

### 3. Health information systems



# Health information systems

## 3.1 Introduction

Sound and reliable information is the foundation of decision-making across all health system building blocks. It is essential for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing.

The health information system provides the underpinnings for decision-making and has four key functions: (i) data generation, (ii) compilation, (iii) analysis and synthesis, and (iv) communication and use. The health information system collects data from health and other relevant sectors, analyses the data and ensures their overall quality, relevance and timeliness, and converts the data into information for health-related decision-making (1).

The health information system is sometimes equated with monitoring and evaluation but this is too reductionist a perspective. In addition to being essential for monitoring and evaluation, the information system also serves broader objectives, such as providing an alert and early warning capability, supporting patient and health facility management, enabling planning, underpinning and stimulating research, permitting health situation and trends analyses, orienting global reporting, and reinforcing communication of health challenges to diverse users. Information is of little value if it is not available in formats that meet the needs of multiple users, i.e. policy-makers, planners, managers, health-care providers, communities and individuals. Dissemination and communication are therefore essential attributes of the health information system.

Health planners and decision-makers need different kinds of information including:

- health determinants (socioeconomic, environmental, behavioural and genetic factors) and the contextual environments within which the health system operates);
  - inputs to the health system and related processes (policy and organization, health infrastructure, facilities and equipment, costs, human and financial resources and health information systems);
  - the performance or outputs of the health system (availability, accessibility, quality and use of health information and services, responsiveness of the system to user needs, and financial risk protection);
  - health outcomes (mortality, morbidity, disease outbreaks, health status, disability and wellbeing); and
  - health inequities (determinants, coverage of use of services, and health outcomes, and including key stratifiers such as sex, socioeconomic status, ethnic group and geographical location).
- A good health information system brings together all relevant partners to ensure that users of health information have access to reliable, authoritative, usable, understandable and comparative data.

## 3.2 Expectations from country health information systems

Health information systems serve multiple users and a wide array of purposes that can be summarized as the generation of information to enable decision-makers at all levels of the health system to identify problems and needs, make evidence-based decisions on health policy and allocate scarce resources optimally (1). Data from different sources are used for several purposes at different levels of the health-care system.

- Individual level data about the patient's profile, health-care needs and treatment serve as the basis for clinical decision-making. Health-care records provide the basis for sound individual clinical care. Problems can arise when health workers are overburdened by excessive data and reporting demands from multiple and poorly coordinated subsystems.
- Health facility level data, both from aggregated facility level records and from administrative sources, such as drug procurement records, enable health-care managers to determine resource needs, guide purchasing decisions for drugs, equipment and supplies, and develop community outreach. Data from health facilities can provide immediate and ongoing information relevant to public health decision-making, but only if certain conditions are met. The data must be of high quality, relate to all facilities (public and private), and be representative of the services available to the population as a whole.
- Population level data are essential for public health decision-making and generate information not only about those who use the services but also, crucially, about those who do not use them. Household surveys have become a primary source of data in developing countries where facility-based statistics are of limited quality. Household surveys are needed everywhere, however, because they are the only good source of information on individual beliefs, behaviours and practices that are critical determinants of health-care use and health status.
- Public health surveillance brings together information from facilities and communities with a main focus on defining problems and providing a timely basis for action. This is especially important when responses need to be urgent, as for epidemic diseases. The need for timeliness of reporting and response and the requirement for effective linkages, to those in authority with the responsibility for disease control, impose additional requirements on health information systems.

Recognition of the importance of health information systems to be capable of generating reliable data is growing. In many countries, health sector reform and decentralization have brought about shifts in functions between the central and peripheral levels and have generated new information needs with changing requirements for data collection, processing, analysis and dissemination. Health sector reforms also magnify the need for standardization and quality of information.

Performance and results based monitoring, stimulated by unprecedented increases in development assistance and global health initiatives — such as the Global Alliance on Vaccines Initiative (GAVI), Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), the United States President's Emergency Plan for AIDS Relief (PEPFAR), and the Roll Back Malaria partnership — have increased pressure on governments and organizations to improve their performance and demonstrate tangible results to their stakeholders. In this environment, a premium has been placed on the existence of adequate health information of good quality. Health information systems are called upon to enable tracking along the continuum of inputs to the health system, processes and outputs, as well as outcomes and impact.

Few developing countries have sufficiently strong and effective health information systems to meet all these diverse information needs. New technologies can contribute to improving data generation, compilation and exchange but will require the existence of clear data quality standards to be of optimal value.

### 3.3 Sources of information on country health information systems

Information about the functioning of the health information system can be obtained from the different sectors and agencies that are responsible for the generation, synthesis, analysis and use of data at the country, regional and global levels. At the country level, the ministries of health record the timeliness and quality of data reported through health services and disease surveillance systems. National Statistics Offices maintain information on

the availability and quality of data generated through major data collection undertakings, such as the decennial census, large-scale household surveys and the civil registration system. As custodians of national official statistics, they often have explicit requirements for the method of data collection, compilation and sharing, and adhere to the *Fundamental principles of official statistics* devised by the United Nations (2). International agencies working in health also maintain information about the availability and quality of data on international health goals, including (but not limited to) the MDGs.

### 3.4 Criteria for assessing country health information systems performance

Criteria for assessing performance of health information systems and the quality of data they generate have rarely been defined, let alone implemented. In contrast, in sectors other than health — particularly for macroeconomic and financial statistics — considerable work has been done to define standards, guidelines and best practices (see Box 3.1).

#### Box 3.1 Tools to assess the quality of national statistics

The Organisation for Economic Co-operation and Development (OECD) has developed statistical standards, guidelines and best practices on development indicators (3). Explanatory metadata are collected and published to accompany all data thus enabling users to assess data quality, i.e. fitness for use. Based on these metadata, comparability across countries — an important aspect of data quality — can be assessed.

Some national statistics offices have commissioned external reviews of performance to identify strengths and weaknesses and to make recommendations for improvement (4). The United Nations *Fundamental principles of official statistics* is often used as a general framework to assess the performance of national statistics offices (5). The quality of information is central to its usefulness. Information must be reliable, up to date, independent and trustworthy. At the same time, it is important to avoid duplication of efforts and minimize the burden of data collection on front-line staff, so that data are generated with minimal disruption of the delivery of care.

Although there is wide agreement in the literature on what the components of data quality should be, there is no universal consensus on how to group them. Some authors have proposed headings covering accuracy, relevance, coherence and consistency, continuity, timeliness, accessibility and revisability (6). Others include coherence (especially comparability), availability and clarity (7). Clearly, conflicts can arise between different facets, such as those between consistency and timeliness, and trade-offs must be made. The extent to which statistics meet users' needs and expectations for statistical information is widely recognized to be of paramount importance. To allow users to assess the quality of the statistics they utilize, producers of statistics provide neutral, descriptive information about all aspects of statistics that affect users' views on how well the statistics might meet their needs and expectations.

The International Monetary Fund (IMF) has developed the General Data Dissemination Strategy (GDDS) to help countries in improving the quality of their data (8). The GDDS strategy provides a framework for evaluating needs for data improvement and setting priorities; it provides guidance on dissemination to the public of comprehensive, timely, accessible and reliable economic, financial and sociodemographic statistics.

Arising out of the dissemination strategy, the IMF has produced a Data Quality Assessment Framework (DQAF), which identifies quality-related features of governance of statistical systems, processes and products. The framework is rooted in the *Fundamental principles of official statistics* and describes five dimensions of quality — assurances of integrity, methodological soundness, accuracy and reliability, serviceability and accessibility. The framework, which is used for comprehensive assessments of countries' data quality, covers institutional environments, statistical processes and characteristics of the statistical products (9).

The Food and Agriculture Organization (FAO) has developed a Data Quality Stamp for statistical data that meet quality criteria including: availability of appropriate metadata for all data series; use of international classifications; provision of an updated schedule to ensure timeliness; provision of global coverage information in the data series; integration of the data series in the databases within a statistical framework; and assurance that the data series is up to date (10).

A commonly used standards framework is provided by the *Fundamental principles of official statistics* (2). Data quality assurance approaches generally distinguish assessment criteria for data outputs from those that relate to the quality of institutional frameworks, which is a prerequisite for the generation of reliable data. Some of the quality frameworks are intended to be used to assess national level data, whereas others relate to the quality of data issued by international agencies, such as the World Bank or the International Monetary Fund (IMF).

The Health Metrics Network (HMN) framework identifies the key components and standards of a country health information system (1). The framework describes health information system components in terms of resources, indicators, data sources, data management, information products, and dissemination and use and specifies the standards to be attained for each component.

### 3.5 Methods for assessing country health information system performance

A country's health information system performance can be assessed either by using a self-administered tool or through independent (often external) expert evaluation (see the matrix in Table 3.1). The major advantage of *self-assessment approaches* is the degree of country ownership generated that enables the assessment to serve as the basis for the development of a plan for improvement. However, self-assessment approaches are generally time consuming and complex to implement; they are less likely to generate results that can be compared over time or between countries and are more likely to be biased. *Independent assessment* is generally based on existing sources, such as databases of international agencies, so as to minimize the reporting burden on countries. The disadvantage is that countries may not agree with the assessment and therefore may not use the results for developing an improvement strategy.



**Table 3.1 Assessment matrix for country information systems performance**

| National data process     | Self-assessment                             | Independent assessment   |
|---------------------------|---|--|
| Statistical system        | General Data Dissemination Strategy         | World Bank Statistical Capacity Indicator score  |
| Health information system | Health Metrics Network self-assessment tool | Health Information System Performance Index (HISPIX)<br>Specific indicators: reporting rates, data and statistics availability |

### Self-assessment approaches

The *General Data Dissemination Strategy* (GDDS) developed by IMF (8) is designed:

- to assist countries in assessing and documenting their statistical practices and procedures and in compiling metadata;
- to enable countries to develop and implement plans for improvement in the different areas of statistics covered by the GDDS.

The principal goal of the GDDS is to improve data quality — quality relating both to the actual data and also to the whole statistical system. The strategy involves providing short-term technical assistance to countries to engage in a systematic review of existing statistics as compared with international standards — essentially an externally facilitated self-assessment. The process engages both data producers and data users and seeks to bring about more effective communication both among national statistical agencies and with the user community. Based on the result of the assessment, countries develop a comprehensive improvement plan for the statistical system. The GDDS has been used as the basis for the formulation of national strategies for the development of statistics.

The *HMN assessment tool* brings together country users and producers of health data to assess the strengths and weaknesses of the national health information system. Like the GDDS, it involves a facilitated assessment that is intended to guide countries' efforts to strengthen their health information systems by enabling a baseline analysis and identification of areas for improvement in which donor support might be sought. The HMN assessment tool framework follows a cascading structure that flows from five main dimensions of data quality: (i) integrity, (ii) methodological soundness, (iii) accuracy and reliability, (iv) serviceability, and (v) accessibility. For each of these interrelated dimensions, the framework identifies pointers, or observable features, that can be used in assessing quality. In addition to these five dimensions, the tool describes a set of prerequisites for the assessment of data quality. The coverage of these dimensions recognizes that data quality encompasses characteristics related to the institution or system used for the production of the data as well as characteristics of the individual data product. By engaging all stakeholders, it helps develop a shared vision of a more coherent, integrated, efficient and useful system.

More than 50 countries completed their health information systems assessment by the end of 2009 (11). Overall, the self-assessment approach appears to have worked well in generating a broad understanding of the HMN concept of health information systems, cutting across both disease-based and source-based reserves of information. This tool resulted in enhanced collaboration among various stakeholders in health information, particularly between health and statistics constituencies. However, considering the degree of stakeholder involvement required, the approach is complex and time consuming to administer. There are issues of objectivity of the respondents and possible conflicts of interest that arise when a self-assessment approach used is not well-suited to enabling comparisons between countries and over time.

## Independent assessments

The *World Bank Statistical Capacity Indicator* is calculated on the basis of a desk review by external technical experts. This summary measure provides an overview of the statistical capacity of developing countries and is based on a diagnostic framework developed with a view to assessing the capacity of statistical systems using metadata information generally available for most countries. The framework has three dimensions: (i) statistical practice (the ability to adhere to internationally recommended standards and methods); (ii) data collection (frequency of censuses/surveys and completeness of vital registration); and (iii) indicator availability (availability and frequency of key socioeconomic indicators). Countries are scored against specific criteria, using information available from the World Bank, IMF, the United Nations, United Nations Educational, Scientific and Cultural Organization (UNESCO) and WHO. A composite score for each dimension and an overall score combining all three dimensions is derived for each country on a scale of 0–100. A score of 100 indicates that the country meets all the criteria and suggests good statistical standing. The assessment is carried out annually.

## 3.6 Core indicators

Indicators of country health information system performance can be categorized as two broad types:

1. Indicators related to data generation using core sources and methods (health surveys, civil registration, census, facility reporting, health system resource tracking). These reflect country capacity to collect relevant data at appropriate intervals and uses the most appropriate data sources. Benchmarks include periodicity, timeliness, contents of data collection tools and availability of data on key indicators.
2. Indicators related to country capacities for synthesis, analysis and validation of data. These measure key dimensions of the institutional frameworks needed to ensure data quality, including independence, transparency and access. Benchmarks include the availability of independent coordination mechanisms and the availability of microdata and metadata.

The following indicators are grouped according to the assessed data sources that make up a country's health information system. The last group of indicators addresses the capacity for data synthesis, analysis and validation. Table 3.2 defines the indicators listed below and describes methods of measurement.

### **Recommended indicators to assess data sources:**

#### Health surveys

- Country has a 10-year costed *survey plan* that covers all priority health topics and takes into account other relevant data sources.
- Two or more data points available for *child mortality* in the past five years.<sup>1</sup>
- Two or more population-based data points for *maternal mortality* in the past 10 years, including one in the past five years.
- Two or more data points for *coverage* of key health interventions in the past five years.
- One or more data point on *smoking* and *adult nutritional status* in the past five years.

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1 Only relevant to countries without complete civil registration systems (>90% coverage of births and death).

### Birth and death registration:

- *Birth registration* of at least 90% of all births (intermediate goal 50%). Indicator: percentage of births registered.
- *Death registration* of at least 90% of all deaths (intermediate goal 50%). Indicator: percentage of deaths registered.
- ICD-10 used in district hospitals and *causes of death* reported to national level.

### Censuses

- *Census* completed within the past 10 years.
- *Population projections* for districts and smaller administrative areas available for the next 10 years, in print and electronically, and well documented.

### Health facility reporting

- Number of *institutional deliveries* available, by district, and published within 12 months of the preceding year.
- *HIV prevalence* for relevant surveillance populations published within 12 months of the preceding year.
- Country *web site for health statistics*, with latest report and data available to the general public.
- Reporting of *notifiable diseases* makes use of modern communication technology, and reporting of statistics from district to national levels is web-based.
- At least 90% of the *districts* submit timely, complete, accurate reports to national level. Indicator: percentage of districts that submit timely, complete, accurate reports to national level.
- *Data quality assessments* carried out and published within the past three years, using internationally agreed quality criteria, such as Data Quality Assessment Framework (DQAF).
- *International Health Regulations* implemented according to international standards.

### Health system resource tracking

- At least one *national health accounts* exercise completed in the past five years.
- National database with *public and private sector health facilities* and geocoding, available and updated within the past three years.
- National database with *health workers* by district and main cadres updated within the past two years.
- Annual data on availability of *tracer medicines and commodities* in public and private health facilities.

### **Recommended indicators to assess capacity for analysis, synthesis and validation of health data**

- A designated and functioning *institutional mechanism* charged with analysis of health statistics, synthesis of data from different sources and validation of data from population-based and facility-based sources.
- A *national set of indicators* with targets and annual reporting to inform annual health sector reviews and other planning cycles.
- A national *microdata archive* for health surveys and census that is established and operational.
- Survey data used to assess and *adjust routine reports* from health facility on vaccinations, with the results published within 12 months of the preceding year.
- A *burden of disease* study conducted within the past five years, with a strong national contribution.
- A *health systems performance* assessment carried out within the past five years, with a strong national contribution.



**Table 3.2 Summary of core indicators and scoring for Health Information Systems Performance Index (HISPIX)**

| Indicators   | Definition  | Data collection method  | Scoring for HISPIX             |
|--|---|---|--------------------------------|
| <b>Health surveys</b>  |   |   |                                |
| Country has a 10-year costed <i>survey plan</i> that covers all priority health topics and takes into account other relevant data sources.     | Survey plan comprises modular contents with periodicity for specific indicators calibrated to achieve maximum sensitivity and efficiency. Includes data collection concerning health-related behaviours and bio-clinical measurements   | Bureau of the Census, National Statistics Office and Ministry of Health | Yes: 1<br>No: 0                |
| Two or more data points available for <i>child mortality</i> in the past five years <sup>a</sup>   |   | Country reports, DHS <sup>b</sup> and MICS <sup>c</sup>                 | Yes: 1<br>No: 0                |
| Two or more population-based data points for <i>maternal mortality</i> in the past 10 years, including one in the past five years <sup>a</sup> |   | Country reports, DHS and MICS   | Yes: 1<br>No: 0                |
| Two or more data points for <i>coverage</i> of key health interventions in the past five years   | Comprising coverage of key maternal and child health-care interventions, risk behaviours and care-seeking   | Country reports, DHS and MICS   | Yes: 1<br>No: 0                |
| One or more data points on <i>smoking and adult nutritional status</i> in the past five years  | Nutritional status clinically measured  | Country reports, DHS and MICS   | Yes: 1<br>No: 0                |
| <b>Birth and death registration</b>  |   |   |                                |
| <i>Birth registration</i> of at least 90% of all births (intermediate goal 50%). Indicator: percentage of births registered                    | <i>Numerator:</i> number of births registered, as reported by civil or sample registration systems, hospitals and community-based reporting systems   | Civil registration or sample registration systems                       | <50% score 0<br>50–89% score 1 |
|  | <i>Denominator:</i> total births for the same time period and geographical region. Where information on total births is not available because of incomplete civil registration, total births can be estimated by extrapolating from the census or on the basis of information about natality rates derived from population surveys  |   | ≥90% score 2                   |
| <i>Death registration</i> of at least 90% of all deaths (intermediate goal 50%). Indicator: percentage of deaths registered                    | <i>Numerator:</i> number of deaths registered as reported by civil or sample registration systems, hospitals and community-based reporting systems  | Civil or sample registration systems                                    | <50% score 0<br>50–89% score 1 |
|  | <i>Denominator:</i> total deaths for the same time period and geographical region. Where information on total deaths is not available because of incomplete civil registration, total deaths can be estimated by extrapolating from the census or on the basis of information about mortality rates derived from population surveys |   | ≥90% score 2                   |
| ICD-10 <sup>d</sup> used in district hospitals and causes of death reported to national level  | <i>Numerator:</i> number of district hospitals using ICD-10 to certify cause of death   | Routine Health Management Information System HMIS reports               | <50% score 0<br>50–89% score 1 |
|  | <i>Denominator:</i> total district hospitals  |   | ≥90% score 2                   |

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| Indicators  | Definition  | Data collection method  | Scoring for HISPIX |
|---|---|---|--------------------|
| <b>Census</b>   |   |   |                    |
| <i>Census</i> completed within the past 10 years  |   | Bureau of the Census, National Statistics Office and Ministry of Health | 1                  |
| <i>Population projections</i> for districts and smaller administrative areas available for next 10 years, in print and electronically, well documented  |   |   | 1                  |
| <b>Health facility reporting</b>  |   |   |                    |
| Number of <i>institutional deliveries</i> available, by district, and published within 12 months of preceding year  | Includes deliveries in public, private and nongovernmental organization facilities  | Country HMIS reports  | 1                  |
| <i>HIV prevalence</i> for relevant surveillance populations published within 12 months of preceding year  |   | National Aids Committee reports   | 1                  |
| Country <i>web site for health statistics</i> , with latest report and data available to the general public   |   | Country HIS <sup>e</sup> reports  | 1                  |
| Reporting of <i>notifiable diseases</i> makes use of modern communication technology, and reporting of statistics from district to national levels is web-based                                   |   | Country HMIS reports  | 1                  |
| At least 90% of <i>districts</i> submit timely, complete, accurate reports to national level. Indicator: percentage of districts that submit timely, complete, accurate reports to national level | <p><i>Numerator</i>: number of health districts with timely and complete reporting of key data series</p> <p><i>Denominator</i>: total districts</p> <p>Countries should define core data series that should be reported to districts by all facilities and compare reports against this list</p> | Country HMIS reports  | 1                  |
| <i>Data quality assessments</i> carried out and published within the past three years, using internationally agreed quality criteria such as the Data Quality Assessment Framework (DQAF)         | <p>Assessment should routinely cover all administrative data sources (e.g. civil registration, facility reports)</p> <p>Assessment should use internationally agreed data quality criteria such as DQAF</p>   | Country HMIS reports  | 1                  |
| <i>International Health Regulations (IHR)</i> implemented according to international standards  | Compliant with IHR monitoring and evaluation framework  | Country health sector reports   | 1                  |
| <b>Health system resource tracking</b>  |   |   |                    |
| At least one <i>national health accounts</i> exercise completed in the past five years  |   | NHA <sup>f</sup> report   | 1                  |
| National database with <i>public and private sector health facilities</i> and geocoding, available and updated within the past three years  | Database should separate public, private and non-profit facilities; it should also include key infrastructure, human resources, medicines, equipment and supplies, and service availability   | Health facility assessments   | 1                  |
| National database with <i>health workers</i> by district and main cadres updated within the past two years  | Database comprises data from multiple sources, including census, labour force surveys, professional registers, training institutions and facility assessments   | National health sector review   | 1                  |
| Annual data on availability of <i>tracer medicines and commodities</i> in public and private health facilities  | Aligned to national essential medicines list  | Essential medicines reviews; health facility assessments                | 1                  |

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| Indicators   | Definition  | Data collection method                               | Scoring for HISPIX |
|--|---|--|--------------------|
| <b>Capacity for analysis, synthesis and validation of health data</b>  |   |  |                    |
| A designated and functioning <i>institutional mechanism</i> charged with analysis of health statistics, synthesis of data from different sources and validation of data from population-based and facility-based sources | Body should be administratively separate from programmes responsible for delivery of interventions. Should adhere to <i>Fundamental principles of official statistics</i>                     | National health sector reports                       | 1                  |
| A <i>national set of indicators</i> with targets and annual reporting to inform annual health sector reviews and other planning cycles   | Indicators cover key issues including health determinants, health system inputs, processes and outputs, use of health care services, mortality, morbidity, health system responsiveness, etc. | National health sector reports                       | 1                  |
| A national <i>microdata archive</i> for health surveys and census established and operational  |   |  | 1                  |
| Survey data used to assess and <i>adjust routine reports</i> from health facility on vaccinations, with the results published within 12 months of the preceding year   | Validation by an independent reviewer would be needed to ascertain the extent of analysis and validation  | Information available from health statistics reports | 1                  |
| A <i>burden of disease</i> study conducted within the past five years, with a strong national contribution   |   |  | 1                  |
| A <i>health systems performance</i> assessment carried out within the past five years, with a strong national contribution   |   |  | 1                  |
| <b>Overall HISPIX</b>  |   |  | <b>30</b>          |

<sup>a</sup> Only relevant to countries without complete civil registration systems (>90% coverage of births and death).

<sup>b</sup> Demographic and Health Surveys.

<sup>c</sup> Multiple Indicator Cluster Surveys.

<sup>d</sup> *International statistical classification of diseases and related health problems, 10th revision (ICD-10)*. 2nd edition. Geneva, World Health Organization, 2005 (<http://www.who.int/classifications/icd/en/>).

<sup>e</sup> Health Information System.

<sup>f</sup> National Health Accounts.

### 3.7 Summary measure of health information system performance

WHO is proposing a Health Information System Performance Index (HISPIX) — a summary measure based on the above-mentioned standardized indicators for assessing data quality and the overall performance of the health information system. The score is calculated from information available in the public domain using standard indicators to enhance objectivity and comparability over time and across countries.

For the majority of the indicators, a simple binary scoring system (“yes” or “no”) is used, with no weighting. For the few indicators that are measured in terms of percentages, the score is calculated as described in Table 3.2. The advantage of this approach is that it permits countries and development partners to identify key areas for improvement as part of a health information system strengthening plan.

The crucial difference between the HISPIX approach and the HMN self-assessment tool is that the indicators can be assessed on the basis of information that is largely available in the public domain. Information on data sources and data availability can be compiled from WHO databases and those of other international agencies. Information on inputs and resources is available from country health statistics reports and from the self-assessments conducted through HMN. For countries that have not conducted such assessments, it may be

necessary to gather information through WHO and other agency country offices and through direct contacts with country health information units and statistics offices.

Because of the relative ease of data collection, and because several of the indicators are amenable to relatively rapid change, it is suggested that the analysis be conducted every three years to gauge trends over time.

Efforts should continue, however, to link the independent assessment approach to self-assessment strategies, such as the HMN tool. This would help ensure continued country involvement and thus sustainability. Clear descriptions of data quality criteria and user-friendly checklists could be valuable tools in this regard.

## Selected resources and tools

The following annotated references and links to key sources of standards, guidelines and quality criteria for different components of the health information system are not necessarily assessment tools in themselves; they offer guidance on quality criteria for various aspects of the health information system. The main focus is on ensuring data quality.

### General health information systems assessment

Health Metrics Network. *Assessing the national health information system: an assessment tool, version 4.00*. Geneva, World Health Organization, 2008 (<http://www.who.int/healthmetrics/tools/hisassessment/en/index.html>, accessed 1 April 2010).

This is a tool for conducting a systematic assessment of the existing national health information systems — both to establish a baseline and to monitor progress. The assessment is aligned with the standards for health information systems described in the HMN framework. The assessment covers the many subsystems of a national health information system, including public and private sources of health-related data. It addresses the resources available to the system (inputs), its methods of work and products (processes and outputs) and results in terms of data availability, quality and use (outcomes). All major stakeholders should participate in assessing the national health information system and planning for its strengthening. Stakeholders include the producers, users and financiers of health information and other social statistics at various national and sub-national levels: officials in government ministries and agencies; donors and development partners such as multilateral and bilateral agencies; nongovernmental organizations; academic institutions; professional associations; other users of health-related information such as parliamentarians; civil society (including health-related advocacy groups); and the media. The tool is also available as an electronic spreadsheet to facilitate scoring of the indicators.

### Health surveys

United Nations Statistics Division. *Household sample surveys in developing and transition countries*. New York, NY, United Nations, 2005 (Series F, No. 96, sales number E.05.XVII.6; <http://unstats.un.org/unsd/hhsurveys/>, accessed 1 April 2010).

This handbook describes standards for household surveys but is not an assessment tool. The publication presents the “state of the art” on important aspects of conducting household surveys in developing and transition countries, including sample design, survey implementation, non-sampling errors, survey costs, and analysis of survey data. The main objective of this handbook is to assist national survey statisticians to design household surveys in an efficient and reliable manner, and to allow users to make greater use of survey generated data.

MEASURE DHS. *Demographic and health surveys (DHS)*. (<http://www.measuredhs.com/>, accessed 1 April 2010).

The USAID-supported surveys, implemented by ICF Macro, are based on specified standards and quality criteria. DHS has been conducted around the world for more than two decades. These nationally representative household surveys include large sample sizes (usually between 5000 and 30 000 households) and are generally conducted every five years to allow for comparisons over time. DHS staff members have advanced training in economics, sociology, behavioural psychology, statistics, management and social marketing.

## Civil registration

United Nations Statistics Division. *Principles and recommendations for a vital statistics system, revision 2*. New York, NY, United Nations, 1998 (Series M, No. 19/Rev. 2, sales number 01.XVII.10).

This serves as a guide for national governments in establishing and maintaining reliable civil registration systems for legal documentation on events throughout the lifetime of individuals: birth, changes in marital status, and death. This book provides technical guidance on standards, concepts, definitions and classifications for civil registration and vital statistics to further increase the international comparability of data. Companion publications include the *handbooks on civil registration and vital statistics systems* issued by the United Nations over the past few years (<http://unstats.un.org/unsd/demographic/standmeth/handbooks/default.htm#civilreg> ).

## Censuses

United Nations Statistics Division. *Principles and recommendations for population and housing censuses (2008)*. New York, NY, United Nations, 1998 (<http://unstats.un.org/unsd/demographic/sources/census/census3.htm>, accessed 1 April 2010).

This provides international principles and recommendations for use by national statistical offices and census officials throughout the world in planning and organizing a census.

## Health facility reporting

Lafond A, Field R. *The PRISM: introducing an analytical framework for understanding performance of routine health information systems in developing countries*. Presented at: Workshop on Enhancing the Quality and Use of Health Information at the District Level, Eastern Cape Province, South Africa, 29 September–4 October 2003 ([http://www.globalhealthcommunication.org/tool\\_docs/64/the\\_prism\\_introducing\\_an\\_analytic\\_framework\\_for\\_undersanding.pdf](http://www.globalhealthcommunication.org/tool_docs/64/the_prism_introducing_an_analytic_framework_for_undersanding.pdf), accessed 1 April 2010).

PRISM (Performance of Routine Information System Management), has been developed by MEASURE Evaluation and John Snow, Inc. It is designed to assess routine, facility-based information and management systems while acknowledging the broader context in which such systems operate. It emphasizes strengthening routine health information system performance through better data quality and improved information use. PRISM broadens the analysis of performance to include three key categories of determinants that affect performance:

- behavioural determinants: the knowledge, skills, attitudes, values and motivation of the people who collect and use data;
- technical determinants: data collection forms, processes, systems and methods;

- organizational determinants: information culture, structure and resources and the roles and responsibilities of key contributors at each level of the health system.

## Health system resource tracking

WHO/World Bank/USAID. *Guide to producing national health accounts with special applications for low-income and middle-income countries*. Geneva, World Health Organization, 2003 (ISBN 92 4 154607 7, NLM classification W 74.1; [http://www.who.int/nha/docs/English\\_PG.pdf](http://www.who.int/nha/docs/English_PG.pdf), accessed 1 April 2010).

This document guides the reader through the process of acquiring and evaluating data and provides step-by-step examples of how to convert raw numbers into information useful for policy analysis and development.

## Assessment of data quality in national statistical systems

De Vries W. *How are we doing? Performance indicators for national statistical systems*. Washington, DC, International Monetary Fund, 1998 (<http://dsbb.imf.org/vgn/images/pdfs/nld.pdf>, accessed 1 April 2010).

This proposes a systems approach for evaluating the performance of national statistical offices and takes the view that there is a high correlation between the quality of a statistical system and the quality of its products. The United Nations *Fundamental principles of official statistics* is used as a general framework to assess the performance of national statistical offices; the guide provides a brief explanation of the principles and raises several operational questions related to each one.

Elvers E, Rosén B. Quality concept for official statistics. In: *Encyclopedia of statistical sciences*. Malden, MA, John Wiley & Sons, Inc., 1997 (Wiley InterScience Publication, <http://dsbb.imf.org/vgn/images/pdfs/Encyc.pdf>, accessed 1 April 2010).

Quality of statistics is defined by how well statistics meets users' needs and expectations for statistical information, once disseminated. The authors suggest that producers of official statistics should provide neutral, descriptive information about all aspects of statistics, so that users may assess their quality. They suggest the information be organized by main quality components, such as content, accuracy, timeliness, coherence (especially comparability), availability and clarity. Definitions of these components and their subcomponents are provided.

*General data dissemination system (GDDS)*. Washington, DC, International Monetary Fund, 1995 (<http://dsbb.imf.org/Applications/web/getpage/?pagename=gddswhatgdds>, accessed 1 April 2010).

The GDDS framework is built around four dimensions — data characteristics, quality, access, and integrity — and is intended to provide guidance for the overall development of macroeconomic, financial, and socio-demographic data. The framework takes into account, across a broad range of countries, the diversity of their economies and the developmental requirements of many of their statistical systems.

*Data quality assessment framework (DQAF)*. Washington, DC, International Monetary Fund, 2003 ([http://dsbb.imf.org/vgn/images/pdfs/dqrs\\_factsheet.pdf](http://dsbb.imf.org/vgn/images/pdfs/dqrs_factsheet.pdf); [http://dsbb.imf.org/vgn/images/pdfs/dqrs\\_Genframework.pdf](http://dsbb.imf.org/vgn/images/pdfs/dqrs_Genframework.pdf), accessed 1 April 2010).

Five dimensions of data quality: assurances of integrity, methodological soundness, accuracy and reliability, serviceability, and accessibility, and a set of prerequisites for data quality are the centre of the IMF DQAF. The DQAF, which is used for comprehensive assessments of countries' data quality, covers institutional environments, statistical processes, and characteristics of the statistical products.



*Fundamental principles of official statistics*. New York, NY, United Nations, 1994 (<http://unstats.un.org/unsd/methods/statorg/FP-English.htm>, accessed 1 April 2010).

These were adopted by the Statistical Commission in 1994. While not an assessment tool, the principles provide a general quality framework for national statistics offices to review performance, identify strengths and weaknesses, and make recommendations for improvement. The ten principles cover: relevance impartiality and equal access; professional standards and ethics; accountability and transparency; prevention of misuse; cost-effectiveness; confidentiality; legislation; national coordination; international standards; and international cooperation.

*Implementation of the fundamental principles of official statistics*. Report of the Secretary-General to the Thirty-fifth session of the United Nations Statistical Commission, 2–5 March 2004 (<http://unstats.un.org/unsd/statcom/doc04/2004-21e.pdf>, accessed 1 April 2010).

The Statistical Commission has developed a questionnaire allowing national statistical offices to report their experiences with the fundamental principles in a uniform way. This report presents the main results of the survey on the implementation of the Fundamental Principles of Official Statistics conducted by the Division between May and November 2003.

*Statistical capacity improvement in IDA countries: progress report*. Washington, DC, The World Bank, 2006 ([http://siteresources.worldbank.org/SCBINTRANET/Resources/Statistical\\_Capacity\\_Improvement\\_in\\_IDA\\_Countries-May16\\_2006.pdf](http://siteresources.worldbank.org/SCBINTRANET/Resources/Statistical_Capacity_Improvement_in_IDA_Countries-May16_2006.pdf), accessed 1 April 2010).

This paper is the first progress report on statistical capacity improvement in IDA countries. It reports on improvements made by IDA member countries to their capacity to produce good quality official statistics. It also reviews the support given to countries by the World Bank and by other development partners, discusses key issues and constraints, and outlines plans for further work.

## Assessment of data quality in international agencies

*Quality dimensions, core values for OECD statistics and procedures for planning and evaluating statistical activities*. Paris, Organisation for Economic Co-operation and Development, 2003 (STD/QFS(2003)1; <http://www.oecd.org/dataoecd/26/38/21687665.pdf>, accessed 1 April 2010).

The guidelines aim to ensure that OECD published statistics meet specific quality criteria. Quality is defined as “fitness for use” in terms of user needs. Given the work already done by several statistical organisations, the OECD drew on their experience and adapted it to the Organisation’s context. The OECD views quality in terms of seven dimensions: relevance; accuracy; credibility; timeliness; accessibility; interpretability; and coherence, which are described in this document.

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