IMPLEMENTATION SUPPORT GUIDE

Development of a National Georeferenced Community Health Worker Master List Hosted in a Registry

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Clinton Health Access Initiative

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Community Health Roadmap
Investment priorities to scale primary care at the community level

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Acronyms and abbreviations

API	application programming interface
CHIS	community health information system
CHW	community health worker
CHW AIM	Community Health Worker Assessment & Improvement Matrix
CHWML	community health worker master list
CHWR	community health workforce Registry
EHR	electronic health record
FHIR	Fast Healthcare Interoperability Resources
GDPR	general data protection regulation
GNSS	Global Navigation Satellite System
HFR	health facility registry
HIS	health information system
HL7	Health Level Seven International
HMIS	health management information system
HRH	human resources for health
HRIS	human resources information system
HWR	health workforce registry
IT	information technology
LMIS	logistics management information system
mCSD	Mobile Care Services Discovery
MOH	Ministry of Health
MUAC	mid-upper arm circumference
NGO	non-governmental organization
NHWA	National Health Workforce Accounts
OpenHIE	Open Health Information Exchange
PHC	primary health care
PPE	personal protective equipment
SMS	short message service
SOPs	standard operating procedures
UHC	universal health coverage
UID	unique identifier
WHO	World Health Organization

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EXECUTIVE SUMMARY

The value of a national georeferenced community health workers master list

Community Health Workers (CHWs) – lay people trained and equipped to provide essential health services to their neighbours – have been a cornerstone of primary health care delivery across the globe for more than a century. The World Health Organization (WHO) recognizes CHWs as vital components of primary health care and important contributors to achieving universal health coverage. Unfortunately, the often limited availability of a single source of information about CHWs hampers their ability to provide robust, accessible care. Information deficits include official CHW counts; records of CHWs' active status, accreditation status and competencies; location of service; and availability of essential supplies.

A functional and institutionalized national georeferenced CHW master list (CHWML) can close these gaps. A CHWML is a single source of truth containing the data elements required to uniquely identify, effectively describe, enumerate, locate and contact all CHWs in a country. It is critical for strategic planning, training, deployment, payment, supply, supervision, monitoring and evaluation of CHWs in the context of broader human resources for health (HRH) and primary health care (PHC) systems. By providing insight into the number, spatial distribution, socio-demographics and training of CHWs across different parts of the country, a CHWML hosted in an appropriate registry is fundamental to maximize impact, efficiency and equity of health service delivery and meeting UHC goals. In the context of outbreaks, and in current and future pandemic response, CHWMLs can serve as critical tools to identify total healthcare personnel resources available to inform a national strategic response plan.

Establishing and reinforcing the use of a CHWML can unlock opportunities for building more resilient and sustainable health systems at the community level by informing more accurate financial planning and resource allocation; surge capacity needs at the last mile during emergencies; general programme design and service delivery; personal protective equipment (PPE) quantification and delivery; resourcing for campaign-based health interventions such as vaccinations; community-based mobilization; compensation and more (see Table 1 for details on use cases). When hosted in an interoperable registry with appropriate access controls, data from the CHWML can be used by other entities and systems that carry out programme operations.

WHO estimates that there will be a shortfall of 18 million health workers by the year 2030. To overcome this projected shortfall, it is critical to generate and manage the data required to strategically plan and coordinate the health workforce,[1] inclusive of CHW cadres. Better visibility into the CHW workforce and its performance through CHWMLs, which are kept up to date, can accelerate governments to progress toward effective institutionalization of these cadres to achieve universal health coverage and respond in times of crisis.

ABOUT THIS GUIDE

This implementation support guide was developed to support national governments, and their technical and financial partners to develop a functional, continuously maintained, shared and institutionalized CHWML hosted in a national registry.

This guide presents the guiding principles for a national, georeferenced CHWML and a seven-step process for generating, sharing and maintaining the CHWML in a registry. Each step includes a decision checklist and key considerations for planning and implementation. The guide also includes a three-stage maturity continuum to evaluate the current state of a national CHWML, five candid country experiences illustrating national-level lessons from implementing CHWMLs and/or registries, a summary of financial resource requirements, and links to tools and practical resources to aid in operationalization.

The seven-step process of establishing, sharing and maintaining a CHWML in a registry is described in great detail in this guide. The process begins with a current state assessment (**Step 1**), which reviews the availability, accessibility and quality of CHW lists in a given country, the existence of platforms that are already used or could be used as a registry to host the list, as well as the use cases and supporting environment. The current state assessment helps identify the maturity of the CHWML in a country (see Figure 3). It also helps identify critical gaps and enablers that can be leveraged in the journey of implementing or augmenting the CHWML and registry.

This step is followed by establishing the governance structure (**Step 2**) to serve as an institutional home for the CHWML and registry. Registry stakeholders and their roles, such as community health workforce registry (CHWR) systems administrator, CHWR/CHWML administrator(s), CHWML maintainer(s), CHWML contributors and consumers are described in Table 2. Recommendations for long-term governance structures are also described in Step 2.

Findings from the current state assessment and feedback from stakeholder engagement can inform the functional and technical requirements as part of defining the ideal target state (**Step 3**). This guidance recommends 17 core data elements for inclusion in a CHWML, with the option of an expanded data set of another 16 data elements (see Tables 3 and 4). The selection of the data elements should be a consultative process and align with the HRH master list, if it exists. A CHWML contains contain sensitive personal identifiable information, and therefore, it is critical that appropriate country-specific policies for data privacy and protection should be identified and

understood for all data elements, especially sensitive data, and norms enforced through guidance, training and appropriate access controls. This step also requires mobilization of resources to implement the CHWML and registry, and evaluation of ICT infrastructure requirements and technical capacity. When selecting a platform to serve as the CHWML registry, stakeholders should consider hosting options; cost; software and hardware requirements; technical capacity; and documentation and support. Resources to implement the CHWML and registry should include both start-up costs for establishing the CHWML and registry as well as recurring costs to maintain it. These costs may include human resources for planning, developing, updating and maintaining the CHWML and registry; field data collection; training; initial technology set-up; routine updating of the data in the CHWML; and hosting and maintenance of the registry.

Once the target state has been defined, stakeholders proceed to generate the first version of the CHWML (**Step 4**). This step describes how to source any existing CHW lists and associated data to generate the first version of the CHWML covering all cadres agreed upon for inclusion. Once all the available CHW lists have been identified and obtained for all included cadres, the quality of the content of each pre-existing list and its associated data elements must be evaluated. We recommend assessing each data element across dimensions of data quality: timeliness, completeness, uniqueness, accuracy, validity and consistency, and provide guiding questions to assess each dimension (see Table 7). Based on the quality of the data, the CHWML may either be generated from scratch or built using the available highest quality list(s). Subsequently, the data cleaning process is initiated. This includes but is not limited to the following data transformations: removal of data elements that are not approved to be included in the minimum data set; re-classifications of data elements and field; adjustment of the data elements labels to facilitate merging and combination of lists, introduction of unique IDs for CHWs; and de-duplication of data elements. This step will be followed by merging of CHW lists using both manual and semi-automatic methods. The CHWML compilation process now must address any data gaps identified post-merging using different data collection modalities to complete the information. The most cost-effective approaches, given available resources, should be considered. Finally, this first version of the CHWML should be validated following the collection, cleaning and integration of the missing data. The CHWML governance structure should lead the validation, with the content being validated by the stakeholders that are going to be in charge of its regular update through the use of the registry (e.g., district level representatives).

In parallel to Step 4, a decision needs to be taken regarding the IT solution – the registry – to store, manage, validate, update and share the CHWML. Sharing the CHWML with other systems allows countries to use data from the CHWML to facilitate the uptake of the CHWML as a shared source of information. Key activities to execute during Step 5 include the technical set-up of the selected registry, completion of user acceptance testing; quality assurance of the registry and if possible, iteration of the selected platform to meet requirements as necessary; and operationalization of the registry.

An effective CHWML can be used to inform decision making to improve CHW programmes and support broader health system planning. The sixth step (**Step 6**) involves the development of policies, processes, security protocols, access controls, and systems to support a culture of data sharing and use of data for decision making while protecting CHW data. To encourage demand across stakeholders for the CHWML, active data use should be promoted to encourage the use of the list to inform strategic and programmatic activities. For example, the use of the CHWML in existing routine activities can be institutionalized to promote ongoing demand by increasing its quality. The benefits of using a shared list across health human resource management functions should be articulated and regularly reiterated to the relevant stakeholders. These benefits include the efficient use of resources, reduction of duplication, reduced need for data collection and cleaning, data compatibility between sources, and generation of consistent information and data products.

The last step (**Step 7**) involves developing standard procedures, sustaining technical capacity and implementing policies for maintaining and regularly updating the CHWML and registry. These procedures should describe the process for submitting and tracking change requests to the CHWML and the frequency at which updates are expected to take place. These procedures should outline the software and hardware maintenance and update plan as well as the process for providing helpdesk support. The technical capacity established during the deployment of the CHWML and registry needs to be sustained and expanded.

What's Needed Now

While one-off georeferenced censuses of CHWs may be effective for establishing a baseline and providing strategic information for planning, it is only a first step toward establishing a functional and institutionalized CHWML – one that is inclusive, routinely updated, stored in a registry and integrated with national HRH systems. Investing in the development and use of the CHWML is fundamental to ensuring the HRH completeness and accuracy required to maximize the impact, efficiency and equity of health service delivery to meet UHC goals and respond to emergencies. This living guidance will evolve over time as needs and technology evolve. For now, it showcases and builds on the lessons learned of several ministries of health and their partners that have already begun this process and serves as an invitation to join them.

Objectives and Target Audience

This guidance is intended to support national governments to develop a functional and institutionalized national georeferenced community health worker master list (CHWML), one that is inclusive, routinely updated, stored in a registry, interoperable, secure, governed, routinely used, and sustainable. The guidance may also be informative for other stakeholders such as implementing partners, civil society groups, and donors interested in understanding the process and requirements for establishing, maintaining, sharing, and using a CHWML hosted in a national health workforce registry (HWR).

A CHWML serves as a single source of truth and is fundamental for optimizing the equity, efficiency and impact of investments in CHWs. It contributes to enhancing strategic planning, training, deployment, payment, supply, supervision, monitoring and evaluation of CHWs in the context of broader human resources for health (HRH) and primary health care (PHC) systems.

Background Resources

A CHWML contained in an appropriate registry is a key precursor to realizing and sustaining many of the recommendations contained in the World Health Organization (WHO) guideline on health policy and system support to optimize community health worker programmes and the Community Health Worker Assessment & Improvement Matrix (CHW AIM).

For broader information on National Health Workforce Accounts (NHWA) please see the WHO Handbook.[2] For analogous guidance on master facility lists see the Master Facility List Resource Package. For more on building country capacities to better collect, analyse and use data see Guidance for CHW Strategic Information and Service Monitoring. For more information on digital health platform implementation, see the Digital Health Platform Handbook developed by the ITU.

Document Methods and Updates

This document was drafted in response to the urgent need to count and identify CHWs for the purposes of distribution of personal protective equipment (PPE) distribution and vaccinations during the COVID-19 pandemic. It was a collaborative effort by the Clinton Health Access Initiative (CHAI), Community Health Impact Coalition (CHIC), Global Fund, Living Goods, Health GeoLab Collaborative (HGLC), and UNICEF. More than 50 organizations provided technical review, including Africa CDC, USAID and WHO. Representatives from the ministries of health of Ethiopia, Kenya, Mali, Rwanda, Uganda, Sierra Leone, Togo and Zambia provided input on their experiences crafting CHWML, needs from a guidance document, and technical expertise.

This guidance is based on information available as of September 2021 and will be updated as new information becomes available.

Organization of this Guidance

This document describes guiding principles for a national, georeferenced CHWML and a proposed sequence of activities for generating, applying and maintaining the list. Each step includes a decision checklist and key considerations for planning and implementation. The guidance also includes a summary of resource needs and links to tools and practical resources to aid in operationalization.

Glossary of terms

Community Health Information System (CHIS)	CHIS is a combination of paper, software, hardware, people and processes that seeks to support informed decision-making and action by CHWs and related actors (e.g., head of facility responsible for CHWs, community health nurses, community data managers, etc.) in the health system[3]. CHIS typically collect data on service delivery and may also collect data to support programme management and operations, including data related to human resources and supply management.
Data dictionary	A collection of names, definitions, and attributes about data elements that are being used or captured in a database or information system
Data model	A model that organizes elements of data and standardizes how they relate to one another and to properties of the real world entities
Data element	Fundamental data structure in a data processing system. Any unit of data defined for processing is a data element. For example: Full name, Type, Address, etc. are each separate data elements. A data element is defined by its size (in characters) and type (alphanumeric, numeric only, true/false, date, etc.).
Foreign key	A data element, or a combination of data elements, in a table that refers to the primary key of another table
Geographical feature	Naturally and artificially created features on the earth. Natural geographical features consist of landforms and ecosystems. For example, terrain types and physical factors of the environment are natural geographical features. Conversely, human settlements or other engineered forms are considered types of artificial geographical features.
Geographic object	Computer representation of a geographical feature
Health Management Information System (HMIS)	A system for the collection of health service delivery and public health indicators from different information systems at facility, district and higher levels to help improve health outcomes[4]
Health Worker Registry (HWR)	A system that manages and maintains unique identities of health workers within a country. This may sit within an HRIS or be a separate registry with reference data.

Human Resource Information System (HRIS)	A system that manages human resource data such as employee records, compensation, benefits, time-tracking, time-off, on-boarding, training, certifications and accreditations. HRIS should support core business processes to manage a workforce.
Master list	Authoritative, officially curated by the mandated agency, complete, up-to-date and uniquely coded list of all the active (and past active) records for a given type of geographic feature/object (e.g., health facilities, administrative divisions, settlements)
Metadata	Data providing information about one or more aspects of the data (for example, the date and time a data element was recorded.)
National georeferenced CHW master list	The digital master list of CHWs that contains essential data elements required to effectively describe, enumerate and locate all CHWs in a country.
National health workforce account	A system through which countries progressively improve the availability, quality and use of data on their health workforce, using standardized indicators aimed to answer major policy questions related to current HRH challenges and to optimize planning. HRH registries, HRIS and health workforce observatories may serve or inform the national health workforce account.[5]
Primary key	Data element (or combination of data elements) designated to uniquely identify each record in a table (i.e., the data elements containing the unique identifier)
Registry	An IT solution that allows storing, managing, validating, updating and sharing of the master list for a specific geographic object.It is the “container” for the master list.
Terminology service	Mechanism for applications to interact with, and operate on terminology elements
Unique ID	Data element in a relational database that is unique for each record
Use case	A description of all the ways an end-user wants to “use” a system

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INTRODUCTION

Introduction to CHWML hosted in a Registry

Community Health Workers (CHWs) are lay people trained and equipped to provide essential health services to their neighbours, and have been a cornerstone of primary health delivery across the globe for more than a century.[6] CHWs deliver promotive (e.g., health talks), preventative (e.g., polio vaccination), diagnostic (e.g., malaria rapid diagnostic tests), and treatment services (e.g., psychosocial counselling).[7] In Rwanda, for example, 56 per cent of malaria cases are treated by CHWs.[8] Care delivered by CHWs helps foster trust, improve linkages between health facilities and communities, and ultimately reduces morbidity and mortality while providing an economic return on investment of up to 10:1.[9] In addition to providing essential health services, CHWs have demonstrated that they are essential to a country's surveillance of, and response to, emerging disease threats, such as Ebola[10] and COVID-19.[11]

The World Health Organization (WHO) recognizes CHWs as a vital component of primary health care and important contributors to universal health coverage (UHC).[12] It is critical that they be enumerated and geolocated routinely (i.e., through routine processes and systems), so that they may be effectively supported and their profiles, locations and contributions accounted for when planning for, managing, monitoring and supporting the broader workforce.

Unfortunately, these vital cadres of the health workforce are often not counted. Data on the current number of CHWs worldwide are generally incomplete and data on CHW numbers and locations are frequently unavailable to ministries of health, out of date, and/or inaccurate, which impedes health system planning, health workforce management and decision-making.[13,14] WHO's Global Health Workforce Statistics 2021 estimated that there were 3,313,170 CHWs globally.[15] These statistics, however, are compiled from diverse sources such as national censuses, labour force surveys and NHWA reporting. CHWs, due to their often limited institutionalization within a health system, are less likely to be counted. As a result, there is considerable variability across countries in the coverage, quality and reference year of the original data. Data are only available for 75 countries, with reference years ranging from 2000 to 2019. For 40 percent of countries, available data is more than a decade old.[16]

Previous efforts to address this gap in timely and accurate data on the number of practicing CHWs include the One Million CHWs campaign, which set up the Operations Room, an information dashboard to collect country-specific information on CHW scale-up activities across sub-Saharan Africa in January 2013.[17] Data on CHW numbers in the One Million CHWs dataset are self-reported by practitioners without reference years and are no longer being maintained.

In 2020-2021, the African Union began undertaking a census of CHWs across the continent. While this is a positive development, the usefulness of a point-in-time count is limited when compared to the many applications of a CHWML that is functional, continuously maintained, shared, routinely used, institutionalized and hosted in a registry.[18]

Health information Systems (HIS) are a key building block of health systems and, as part of HIS, Human Resource Information Systems (HRIS) are foundational sources of information on the health workforce.[19,20] A national Health Worker Registry (HWR), housed within a HRIS, contains information that uniquely identifies each health provider in the country. This single source of truth on the health workforce is critical for the functioning of the HRIS and other systems within the HIS such as payroll, health management information systems (HMIS) and digital applications. This allows for quality control and interoperability between systems – and this is reflected within digital health guidance[21,22,23] and, increasingly, within national digital health strategies.

Furthermore, the Global Strategy on Human Resources for Health, endorsed by the Sixty-ninth World Health Assembly, calls for all countries to establish a health workforce registry to track health workforce stock, distribution, flows, demand, supply, capacity and remuneration.[24] Progress has been made toward this milestone, though further acceleration is needed. For example, a UNICEF assessment conducted in 2020 identified only 34 countries that had a health worker registry and only 24 countries had implemented an HRIS.[25] HWRs and HRIS have demonstrated important value for health workforce planning and management,[26,27,28,29] even enabling significant resource savings through the detection and prevention of 'ghost workers.[30] However, HWRs and HRIS are often restricted to facility-based health workers and have varying functionality and capacity.[31,32,33,34] Furthermore, an assessment of national HRIS in 20 countries, published in 2021, found that few HRIS include any data on CHWs.[35]

The Value of a National Georeferenced CHWML

A CHWML contained in an appropriate registry is a critical building block for realizing and sustaining many of the recommendations contained in the WHO guideline on health policy and system support to optimize community health worker programmes, and the Community Health Worker Assessment & Improvement Matrix (CHW AIM).[36,37]

Accurate, up-to-date, reliable data on CHWs, which captures their location, qualifications and activities, is critical for strategic decision-making. Hosted and kept up to date in a CHWML, these data is vital not only to support the CHWs who already serve, but also to identify and close coverage gaps in pursuit of UHC. THese data can do so by providing insight into the number, spatial distribution, socio-demographics, and training of CHWs and other HRH across different parts of the country. Additionally, CHWMLs are critical to pandemic preparedness and response so that CHWs can be rapidly deployed to facilitate disease surveillance, community mobilization and outbreak response, and maintain routine service delivery that may shift from health facilities to the community level. Counting CHWs and their distribution is critical for allocation planning for personal protective equipment (PPE) and ensuring vaccination of health workers at all levels.

The CHWML is a precursor for systems strengthening. Neither sustainable financing (it is not possible to pay workers that cannot be identified) nor human resources for health planning (it is not possible to plan for workers that are not counted) are possible without up-to-date data on the health workforce, including CHWs. Furthermore, at the global level, CHWML data from multiple

countries can be aggregated to showcase the skill sets and contributions of CHWs to track progress and inform strategic investments.

Given that the WHO estimates a shortfall of 18 million health workers by the year 2030, generating and managing the data required to strategically plan and manage the health workforce is critical.[38] A single source of truth for CHW information that can be accessed for multiple use cases and across multiple information systems can improve quality of health worker information, reduce duplication of data, and enable information systems to contextualize health programme information, aid planning, monitoring and evaluation, learning, and promote evidence-based planning and budgeting (see Table 1).

Sharing of the CHWML can be facilitated through a registry, which has several additional advantages. First, with a CHWML hosted in a registry, relevant government departments can maintain and update CHW information in a single place, replacing the need for separate spreadsheets or multiple paper-based systems. Second, information about a given CHW can be stored securely when in a registry, rather than in a series of unencrypted Excel files. Third, using a shared list across stakeholders ensures efficient use of resources in the generation of consistent information and data products, avoiding duplication of efforts, reducing the need for data collection and cleaning, and supporting data compatibility between sources. Fourth, it allows for up-to-date CHW information from the CHWML to be shared directly with different systems, for example, training and supervision systems, payroll systems (to pay CHWs), supply chain systems (to procure and distribute equipment/material for CHWs), health information systems (to plan health activities, attendance of CHWs, optimize distribution of health resources versus health needs)[39], communication platforms (to communicate with CHWs on outbreaks/dissemination of information), and service monitoring.[40,41]

Table 1 Use cases for a CHWML[42]

Use case	Description
HRH strategic planning and data reporting	Assess CHW to population ratios, including geographic distribution. This is critical to inform strategic health workforce planning and development, including assessing optimal caseloads and determining additional coverage needs to achieve universal healthcare and inform succession planning and future recruitment. Where country governments are already reporting into NHWA, CHWs can and should be included in this reporting.
Pandemic and emergency preparedness and response	Support surge planning exercises in conjunction with other tools[43] in times of crisis to avail additional health workforce capacity. Information related to CHW cadre types, training and certification can be leveraged to consider emergency task-sharing scenarios and potentially engage CHWs for new responsibilities (e.g., contact tracing, surveillance and event reporting, testing, or vaccine delivery). CHW location data can support training, vaccination and equipping CHWs with PPE.
CHW role harmonization	Support planning for the harmonization and integration of disease-specific and/or partner-supported CHWs into one or more standardized national cadres.
Training	Inform training goals, budgets (initial and ongoing), and in- service training/refreshers. Target upskilling of CHWs in relation to baseline credentials and/or completed training. Enable required ongoing training/professional development for CHWs.

Use case	Description
Accreditation	Establish the number of CHWs able to provide services at a verified level of competence. Manage data on accreditation status and enable the establishment and enforcement of competency-based licensure/re-licensure schemes.
Equipment and supplies	Inform procurement and commodity distribution planning, including PPE and availability of essential medicines for CHWs.
Performance management	Optimize supervision ratios between CHWs and supervisors; estimate hiring needs for dedicated CHW supervisors; and measure and manage individual performance and develop strategic initiatives to enhance overall CHW performance management and facilitate review of performance data by parties entrusted with decisions relevant to employment renewal or termination.
Compensation	Inform budgets and absorption planning for CHW salaries, benefits and non-monetary support; reduce the number of 'ghost workers' (inactive workers receiving incentives), and make it easy to verify who the workers are in order to pay them efficiently.
Community involvement	Compare data on CHWs with catchment area population (if available) to enable effective support and advocacy for CHWs from community groups and local leadership (e.g., civil society, women's groups, traditional leaders, local governance and administrative structures).
Opportunity for advancement	Crosscheck accreditation, performance and training data with competency frameworks to identify merit-based career advancement opportunities.
Data	Facilitate data generation and use: streamline bi-directional data flow between CHWML and other systems, reduce duplication of efforts incurred by maintaining multiple siloed lists, improve quality of other lists (e.g., payroll)
Systems strengthening initiatives	Support holistic planning (including training, procurement and financing needs) for broad systems strengthening initiatives such as digitally equipping CHWs, or strengthening the role of CHW responsibilities (e.g., in disease surveillance to provide additional essential health services).
Linkages to national health system	Design and review of national policies for primary health care (PHC) and community health, as well as routine processes such as strategic planning and budgeting, supply chain planning, and human resources for health planning.
Strengthen Health Information System (HIS) architecture	Facilitate the HIS architecture by functioning as a source of accurate CHW information that is shared across different systems (e.g. HMIS, HRIS, digital applications)

CHARACTERISTICS OF A FUNCTIONAL AND INSTITUTIONALIZED CHWML

A functional and institutionalized CHWML will have the following characteristics:

- **Inclusive:** There may be multiple CHW lists that may need to be reconciled (see Box 4, Country Experience: Mali). Such lists may need to be stored in a registry, with clear indication of overlapping geographies. This would likely arise as a function of how health systems have been segmented and the role of implementing non-governmental organization (NGO) partners.

- **Routinely updated:** Ad hoc CHW censuses should be avoided in favour of routine updating after the initial master list is established within a registry. The list needs to be updated routinely, with a frequency (e.g., biannually) to be determined by country stakeholders based on anticipated CHW attrition or recruiting needs. Data must also be routinely checked to ensure it is complete, accurate and validated.

- **Stored in a registry:** The utility of a one-off CHW census exercise can be maximized if the outputs (e.g., lists) are managed in a registry that is used to maintain and update the list over time, and is accessible by different information systems that require CHW data (see Step 7). Such a registry should manage core information on CHWs that is needed across different programmes, and be accessible by multiple information systems that serve different business domains (see Figure 1). Typically, the CHWML may sit within the HWR as one health worker cadre. In some contexts, however, some CHWs may not be allowed in the HWR due to country policy (see: Identify the CHW cadres to include in the CHWML and registry, Step 3). This may include non-government supported or unpaid CHWs who are not yet recognized as a formal part of the national health workforce. Given this, it may make sense for the CHWML to sit in a separate registry outside the HWR but link to it in order to facilitate operations (see Figure 2). This would allow data elements like geographic coordinates, supervising facility, etc., which would not typically be contained within the HWR, to be collected as well.

- **Interoperable:** The CHWML should be hosted in a registry that uses standards to allow the access, exchange, integration and use of data between information systems. This may include ability to integrate with human resource information systems, health management information systems, community health information systems, and logistics management systems as well as point of service information systems (e.g., mobile applications carried by CHWs) to allow other systems to query the registry and synchronize data on a routine basis. Access controls should be applied to application programming interfaces (APIs) and user permissions in order to protect private data.

- **Secure:** The CHWML and registry should align with national data protection standards and international best practices to protect CHW privacy and confidential information. To do this, there should be robust standard operating procedures (SOPs) and access controls within the registry. CHW lists may be leveraged for different needs and by different stakeholders (training, allocation, payment, costing, and resource mobilization with appropriate data safeguards in place). Furthermore, caution should be taken to protect sensitive information such as names and location, particularly in areas of security risk (e.g., humanitarian settings).

- **Governed:** A clear institutional owner and governing structure for the CHWML and registry is required to ensure dedicated management and institutionalization, reduce duplication of effort and prevent discrepancies, develop and enforce policies to ensure adherence to the principles of a CHWML (e.g., including enforcing access controls and determining user roles for updating and validating lists), and to ensure CHW information is protected. The institutional owner(s) of the CHWML and registry may differ (e.g., a CHW department and an information systems department), but should have a clear mutual understanding of each party's roles and responsibilities.

- **Routinely used:** Registries, including their interface with other systems and datasets, must be used in accordance with SOPs to strengthen management and coordination of CHWs and avoid data silos. The potential for the CHWML and registry to improve programme function and health outcomes is only realized when they are leveraged for planning and decision-making. This can be facilitated by ensuring CHWML data is accessed by other information systems such as HRIS, HMIS, CHIS and logistics management information systems (LMIS), and thus, used across health programmes. See Table 1 for examples of use cases, and Figures 1 and 2 for how a CHWML may be used across different business domain services.

- **Sustainable:** The CHWML and the registry should be sustained through dedicated funding to support the people, processes and technologies required to ensure their continuous maintenance and regular updating.

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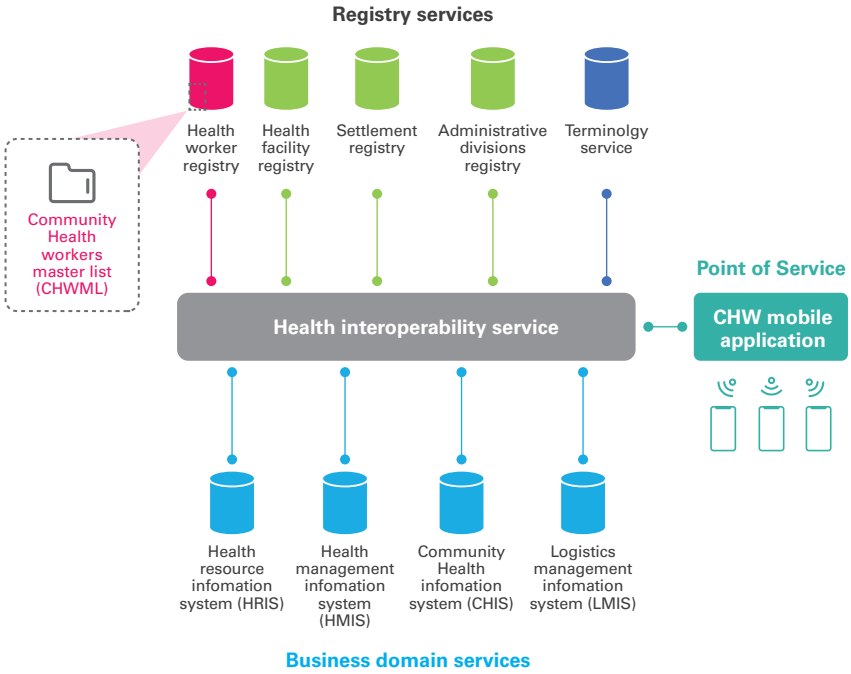
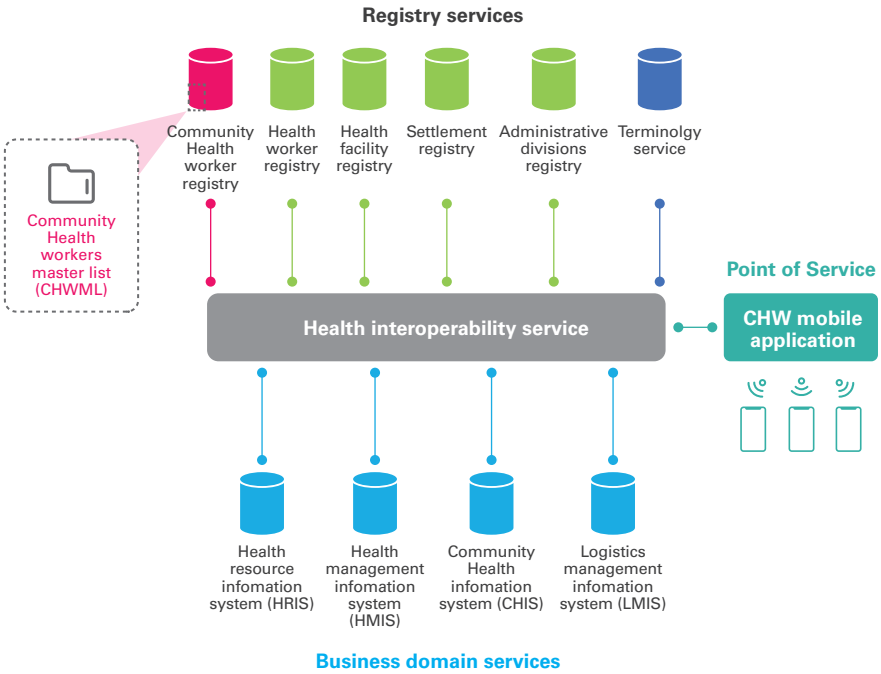
Figure 1 The CHWML is managed within the broader Health Worker Registry



Source: Adapted from UNICEF et al, Guidance for CHW strategic information and service monitoring

Figure 2 The CHWML is managed in an independent registry



Source: Adapted from UNICEF et al, Guidance for CHW strategic information and service monitoring

CHWML Maturity Continuum

The path to a functional and institutionalized CHWML is illustrated in the maturity continuum in Figure 3, adapted from existing maturity models for health facility registries[44] and broader HIS.[45,46] Four high-level domains (Use, Master List, Registry and Supporting Environment) can be measured qualitatively to guide a country or programme in understanding the current state of their CHWML. The continuum suggests what actions may be taken to increase the CHWML effectiveness and robustness, and to regularly monitor where the country stands towards establishing a functional and institutionalized CHWML. Segmentation of CHWML maturity across countries can provide insightful perspectives on levels of professionalization and institutionalization of CHW cadres in a country's health system and identify gaps, and opportunities and prioritizations for health system strengthening investments.

Figure 3 CHWML Maturity Continuum

Box 1 Country experience: **Sierra Leone**

In 2015-2016 the Ministry of Health and Sanitation (MOHS) of Sierra Leone led and conducted a national georeferenced census of community health workers (CHWs). The exercise was the first of its kind in Sierra Leone and, to the best of our knowledge, the largest georeferenced census of CHWs conducted in any country up to that time. The aim was to establish the first national CHWML as the baseline, authoritative source of accurate information on the number and distribution of CHWs. This information included CHW profiles and demographics, training received, incentives, supervision and other key information. It also built the capacity of the MOHS to lead and sustain CHW mapping in the future and to use the data to inform strategies, planning, management and monitoring and evaluation.

The MOHS effort had financial and technical support from UNICEF and other partners. Data collection was conducted by managers at front-line health facilities, called peripheral health units (PHUs), with quality assurance provided by District Health Management Teams, regional and national MOHS staff, UNICEF and other partners using a lot quality assurance sampling (LQAS) approach. In total, 14,622 working CHWs were identified and consented to be included.

During the public dissemination of the results, the then Deputy Minister of Health and Sanitation, Madam Zuliatu Cooper said, "This event is historic not only because of what the census entails, but because of how the census was conducted. It has built the capacity of the Ministry to conduct such massive exercises in a quality manner, facilitated ownership of the data by the Ministry...This will be crucial to ensuring that we have a Ministry that is better informed in order to make timely, quality decisions, a key goal for the health system given the harsh lessons learned during Ebola, which demonstrated the need for better data to help us prevent, and respond to, our country's recurrent and emerging health needs." Mohamed S. Marah, Monitoring and Evaluation Officer at the MOHS indicated, "The data has also informed us about gaps like where there is need to deploy more CHWs and what kinds of challenges the CHWs are facing including the higher rates of stock outs of supplies." Lucy Lawal, the head nurse at the Maternal and Child Health Post (MCHP) in the Deep Water community of rural Freetown, who collected the data on CHWs in her catchment area, said, "Before our training, we did not know about GPS. We thought it is a very complicated thing to do. So, it is a surprise to us! It is a very exciting new technology that makes the data collection easier". Dr. Kebir Hassen of UNICEF added, "Strong and resilient health systems require up-to-date information on the location and functionality of health assets, including CHWs. We, therefore, supported the government to do a georeferenced mapping of all CHWs in the country to establish a comprehensive database."[47]

Since 2016, Sierra Leone's georeferenced census of CHWs informed the national assessment of the CHW programme and revision of national CHW policy and strategy. Looking forward, the MOHS is interested in building on its experience by maintaining the CHWML through routine processes and hosting it in a registry integrated with their health sector human resource information system (HRIS).

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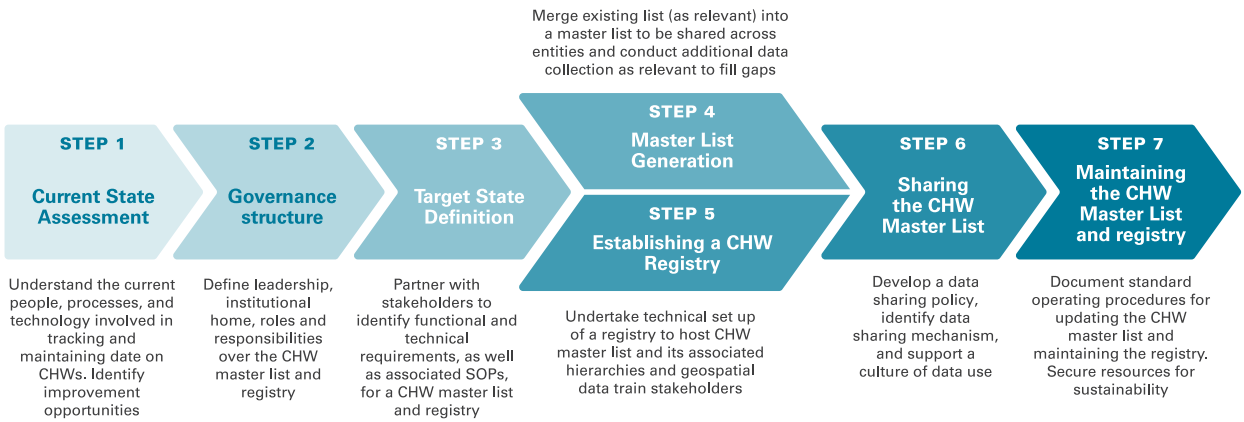
PROPOSED SEQUENCE OF STEPS

The process of establishing the CHWML and registry can be carried out in seven steps, as illustrated below. The process begins with a current state assessment (Step 1). This is followed by establishing the governance structure (Step 2). Findings from the current state assessment are used by the established governance structure to inform the functional and technical requirements as part of defining the target state (Step 3). Once the target state has been defined, stakeholders proceed to generating the first version of the CHWML (Step 4) and establishing the registry to contain CHWML (Step 5). The next step involves the development of policies, processes and systems to support a culture of data sharing and use of data for decision-making (Step 6). The last step involves developing standard procedures and securing the necessary resources for maintaining and regularly updating the CHWML and the registry (Step 7).

Windows of opportunity for undertaking this process include the drafting or updating of national strategies for community health, UHC, and/or health security.

Figure 4 Steps to establish a CHWML and Registry



Box 2 Country experience: **Uganda**

The Ugandan Ministry of Health, with funding from Korea International Cooperation Agency (KOICA) and technical support from UNICEF, One Million Community Health Workers Campaign (1mCHW) and IntraHealth International, developed the Community Health Worker Registry (CHWR) in 2017.

The CHWR is an online system for registration, tracking and management of CHWs. It is intended to strengthen evidence-based planning and management by enabling managers to make data-driven policy decisions based on granular, verified data on community-health workforces, and with customization, to create tailored reports such as actionable insights on workforce density, succession, incentives, training and programme design to drive decision-making.

Village health teams (VHTs) and community health extension workers associated with public facilities that are tied to the Ministry of Health were included in the CHWR. Implementing partners providing training to village health teams must register the training information in the CHWR. Because not all CHWs had national ID cards, they were both biometrically registered for national IDs and HRIS at the same time.

Following the CHWR's successful pilot in 11 districts by IntraHealth, it has been rolled out in 23 additional districts of Uganda with support from partners including Living Goods among others. The CHWR continues to be used by the districts to guide real-time decision-making and planning for CHWs.

In the first districts that piloted the use of the CHWR, data from the system was used to identify which VHTs qualified for community health extension workers (CHEWs) at the time of CHEW selection. The CHWR was also used to identify which VHTs could be deployed to sensitize on measles outbreaks in a targeted way to the location of the outbreak, avoiding the need to train all VHTs. Districts that kept the data in the CHWR updated for their localities also reported using it to plan long-lasting insecticidal net (LLIN) campaigns.

STEP 1

Current State Assessment

☐ Conduct the assessment

It is important to begin the process of establishing the CHWML and deploying the registry with a good understanding of the current state across the four domains included in the CHWML maturity continuum: Use, Master List, Registry and Supporting Environment (Figure 3). This includes reviewing the availability, accessibility and quality of CHWs lists in the relevant country, as well as platforms that are already used or could be used for the registry, the use cases that will drive the investment, and the supporting environment that will ensure long-term sustainability of both the CHWML and registry.

Such an understanding will allow for the identification of gaps that should be filled through the implementation of the other steps in the process. Step 1 also serves as the baseline to monitor and evaluate the impact of the CHWML and registry.

Conduct the assessment

In order to be useful, the assessment should at least:

1. Identify key entities (government and non-government) that support and manage CHWs across the country and analyse if, and how, CHWs overlap between these entities and how different entities coordinate their work (e.g., existing steering committees, working groups) between ministry units (e.g., Community Health, Human Resources for Health, Health Promotion, Child Health, planning departments);
2. Identify other potential key CHWML stakeholders and their respective needs and use cases;
3. Identify existing CHW list(s), the current practices and resources for maintaining, updating and sharing them (human resources and financing);
4. Identify how the lists are used, and what decisions are made based on their content;
5. Identify existing registry(ies) or other platforms currently used to host the HRH and/or CHW lists as well as if and how they are being maintained;
6. Identify current information system linkages or opportunities for strengthening system linkages and integration with other registries and information systems (HWR/HRIS, health facility registry, settlement registry, HMIS etc.) to meet user needs;

7. Identify the strengths and weaknesses in the current supporting environment (governance, policies, capacity, resources);
8. Analyse gaps in implementing and sustaining the CHWML and registry, and identify potential pathways for addressing those gaps.

While the approach to be used for the assessment might greatly depend on the country context, it is important to keep in mind that this approach should:

- Provide the necessary information to cover the areas of focus listed in the previous section (stakeholders, existing lists and registries, supporting environment) and, as such, support the development of the strategic and implementation plan;
- Involve all the key stakeholders;
- Be conducted in person as much as possible, as this also helps build interest and trust;
- Be generic enough to be easily implemented over a limited period of time;
- Produce a similar result if implemented by different people.

Like for other geographic objects,[48] the assessment mainly consists of review of documents, interviews and review of existing lists.

The documents to be reviewed should include national policies, strategies, plans, guidelines and SOPs related to CHWs in general as well as the establishment of the CHWML and registry in particular. Starting the assessment with such a review will not only provide the required background to build on during the interviews but also help identify the key stakeholders to be interviewed.

All stakeholders involved in community health delivery as well as the use and curation of the CHWML should be involved in the assessment and therefore interviewed. Potential ministry of health programmes/departments and stakeholders include Community Health, Primary Health Care, Human Resources for Health, Planning, Health Information, Malaria, TB, HIV, Infectious Disease, Health Finance, One Health, Executive (Minister, Assistant Minister, Deputy), Monitoring and Evaluation, and technical, financial and implementing partners who support community health workers, broader community health systems and/or HRH in partnership with the Ministry of Health. Actors outside the Ministry of Health may also be involved, for example, the Ministry of Finance, Ministry of Planning, Ministry of Information, Communications and Technology, Ministry of Social Welfare/Development, Ministry of Public Administration/Civil Service, Ministry of Local Government, Ministry of Labour, and health worker regulatory bodies. Regional and subnational representation should also be considered, for example, county/provincial/state heads of health, officers in charge and community health workers themselves.

When it comes to reviewing existing lists, the main objectives at this stage are to identify their existence (availability) and to obtain access to a copy of each list (accessibility). From a qualitative perspective, the assessment can be limited to getting a preliminary sense in terms of the data elements being included, of the timeliness of the information contained in these lists, and of a number of issues that would have to be addressed (e.g., duplicates, information gaps). There will be a need to first define the data dictionary for the minimum set of data elements to be included in the CHWML before conducting a more in depth quality assessment of the available and accessible data as reported under Step 4.

1. Apart from the approach and data/information collection tools being used during the implementation of the assessment, it will be useful to develop the supporting material, which includes: a generic slide deck introducing the CHWML/registry process as well as the assessment to be presented during group consultations, for example:
2. An assessment report template to facilitate the capture of the information that is being collected;
3. The list of questions that will need to be answered in order to cover all the focus areas considered for the assessment. To facilitate the work of the assessment team, each question should ideally be accompanied by the indication of the function and entity of the anticipated respondent, the type of response that is expected (list, narrative graph, profile), list of additional questions and/or material to collect depending on the answers to the main question, examples of expected answers and explanation of where to capture the answer in the report;
4. A glossary of terms and examples for some of the concepts that might not be easily understood by the respondents.

If the assessment approach is to be implemented in different countries, it is important to document the approach being implemented under the form of a guideline, as this would ensure the homogeneity of the implementation.

When it comes to the process to be followed to conduct the assessment, and while focusing on health facilities, the section dedicated to the implementation of the assessment in the Master Facility List Resource Package[49] can very much be applied to the CHW context. Such a process contains three main phases:

1. Assessment preparation (stakeholder meetings; purpose, scope and timeline definition taking available funding into account; implementer identification; respondents identification; tools development and training);
2. Assessment fieldwork (interviews, key document and existing lists review);
3. Assessment analysis and dissemination (review, analysis and presentation of collected information and analysis, assessment report including recommendations for the operationalization of the CHWML and registry, drafting, finalization and dissemination).

The timeline for the implementation of the assessment will depend on the country's context, including but not limited to the number of CHW stakeholders to be interviewed and their availability, the number of existing CHW lists and their accessibility, and the level of documentation of current practices.

STEP 2

Establish the Governance Structure

- ☐ Identify relevant existing governance structures, as well as potential CHWML and registry stakeholders and their roles
- ☐ Identify the "institutional home" and establish stakeholder roles for governance of the CHWML and registry

Step 2 is to establish the governance structure by identifying the "institutional home" and establishing stakeholder roles within the governance structure for governance of the CHWML and registry. The "institutional home" is the institution, or group of institutions, that maintains ownership of and provides overall leadership for development and maintenance of the CHWML and registry.

Identify relevant existing governance structures, as well as potential CHWML and registry stakeholders and their roles

Prior to establishing the governance structure, potential CHWML and registry stakeholders and relevant existing governance structures (e.g., Technical Working Groups or TWGs) should be identified and their potential roles in the governance of the CHWML and registry should be clarified. In all contexts, CHWs and/or representatives from CHW networks must be included. Key stakeholders may also include representatives of the following: Ministry of Health (MOH) departments responsible for HRH, Community Health, Maternal and Child Health, Monitoring and Evaluation (M&E), Payroll, Information Systems; relevant government entities outside of the MOH; technical partners; civil society organizations that train, employ and/or represent CHWs; CHW accreditation bodies; and training institutions involved in training of CHWs. Furthermore, depending on the structure of the health system (centralized, decentralized, etc.) and the envisaged governance structure for the CHWML and registry, potential stakeholders might include national and subnational levels of the health system.

The roles for each of the potential stakeholders should be identified. Key roles for list and registry management, and example departments that may fulfil this role can be found in Table 2.

Table 2 Roles of CHWML and registry stakeholders

Role	Description	Example representative
CHWR system administrator	Supports initial technical set up and maintenance, including configuration of roles within the CHWR platform	• Information systems
CHWR/CHWML administrator	Defines user roles and access rights for CHWR functionality and CHWML content	• HRH department • Community health department
CHWML maintainer	Manages the CHWML, including the approval of updates in the registry	• Community health department
CHWML contributor	Submits change requests to the CHWML through the registry	• Administrative/HRH staff at district level
CHWML consumer	Consumes data from the CHWML for which they have access rights (either through user access or through API to their own systems)	• Information systems • HRH department • Community health department • Maternal Child Health • Monitoring and Evaluation • Payroll • Technical partners • Civil society organizations • CHW accreditation bodies

Additional guidance for stakeholder engagement can be found in WHO and ITU's Digital Health Platform Handbook (pages 28 to 33).[50]

Identify the "institutional home" and establish stakeholder roles for governance of the CHWML and registry

Following the identification of potential CHWML and registry stakeholders, and relevant existing governance structures, an "institutional home" for the CHWML and registry should be decided and stakeholder roles confirmed. The MOH can decide whether to create a new governance structure (e.g., technical working group) to govern the CHWML and registry, or integrate this function into an existing governance structure (e.g., an existing structure for health workforce data management).

The "institutional home" should reside within a broader governance structure for the CHWML and registry, including other key CHWML and registry stakeholders. This is an important early step because it clarifies institutional ownership of and leadership for the development and maintenance of the CHWML and registry, clarifies the accountabilities of key stakeholders, and creates a foundation for the governance of the CHWML and registry.

Leadership and membership of the governance structure should be decided by the MOH and should include representation of the identified CHWML and registry stakeholders. The governance structure should provide overall leadership for governance of the CHWML and registry. It is important to identify leadership that would be accountable for driving use of both the CHWML and registry across all stakeholders, and to be a champion across the MOH and MOH partners in using a shared list for the different use cases across departments (e.g., HR departments for recruitment and planning, Information Systems for data systems management, disease-specific teams for organizing public health activities). In all contexts, CHWs and/or representatives of CHW networks must be included in the governance structure to ensure CHW voices in the leadership and governance of the CHWML and registry.

The roles and responsibilities of the governance structure should include, at minimum, ensuring stakeholder engagement and coordination, developing relevant policy and standard operating procedures, providing overall management, monitoring and evaluating the CHWML, implementing the registry, and enforcing SOPs, particularly with the goal of not only counting CHWs but also protecting them and their information. Additional guidance for establishing governance structures for health information systems can be found in WHO and ITU's Digital Health Platform Handbook (pages 133-141).[51]

Box 3 Country experience: **Kenya**

Kenya has a vision for a comprehensive health workforce management approach that includes the CHWs and is a priority for the Ministry of Health (MOH) to get completed by 2022. The country determined that it is necessary to have a harmonized, comprehensive, digital master list that has information for all cadres of CHWs, i.e., Community Health Assistants and Community Health Volunteers. A CHW registry has been established in 15 counties through the support of a USAID-funded project called Human Resources for Health (HRH) Kenya Program. The MOH is to scale up the CHW registry implementation in the rest of the country to continue beyond the life of the programme, which ended in September 2021. However, there are a few foreseen challenges in scaling up and sustaining the process that include a funding gap, continuation of paper-based data entry, and lack of coordination between implementing partners across counties.

Kenya will gain from a comprehensive CHW registry guidance document, so CHWs' details that are collected and collated as part of a CHW master list align with the requirement and functioning at the country's health system levels.

- At the national level, the registry is needed to track supplies and commodity requirements, resource mobilization, and programme development.
- At the sub- national level, more detailed information is needed for programme implementation and incentive payment.
- At the community level, information is needed for service delivery.

A cascading and need-based data flow in the CHW registry can be helpful for evidence-based decision-making in the country's health system.

STEP 3

Define the Target State

- ☐ Define the purpose and scope of the CHWML
- ☐ Identify the CHW cadres to include in the CHWML and registry
- ☐ Define the CHWML content
- ☐ Determine the registry minimum business and functional requirements
- ☐ Select the appropriate digital platform to serve as the registry for the CHWML
- ☐ Develop the implementation plan
- ☐ Mobilize resources to implement and sustain the CHWML and registry

Define the purpose and scope of the CHWML and registry

Taking stock of the result of the assessment conducted during Step 1, the governing structure defined in Step 2 should coordinate across stakeholders that would use the CHWML content to define the purpose of the CHWML and registry as well as scope of the needs they aim to address.

Identify the CHW cadres to include in the CHWML and registry

Identification of the CHW cadres to be included in the CHWML and registry is a country decision to be taken by the governance structure defined under Step 2. The identification process should have a clear definition to inform a decision on inclusion/exclusion of cadres (e.g., by type, such as full-time paid CHWs such as the Health Extension Workers of Ethiopia or volunteer cadres such as the Relais Communautaire of Niger; or by function, such as polyvalent or vertical disease-specific CHWs, peer educators, etc.).

Decisions on which cadres to include should be as inclusive as possible while reflecting applicable regulatory and legislative frameworks in the jurisdiction. In highly fragmented health systems, where community care is provided by a mix of vertical and comprehensive, public sector and private sector, professional and volunteer actors, this will be more complicated. In all cases, clear definitions for which cadres are to be included is a critical prerequisite.

Depending on country laws and policies regarding CHWs and requirements for inclusion in the national HWR (for the broader health workforce), some CHWs may not be permitted to be included in the national HWR, and a separate CHWML and registry may be needed (as shown in Figures 1 and 2) until inclusion of such CHWs within the HWR is permitted. As there may be scenarios where multiple CHW cadres managed by different entities are stored within a CHWR, it is important to ensure that access controls are properly configured within the registry to protect individual CHW's information.

Define the CHWML content

The purpose and needs identified at the beginning of this step should guide the selection of the data elements to be included in the master list to form its content.

Two types of data elements are to be considered for a CHWML:

- The core data elements necessary to uniquely identify, classify, locate and contact each CHW in the country as well as know their current contractual and reporting status. These data elements should be considered as mandatory and, as such, included by default in the CHWML;
- Any other data elements complementing the core ones that are required to address the purpose and needs that have been identified (e.g., for the use cases identified in Table 1).

Two considerations are unique to a CHWML:

(i) There is typically more than one type of CHW. Clear definitions must be employed to specify which cadres will be included in the CHWML,

(ii) Unlike health facilities, which very rarely move from a single location, CHWs typically move within a catchment area. Given this, their location will likely be a set of points within an area rather than a fixed point.

Table 3 provides the list of core data elements recommended by the present guidance. While not exhaustive, Table 4 provides a set of additional data elements for consideration when looking at complementing the core ones.

Table 3 Core data elements for the CHWML

Group	Data element	Definition	Considerations
Uniquely identify	Official unique ID	A unique code that officially identifies a CHW and distinguishes from others	This may be a government-issued unique ID, MOH ID, etc.
	CHW full name (English)	Complete official name of the CHW in English	First, middle and family names should be captured in full and, as much as possible, in separated fields taking into account that names follow different structures in different countries.
	CHW full name (official local language)	Complete official name of the CHW in the official local language	First, middle and family names should be captured in full and, as much as possible, in separated fields.
	CHW birth date	Date when the CHW was born	The date should follow an agreed upon format and be consistent across all the records in the list. The format in question should cover cases when only the birth year is known.
Classify	CHW gender	Self-identified CHW gender	The way gender is defined and classified depends on the country context. This should be defined in country and be inclusive.[52]
	CHW employment occupation category (CHW type)	Classification of the CHW by type	Ideally defined based on the country's official taxonomy of CHWs (e.g., Health Extension Worker, Community Health Agent, Community Based Volunteer). If an official taxonomy does not exist, this can be developed by the governance structure.
Locate[53]	CHW human settlement of residence (unique ID and name)	Unique identifier and name of the human settlement within which the CHW resides (community, village, etc.)	Each country might define the concept of human settlement differently. Information ideally sourced from the human settlement master list and stored in separated fields.
	CHW human settlement of residence (administrative structure)	Unique identifier and name of the administrative unit in which the CHW place of residence is located across the levels of the administrative structure (province, district, etc.)	Each country has a different administrative structure. Information ideally sourced from the human settlement master list.
	CHW human settlement of residence (geographic coordinates)	Latitude and longitude as well as associated information of the human settlement within which the CHW resides	It is important to identify which landmark within the human settlement has been used as reference to collect its geographic coordinates and if this respects potential data privacy regulations in place in the country Information ideally sourced from the human settlement master list (latitude, longitude and associated information stored in separated fields).

Group	Data element	Definition	Considerations
	CHW primary place of work (unique ID and name)	Unique identifier and name of the primary human settlement within which the CHW works	Each country might define the concept of human settlement differently. Ideally sourced from the human settlement master list and stored in separated fields.
	CHW primary place of work (administrative structure)	Unique identifier and name of the administrative unit in which the CHW primary place of work is located across the levels of the administrative structure (province, district, etc.)	Each country has a different administrative structure. Ideally sourced from the human settlement master list.
	CHW primary place of work (geographic coordinates)	Latitude and longitude as well as associated information of the primary human settlement within which the CHW works	Ideally sourced from the human settlement master list (latitude, longitude and associated information stored in separated fields).
	Health facility (unique ID and name)	Unique identifier and full name of the fixed health facility to which the CHW reports	Should include official unique ID and name of health facility Ideally sourced directly from the health facility master list and stored in different fields.
	Health facility (geographic coordinates)	Geographic coordinates as well as associated information of the fixed health facility to which the CHW reports	Ideally sourced directly from the health facility master list (latitude, longitude and associated information stored in separated fields)
Contact	CHW mobile number	Main mobile phone number at which the CHW can be reached	Mobile phone numbers should be formatted in an agreed upon form, verified and consistent across CHWs in the list.
Status	CHW employment status	Employment status of the CHW	The other information linked to the employment are themselves part of the additional data elements included in Table 4.
	CHW functional status	Whether or not the CHW has submitted a report within a given temporal interval (e.g., in the last month or quarter)	Ideally, the submission of a periodic report is an excellent way to assess the CHW functional status. Where supervision is carried out, the supervisor can inform about the functional status based on recent interactions with the CHW.

Table 4 Example of additional data elements to be prioritized in order to define which ones to be included in the minimum set for the CHWML

Data element	Definition	Considerations
CHW photograph	Recent picture of the CHW	To be useful, the picture in question should comply to the general requirements for travel documents
CHW secondary place(s) of work	Unique ID and name of the human settlement(s) within which the CHW works but not as his/her primary place of work within the catchment area the CHW covers	Each country might define the concept of human settlement differently. Ideally the official unique identifier and name of the human settlement are coming from the settlement master list. The sum of the primary and secondary places of work corresponds to the extent of the CHW catchment area.
CHW education level	Level of formal education completed by the CHW	For example, primary school, secondary school, university. Should include provision for accredited/ recognized adult learning and tertiary institution courses that a CHW might have completed.
CHW training	Modules on which CHW has received training	Should list all the training modules the CHW has received training on, their duration of training and when training was conducted.
CHW accreditation status	Annual CHW accreditation examination performance	Should indicate the CHW performance or test scored for each exam taken, and accreditation received.
CHW contract duration	Start and end date of current CHW contract	According to the contractual status, especially when wages are provided, and based on the duration of the grant, some CHWs can have time-bound contract durations.
CHW contract type	Type of arrangement under which the CHW is contracted	To reflect the type of contract a CHW has with its managing organization, which can be formal, informal, permanent or temporary or short term.
CHW contracting authority	Official name of the organization that contracts the CHW	Depending on the context, the CHW can be contracted by a government department, specific donor, or NGO.

Data element	Definition	Considerations
CHW managing authority	Official name of the organization that manages the CHW	Should reflect the complete official name of the organization that manages the CHW.
Salary or other incentives received by the CHW	The salary amount, and/or other regular incentives (e.g., financial, material, recognition) provided to the CHW	CHW incentives/remuneration can differ according to the purpose of the CHW programme, the training received, roles and responsibilities, and the context in which they operate.
CHW supervisor	Unique ID and/or name of CHW's supervisor	Where CHWs are supervised by the upper level (health facility), the Unique ID of the supervisor drawn from HRH can be used.
CHW commodities	Treatment and diagnostics commodities with which the CHW is meant to be equipped to administer assigned health services	This may include rapid diagnostics (e.g., malaria RDT) and treatment (e.g., ORS, Zinc, ACT, antibiotics). Ideally this is sourced from a master list of essential medicines or supplies for the health system.
CHW equipment	Resources and tools with which a CHW is supposed to be equipped to help support their work functions	This may include a bicycle, mobile phone, job aids, backpack, Mid-Upper Arm Circumference (MUAC) tape, height board, etc.
CHW language	Languages spoken by CHW	Languages could be limited to a maximum of two per CHW, depending on country context.
Alternate phone number	Alternate phone number at which the CHW can be reached	Alternate phone numbers could be limited to a maximum of two per CHW.
Services offered	Services provided by the CHW	Can list services for which the CHW has been accredited.

The best way to identify and document the complete list of data elements of relevance to cover the purpose and needs of the CHWML is through a consultation involving all CHW-related stakeholders. During this consultation it is important to ensure that the following is defined and captured for each data element:

- A clear contextual definition
- Its applicability (applied to all individuals in the list or only some of them)
- Its format (alphanumeric, numeric, date, other)
- Its maximum character length
- The values that the data element can take, especially when these are bound to a limited number of options
- Whether the data element should be considered as mandatory when a new CHW is being added to the master list (all the core data elements should be considered as mandatory by default).

Examples, notes and, when applicable, the source (reference) of the data element can be added to the above information when it can help those in charge of managing the CHWML and its users to have a clear understanding of each of these data elements. The sum of the data elements information collected constitutes what is referred to as the CHWML data dictionary. Due to the importance of such information, not only from a content management perspective but also from a use perspective, a simplified version of the data dictionary should be attached to the CHWML together with the CHWML metadata when extracted from the registry. This version of the data dictionary should at least contain the label, full name and description for each data element. Please see examples below for some of the core data elements.[54]

Annex II provides an example of how the above information can be captured for a set of the core data elements.

When performing this step it is also important to:

1. Ensure that the data elements included in the CHWML are aligned as much as possible with those included in any existing HRH master list and to ensure data compatibility between the two.[55] If coded data values differ between the HRH master list and CHWML, then matching should be provided between them.

2. Look at how the concept of CHW relates to the other geographic objects of importance to public health. The relationships in question can be of different types: geographic (is within, lives in), administrative (is reporting to), health related (covers, providing services to, refers to) or associative (is part of). This kind of information can be captured under the form of distinct hierarchies or a conceptual data model, such as the one presented in Figure 5. This might reveal the need to include some specific data elements in the CHWML in order to capture these relationships.

3. Assess country-specific privacy policies and regulations/permissions needed to collect certain potentially sensitive data elements (e.g., name, gender, place of residence, phone number). It is also important to verify that all envisioned data elements can be legally collected and to understand what informed consent might be necessary from CHWs. This needs to be incorporated in implementation planning.

4. Take the time to define an appropriate coding scheme for the CHW official unique identifier (UID). While different options are possible, it is important to take the following rules into account when defining such coding scheme:
   a. The scheme should not to embed any information that could change through time (e.g., administrative division code, CHW type, etc.);
   b. The UID attached to each CHW should remain the same from the first time the CHW is included in the master list until the last time they are active in the field;
   c. Use a sequence as short as possible but taking into account the number of new CHWs that could be nominated over the coming decades (function of the current number of CHWs in the country);
   d. Do not start the sequence with zeros ("0") as they might fall depending on the software you are using. If the purpose is to use a coding scheme that presents the same number of digits/characters across all the records then include a set of characters not meant to change at the beginning of the sequence (for example: CHW000001);
   e. Generate UIDs sequentially or randomly;
   f. Determine, if any, programme-, project- or initiative-specific ID is assigned to a CHW, this should be captured separately from the "universal" government issued UID(s). When doing this, the master list can also serve as a key correspondence table between systems, as aligning IDs to a unique one can take time.

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5. Define the classification tables for data elements where the values will be chosen among a limited number of options (example: CHW type, CHW functional status). Such tables should at least contain the following for each option: a unique code, a label and a description in both English and the local language.

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6. Consider using the following standards not only to homogenize the content of the data elements but also to make them compatible with other sources of information:
   a. Character encoding: UTF8;
   b. Dates: ISO 8601 (YYYY-MM-DD);
   c. Phone number: ITU-E.164 (Country Code (CC) + GSN (Global Subscriber Number);
   d. Geographic coordinates: ISO 6709:2008 (Decimal degrees (EPSG: 4326); latitude: +/- DD.DDDDD; longitude: +/- DDD.DDDDD). This is the format suggested for computer data interchange and the most universally used to limit potential data entry errors. It is also recommended to capture the source and method used to collect the geographic coordinates as well as a qualitative measure of the coordinates accuracy. The expected level of accuracy and precision (number of digits after the decimal point) for the geographic coordinates to be included in the CHWML should also be defined.[56]

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7. Define a short label for each data element. Such a label will not only be used to differentiate each data element in the registry but also serve as the header for the CHWML when presented in a tabular form. Due to some software not being able to handle long labels it is recommended that these do not contain more than 10 characters.

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8. Define the profile of the metadata to be attached to the CHWML. Metadata should be accessible to the users within the registry as well as when the list is being extracted from the registry. Metadata should at least contain the following information for a user to directly know if the master list they are looking at corresponds to their needs:[57]

a. Title: Full name by which the CHWML is known
b. Originator: Complete name of the institution curating the CHWML
c. Validity date: Temporal validity of the CHWML (date)
d. Extraction date: Date when the CHWML was extracted from the registry (date)
e. Abstract: Short description of the CHWML content and purpose
f. Process: General description of the steps that have been followed to create the CHWML
g. Progress: Development status of the CHWML
h. Access constraints: Potential limitations in accessing the CHWML (e.g., limited access to certain users)
i. Use constraints: Potential limitations in using the CHWML
j. Acknowledgement: Statement that should be mentioned when using the CHWML
k. Disclaimer: Liability statement for the CHWML
l. Primary contact: Contact details of the person in charge of the CHWML (full name, organization, phone number and email address)

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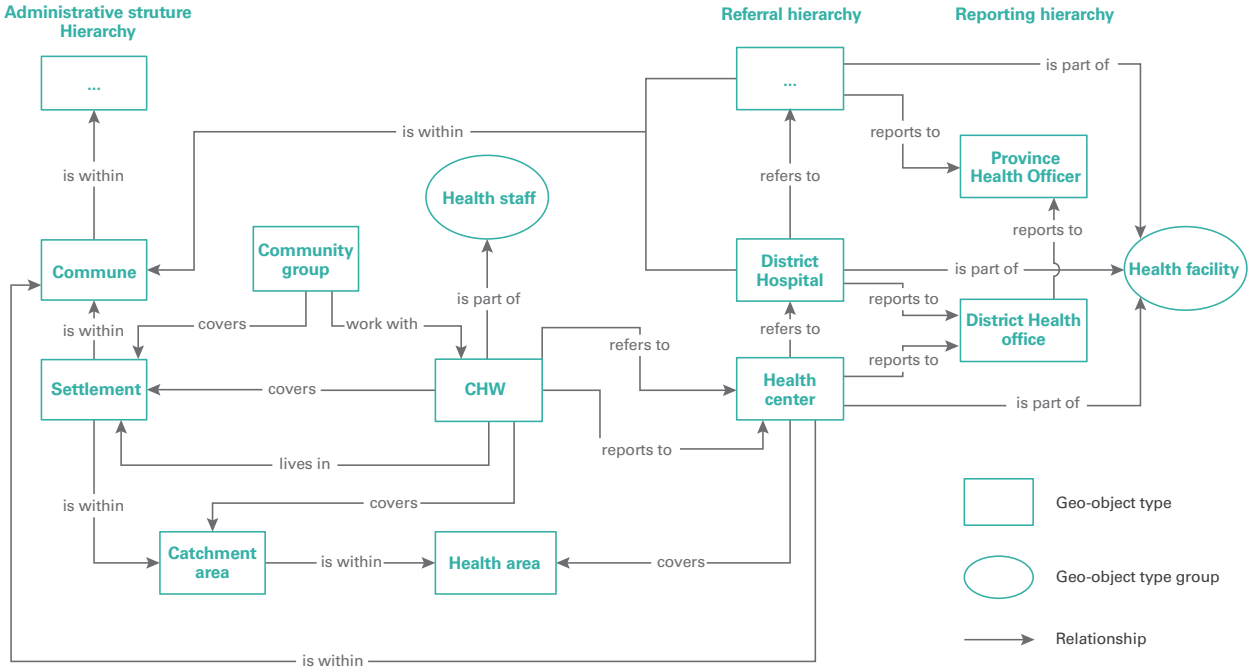
9. Identify which governmental entity has the official curation mandate over each data element as well as the potential source(s) for each (might be different from the entity having the curation mandate), including the information system in which they might be stored and maintained. This information will be very useful not only when generating the first version of the master list (see Step 4) but also when determining the minimum set of data elements to be included in the list (see process outlined below).

Figure 5 Example of conceptual data model centred on the CHW concept



Note: The type of infrastructures (health facilities, offices,...) and administrative units might differ from one country to the other

The above-mentioned consultation might result in the identification of more data elements than can be collected, managed and regularly updated in an effective way.

When this is the case, it is important to determine the minimum set of data elements on which to focus efforts and resources. When identifying the content of this minimum set it is recommended to:

- Include the core data elements necessary to uniquely identify, classify, locate and contact each CHW (Table 3) as part of the minimum set by default
- Prioritize the other data elements that have been identified during the consultation taking following into account:
  - The number of use cases that each data element could help address, including the reports and other outputs to which they would contribute. The higher the number the more useful and therefore, important for inclusion.
  - The existence of an information system already covering and regularly updating some of the data elements. In this case, plugging the system to the registry and aligning its content with the CHWML would allow for directly obtaining the data elements in question without having to include it in the minimum set as long as one data element (generally the unique identifier) is in common between the master lists and the data set/list (foreign key). Table 5 provides examples of data elements that might be found in other information systems together with the data elements that should be in common between the dataset set/ list managed by these systems and the CHWML to serve as primary/foreign key
  - The potential challenges in collecting and regularly updating the data element including the frequency at which the data element should be updated to remain relevant. The greater the challenge, the higher the cost and therefore, the higher potential limitation for inclusion.

Table 5 Examples of information systems that could contain some of the data elements to be included in the CHWML

Information system	CHWML Data elements possibly contained	Primary/foreign key
Human resource information system (HRIS)	Pre- and post-service training received; dates of pre- and post-service training received; Certificate/ documentation providing proof of training; Contracting organization, employment status, compensation information, accreditation	CHW unique ID
Health facility registry (HFR)	Official health facility ID, name, type and geographic coordinates from the health facility master list	Health facility unique ID
Settlement registry	Settlement official ID, name and geographic coordinates, administrative units official ID and name	Settlement unique ID
Logistics management information system (LMIS)	Equipment, commodities	CHW unique ID

Determine the registry minimum business and functional requirements

A registry is an IT solution that allows storing, managing, validating, updating and sharing of the master list for a specific geographic object. It is the "container" for the master list.

To determine the appropriate registry to host the CHWML, the governance structure should define the key business and functional requirements to address the use cases it will serve. This exercise should include identifying the types of users to access the registry and interact with the CHWML as well as their roles and responsibilities. This will help inform any functionality required to limit access permissions in order to protect CHW information. A well-executed exercise at this stage will inform adherence to principles and standards around data protection and security standards, including collecting purposeful data for specific uses, and implementing robust access controls.

The goal of a mature CHWR is to host, maintain, regularly update and share a CHWML to different entities and systems that have access controls. The platform to serve as the CHWR should provide the functionalities for each workflow (depending on the user role), which is outlined in Table 6.

Table 6 CHWR functionalities

Workflow	Functionalities

Set up the registry	• Configure and manage user permissions at the administrator level based on user roles such as:
	  ▸ Registry administrator – e.g., can edit the CHWML, approve changes from other users, define user roles and manage permissions
	  ▸ Registry maintainer – e.g., can edit the CHWML and approve changes from other users
	  ▸ Registry contributor – e.g., can submit change requests to the CHWML
	  ▸ Anonymous user – e.g., can view a public CHWML if available
	  ▸ API consumer – e.g., a system that can use the registry's APIs to exchange content
	• Define each data element included in the CHWML (label, description, format, etc.), including governance over the data element if needed
	• Define the hierarchies included in the CHWML

Upload, export and exchange the CHWML	• Upload data sets of CHW information (e.g., Comma Separated Values (CSV), Excel files) • Export the CHWML together with its metadata and data dictionary • Exchange CHWML content with other systems using interoperability standards (e.g. mCSD)
Manage the CHWML	• Store, view, edit and delete CHWML content as needed • Uniquely identify CHWs and allow de-duplication • Create, view and edit the CHWML metadata • Manage and link multiple lists if necessary (e.g., multiple types of CHW cadres) • Manage changes through time (capacity to store and retrieve older instances for a given data element, and logs history of changes) • Operationalize the CHWML updating mechanism • Generate analytics
Data privacy and security standards	• Adhere to data privacy and security standards required for a health workforce registry in-country – e.g., data is shared either in aggregate form or using unique IDs or without individually identifiable information, general data protection regulation (GDPR) style legislations
Interoperability	• Supports relevant data interoperability standards – e.g., mCSD, HL7 FHIR • Aligns with existing health workforce information system architecture in-country (if any) and/or with OpenHIE architectural framework [58]

These registries should ideally be built in keeping with the Principles for Digital Development to ensure integration of best technology practices[59] and with implementation guidelines for HWR where appropriate.[60]

Select the appropriate digital platform to serve as the registry for the CHWML

When assessing different digital solutions as a CHW registry, it is important to select a platform that meets country needs (based on Step 1 and Step 3 of this guidance), the minimum requirements required of a registry outlined above, and global standards for digital solutions.

Furthermore, as establishing a registry can require a considerable investment in time and funding, it is important to adequately evaluate the IT infrastructure requirements and technical capacity to make a decision on which digital platform will serve as the registry for the CHWML. When selecting a platform to serve as the CHWML registry, stakeholders should also consider:

- **Hosting options:** Registry can be hosted based on country requirements. This may include on-premise local hosting or Cloud hosting depending on country needs and regulations.
- **Costs:** Set-up, maintenance and hosting (if applicable) costs for the registry needs to align with the country budget.
- **Software and hardware requirements:** Minimum software/hardware requirements required to use the CHW registry.
- **Technical capacity:** Technical capacity required to set up, support and maintain the platform (often underestimated).
- **Documentation and support:** Platform documentation available and up-to-date and technical support available.

If an HWR is in use, the country should consider including the CHWML in that registry, if allowable by policy. An assessment can be administered to identify whether this registry complies with the minimum requirements or if it requires enhancements to support the CHWML. If the CHWML cannot be included in the existing HWR, then the government should consider setting up a separate CHW registry that can be linked to the HWR when appropriate.

Develop the implementation plan

Once the target state has been identified, an implementation plan should be developed by the governance structure to generate the CHWML, establish the registry, share the CHWML through the registry, and maintain both the CHWML and registry in the long term. The implementation plan should articulate the shared vision and desired outcomes, estimated timeframe for completion, and provide a clear breakdown of roles and responsibilities. This plan can then be costed to ensure that sufficient resources are deployed to support the implementation.

Mobilize resources to implement the CHWML and registry

Resources to implement the CHWML and registry should include both start-up costs when first establishing the CHWML and registry as well as recurring costs to maintain it. These costs may include:

Start-up costs

- Staff: Human resources for planning, development, updating and maintenance (ideally situated within the MOH department/directorate tasked with governance of the CHWML and registry).
- Meetings: Meetings with key stakeholders who would need to share the list or use the information for decision-making periodically.
- Initial data collection: If data collection is needed to generate the first CHWML, planners should bear in mind training, daily allowances, transport, staff time and equipment (e.g., Global Navigation Satellite System (GNSS)-enabled receivers, phones or tablets to collect data including location information).
- Training: At initial setup there will need to be capacity building for both the maintainers of the CHWML and the registry as well as training on data use.
- Initial technology set up: Registry set up will include initial start-up costs including server setup and deployment. There may also be associated licensing fees or software development time to build any missing functionality.

Recurrent costs

- Meetings: Meetings for the governance structure
- Ongoing updates of the CHWML: Periodic data collection is needed for updating the CHWML. Ideally, this can be integrated within routine processes of the MOH (e.g., new entry or changes to existing data made by CHW supervisor with checks and validation at higher levels within the MOH for district, regional and national levels before being submitted through the registry).
- Ongoing hosting and maintenance of the registry: Any deployed technology should be maintained over time. Costs may include ongoing hosting (either in country or Cloud), and time from software developers/consultants to troubleshoot the technology or provide updates as necessary.

Box 4 Country experience: **Mali**

Multiple CHW lists are established and managed by different stakeholders in Mali, including the geographic mapping of community actors developed by the national public health institute with UNICEF's support, the ASAMALI database managed by MUSO, and the CHW mapping developed by the HRH department. The Ministry of Health, however, reported discrepancies across existing lists due to the weak quality of data collection and lack of systematic updates.

Based on this situation, the Directorate of Health and Public Health Hygiene (DGSHP) suggested harmonizing and aligning the existing CHW lists to provide a single CHW "master" list to the country. The harmonization exercise took place during the 2021 national review of essential services at the community level to cross-check information across CHW lists and validate one principal list for use by all stakeholders. Mali is moving towards adopting the ASAMALI platform as the registry system to manage the CHW master list (CHWML). This platform allows the supervision of the CHWs and provides the means for CHWs' information to be regularly updated, including information on the functioning status of the sites where they operate.

Mali sees several benefits that a harmonized and validated CHWML can provide in managing CHWs' information:

- Provide an accurate overview on CHWs geographic coverage and identify gaps
- Improve the planning of activities, bottom-up, from the community to subsequent levels of the health system
- Understand the number of CHWs and their functional status to better estimate the budget for salaries/incentives, equipment and commodities
- Improve transparency and accountability
- Enable advocacy and resource mobilization with the Government, partners and donors to strengthen community health programming
- Strengthen the monitoring and evaluation of essential services provided at the community level.

STEP 4

Generate the First Version of the CHWML

- ☐ Assess, clean, merge and combine existing CHW lists
- ☐ Identify and fill data gaps through data collection
- ☐ Validate the first version of the CHWML

The existing CHW lists that were identified during the current state assessment (see Step 1) need to be processed in order to generate the first version of the CHWML, which covers the CHW cadres agreed upon for inclusion. Ideally, the national HWR includes CHWs. However, even if the HWR includes CHWs, it may not include all CHW cadres agreed upon for the CHWML (see Step 3). Therefore, it is important to ensure that all existing CHW lists for the CHW cadres agreed upon for inclusion are taken into account to generate the first version of the CHWML.

Assess, clean, merge and combine existing CHW lists

Once all the available CHW lists have been identified and obtained, the next step is assessing the quality of the content of each existing list for the data elements that have been included in the minimum set.

Such an assessment should be performed across the six dimensions of data quality: timeliness, completeness, uniqueness, accuracy, validity and consistency. This can be done by answering the questions listed in Table 7.

In order to be effective, the identification of duplicates will require the data to be as clean as possible. The identification of potential inconsistencies between lists will be far easier if it is performed not only after the cleaning, but also after merging of the different lists, which should, therefore, take place after the corresponding operation has been performed on the list. As such, the process described in this section goes through the following general steps:

1. Assess each list for timeliness, completeness, validity and accuracy;
2. Clean the different lists;
3. Identify duplicates in each list (uniqueness);
4. Merge and combine the lists;
5. Assess for information consistency

Table 7 Questions to be answered and resulting information/ measurements expected from the quality assessment of the existing CHW lists

Quality dimension	Questions to be answered	Method to answer the question	Resulting information/ measurement
Timeliness	When was the last update?	Access to metadata and/or interview data source	Date (YYYY-MM-DD) when the list was last updated
	Were all the data elements updated or only some of them?		List of data elements that were updated during the last update
Completeness	Does the list contain all the data elements included in the minimum set?	Visual analysis of the list	List of the minimum data elements contained by the list
	Is the value for each data element available for all records in the list?	Manual or pseudo-automatic identification of empty records	Missing values for each data element (%)
Uniqueness	Does the list contain duplicate records?	Manual or pseudo-automatic identification of duplicates	Duplicates identified in the list (%)
Accuracy	Does the information captured in the list correspond to reality?	Access to SOP used for data collection, random check, comparison between sources, visual check for geographic coordinates	Records checked for values that do not match the reality (%)
Validity	Are the values for each data element captured according to the format and standards that have been agreed upon?	Manual check of the format and standards against which the values are captured	List of the data elements for which the values do not match the format and/ or standards
Consistency	Are there important inconsistencies in the way some of the data elements are being captured between lists?	Visual comparison between lists	List of the data elements for which important discrepancies have been observed between lists

Once the different lists are assessed for timeliness, completeness, validity and accuracy, and taking the level of authoritativeness of each of them into account, it is important to identify which list(s) contains information of sufficient quality to be used for the rest of the process. Several cases can occur:

- None of the lists contains information considered as being of sufficient quality (too old, too many gaps, a lot of duplicates, etc.). In this case, starting the development of the master list from scratch is an option that should be considered.
- Only one of the lists contains information considered as being of sufficient quality. In this case, the process will continue on the basis of this list only (no merging necessary).
- More than one list contains information considered to be of sufficient quality. In this case, the process will continue using all these lists, and it would be useful to identify which list or lists contain the highest quality information. This list or these lists would then be used as the backbone into which the other lists would be merged.

The cleaning phase, inclusive of data homogenization, can then be implemented as follows on each of the lists that have been identified as containing information of sufficient quality:

- Remove the data elements that are not part of the defined minimum set;
- Remove the values that have been identified as being of low quality (i.e., phone numbers missing digits or geographic coordinates of low precision);
- If necessary, de-concatenate information that should be stored in different fields (example: settlement and administrative unit names);
- If necessary, adjust the values for the different data elements to the format and standards agreed upon under Step 3 (i.e., phone number format, geographic coordinates in decimal degrees, etc.);
- Adjust the label for each data element in order to facilitate the merging and combination of the lists while at the same time keeping track of the source of the information as well as its temporal validity (examples: CHW_Name_DHIS2_2017; CHW_Name_MOF_2020);
- If the list does not include any unique ID for each CHW, add a temporary one to facilitate the identification of each record once the merging and combining has been operated.

Once the different lists are cleaned and homogenized, identify potential duplicates within each list, decide which record among the duplicates should be kept, and if some data elements should be transferred from the duplicates to the main record (e.g., some of the data elements were only captured in one of the duplicates or the value is more up-to-date in a duplicate than the record that will be kept). Then delete the duplicates.

At this stage, it is possible to merge lists through matching the different lists together to get the most complete list possible of CHWs (rows in the list), and then to combine the values that are available for each of the data elements included in the minimum set (columns in the list).

Manual and semi-automatic methods and associated tools exist that can perform both merging and combining the lists. A few important considerations when determining an approach include:

- The number of lists to be merged. Some of the semi-automatic methods/tools are not able to merge more than two lists at a time, which might be a limitation;
- The number of CHWs included in the lists. Semi-automatic methods/tools become relevant only when the number of records in the list becomes difficult to manage through a manual approach;

- The level of cleaning that has been possible to perform on the different lists. Semi-automatic methods/tools provide more relevant results when it has been possible to clean and homogeneously structure the lists, as these methods/tools are mainly looking at matching the values provided for specific data elements;
- The number of data elements that can be used for matching the common elements between the lists. The higher the number, the more relevant the use of a semi-automatic method/tool.

Once the method and associated tools are identified, start merging the different lists together through matching to obtain the most complete list of CHWs possible (rows in the list). When doing this:

- Make sure that the already established and temporary unique IDs attached to each CHW remains in separated fields in the merged list as they will be needed for the combination part;

- When using a semi-automatic method, manually check to see if the records that have:
  - been poorly matched and should be considered as corresponding to the same CHW or a different one. Keep the records separated if the latter;
  - not been matched but do correspond to CHWs that are captured in one of the lists (e.g., CHWs that might have been active over a given period of time or only captured by a single source).

The data elements not used during the matching exercise and still stored in the original lists can then be combined with those already in the merged list using the corresponding unique ID attached to each CHW (established or temporary) as the common field.

Before moving to the reconciliation part of the process, and in a scenario where several lists have been merged and combined together, there is a need to decide if the objective is to create a unique version of the master list containing the most recent information about each CHW or to conserve how the information for each CHW has evolved through time.

When creating a single most up-to-date list, the reconciliation process will need to:

- Go through each record in the list and, for each data element, identify the most recent value based on the time stamp identified during the assessment of the different lists;
- Capture the value considered as being the most recent together with its source and date of last update in separate columns, as these are important information to be captured in the registry.

If the objective is to conserve how the information for each CHW has evolved through time, then the file resulting from the reconciliation process will need to contain the available values for the different dates covered by the original lists. In this case, the value for each temporal validity will be stored in a separated column, with the source and time stamp, for example, being captured in the header of these columns. If several lists present the same temporal validity, then a decision will have to be taken regarding the value and source that should be kept.

It is important to identify and document inconsistencies that are not linked to temporal differences between lists (e.g., differences in definitions between the same data elements captured in different lists). These types of inconsistencies might lead to the need to go back to the definition attached to each data element to see if these differences are equivalent. If not, the use of some of the sources might have to be reconsidered for these specific data elements.

Independent from the methods and tools being used, the whole process followed in order to assess, clean, merge and combine the different lists to obtain the first draft CHWML should be documented. This is not only to enable reproduction of the CHWML from the original CHW lists but also to provide an audit trail.

Such a document should provide the link to the original lists as well describe all the discrepancies identified within and between lists together with the rationale used for deciding on the final source of truth included in the CHWML.

At this stage, it is also important to finalize the labels associated with each data element in line with the data dictionary developed under Step 3.

Identify and fill data gaps through data collection

Following creation of the draft CHWML, data gaps should be identified, which may include:

1. Absence of value for a given data element (for all or specific CHWs)
2. Uncertainty about the value being captured
3. Out-of-date information for given data elements and CHWs

Consideration should be given to different modalities of collecting the data needed to fill data gaps in the most accurate and economical way, given available resources. For example, depending on the context, it may be feasible to fill data gaps through routine processes (e.g., CHW supervision or training). On the other hand, ad hoc data collection to fill data gaps may be needed under some circumstances (see the Annex I for an example budget from an ad hoc national georeferenced census of CHWs in West Africa).

SOPs should be developed for guiding data collection to fill the identified gaps, cleaning the newly collected data, and integrating it into the draft CHWML to create the first version of the master list. SOPs for data collection might be tailored to the specific data elements (e.g., for missing geographic coordinates, and the SOPs should include specific instructions to ensure the standardized collection of these coordinates[61]).

If the timeline permits, and depending on functionalities included in the platform selected to serve as the registry, this exercise could take place through the use of the registry. If this is the case, the validation of the CHWML could also take place at the same time (see the next section).

Validate the first version of the CHWML

The first version of the CHWML should be validated following the collection, cleaning and integration of the missing data. The CHWML governance structure should lead the validation and the content being validated by the stakeholders who are going to be in charge of its regular update through the use of the registry (e.g., district level representatives). Any errors should be identified, systematically documented and corrected in the first version of the CHWML.

Ideally, this validation would take place directly through the use of the established registry and be an integral part of the training of the stakeholders in charge of the regular update of the CHWML.

STEP 5

Establish the CHW Registry

- [ ] Conduct user research
- [ ] Deploy the registry
- [ ] Operationalize the registry

In this section, we elaborate on high-level considerations in the process of establishing a CHWR.

Conduct user research

Before introducing the CHWR to all users, it is recommended to test and validate the workflows that users will perform in the registry with a sample and representative group of users. Testing the registry with users prior to implementation is critical to ensure that the CHW registry works as expected and meets the required user needs.

Record user feedback and prioritize any requests to develop enhancements to the CHW registry, if possible. Focusing on the higher priority requests, determine the type of adjustments required (e.g., configuration change vs. change in code) and technical resources required to implement the changes.

Conduct user research

Before introducing the CHWR to all users, it is recommended to test and validate the workflows that users will perform in the registry with a sample and representative group of users. Testing the registry with users prior to implementation is critical to ensure that the CHW registry works as expected and meets the required user needs.

Record user feedback and prioritize any requests to develop enhancements to the CHW registry, if possible. Focusing on the higher priority requests, determine the type of adjustments required (e.g., configuration change vs. change in code) and technical resources required to implement the changes.

Deploy the registry

Following the finalization of CHW registry features, technical deployment may commence. The technical set-up of the registry consists of planning, setting-up, configuration and quality assurance.

- Plan: Review installation guidelines for the digital solution to determine the technical capacity required (in-house or external technical partner), software requirements and server requirements. Ensure that any hardware required to support the registry is available in-country.
- Set-up of the registry: Budget enough time to set-up the CHWR (e.g., set up server and install software). If the CHWR requires code updates or configuration during set-up, ensure access to the developers of the registry software during initial set-up.
- Configure registry: Configure the registry based on country needs (e.g., official languages), create and invite users, create user permissions and integrate with other systems.
- Quality assurance: Test the registry by uploading test data and completing workflows that the registry will support (e.g., view and edit data). If there are any issues with the registry, determine severity of the issue and develop a process to resolve it (e.g., configuration change vs. change in code). This may be done on a test instance before deploying to a live server.

Once the technical set-up of the registry has been completed, the administrator can upload the first version of the CHWML and other associated data to the registry.

Operationalizing the registry

To ready the registry for launch, the following activities should be planned:

- Training: Standardized training sessions should be set up for the primary registry users – including both system administrators and those who will be maintaining, updating and contributing to the CHWML. Reference material, such as user guides or troubleshooting instructions, should be provided to support the use of the registry post-training.
- Provide ongoing operational support and supervision: New users should be provided operational support or supervision from trainers and/or supervisors from the governing entity to ensure regular usage of the registry and to help provide troubleshooting support if needed.
- Ongoing monitoring: The monitoring of system usage (e.g., number of active users or session lengths) can help to identify users who may be having challenges with the system. Ongoing monitoring by the governing entity can support rapid resolution in order to encourage regular usage of the registry and collect user feedback that may contribute to positive experiences with the registry.

Box 5 Country experience: **Zambia**

Zambia has two lists for community health workers (CHWs):

a) Community Health Assistants (CHAs),

b) Community-Based Volunteers (CBVs).

The Community-Based Volunteer Management Tool (CBV-MT) is currently being piloted in three provinces. Management, organization and continuous update of the CBV register been done by the Ministry of Health at different levels. The list is detailed, including information ranging from personal information on CBVs, current positions, competencies, special payments/benefits and types of incentive and language proficiency, training received, education background, and any other form of work in which the CBVs are engaged. The web-based tool allows capturing information of one person (CBV), thus avoiding double entries. It also allows capturing of competencies of multiple skills of each CBV to mitigate duplication.

The CHW master list can facilitate the health system:

- Enhance the coordination, management and utilization of CHWs
- Strengthen an accountability mechanism
- Establish a central coordination mechanism to ensure efficiency and effectiveness in the allocation of CHWs
- Conduct gap analyses by the government and partners
- Align government's and partners' resources and support
- Streamline planning and supervisory needs

STEP 6

Share the CHWML

- ☐ Develop a data-sharing policy
- ☐ Identify and operationalize a data-sharing mechanism
- ☐ Support a data-use culture

An effective CHWML can be used to inform decision-making to improve CHW programmes and support broader health system planning. In order to encourage use, data should be shared with other government entities or non-government entities that can leverage the data within a CHWML for ongoing activities. Regularly sharing a CHWML is important to:

- Continue improving its value and receive resources to maintain the CHWML over time
- Improve data quality by allowing other stakeholders to review and contribute to the list
- Encourage use of the list as a source of accurate information for CHW data
- Support data linkages across systems using the unique identifiers in a CHWML

To encourage demand across stakeholders for the CHWML, a strong culture of active data use should be promoted to encourage the use of the list to inform strategic and programmatic activities. Institutionalizing use of the CHWML into existing routine activities that require using the contents of the CHWML can then promote ongoing demand from multiple departments that may need such information. This, in turn, can be converted into ongoing desire for up-to-date lists and provision of resources to ensure such lists are kept up to date and shared.

Develop a data-sharing policy

A comprehensive data-sharing policy can assure transparency on the criteria to gain access to the CHWML.

A data-sharing policy should include clear procedures on the approval processes and level of access to and use of the CHWML based on the type of data consumer. The policy should outline how sensitive data should be handled (e.g., location data in settings vulnerable to violence or personally identifiable information). This should include setting up restricted access to sensitive information, only including sensitive data on an as-needed basis – to be determined by a governing organization – or outlining conditions upon which sensitive data can be viewed. This will be critical to ensure protection of CHWs and their private information.

Identify and operationalize a data-sharing mechanism

The mechanism to share a CHWML may depend on how it is hosted and on the data-sharing policy. In the absence of a CHW registry, it could be sent electronically as a static file. However, this brings significant risk in version control.

Sharing the CHWML directly to other information systems can facilitate uptake of the data by other entities. A well-documented API with proper access controls can enable other information systems to query and sync with the CHWML in a registry, rather than store a duplicate set of CHW information that would need to be periodically reconciled. Information systems that may routinely require the CHWML include HRH systems, LMIS, EHR, CHIS and HMIS. A department for information systems or technical units could support building integrations between registries and ensure seamless flow of information between systems, particularly within an existing health information system architecture. Other options could include sharing the list via a website as view-only, or through an online interface to query, filter and download data.

Support a data-use culture

To encourage active use of the CHWML for decision-making, the CHWR and CHWML should be leveraged in routine operational and human resource management processes. Particularly in countries where CHWs may have limited recognition and may not be included in formal HRH information systems, the CHWML and registry may still be positioned in a way that can help improve operational efficiency. This may include using such a list to inform planning of new recruitment and allocations, optimization of the number of CHWs deployed in different areas that may lead to cost savings and better targeting, and ensuring that commodities, supplies, payments, or incentives are distributed to verified, active CHWs. A full list of operational processes that could be supported through the use of data from the CHWML can be found in Table 1.

The benefits of using a shared list across these functions should be articulated and regularly reiterated to the relevant stakeholders, including efficient use of resources, reduction of duplication, reduced need for data collection and cleaning, data compatibility between sources, and generation of consistent information and data products.

STEP 7

Maintain the CHWML and Registry

- ☐ Develop SOPs for updating the CHWML
- ☐ Develop SOPs for maintaining the registry
- ☐ Strengthen capacity to implement SOPs to maintain the CHWML and registry
- ☐ Develop and implement policies to maintain the CHWML and registry

Develop SOPs for updating the CHWML

Key stakeholders with an interest in maintaining the CHWML should make decisions on how the CHWML is updated over time. A protocol for updating the CHWML should be well documented and made available to any contributor at national or sub-national level in order to routinize regular updates. The protocol should include information on:

- Change request process: Information on how a contributor should request an update to the CHWML should be clear, for example, providing details on where to submit a change in the CHW registry, the approval timelines (e.g., number of business days for approving and rejecting a request), information that should be submitted with each change (e.g., type of change requested, change requestor, date of request, and reason for request), and information on the entities providing approval.
- Frequency of updates: Information should be provided on expected frequency of updates. For example, updates may be made on a routine basis (e.g., quarterly or biannual, or linked to existing human resource management processes such as payment or training completion). Supplementary updates may be necessary, and criteria should be shared on events for which these would be allowed.
- Change history: Information should be shared on how a contributor can view and search changes that may have been made to the list in the past. To this end, there should be clear documentation of each change submitted that is stored within the registry.

Develop SOPs for maintaining the registry

A well-defined plan for maintenance for the software and hardware supporting the registry is important to ensure the solution continues to be fit for purpose and provides value to its users over time. Key maintenance tasks for the CHWR may include updating access controls for users, updating the platform with software patches, and reporting any bugs for resolution. Clear owners should be identified to carry out periodic audits of the registry, manage the overall registry maintenance plan, and help troubleshoot and/or escalate technical issues.

The implementation of a HelpDesk, supported by email or telephone, is greatly beneficial for ensuring that any issues in the registry are reported swiftly and resolved on a timely basis to avoid any disruption of use. This process will require consultation with regular users and administrators of the system (i.e., district or national staff), and may lead to identification of new or revised features, data elements and workflows that could generate greater value for them. These ideas should be escalated to the overall product owner and custodian of the registry for review and prioritization in the roadmap.

The custodian of the registry should stay informed of new software versions as they are released and ensure that these updates are tested and installed in order to ensure the registry is operating smoothly.

Strengthen capacity to implement SOPs to maintain the CHWML and registry

Capacity building to manage the CHWML and registry should be conducted to ensure ongoing maintenance of the integrity of the list and utility of the CHWML registry. The maintainer of the CHWML and maintainer of the registry may be from two different government entities (e.g., a CHW department and an information systems department, respectively), but should be trained in coordination with each other and aware of SOPs that are housed within the other department. Periodic refresher training should be provided to ensure compliance to the SOPs, or upon any significant update to the CHWML, the registry, or the SOPs to manage them.

Develop and implement policies to maintain the CHWML and registry

Under the leadership of the governance structure for the CHWML and registry, a policy for governance of the CHWML and registry should be developed or existing policies may be updated to include governance of the CHWML and registry.

Policies that are designed to support the institutionalization of CHWs – e.g., the incorporation of a CHW cadre into the formal HRH workforce and systems, or the transition of a CHW cadre from part-time to full-time – may provide an enabling environment to encourage the maintenance of the CHWML and registry to "count" each individual CHW. Other policies that may help encourage the uptake, maintenance and ownership of the CHWML and registry may include policies on data sharing and harmonization between MOH departments. Finally, policies that incentivize updating the list in order to facilitate HRH operations (e.g., payroll linkages to active status in registry) may also be useful to consider.

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Box 6 Structured synthesis of country experiences

Seven country consultations were organized to distil country experiences in establishing, maintaining and utilizing CHW registries to further enrich and validate this guidance document. With support from UNICEF regional and country offices, key informant interviews were held with Ministry of Health officials and implementing partners from Ethiopia, Kenya, Mali, Rwanda, Sierra Leone, Uganda and Zambia,. Countries were selected to represent varied typology of (community) health systems and include countries at different milestones in the pathway to establishing CHW registries.

Utility of national CHW master lists

All the countries articulated the need for a national CHW master list (CHWML) that would provide current numbers of functional CHWs to aid in decision-making, remuneration, logistics and supply management, planning for training and supervision, accountability, performance management, and conducting coverage analysis for effective resource allocation. A consolidated and harmonized CHWML that merges fragmented lists across various cadres is particularly beneficial for coordination across different health system levels and between partners and the Ministry of Health in each country. CHWMLs are useful in enhancing coordination, management and accountability, and can critically inform the establishment of a central coordination mechanism to ensure efficiency and effectiveness in the allocation of CHWs. Strategic plans for CHWs, based on robust monitoring and evaluation of their services, can greatly benefit the country if it knows the actual coverage of CHWs and their level of performance.

Countries are at different stages in creating and managing CHWMLs, with countries having multiple lists for different CHW cadres. In Uganda, a simple ruled 'blue' book has been in use since 2001 to manually collect information pertaining to Village Health Teams (VHTs). Zambia has primarily two CHW lists – a recently conducted census mapping of their Community Based Volunteers (CBVs) and that of their professionalized cadre of Community Health Assistants (CHAs). Kenya has a comprehensive CHW list that incorporates the two main cadres – Community Health Volunteers (CHVs) and Community Health Assistants (CHAs) in 15 of the 47 counties, with the aim of linking this to the Master Community Unit List (MCUL). In Mali, apart from the CHW mapping database (developed and updated through the national master) being used for implementation of activities, there are lists pertaining to mapping of actors at community levels (developed by the Ministry of Health with support from UNICEF), and the ASAMALI database managed by MUSO. In response to COVID-19 and the need for virtual training, Ethiopia has started maintaining a list for their Health Extension Workers (HEWs). They also have a list for CHWs for the purpose of payroll, maintained at the district level. Sierra Leone is in the initial stages in developing and deploying their CHWML and updating it in a platform in select districts.

Current practices in management and updating of lists

There is a gap in regular updating of the lists. For example, in Uganda, only select districts are actively updating the VHT information to inform planning of community-based activities. In Zambia, management, organization and continuous update of the CBVs register are done by the Ministry of Health with partner support using an Excel-based tool that collected information on the CBVs, but the responsibility for managing the tool will be defined after the pilot phase of the new web-based tool. In Kenya, there is on-going effort to have a consolidated list, which will be regularly updated by focal persons at the sub-county level who are responsible for collecting community health data. In Mali, to address the issue of quality of data collection and lack of systematic updates, the ASMALI platform is to be adopted as a comprehensive database, with a HRH representative (CHW Supervisor) for each region assigned to update it. The primary health care directorate monitors and annually updates the HEW list in Ethiopia. Through the CHW Hub, managed by the Primary Health Care Unit in the Ministry of Health and Sanitation (MOHS) of Sierra Leone, the list has been updated, and there is plan to update annually with better coordination across three directorates within MOHS. In Rwanda, Rapid SMS systems that are deployed at scale are complimenting the CHW list in terms of verification, particularly for remuneration.

Key data elements in the master list

In the pilot and adaptation phase, the countries have included minimum data elements necessary for capturing the actual coverage of CHWs and to provide an overview of the profiles of the cadres. The main elements include those that capture basic socio-demographic information (name, gender, date of birth, education level, marital status) and CHW competencies (training received, accreditation status). Zambia, Kenya and Mali are also incorporating the geographic areas where CHWs are functioning by linking with the health facility, community/catchment areas. Payments/benefits and types of incentives offered are also captured in the master list in Kenya and Zambia. In Ethiopia, there is are plans to link the HEW list with the facility mapping database, digitize them and incorporate a few more data elements like sex, age, martial status, education level, language proficiency and competency level. Since payment of incentives is one of the key aims for Sierra Leone to have a comprehensive and updated list, there is a plan to link it to service delivery at the community level. Kenya proposes selective access to specific data elements based on end-user credentials and use cases, which vary according to the health system levels. For example, at the ministry level, information is needed for distribution of essential commodities, resource mobilization and policy/strategy development. At the sub-national level, where remuneration typically takes place, further personalized details will be needed (bank details and information on competency and performance), whereas at the community level, further information to support effective supervision is needed such as the name of CHWs, phone numbers, identification numbers and referral information.

Alignment of CHWMLs with national HRH lists

In order to integrate CHWs and institutionalize them in countries, there is need to link CHWMLs into national HRH databases that are regularly updated to inform health system planning. Linking electronic CHW databases with portals, such as DHIS 2 (in the case of Mali), or the HRH system (as in Uganda, Mali and Zambia), enables routine updating that will benefit countries in planning, resource allocation and alignment of activities with partners. Further, the CHWML can help impart online training and determine CHW competency levels for career progression and redistribution (Ethiopia). The performance-based financing system in Rwanda is dependent on the CHWML, which is complemented through mobile money (Rapid SMS). In addition, the list is used in planning for medicine and supplies, including the procurement of kits and tools such as flashlights.

The challenges articulated by the countries are lack of focal persons responsible for updating the list, manual data entry leading to duplication (Uganda, Zambia, Ethiopia, Sierra Leone), and lack of funding (Kenya). Moreover, lack of motivation and high attrition of CHWs often leads to fragmentation and inconsistency in the list (Rwanda). Coordination mechanisms across different directorates, mainly planning and policy, ICT and primary health care, need to be streamlined in Sierra Leone.

Country visions for adapting a comprehensive CHWML

All the countries have stated a strong need for a harmonized, comprehensive, digital list for CHWs. In Kenya, it is a priority for the MoH to complete the process by 2022. The countries are currently piloting their tools, which they want to scale-up and sustain. Countries are looking for support to standardize the process through SOPs for data entry and validation (such as in Kenya), and guidance on access points at different health system levels. In Ethiopia, as part of the plan to have GPS coordinates with health facilities in order to understand accessibility issues, there is a plan for interoperability with that of the HEW list. In Rwanda, there is a need to build capacity and empower the cell coordinators/ supervisors to regularly and accurately update the list, and there is a need to digitize the CHW dashboards at the central level to overcome the inaccuracy in reporting. As countries are developing frameworks and strategies to streamline incentives to CHWs and budgetary allocation, an updated, comprehensive and digitized CHW list can aid the process.

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CONCLUSION

Accurate, up-to-date, reliable data on CHWs of the type contained in a CHWML hosted, maintained, regularly updated, shared and used in a registry is critical for strategic decision-making. Only with insight into the number, spatial distribution, training and activities of CHWs and other HRH across different parts of countries can ministries of health maximize impact, efficiency and equity to meet UHC goals while ensuring emergency preparedness.

This guidance covered the process of establishing and maintaining a CHWML hosted and managed in a registry in seven practical steps. It is a living guidance that will evolve over time as needs and technology evolve. It builds on the good work of several ministries of health that have already begun this process towards having a CHWML that is hosted in a registry.

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Annexes

Annex I Example of budget from an ad hoc national georeferenced census of CHWs in West Africa

Example from a country in West Africa

Number of health facilities + CHWs (CHWs work from health post)	3000
Days of data collection	45
Number of structures/CHWs per day	67
Number of interviews per day	133
Number of teams	30
Number of data collectors	60

Estimated budget for an adhoc georeferenced census of health facilities and CHWs (CHWs working at health post)

	Number of days	Quantity	Persons/ days	Unit costs	Total FCFA	Total USD
1. Design of technical documents					**950,000**	**1,863**
Design of the methodology	4	2	8	25,000	200,000	392
Adaptation of the questionnaire (paper)	5	4	20	25,000	500,000	980
Configuration of data entry mask and GPS devices	5	1	5	50,000	250,000	490
2. Training					**2,605,000**	**5,108**
Data collectors	5	64	320	5,000	1,600,000	3,137
Trainers	5	6	30	10,000	300,000	588
Training fees	5	6	30	5,000	150,000	294
Transportation (trainers)	5	6	30	3,000	90,000	176
Driver	5	1	5	3,000	15,000	29
Conference hall rental	5	1	5	90,000	450,000	882

	Number of days	Quantity	Persons/ days	Unit costs	Total FCFA	Total USD
3. Printing of documents					**4,279,200**	**8,391**
Questionairs	1	7,062		600	4,237,200	8,308
Manuels	1	70		600	42,000	82
4. Data collection					**31,320,000**	**61,412**
Per diem data collectors	45	30	1,350	375,000	11,250,000	22,059
Per diem team leaders	45	30	1,350	375,000	11,250,000	22,059
Per diem drivers of data collectors	45	30	1,350	180,000	5,400,000	10,588
Perdiem supervisors (2 supervisions of average 10 days)	20	6	120	25,000	3,000,000	5,882
Per diem drivers of supervisors	20	3	60	7,000	420,000	824
5. Vehicle rental					**84,600,000**	**165,882**
Vehicle rental for data collectors	45	30	1350	60,000	81,000,000	158,824
Vehicle rental for supervisors	20	3	60	60,000	3,600,000	7,059
6. Fuel and oil					**25,662,312**	**50,318**
Fuel and oil for data collectors		43,757.2		540	23,628,888	46,331
Fuel and oil for supervisors (2 missions)		3765.6		540	2,033,424	3,987
7. Equipment and material					**9,785,000**	**19,186**
Laminated folders	1	100	100	600	60,000	118
Cartes de communication	forfait				400,000	784
Bags	1	64	64	3,000	192,000	376
Pharmaceutical products	1	30	30	20,000	600,000	1,176
Notebooks (100 pages)		100	100	500	50,000	98
Pens (training and data collection)		4	4	7,250	29,000	57
Badges	1	64	64	1,000	64,000	125
GPS devices		60		127,500	7,650,000	15,000
Batteries for GPS devices		200		2,500	500,000	980
Memory cards for GPS devices		80		3,000	240,000	471

	Number of days	Quantity	Persons/ days	Unit costs	Total FCFA	Total USD
8. Data entry					**3,560,000**	**6,980**
Training of data entry clerks	2	20	40	3,000	120,000	235
Trainers	2	2	4	10,000	40,000	78
Per diems data entry clerks	30	20	600	150,000	3,000,000	5,882
Per diem supervisor	30	2	60	200,000	400,000	784
9. Analysis					**2,650,000**	**5,196**
Cleaning	5	4	20	20,000	400,000	784
Tabulation and report writing	15	6	90	25,000	2,250,000	4,412
10. Presentation of results					**400,000**	**784**
Validation workshop	1	4	4	100,000	400,000	784
11. Printing report					**1,260,000**	**2,471**
Draft report	1	5	5	12,000	60,000	118
Final report	1	100	100	12,000	1,200,000	2,353
12. Sub-total	1				**167,071,512**	**327,591**
13. General fees (5 %)					**8,353,576**	**16,380**
Total					**175,425,088**	**343970.76**

*Note costs are circa 2012 and do not account for inflation or changes in exhange rates to present

Annex II Core Data Elements

Example of how the information for a set of data elements could be captured as part of the CHWML data dictionary.

Unique ID

Contextual definition: A unique code that identifies a CHW and distinguishes her/him from others

Applicability: All individuals included in the list

Suggested updating frequency: Not applicable (applied once)

Data type: String
Format: Alphanumeric
Maximum character length: Variable

Example values:	Value	Meaning
	CHW0098758	Unique ID

Notes: This may be a government issued unique ID, or an MOH ID (see the Define the CHWML content section under Step 3 for more recommendations regarding the definition of the unique ID coding scheme)

CHW Full Name (English and local language)

Contextual definition: The full name of the CHW in English and in the local language

Applicability: All individuals included in the list

Suggested updating frequency: As necessary (when a change in name occurs)

Data type: String
Format: Alphabetical
Maximum character length: Variable

Permissible values:	Value	Meaning	Range
	Last name	Family name	Variable characters
	Middle name	Middle name	Variable characters
	First name	First name	Variable characters
	Other name	Other name	Variable characters

Example values:		
	English	Henri Bernard Steelwood
	Local language:	

Notes: First, middle, family and other name should be captured in full and as much as possible in separated fields

CHW birth date

Contextual definition: Date when the CHW was born

Applicability: All individuals included in the list

Suggested updating frequency: Not applicable (collected once)

Data type: Integral
Format: Numeric
Maximum character length: 10

Suggested values:	Value	Meaning	Range
	YYYY	Year	1920-.....
	MM	Month	01-12
	DD	Day	01-31

Example of data representation: 1989-05-25

Notes: Dates should be formatted in an agreed upon form and consistent across the all CHWs in the list. It is recommended for dates to follow the ISO 8601 format.

CHW settlement of residence (Unique identifier and name)

Definition: Unique identifier and name of the settlement within which the CHW resides (community, village,...) together with the indication of the administrative division in which it is located

Applicability: All individuals in the list

Suggested updating frequency: Each time the CHW changes her/his place of residence

Data type: String
Format: Variable
Maximum character length: Variable

Suggested values:	Value	Meaning	Range
	Settlement ID	Settlement unique ID	Variable characters
	Settlement name (English)	Settlement name in English	Variable characters
	Settlement name (local language)	Settlement name in local language	Variable characters
	Upper admin div ID	Unique ID upper-level administrative division	Variable characters

Example values:		
	Settlement ID:	LAO0101001
	Settlement name (English):	Nongping
	Settlement name (local language):	ໜອງປິ່ງ
	Upper admin div ID:	LAO0101

Notes: Each country might define the concept of settlement differently. Ideally the official unique identifier and name of the settlement in English and local language would come from the settlement master list and would make the link with the upper administrative units unique identifier.

CHW settlement of residence (Administrative structure)

Definition: Unique identifier and name of the administrative units in which the CHW's place of residence is located

Applicability: All the individuals in the list

Suggested updating frequency: Each time the CHW changes her/his place of residence

Data type: String
Format: Variable
Maximum character length: Variable

Suggested values:

Value	Meaning	Range
Admin level 1 ID	1st level administrative unit unique ID	Variable characters
Admin level 1 name (English)	1st level administrative unit name in English	Variable characters
Admin level 1 name (local)	1st level administrative unit name in local language	Variable characters
Admin level 2 ID	2nd level administrative unit unique ID	Variable characters
Admin level 2 name (English)	2nd level administrative unit name in English	Variable characters
Admin level 2 name (local)	2nd level administrative unit name in local language	Variable characters

Example values:

Admin level 1 ID:	LAO01
Admin level 1 name (English):	Vientiane Capital
Admin level 1 name (local language):	ນະຄອນຫຼວງ ວຽງຈັນ
Admin level 2 ID:	LAO0101
Admin level 2 name (English):	Chanthabuly
Admin level 2 name (local language): Grand Gedeh	ຈັນທະບູລີ

Notes: Each country has a different administrative structure. Ideally the official unique identifier and name of the administrative units in English and local language would come from the settlement master list. The information should be collected down to the lowest level in the administrative structure possible.

CHW settlement of residence (Geographic coordinates)

Definition: Latitude and longitude as well as associated information of the settlement within which the CHW resides

Applicability: Only individuals in the list who are employed

Suggested updating frequency: Each time the CHW changes her/his place of residence

Data type: String
Format: Latitude/longitude: Numeric; Source (method)/Accuracy: Alphanumeric
Maximum character length: Latitude: 9; Longitude: 10; Source (method)/Accuracy: variable

Suggested values:	Value	Meaning	Range
	Latitude	Latitude	-90 to 90
	Longitude	Longitude	-180 to 180
	Source (method)	Source and method	Variable
	Accuracy	Qualitative accuracy	Variable

Example values:
Latitude: 14.19474
Longitude: 121.01441
Source (Method): MOH (GPS)
Accuracy: High

Notes: Ideally the geographic coordinates of the settlement would come from the settlement master list (see the Define the CHWML content section under Step 3 for more recommendations regarding the standardization of geographic coordinates).

CHW mobile number

Contextual definition: Main phone number at which the CHW can be reached

Applicability: All individuals in the list

Suggested updating frequency: Quarterly

Data type: String
Format: Numeric only
Maximum character length: 18

Example: +231 88 683 0888

Notes: Phone number should be formatted in an agreed upon form, verified and consistent across CHWs in the list. Proposed standard to be followed: ITU-E.164 (Country code (3 Digits) + national telephone number (15 digits maximum))

CHW employment status

Contextual definition: Employment status of the CHW

Applicability: All individuals in the list

Suggested updating frequency: Quarterly

Data type: String
Format: Numeric only
Maximum character length: 2

Suggested values:[62]	Value	Meaning
	1	Not commenced
	2	Active – In-service
	3	Active – Intern
	4	Inactive – Discharged-voluntary
	5	Inactive – Discharged-involuntary
	6	Inactive – Deceased
	7	Inactive – Internship completed
	8	Inactive – Resigned
	9	Inactive – Retired
	10	Inactive – Suspended
	11	Other – Unclassified

Note: The other information linked to that contract are themselves part of the additional data elements included in Table 3.

CHW functional status

Contextual definition: Whether or not the CHW has submitted a report within a given temporal interval (e.g., in the last month or quarter)

Applicability: Only individuals in the list who are employed

Suggested updating frequency: Quarterly

Data type: String
Format: Numeric only
Maximum character length: 1

Suggested values:	Value	Meaning
	1	Yes
	2	No

Notes: Ideally, the submission of a periodic report is an excellent way to assess the CHW's functional status. Where supervision is carried out, the supervisor can inform about the functional status based on recent interactions with the CHW.

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Endnotes

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