# Human Resources for Health Information System

## Minimum Data Set for Health Workforce Registry

World Health Organization

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# ACKNOWLEDGEMENTS

A detailed list of individuals and entities that contributed to the development of the tool is provided at the end of the document.

# ABBREVIATIONS

| | |
|---|---|
| CHW | community health worker |
| CPD | continuing professional development |
| HEC | Higher Education Council |
| GPS | global positioning system |
| HMIS | health management information system |
| HR | human resources |
| HRH | human resources for health |
| HRHIS | human resources for health information system |
| IMAP | internet message access protocol |
| ISO | International Organization for Standardization |
| POP | post office protocol |
| SMTP | simple mail transfer protocol |
| MDS | minimum data set |
| MIME | multipurpose internet mail extensions |
| MOH | ministry of health |
| PBF | performance-based financing |
| UIN | unique identification number |
| WHO | World Health Organization |

# PURPOSE OF THE DOCUMENT

This document provides a standard-based tool for health workforce planners and decision-makers developing an electronic system or modifying an existing health information system to count and document all health workers within national and sub-national contexts.

The minimum data set for health workforce registry provided in this document can be used by ministries of health to support the development of standardized health workforce information systems. The minimum data set allows standardization of data values within existing electronic human resources for health (HRH) information systems.

When used appropriately by information systems designers and software developers, a functional electronic health workforce registry can be designed to enable health workforce data interoperability—i.e. the ability to exchange health workforce data between software applications and computer systems within broader sub-national or national health information systems.

Through this approach, rapid aggregation and display of health workforce data for decision-making can be fully realized.

# How to use this document

This document is designed for simple and easy use, and need not be read in a linear fashion from beginning to end.

It is designed to be used in the context of ongoing efforts to develop human resources information systems in national and sub-national contexts, and in accordance with countries' strategic health development plans, which often address the need for health workforce information systems.

At all stages of health workforce registry development, stakeholder engagement is an essential requirement of the decision-making process. For the purposes of this document, a 'stakeholder' is any individual, community group, entity or organization that produces, consumes, or is otherwise directly involved in health workforce data, and which has an interest in the outcome of the health workforce registry.

For the purpose of clarity, it is important to recognize that each data set referred to in this document contains one or more data elements that requires a standardized data representation (Fig 1).

Figure 1. **Relationship of data set to data element**
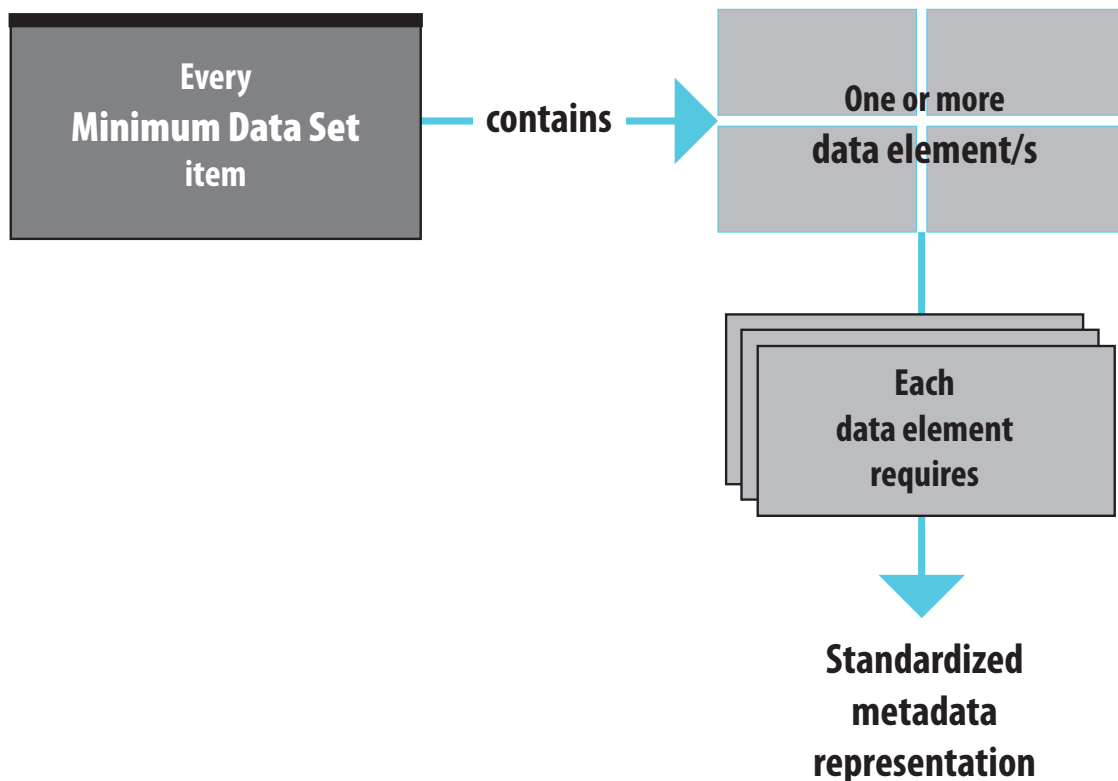
Figure 1 illustrates an easy way to understand the relationship between a minimum data set and the relevant data elements that require standardization (standardized metadata representation) in an electronic health workforce registry. The metadata provides standards and essential information on how to structure health workforce data in the context of electronic information systems, whether web-enabled or in a stand-alone computing environment.

Each metadata element has a contextual definition to serve as a starting point for implementation of the registry. However, in certain instances, these definitions should undergo adaptation.

For example, as illustrated in Figure 2, *birth history* is among the 10 minimum data sets described. *Birth history* constitutes a data set which itself contains several data elements (such as *date of birth, sex at birth, place of birth (country, town), father's name, mother's name, and photograph*). The element *date of birth* is standardized by standardizing date using the metadata representation. When date is standardized, all places where date is referred to are standardized (such as *date of birth, date of expiry, date of issue, date of expiration, etc.*). An example of standardized representation of date of birth for a person who is born on December 31, 2013 is represented as 2013-12-31, based on ISO 8601

Figure 2: **Example of representation of data element**
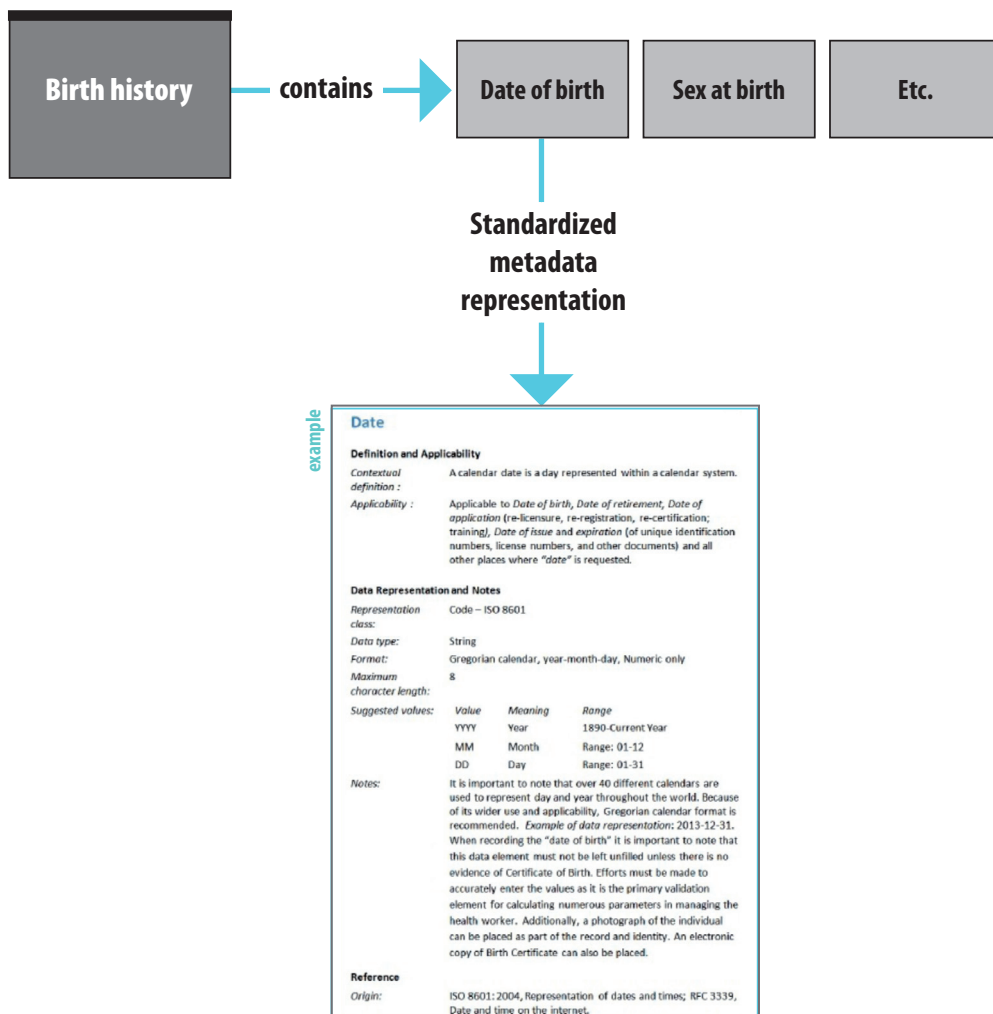
# HEALTH WORKFORCE REGISTRY
## CONCEPT AND FUNCTION

# Health Workforce Registry – concept and function

At a national level the health workforce registry is analogous to a highly sensitive and essential civil registration and vital statistics system.

In a national context an electronic health workforce registry can be considered the single authoritative source of health workforce information that can provide an accurate count of all health care personnel that either have worked or are currently working at national or sub-national levels, including in the private sector. An electronic health workforce registry can be designed to authenticate and validate the existence of a health worker and provide essential details about that person.

The establishment of a national health workforce registry is essential for strengthening national health systems at all levels. Accurate and timely health workforce data is crucial for health workforce planning, national referral, training, reducing or eliminating misinformation and duplicate health worker records, improving regulation of practice and tracking appropriate licenses of health professionals. In addition, a health workforce registry can ensure quality control, provide easy access to information on production, distribution and utilization of health personnel, and assist in budgeting, research development and advocacy. A health workforce registry allows aggregation of health workforce data in several combinations and assists both national and sub-national ministries of health in producing essential indicator-based reports, as needed.

In order to understand the relevance of the health workforce registry in a given national context, it is important to recognize the registry's relationships to larger national and sub-national health workforce information systems and health information systems, as summarized in Figure 3.

At the top of Figure 3 is a depiction of a model health information system. A national or sub-national health information system is often complex and decentralized with data or information being transmitted between and within several sub-systems. These sub-systems may include but are not limited to environmental monitoring systems, patient management systems, alert and response systems, disease surveillance systems, financial management systems, knowledge management systems, asset management systems, supply and commodity management systems, and human resources for health information systems. Due to a lack of wider use of health data standards within health information systems, health data is not often interoperable, leading to information system fragmentation.

The centre box in Figure 3 depicts a model health workforce information system, often referred to as HRIS, with numerous functional components. In some instances, these components serve as independent, decentralized and fragmented information systems, providing data and information to perform a specific health workforce function to a particular ministry of health unit. Examples of such independent components include centralized or federated payroll systems.

One critical component listed as part of the HRIS is the health workforce registry. The health workforce registry is a central and essential component of a functional HRIS, as it contains important health worker attributes that can subsequently be linked to other relevant HRIS components.

In this light, the health workforce registry serves as an important link and repository containing essential information about health workers. While health workforce registries exist in some form in most countries, they are often not standardized, updated, reliable, centralized or in electronic form.

In this document, a minimum data set is proposed to construct an electronic health workforce registry. Using this tool, data elements can be standardized within electronic systems to help facilitate the collection, collation, analysis, reporting and utilization of national and sub-national health workforce data. The tool can also assist in achieving data interoperability between and within information systems.

Figure 3: **Relationship of health workforce registry to health information systems**

## Health Information System (HIS)

*A complex system containing various health information sub systems*

- Financial Management System
- Alert and Response System
- EMR/Patient Management System
- Environmental Monitoring System
- Diagnostics/Lab System
- **HRH Information System**
- Asset Management System
- Financial Management System
- Disease Management System
- Supply-chain Management System

## Functional Components of Human Resources for Health (HRH) Information System

- Workforce Production
- Vacancy and Recruitment
- Finance
- Registration and Listening
- Migration
- Payroll
- Benefits
- Performance Management
- **HRH Workforce Registry**
- Training
- Retirement

## Minimum Data Set for Health Workforce Registry

1. Identification Number
2. Full name
3. Birth History
4. Citizenship, Country of Residence, and Language
5. Address
6. Contact Information
7. Education, Professional License and Certification
8. Employment Status
9. Employment Address
10. Data Submission Institution

A national or sub-national health workforce registry can provide critical data that helps perform many important primary health workforce functions (Table 1). In order to establish a functional and interoperable health workforce registry, it is important to understand the life cycle-based, person-centric health workforce information system.

Figure 4 highlights the four major health workforce functional domains as part of the life cycle of the health workforce: pre-entry; entry; exist; and exit. Table 1 shows the primary functions associated with each functional domain.

Figure 4. **Context of health workforce registry: person-centric information system**
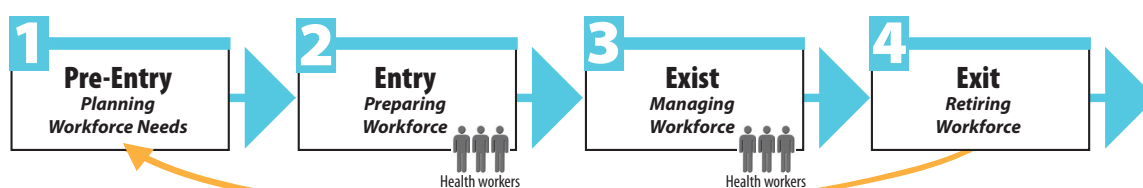


The Pre-Entry category involves a major function termed 'action plan and budget'. National and sub-national ministries utilize data in this category for various planning purposes.

In the Entry category, students enrolled or recruited in academic institutions are documented. The Entry process largely contains functions related to preparing the health registry; graduated students are documented at various institutions and appropriately credentialed. Where applicable, lists of health professional graduates are made available by academic (or training) institutions to national and sub-national ministries of health. Health professional councils provide licenses or renew credentials and licenses for graduates practicing appropriate professions.

In the Exist process, employed licensed health professionals and other health workers serving in public or private health facilities are listed. Managing the workforce demands various information-intensive functions such as payroll, in-service training, performance-based finance, relicensure, and other functions.

During the Exit process, health professionals exit the employment processes. Health workforce information systems need to be able to manage workers exiting the workforce through retirement, or otherwise exiting the system through death or discharge. Data from pension and retirement administration units form an important part of the Exit process.

Table 1. **Primary functions associated with health workforce information systems**

| Functional domains | Primary functions |
| --- | --- |
| Pre-Entry *(Planning Workforce Needs)* | Action Plan and Budget |
| Entry *(Preparing Workforce)* | Education - Enrolment<br>Education - Graduation<br>Education - Accreditation<br>Regulation - Registration and Licensing<br>Regulation - Disciplinary Action<br>Recruitment |
| Exist *(Managing Workforce)* | Payroll Administration<br>Training (in-service)<br>Leave Management<br>Relicensure<br>PBF Evaluation<br>Transfer<br>Disciplinary Action |
| Exit *(Retiring Workforce)* | Retirement<br>Discharge - Involuntary<br>Discharge - Voluntary<br>Discharge - Death during tenure<br>Pension |

Note: This table lists only "primary" or major functions; there are numerous other functions that are not included but which are recognized as important.

Typically, ministries of health require the following type of health workforce data to manage essential health workforce functions.

Table 2. **Types of health workforce information needs at national and sub-national levels**

| Information category | Ministry of Health-health workforce information need |
|---|---|
| Workforce forecasting and budget | –Staffing gaps against norms<br>–Estimation of workforce needs<br>–Estimation of financial needs<br>–Timely standardized reports |
| Distribution of workforce by cadre, facility, and targets | –Private sector / cadre types<br>–Facilities-type, geographic location |
| Workforce training and development | –Pre-Service training and production: categories of information by discipline within medical, nursing, and public health schools and other training and health institutions<br>–In-service training and continuing professional development |
| Workforce recruitment and retention | –Manage staff vacancies<br>–Planning and forecasting staff needs<br>–Manage promotion, retention, and pension Workforce credential management |
| Performance management | –Document employee performance management<br>–Document data on quality and quantity indicators |

# Minimum data set for Health Workforce Registry

# Minimum data set for Health Workforce Registry

This section provides 10 minimum data sets that are essential for designing interoperable and functional electronic health workforce registries.

Table 3.    **Minimum data set for health workforce registry**

| Item | Minimum data set | Data elements |
|:---:|---|---|
| 1 | Identification Number | *Unique identification number* or other form of ID, d*ate of issue, date of expiration, place of issue* |
| 2 | Full Name | First name, last name, middle name, maiden name, other name 1, other name 2, other name 3 |
| 3 | Birth History | *Date of Birth, Sex at Birth, Place of Birth* (country, town), father's name and mother's name, *photograph* |
| 4 | Citizenship, Country of Residence, and Language | Citizenship at birth, citizenship at present, country of residence, ability in spoken and written languages |
| 5 | Address | Physical address (country, town, street address) |
| 6 | Contact Information | *Telephone number*, *email address*, emergency contact name |
| 7 | Professional License and Certification | Education, license and certification name, issuing institution, date of issue and date of expiration, photograph |
| 8 | Employment Status | *Employment status*, *employment title* and *occupational category* |
| 9 | Employment Address | Full address of current employer |
| 10 | Data Submission Institution | Name of the institution submitting data; date and time of submission |

As described earlier, each data set contains several data elements. The standardization of data elements is accomplished using relevant metadata provided in the subsequent pages.

## Address (physical)

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | Geographic description of physical location (such as home or workplace) that can be identified and located on earth. |
| *Applicability:* | *Business address* |
| | *Residential (home) address* |
| | *Place of issue* (for identity documents) |
| | *Place of birth* |

| Data representation and notes | |
| --- | --- |
| *Data type:* | Character |
| *Format:* | Alphanumeric |
| *Maximum character length:* | 32 |
| *Suggested values:* | |

| Value | Meaning | Range |
| --- | --- | --- |
| Line 1 | *Person/entity* | *1-32* |
| Line 2 | *Street* | *1-32* |
| Line 3 | *City/town* | *1-32* |
| Line 4 | *Post code* | *1-32* |
| Line 5 | *Country (Code)* | *1-32* |

| | |
| --- | --- |
| *Notes:* | Address assignment schemes are country dependent and hence basic core components are suggested for each address line. As such, a generic format is proposed. An additional line can be added as part of the street, if necessary. The data entered must be verified through legitimate source documents at the time of record creation. |

| Reference | |
| --- | --- |
| *Origin:* | ISO 19112:2003, Spatial referencing by geographic identifiers; ISO/TS 15000-5, Electronic Business Extensible Markup Language (ebXML); ISO 27789:2013, Audit trails for electronic health records; ISO 3166:2006, Codes for the representation of names of countries and their subdivisions; UPU S42, International postal address components and templates |

## Address (electronic mail)

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Email address, unlike physical address, identifies a person or entity using a local part and a domain part such that the electronic communication can be delivered to an inbox. |
| *Applicability:* | Professional email address |
| | Personal email address |
| **Data representation and notes** | |
| *Data type:* | String |
| *Format:* | Alphanumeric only |
| *Maximum character length:* | Variable-length character encoding |
| *Notes:* | At least one email address is recommended, preferably a professional email address. Email addresses must be verified through other verifiable source documents at the time of record creation. |
| | Most emails are transmitted using SMTP for delivery protocol and IMAP or POP for retrieval protocol. |
| | Applicable to all individuals that are represented in the registry. |
| **Reference** | |
| *Origin:* | RFC 822 and all subsequent revisions, and RFC 2045 and related memoranda of Internet Engineering Task Force that defines MIME format. |

# Country

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | A territory that is legally identified as a distinct sovereign entity (independent nation or state) where the person was born. |
| *Applicability:* | *Country of birth* (denotes where the person was born)<br>*Citizenship at birth* (indicates the person's first citizenship at the time of birth)<br>*Citizenship at present* (indicates citizenship at the time of record creation, updated subsequently if the person is naturalized or obtains citizenship of a country or countries other than the country of birth). |

| Data representation and notes | |
| --- | --- |
| *Representation class:* | Code – ISO 3166 |
| *Data type:* | String |
| *Format:* | Alphabet only |
| *Maximum character length:* | 3 (see *Origin*) |

| *Suggested values:* | Value | Meaning |
| --- | --- | --- |
| | *Country 1* | *Country of birth* |
| | *Country 2* | *Citizenship at birth* |
| | *Country 3* | *Country of present citizenship* |
| | *Country 4* | *Country fo residence* |
| | *Country 5* | *Country of second citizenship (multiple citizenship)* |

| *Notes:* | In some instances, the name of the original country of birth may have changed. In such instances, locally applied practices may be employed. This data element needs to be verified through other verifiable source documents at the time of record creation. In those instances where multiple citizenships occur, it is recommended to include all applicable citizenships. As best practice, copies of citizenship and residency documents must be placed on file. |
| --- | --- |
| | Multiple country selection is not permitted for *Country of residence* or *Country of birth* or *Citizenship at birth.* Multiple country selection may be permitted for *Present citizenship*. |

| Reference | |
| --- | --- |
| *Origin:* | ISO 3166:2006, Codes for the representation of names of countries and their subdivisions. |

# Date

| Definition and applicability | |
|---|---|
| *Contextual definition:* | A calendar date is a day represented within a calendar system. |
| *Applicability:* | *Date of birth* |
| | *Date of retirement* |
| | *Date of application* (re-licensure, re-registration, re-certification; training) |
| | *Date of issue* and *expiration* (of unique identification numbers, license numbers, and other documents) |
| | *all other places where *"date"* is recorded |

| Data representation and notes | |
|---|---|
| *Representation class:* | Code – ISO 8601 |
| *Data type:* | String |
| *Format:* | Gregorian calendar, year-month-day, numeric only |
| *Maximum character length:* | 8 |

| *Suggested values:* | Value | Meaning | Range |
|---|---|---|---|
| | YYYY | Year | 1890-Current year |
| | MM | Month | Range: 01-12 |
| | DD | Day | Range: 01-31 |

| | |
|---|---|
| *Notes:* | There are over 40 different calendars used to represent day and year. Because of its wider use and applicability, Gregorian calendar format is recommended. |
| | *Example of data representation*: 2013-12-31. |
| | When recording *Date of birth* it is important to note that this data element must not be left unfilled if there is no evidence or certificate of birth. Efforts must be made to enter the values accurately, as this is the primary validation element for calculating numerous parameters required in managing the health worker. |
| | An electronic copy of the birth certificate can also be placed on file. |

| Reference | |
|---|---|
| *Origin:* | ISO 8601: 2004, Representation of dates and times; RFC 3339, Date and time on the internet |

## Disciplinary action

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Disciplinary action may involve revocation, suspension or seizure of a health worker's right or privilege to practice a health profession and may lead to fines, reprimands and/or other forms of punitive action against that health worker. |
| *Applicability:* | Applicable only to individuals in the registry who have one or more professional licences, issued by legitimate health-related regulatory bodies, to practice the intended health care professions. |

| Data representation and notes | |
|---|---|
| *Data type:* | Character |
| *Format:* | Alphabet only |
| *Maximum character length:* | 1 |
| *Suggested values:* | |

| Value | Meaning |
|---|---|
| N | No complaints |
| Y | Complaint(s) filed |

| | |
|---|---|
| *Notes:* | This data element must be provided only by legalized professional health regulatory bodies within a country. Null value is not permitted. |

| Reference | |
|---|---|
| *Origin:* | ILO, WHA 63.16 |

# Education

| Definition and applicability | |
|---|---|
| *Contextual definition:* | History of academic or professional training obtained from accredited institution  by the person in the Registry, including highest academic level attained, that includes the name of certificate or degree granting institution, country and city of the institution, date or month of certificate or degree obtained by the person and the major and minor academic study areas, if applicable . |
| *Applicability:* | Applicable to all persons in the registry. |

| Data representation and notes | |
|---|---|
| *Representation class:* | |
| *Data type:* | Variable [see below under *Suggested values*] |
| *Format:* | Variable [see below under *Suggested values*] |
| *Maximum character length:* | Variable |

| *Suggested values:* | Category | Meaning | Value |
|---|---|---|---|
| | Name of the Institution | Full name of the accredited university, college, school, institute, etc. | Alphanumeric |
| | Country | [see *Country*] | String |
| | City or Town | Location of the institution | Alphanumeric |
| | Degree or Certificate | Type of degree or certificate (example include bachelors, masters, etc.) | Alphanumeric |
| | Completion date | [see *Date*] | String |
| | Major study | Specialization | Alphanumeric |
| | Minor study | Specialization | Alphanumeric |

| | |
|---|---|
| *Notes:* | This data element represents recording history for only one education qualification and it needs to be verified through other verifiable source documents at the time of record creation. Additional education history can be added as deemed necessary by repeating the suggested values for each of the degree or certificate. All institutions recorded within this category must be verified for proper accreditation. |
| | Commencement of documentation of academic history shall be determined by the Registry administering authority. |

| Reference | |
|---|---|
| *Origin:* | |

## Employment occupational category

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Employee's detailed occupation, classified under a broader category by the legally hiring authority within a country for the purposes of organizing employment. |
| *Applicability:* | Applicable only to individuals in the registry who are employed. |
| **Data representation and notes** | |
| *Representation class:* | Code – ISCO 08 (2008) |
| *Data type:* | String |
| *Format:* | Numeric only |
| *Maximum character length:* | 4 |
| *Suggested values:* | Value — Meaning<br>9998 — Not applicable<br>9999 — Unknown |
| *Notes:* | Country-specific occupational category could be mapped against ISCO 08 standard. |
| **Reference** | |
| *Origin:* | ISCO 08; International Standard Classification of Occupations 2, 3 and 4 digits |

## Employment status

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | The status of employment of persons within the registry as reported by the data submitting entity. |
| *Applicability:* | Applicable to all individuals in the registry. |
| **Data representation and notes** | |
| *Data type:* | String |
| *Format:* | Numeric only |
| *Maximum character length:* | 2 |

*Suggested values:*

| Value | Meaning |
| --- | --- |
| 00 | Not commenced |
| 01 | Active – In-service |
| 02 | Active – Intern |
| 03 | Inactive – Discharged-voluntary |
| 04 | Inactive – Discharged-involuntary |
| 05 | Inactive – Diceased |
| 06 | Inactive – Internship completed |
| 07 | Inactive – Resigned |
| 08 | Inactive – Retired |
| 09 | Inactive – Suspended |
| 10 | Other – Unclassified |

| | |
| --- | --- |
| *Notes:* | This data element needs to be verified through other verifiable source documents at the time of record creation. The data elements listed above will be used for salary/wages and other payment processing. |
| **Reference** | |
| *Origin:* | The permissible value table is recommended. However, country-specific categories can be amended. |

## Employment title

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | Employment title is a term that describes the occupation held by an employee, and is also referred to as job title. |
| *Applicability:* | Applicable to all individuals in the registry. |
| **Data representation and notes** | |
| *Data type:* | Character |
| *Format:* | Alphanumeric |
| *Maximum character length:* | 32 |
| *Suggested values:* | |

| *Valute* | *Meaning* |
| --- | --- |
| (Position Title) | (Description) |
| 9998 | Not applicable |
| 9999 | Unknown |

| | |
| --- | --- |
| *Notes:* | This data element needs to be verified through other verifiable source documents at the time of record creation. The data elements listed above will be used for salary/wages and other payment processing. |
| | *Examples of employment titles include: pharmacist, laboratory technician, radiologist, driver, health promotion officer, community health worker.* |
| **Reference** | |
| *Origin:* | The entity-specific categories can be amended as deemed necessary. |

# Facility type and ownership

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Physical entity where a person is professionally affiliated that can be geographically located and where health care delivery or health-related activities (including education) are practiced, performed or administered by a national, sub-national or local governmental agency or by the private sector. |
| *Applicability:* | Applicable to all individuals in the registry. |

| Data representation and notes | |
|---|---|
| *Data type:* | Character |
| *Format:* | Alphanumeric |
| *Maximum character length:* | 36 |
| *Suggested values:* | *Value*<br>(Facility type)     *Meaning*<br>(Ownership/Public or private) |
| *Notes:* | Facility types are generally described by legalized health services agencies within countries as part of their operations manual; hence standardized codification is unavailable.<br><br>In some countries, the national health agency maintains the facility codes, listing all facilities and their corresponding attributes. This code-set can be linked to facility type and ownership.<br><br>*Examples of facility include: health centre, health post, medical college, university, health workforce training centre, regional administrative office, drug storage facility, blood bank, diagnostic laboratory, hospitals, primary health care centre, tertiary hospital.*<br><br>*Ownership: Public (national, sub-national, or local government owned and operated), private (including for-profit and NGO-operated).* |

| Reference | |
|---|---|
| *Origin:* | WHO |

## Full name

| Definition and applicability | |
|---|---|
| *Contextual definition:* | For a person in the registry, *Full name* refers to a combination of last name (surname/family name), first name (forename), middle name, maiden name (when applicable), and any other names that appear in original national identification documents. |
| | For a facility in the registry, full name refers to the actual name of the facility as legally registered, as opposed to abbreviations. |
| *Applicability:* | Applicable to all individuals and entities in the registry. |

| Data representation and notes | |
|---|---|
| *Representation class:* | Description |
| *Data type:* | String |
| *Format:* | Alpha characters with permissible special characters including hyphen and period |
| *Maximum character length:* | Variable |

| *Permissible values:* | Value | Meaning | Range |
|---|---|---|---|
| | **Last name** | Family name or facility's full name | Variable characters |
| | **First name** | First name | Variable characters |
| | **Middle name** | Middle name | Variable characters |
| | **Other name** | Other name | Variable characters |

| | |
|---|---|
| *Notes:* | Each name may be up to 16 characters in length. Other characters as nationally and linguistically appropriate may be permitted. The *Full name* must match fully with the primary document reviewed at the creation of the record. This data element needs to be authenticated through original verifiable source documents at the time of record creation. It is also important to use this data element while capturing names of employees; the names of the employee's mother, father and guardian(s), and their emergency contact, must also be captured. In addition, it is important to capture previous names and name changes. For example, it is important to verify that names given at registration with professional health councils are the same as the names in the registry. Any change of name(s) during the course of the person's life must be appropriately updated. This is especially important for documenting any potential disciplinary actions and follow-up action with the professional health councils. |
| | For data elements not applicable use 9998. |
| | For unknown data elements use 9999. |

| Reference | |
|---|---|
| *Origin:* | WHO |

## GPS coordinates

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | Location of facility using standard representation of geographic point location by coordinates. |
| *Applicability :* | Applicable to only to facilities listed in the registry. |

| Data representation and notes | |
| --- | --- |
| *Representation class:* | Code - ISO 6709:2008 |
| *Data type:* | String |
| *Format:* | Numeric |
| *Maximum character length:* | 8 |

| *Suggested values:* | *Value* | *Meaning* | *Range* |
| --- | --- | --- | --- |
| | Degree | Unit value of 360 degrees | 000-359 |
| | Minute | Unit value of hour | 00-59 |
| | Seconds | Unit value of a minute | 00-59 |
| | Decimal seconds | Unit value of a seconds | 00-59 |

| | |
| --- | --- |
| *Notes:* | The data element is essential for monitoring the health facilities using visualization tools coupled with geographic information systems. |

| Reference | |
| --- | --- |
| *Origin:* | ISO 6709:2008, Standard representation of geographic point location by coordinates. |

## Identification number

| Definition and applicability | |
| --- | --- |
| *Contextual definition:* | The identification number can be a combination of values that uniquely identifies individuals within a country's health system. The unique identification number (UIN) can be system-generated based on a pre-set algorithm. Where permissible through applicable national/sub-national policies and laws, national identification number may be used in place of the UIN |

| Data representation and notes | |
| --- | --- |
| *Data type:* | Characters |
| *Format:* | Variable; alphanumeric |
| *Maximum character length:* | 16 |
| *Notes:* | Unique identifier: Algorithm based on combination of variables; generated by a computer application. |
| | Various identification numbers are recorded at the time of registration in compliance with privacy policies. Storage of multiple identification numbers will assist in resolving issues that might arise due to duplicate records. It is also advised to maintain data on *Date of issue*, *Date of expiration*, and *Place of issue* for all types of ID recorded in the registry. |
| | It is strongly recommended that all individuals registered in the system are uniquely identified. |
| | A unique identification number may serve as an important record link key within the HRHIS. As such, efforts must be made to define the UIN appropriately. If a UIN or national identification number is not available, details of at least two other forms of ID (e.g. driver's licence number; social security number; income tax number; national passport number) need to be collected to validate the records. |

## Language

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Ability of the person in the registry to read, write and speak one or more languages. |
| *Applicability :* | Applicable to all individuals in the registry. |

| Data representation and notes | |
|---|---|
| *Representation class:* | Code - ISO 639-6:2009 |
| *Data type:* | Characters |
| *Format:* | Alphabet only |
| *Maximum character length:* | 4 (for each representation) |

| *Suggested values:* | Value | Meaning | Range |
|---|---|---|---|
| | Language | Read | 0000-9999 |
| | Language | Write | 0000-9999 |
| | Language | Speak | 0000-9999 |

| | |
|---|---|
| *Notes:* | Multiple lines can be added to accommodate listing of more languages and corresponding meanings. |
| | For data elements not applicable use 9998. For data elements not listed use 9999. |

| Reference | |
|---|---|
| Origin: | ISO 639-6:2009, Codes for the representation of names of languages |

## License, registration, and certification

| Definition and applicability | |
|---|---|
| *Contextual definition:* | The license or certification is the permission to practice in the appropriate field of health, issued by a legitimate regulatory body within the profession. |
| *Applicability :* | Applicable to all individuals in the registry. |
| **Data representation and notes** | |
| *Data type:* | Character |
| *Format:* | Alphanumeric |
| *Maximum character length:* | Variable (see below) |

| *Suggested values:* | Value | Meaning | Range |
|---|---|---|---|
| | Document type | License, Certificate | (L; C; R) |
| | Document category | Renew, original | E, O |
| | Date of issue | Issue date | See *(Date)* |
| | Date of expiration | Expiry date | See *(Date)* |

| *Notes:* | The permissible values for license/certification type are country-specific, depending on which professional health councils exist and grant licenses within the country. |
|---|---|
| | *L=License;  C=Certificate ; R=Registration; O=Original; E=Renew* |
| **Reference** | |
| *Origin:* | WHO |

## Photograph

| Definition and applicability | |
|---|---|
| *Contextual definition :* | An electronic image of the person in the registry. The definition also applies to an electronic copy of the birth certificate, stored as part of the person's documented evidence of birth. |
| *Applicability :* | Applicable to all individuals in the registry. |
| **Data representation and notes** | |
| *Data type:* | Image |
| *Suggested format:* | JPEG |
| *Additional Notes:* | **Photograph 1**: Photograph of the individual can be placed as part of the record and identity management system.<br><br>**Photograph 2**: Electronic copy of birth certificate can be placed in the field. |
| **Reference** | |
| *Origin:* | JPEG |

## Postal code

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Alphanumeric digits that represent a geographic locality associated with the full address of a person or facility in the registry. |
| *Applicability :* | Applicable to all individuals and entities in the registry. |
| **Data representation and notes** | |
| *Representation class:* | Code |
| *Data type:* | String |
| *Format:* | Alphanumeric only |
| *Maximum character length:* | 9 |
| *Notes:* | Postal codes are generally country-specific. Universal adoption of a single postal code system has not been realized. |
| **Reference** | |
| *Origin:* | UPU |

## Sex at birth

| Definition and applicability | |
|---|---|
| *Contextual definition:* | Biological determination of person's sex at birth. |
| *Applicability:* | Applicable to all individuals in the registry. |
| **Data representation and notes** | |
| *Data type:* | String |
| *Format:* | Numeric only |
| *Maximum character length:* | 1 |
| *Suggested values:* | |

| Value | Meaining |
|---|---|
| 1 | Female |
| 2 | Male |

| | |
|---|---|
| *Additional Notes:* | Transgender individuals may be represented by additional codes. |

## Telephone number

| Definition and applicability | |
|---|---|
| *Definition:* | The identifying number or numbers assigned to a telephone or group of telephones that are dialled in order to make a connection to those telephones. |
| *Applicability:* | Applicable to all individuals and facilities in the registry. |
| **Data representation and notes** | |
| *Representation class:* | Code- ITU-E.164 |
| *Data type:* | String |
| *Format:* | Numeric only |
| *Maximum character length:* | |
| | 18 |
| *Notes:* | Country code (3 Digits) + national telephone number (15 digits maximum) |
| | This format can be used for multiple telephone numbers including professional, office, mobile, satellite, residential, home and emergency contact numbers. |
| **Reference** | |
| *Origin:* | ITU-E.164, General format for telephone numbers. |

# DESIGNING AND OPERATING AN ELECTRONIC HEALTH WORKFORCE REGISTRY

# Designing and operating an electronic Health Workforce Registry

A health workforce registry is analogous to highly sensitive country civil registration and vital statistics systems. It is therefore important, prior to implementation of the registry, to ensure full engagement of appropriate stakeholders from the start of implementation until its completion.

National ownership of the registry is an important part of the process. Stakeholders are therefore required to develop a roadmap that includes policy and governance mechanisms, financing of implementation, and identification of all authorized data-submitting entities, and which also ensures data security, privacy and confidentiality, and adequate staff for all day-to-day operations and management of the registry.

Since the establishment of a registry at national or sub-national level is context-specific, the following high-level areas must be taken into consideration prior to implementation.

a)  **Engage stakeholders from the beginning**

Stakeholder engagement is an essential part of the design and implementation of the registry. The list of stakeholders may vary depending on the country; however stakeholders from major categories must be reviewed to ensure their inclusion. Such categories might include producers of the health workforce (colleges, training institutions etc.), health professional councils, credentialing authorities, employers and external donor partners.

Among the stakeholders to include are ministries of health and their various departments (human resources, administration, planning, payroll, pension, recruitment, training, and other relevant units); ministries of labour, education, and defence; national health professional regulatory bodies; selected higher education institutions specialized in health sciences; professional health associations; national hospitals; laboratories; pharmacies; sub-national health authorities; district managers of health; hospitals services commissions; civil service commissions; and national primary healthcare development agencies.

b)  **Address policy and governance mechanism**

There is a need for adequate policy and governance mechanisms to ensure full functioning of an electronic and web-enabled health workforce registry. Well-defined policy and governance mechanisms must be developed, documented, and made available to all relevant stakeholders. Governing mechanisms should include clearly identified representations of all key stakeholders.

Prior to full operation of the registry, appropriate governance structures must be established, with policy directives for mandatory reporting of data to the registry

by health workforce data producers, employers, and regulatory bodies. In addition, a clear policy articulating rules-based algorithms for data validation and de-duplication must be in place. Necessary and sufficient data access controls must be instituted based on an agreed policy to address data privacy, security, confidentiality and meaningful use.

### c) Establish a list of authorized health workforce data submitting entities

Only legally recognized and authorized entities can be allowed to submit health workforce data to the registry; however, such entities can only be determined by participating stakeholders in national and sub-national contexts. Examples of entities that can submit primary health workforce data to the registry may include, but are not limited to, national and sub-national ministries of health; health regulatory bodies; academic health training institutions; non-governmental health care organizations; and licensed private health facilities and institutions.

It is important to assure that data entered into the registry is in compliance with local rules governing data quality, timeliness, and reliability. To ensure accountability, the providers of the original data must be held responsible for the accuracy, timeliness, completeness, and reliability of data submitted to the registry.

### d) Assure financing of full implementation

Financing of the implementation of the registry can be considered under the following two broad categories: (a) design, development, and deployment; (b) training of essential staff.

Design, development, and deployment: The initial costs for implementation of the electronic registry can include hardware, software, training, consultants, and pilot testing. The on-going costs can include technical enhancements, coordination and collaboration with other sectors, technical assistance, training of existing staff and replacement staff members, and conducting monitoring and evaluation. Maintenance and support costs can include corrective maintenance such as fixing bugs in codes and algorithms. Other aspects of maintenance of the electronic registry include adapting the registry application (software) to new environments, updating the software according to changes in user requirements, and conducting routine preventive maintenance.

### e) Agree on a location to operate the registry

The central placement of the registry is often governed by national policies and practices. For general management of health workforce data, it is recommended that the health workforce registry be placed at national level with adequate access at sub-national levels for both authorized data access and data submission.

### f) Provide training for essential staff

Staff training is an important component of implementing a health workforce registry. A well-planned staff training programme must be taken into consideration for managing the daily operations of the registry, and for providing sub-national training to staff members who require it

Figure 5: **Conceptual representation of web-enabled, secure, nation-wide accessible electronic health workforce registry**
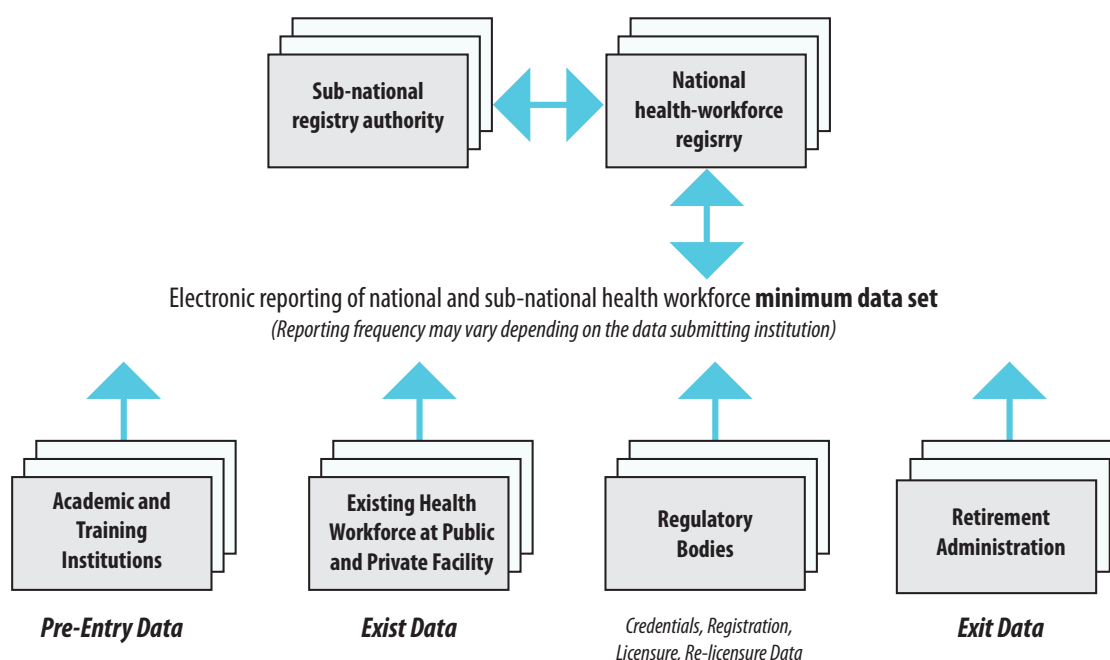


g) **Methodically enter primary data to electronic health workforce registry**

Based on the minimum data set outlined in this document, health workforce data can be entered into an electronic health workforce registry using the following phase-based approach. Caution should be exercised to assure data validity, reliability and accessibility, and updates should be frequent.

Table 4. **Phase-based approach to entering primary data to electronic registry**

| Phase | Entity/category of data for inclusion in the registry |
|---|---|
| Phase 1 | (a) All health workforce (employees) from government entities (national and sub-national ministries of health and other relevant line-ministries and government healthcare-related service providers) <br> (b) All registered persons from professional health regulatory bodies |
| Phase 2 | (c) All physical facilities relevant to health services delivery and administration (include public, quasi-governmental, and non-government facilities) <br> (d) All health professional regulatory bodies <br> (d) All academic and training institutions relevant to healthcare <br> (e) All postal code and geocoded information |
| Phase 3 | (f) All enrolled students in relevant health sciences fields <br> (g) All retired and exited employees |
| Phase 4 | (h) All employees from the private health sector |

Table 5.    **Suggested list of health workforce data submitting entities**

| Entity category | Example entities |
|---|---|
| **Teaching and training institution** *(Health workforce production and training data)* | Medical education institutions, teaching hospitals, nursing education and training institutions, community health officers training programmes, allied health professionals and workforce training institutions, other similar healthcare professional training institutions and specialized training institutions at both national and sub-national levels. |
| **Health professionals registration and regulatory bodies** *(Health workforce licensing, re-licensing, and certification data)* | Health professional councils, registration boards and other similar entities. |
| **Health workforce employers** *(Nominal roll or payroll data of active employees)* | All public and private health facilities (all categories of facilities) |
| **Retirement administration** *(data on inactive health workforce)* | Insurance corporations, national and sub-national retirement and benefits management entities |

Table 6.    **Suggested minimum data by entity category and frequency of submission**

| Entity category | Minimum data set | Frequency of submission |
|---|---|---|
| **Teaching and training institution** *(Health workforce production and training data)* | Full name of the person, birth history, address, contact information | Quarterly |
| **Health professionals registration and regulatory bodies** *(Health workforce licensing, re-licensing, and certification data)* | Full name of the person, birth history, citizenship, country of residence and language, address, contact information, professional license and certification | Quarterly |
| **Health workforce employers** *(Nominal roll or payroll data of active employees)* | Full name of the person, birth history, citizenship, country of residence and language, address, contact information, professional license and certification (where applicable), employment status, facility name and address | Monthly (automated) |
| **Retirement administration** *(data on inactive health workforce)* | Full name of the person, birth history, citizenship, country of residence and language, address, contact information | Quarterly |

**Note 1:** Full name and birth history of individuals on the health workforce registry are required to cross-verify and de-duplicate the names in the registry.

**Note 2:** The registry maintenance agencies at national and sub-national levels are determined by national and sub-national health authorities. As such, the data submission entities must be mapped to corresponding sub-national and national data recipient entities.

As illustrated below in Figure 6, additional data for the electronic health workforce registry can be utilized by updating the appropriate relevant data elements from lists of public and private health facilities, teaching and training institutions, postal codes and zonal information, population data, and regulatory bodies.

Figure 6: **Illustration depicting additional data sources required to establish a functional health workforce information system**
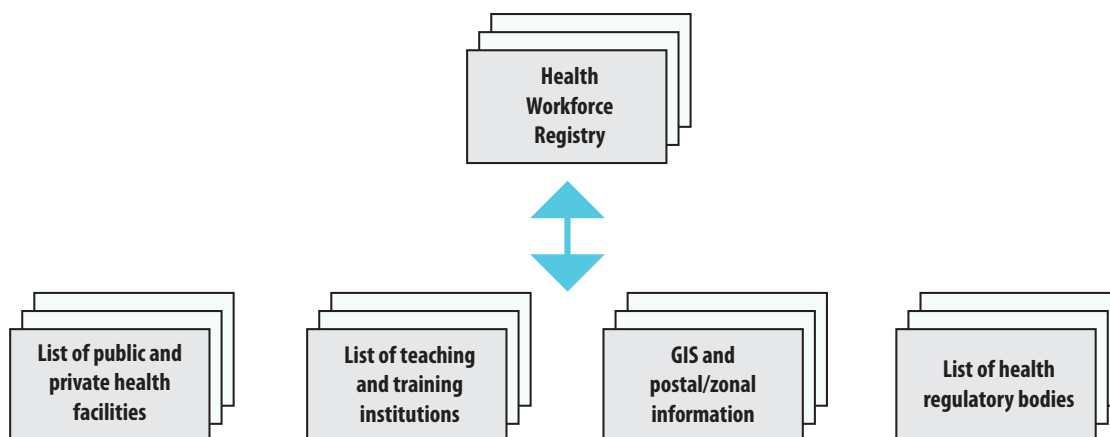
**h) Identify all relevant data elements that correspond to data submitting entities**

Table 7 provides a list of all data elements and their applicability to corresponding data submitting entities.

Table 7.　**Data elements and their applicability to submitting entities**

| Data elements | Applicability of data |
|---|---|
| *Address (physical)* | Business address; Residential (home) address; Place of issue; Place of birth |
| *Address (electronic mail)* | Professional email address; Personal email address |
| *Country* | Country of birth; Citizenship at birth; Citizenship at present |
| *Date* | Date of birth, Date of retirement, Date of application (re-licensure, re-registration, re-certification; training), Date of issue and expiration |
| *Disciplinary action* | All individuals |
| *Education* | All individuals |
| *Employment (occupational) category* | Individuals who are employed |
| *Employment status* | All individuals |
| *Employment title* | All individuals |
| *Facility type and ownership* | All individuals |
| *GPS coordinates* | All facilities |
| *Language* | All individuals |
| *License, registration and certification* | All individuals |
| *Name (full name)* | All individuals and facilities |
| *Photograph* | All individuals |
| *Postal code* | All individuals and facilities |
| *Sex (at birth)* | All individuals |
| *Telephone number* | All individuals and facilities |

**Note:** "All individuals" refers to all persons listed in the registry; "facilities" refers both to facilities providing health services and to health administrative facilities.

i) **Assure privacy, security and confidentiality of health workforce data**

It is essential that adequate privacy, security and confidentiality of health workforce data be enforced at all levels of data transaction. Modern electronic health workforce registry design must assure sufficient data protection without preventing data use. In addition, sufficient security of both electronic data and related physical assets must be ensured to guard from theft and misuse.

j) **Establish standardized reports**

Based on stakeholder input, a standardized list of reports must be programmed as part of the software design to generate accurate and timely reports. Following is a suggested list of sample reports; these can be generated by an automated system using the data elements provided in the preceding sections of this document.

- Number of health workforce by cadre, gender and facility

- Number of expected retirements

- Number of expected and completed renewals of license/credentials

- Number of vacant positions by facility

- Geographic distribution of total workforce by facility

- Geographic distribution (by district) of male and female employees

k) **Develop, test, and deploy a functional electronic health workforce registry**

While designing the electronic health workforce registry, adhere to best practices in information systems design to assure accuracy, timeliness, completeness, reliability, privacy, security, and confidentiality of the data and information systems and assets. Test and validate all data within the registry before it becomes fully operational. Full consideration must be given to all interoperability issues, in order to ensure that data from the registry can easily be transported to existing health workforce information systems or larger health information systems.

l) **Manage and operate the registry**

A well-coordinated operations mechanism must be instituted at national level to facilitate data collection and update from sub-national health workforce units, regulatory bodies and institutions to the national health workforce registry. In addition, similar mechanisms shall be established to collect and manage from the private sector and NGOs. At all levels, focal persons for the health workforce registry must be identified to manage data.

# HEALTH WORKFORCE REGISTRY
## IMPLEMENTATION CONSIDERATIONS

# Health Workforce Registry implementation considerations

The following approach would enable implementation of the health workforce registry.

- Establish a National Human Resources for Health Technical Workgroup under the purview of the national health authority
  - Obtain a mandate to establish an electronic and web-enabled national health workforce registry.

- Address policy and governance mechanisms for administration and management of the registry
  - Well-defined policy and governance mechanisms must be developed, documented, and made available to all relevant stakeholders. Governing mechanisms should include clearly identified representations of all key stakeholders.

- Authorize entities to submit health workforce data to the registry.
  - Authorize only legally recognized bodies to submit primary health workforce data to the registry. Establish appropriate access controls based on an agreed policies.
  - Non-governmental organizations, private health facilities and institutions must be mandated to provide health workforce data to the registry on a periodic basis.

- eHealth and enterprise architecture-based health workforce registry
  - Design, test and deploy the electronic web-enabled registry based on national eHealth enterprise architecture.
  - Adopt the Minimum Data Set as basis for establishing the national health workforce registry.
  - Make available, at sub-national level, a replica of the registry with similar structure and functions, in order to collect and manage the minimum data set from authorized entities at sub-national-level.
  - Adhere to best practices in information systems design to assure accuracy, timeliness, completeness, reliability, privacy, security, and confidentiality of data and information systems and assets.

- Operations and management of the registry
  - A well-coordinated operations mechanism must be instituted to facilitate data collection and updates from sub-national health workforce units, regulatory bodies and institutions to the national health workforce registry. In addition, similar mechanisms shall be established to collect and manage from the private sector and NGOs.

- At all levels, focal persons for the health workforce registry must be identified to manage data.

- A Standard Operations Procedure document pertaining to data submission, data use, privacy, security, confidentiality, frequency of data collection, and compliance must be developed and made available to all relevant stakeholders.

# Annexes

## Annex A. **Sample illustration of health workforce registry**

Illustration depicting a web-enabled electronic

Health Workforce Registry with person-centric data entry screen and analytics display abilities

## Annex B. **Sample components of the registry operational framework**

**Component 1:** Health Workforce Registry data submitting entities

1. Statutory entities shall submit primary health workforce data to the registry.

2. All public health facilities, private health facilities, non-governmental organizations providing health services, and academic and training institutions producing or training the health workforce shall be mandated to provide health workforce data to the registry on a periodic basis.

3. Accuracy, frequency and timeliness of health workforce data submission to the registry shall be managed by a designated sub-national or national health authority.

4. All health workforce data submitted to the registry shall conform to the agreed minimum data set for the Health Workforce Registry.

5. Data entered into the registry shall adhere to guidelines set out for quality, accuracy, completeness, timeliness, reliability, privacy, security and confidentiality, and the providers of the original source of data shall be accountable for their data.

**Component 2:** Policy and governance mechanisms

6. Appropriate governance mechanisms with clearly defined roles and responsibilities shall be established at national and sub-national levels, involving all stakeholders.

7. A national (or sub-national) Steering Committee shall be constituted and shall serve as the highest coordination body for the implementation and operation of the registry. The Committee will enable and manage the data of the registry, provide general oversight and guidance, approve decisions related to the registry, provide advocacy regarding utilization of the data, ensure appropriation of funds for the operations of the registry, and ensure access, security, safety, privacy, and confidentiality of the registry and its components.

8. The members of the national (or sub-national) Steering Committee shall be approved by the country's most senior health official.

**Component 3:** Operations and management

9. A well-coordinated operations mechanism shall be instituted to facilitate data collection and updates from sub-national health facilities, regulatory bodies and institutions to the national health workforce registry. In addition, similar mechanisms shall be established to collect and manage data from the private sector and NGOs.

10. Standard Operating Procedures (SOPs) pertaining to data submission, use, privacy, security, confidentiality and frequency shall be developed by the national Steering Committee and made available to all stakeholders. The SOPs shall be adopted by stakeholders.

11. At all levels, focal persons for the registry shall be identified to manage data.

**Component 4:** Enterprise information architecture-based registry development

12. Based on national or sub-national eHealth enterprise information architecture, national and sub-national health authorities shall develop and deploy the registry.

13. The registry shall conform to best practices in information systems design in order to assure quality, accuracy, timeliness, completeness, reliability, privacy, security, and confidentiality of the data and information systems and assets.

14. Initial person-level data collection efforts to populate The Registry shall include the following data-submitting entities in compliance with the minimum data set:

    a) Professional health regulatory bodies
    b) Public health facilities (both national and state-owned)
    c) Registered private health facilities that are licensed to operate
    d) Administrative facilities of national and sub-national health authorities
    e) Teaching and training institutions.

**Component 5:** Access to the registry

15. Legally authorized users of the registry shall be required to have unique user names and passwords that will be provided by the national Steering Committee, on the approval of the highest health authority at national and sub-national levels. Level of access to the registry shall be determined by the national Steering Committee or its authorized agent.

**Component 6:** Privacy, security and confidentiality

16. The registry must be in compliance with all applicable national and sub-national laws related to privacy, security, and confidentiality of data.

17. The registry and its related physical assets shall be secured in accordance with applicable national and sub-national laws.

# Technical notes

**Method for documenting needs for Human Resources for Health Information System (HRHIS).**

A systematic methodology is essential to conducting any rigorous analysis of the HRHIS landscape and associated business processes and functions. In this light, WHO developed a methodology for documenting business processes and functional requirements for HRHIS using an enterprise architecture approach to health information system design. The methodology was followed in Rwanda, Guatemala, and Nigeria. In all countries, rigorous analyses of existing data and subsequent validation of the findings were conducted. The results were further validated by the members of Health Workforce Information Reference Group.

**HRHIS activity overview and objectives**

The HRHIS activity was conducted in two phases, each having specific objectives.

*Activity Phase 1*

The objective was to identify all public health workforce data sources available within countries.

Phase 1 was conducted in three steps:

Step 1 identified the health workforce information source stakeholders in order to conduct structured interviews. In addition, a thorough review of all available background documents was undertaken. A Ministry of Health-led planning meeting was held to identify key stakeholders to conduct health workforce information landscape analysis through structured interviews.

Step 2 involved conducting structured interviews of selected stakeholders in order to document the health workforce information landscape. During this step, stakeholders were informed that the activity was neither an HRHIS assessment nor development of a software application.

Step 3 included a review of the findings of the health workforce information landscape analysis with stakeholders in order to obtain feedback and solicit input for Activity Phase 2.

*Activity Phase 2*

The objectives of Phase 2 were to: (a) identify and document discrete business processes and corresponding functional requirements associated with health workforces at the national and sub-national levels as regards eHealth architecture; and (b) document primary health workforce business processes and associated functions by visiting selected sites.

Phase 2 involved two steps:

Step 1 focused on interviewing stakeholders in selected districts in order to document primary health workforce functions and their associated processes.

Step 2 involved stakeholder input and review of the findings pertaining to business processes and functional requirements.

The expected product of the overall activities was a document containing a description of the normalized business process and its functional requirements, and a corresponding data dictionary containing minimum (essential) data elements. This document is intended for use by Ministries of Health to design, develop or improve health workforce information systems as part of the eHealth architecture. In addition, this outcome was intended to assist in the development of global guidelines for functional HRHIS.

**Stakeholder engagement**

A major part of the activity was aimed at engaging multiple stakeholders. As part of the activity methodology, a list of stakeholders was identified covering all major categories: academic institutions (producers of health workforce); health professional councils (health workforce credentialing authorities); higher education councils (accreditation of health education institutions and curricula); ministry of health HR unit staff members (administrative units responsible for health workforce appointments, management, training, and retirement); sub-national health authorities in selected districts/provinces/states; and external partners.

Using two instruments[1], open-ended descriptive questions were asked in order to obtain in-depth sources of health workforce information within each entity. Additional documentation was collected as part of the structured interviews for further analysis and all material collected were analysed and appropriately catalogued. Semi-structured stakeholder interviews were administered to capture responses during the interview process.

**The Minimum Data Set for Health Workforce Registry**

The Minimum Data Set for Health Workforce Registry is a product of the aforementioned methodology through validation in the field and as well as the WHO's health workforce information reference group (HIRG).

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[1]   *The WHO tool for documenting business processes, functions, and minimum data elements for HRH information systems.* Geneva, World Health Organization (forthcoming; http://knowledge-gateway.org/HIRG/library).

## Collaborators

The work represented in this document is a product of collaboration of numerous individuals and institutions listed below. We appreciate the support of the individuals and institutions that were part of the development of the document.

**World Health Organization**

Marie-Paule Kieny, Najeeb Al Shorbaji, Ramesh Krishnamurthy, Ties Boerma, James Campbell, Rui Gama Vaz, David Okello, Stella Matutina Tuyisenge, Akjemal Magtymova, Delanyo Dovlo, Isabelle Wachsmuth, Reynald Fleury, Lucrecia Hernandez Mack, Eileen Petit-Mshana, Amani Siyam, Mario Del Poz, Adam Ahmat, Walid Abubaker, Gulin Gedik, Angelica Sousa, Teena Kunjumen, Lamine-Cissé Sarr, Sarah Guenther, David Imo, Guadalupe Verdejo, Juan Guillermo Orozco, Mónica Padilla, the staff of the Health Workforce Department at WHO Headquarters, and members of the Health Workforce Information Reference Group.

**United States of America**

Alexandra Zuber, Patricia Riley, Xen Santas, Mike Gehron, Dady Shirley, Okey Nwanyanwu, Brian Agbiriogu, Raphael Akpan, Zara Ahmed, Jean Baptiste Koama , Pratima Raghunathan, Heidi Mihm, Nelson Arboleda, Carl Newman and Keith Waters.

**Republic of Guatemala**

Honourable Minister of Health Ludwig Werner Ovalle, Guillermo Echeverría, Mario Figueroa, Shelly Audon, Walter Oswaldo Moran Rodriguez, Ricardo López, Reynald Fleury, Lisbeth Santizo, Patricia Salazar, Edger Abel Morales, Alvaro Pineda, Nuvia Gatell, Ricardo Lopez Rodas, Maria Eugenia De Leon de Monroy, Enrique Chávez, Carlos Mejía, Mario Figueroa, Edgar González, Mayra Iliana Chávez, Vilma Chávez de Pop, Rodolfo Solis, Juan Carlos Aresti , Eduardo Montenegro, Fredy Alberto Ardón Decaro, Miguel Morales, Jorge Bolivar Diaz, Jaime Guerra, Fernando Gonzalez Poggio, Rosa Julieta Ramirez, Lima Duarte Conyduarte, Ines Vanegas de Chavez, Renato Esteban Franco Gomez, Juan Tomas Garcia, Elsa M Fagardo, Heiby Lizetu Erazo Hendoza, Celilio Hernan Mayorga Lopez, Sergio Ayapán, Anabella Batres, Jaime Velasquez, Samuel Mendez, Xiomara Castañeda, Patricia Salazar, De Sora Guerra De Albana, Nuria Gatell, Erier Toc, Aida Zepeda, Lilian Eva Colon, Oliviero Paaw, Vilma Villa Toro, Lucrecia Ramírez, Licda Maricel Dardon, Leonel Palommo Alvardo, Ana Maria Villagrau, Licda Gabriela Rosas, Rose Maria Valuenzuela, Kesia Garcia Jimenez, Ileana Rabanales, Claudio Ramírez, Rubelio Rodríguez, Rutilia Herrera, Silvia Nohemí González, Shelly Hess, Coronel Mazariegos , Blanca Guevara, Cristina Maldonado, Claudia Lissette Vásquez Santos, Arnoldo Aval, Jesús Oliva, Óscar Galindo, Dania Moscoso, María del Rosario Pereira, Jose Jullian Figueroa, Manuel Tererro, Immer Elias, Lic. Sandoval, Cristian Miguel, Cabrera Ayala, María Eugenia Guzman, Arnoldo Arevalo, and César González.

In addition, acknowledgement is due to the officials of: Ministerio de Salud Pública; Departamento de Planificación; Departamento de Formación de Recursos Humanos; Comision Interinstitutional de Acciones Conjuntas del Sector Academico y el Sector Salud; Colegio de Médicos; Dirección de Área de Salud de Zacapa; Zacapa Hospital; Zacapa Health Center; Centro de Salud, Health Center, Zacapa; Centro Salud Tipo B, Zacapa; Dirección de Área de Salud Guatemala Central; Centro de Conocimientos; Dirección, Sistema de Informacion Gerencial de Salud del Ministerio de Salud Publica; Dirección General, Sistema Integral de Atención en Salud (Guatemala); Hospital Centro Médico Militar; Dirección de Área de Salud de Escuintla; Hospital Policía Nacional; Instituto Guatemalteco de Seguridad Social; La Oficina Nacional de Servicio Civil; Hospital Roosevelt; Gerencia, Hospital Centro Médico; Instituto Nacional de Estadística de la República de Guatemala; Escuela Nacional de Enfermería; Universidad Mariano Gálvez; Universidad Galileo; Universidad Rafael Landívar; Universidad de San Carlos de Guatemala, and IntraHealth-Guatemala.

## Republic of Rwanda

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We are indebted to the support of many individuals from various entities within Rwanda: Ministry of Health-Rwanda's Community Health Workers Desk, Decentralization Desk, eHealth Unit, Human Resources Desk; Higher Education Council, Ministry of Education; Kigali Health Institute; National Council of Nurses and Midwives; Pharmacies Association; Rwanda Medical Council; National Reference Laboratory of Rwanda; Centrale d'Achats des Médicaments Essentiels du Rwanda; Centre de Transfusion Sanguine; Clinton Health Access Initiative; Management Sciences for Health; Partners in Health; Rwandaise d'Assurance; Maladie Muhima District Hospital; Nyarugenge District Centre; Hospitalier Universitaire Kigali; Nyarugenge District Administration; Nyarugenge District Kinyinya Health Center; Nyarugenge District Gisenyi District Hospital; Rubavu District Administration; Rubavu District Pharmacy; Rubavu District Gisenyi Health Center; Rubavu District Murara Health Center; Rubavu District Busasamana Health Center; Rubavu District Cyanzarwe Health Post; and Rubavu District and Rwamagana District Hospital, Rwamagana District.

## Federal Republic of Nigeria

Sincere appreciation is due to to C.O. Onyebuchi Chukwu (Federal Minister of Health), Muhammad Alli Pate (State Minister of Health), Fatima Badele (Permanent Secretary), Ansa Boco Ogu, Shakuri Kadiri, Uduakabasi Udoh, Olufunmilola Janet Alaka, Folasade Esan, Tolu Fakeye, Adetunji Labiran, and members of Human Resources for Health Technical Working Group.

Thanks are also due to officials from Nigeria's Office of the Head of Civil Services of the Federation; Federal Ministry of Health; Federal Ministry of Defence; Federal Civil

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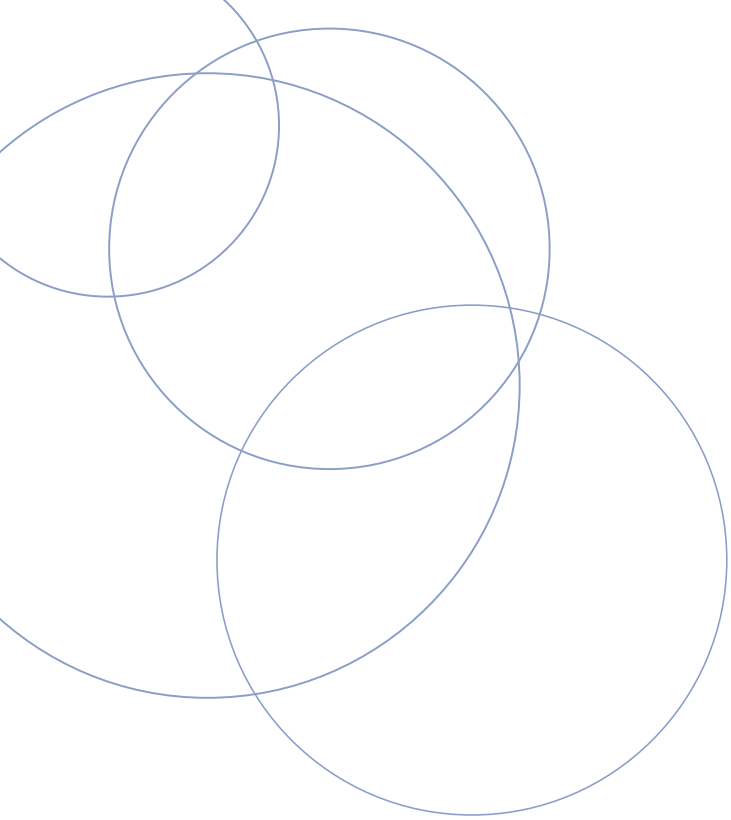
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