

Establishing and Using Data Standards in Health Workforce Information Systems

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Over the last nine years, the USAID-funded CapacityPlus global project and its predecessor, the Capacity Project, have worked with countries to adapt and implement human resources information systems (HRIS) to better track and support their health workforces. HRIS are only valuable, however, to the extent that stakeholders use them for policy and management decisions, and can only be deemed successful if the decisions in turn lead to better health care. Both criteria wholly depend on the quality of data in the system.

In the context of HRIS, data quality is best defined as *how well the data represent the real world* (Brown 2011). Poor data quality can adversely affect support for—and even the livelihoods of—the very health workers we want the systems to benefit. Low-quality data can also influence organizational, project, or donor indicators. A national HRIS typically involves numerous data collection and entry steps and many users countrywide, all of which pose challenges to ensuring data quality (Wakibi 2008). As countries move ahead with HRIS scale-up efforts, it is important to establish and use standards (organizational, national, and international) to align and harmonize the collection, aggregation, and analysis of human resources for health (HRH) data.

Utilizing international standards

Sometimes it can be difficult to identify or reach agreement on data standards. It is often helpful to identify available international standards to use as a starting point and, ideally, a landing place. (The World Health Organization Minimal Data Set on Health Worker Information, not yet published, will help facilitate regional and cross-country comparison of HRH issues and give countries a starting point as they think about their health worker information systems.) Use of international standards has the added benefit of preparing the data to be aggregated with other country HRH information at the regional or global levels. Work to identify and adopt international standards gets significant support from regional and multilateral organizations because it is of considerable value to their own efforts.

In the HRH arena, there are two types of international standards to consider: 1) those that define standard HRH terminology; and 2) those that define how HRH-related information is accessed and shared. A key example of the former is provided by International Standard Classifications of Occupations (ISCO), which is maintained by the International Labour Organization (2013). The ISCO standards provide a mechanism for establishing workforce classifications. For example, even with identical job duties, a Ministry of Health might call a cadre a midwife, whereas another organization such as a



faith-based organization (FBO) might call the same cadre a nurse-midwife, and yet another entity might call the cadre a birthing coach. Software such as iHRIS can map various occupations to the ISCO code, allowing accurate comparisons and aggregation of data across organizations and countries. Excerpts from the ISCO (2008 revisions) are included in Appendix A.

The second type of international standard (defining how HRH-related information is accessed and shared) is most useful for specifying how information systems can communicate with one another to share health worker information across organizations. This is called interoperability or the exchange of information across systems. Several organizations define standards for interoperability. The standards published by Integrating the Health Enterprise (IHE) are noteworthy in that, unlike others, they are open access. Not only are the IHE standards free to download and implement, any organization can freely participate in their ongoing development. The Care Services Discovery profile (IHE

International 2013), which defines data models for health workers and the services they provide, was developed with a key requirement that it be applicable in low-resource settings.

Standardization at the country level

As low- and middle-income countries grow and develop, they often decentralize management of the health workforce. Human resources management and support that once took place at the central level increasingly occur at the district or facility levels, relying on data collected at those levels. There are many advantages to district- and facility-level data collection, including greater ease and cost-effectiveness of data collection, improved day-to-day management decisions and actions, and added value for health managers and staff, who are more likely to use their own data for decision-making. Data collected and entered directly at these levels also tend to be of higher quality. However, it is still essential to aggregate lower- and higher-level data for analysis to support strategic planning and policy decisions. Facilities and districts aggregate to the regional level, while regions aggregate to the national level.

As data move through and up a system, a paper-based HRIS can correct errors such as misspellings. This is not the case, however, with electronic systems. Whereas people working with paper files can easily tell that “nurse/midwife” and “nurse-m/wife” are the same thing, computers require relentless consistency to recognize apples as apples, or nurses as nurses. Thus, accurate aggregation and analysis depend on facility and district systems all using a standardized terminology and framework. A nurse/midwife in district A must be equivalent to a nurse/midwife in district B if they are to be counted as two nurse/midwives at the regional and national levels.

The task of standardizing definitions and developing job titles with the exact same nomenclature and spelling for each cadre in HRIS generally needs to involve participation and agreement from the Ministry of Health and all other relevant stakeholders. This approach worked well in Kenya, where stakeholders created a standardized list of 31 cadres to categorize the 38,413 health workers captured by iHRIS as of December 2011.

After standardized lists have been established for all possible data characteristics, they can be built into the HRIS. These standards are best documented as part of a system’s data dictionary—a lexicon of data fields and types supported by the system. Appendix B provides a small subset of the data dictionary for the general (uncustomized) release of iHRIS Manage; the full data dictionary can be found online (iHRIS 2009). The Data Type column indicates whether the field allows data to

iHRIS



iHRIS is an open source HRIS product originally developed by the Capacity Project and currently managed by CapacityPlus. The easy-to-use and customizable iHRIS platform (www.ihris.org) allows countries, ministries, and service delivery organizations to collect and use quantitative and qualitative health workforce characteristics. For example, the iHRIS Manage application makes it possible to track, manage, and map the health workforce. iHRIS Qualify enables professional entities to maintain a database of registered and licensed health professionals to support quality of care. We use examples from iHRIS in this brief, but all of the concepts and strategies that we discuss are equally applicable to other HRH information systems.

At present, 19 countries around the world use iHRIS. The number of health worker records captured by iHRIS surpasses 810,000, although data quality checks reveal that many records are duplicates—the result of poor data quality in the original paper-based records. A well-implemented and maintained electronic HRIS is able to reveal these kinds of problems via automatic reports that identify, compare, and analyze common fields, making it possible to correct double counting and other data quality issues that are more difficult to identify and remedy in paper-based systems.

be captured in free text or if the user will select data from a drop-down menu with predetermined data fields. The simple rule is as follows: If a data element *can* be selected from a list, it should be, and that list should be populated by consensus-based standards.

This general approach not only applies internally to a Ministry of Health HRIS but can go further by establishing standards that link HRIS data with data in other sources and systems. These linkages can extend to other HRH data sources (such as censuses and surveys), or to other health information systems and even other countries. This is where national and international standards demonstrate their power.

Stakeholder leadership groups

A multisector stakeholder leadership group with a broad representation of health workforce informatics producers and consumers can be a key player in standardizing data elements for easier aggregation and analysis. An HRH stakeholder leadership group includes individuals involved in planning, producing, managing, and supporting a country's health workforce. Members work collaboratively to address locally relevant HRH challenges (see Gormley and McCaffery 2011). This group should also have the authority and mandate to establish national systems and standards. Stakeholder leadership groups may exist at the national level in the form of a World Health Organization national health workforce observatory (WHO/AHWO n.d.), a committee following the Global Health Workforce Alliance (n.d.) country coordination and facilitation principles and process, or as an HRH technical working group. The group's specific mechanism is not as important as ensuring that it represents all who may derive or add value from linking data in the HRIS with other systems or sources.

The optimal membership of a country's stakeholder leadership group may not be obvious at first. For example, if a country already has an eHealth or health information system (HIS) working group, the group's members may be able to provide valuable oversight and coordination as part of the stakeholder leadership group. However, it is not always evident to HIS or HRH professionals that HRIS is a subsystem of the national health information system. Therefore, it is important to ensure standardization of information so that the HRIS and HIS encompass the same HRH information. Additionally, national statistics offices or national bureaus of standards are often engaged in setting national data standards, and these organizations can contribute to an HRIS standards-setting committee.

A country's Ministry of Public Service is often another key collaborator for HRH data. Because this ministry is concerned with managing the public service workforce, it will almost certainly have a payroll system that

incorporates some of the same fields as the HRIS. Since one valuable use of a health workforce information system is to help exorcise health workers who are in the payroll system but who do not actually exist at a health facility, it can be very helpful to engage the Ministry of Public Service at the earliest stages.

Country examples: In Uganda, stakeholders set out to analyze data from the central Ministry of Health, eight national and regional hospitals, and eight districts, totaling 17 data sets and 5,565 health worker records. They identified five cadres (see Table 1) and requested a standard breakdown of the sample by cadre. The differences in terminology and typos caused the system to produce a report on 34 cadres instead of five (see Table 2 on the next page). Although the original five cadres represent the largest categories, the numerous subcategories illustrate how problems with data quality can make an HRIS difficult to use.

Cadre	Staff (#)
Administration and support staff	1,748
Allied health	922
Medical	347
Nursing	2,517
Pharmacy	31
Total	5,565

In Kenya, the HIS technical working group had already established a master facility list that all health information systems could use. The HRH technical working group then made sure that the master facility list was used in the HRIS. This consistency has helped ensure that stakeholders are able to map data from different systems to the same facilities. For example, utilization of HIV services in a given facility could be examined alongside the number of health workers trained in antiretroviral therapy in that facility. Kenya's vision extends beyond the health sector; the Kenya Open Data Initiative publishes the master facility list and many other data sets online (Kenya Open Data 2011).

In Ghana, HRH stakeholders formed a health workforce observatory to produce "data and advice to help the Government of Ghana set direction for the country's health workforce in the areas of production, equitable distribution, management, and financing" (Ghana Health Workforce Observatory n.d.). Stakeholders wanted to implement an HRIS to track health workers at the facility level and agreed on the application and use of the iHRIS Manage Ghana platform. Furthering commitment to the observatory's objectives, including using iHRIS, the interactive Ghana Health Workforce Observatory website was relaunched in 2013 as an instrument to accelerate the observatory's progress and spur implementation of the HRIS and HRH policies.

Table 2: Report Showing Cadres in Uganda, Including Typos and Alternate Categories

Cadres	Staff (#)
Administration and support staff	818
Administrative & support staff	27
Administration and support	58
Administration	35
Adminstration	13
Support staff	795
Maintainance workshop	2
Subtotal	1,748
Allied health	102
Allied health officer	31
Allied health professional	461
Allied health professionals	95
Allied health proffessional	57
Allied health professional	90
Allied health workers	49
Laboratory staff	37
Subtotal	922
Medical	281
Medical doctor	9
Medical officer	6
Clinical officers	31
Dental	9
Dentistry	11
Subtotal	347
Nursing	1,055
Nursing (nurse)	750
Nursing assistant	94
Nursing (midwifery)	4
Nurses	27
Enrolled nursing	177
Midwifery	307
Midwife	29
Midwives	27
Enrolled midwifery	47
Subtotal	2,517
Pharmacy	30
Pharmacist	1
Subtotal	31
Total	5,565

Conclusion and recommendations

Deployment of an HRIS can help track and support a country's health workforce. Ensuring the standardization of the data within the system is essential to enabling stakeholders and policy-makers to make the best HRH decisions to address health workforce challenges.

Five key recommendations to establish and promote HRIS data quality are to:

1. Standardize and aggregate data to ensure consistency among different systems
2. Link HRIS with the already established HIS standards so that different systems can aggregate and map the same data
3. Consider international standards so that HRH information can be compared at the regional and global levels
4. Take a measured pace and engage a sufficiently broad HRH stakeholder leadership group and other key collaborators who have the authority to manage and establish national systems and standards
5. Engage and build the capacity of both data users and data producers, including members of a stakeholder leadership group, so they are well placed to successfully aggregate, analyze, and make good use of HRIS data when they become available.

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Appendix A: Occupational Titles Related to Health According to the International Standard Classifications of Occupations, 2008 Revisions (Excerpts)

Occupation group	ISCO code	Definition	Examples of occupations classified here	Notes
Generalist medical practitioners	2211	Generalist medical practitioners (including family and primary care doctors) diagnose, treat and prevent illness, disease, injury, and other physical and mental impairments and maintain general health in humans through application of the principles and procedures of modern medicine. They plan, supervise and evaluate the implementation of care and treatment plans by other health care providers. They do not limit their practice to certain disease categories or methods of treatment, and may assume responsibility for the provision of continuing and comprehensive medical care to individuals, families and communities.	Medical doctor (general), medical officer (general), physician (general), general practitioner, family medical practitioner, primary health care physician, district medical doctor, resident medical officer specializing in general practice	Occupations included in this category require completion of a university-level degree in basic medical education plus postgraduate clinical training or equivalent. Medical interns who have completed their university education in basic medical education and are undertaking postgraduate clinical training are included here. Although in some countries "general practice" and "family medicine" may be considered as medical specializations, these occupations should always be classified here.
Nursing professionals	2221	Nursing professionals provide treatment, support and care services for people who are in need of nursing care due to the effects of aging, injury, illness or other physical or mental impairment, or potential risks to health, according to the practice and standards of modern nursing. They assume responsibility for the planning and management of the care of patients, including the supervision of other health care workers, working autonomously or in teams with medical doctors and others in the practical application of preventive and curative measures in clinical and community settings.	Professional nurse, specialist nurse, nurse practitioner, clinical nurse, district nurse, operating theatre nurse, public health nurse, nurse anaesthetist, nurse educator	This category includes occupations for which competent performance usually requires formal training at a higher educational institution in nursing. The distinction between nursing and midwifery professionals and associate professionals should be made on the basis of the nature of the work performed in relation to this definition. The qualifications held by individuals or that predominate in the country are not the main factor in making this distinction, as training arrangements for nurses and midwives vary widely between countries and have varied over time within countries.
Midwifery professionals	2222	Midwifery professionals plan, manage, provide and evaluate midwifery care services before, during and after pregnancy and childbirth. They provide delivery care for reducing health risks to women and newborn children according to the practice and standards of modern midwifery, working autonomously or in teams with other health care providers. They may conduct research on midwifery practices and procedures, and implement midwifery education activities in clinical and community settings.	Professional midwife	This category includes occupations for which competent performance usually requires formal training at a higher educational institution in midwifery. The distinctions between nursing and midwifery professionals and associate professionals should be made on the basis of the nature of the work performed in relation to this definition. The qualifications held by individuals or that predominate in the country are not the main factor in making this distinction, as training arrangements for nurses and midwives vary widely between countries and have varied over time within countries.
Dentists	2261	Dentists (including dental surgeons and related) diagnose, treat and prevent diseases, injuries and abnormalities of the teeth, mouth, jaws and associated tissues by applying the principles and procedures of modern dentistry. They use a broad range of specialized diagnostic, surgical and other techniques to promote and restore oral health.	Dentist, dental practitioner, dental surgeon, endodontist, oral and maxillofacial surgeon, oral pathologist, orthodontist, paedodontist, periodontist, prosthodontist, stomatologist	Occupations included in this category normally require completion of university-level training in theoretical and practical dentistry or a related field. Although in some countries "stomatology" and "dental, oral and maxillofacial surgery" may be considered as medical specializations, occupations in these fields should always be classified here.

Appendix B: Excerpts from iHRIS Manage Data Dictionary

Category	Field Name	Definition	Data Type
Identity	ID number	The unique identifier—usually a number—that, when combined with an identification type, is used to identify a person (organizational or national standard)	Text entry
	ID type	An official document (such as Social Security number, national health insurance, or passport) used to identify a person	Selection (from preset list of ID types)
	Name	A person's name	Text entry
Demographic	Date of birth	A person's birthday	Date
	Gender	Indicates whether a person is male or female	Female/male
	Nationality	The country where a person is a legal citizen	Selection (from country)
Employment	Cadre	A broad category or subset of health workers characterized by the specific training, degree, or other qualifications required to practice or be licensed in that field (e.g., nurse) (Ministry of Health standard)	Selection (from preset list of cadres)
	ISCO code	A unique code that identifies a job classification using a standard coding system established by the ILO's International Standard Classification of Occupations (ISCO) for classifying professions	Selection (from list of ISCO codes)
	Job	A general set of qualifications, duties, and responsibilities that matches a particular job description and has a unique job code; there may be multiple instances of the same job within an organization (Ministry of Public Service standard)	Selection (from preset list of jobs)
	Health facility	A specific division within an organization that is defined by having its own budget and often has a unique facility code; often a facility is responsible for providing health care services (Ministry of Health standard)	Selection (from preset list of facilities)
	Health facility type	A type or level of health facility (e.g., hospital, health center III, HC-II, HC-I, health post)	Selection (from a preset list of facility types)