Generic Data Quality Assurance Framework

for a UN Agency

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Preface

The purpose of this document is to present a *Generic Statistical Quality Assurance Framework (GSQAF)* to assist in the development and implementation of a SQAF in a UN Agency that does not have one, and as a basis for review of a SQAF in a UN agency that already has one.

The GSQAF refers to "an Agency". It can be specialised to a particular agency in essentially three steps:

1. *replacing "Agency" by the actual name of the agency and "Generic Statistical Quality Assurance Framework (GSQAF)" by the actual name given to the framework;*

2. *following the instructions in the text in red italic script such as this, and then eliminating the text as it should not be carried through to the agency specific SQAF; and*

3. *adapting the rest of the text as required to deal with the particular circumstances of the agency. Of course this is the major step.*

1 Introduction

1.1 Context for the GSQAF

The primary function of the Agency should be briefly described here.

In performing these functions, the agency compiles, validates and processes a wide range of data obtained from national and international sources. These data cover many countries and span long periods. Thus, statistics are an important aspect of the Agency's work, and maintaining the quality of the Agency's data is vital. Quality needs to be constantly monitored and improved. It is important to demonstrate that the Agency's statistics are of good quality. The Agency's *Statistical Quality Assurance Framework (GSQAF)* is a means of doing this.

1.2 Benefits of the GSQAF

The benefits of a GSQAF are that it will:

- provide a systematic mechanism for facilitating the ongoing identification of data quality problems and possible actions for their resolution;
- provide a basis for creating and maintaining a data quality culture within the Agency;
- stimulate and maximize the interaction among the Agency staff involved in production or use of statistics;
- give greater transparency to the processes by which statistics are produced and their quality is assured and thereby reinforce the Agency's image as a trustworthy provider of good quality statistics;
- provide reference material that can be helpful in training;
- provide a mechanism for the exchange of ideas on quality assurance with other producers and users of statistics, at international and national levels.

1.3 Audience for the GSQAF

The intended readership/users of the GSQAF are:

- Agency managers and staff involved in statistical production – the GSQAF provides a framework for assessment of statistical activities;
- Agency senior management – the GSQAF provides an indication how quality may be assessed;
- data providers – the GSQAF includes quality guidelines and an indication of roles data providers can play in quality assurance;
- data users – the GSQAF provides users of the statistics with evidence of quality assurance by the Agency.

1.4 Scope of the GSQAF

The GSQAF includes all statistical development and production activities within the Agency, whether conducted by persons with a formal role of statistician or any other role such as economist or sociologist, metadata management, statistical systems development, and whether on a full time or part-time basis.

It does not include human resource management, financial management and ICT infrastructure as these are not specific to the Agency's statistical activities

1.5 GSQAF Components

The GSQAF has five components.

- The first component describes those aspects of the statistical processes of an Agency that need to be described in order to give context to the GSQAF.

- The second component is a set of *underlying statistical principles* that provide the basis for formulating a GSQAF.

- The third component is a set of *quality dimensions,* highlighting the various aspects of data and process quality.

- The fourth component is a set of *quality guidelines,* comprising good practices for assuring quality, including management of metadata.

- The fifth component is *quality assessment and improvement program*, comprising a set of procedures for ensuring that quality is regularly assessed and appropriate quality improvement actions are implemented.

2 Underlying Statistical Principles

The underlying *Principles Governing International Statistical Activities* upon which the GSQAF is based were formulated by the Committee for the Coordination of Statistical Activities and endorsed by the chief statisticians/coordinators of statistical activities of UN agencies in 2005. They are as follows.

1. ***High quality international statistics, accessible for all, are a fundamental element of global information systems***

Good practices include:

- Having regular consultations with key users both inside and outside the relevant organisation to ascertain that their needs are met
- Periodic review of statistical programmes to ensure their relevance
- Compiling and disseminating international statistics based on impartiality
- Providing equal access to statistics for all users
- Ensuring free public accessibility of key statistics

2. ***To maintain the trust in international statistics, their production is to be impartial and strictly based on the highest professional standards***

Good practices include:

- Using strictly professional considerations for decisions on methodology, terminology and data presentation
- Developing and using professional codes of conduct
- Making a clear distinction, in statistical publications, between statistical and analytical comments on the one hand and policy prescriptive and advocacy comments on the other

3. ***The public has a right to be informed about the mandates for the statistical work of the organisations***

Good practices include:

- Making decisions about statistical work programmes publicly available
- Making documents for and reports of statistical meetings publicly available

4. ***Concepts, definitions, classifications, sources, methods and procedures employed in the production of international statistics are chosen to meet professional scientific standards and are made transparent for the users***

Good practices include:

- Aiming continuously to introduce methodological improvements and systems to manage and improve the quality and transparency of statistics
- Enhancing the professional level of staff by encouraging them to attend training courses, to do analytical work, to publish scientific papers and to participate in seminars and conferences.

- Documenting the concepts, definitions and classifications, as well as data collection and processing procedures used and the quality assessments carried out and making this information publicly accessible
- Documenting how data are collected, processed and disseminated, including information about editing mechanisms applied to country data
- Giving credit, in the dissemination of international statistics, to the original source and using agreed quotation standards when reusing statistics originally collected by others
- Making officially agreed standards publicly available

5. *Sources and methods for data collection are appropriately chosen to ensure timeliness and other aspects of quality, to be cost-efficient and to minimise the reporting burden for data providers*

Good practices include:

- Facilitating the provision of data by countries
- Working systematically on the improvement of the timeliness of international statistics
- Periodic review of statistical programmes to minimise the burden on data providers
- Sharing collected data with other organisations and collecting data jointly where appropriate
- Contributing to an integrated presentation of statistical programmes, including data collection plans, thereby making gaps or overlaps clearly visible
- Ensuring that national statistical offices and other national organisations for official statistics are duly involved and advocating that the Fundamental Principles of Official Statistics are applied when data are collected in countries

6. *Individual data collected about natural persons and legal entities, or about small aggregates that are subject to national confidentiality rules, are to be kept strictly confidential and are to be used exclusively for statistical purposes or for purposes mandated by legislation*

Good practices include:

- Putting measures in place to prevent the direct or indirect disclosure of data on persons, households, businesses and other individual respondents
- Developing a framework describing methods and procedures to provide sets of anonymous micro-data for further analysis by bona fide researchers, maintaining the requirements of confidentiality

7. *Erroneous interpretation and misuse of statistics are to be immediately appropriately addressed*

Good practices include:

- Responding to perceived erroneous interpretation and misuse of statistics
- Enhancing the use of statistics by developing educational material for important user groups

8. *Standards for national and international statistics are to be developed on the basis of sound professional criteria, while also meeting the test of practical utility and feasibility*

Good practices include:

- Systematically involving national statistical offices and other national organisations for official statistics in the development of
- international statistical programmes, including the development and promulgation of methods, standards and good practices
- Ensuring that decisions on such standards are free from conflicts of interest, and are perceived to be so
- Advising countries on implementation issues concerning international standards
- Monitoring the implementation of agreed standards

9. *Coordination of international statistical programmes is essential to strengthen the quality, coherence and governance of international statistics, and avoiding duplication of work*

Good practices include:

- Designating one or more statistical units to implement statistical programmes, including one unit that coordinates the statistical work of the organisation and represents the organisation in international statistical meetings
- Participating in international statistical meetings and bilateral and multilateral consultations whenever necessary
- Working systematically towards agreements about common concepts, classifications, standards and methods
- Working systematically towards agreement on which series to consider as authoritative for each important set of statistics
- Coordinating technical cooperation activities with countries between donors and between different organisations in the national statistical system to avoid duplication of effort and to encourage complementarities and synergy
- to the improvement of statistics in the organisations and in countries

10. *Bilateral and multilateral cooperation in statistics contribute to the professional growth of the statisticians involved and to the improvement of statistics in the organizations and in countries*

Good practices include:

- Cooperating and sharing knowledge among international organisations and with countries and regions to further develop national and regional statistical systems
- Basing cooperation projects on user requirements, promoting full participation of the main stakeholders, taking account of local circumstances and stage of statistical development
- Empowering recipient national statistical systems and governments to take the lead
- Advocating the implementation of the Fundamental Principles of Official Statistics in countries
- Setting cooperation projects within a balanced overall strategic framework for national development of official statistics

3 Quality Dimensions

3.1 Introductory Remarks

It is generally agreed that, whilst *statistical product quality* can be summarized in line with the definition in the ISO 9000 Series for any product as *fitness for use*, there is a need to elaborate this definition in terms of the various quality aspects or *dimensions*. Many versions of quality dimensions have been proposed over the last 20 years, most of which contain essentially the same ideas and all of which include a significant expansion of the original narrow interpretation of quality as simply *accuracy*.

In developing the following set of dimensions particularly influential documents were:

- the UN's Generic Statistical Quality Assurance Framework (the primary source);
- the *OECD Quality Framework and Guidelines*
- the European Statistical System quality dimensions that are incorporated in the *European Statistics Code of Practice*.

Other reference documents are listed in the Annex.

The Agency quality dimensions are in two groups: those relating to *data quality* that apply to a data product and those relating to *process quality*. The latter group is important as well designed and executed processes provide the basis for data quality.

3.2 Data Quality Dimensions

Relevance

The *relevance* of a data product is the degree to which the data serve to address the purposes for which they are sought by users. Relevance has three aspects: coverage of the required population (completeness); inclusion of the appropriate content: and use of appropriate concepts. Relevance is further characterised by the merit of the data uses in terms of the the Agency mandate.

Typically a data product has multiple users and uses. Thus, measuring relevance requires the identification of user groups and their needs, whilst recognizing that these may change over time.

Relevance may be indirectly assessed by ascertaining whether there are processes in place to determine the views of users and the uses they make of the data.

Users of the Agency data may be divided into two main groups;

- *internal users* - primarily analysts within the Agency divisions; and
- *external users* - including other UN organisations, other international organisations, national governments, national statistical offices and other national organisations, ICT operators and other businesses, academic institutions and the media.

Whilst internal users are the very important, it is essential that the content and format of published outputs be adapted to the full range of potential users.

Accuracy

The *accuracy* of a data product is the degree to which the data correctly estimate or describe the quantities or characteristics they are designed to measure. Accuracy refers to the closeness between the values provided in the product and the (unknown) true values. Accuracy has many attributes, and, in practical terms, there is no single overall measure of it. Typically, accuracy is described in terms of the errors, or the potential significance of errors, introduced at various stages in the production process from initial acquisition of the data to dissemination of aggregates.

In the case of data from sample surveys, the major sources of error are coverage, sampling, non-response, response, processing, and seasonal adjustment. For data from censuses there are no sampling errors. For data from administrative sources, there are also no sampling errors, but there are additional problems due to mismatching of administrative concepts or classifications to statistical requirements.

The accuracy of the data produced by the Agency is largely determined by the accuracy of the data received from the contributing organisations. However, Agency activities can also improve accuracy; for example, quality checks may result in detection and correction of errors in data provided by contributing organisations and thus lead to improvements in the data. Agency activities may also have an adverse effect, for example by introducing errors during the processing stages.

Reliability

The *reliability* of data is the closeness of the initially released values to subsequently revised values that are released. The sources of revision are typically include (1) replacement of preliminary source data with later data, (2) replacement of projections with source data, (3) changes in definitions or estimating procedures, and (4) updating of the base year for constant-price estimates.
Sometimes reliability is considered as an aspect of accuracy.

Coherence

The *coherence* of a data product reflects the degree to which it is logically connected and mutually consistent with other data products. Coherence implies that the same term should not be used without explanation for different concepts or data items; that different terms should not be used without explanation for the same concept or data item; and that variations in methodology that might affect data values should not be made without explanation.

Coherence in its loosest sense implies the data are "at least reconcilable." For example, if two data series purporting to cover the same phenomena differ, the differences in time of recording, valuation, and coverage should be identified so that the series can be reconciled.

Coherence has four important sub-dimensions.

- *Coherence within a dataset* implies that the elementary indicators are based on compatible concepts, definitions, and classifications and can be meaningfully combined. Incoherency within a dataset occurs, for example, when indicator values that should add up to a total do not.

- *Coherence across datasets* implies that the data are based on common concepts, definitions and classifications, or that any differences are explained and can be allowed for. An example

of incoherency across datasets would be if household ICT usage could not be reconciled with ICT supply. Unexplained inconsistencies across datasets could seriously reduce the interpretability and credibility of the Agency statistics.

- *Coherence over time* implies that the data are based on common concepts, definitions, and methods over time, or that any differences are explained and can be allowed for. Incoherence over time refers to breaks in a series resulting from changes in concepts, definitions, or methodology.
- *Coherence across countries* implies that, from country to country, the data are based on common concepts, definitions, classifications and methodology, or that any differences are explained and can be allowed for. Ensuring coherence across countries, commonly referred to as *harmonization*, is one of the major sources of value added by the Agency.

Metadata plays a fundamental role in explaining possible changes in concepts or methodologies over time and across countries.

Timeliness

The *timeliness* of a data product is the length of time between its availability and the event or phenomenon it describes. Timeliness is assessed in terms of a time scale that depends upon the period for which the data are of value, i.e., are sufficiently timely to be acted upon. The concept applies equally to short-term or structural indicators, the only difference is the time scale.

Although the Agency processes themselves can have an adverse effect, for the most part the timeliness of the Agency data products is determined by the timeliness of the data it receives from the contributing organisations.

Punctuality

The *punctuality* of a data product implies the existence of and adherence to a *data product dissemination schedule.* A data product is punctual if it is disseminated in accordance with the schedule. In the case of data published externally the schedule may comprise a set of target release dates or may involve a commitment to release data within prescribed time period. (Here "release date" refers to the date on which the data are first made publicly available, by whatever medium, typically, but not inevitably the web site).

A dissemination schedule assists:

- internal users, by enhancing their capacity to plan their work based on target internal dissemination dates for data they require;
- external users, by improving their capacity to make timely use of the Agency statistics;

There may be occasions when the Agency simply cannot adhere to the dissemination schedule due to the late acquisition of data from input sources. In such circumstances advance warning regarding the delay in dissemination should be communicated to users.

Sometimes, but not here, timeliness and punctuality are grouped together in a single quality dimension, first, because their separate achievements are heavily inter-related and, second, to be in line with international standards and practices.

Accessibility

The *accessibility* of a data product reflects how readily the data can be discovered, located and accessed from within the Agency data holdings. It includes the suitability of the formats in which the data are available, the media of dissemination, the availability of metadata and user support services, and, in the event that there is a charge, the affordability of the data to users.

From the perspective of data availability, the Agency users are divided into two very distinct groups: internal users; and external users. Typically, because of the differences in access methods, internal users can access data earlier and in more detail than external users. Thus these two groups may have quite different perceptions of accessibility.

The range of different external users leads to the need for multiple dissemination formats and selective presentation of metadata. A publication policy should be articulated and made publicly known.

Interpretability

The *interpretability* (sometimes called *clarity*) of a data product reflects the ease with which users can understand and properly use the data. The degree of interpretability is largely determined by the adequacy of the definitions of concepts, target populations, indicators and other terminology describing the data, and its limitations.

If there are several dissemination mechanisms they should be harmonised in order to avoid confusing users.

Coping with the needs of the broad range of external users leads to the use of metadata presentation in layers of increasing detail. The content and format of published products should be adapted to the different target groups.

Credibility

The *credibility* of a data output refers to the confidence that users place in that product based primarily on their image of the data producer and the product, i.e., the *brand image*. It is based on the users' *perceptions* of accuracy as well as the actual accuracy.

Credibility is built over time. An important aspect is trust in the objectivity of the data. This implies that the data are perceived to be produced professionally in accordance with appropriate statistical standards, and that policies and practices are transparent. In particular, data are not manipulated, nor their release timed in response to political pressure.

Another aspect of credibility is trust in the integrity of the production process. To obtain complete coverage the Agency may impute data for missing countries; to improve accuracy it may adjust data received. The extent to which this is well done and well understood affects credibility. Also, once agreement between the Agency and an organisation has been reached on how data will be provided or imputed, the agreement should not be subsequently withdrawn in response to political pressure.

Balancing Data Quality Dimensions

The data quality dimensions are not mutually exclusive in the sense that there are relationships between the factors that contribute to them. Factors leading to improvements with respect to one dimension may result in deterioration with respect to another. Thus, in designing a data

collection and products, it is often necessary to trade-off quality in one dimension with quality in another. The most significant trade-offs to consider are as follows.

- *Accuracy and timeliness.* This is probably the most frequently occurring and important quality trade-off. Improvement in timeliness can be obtained by terminating data acquisition earlier and compiling products based on a smaller number of countries and/or reduced editing. However, as this reduces accuracy, there needs to be a trade-off. For major products a compromise is to disseminate a preliminary version of the data product based on partial acquisition and then one or two revised products based on successively more acquisition and editing. The size of the revisions between preliminary and revised products is an indicator of degree of accuracy that is being sacrificed in order to produce the increased timeliness.

- *Relevance and accuracy.* Relevance can be increased by acquiring more data items, but accuracy may be diminished because the additional data are less reliable. Conversely elimination of inaccurate data items will increase accuracy but reduce relevance.

- *Relevance and timeliness.* Timeliness may be improved by reducing the number of data items collected or by replacing those that are difficult to collect by ones that are easier. This will have a negative effect on relevance.

- *Relevance and coherence.* Improvements in relevance, for example by redefining the indicators for which data are collected, or moving to a later version of a classification, will reduce comparability over time, perhaps to the point of requiring a series break. Conversely, the desire to retain comparability over time may inhibit changes in content required to improve relevance.

- *Accuracy and coherence.* Improved methods may increase accuracy but reduce coherence by introducing changes in data that are attributable to changes in methods not in what is being measured. Conversely, the desire to retain coherence may inhibit changes required to improve accuracy.

3.3   Process Quality Dimensions

Sound Methods and Systems

Sound methods refers to the use of international standards and best practices through all stages of a data collection from identification of requirements, through design, data collection, processing, analysis, dissemination, archiving and evaluation. Application of standards and best practices not only engenders the Agency process and product quality, it fosters comparability across organisations and countries.

Sound systems refers to the use of international standards and best practices in systems development, including liaising with systems developers in other statistical organisations and making optimum use of off-the-shelf or shared statistical products where available.

Sound methods and systems also includes both theory and its application in the sense of ensuring that methods and systems are well designed, developed, implemented and documented, and that staff are well trained in their use.

Cost-Efficiency

The *cost-efficiency* with which data products are produced is a measure of the costs incurred and resources expended relative to the benefits of the products. The aim is to produce a specified set of products of specified quality at minimum cost.

Efficiency can affect all dimensions of product quality in the sense that, if a product can be produced more efficiently with the same quality, then the resources released can be used to improve any dimension of the quality of that product or other products, or to create new products.

Two types of costs are incurred:

- the costs to the Agency of acquiring, processing and disseminating the data;
- the costs incurred by the national providers from which the data are acquired. These costs depend significantly on whether or not they actually collect and use the data for their own purposes. If they do, then the costs are essentially those of repackaging and transmitting data already collected. Otherwise they are the full costs of data collection.

The Agency never collects data directly from basic units (operators, households, and individuals) to which the data refer and that provide the original primary data. Thus their costs in responding are of only indirect concern.

4   Quality Guidelines

4.1   Introductory Remarks

The guidelines are presented in two broad groups: those applying to each *individual statistical production process* within the Agency; and those applying to the Agency *statistical infrastructure.*

For the purposes of presenting guidelines for a statistical production process, the various activities associated with a statistical production process are subdivided into eight subgroups corresponding to the *phases* defined in the *Generic Statistical Business Process Model (GSBPM),* published by UNECE, which is the international standard.   The groups have been slightly expanded to include certain closely related statistical infrastructure activities, namely *managing provider relations, managing user relations* and *assuring quality*

The remaining activities associated with the statistical infrastructure are presented in three subgroups, namely, *promote methodology impartiality, objectivity and transparency; manage metadata,* and *manage performance.*

Even though not explicitly referenced, staff training is part of every subgroup.

For each subgroup of statistical activities thus defined, the guidelines include the following:

1.   *Scope* – a short description of the statistical activities to which the guidelines refer;

2.   *General guidelines* – statements of best practice reflecting the aims of the guidelines in general terms;

3.   *Links to more detailed guidelines* – comprising standard methods and operating procedures;

4.   *Monitoring mechanisms* – the methods by which adherence to the guidelines might be monitored, including quality and performance indicators and quality assessments; and

5.   *Reference documentation* – documents that elaborate the guidelines and/or that were instrumental in their formulation.

In this document only the first two items are provided. The remaining items are specific to each agency and have to be provided when the document is being specialised to an agency.

4.2   The Guidelines

1. *Specify Needs and Manage User Relations*

Scope

This group includes all activities associated with engaging users to identify their statistical needs, proposing strategic options for meeting these needs, and, if required, preparing a business case for changes to the production process and products. It includes: maintaining a knowledge of, and good relationships, with users, and examining their statistical needs in detail; checking the extent to which current statistical production process and other data sources meet these needs; defining

the general content of new or changed statistical products to meet the needs; and preparing a business case where needed to secure approval and resources to re-engineer the production process and/or produce new or changed statistics.

Guidelines

The Agency should

- determine the needs, or changes in needs, for the statistical data products it produces;
- categorise the users and potential users by type of use and data needs;
- review user requests, queries and comments with a view to identifying new or changing user needs;
- identify the most important, say 20, individual users, discuss their needs and specify in detail the corresponding data requirements;
- establish memoranda of understanding, service level agreements or equivalent for provision of data to key users;
- conduct user satisfaction surveys on a regular basis;
- identify the relevant populations and indicators for which data are required and the appropriate definitions and classifications;
- evaluate data currently available from all possible sources and determine the extent to which the data requirements can be met with data from these sources;
- if required prepare a business case for substantial revision of the statistical process and products;
- consult with key users on proposed changes to statistical products;
- share information about new or revised statistical products with other WHO units/departments that are involved in collection of related data thereby maximizing the data coherence and minimizing any risk of duplication of effort;
- provide opportunities to interested staff in other units/department to contribute to the development or redevelopment of the data production process;
- facilitated sharing of NHA data between units/departments;
- ensure the coherence of all NHA data acquired and produced by WHO.

2. Design Statistical Production Process and Statistical Infrastructure

Scope

The statistical activities in this group follows from, and build on, the results of specifying user needs. They include the research and design work needed to define or redefine, as needed, the statistical concepts and indicators, and the data collection, processing, storage and dissemination procedures required to produce the envisaged statistical products. They include specification of the metadata that are inputs to and outputs from to the production process, and general design of the systems and workflows that support and enable the efficient conduct of the procedures.

General Guidelines

The Agency should:

- define and justify the scope and content of the data collected, i.e., countries to be included, indicators and classifications;
- identify and use the most appropriate concepts, definitions, and classifications, where possible taking advantage of those already developed and used by the international statistical community;
- identify and review all possible available data sources and select the most appropriate;
- design efficient and effective data acquisition systems and procedures, including making formal agreements with providers where required;
- design efficient, effective and integrated data processing procedures and systems for coding, verifying, estimating, integrating data, and assembling data products, using internationally accepted methods to the fullest extent possible;
- design statistical products, including tables, datasets, databases and analyses in accordance with the specified data requirements;
- identify and include all the metadata required to support data collection and production and to inform users;
- involve experts, whenever available, in data collection and processing, and in designing statistical products.

3. Build Statistical Procedures and Systems

Scope

The statistical activities in this group cover building procedures and systems to support the production process and infrastructure and testing them prior to production. They include building the data collection tools, data repositories, processing tools, management control functions, and metadata management tools. They include configuring workflows to handle data transformations from acquisition to evaluation. They include producing documentation and training production staff, providers, and users in use of the systems and procedures.

General Guidelines

The Agency should:
- build efficient data collection tools;
- build appropriate and efficient data storage mechanisms, for example using databases rather than worksheets for data storage;
- build efficient and effective processing tools and metadata management tools;
- configured smooth workflows in which all activities within the entire production process fit together efficiently without gaps or redundancies;
- document all systems and procedures;
- train production staff, providers and users in use of the systems;
- specify and meet deadlines for introduction of new statistical products and/or reengineering of statistical processes;
- test all new procedures and systems before putting them into production.

4. Collect Data and Manage Provider Relations

Scope

The statistical activities in this group refer to the actual acquisition of data, using the various sources and collection modes specified in the design phase, and storing the data acquired securely in an appropriate repository. They include implementing procedures and systems for data collection from ministries of health and databases of international organisations, including follow-up in the event dubious or missing data values. They include liaising with providers, making them aware of the reasons for and specifics of the data required, and responding to their comments, queries and complaints. They include ensuring that the data and associated metadata are loaded into a suitable repository.

General Guidelines

The Agency should:

- ensure that providers are totally familiar with the reasons for data collection and the precise meanings of the indicators to be provided;
- implement efficient and effective procedures for collecting data and associated metadata from providers;
- make provision for responding to comments, queries and complaints from providers;
- monitor and follow up non-responses and partial responses and thus ensure that as much of the required data and metadata are collected;
- implement procedures to obtain data and corresponding metadata from the databases of other international or commercial organisations where appropriate,;
- ensure the risk of errors in data and metadata acquisition is minimised;
- minimise the reporting burden on providers;
- minimise the Agency resources spent in data and metadata acquisition;
- ensure that all information concerning data and metadata flows between any organization within a country and the Agency is reported to the country NSO (in view of its role as statistical coordinator for the country)..

5. Process Data

Scope

The statistical activities in this group refer to the capture verification, editing, and harmonisation of incoming data and their preparation for analysis. They include integrating data from various sources and classifying and coding them where needed; applying checks that identify missing, invalid or inconsistent data or metadata; imputing missing values for which no data have been received or for which data are inadequate or in error; applying adjustments to harmonise data across countries; deriving values for indicators for which data are directly acquired; producing estimates for countries for which no health expenditure data are available; and storing data and metadata in databases from which data can be readily extracted for analysis purposes, statistical products can be compiled, and users internal to WHO can make extracts.

General Guidelines

The Agency should:

- devise and implement efficient and effective procedures and systems for data verification, editing, harmonisation, and estimation including a full range of validity checks and edits;
- devise and implement efficient and effective procedures and systems for aggregation, including production of totals, averages and ratios for regions, and measures of dispersion where relevant;
- devise and implement efficient and effective procedures and systems for storage of data and metadata in an internal database from which statistical products can readily be compiled and internal users can take extracts;
- minimize the human resources required for data and metadata processing by good workflow management;
- collect, review and analyse all operational metadata, including number of countries providing data, and data item non-response rates;
- facilitate internal user access to the data;
- facilitate internal user understanding of the data, and their limitations, through provision of metadata describing procedures and operations;
- facilitate integration of the data with data from other production processes and check their coherence.

6. Analyse Data

Scope

The statistical activities in this group refer to the analysis required for verification of the statistical products and their preparation for dissemination. They include preparing draft statistical products, including associated metadata and quality indicators and checking that they will support the analyses for which they were designed. They include undertaking the analyses required to explain the data. They include scrutinizing, analysing and explaining the data in relation to expectations and identifying divergences from expectations. They include finalising the statistical products including interpretation notes, briefings, measures of uncertainty and other relevant metadata.

General Guidelines

The Agency should:

- prepare and review draft data products and scrutinize, analyse and explain the data in relation to expectations;
- compare the data with data for previous reference periods, and confront the data with any related data from other sources;
- view the data from all other perspectives and ensured there is an in-depth understanding of the data content before dissemination;
- produce and analyse quality indicators;

- discuss the results with internal experts and otherwise check that statistical products and associated metadata are fit for purpose before external dissemination.

7. Disseminate Statistical Products

Scope

The statistical activities in this group refer to the dissemination of the statistical products to internal and external users. They include formulating and applying a dissemination strategy, including a release schedule and pricing policy; reformatting the data and metadata as required and loading them into publicly accessible databases, and preparing and disseminating printed publications in accordance with the Agency's publishing and presentation guidelines; notifying users of the release of the statistical products, giving briefings for key users and user groups; promoting the products to ensure that they reach the widest possible range of users; and managing communications with internal and external users, including ensuring that user queries are recorded and that responses are provided

General Guidelines

The Agency should:
- implement efficient and effective procedures and systems for data dissemination;
- notify internal users and enable their access to statistical products at the earliest possible opportunity;
- prepare statistical products in accordance with relevant the Agency's publishing and presentation guidelines;
- maximize internal and external interpretability of the data products by accompanying them with appropriate metadata;
- ensure that products are timely and punctual by maintaining and adhering to detailed activity and release schedules;
- disseminate statistical products externally, including making databases accessible via the web site and preparing material for printed publications;
- give briefings to key users, including senior officials of international and national organisations, large health service providers, members of think tanks, academia and the media;
- promote externally products via wikis and blogs and social media to ensure that they reach the widest possible audience;
- manage communications with internal and external users by ensuring that user queries are recorded, that responses are provided.

8. Monitor and Evaluate Quality and Performance

Scope

Depending upon the scale of the evaluation, activities may include: defining the evaluation objectives and procedures; establishing the evaluation team; assembling the relevant documentation; analysing the documentation; discussing the statistical process and products with

the staff responsible for them and with key users and providers; identifying quality and performance issues; and making recommendations for improving quality and performance.

General Guidelines

The Agency should

- review quality concepts and prepared a data quality assurance framework, including quality principles, dimensions, guidelines and assessment checklist;
- define evaluation procedures and implemented an evaluation programme;
- conduct an annual self-assessment of its production process and products;
- commission an external assessment of its production process and products from time to time; and
  - set the objectives and scale of the evaluation;
  - provide the evaluation team with comprehensive documentation;
  - review and discuss the evaluation results;
  - based on the results, implement quality and performance improvements;
  - based on the results, prepare a business case for quality and performance improvements and submit to senior management for support and resources.

9. *Promote Professionalism, Impartiality, Objectivity, and Transparency*

Scope

The statistical activities in this group aim at ensuring that the manner in which the Agency collects, produces and disseminates statistics is seen to be professional, impartial, objective, and transparent. The activities include: demonstrating the commitment to follow international standards and best practices; publicising the methods used; ensuring that statistics are determined by statistical considerations and not by pressure from providers or users; and explaining major changes in methodology to users.

General Guidelines

The Agency should

- make known the commitment to follow professional standards in collecting, producing and disseminating statistics that are impartial and objective, including by publicizing its data quality assurance framework;
- develop and made public a data dissemination policy;
- develop and made public a release calendar in which dissemination dates and times are pre-announced and ensure that any deviations from the calendar are announced and justified to the users.
- ensure that statistics are produced on an objective basis, determined only by statistical considerations;
- select sources, concepts, methods, processes and dissemination practices on the basis of statistical considerations, and national and international principles and best practices;

- explain major changes in the methodologies and data revisions to users;
- ensure that statistical releases are clearly distinguished from political/policy statements and issued separately from them;
- ensure that statistical releases and statements made at press conferences are objective and non-partisan;
- correct errors in data outputs as soon as possible after they are detected and inform users.

10. Manage Metadata

Scope

In broad terms metadata are *data about data*. In the specific context of this quality assessment, they are data about every aspect of each statistical production process and its products. Activities in this group are cross-cutting in the sense that they cover all phases. They include identifying and classifying the various types of metadata of interest; determining how they are to be managed, i.e., obtained, recorded, accessed and used; building appropriate procedures and systems to do so; and analysing them in order to better understand and improve the production process and products.

To provide a framework for description of metadata, they are divided into four broad types: *data-related metadata, definitional metadata, procedural metadata,* and *operational metadata*.

- *Data-related metadata* are those metadata that directly describe the data as they are input and output during the various phases constituting the production process. Examples are descriptions of rows and columns in output tables, and descriptions of the contents of a database. Data-related metadata are the most frequently recorded and best understood type of metadata as they are essential in handling the data.

- *Definitional metadata* are the metadata that describe the concepts and definitions used in the production process. Examples are definitions of data items and indicators, classifications, and wordings in questionnaires.

- *Procedural metadata* are those metadata that describe the particular procedures that constitute the statistical activities of the production process. An example of procedural metadata is the specification of the automated verification rules applied during data entry or data verification.

- *Operational metadata* are metadata that describe the inputs and outputs of a procedure, other than the actual data. Operational metadata include *process metrics,* also called *paradata*, that are generated during the various production phases. An example of a process metric created during data collection is the *number of countries from which data have been received in the form*. Another example during data processing is the *number of countries for which a particular indicator has been estimated*. Such metadata are the source of quality and performance and quality indicators.

Relationship to standards and best practices

Metadata are closely related to standards and best practices in the sense that they may be derived from standards or best practices and/or be examples of instances of application of standards or best practices.

General Guidelines

The Agency should:

- identify and fully document the various types of metadata, and the needs for and uses of them;
- design, build and operate a comprehensive metadata management tools;
- appoint a single, authoritative registration authority for each metadata type;
- register metadata using a registration process that is well documented so there is clear identification of ownership;
- ensure that metadata are active to the greatest extent possible, thereby ensuring they are accurate and up-to-date, and paving the way for automation;
- ensure that passive metadata are recorded at the time they are created, preferably automatically as a by-product of the processes that generate them;
- ensure that there is a single copy of each metadata value, which is entered once and can be accessed or superseded, but not overwritten, earlier values being retained to allow historical access;
- construct different views of metadata corresponding to the differing needs of the various users;
- reuse metadata wherever possible rather than recreating them.

11. Manage Information and Communications Technology Systems and Services

Scope

The activities in this group are aimed at ensuring that an informed choice is made of contractor responsible for application development and support, that the platform where the data are stored and on which applications run is appropriate, that systems needs are well defined and conveyed to the contractor, that tools, databases and other applications are tested before being put into production, that problems with the systems are recorded, communicated to the contractor and corrected

General Guidelines

The Agency should:

- map the activities in each phase of the process and determine the potential for their automation;
- ensure that systems needs are well defined and conveyed to the contractor;
- ensure that all systems are tested before being put into production;
- ensure that problems with the systems are recorded, communicated to the contractor and corrected

12. Manage Performance

Scope

The activities in this group are aimed at ensuring that the Agency is well organised and that the human and financial resources available are adequate in magnitude and quality.

General Guidelines

The Agency should:

- measure and analyse the work effort involved in each phase of the production process;
- organise work flow efficiently;
- ensure good communication channels within the team and between the team and data providers and users and stakeholders;
- ensure that statistical activities and outputs have high profile with senior management;
- ensure user feedback is taken into account in determining priorities when resources are limited;
- advise management when the financial and human resources available do not match the statistical activities envisaged;
- prepare a business case to support any request for additional resources;

5 Quality Assessment and Improvement Programme

5.1 Introductory Remarks

Quality is managed through a comprehensive quality assessment and improvement programme that draws on and puts into action the quality principles, dimensions and guidelines described above. The programme comprises three types of quality assessment:

- monitoring quality and performance indicators for each repetition of each statistical production process;
- annual or biennial quality self-assessment of each production process or component of the statistical infrastructure;
- external quality review of a particular process or infrastructure component on an occasional basis.

These types of assessment differ from one another in their aims, the amount of detail and effort involved, the frequency with which they are conducted and the sort of recommendations they may generate. In all cases the goal is to improve quality.

In all cases there has also to be a process for ensuring that all recommendations arising from an assessment are implemented where this can be done with existing resources, or are advanced to senior management for consideration if additional resources are required.

5.2 Monitoring Quality and Performance Indicators

The objectives of identifying and monitoring quality and performance indicators (QPIs) are to quickly check ongoing operations, to monitor performance with respect to target objectives, and to identify sources of operational errors and correct them.

QPIs monitor statistical operations in terms of quality (i.e., effectiveness) and performance (i.e., efficiency). They may be divided into two groups:

- *product QPIs* - monitoring output indicators and analyses;
- *process QPIs* - monitoring all phases of statistical processes and infrastructure;

QPIs for the GSQAF have to be developed by the staff with intimate knowledge of the statistical activities to be monitored. They must be very carefully chosen. Too few QPIs, or the absence of QPIs for key procedures or outputs, result in ineffective monitoring. Too many QPIs, or ill-chosen ones, overload the production procedures and are a waste of resources.

The procedures involved in development and use of QPIs are:

- define a preliminary set of QPIs;
- designate selected QPIs as being *key* and set targets for each of these;
- analyse the values of process and product QPIs for each repetition of each statistical process;
- take immediate action to address the *operational* problems thereby identified; and

- document *structural* problems, i.e., problems that cannot be solved at operational level, and provide them as input to the next quality self-assessment, and, if serious, use them to trigger a quality self-assessment.

5.3 Quality Self-Assessment of a Statistical Production Process and Its Products

A self-assessment of quality is conducted by the staff responsible for the statistical process, typically on an annual or biennial basis. Its objectives are to help the staff responsible to develop an impression of the quality of their process and products, and hence to identify structural weaknesses and to propose quality improvements. It involves:

- assembling documentation about the process and its products;
- convening one or more meetings with the staff responsible for all aspects of processing, and at these meetings reviewing the documentation, completing the relevant sections of the checklist, and identifying process and product weaknesses and potential improvements;
- convening one or more meetings with the principal users and at these meetings reviewing the products, completing the relevant sections of the checklist and identifying product weaknesses and potential improvements;
- taking action on any improvements that can be implemented with existing resources and documenting improvements that would require additional resources and/or support from other areas; and
- presenting a summary of the results to senior management.

Self-assessment is facilitated by use of a self-assessment checklist. The checklist should cover all aspects of the production process from identification to dissemination each viewed in terms of the quality dimensions. The quality guidelines in Chapter 4 can be used as the basis for a checklist.

5.4 External Quality Assessment

External quality assessment is appropriate on a regular but infrequent basis, or if concerns about the quality of some products or processes reach a high level. The assessment objectives are to provide Agency senior management with an objective view of the quality of the statistical production process, and hence to identify any structural weaknesses, to propose quality improvements to address them, and to draw attention to the resource implications.

An external quality assessment involves the following steps:

- defining the terms of reference for the assessment;
- identification of the assessment team, involving an external expert, with the manager of the statistical process as a resource person;
- obtaining documentation and the results of recently completed self-assessments;
- convening meetings with relevant the Agency staff to further elaborate the problem areas and improvements required to address them;
- convening meetings with the principal users and further investigating the problem areas that are reflected in product weaknesses;

- reporting the results of the assessment to the Agency management in accordance with the terms of reference.

Annex 1: Reference Documents

(The list below should be replaced by the actual reference documents used.)

Fundamental Principles of Official Statistics (1994), UN Statistics Division
- indicating how national statistical systems should be organized in order to produce appropriate and reliable data that adhere to appropriate professional and scientific standards.
- http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx

Principles Governing International Statistical Activities (2005), UN Statistics Division
- comprising principles and practices that were developed and publicized by the CCSA and that should underpin the production of statistics by an international organisation
- http://unstats.un.org/unsd/methods/statorg/Principles_stat_activities/principles_stat_activities.htm

National Quality Assurance Framework (NQAF) Template and Guidelines (2012), UN Statistics Division
- the template is a tool to provide the general structure within which countries can formulate and operationalize national quality frameworks of their own or further enhance existing ones.
- the guidelines support the template providing lists of tools and references specific to sections 3 and 4 of the template, and a detailed mapping showing the correspondence to several existing quality frameworks, and links to the online NQAF glossary.
- http://unstats.un.org/unsd/dnss/QualityNQAF/nqaf.aspx

European Statistics Code of Practice (2011), Eurostat
- the Code is based on 15 principles concerning the institutional environment, statistical processes and outputs. It aims to ensure that statistics produced within the European Statistical System are not only relevant, timely and accurate but also comply with principles of professional independence, impartiality and objectivity.
- http://epp.eurostat.ec.europa.eu/portal/page/portal/quality/code_of_practice

European Statistical System Quality Assurance Framework (ESS QAF) (2011), Eurostat
- developed by Eurostat
- the framework identifies possible activities, methods and tools that provide guidance and evidence for the implementation of the European Statistics Code of Practice by European NSOs and Eurostat
- http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/QAF_2012/EN/QAF_2012-EN.PDF

Data Quality Assessment Framework (SQAF) (2003), International Monetary Fund

- developed by the IMF Statistics Division for use by NSOs and other national government agencies collecting and disseminating statistics.
- https://www.imf.org/external/np/sta/dsbb/2003/eng/dqaf.htm

Quality Framework and Guidelines for OECD Statistical Activities (2011), OECD
- developed by the OECD for managing quality within its own organisation.
- http://www.oecd.org/std/qualityframeworkforoecdstatisticalactivities.htm

European Central Bank Statistics Quality Framework (ECB SQF)
- developed by the ECB for managing quality within its own organisation.

UNIDO Data Quality: A quality assurance framework for UNIDO statistical activities
- developed by UNIDO Statistics Unit as a framework of data quality assurance for UNIDO
- covers major quality aspects of statistics produced by UNIDO, including the key quality dimensions applicable to UNIDO's statistical activities.

The FAO Statistics Quality Assurance Framework (FAO-SQAF)
- Developed within the context of the creation of the position of Chief Statistician and the establishment of the Inter-Departmental Working Group on Statistics (IDWG-Statistics).
- Comprises a quality framework and a mechanism to ensure the compliance of FAO statistics.

The UNCTAD Statistical Quality Framework (USQF) (Draft)
- To address quality and efficiency concerns in a harmonised way.
- Presents a commonly understood definition of quality and its dimensions, agreement on quality and performance indicators, and a quality assessment program.

Quality Assurance Framework Humanitarian Data Exchange (Draft)
- A descriptive report on the data quality assurance framework that will be adopted by the Humanitarian Data Exchange (HDX) platform.
- Builds on existing best practices within internationally recognised quality management frameworks.

Generic Statistical Business Process Model (GSBPM) Version v5.0 (2013), UNECE
- developed by UNECE and endorsed by the UN Statistical Commission;
- describes and defines the set of business processes needed to produce official statistics;
- provides a standard framework and harmonised terminology to help statistical organisations to modernise their statistical production processes, as well as to share methods and components.
- http://www1.unece.org/stat/platform/display/metis/The+Generic+Statistical+Business+Process+Model