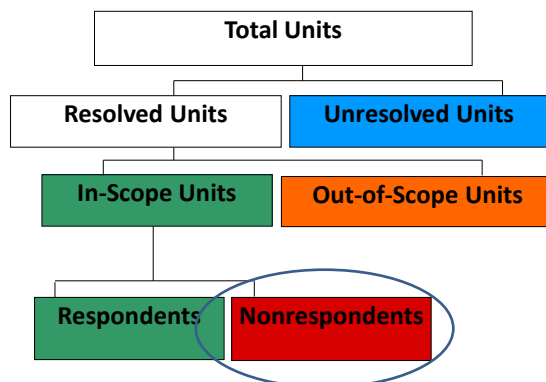
## Accuracy: other indicators

Reasons for nonresponse

**Standard outcome classification**



Adapted from Hidiroglou et al. (1993).

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# Accuracy: other indicators

**Standard outcome definitions**

Refusals: in scope units explicitly refusing to participate to the survey

No Contacts: in scope units which have not been possible to contact

Other Nonrespondents: in scope units which have been contacted but have not been able to provide the required information (e.g. diseased or elderly persons)

No Contacts Due to Frame Errors: in scope units which have not been contacted due to errors or incomplete information in the frame (e.g. wrong addresses)

No Contacts Due to Other Reasons: in scope units which have not been contacted due to impossibility to be found (e.g. family left for holiday)

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# Accuracy: other indicators

| refusals | nocontacts | otherreasonsfornonresponse |
|---|---|---|
| inscopeunits | inscopeunits | inscopeunits |

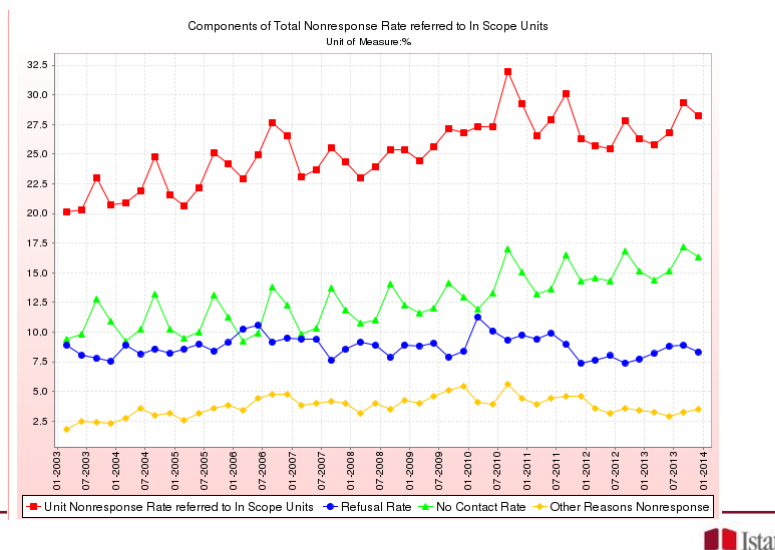➡ **Indicators on the causes of nonresponse**

These indicators are useful to monitoring data collection and to address efforts

On the basis of the standard classification, ad-hoc indicators can be defined and calculated for specific objectives

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## Indicators on the causes of nonresponse: example

CAPI survey on households



Components of Total Nonresponse Rate referred to In Scope Units
Unit of Measure:%

Legend: Unit Nonresponse Rate referred to In Scope Units · Refusal Rate · No Contact Rate · Other Reasons Nonresponse

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## Over-coverage rate and Unit non-response rate: Practice

The outcomes of a web survey on a sample of 30000 businesses with a specific NACE and size 1 to 100 employees are classified as follows:

| Outcome | n | Standard Outcome |
|---|---|---|
| Completed questionnaire | 19521 | Respondents |
| Refusals | 25 | Nonrespondent (refusal) |
| No answer | 9362 | Unresolved units |
| Change in NACE | 573 | Out-of-scope (change in status) |
| Employee >100 | 201 | Out-of-scope (out-of-target) |
| Not usable questionnaires | 318 | Nonrespondent (other reasons) |
| Total | 30000 | Total |

$\alpha=1$

Over-coverage rate= [(573+201)+(1-1)x(9362)]/30000=2.58%

Unit non-response rate= 1-{19521/[19521+(25+318)+(1x9362)]}=33.20%

$\alpha=0$

Over-coverage rate= [(573+201)+(1x9362)]/30000=33.79%

Unit non-response rate= 1-{19521/[19521+(25+318)+(0x9362)]}=1.73%

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## Item non-response rate (ESS QPI)

**Definition:** The item nonresponse rate for a given variable is defined as the ratio between in-scope units that have not responded and in-scope units that are required to respond to the particular item.

$$\frac{\text{Non respondentsY}}{\text{RespondentsY+Non respondentsY}} \cdot 100$$

RespondentY = the set of eligible units responding to item Y (as required)

Non respondentsY = the set of eligible units not responding to item Y although this item is required. – The denominator corresponds to the set of units for which item Y is required. (Other units do not get this item because their answers to earlier items gave them a skip past this item; they were "filtered away".)

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## Item non-response rate (ESS QPI)

**Interpretation:** A high item non-response rate indicates difficulties in providing information, e.g. a sensitive question or unclear wording for social statistics or information not available in the accounting system for business statistics. The target value for this indicator is as close to 0 as possible.

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## Item non-response rate: practice

| Age | Employed/not employed | Occupation |
|-----|----------------------|------------|
| 10 | | |
| 25 | Y | Teacher |
| 49 | N | |
| 21 | | |
| 52 | Y | Researcher |
| 45 | Y | Plumber |
| 29 | | |
| 36 | N | |
| 6 | | |
| 19 | N | |
| 38 | Y | |

Item nonresponse rate for variable Employed/not employed=
1-[7/(7+2)]=22.22%

Item nonresponse rate for variable Occupation=
1-[3/(3+1)]=25.00%

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## Imputation rate (ESS QPI)

- 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.

- After imputation, the data file should normally only contain plausible and internally consistent data records.

- This indicator is influenced both by the item non-response and the editing process. It measures both the relative amount of imputed values and the relative influence on the final estimates from the imputation procedures.

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## Imputation rate (ESS QPI)

$$A6_{uw} = \frac{n_{AV}}{n_{AV} + n_{OV}} \qquad A6_{dw} = \frac{\sum_{AV} w_j y_j}{\sum_{AV} w_j y_j + \sum_{OV} w_j y_j}$$

AV = the set of units with assigned values
OV = the set of units with observed values
$Y_j$ = value of variable of interest for unit j
$w_j$ = weight of unit j (final weights or size weights)

The **un-weighted imputation rate** for a variable is the ratio of the number of imputed values to the total number of values requested for the variable.

The **weighted rate** shows the relative contribution to a statistic from imputed values; typically a total for a quantitative variable. For a qualitative variable, the relative contribution is based on the number of units with an imputed value for the qualitative item.

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## Imputation rate: practice

| Age | Employed/not employed | Occupation |
|---|---|---|
| 10 | | |
| 25 | Y | Teacher |
| 49 | Y N | |
| 21 | N | |
| 52 | Y | Researcher |
| 45 | Y | Plumber |
| 29 | Y | |
| 36 | N | |
| 26 6 | N | |
| 13 19 | N | |
| 38 | Y | |

Imputation rate for variable Age= 2/11= 18.18%

Imputation rate for variable Employed/not employed= 5/11=45.45%

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# Editing and imputation indicators

Labour cost survey - 2012

| Relevant metadata on the variable | | |
|---|---|---|
| **Reference unit** | Public and private institutions with at least 10 persons employed [<<<] | |
| **Variable** | Total labour costs | |
| **Editing and imputation procedure** | Deterministic error and outlier detection and nearest-neighbour donor imputation [<<<] | |
| **Data Collection mode** | Self-administered data collection by e-questionnaire (Computer Assisted Web Interviewing-CAWI) or through upload of datasets on Istat web site INDATA [<<<] | |

| Indicator | Value | U.M. |
|---|---|---|
| Total Records | 43318 | |
| Imputation Rate | 42,96 | % |
| Modification Rate | 25,7 | % |
| Net Imputation Rate | 17,26 | % |
| Cancellation Rate | 0 | % |
| Non Imputation Rate | 57,04 | % |
| Blank Unmodified Values Rate | 0 | % |
| Non Blank Unmodified Values Rate | 57,04 | % |
| Item response rate - proxy measure | 82,74 | % |

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# Editing and imputation indicators

Labour cost survey - 2012

| Relevant metadata on the variable | | |
|---|---|---|
| **Reference unit** | Public and private institutions with at least 10 persons employed [<<<] | |
| **Variable** | Total hours paid | |
| **Editing and imputation procedure** | Deterministic error and outlier detection and nearest-neighbour donor imputation [<<<] | |
| **Data Collection mode** | Self-administered data collection by e-questionnaire (Computer Assisted Web Interviewing-CAWI) or through upload of datasets on Istat web site INDATA [<<<] | |

| Indicator | Value | U.M. |
|---|---|---|
| Total Records | 43318 | |
| Imputation Rate | 25,56 | % |
| Modification Rate | 8,3 | % |
| Net Imputation Rate | 17,26 | % |
| Cancellation Rate | 0 | % |
| Non Imputation Rate | 74,44 | % |
| Blank Unmodified Values Rate | 0 | % |
| Non Blank Unmodified Values Rate | 74,44 | % |
| Item response rate - proxy measure | 82,74 | % |

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## Reliability

**Reliability is the closeness of the initial released estimated value to the subsequent ones.**

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## Data revision – average size (ESS QPIs)

- The "revision" is defined as the difference between a later and an earlier estimate of the key item.
- The number of releases of a key item (number of times it is published) is fixed and specified in the revision policy.
- Usually, revisions involve a time series: when publishing an estimate of the key indicator referring to time t, it is a common practice to release the revised version of the indicator referring to a set of previous periods.

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## Data revision – average size (ESS QPIs)

- The quality indicators on revisions allow to understand how a earlier releases approach to later ones, that are supposed to be closer to the true value
- Quality indicators on revisions are usually averages of the revisions between two given releases calculated over the timeseries
- The sign of the averages provide an indication of the revision: i.e. if the later estimate is generally greater then the previous one, it means that the first results tend to underestimate the parameter
- The size of the averages of the revision in absolute value provide an indication of the stability of revisions
- Current approach to revision analysis was developed by OECD Example

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## ESS Quality and Performance Indicators

**Relevance**

- Data completeness - rate

**Timeliness and punctuality**

- Time lag - first results
- Time lag - final results
- Punctuality - delivery and publication

**Accuracy and reliability**

- Sampling error - indicators
- Over-coverage - rate
- Common units - proportion
- Unit non-response - rate
- Item non-response - rate
- Imputation - rate
- Data revision - average size

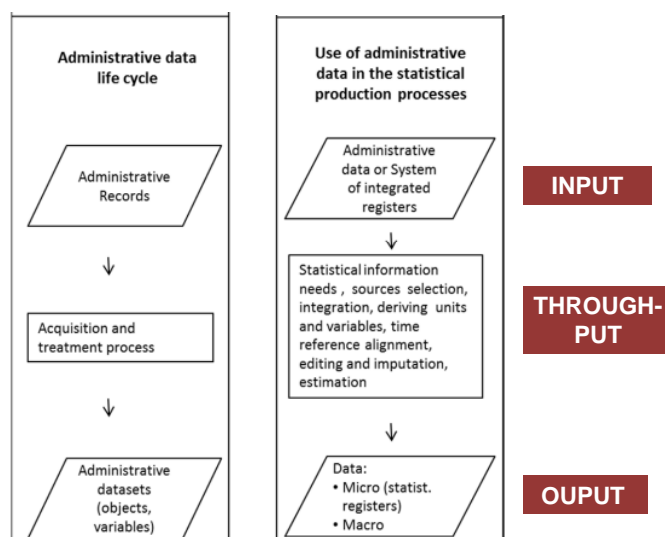**Comparability and coherence**

- Asymmetry for mirror flows statistics - coefficient
- Length of comparable time series

**Accessibility and clarity**

- Data tables - consultations
- Metadata - consultations
- Metadata completeness - rate

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## Quality for statistics based on administrative data



| Administrative data life cycle | Use of administrative data in the statistical production processes | |
|---|---|---|
| Administrative Records | Administrative data or System of integrated registers | **INPUT** |
| ↓ | ↓ | |
| Acquisition and treatment process | Statistical information needs , sources selection, integration, deriving units and variables, time reference alignment, editing and imputation, estimation | **THROUGH-PUT** |
| ↓ | ↓ | |
| Administrative datasets (objects, variables) | Data: • Micro (statist. registers) • Macro | **OUPUT** |

*\* Adapted from Istat, Guidelines for the quality of statistical processes that use administrative data, 2016*

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## Quality for statistics based on administrative data

- It is important to focus on:

  - **Input quality**: this is the main peculiarity in the use of administrative data. There are not standard indicators on the outcomes of data collection like unit non response rate but similar sources of error. Several indicators on input quality have been proposed in international project.

  - **Throughput quality**: most of administrative data processing is similar to survey data processing. Attention should be paid to errors that could be originated during data integration and derivation of new unit and variable

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## Input quality indicators

• Framework for quality of administrative data sources

Organised in hyperdimensions > dimensions > indicators:

Hyperdimensions

> **Source**: quality aspect related to the data keeper as a whole and characteristics of the delivery

> **Metadata**: clarity of the documentations of the data source in terms of concepts used and treatment of data by the data keeper (clarity, comparability, process documentation)

> **Data**: different sources of errors that could affect administrative data quality (accuracy)

Daas et al.(2009) Checklist for the Quality evaluation of Administrative Data Source

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*Table 1. Dimensions, quality indicators, and methods for Source*

| DIMENSIONS | QUALITY INDICATORS | METHODS |
|---|---|---|
| 1. Supplier | 1.1 Contact | -Name of the data source |
| | | -Data source contact information |
| | | -NSI contact person |
| | 1.2 Purpose | -Reason for use of the data source by NSI |
| 2. Relevance | 2.1 Usefulness | -Importance o |
| | 2.2 Envisaged use | -Potential stat |
| | 2.3 Information demand | -Does the dat |
| | 2.4 Response burden | -Effect of dat |
| 3. Privacy and security | | |
| | 3.1 Legal provision | -Basis for exis |
| | 3.2 Confidentiality | -Does the Per |
| | | -Has use of da |
| | 3.3 Security | -Manner in w |
| | | -Are security |
| 4. Delivery | 4.1 Costs | -Costs of usin |
| | 4.2 Arrangements | -Are the terms of delivery documented? |
| | | -Frequency of deliveries |
| | 4.3 Punctuality | -How punctual can the data source be delivered? |
| | | -Rate at which exceptions are reported |
| | | -Rate at which data is stored by data source keeper |
| | 4.4 Format | -Formats in which the data can be delivered |
| | 4.5 Selection | -What data can be delivered? |
| | | -Does this comply with the requirements of NSI? |
| 5. Procedures | 5.1 Data collection | -Familiarity with the way the data is collected |
| | 5.2 Planned changes | -Familiarity with planned changes of data source |
| | | -Ways to communicate changes to NSI |
| | 5.3 Feedback | -Contact data source keeper in case of trouble? |
| | | -In which cases and why? |
| | 5.4 Fall-back scenario | -Dependency risk of NSI |
| | | -Emergency measures when data source is not delivered according to arrangements made |

Mostly qualitative information, related to relevance, timeliness and punctuality and accessibility of the administrative data source

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## Table 2. Dimensions, quality indicators, and methods for Metadata

| DIMENSIONS | QUALITY INDICATORS | METHODS |
|---|---|---|
| 1. Clarity | 1.1 Population unit definition | -Clarity |
| | 1.2 Classification variable definition | -Clarity |
| | 1.3 Count variable definition | -Clarity |
| | 1.4 Time dimensions | -Clarity |
| | 1.5 Definition changes | -Familia |
| 2. Comparability | 2.1 Population unit definition comparison | -Compar |
| | 2.2 Classification variable definition comparison | -Compar |
| | 2.3 Count variable definition comparison | -Comparability with NSI definition |
| | 2.4 Time differences | -Comparability with NSI reporting periods |
| 3. Unique keys | 3.1 Identification keys | -Presence of unique keys<br>-Comparability with unique keys used by NSI |
| | 3.2 Unique combinations of variables | -Presence of useful combinations of variables |
| 4. Data treatment (by data source keeper) | | |
| | 4.1 Checks | -Population unit checks performed<br>-Variable checks performed<br>-Combinations of variables checked<br>-Extreme value checks |
| | 4.2 Modifications | -Familiarity with data modifications<br>-Are modified values marked and how?<br>-Familiarity with default values used |

> Mostly qualitative information, related to clarity, comparability and process documentation of the administrative data source

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## Table 3. Dimensions, quality indicators, and methods for Data

| DIMENSIONS | QUALITY INDICATORS | METHODS |
|---|---|---|
| 1. Technical checks | 1.1 Readability | -Can all the data in the source be accessed? |
| | 1.2 Metadata compliance | -Does the data comply to the metadata definition?<br>-If not, report the anomalies |
| 2. Over coverage | 2.1 Non-population units | -Percentage of units not belonging |
| 3. Under coverage | 3.1 Missing units | -Percentage of units missing from t<br>population |
| | 3.2 Selectivity | -R-index [1] for unit composition |
| | 3.3 Effect on average | -Maximum bias of average for core<br>-Maximum RMSE [2] of average for |
| 4. Linkability | 4.1 Linkable units | -Percentage of units linked unambi |
| | 4.2 Mismatches | -Percentage of units incorrectly link |
| | 4.3 Selectivity | -R-index for composition of units l |
| | 4.4 Effect on average | -Maximum bias of average for core<br>-Maximum RMSE of average for c |
| 5. Unit non response | 5.1 Units without data | -Percentage of units with all data n |
| | 5.2 Selectivity | -R-index for unit composition |
| | 5.3 Effect on average | -Maximum bias of average for core<br>-Maximum RMSE of average for c |
| 6. Item non response | 6.1 Missing values | -Percentage of cells with missing v |
| | 6.2 Selectivity | -R-index for variable composition |
| | 6.3 Effect on average | -Maximum bias of average for vari<br>-Maximum RMSE of average for v |
| 7. Measurement | 7.1 External check | -Has an audit or parallel test been p<br>-Has the input procedure been teste |
| | 7.2 Incompatible records | -Fraction of fields with violated ed |
| | 7.3 Measurement error | -Size of the bias (relative measurem |
| 8. Processing | 8.1 Adjustments | -Fraction of fields adjusted (edited) |
| | 8.2 Imputation | -Fraction of fields imputed |
| | 8.3 Outliers | -Fraction of fields corrected for out |
| 9. Precision | 9.1 Standard error | -Mean square error for core variabl |
| 10. Sensitivity | 10.1 Missing values | -Total percentage of empty cells |
| | 10.2 Selectivity | -R-index for composition of totals |
| | 10.3 Effect on totals | -Maximum bias of totals<br>-Maximum RMSE of totals |

[1] R-index: Representative Index, an indicator that estimates the selectivity of the data missing by using information available in other sources (Schouten and Cobben 2007, Cobben and Schouten 2008).
[2] RMSE: root mean square error; a common used statistical measure for the quality of an estimator. The RMSE is equal to the square root of the sum of the bias and variance of the estimator.

> Dimensions are defined as error sources, most of them are the same that are defined for surveys, but
> - in some cases indicators need external sources to be calculated
> - Other are almost the same
>   - Other are specific to administrative data

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## Throughput quality indicators

- Statistics based on administrative data are compiled using the same methodologies that are used for survey data, but some processes like data integration or derivation of new variables and units are more frequent.
- For data integration, it would be useful obtain indicators on:

> False link: units that have been matched but are not the same

> False non link: units not matched that should be

Unfortunately, it is necessary to make ad hoc studies to identify this errors. An indirect indicator could be the number of non linked units.

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## References

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