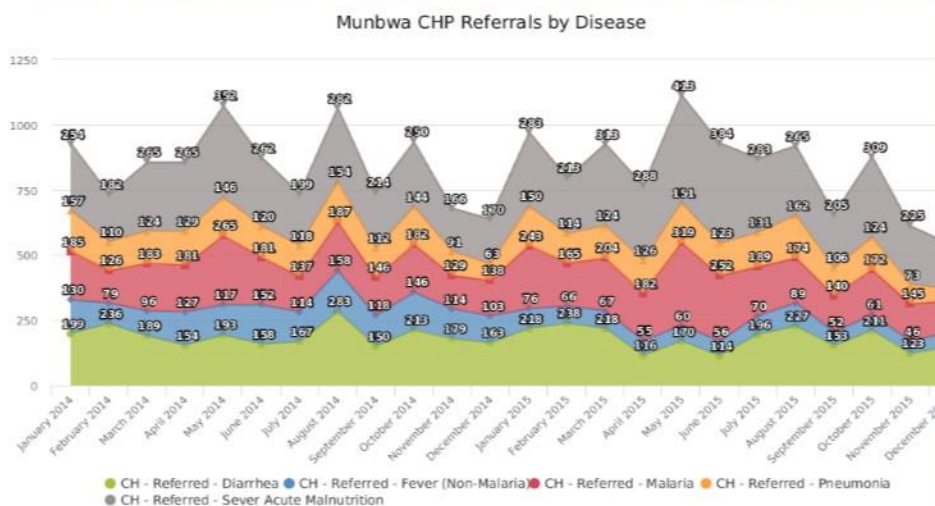
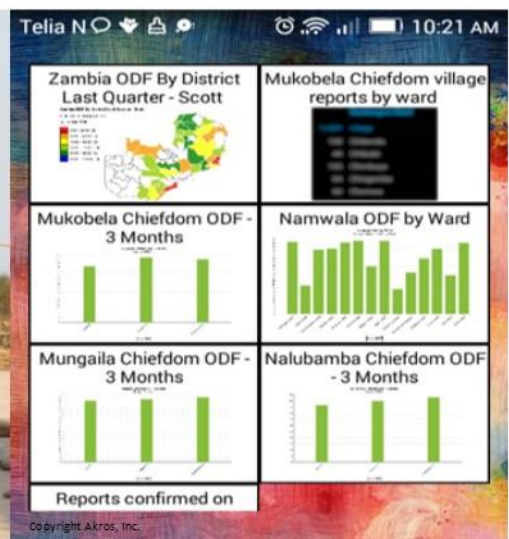


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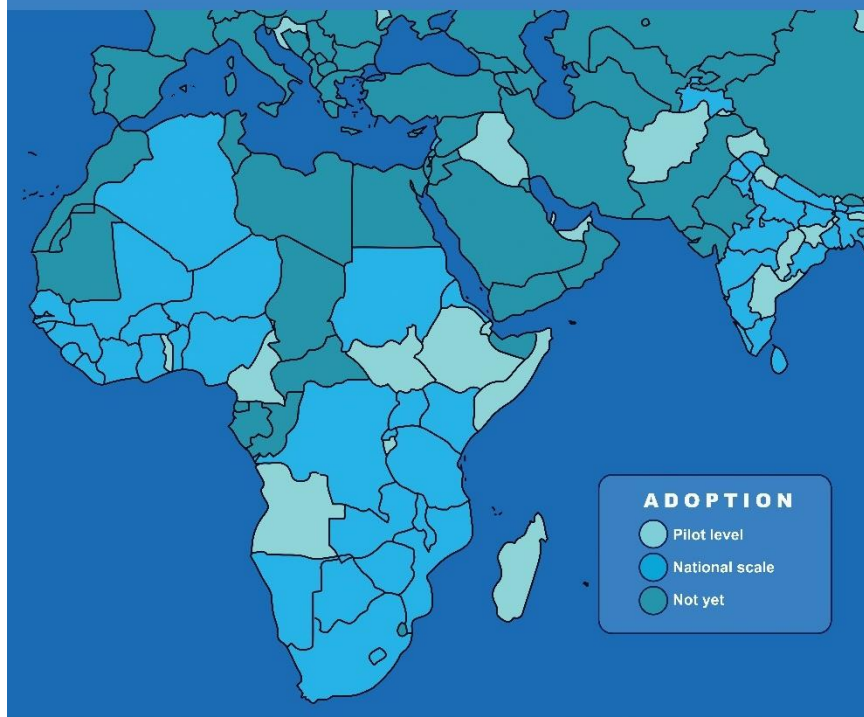
DHIS2 Community Health Information System Guidelines



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Acknowledgments

These guidelines were made possible the Health Data Collaborative (HDC). The HDC is a global network working to strengthen country-led health information systems. The HDC is composed of several working groups and subgroups, including the Community Data Working group; whose objectives, broadly speaking are 1) to develop global goods, including standards, generic guidance and operational tools for community health information systems (CHIS) as an integrated component of broader RHIS; 2) identify ways in which investments in improving CHIS as integrated component of RHIS can be better harmonized at country level; and 3) promote and provide coordinated financial and technical support to governments for strengthening CHIS based on joint investment plans at country level.

These guidelines have been developed by the DHIS2 Health Information Systems Program (HISP) at the University of Oslo (UiO) in collaboration with Akros Zambia. This work is based on 20 years of action research at UiO, and active engagement from the global DHIS2 network. Valuable inputs, use-cases, and best practices have been included from the Ministries of Health of Liberia, India, Ethiopia, Malawi, Zambia, Uganda, Afghanistan, Nepal, Zimbabwe, Tanzania, South Africa, Ghana, Bangladesh, and Nigeria. Additional inputs, use-cases, and edits have been provided by Last Mile Health, UNICEF HQ, HISP India, HISP Tanzania, HISP South Africa, HISP Namibia, HISP East Africa, HISP Bangladesh, HISP Zimbabwe, Measure Evaluation, CDC, JSI, and UNICEF West Africa.



Executive Summary

Background

The University of Oslo (UiO) was commissioned by the Global Fund, as part of the action plan of the Community Data Working Group of the Health Data Collaborative¹ to develop a “guidance document” on community health information systems (CHIS), training curriculum, and modular toolkit for routine CHIS as an integrated component of routine health information systems (RHIS).

The key outputs envisaged through this process included the following:

- i) A practical guidance document to strengthen the design, development and use of CHIS (paper and digital). This guide should cover data collection, data management – including integration of parallel CHIS reporting into Routine Health Information Systems (RHIS) such as DHIS2 and interoperability between CHIS and other information systems (e.g. LMIS, HRIS, disease surveillance) serving community-based health service providers – data analysis, use and dissemination for community-based health services.
- ii) Development of a generic curriculum on CHIS for DHIS2 Academies and other pre-service and in-service training opportunities (e.g. in-country training institutions, training of trainers).
- iii) Development of a Toolkit, Standard Operating Procedures (SOPs), sustainability and governance guidelines to aid the practical development and use of a CHIS in a field setting.

Aims

This guidance document aims to serve as a practical guide for national and local-decision makers involved in the design, planning, deployment, governance and scale up of successful DHIS2 based CHIS that support community-based health service providers and the communities they work in. This guidance covers the full information cycle, including: data collection, analysis, dissemination (feedback loops) and use/action taking for improved and equitable community-based health services.

It provides an in-depth review of key questions that should be considered when addressing issues relevant for governance, design, development and use of large-scale CHIS. It is applicable to countries that are beginning the design process as well as for existing systems that are being strengthened, scaled up or integrated with other information systems such as the facility based or RHIS. It is meant to provide general guidelines whose applicability must be considered and adapted to different country and within country contexts.

¹

Community health data is broad and complex in terms of how it is produced, who produces it, how it is used (or not) and who uses it (or not)². This guide focuses primarily on community health workers (CHW) programs and their routine information needs with direct links to the formal health system; starting with information needs of CHWs and other community-based providers and support at facility, district, and higher levels. While the CHW is the primary focus of our analysis, the guidelines actively consider the linkages of the system of the CHW with other stakeholders at the community and health system levels. In considering these multi-level linkages, this guide also looks at sustainable governance and advocates an architecture based approach to avoid the problem of the CHIS being considered as a standalone system, rather than as an entity within a broader ecosystem of HISs which need to speak to each other for an effective CHIS.

The evidence base for this guidance document is derived from the broad experience of the more than two decades of Health Information Systems Program (HISP) research and development initiative of the UiO³. This led to the commissioning of this document, where specific experiences of CHIS in different country contexts such as Zambia, India, Ethiopia, Liberia, Uganda, Indonesia and others were examined to build case studies, insights, lessons and practical exercises on different facets of building a CHIS, including monitoring of integrated community case management (iCCM)⁴.

The specific value add that this guidance document seeks to provide includes:

- i) Provides insights into the building of a CHIS while considering, in a holistic manner, the work context of a CHW, and the particular complexities of their information needs.
- ii) Adopts an architecture approach to enable viewing the challenge of building a sustainable and well-governed CHIS which is interconnected with other systems such as RHIS, logistics, human resources and others.
- iii) Builds upon a wealth of practical and research experience, and adapts this to the complex particularities of a CHIS.
- iv) Highlights that building a CHIS is a socio-technical and not just a technical challenge, and the people and institutional considerations must be treated with equal importance as the technical.

² We define community health data as data on health, health services, and determinants of health derived from and relevant to community administrative/geographic units, community members, and/or the community level of health systems.

³ This initiative, which has action research at its core, has effectively combined research, education, and practical systems development including of the DHIS2 platform and its application to over 60 country contexts. While the primary focus of the HISP efforts to date has focused on facility based information systems, the value of the practical and educational experience is acknowledged by the global community for the building of CHIS.

⁴ Guenther, T., et al. (2014). Routing monitoring systems for integrated community case management programs: Lessons from 18 countries in sub-Saharan Africa, *Journal of Global Health*, 4 (2):1–8. Available at (accessed May 2017): http://www.jogh.org/documents/issue201402/Guenther_Final.pdf

Target Audience

While acknowledging there is a multiplicity of stakeholders engaged in the development of CHIS like ministries, donors, software vendors, private sector, and NGOs, we believe one document cannot detail relevant recommendations for all these audiences. We have, therefore, focused on the primary audience to be the national Ministry of Health (MoH) of countries. Ministries of health are ultimately the stewards and owners of the CHIS and key beneficiary in using the information generated from the CHIS for strengthening their CHW programs and achieving global and national health reform goals of Universal Health Coverage (UHC), Sustainable Development Goals (SDGs) and others. The primary audience for these guidelines are the policy makers in MoH designing sustainable and well governed CHIS that support community health systems and their implementing team, including district, community health managers, and CHWs.

The secondary audience for this guidance includes other relevant stakeholders supporting community health systems and CHIS such as:

- Development agencies and donors who provide technical assistance, governance oversight or financing to community health programs and CHIS.
- Universities and “capacity builders” since many CHIS have their capacity building efforts institutionalized at universities.
- Private sector practitioners, NGOs and other providers of community services who are engaged in bridging the gap between private and public service providers (e.g. BRAC in Bangladesh, or PSI for malaria in Cambodia)

We hope this guidance can provide insights to these groups on the complexities of CHIS and approaches to their governance and sustainable development, which they can then adapt to their particular use cases.

Guidance Structure

These generic guidelines are organized around the key components which describe the evolution of CHIS built in DHIS2 from its initial planning and assessment phase through to achievement of sustainability through government maintenance and cultivation of community ownership.

As such, it is structured as follows:

- *Chapter 1* covers an Introduction to CHIS, including foundational concepts relevant to a CHIS.
- *Chapter 2* covers an Assessment tool to help assess the state of an existing CHIS, and provides for a diagnosis on how to plan for a CHIS.

- *Chapter 3* covers Data Use and Action taking based on a CHIS primarily from the perspective of the community.
- *Chapter 4* covers guidelines on how to configure DHIS2 to meet the needs of a CHIS.
- *Chapter 5* covers Training and Support to discuss how plan systems that meet the crucial challenge of capacity strengthening for effective use of CHIS.
- *Chapter 6* concludes with guidance on governance and sustainability of CHIS, addressing the issues of participation, accountability and transparency within a MoH and including policies and Standard Operating Protocols (SOPs) to guide the design, development and use of CHIS.

The Guiding Principles used in Building this Document

The following key principles have been taken into consideration when developing the guide:

- Treat CHIS as part of broader strategy and architecture and develop sustainable governance systems to ensure interoperability.
- Seek to harmonize donor, country, and partner efforts while keeping the national MoH at the center, always.
- Consider the CHIS in its broader supporting roles of advocacy, policy, communication and not just reporting.
- Build on what exists and have integration as a guiding principle to help move beyond siloed disease programs and other data sources into the national HMIS (e.g. DHIS2 as is the case in many countries).
- Seek to actively work towards reducing the data management burden of CHWs and enable those individuals to adopt processes of data use for local action taking.
- Adopt a multi-sectoral approach and move beyond the “health sector”, as in the case of planning SDGs.

In each chapter, we formulate a set of design and implementation principles which provide takeaways to guide the design, management, implementation and use of CHIS. These principles are not meant to be prescriptive “how to do it” guides, but rather to highlight a set of issues that a reader must be sensitive to in order to build a CHIS. Through case studies, examples, exercises, and discussions we seek to provide alternatives on how to approach these different issues and the contextual considerations that need to be incorporated.

Chapter 1: Foundational Concepts for CHIS

Introduction

This chapter outlines some foundational concepts relevant to the understanding of CHIS, their nature, scope and purpose. Further, we discuss some key “design principles” that underlie this entire approach to community health information systems.

Learning Objectives:

By the end of this chapter, readers should be able to:

- Build an understanding of foundational concepts of community, community health worker (CHW) and community health information system (CHIS).
- Understand the important role of information in the work of a CHW, and how the landscape of demands for information are radically and fast changing.
- Describe the diversity that is inherent in CHIS across and within countries, and the relevant contextual parameters to consider in building a CHIS.
- Outline the design and implementation characteristics of a successful CHIS.
- Explain the guiding design principles for building an effective CHIS using DHIS2, and how these should be used.

Foundational Terms for CHIS

To understand where CHIS is used, by whom, and what it is, we briefly outline some fundamental concepts of a community, CHW and CHIS.

Community

A community can be considered a social unit, such as a group of people, who have something in common, such as norms, values, or identity. Communities usually share a sense of place that is situated in a given geographical area, such as village or neighborhood. For purposes of provision of community health services, a community includes a set of stakeholders who meet one or more of the following conditions:

- Reside in a defined geographic area.
- Share demographic traits (e.g. children under five, pregnant women).
- Behavioral or occupational characteristics (e.g. sex workers, truck drivers).
- Situational factors (e.g. orphans, prisoners).

In addition to the residents of the community, who are beneficiaries of health services being provided by the CHW, the community also includes others such as local political or religious leaders, village or tribal chiefs and other local decision-makers serving in policy or legislative roles, overseeing local resource allocation, identification of individuals or families in need of services, or similar capacities. The proposed CHIS which we build needs to also incorporate the information needs of these stakeholders in addition to that of the health department.

Community Health Worker (CHW):

A widely accepted definition of a CHW was proposed by a WHO Study Group (WHO 1989):

Community health workers should be members of the communities where they work, should be selected by the communities, should be answerable to the communities for their activities, should be supported by the health system but not necessarily a part of its organization, and have shorter training than professional workers.

This 20th century definition is based on global principles and does not directly address the numerous variations that exist around CHWs across countries. We discuss some conditions of variations which arguably have implications on the design and use of CHIS. These include:

- i) Do they have to be *community members* or can they be "known and respected by the community."
- ii) Do they have to be *literate*? Many CHW programs insist on literacy and with increasing technology, the ability to use a mobile phone is increasingly in demand.
- iii) *Who hires them?* While in many countries the CHWs are recruited by the Ministry of Health and are members of the health system, in many countries, CHWs are hired and managed by development partners or local NGOs.
- iv) *Are they salaried or voluntary or incentivized?* CHWs can either be salaried (paid by the Ministry or the Development Partner), be voluntary in nature, or paid through some form of incentive systems.
- v) *What tasks are they responsible for?* In some scenarios, the CHWs perform a wide range of primary health care related tasks that can be preventive, curative, and developmental, while, in other cases, CHWs may be hired for very specific interventions or to support certain health campaigns.

These variations in recruitment, modes of payments and activities performed by the CHW all have a bearing on the CHIS. For example, a voluntary worker or one hired by a development partner will not have the same degree of accountability to the national CHIS as those hired by the MoH. CHWs working on specific campaigns may not have the responsibility to report into a routine and ongoing CHIS.

Regardless of the scope of services, community activities that are measured by the CHIS need to be carefully planned from the outset and well-supported financially and technically, with strong managerial and political leadership from all levels. The scope of measurement needs to, at a minimum, encompass and support the activities that the CHW performs including:

- Providing care and appropriate referrals for patients/ beneficiaries.
- Engaging with communities and their leaders.
- Providing information, education, and communication ([IEC](#)) activities.
- Promoting public health in other locally specific actions.
- Recording and reporting data to higher levels on activities performed and diseases identified for surveillance.
- Managing stocks and inventory.
- Providing training and supervising community-based activities.
- Managing incentives to strengthen enrollment of beneficiaries in health programs.

Some of these activities such as patient care, community engagement, and IEC are mainly done by CHWs, while others (stock management, training, incentives) require ongoing support and supervision from the facility level. All of these activities need to be measured and supported by the CHIS that is simple, appropriate and locally useful to CHWs and their supervisors. Furthermore, there is a continually changing context of CHW work which has significant implications on the information needs of the CHW and the CHIS. For example, while effective and low-cost interventions to improve maternal and child health and survival are well known and practiced, achieving universal health coverage of such services remains a challenge. Now, dealing with non-communicable diseases (NCDs) under universal health coverage is emerging as a new challenge. This requires different kinds of data to be collected that are case and transaction based rather than aggregate, collected over time rather than one time, and have a key focus on provision of continuity of care within an equity based framework.

The unsolved, existing challenges, the new frontiers of information, coupled with the continued and acute shortage of CHWs⁵ makes the challenge of designing effective CHIS an urgent priority which this guidance document seeks to address. Supported by a well-functioning CHIS that brings all community-related data into one, easily accessible place, CHWs can make a valuable contribution to overall community development and can improve access to and coverage of communities with basic health services and undertake actions that lead to improved health outcomes, especially in the field of primary care. CHWs represent an important health resource whose potential in providing and extending a reasonable level of health care to underserved populations must be fully tapped. Further, in order to implement, support, learn from and measure aspects related to community health listed above, a well-functioning CHIS is necessary.

⁵ World Health Report, 2006

Community Health Information System (CHIS)

A working definition of CHIS adopted for this document is

“A CHIS is a combination of paper, software, hardware, people and process which seeks to support informed decision making and action taking of CHWs. This includes:

- **Recording** of basic data such as population, health program transactions, case based data, stock and resource availability
- **Tracking and taking action** on individual program based needs such as disease surveillance, mortality and morbidity
- **Reporting and feedback** including routine upward reports, feedback reports, ad hoc reports and specific reports for different stakeholders”

A CHIS is visualized by the information cycle (see Figure 1.1) for community health information. The information cycle starts with decisions made or actions taken by the CHW at the community level, clarifies data sources and collection methods, describes data aggregation and processing as well as mechanisms for communication with higher levels, including data into the overall HIS and getting expert analysis and interpretation.

While the details of this cycle will vary from program to program, and at different levels, the principle applies to all information systems.



Figure 1 The health Information cycle

CHIS service data are captured primarily by CHWs and relate to the functions of recording, tracking, and reporting in relation to the activities that CHWs perform. The nature of CHIS varies with contexts.

- In some cases, they are manual and paper-based registers, diaries, tally sheets, and reporting forms.
- In other contexts, they are ICT- based using devices such as mobile phones, tablets, and computers.
- In most cases, they represent some kind of hybrid combining elements of paper and ICT-supported solutions.

Many countries are in the process of moving towards more automated DHIS2 based CHIS, a process which this guidance document is aimed support.

How is a CHIS Different from a HMIS?

For the purposes of this document, we distinguish between a Community HIS and a facility based HIS or Health Management Information System (HMIS). While the HMIS concerns information for services provided at a facility, a CHIS concerns activities provided to members of a community, typically by CHWs living in the community or through outreach services conducted by CHWs from a facility. However, it is important to emphasize that within the architectural approach that this guide is advocating, we see the CHIS and HMIS to be intricately inter-connected. This implies that CHIS data must feed seamlessly into the HMIS to avoid duplications and redundancies, and the HMIS must be capable of providing feedback and support to strengthen the CHIS.

The CHIS is much more granular (i.e. more detailed) and wider in scope and scale than a facility HIS and this brings with it unique challenges that need to be specifically addressed. For example in a country of ten million people there may be 350 health facilities. Each health facility may be a reporting unit in the HMIS and service an average population of 30,000 people. However, in that same country there may be one CHW per 1,000 people meaning that there will be 10,000 CHWs each represented as a reporting unit in the CHIS. A CHIS is, thus, distinct from a facility-based HIS, though the CHIS should feed into the higher level HIS. This linkage strengthens the important developmental and promotional roles of the CHW to act as a bridge between the community and the formal health services. A well-functioning CHIS thus provides opportunities to increase both the effectiveness of curative and preventive services as well as the community management and ownership of health-related programs. Nevertheless, in reality, a considerable gap exists between the programs driven and owned by communities and program realities at health facilities. This is reflected in the typically fragmented and stand-alone nature of most existing CHIS.

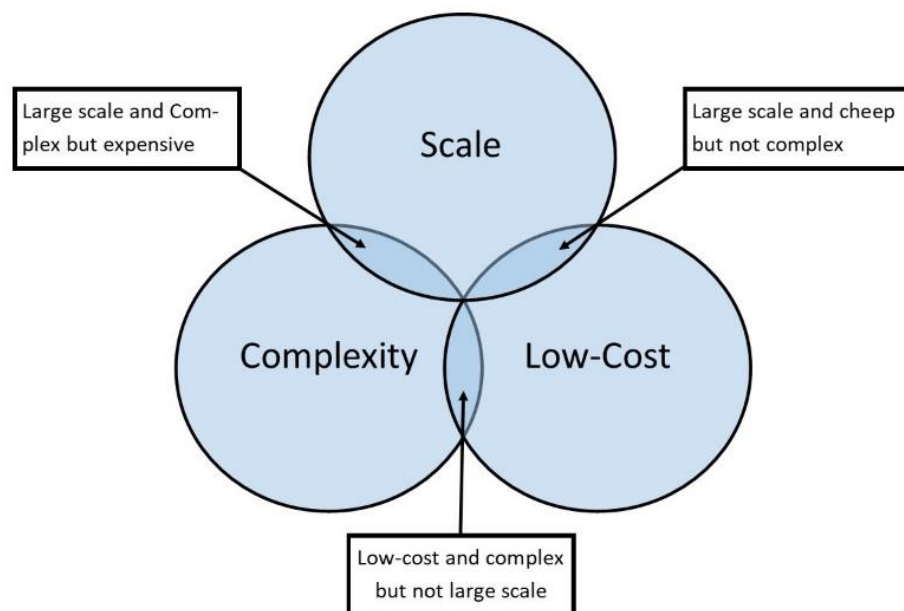
A typical CHIS needs to focus on the following areas:

1. **Patients treated, referrals, and drug availability:** CHIS should measure CHW program performance in terms of patients treated, referrals and drug availability. Note that health worker performance also depends on many other aspects of management such as selection, training, supervision and support, which are measured elsewhere.
2. **Clients attending primary health care (PHC) activities:** Use of CHW programs can be measured by the number of clients seen for different PHC activities - preventive, promotive, rehabilitative, and curative. Results are linked to community involvement in the program and community preference for formal, established health services if they are available.
3. **Reporting rates:** Retention/ attrition is measured by numbers of CHWs reporting each month. High attrition rates (3 to 77 percent a year) have been reported in many CHW programs and causes major problems that need to be dealt with through refresher training and the broader package of management interventions.

A well-functioning CHIS, just as HMIS, is a balancing act between getting the data you need (complexity), expanding the system to cover all services across the whole country (scale), and minimizing costs. Typically, the goal of a HMIS would be to find a balance between these three factors: scale, complexity, and cost. However, from experience, it is exceptionally difficult or nearly impossible to find this

balance between all three factors for a CHIS primarily due to the massive scale and scope of a CHIS. Therefore, for the purposes of these guidelines, a CHIS implementer should initially focus on picking two of the three factors. Most countries will be likely to prioritize a CHIS that is large in scale and low-cost, but this requires that the complexity must be minimized and tightly controlled. Practically, minimizing complexity results in a very simple

CHIS: You can only pick two



reporting platform capturing a small number of key indicators, extensive use of job aids and automated feedback mechanisms to help CHWs and CHW supervisors understand their data and perform tasks. From a governance perspective, adding additional reporting burden to CHWs must be minimized and tightly controlled centrally.

Strengthening CHW work through improved CHIS runs contrary to the typical perception that health professionals have of CHWs as mere aides who should be assistants within health facilities and serve as passive data providers. Such a perception completely misunderstands the CHWs health promoting and enabling roles within communities, and the need for the CHWs to be empowered with relevant information. In many programs, even those personnel who are supposed to supervise CHWs (usually nurses) are not taught about CHW work in their basic training and are not involved in the planning, implementation, monitoring and evaluation of such programs. This attitude is carried over to the CHIS which typically is the subject of abject neglect. Good quality community data provides an entry point to promote change of entrenched attitudes as well as promote the PHC Care principles of integrated service delivery - preventive, promotive, curative, and rehabilitative, and provision of care to the population in an equitable manner. Extending data collection to the community to “find the missing data” is a logical and necessary extension of facility HIS to enable a full view of the health of the catchment population, including morbidity and mortality profiles and unmet needs of health services.

While information flows around the CHIS varies significantly across contexts, a generic data flow for a “hybrid” CHIS may be close to the following:

1. The CHW provides services to individuals or groups in the household and notes details relating to that in her field diaries.
2. At the end of the day, the CHW transfers data from her diaries to her primary registers.
3. At the end of the reporting month, the CHW tabulates totals. The CHW extracts data from her registers to put into reporting formats to send to the level above.
4. Reports are checked for quality and used to take local action. Selected data is sent to the next level either manually, or using a computer/mobile application.
5. Denominator data is used to convert raw data into key performance indicators.

Five Design Principles for Implementing CHIS

When creating new CHIS in DHIS2, the system builders face many fundamental system design considerations, and the choices they make profoundly influence the trajectory of the CHIS. We describe these principles below and list a set of action points under each to enable operationalization of the design principles in practice.

1. Design the CHIS to strengthen government ownership and sustainability.
2. Enable and strengthen community engagement.
3. Build a balance between reporting burden and provision of care.
4. Strengthening capacity of CHWs and other stakeholders as a team.
5. Follow incremental and evolutionary principles of system design and development.

Design Principle 1: Strengthen Government Ownership and Sustainability of the CHIS

In the same way as community health fits within the larger arena of public health, the CHIS must fit within the larger ecosystem of public health information systems. A government-led CHIS strategy and implementation process ensures that essential community-level data are collected sustainably and promptly delivered to the right people in the health system, to enable effective decisions to strengthen health services delivery can be taken. Integrated design approaches which inherently strengthen government ownership will help reduce the unsustainable fragmentation of information systems, arising when non-standard systems are introduced by third-party agencies such as donors, NGOs, and faith-based organizations.

Action points to operationalize the design principle

1. Meet and engage government stakeholders at all levels - particularly district and local government - to discuss stimulating local demand for and availability of community-level health data.
2. Commit public, donor and NGO resources and infrastructure such as money, materials, and manpower to sustain locally developed plans to sustain the community system, right from the start.
3. Design CHIS to integrate with the existing government health management information system from the start.
4. Focus data collection on locally useful data on PHC, (preventive, promotive, curative, rehabilitative) and continuity of patient care. Also include data on SDGs/ MDGs, equity in care provision and universal health coverage.
5. Review CHIS-related health policies, M&E plans, and legislation regarding issues such as confidentiality, privacy, and data disaggregation.

Design Principle 2: Enable and Strengthen Community Engagement

Data collected through CHIS will only be accurate and consistent when the community and its leaders find value in the data generated and use it for local action. The CHIS, thus, must be designed to support community-based action, meaning that relevant local stakeholders should participate early in system design and implementation, and be able to see added value to their everyday work from the CHIS.

Action points to operationalize the design principle

1. Identify legitimate community stakeholders (e.g. traditional healers, chiefs, religious leaders, health committees, teachers, etc.), who can hold local actors accountable through participatory processes. They may have multiple roles such as data auditing, triage of data, and identifying gaps in service coverage.
2. Draw on existing institutional structures rather than creating new ones for CHIS. Strike a balance between ensuring continuity and promoting innovative change.
3. Strengthen use of CHIS data in local supervision, mentorship, and support to stakeholders, depending on how they will use or interact with the CHIS.
4. Ensure timely and appropriate feedback that makes the analyzed CHIS data interesting and immediately useful for targeted local stakeholders.
5. Promote community-led CHIS innovations that improve data use, using an approach that encourages critical thinking and problem solving. Identify good ideas generated in the community and nurture them to scale.

Design Principle 3: Build a Balance between Reporting Burden and Provision of Care

CHWs bear the brunt of data collection processes introduced by health programs and donors. Data collection often cuts into the time and energy that CHWs could be using to provide health care services. CHWs should prioritize care-giving tasks over data-reporting ones, which require CHIS designers to promote local action over upward reporting to national systems. While detailed household and individual data is essential for local use, it is not needed for action at higher levels which requires more aggregated data. As a general principle, data should not be transmitted upwards unless it can be used at higher levels.

Action points to operationalize the design principle

1. Keep information systems simple, sustainable, minimal, and frugal.
2. Standardize all CHW reporting forms across the country.
3. Simplify forms to make CHW data entry more efficient, user-friendly, and accurate.
4. Report only critical, “must know” information to next level. CHIS Data is for strengthening local monitoring and evaluation of programs, not for ‘research purposes’
5. Follow the hierarchy of reporting standards. Retain detailed data locally, and only report data necessary to inform policy and generate indicators to higher levels.
6. Integrate job aids such as data quality assessments or CHW diagnosis guides into the CHIS.

Design Principle 4: Strengthening Capacity Development Processes of All CHIS Stakeholders

CHIS should be both an object of capacity strengthening and a means to support teams of CHWs and stakeholders to conduct community-based health provision tasks. For example, CHWs need to build skills and capacity to use a mobile device based CHIS, but using this application they are able to strengthen their interactions with other CHWs and clinicians which can contribute to building their capacity to provide better health care services. Because of this potential, capacity strengthening around CHIS needs to span the entire information cycle. Some areas of capacity building that require attention in this context include:

- Target teams of CHWs, stakeholders and supervisors rather than individuals
- Understanding of basic concepts related to data elements and indicators, coverage, and general population data.
- Understanding why certain data elements and indicators are reported and why they are important in the larger health program picture.
- Knowing how to keep records and using appropriate technologies.
- Awareness and understanding of issues of data quality and health status assessment.
- Providing remote and supportive supervision

Action points to operationalize the design principle

1. Capacity strengthening must target teams of CHWs, supervisors and other relevant stakeholders.
2. Use locally appropriate user-focused training methods in the local language.
 - Use stories and images and perform training.
 - Combine on-the-job technical support with classroom training.
3. Develop a system of continuous coaching, supervisor mentorship and peer-to-peer support, which empowers trainees through the CHIS.
4. Focus on data use and understanding, rather than only on data collection.
5. Develop locally appropriate standard operating procedures (SOPs), which will provide the basis of capacity strengthening exercises, mentorship, and job aids.
6. Identify and train IT counterparts in local government who will be responsible for maintaining the CHIS in the long-term, as part of the overall HIS strengthening.

Design Principle 5: Follow Incremental and Evolutionary Principles of System Design and Development

This design principle focuses on adopting participatory and prototype processes that are incremental and evolutionary in nature, rather than attempting perfection at the first attempt. This requires building a prototype, exposing it to users and adapting and improving the prototype based on the feedback received. This process reflects an iterative process of evolving system improvements, and strengthening user ownership.

Action points to operationalize the design principle

1. Build upon systems that exist, ensuring that CHIS design is sensitive to history and existing work practices. Remember that no system can be designed from scratch, from a “clean slate”.
2. Balance the system’s user requirements between continuity and change. Focusing only on continuity may lead to automating existing processes without considering process improvements, and seeking radical change may create resistance.
3. Use [participatory design principles](#) to promote local ownership and buy-in for the system.
4. When mapping the flow of data in a CHIS, implementers must balance the required complexity of data needs with the simplicity necessary for system reliability in resource-constrained communities.
5. Build simple, frugal, and user-friendly systems based on appropriate technology such as simple functional phones and dynamic dashboards.
6. Design iteratively; customize the CHIS through a prototyping framework that builds on principles of agile and incremental design.

Chapter 2: Conducting a CHIS Assessment

Introduction

This chapter covers important aspects of assessing CHIS. Acknowledging the diversity of CHIS, their multiple technical, social, organizational, and cultural determinants, no assessment method or tool will fit all situations perfectly. Therefore, this chapter focuses on the rationale for doing an assessment, various potential methods which can improve understanding of the CHIS, and an in-depth list of key questions, informed by the five design principles of this document, which should be considered in the further design, development, and use of CHIS. Assessment is discussed at two levels: one, the macro policy level, and, two, the operational system development level.

Learning Objectives:

- Build an understanding of the various benefits of conducting an assessment and its inherent limitations.
- What are the two levels at which assessment is done, and what complementary insights that can be gained from each.
- Understand the methodological approaches to these two levels of assessment and their respective strengths and weaknesses.
- Build an understanding of various methods for assessing CHIS as well as their strengths and weaknesses.

Why Do an Assessment?

The process of assessing CHIS has many aims. First and foremost, an assessment should reveal the weaknesses and strengths of the CHIS with the aim of better planning for its improvement, prioritizing resources, and garnering support and agreement among stakeholders for a way forward. Given the complexity of CHIS, a thorough mapping of all aspects of the system will be elusive, and indeed the result of any assessment must be seen as a product of subjective and incomplete information.

Assessment can be done at multiple levels, and over time. In this chapter, we discuss two levels on which assessment of CHIS is recommended. The first is a macro or policy level, which broadly provides insights into the system level of infrastructure, resources, policy environment and capacity. The second is at the information system level, which provides micro level insights into issues of data flows, redundancies, integration needs, technologies in play, and similar issues. Taken together, these two levels of assessment provide complementary insights, which help to develop a holistic perspective of the state of the CHIS, the contextual conditions shaping this state, which helps develop guidelines on what to do to strengthen the CHIS.

A key aim of the assessment described is not only on the end result of the assessment, but more so in the process itself, which should be collaborative, participative and informative. This helps to:

- **Inform stakeholders** of potentially unfamiliar aspects of the CHIS. Conducting a broad assessment with participation from multiple stakeholders contributes to a better understanding of the CHIS at large, its challenges and strengths, its routines and processes, tools, data flows and information needs.
- **Build consensus** around the priorities for strengthening CHIS and the actions that need to be taken to achieve that goal. A key outcome of the assessment process is consensus building among stakeholders concerning the challenges that need to be prioritized and how to approach them.
- **Mobilize joint technical and financial support** for a CHIS strengthening plan. This should include details on prioritization of investments in the short term (1–2 years), intermediate term (3–9 years), and long term (10 years and beyond).

We now discuss the assessment methodologies at the micro and macro levels.

Assessment at the Macro Level: Policy and Health System Issues

There are several assessment tools that support a more quantitative analysis of health information systems, such as the Health Metrics Network Assessment Tool and tools related to the PRISM framework. Inspired by these, an assessment tool is included in the annex of these guidelines. It has been developed to focus on aspects of CHIS specifically, but is in method and outline similar to the HMN Assessment tool.

Pre-Assessment: Stakeholder Identification

To get the most of any assessment, both in terms of covering all aspects of the CHIS as well as building consensus on the way forward, all major stakeholders should be involved. The first step of any assessment should, thus, be to identify the various stakeholders.

Stakeholders for this assessment will include, *any person that has influence over CHIS outcomes, both positive and negative* on a community health worker or program and the CHIS.

These could be change agents in the community such as traditional chiefs, teachers, storekeepers or religious leaders but could also be facility staff, district health officers, supply officers, etc.

The table below shows potential stakeholders from the various levels of the health system, and can function as an example of a stakeholder identification exercise.

Hierarchy/Role	Stakeholders
Community	CHWs, Chiefs, Mayors, Religious Leaders, Parent Teachers Associations (PTA), Village Health Committees
Facility	Information Officer, Clinic In-Charge, Supply Chain Manager, Clinician
District	District Health Team members
Provincial	Provincial Health Team
National	Health Program Units, such as the IDSR Unit, Ministry of Health-HMIS Manager, Disease Program Advisors, Human Resource, Finance Advisors, M&E Advisors, other ministries and governmental agencies
International:	Donor Agencies, Implementing Partners

Figure 2.1: Potential Stakeholders at Various Levels of the Health System

- For each stakeholder, consider the following and add to the table as appropriate:
 - The critical decisions and actions they make.
 - What information they (could) use from the community to make decisions or perform action.
 - How they would use this information to inform decision.
 - Where they get this information and in what format and frequency.

The primary roles and responsibilities of the various stakeholders should also be mapped against the information cycle presented in Chapter 1. While the stakeholder identification is a part of the assessment itself, consider also reflecting the breadth of stakeholders in conducting the further assessment. For example, the provided assessment tool would benefit from input from a wide range of stakeholders, and ideally representing the various roles, levels of the health system, and both health and non-health stakeholders should partake.

The CHIS Assessment Tool

This assessment tool consists of a set of questions, organized under various headings (Government Ownership, Community Engagement, Reporting Structure, Standard Operating Procedures, System Design and Development, and Feedback). For each question, four answers are given (Highly Adequate, Adequate, Present but Not Adequate, and Not Adequate at All).

The scoring exercise should be done by key stakeholders, which should reflect the diversity of the CHIS. Each question should be discussed in plenary, so that all can be informed of areas they might not be fully aware of. Agreement should then be reached on which score to give each particular issue.

An example is shown in Figure 2.2 (with a more detailed explanation in the appendices), from the topic heading “Government Ownership.” While the various answers may not correspond exactly to the situation, the answer that most accurately reflects the situation should be selected.

	Highly Adequate	Adequate	Present but Not Adequate	Not Adequate At All
Items	3	2	1	0
Is there an established CHIS Technical Working Group (TWG) lead by ministry senior staff and including representation from key stakeholder groups?	Yes, there is a CHIS TWG with clear leadership and active participation from all key stakeholders that manages the development, implementation, and sustainability of the CHIS.	Yes, there is a CHIS TWG with clear leadership and active participation from most key stakeholder organizations.	Yes, there is a CHIS technical working group but it does not have clear leadership or it is not able to manage all CHIS development, implementation, and sustainability.	There is not a CHIS technical working group or it is inactive.

Figure 2.2: Example of Assessment Tool from the topic heading “Government Ownership

The scores derived from the assessment tool can then be used for planning CHIS strengthening activities:

- A low score indicates that this particular area of the CHIS is weak. A higher score indicate that this area is functioning adequately. This does not necessarily mean that all questions with low scores should be prioritized, this will depend on the intended system, scaling strategy, and resources.
- The scores can be used as a benchmark for later evaluation. Re-assessment can, for example, be done yearly to track progress
- The items in the assessment tool can also be linked to targets. For example, a target can be to improve from score 1 to a score 2 in a certain area.

These guidelines, and the tool itself, do not provide a list of direct actions, a recipe, to improve the scores. The tool is rather meant as an input to the design, planning, and implementation of CHIS strengthening activities, where the result will have to be interpreted to the context.

Assessment at the Macro Level: An Example

A short example can be used to highlight how the assessment tool can be used for assessing the macro, policy level.

A country is in the process of examining its community health services, and, in that regard, wants to assess the strengths and weaknesses of the overall CHIS before planning specific interventions. The first step they take is to form a steering committee that will oversee the assessment and analyze the results. The steering committee conducts a stakeholder identification exercise to see who should take part in the assessment, and aiming for a rather small group due to logistical reasons, the identify the following.

A community health worker and a representative from a community health committee are selected to bring in the viewpoint of the community itself. They are selected since they have experience with how the data collection and feedback is working between the CHW and the facilities to which they report, and how the CHW interacts with the community at large.

An information officer from a facility is included since this person handles the flow of data between the CHWs and the wider health management information systems, as well as having knowledge of the facilities' challenges with medical stock distribution.

Each district has a Community Health program officer, and the participation of one of them is secured to get the input from this level. This person will, in addition to managing the community health services in the district, also liaise between the CHWs and the other health program managers that are based in the district headquarters, so this is considered adequate participation from the district level.

From the national level, the head of the community health program, as well as the IT technician, is joining. Finally, a representative from a large international NGO, who are supporting the CHWs in some of the districts, is invited.

Conducting the Assessment

The steering committee, consisting of staff at the community health program, then invites the identified stakeholders to a one-day workshop in the capital. Due to logistical challenges, the community, facility, and district representatives are selected from the same district, though the group would ideally bring in representatives from at least two districts. However, the NGO agrees to invite one more CHW from another district as they are piloting new processes around CHW reporting there.

The group goes through the tool question by question in plenary, since they are not so many. This is also a chance for those who are familiar with the issue in question to inform the others on the team.

An example of how they answered one of the questions now follows:

The group is discussing the question: Do traditional health providers report through the CHIS?

The scoring scheme for this question is:

	Highly adequate	Adequate	Present but not adequate	Not adequate at all
Items	3	2	1	0
Do traditional health providers report through the CHIS?	Yes, all traditional health providers working at the community level report their activities to the national CHIS.	Most traditional health providers working at the community level report their activities to the national CHIS.	Some traditional health providers working at the community level report their activities to the national CHIS.	Traditional health providers are not part of the CHIS.

Figure 2.3: Example of scoring scheme for traditional health providers.

First, the head of the community health program informs the team that, no, this is not taking place. They have tried to incorporate data from traditional birth attendants (TBA) in the CHW reporting, but due to the lack of formalized acknowledgment and collaboration, the TBAs see little incentive in reporting neither to the CHWs or the facilities. This is something they would consider, but for now they would need to give this question a score of 0.

However, both the attending CHWs can then attest to that, sometimes, they do collect data from the TBAs. They know at least one TBA themselves, who is based in one of the villages they serve. They have a good relationship, and sometimes communicate with the TBA to confirm a visit there since there is no community health committee in this particular village. When they so do, they can inform that they get relevant data on the TBA activities, and include in their reporting if this is appropriate. However, one of the CHWs says that this is included, and thus part of, her report, while the other says she is adding it on the side of the paper as performed by the TBA.

The team then decides that a score of 1 is appropriate for this question, but make a note in the scoring sheet that how this TBA reporting is done varies and is not standardized at all.

Interpreting the results

And, so, they go through the questions of the assessment tools. In the end, they have a list of scores for all the questions, as well as a number of notes clarifying certain issues. The scoring will itself highlight the strengths and weaknesses of the CHIS, but the steering committee is then charged with further analyzing the data and deciding on the priorities. For instance, since they don't have electronic reporting from CHWs, they realize an improvement in score on automatic reminders when reporting is slow is far away. So, even if they set the score to 0 here, this is not seen as a major weakness that needs to be addressed presently.

A report with the findings and such interpretations of the results is then shared with the team who conducted the assessment, to get feedback. They decide to use a three-level prioritization scheme (high, medium, low priority) for all of the questions, and present it at the next executive meeting for all health programs, as well as sharing it with health partners.

Assessment at the Micro Level: A Case Study

We illustrate this assessment method, using an approach used by HISP in Indonesia.

In 2014, the Indonesian Ministry of Health in collaboration with its stakeholders (including Global Fund, University of Oslo, among others) began an initiative to strengthen the country's HIS with a strong focus on the facility and community level in response to specific challenges. The Indonesian HIS is structured with multiple vertical, health program-specific systems each with its own platforms working in 'silos.' As a result, common problems occurred including limited data sharing among programs which resulted in a duplication of the data collected from health facilities which placed a heavy burden on health workers who were forced to enter similar data across multiple programs. To alleviate these problems, the MoH and its stakeholders performed an assessment of its current HIS. As a result, they began to see the potential of district dashboards to serve as central repositories that did not significantly compromise the underlying structures of individual program data. From there, the MoH and its stakeholders embarked on a mission to implement an integrated dashboard that hosted information from several health programs (e.g. HIV, TB, Malaria, Maternal and Child health etc.) using DHIS2. The project implemented the dashboard in 10 selected districts located in 5 provinces. The district integrated dashboard approach focused on data quality and use as well as identifying and including additional data sets in the system. While the provincial approach was less comprehensive, focusing only on data that was easily available. The 10 districts each had one HIS consultant employed, but the provinces had no extra resources.

All health programs in Indonesia, such as malaria, TB, HIV, nutrition, mother and child health, have their own information system and reporting structures. The aim of the dashboard project was to integrate data from across health programs in one data warehouse and to provide this data through dashboards customized for each level (district, province and national). The main challenge of many of these systems is that facility and community based data is not available at the national level as only district aggregates are reported from districts and provinces. Some programs (such as HIV and TB) have web based national systems with data by facility available in national servers. For these systems, data are extracted directly into the DHIS2 at the national level. For the other systems, however, data need to be identified and imported or captured at the district or in some cases the provincial level.

The first phase of the implementation of district dashboards consisted of a 10-week action oriented assessment in 5 provinces and 10 districts. This initial phase consisted of on-site 'contextual' assessments of the existing HIS as well as a participatory approach to training, dashboard design, and evaluation of data quality using the dashboard system populated with local data. The assessment and training included a situational analysis to establish the existing infrastructures and create awareness amongst the local program managers about the value of district dashboards that can drill down to the facility and community level. Furthermore, there was a need to establish a mechanism to help enable effective data sharing between the implemented DHIS2 dashboard and the existing district and provincial information systems. The training, demonstration, and feedback

sessions used the TB, HIV, and population data already included in DHIS2 to design dashboards and to assess data quality. The assessment was tasked with identifying the following areas:

1. *Data Sources and Management:* The identification of standard data collection tools and data sources for routinely reported data, as well as population surveys and other data sources. This also includes the handling and processing of data at the source point.
2. *Data Import Procedures to Create Comprehensive Dashboards:* Electronic data for 2016 was collected from all identified systems with the purpose of importing it into the DHIS2 in order to develop a comprehensive dashboard system and design procedures for importing data on a regular basis.
3. *Data Flows:* Data flow mechanisms from the community level to the national level. The intermediated processing or conversion of data from one administrative level to another.
4. *Information Systems:* Available information systems and their linkages both horizontally (across programs) and vertically (up the ministry hierarchy).
5. *Indicators and Information Products:* Identification of core set of indicators at different administrative levels and their linkages to the national strategic plans.
6. *Data Dissemination Mechanisms:* Identification of available information dissemination and use approaches to inform internal and external stakeholders.

Assessment Framework

The assessment team was composed of members from MoH (Pusdatin), UiO, University Gajah Madah, and three universities selected as ‘centers of excellence’ in health informatics. Eleven consultants (one for each district and one national) were also involved in the assessment process. Prior to the 10 weeks rollout, each district went through a self-assessment using an adapted version of the Health Metric Network (HMN) evaluation tool. This exercise helped local awareness and commitment related to the more action oriented evaluation which followed. The assessment team built on the results of the HMN questionnaires in a hands-on way by looking at the systems and resources having been targeted by the questionnaires.

The assessment team adopted a nested cyclic approach which consisted of the sequential execution of ‘cycles’, starting from the provincial MoH office focusing on mapping all of the provincial systems (including the two pilot districts), before moving to the first district where a similar set of district focused actions were performed. The learning from the province assessment informed the assessment in the first district, which again informed the assessment in the second district. It was useful to directly compare the perspectives at province level with how different aspects of the HIS were regarded at district level. For example, in one instance, while the provincial drug management in one province emphasized the usefulness of a system to monitor drugs out of stock using 20 ‘tracer drugs’, the first district being assessed used this system in a wrong way; they used a

different list of drugs and they reported actual stock instead of out of stock. As people from the province took part in district assessments, and vice versa, such misunderstandings were rectified directly. The second district in this actual province, however, used the out of stock system as in line with the province administrations instructions.

The learning from each cycle of repetitive assessment activities was used to inform and improve the next cycle; the next district in the same province and then further provinces (see figure 1 below). One cycle comprised of two weeks in each province including three days in the province office and then three days in each of the districts. In each cycle, multiple tools/mechanisms were used to assess the existing situation using Focus Group Discussions (FGDs), field visits, reports and tools assessment, and data analysis. The assessment team was composed of health office staff (national, provincial, and district levels), Puskesmas and Posyandu staff (community level), and other sector staff (hospital, health insurance, national statistical bureau, local government, information and communication office, social and welfare office, civil registration office and NGOs). Data dissemination and advocacy sessions were conducted on the final day of the cycle encouraging the head of local government (the mayor), local parliament, and provincial and district heads to promote the implemented dashboards and provide feedback on the lessons learned.

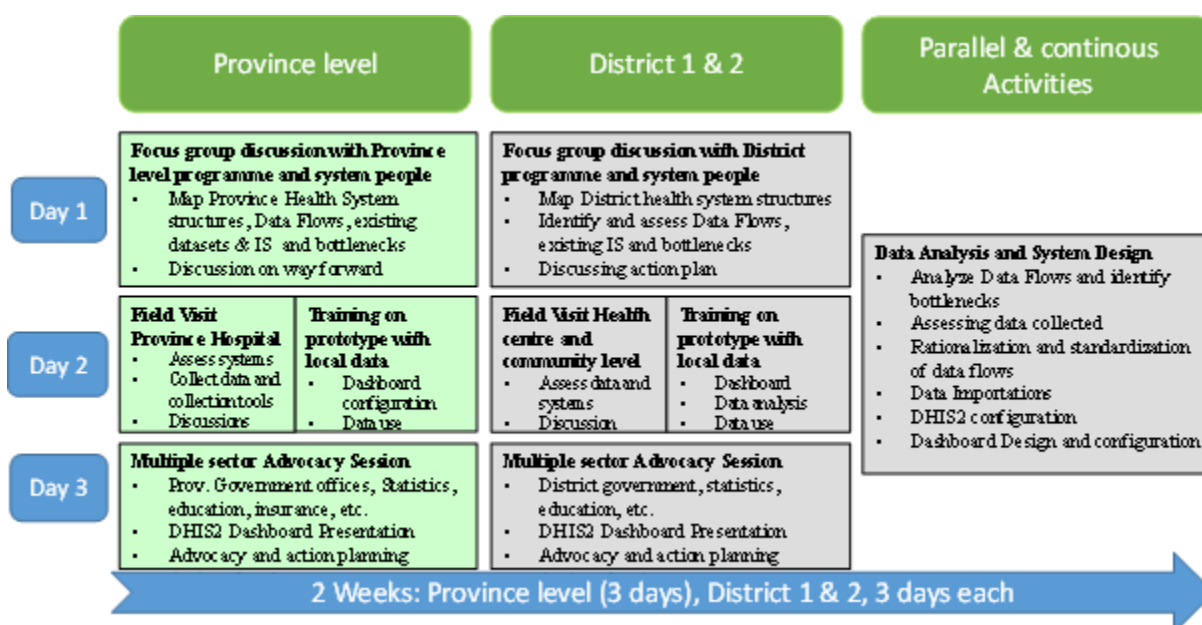


Figure 2.4: One cycle of assessment mechanism in one province.

level were assessed. At the community level, data collection and local information use, and any existing feedback mechanism to and from higher levels were assessed.



Figure 2.6: Health facility assessment

Training and Participatory Prototyping and Assessment

In each province and district, one full day was dedicated to training in DHIS2 and dashboards as well as participation in the assessment of data quality and prototyping of dashboards. The DHIS2 was already populated with data from the national TB and HIV system as well as with data from the KOMDAT, which collected data on key indicators by district. Population data was also included in the system. Training was conducted on how users could design their own dashboards and include new data elements and indicators. The dashboard functionality was popular among users who used it to display, graph, and assess their own data. In particular, the quality of TB data turned out to be questionable. TB data is reported to the district from the facility either electronically or by paper and compiled at the district using an offline system. Then the data is uploaded to the (SITT) online system. In many districts, this created a systemic problem where there was less data in the online system in comparison to the offline system. In fact, there was never more data in the SITT online than in the offline system, indicating that from time to time, some data was not uploaded. It is interesting that the first ‘results’ of making such national data accessible to local users is the identification of data quality issues.

User participation in designing dashboards and in assessing data quality turned out to be an important part of the assessment leading to more ownership and commitment to the implementation process.

Advocacy, Planning, and Data Dissemination

A session with stakeholders from multiple sectors (in addition to health) was conducted for information dissemination and advocacy in all the districts and provinces. Participants in this session included the heads of provincial, district, and local government along with other health program heads. The assessment team presented the implemented dashboard with a primary emphasis on processes of information use. Key issues for discussion included where to include data from other sectors in the dashboard approach. National statistics have offices in all districts and provinces and were particularly interested in becoming part of the project. The presentation was followed by discussions of future plans and an outlining of with probable action points.

Data Analysis and Reflections

In each provincial cycle, a few days were set aside for data analysis and mapping, system configuration, and reflections on the observed assessment challenges. The team assessed data collected during the focus group, field visits, and observations in a discussion format. Afterwards, the assessment team provided recommendations and suggestions for improvement directly to the larger group. Additionally, data mapping, processing, and importation into the DHIS2 platform were done to allow the development of the district and provincial dashboards.

Findings obtained by the assessment approach were presented and discussed first to the internal team and later to the MoH. The process and outcome of the assessment exercise led to the initiation of the following HIS improvement activities.

Data Standardization

A key observation made by the assessment team was the lack of data reporting standards across the assessed provinces. Data reported within the same program had different formats from one province to another and sometimes within the same province. For example, an exclusive breastfeeding data element was collected within the nutrition department. In NTB Province, the monthly age disaggregation was from 0 to 5 months. However, the same data element in Java Timur and Maluku Provinces combined the age dimension into 0-5 months while disaggregating it by gender (male and female). The same was observed in the Integrated Recording and Reporting System of Puskesmas (SP2TP) in LB1 form. In that case, Maluku Province had gender disaggregation while other provinces reporting LB1 had disaggregated data elements by age group. Most of the health program still uses paper tools supplemented by Excel sheets. The programs areas range from Malaria, Nutrition, Immunization, Surveillance, Human resource etc. Furthermore, Excel formats differed from one district to another depending on the local adopted decisions which limited aggregation at higher levels.

Fragmentation of HIS

The assessment observed the health data in Indonesia was managed according to different departments with minimal horizontal communication. Such fragmentation caused duplication of collected data and limited data sharing across the departments. The existence of KOMDAT as the national system which collects data for about 130 national health indicators (based on data aggregated by district) was an example of efforts by the MoH to integrate information from health programs. However, HIS fragmentation, and data quality issues still persist within the health systems. Figure 2.7 outlines portion of the observed system architecture within the five visited provinces.

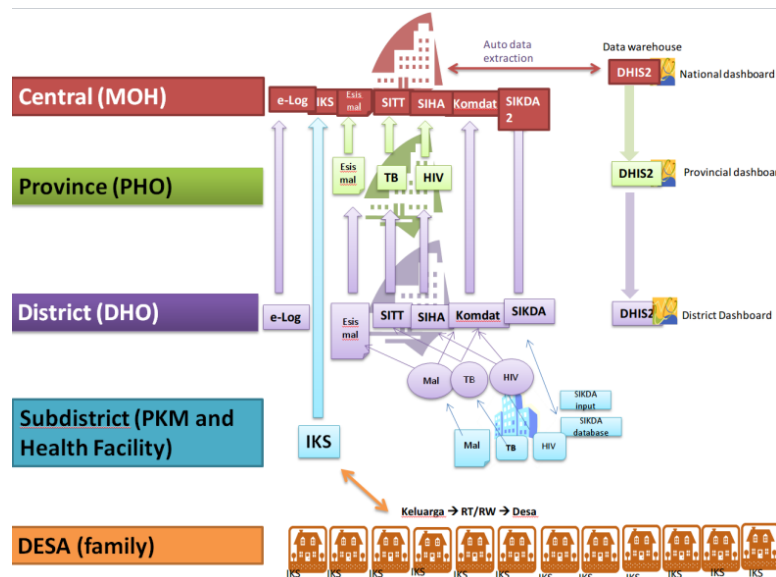


Figure 2.7: Information System mapping.

Information Use and Demand

Local information use was observed at the community and health facility level. Standard practice of identifying follow up cases was used by the health officials. Graphs and charts were plotted at the district and provincial level to disseminate information. Annual bulletins and reports were created from the health facility delivered to the provincial level following a standard format. The use of a dashboard approach appeared to serve as a catalyst to bring stakeholders from different departments together in this process. Managers were motivated by the possibility to have comprehensive information for decision-making.

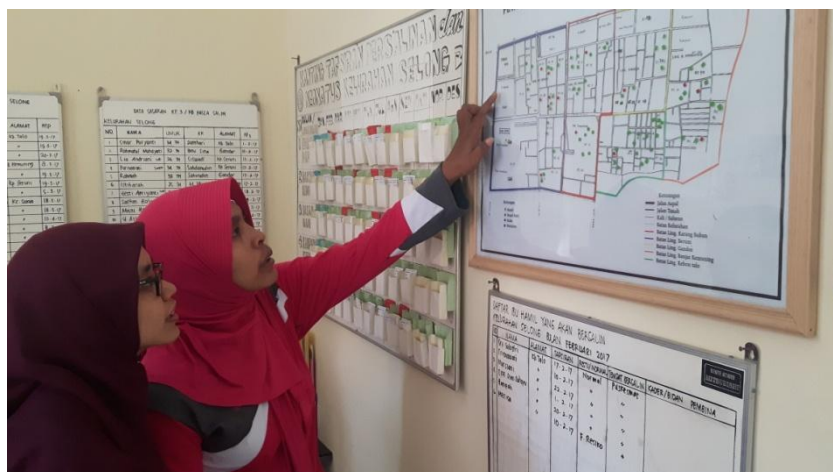


Figure 2.8: Information use by local community

Recommendations from the Assessment Exercise

- Build on the recent DHIS2 implementation to bring more stakeholders onboard and have a comprehensive approach look of cross-sector data (e.g. statistical data, civil registration data, hospital data, health insurance data).
- A provincial approach instead of, or rather in addition to, a district approach to enable swift scaling up the implementation of district dashboards. However, not all data is available by facility and community at the province level and will need to be collected in the districts.
- Invest in capacity building through internal and external training.
- Encourage more integration with other stakeholders by using district dashboards.
- Ensure more functional coordination between health information department and other health programs at the district level and upper administrative levels.
- Creation of standard data collection tools which will be used across the country.
- Build more robust approaches for accommodating other data source with disparate data formats.

Building Synergies from Macro and Micro Level Assessments

The two methods presented earlier in this chapter should be seen as complementary to each other. In the table below, some strengths and weaknesses are outlined to aid in assessing which tool may be more useful in a given context.

	Macro Level Assessment Tool	Micro Level Case Study
Strengths	<ul style="list-style-type: none">• Can be performed with relatively few resources, although broad participation is encouraged• Incorporates a scoring mechanism which can be used for periodic evaluation• Gives a holistic view of important aspects of CHIS	<ul style="list-style-type: none">• Gives a rich understanding of CHIS, such as data flows, work routines• Helps to understand individuals and their reasoning and actions• Appropriate for identifying contextual aspects• Good for identifying challenges and opportunities which are hard to quantify
Weaknesses	<ul style="list-style-type: none">• Process of scoring is subjective• Does not go into depth in any of the aspects• Relatively more static and does not account for process dynamics• Predefined set of questions may not fit all contexts• May not be representative of a multiplicity of views, and limited to those answering the questions	<ul style="list-style-type: none">• Resource-intensive• Hard to scale, some sample areas must be taken as representative of the whole district/province/country• Does not provide rich insights into macro-level conditions that shape CHIS

Figure 2.8: Macro and Micro-Level assessment pros and cons

Synergies between the Macro and Micro-Levels of Assessment

In the above table, we have summarized some of the strengths and weaknesses of both the approaches. However, we argue that taken together there are richer insights that can be developed around the assessment of the overall CHIS. While the macro assessment allows us to understand the broader contextual and policy aspects that shape the CHIS, this is complemented by the understanding of the individuals, their actions and various processes that constitute the CHIS. The

macro level defines the scope for change at the micro level, and vice versa. For example, macro level SOPs such as for infrastructure strengthening is needed to initiate appropriate design at the micro level, such as the need for developing hybrid (offline-online) solutions for the CHIS. At the same time an understanding of the hybrid solutions possible or not at the micro-level, are fundamental to develop the macro-level SOPs. Broadly, the macro level is useful to diagnose and identify the challenges, while the micro level understanding helps to understand possible solutions to the challenges identified. We thus advocate in these guidelines for the use of both the macro and micro level assessments in conjunction, to be able to identify synergies and the corrective actions required for the future improvements of the CHIS.

Chapter 3: Data Quality and Use

Introduction

The primary purpose of a CHIS is to generate information that can be used by CHWs and other stakeholders at various levels to improve and strengthen community health programs, to enhance the health of populations.

Despite the primary importance of enabling data use, it is an area which lags behind in overall CHIS strengthening efforts, as more focus is given to the use of new technologies and devices to automate data collection and transmission processes. This chapter thus seeks to understand what we mean by data use, what are its critical determinants, and how can this be strengthened overall.

Learning objectives

By the end of this chapter readers should be able to

- Describe the virtuous cycle of data quality and data use.
- Identify data quality strengthening tools in DHIS2, and how can they be used to enhance data use.
- Explain data use at community and various levels of the health system
- Discuss the principles for improving data use.
- Describe feedback mechanisms available in DHIS2, and how these are applied to the data needs of community stakeholders.

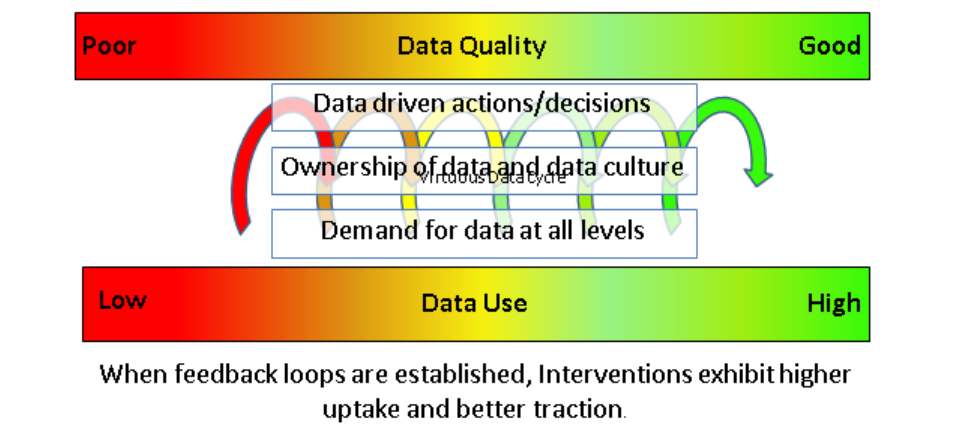
The Virtuous Cycle of Data Use and Data Quality

The “vicious data cycle” is a scenario where the CHIS is seen by CHWs and other stakeholders to provide poor quality data, so they do not trust it and will not use it. They use their own sources, external surveys, or, even worse, create new systems (adding to fragmentation) for meeting their information needs. If they don’t use data, the CHIS will be further neglected, produce even poorer quality data, and this leads to more non-use.

Data quality and data use are intimately inter-connected... the more it is used, the better the quality.

Fortunately, the reverse also holds true, as shown in the “Virtuous data cycle”. The more the data quality is trusted, the more it is used and this further improves the quality of data. As shown in the feedback loops in the diagram, this is an ongoing, incremental process that takes time and needs to be driven by increased demand for data, local ownership of data and visible links between data and decision making. The end result of this virtuous cycle is a vibrant culture of information use

This link between data quality and use requires CHIS developers to attack the problem of poor data use at both the demand and supply sides, and strengthening their interlinkages. The demand side involves improving awareness and capacities of stakeholders to use data for strengthening community health management, while the supply side implies improving the overall quality of the



CHIS generated data. We see the DHIS2 as a tool that can help strengthening both these ends and their inter-linkages. But first we discuss what we mean by data quality, and how can the tools in DHIS2 help to strengthen quality.

Strengthening Supply Side: Essential Elements of Data Quality

Good quality data is that which is trusted by decision makers to be used for basing their decisions on. Characteristics of good quality data include: Correctness, Completeness, Current, and Consistency

Correctness (accuracy)

Does data accurately reflects the reality it seeks to measure?

- Are the data a reflection of what is actually happening in the community?
- Are there mistakes in data entry?
 - Are correct values being recorded in the appropriate places?
 - If there are errors, are they systematic, (e.g. due to a misunderstanding of the indicator definition), accidental (i.e. random), or intentional?
- Are there calculation errors being made?

Completeness

Are all CHWs reporting on all the data elements they are supposed to report on?

- Are all units reporting?
- Are all CHWs transmitting all the forms expected?
- In each report, are all the required data elements being reported?
- What is the percentage of “zero” reporting (i.e. for cells for which there is no service delivery, there is a zero recorded rather than a blank)?

Current (Timeliness)

Is data being reported in a timely manner according to set norms?

- Are facilities reporting by the deadline of reporting established by the MoH?
- Are reporting periods standardized across the country (i.e. the reporting period starts and ends on the same dates in all facilities and districts)?

Consistency

Are the patterns of data reported, consistent, and not consisting of outliers?

- When compared with previous months, is there a consistent pattern (e.g. a similar distribution of cases of diseases, or age/gender proportionality)?
- Are there values from CHWs that are markedly discrepant to values from similar CHWs (i.e. outliers)?

Data Quality Tools in DHIS2

In addition to using data, there are many standard data quality tools embedded within DHIS2:

Data input validation: The most basic data quality check in DHIS2 is to make sure that the data being captured is correctly formatted. The DHIS2 gives the user a message that the value entered is not the correct format and will not save the value until it has been changed to an accepted value. E.g. text cannot be inputted in a numeric field. The different types of data values supported in DHIS2 are explained in the user manual in the chapter on data elements.

Min and max ranges: To stop typing mistakes during data entry (e.g. typing ‘1000’ instead of ‘100’) the DHIS2 checks that the value being entered is within a reasonable range. This range is based on the previously collected data by the same health facility for the same data element, and consists of a minimum and a maximum value. As soon as the users enters a value outside the user will be alerted that the value is not accepted. In order to calculate the reasonable ranges, the system needs at least six months (periods) of data.

Validation rules: A validation rule defines a relationship between a number of data elements. The expression forms a condition which should assert that certain logical criteria are met. For instance, a validation rule could assert that the total number of vaccines given to infants is less than or equal to the total number of infants.

The validation rules can be defined through the user interface and later be run to check the existing data. When running validation rules the user can specify the organization units and periods to check data for. When the checks are completed a report will be presented to the user with validation violations explaining which data values that need to be corrected.

The validation rules checks are also built into the data entry process so that when the user has completed a form the rules can be run to check the data in that form only, before closing the form.

Outlier analysis: The standard deviation based outlier analysis provides a mechanism for revealing values that are numerically distant from the rest of the data. Outliers can occur by chance, but they often indicate a measurement error or a heavy-tailed distribution (leading to very high numbers). In the former case one wishes to discard them while in the latter case one should be cautious in using tools or interpretations that assume a normal distribution. The analysis is based on the standard normal distribution.

Completeness and timeliness reports: Completeness reports show how many data sets (forms) that have been submitted by organization unit and period. There are three different methods to calculate completeness:

- 1) Based on completeness button in data entry.
- 2) Based on a set of defined compulsory data elements.
- 3) Based on the total registered data values for a data set.

The timeliness report is based on a system setting called “Days after period end to qualify for timely data submission” and shows

- which organization units in an area that are reporting on time,
- the percentage of timely reporting facilities in a given area.

Source: Using DHIS2 to improve data quality, Section 13.4 of DHIS2 Implementers Manual

Additional Data Quality Resources

Find these resources located in the appendices of this document.

1. **Improving health data quality, recommendations, and guidelines.** “[This] report focuses on which measures that should be put in place to improve data quality. Suggested improvements are based on lessons learnt in Malawi which also have validity beyond the national experience.”
2. **Manual for the DHIS2 quality tool.** This is a manual for basic use of the DHIS2 quality tool. The manual explains the possibilities of the quality tool, as an input to capacity building and workshops. The data quality tool not only displays potential data errors, but also contributes to improved understanding of the data quality.
3. **Mobile CBHIS Data Quality Guidelines.** This a comprehensive, general guidance on community based health information systems. It consists of 3 sections:

Part 1: Designing Mobile Data Collection Systems for Improved Data Quality. This component includes guidelines on designing mobile data collection systems, along with checklist for assessing a system’s mobile data collection forms and systems.

Part 2: Implementing Programs to Increase Ownership and Commitment to Data Quality. This component includes guidelines on engendering accountability and ownership for data quality, along with a checklist to assess feedback loops and to motivate frontline health workers on data quality issues.

Part 3: Verifying Field Level CBHIS Data. This component includes guidance on how to adapt a Community Trace and Verify (CTV) tool to verify whether individuals who are reported as being provided with services have actually received them.”

4. Data Quality Audit Tool

The DQA Tool focuses on (1) verifying the quality of reported data, and (2) assessing the underlying data management and reporting systems for standard program-level output indicators.

Two versions of the DQA Tool have been developed:

(1) the “Data Quality Audit Tool” which provides guidelines to be used by an external audit team to assess a program/project’s ability to report quality data; and

(2) the “Routine Data Quality Assessment Tool” (RDQA) which is a simplified version of the DQA Tool that allows programs and projects to assess the quality of their data and strengthen their data management and reporting systems.”

Strengthening Demand Side: Understanding Levels of Data Use

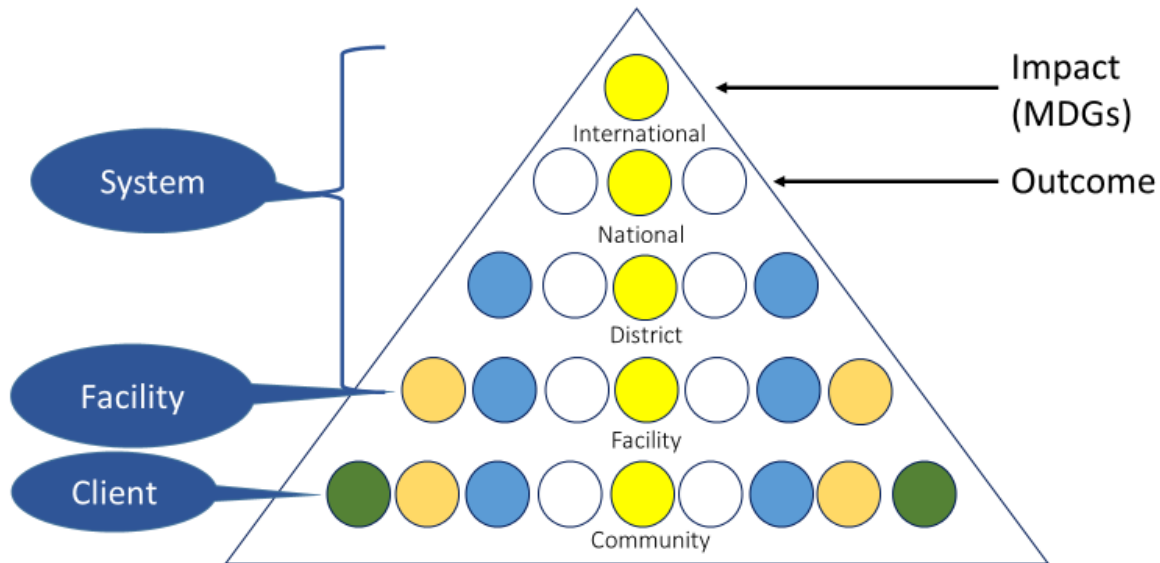


Figure 3 The information Triangle showing three levels of information use

As can be seen in figure 2, data use for the CHIS occurs at three levels, each of which needs to work with the other levels.

Client/Beneficiary Level

The individual who accesses health services from the CHW is termed as the client or beneficiary, and should be the main action level for CHWs and community stakeholders to provide preventive, promotive, rehabilitative or curative care. Beneficiaries include pregnant women, children below five years, communities implementing health programs and individual households with chronic infectious and non-communicable diseases. The different programs of the health system often treat these beneficiaries in isolated ways, depending on the programs of care they are enrolled in, with implications on the CHIS, and limiting taking a holistic picture of care and wellbeing needs.

One of the goals of the CHIS is to provide for a more holistic perspective, both from the perspective of the beneficiary needs and of the different health services that are being provided to them.

Facility Level

The facility in-charge uses data to ensure adequate resources to support community activities and to ensure supportive supervision. Facilities are the link between communities and the health system and facility managers serve as the first point of call for the CHWs for receiving appropriate supervision and informed feedback, and advice on provision of better health care to the beneficiaries.

To enable these functions and other support such as the provision of adequate infrastructure, staffing, equipment and supplies, facilities need reliable CHIS data.

Facilities are also at the front line of promoting “discussions about data”, providing feedback to CHWs and stakeholders on performance and other activities to promote the virtuous data cycle. CHIS data also provides facilities with a picture of the overall resources needed and the “missing data” that shows the real disease burden in their area, and ensuring that CHWs provide services necessary according to the basic health services package. Facilities need to combine the CHIS data with their own service data to create an integrated picture of the health of the catchment population for upward reporting to the district and higher levels.

Health Systems Level

Managers at higher (district and national) levels use the systems approach to strengthen CHW systems of governance, human resources, service delivery, infrastructure, finances and information systems. Data comes from multiple sources, including CHIS, the facility HIS, program specific systems, the census and health surveys and is used for two purposes.

1. to develop policies and plans that shape of the CHIS, including decentralization, resource distribution, standard operating procedures, and supporting the tasks performed by CHWs.
2. to monitor and report on health system indicators such as the SDGs, MDGs and key performance indicators which contain CHIS data.

CHIS data use takes place at multiple levels and for diverse purposes. A strong CHIS thus becomes a firm foundation of the overall national HIS. The different purposes the CHIS supports can be linked back to the functions of recording, tracking and reporting defined in Chapter 1. While recording and tracking are core functions to support services at the client/beneficiary levels, the reporting function builds upon the recording function to meet the information needs of the facility management and health systems levels.

Principles to Enhance Data Use

In this subsection, we discuss key CHIS design principles to enhance data use. These include:

- 1) Design for decentralized use
- 2) Enabling local use engaging a larger group of stakeholders
- 3) Strengthening feedback mechanisms
- 4) Designing for sustainable use
- 5) Using automated tools for feedback
- 6) Best practices for promoting data use

1. Decentralized Use

The further one moves from the community, the less data is used for action. A fundamental principle of the HISP CHIS approach is that data should be used as close to its point of generation as possible. A decentralized CHIS empowers CHWs, supervisors and community leaders to feel ownership and accountability of the program. When the people closest to the ground feel ownership and accountability of the health outcomes of a program the outcomes of that program will be stronger. Driving down authority and accountability to the lowest levels will demonstrate the full utility of the CHIS.

The more the CHIS is designed to strengthen decision making at decentralized local levels, the more chance there is for information to be demanded and used at lower levels to improve service delivery. To enable this, the CHIS needs to provide data with high granularity and user-friendly data analysis tools. A CHIS that is designed primarily to support local-level decision making, with some of the data that flows up collaterally, will ensure a high chance of improved data quality and enable effective local use of data for informed decision making.

Decentralized data use: The EPI example

Anyone who has been to small, rural health facilities anywhere in the world will have seen EPI cumulative coverage graphs proudly pasted on the wall. This is a best practice achieved by one unit in Geneva that has convinced every country in the world to monitor EPI at facility level by drawing a simple graph that records key immunizations given every month towards a set target. This practice has been sustained over many years by a number of simple data use processes outlined in the virtuous data cycle above

1. Facility staff are trained to fill the graphs using clear, simple SOPs in the local language.
2. Facility staff have a sense of pride in watching coverage increase every month.
3. Supervisors, even from other programs, check these graphs when they visit a facility.
4. Districts have resources to provide ready-printed graphs (photocopied if necessary) for every commodity at every facility, and to do supportive supervision of EPI.
5. National EPI units have been convinced that this is standard practice in all other countries, so they should do it too!
6. Community members when visiting the facility expect to be able to see how EPI is doing in their area.

2. Engaging Stakeholders

Various local government, non-government and civil society groups are engaged in ensuring the health of a community. These include village chiefs, local political leaders, women's groups, and NGOs who are engaged in activities such as implementing programs, conducting training, monitoring data, investigating critical events such as maternal and child deaths and others. While the primary stakeholder for the CHIS is local government, engaging these other stakeholders in strengthening data quality, enhancing use, opening up the information for wider public scrutiny, can go a long way in strengthening the CHIS.

Engaging Stakeholders: The Punjab example

Recently, the state of Punjab in India developed a health transparency portal in which all public facilities and private facilities empaneled with the state would self-report details of their facility, including address, contact person, services offered and their respective costs, equipment available, and doctors on call. Using this information, a community member should be able to identify what health services he can access where and most cost-effectively. The citizen can then also provide a rating for the services that he/she has received, which can then also be used by other citizens to inform their choice of service access. By making this health facility information

open to the public, the information use serves two key purposes. One, empower the health worker to make better choices on health care. Two, allows the state to identify what are their gaps in service delivery and take necessary corrective action.

3. Strengthening Feedback Mechanisms

When *strong* feedback mechanisms are implemented many profound phenomenon can occur, but two that stand out are:

1. Reporting rates and data accuracy improve, because CHWs see the value of quality data.
2. If community based stakeholders track their own performance at a local level, they improve their performance too.

We know from the transformational feedback model that a *strong* feedback mechanism is one that:

- **Improves information transparency** – People who need data have data. Raw data is able to be converted into knowledge and acted upon.
- **Enable two-way dialogue** - Feedback mechanisms need to connect the stakeholder to the performance community health program. As stakeholder make decisions and perform actions based upon the knowledge they obtain from the feedback mechanisms, community health is effected and subsequently is reflected in the data displayed in the feedback mechanisms. This cyclical process is a form of two-way dialogue. Another form of feedback that enables a two-way dialogue is support and supervision which is covered in chapter 5.
- **Enables networks for learning** – With multiple stakeholders in the community receiving feedback they can network together and devise stronger and more robust solutions to community health problems. It is a common misconception that community health projects must have all the answers to all problems that a community faces, but in truth the strongest community health programs is one in which the community learns from its members and devises this own informed solutions.

Feedback mechanisms minimize the barriers between data, decision making and actions, but simply pushing data down to stakeholders will not have this effect. A feedback mechanism must enable the stakeholder to receive data and then transform that data into information. Information has meaning while raw data is typically viewed as more abstract and meaningless. Then information must be processed into knowledge. Knowledge is contextual and actionable, but only possible if the stakeholder trusts and has confidence in the source of the information, the raw data. Therefor:

- **Every feedback mechanism must be customized to the best way to give information down to a stakeholder based upon their characteristics and roles.**

Consequently, pushing information via a dashboard on a computer is not enough. This is especially true at facility and community level where they will probably not have access to a computer, the time, nor the ability to do data mining. In these cases, push out only critical indicators that they do not need a computer or log-in to an application.

There are multiple types of feedback mechanisms. Below is a chart that describes these diverse types. The selection of which type of feedback to use is dependent on the role and actions of your identified stakeholders. Typically, a single stakeholder may receive multiple types of feedback mechanisms.

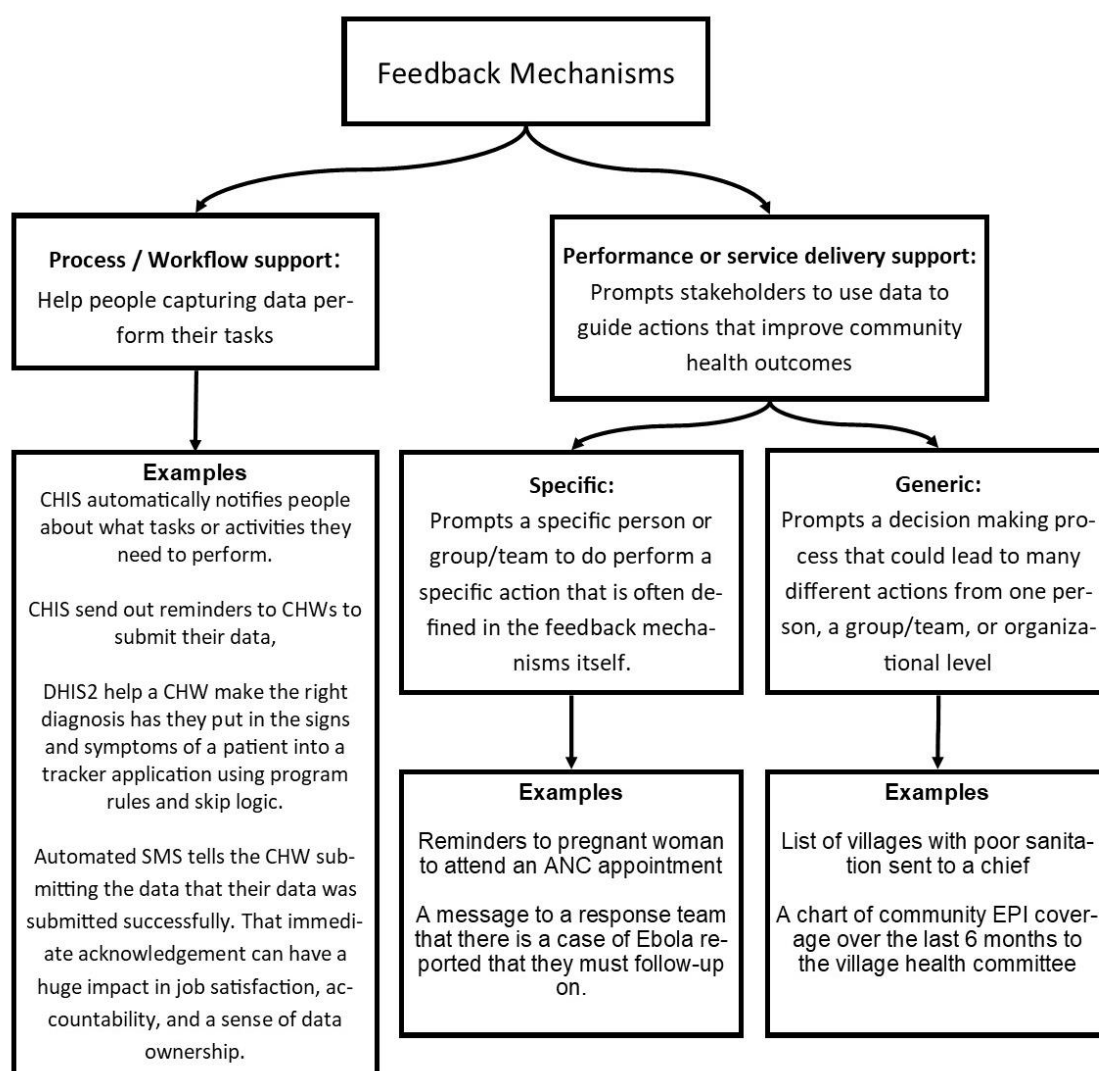


Figure 3.3: Feedback Mechanism Model

Guidance on Developing Feedback Mechanisms

There is not a single technology solution for every stakeholder. For example, a CHW may receive an automated text SMS reminding them to send their monthly disease surveillance report. They might also then receive an automated HTML report via an SMS that shows how their community or catchment is performing in terms of disease burden compared to the district and other communities. In that example, the CHW is receiving feedback mechanisms that supports their workflow but also one that supports the intervention or service delivery. Both are delivered via SMS because that is the most direct way to reach the CHW. A simple text messages prompts a very specific action. The HTML report may not explicitly tell the CHW to perform specific actions but it may prompt them to do something they know will improve their catchment performance.

When choosing the best technology and messaging, the following can be considered:

- 1) What are the indicators that provide the information stakeholders use to base their decisions and actions? – Best practice is to prioritize a list of minimum essential indicators with the stakeholder, as too many of them presents too much noise and renders the feedback mechanisms useless.
- 2) What is the technical ability of the CHW to interpret data? – Best practice is to keep information able to be interpreted by a child with little formal education. The “12-year-old test” will ensure that you are presenting data in an easily comprehensible and actionable manner.
- 3) How often do stakeholders need to get information? Is there targeted information that certain stakeholders need? Are there formal reports that need to be created for different stakeholders (Newsletter, monthly or quarterly information dissemination)? Who do the stakeholders disseminate the information to?
- 4) The person who does data mining is not always the same as the person that does presentation and communication, ask who does the presenting?
- 5) What is the most direct way to present them the data? Please remember that often the most direct way is via push notifications like email and SMS. Only enabling access to data through dashboards in DHIS2 dashboards can be a barrier for access.
- 6) How is the indicator going to be captured? If you identify an indicator for a feedback mechanisms you must ensure that the data elements of that indicator are captured at the right hierarchy level and at the right frequency to provide for the feedback mechanisms.

Automated tools for feedback – DHIS2

There are many ways to get information to people. It is important to remember that data for decision making must be easy to access. Below are some examples of different technologies used for feedback mechanisms. This is not a comprehensive list, but highlights common feedback technology solutions as they have been applied to a CHIS.

- **Automated SMS** – DHIS2 can send out automated messages for the following occasions:
 - **Validation rule alerts:** Validation rules can be used for many purposes. Data quality checks is the most common practice, but validation rules can be used for programmatic alerts as well. For example, a validation rule “Cholera Total Cases == 0”. In this case any instance where more than zero cholera cases have been reported the user group for set to receive automated validation rule alerts will be notified that there are cases of cholera, exactly where they were reported and they would then be able to send out a disease control response team.
 - **Reminder to submit data:** It is always a best practice to send reminders to facility and community health workers to submit their routine data via SMS. Often community health workers do not monitor closely the day of the month or even the week so it is important make sure they are reminded to submit their data.
 - **Reminder of upcoming events using tracker:** This could be used if tracking patients from the community level through a treatment to remind them of an upcoming appointment. It could also be used to remind a community health worker of who they need to meet with for follow-up outreach like in the case of a newborn tracking project.
 - **Alert of missed appointment using tracker:** Enabling community health workers to follow-up with people in their communities who have missed an appointment can be very effective especially if the clinical care providers are unable to follow-up with patients that have missed appointments.
 - **HTML report** – Often stakeholders are using different mobile technology, but nearly all mobile devices now have a basic web browser. Using iReports standard reports can be generated for a specific stakeholder based upon their permission levels in DHIS2. For instance, you could make a standard report that is sent to all chiefs. The chiefs will only be able to see data for the organizational units they are assigned in this report. You can then embed the link to the report into an automatic SMS that is sent to all Chiefs. The chief received the SMS and by clicking on the link the web browser will automatically open to the chief’s custom report.
 -

- **Automated Emails** – Much like automated SMS, DHIS2 can be configured to send out automated Emails for the following occasions
 - Pushing Dashboard
 - Validation rule alerts
 - Messaging
 - Sharing interpretations
- **Public Facing Websites** - Using the web portal app or a custom webpage public analytics can be published to a website. This has proven to be a tremendously effective way to give the general public or government staff that have access to the internet access to health data on their communities and projects.
- **Standardized and custom dashboards** - DHIS2 enables users with the proper permissions to have access to customized or standard dashboards consisting of a broad range of analytics (charts, maps, pivot tables, scorecards, league tables, etc.)
- **PDF Reports** - Using standard reports DHIS2 can produce automated, customized PDF reports.
- **HTML Reports** - DHIS2 is able to produce automated HTML reports. These reports can be useful in calculating complex indicators that are not available in DHIS2
- **Dashboard Android Application** - The dashboard application allows anyone with a DHIS2 dashboard to access that dashboard via their android smartphone.
- **Sharing data interpretations in DHIS2** - Any analytical tool developed in DHIS2 is able to be commented on and those comments can be made available publicly or to a specific user group. This is an effective way of sharing information with groups of users and sparking discussion around that data. This can also be a method of sharing information and assigning tasks to multiple users
- **Scorecard applications** - Scorecards are simple but powerful analytic tools to present a great deal of data quickly in an easily consumable fashion. Scorecards have been specifically designed for village health teams enabling community health stakeholders to quickly get a clear idea of areas where community health is underperforming.

Dashboards

Dashboards allow for the easy access of analytics with pre-defined parameters. Charts, tables, and maps are created once, gathered into thematic dashboards, and then posted on the DHIS2 home page. These visualizations are updated as new data come into the system. Anyone with access to this dashboard can easily find these visualizations as soon as they

open DHIS2, encouraging them to revisit DHIS2 regularly, and dig deeper into data analytics.

Like feedback loop notifications, these visualizations can be customized for each user group and organization unit. When combined with “relative periods,” powerful visualizations can be dynamically updated, and customized by the viewer’s role and location. Imagine you are an obstetrician managing traditional birth attendants in a rural district. At the end of March, you might receive a static table from the MoH called “maternal mortality in the nation last year”. If you open your DHIS2 dashboard, you might see an interactive bar chart titled “Maternal Deaths in *My* District Last Month, By Ward”. This information is much more meaningful to you, and you can use it to inform your programs.

Case Study: Zambia Chiefs Sanitation Dashboard Widget

In 2014, the Ministry of Local Government and Housing in Zambia with UNICEF support launched the community lead total sanitation (CLTS) project. To engage community stakeholders, this project empowers local Chiefs with actionable community sanitation data via a DHIS2 dashboard widget on a tablet. The questions and answers below illustrate how it was decided what and how chiefs should be presented with this feedback mechanisms.

1. What are the indicators that provide the information stakeholders use to base their decisions and actions?

Open defecation free status (ODF) is the measure of the household coverage of “adequate latrine.” This indicator is able to tell the chiefs which areas are performing well and which ones are performing poorly.

2. What is their technical ability to analyze data?

Chiefs in general have a low ability to analyze data. Therefore, Chiefs are only presented with one indicator: latrine coverage. Chiefs do want to know how they are performing against their neighboring chiefdoms so they are presented their whole chiefdom latrine coverage in a bar chart against their neighboring chiefdoms. They are also shown how their district compares against the whole country and how each village in their chiefdom performs.

3. How often do stakeholders need to get information?

Chiefs meet with village headmen monthly, but chiefs may reach out to villages or perform inspections at any time, so chiefs need access to information at all times.

4. Who presents the data?

Chiefs are able to understand the data directly from the widget. In some situations where the chief is unable a chief's advisor is trained on how to use the tablet and widget.

5. What is the most direct and efficient way to present and communicate that data to them?

Chiefs need to be able to interact with this data at any time. All chiefs are able to use smart phones, but remembering log-in credentials was identified as a bottleneck to using applications. Therefore, Chiefs are presented with these analytics via a widget on a tablet which is provided by the project.

6. How is it planned for that data to be captured?

ODF is calculated = (the number of adequate latrines/the number of households) X 100. Both the number of adequate latrines and the number of household are captured by the village sanitation action group monthly from individual households via paper records. Monthly a community

champion aggregates the household data to the village level and the village aggregate are transmitted into the CHIS by the community champion via a DHIS2 application on a project feature phone. For more information on this use-case please see the Zambia Sanitation Use-Case in the annex. Figure 1 in this Case Study show Chiefs Mukobela's widget.

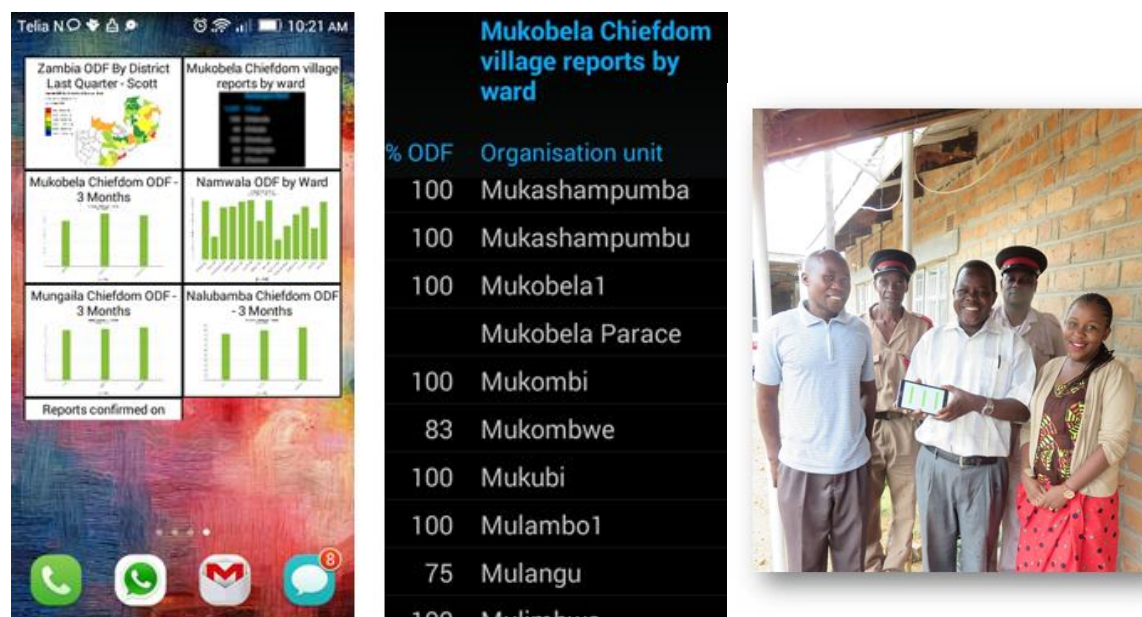


Figure 1: Example Widget from Chief Mukobela Chiefdom

4. Promote Data Use at community level

To gain full value of the CHIS, it needs to provide sustainable use, implying the use processes will be supported in the long run, and should be able to evolve with changing needs. Some steps towards sustainable use, include clearly defined goals, targets and indicators and a CHIS M&E framework

A: CHIS Indicators, Goals, and Targets

Broadly agreed goals and targets and a set of indicators linked to them is the basic tool to promote the shift to an information-led CHIS. To ensure maximum use, all data collected by the CHIS should directly relate to indicators selected to monitor efforts to improve health system performance.

Indicators which are defined as a “*variable that help to measure changes, directly or indirectly*”⁶ is at the core of

⁶ WHO, 1981

- Easily understood, avoid using technical terminology
- Limited in number: three to five per program.
- Easily displayed on a chart, scorecard, or a map.
- Able to evaluate performance over time.
- Identify worst and best community performers.
- Comparable between communities.

promoting a culture of information use. Crafting indicators that are useful for communities is the center of the process of monitoring community health services and systems and is one of the most important skills required for CHIS design.

A good indicator provides information about a broad range of conditions through a single measure and enables CHWs and their supervisors to compare themselves to others doing similar work. Indicators for community actors (CHW, community leaders, community health groups) must be:

A compendium of standards and measurement issues for 40 indicators has been produced by WHO⁷ and at regional level by the West African Health Organization. These need to be adapted to country contexts and again to the community level.

5. Develop Community Action Plans

Community action plans vary across countries, but the essential goal is to have a common set of activities that have been agreed to by local stakeholders and will be achieved in a set time period. These plans need to be developed around locally generated CHIS data from the initial situation analysis, through setting targets, allocating resources, and using indicators to monitor results.

Where are we now?
Where do we want to go?
How will we get there?
How do we know when we have arrived?

Traditionally, in most health systems the lowest level creating action plans is district, but a strong CHIS can drive reporting and feedback mechanisms to community level to develop action plans at that level. This can be a powerful way to bolster program performance, empower local authority, and instill ownership and accountability.



⁷ WHO, 2017

There are many ways to produce action plans and this will vary from country to country or even community to community, but there are many universal best practice of community action plans to consider, listed below:

- Publicize the action plan to get maximum accountability
 - Publicly post the action plan at a community gathering spot like a health facility, school, water point, traditional ceremony area, etc.
 - Have a website that enables anyone to see community performance. Make sure that all community members know how they can access the website.
 - Ensure that other community organizations such as PTA, religious study groups, social/athletics clubs, women's groups, etc. are also aware of the action plan.
- Turn the action plan into a contract.
 - Make the community members sign the action plan and acknowledge that they understand what needs to happen.
 - Require that the community electronically submit their action plan into the CHIS, with a picture of it or manual entry.

6. Develop CHIS M&E framework

A Monitoring and evaluation (M&E) framework should be developed to monitor and evaluate the action plan, using the same indicators and parameters as the plan.

The M&E framework is a systematic method of organizing and defining indicators, goals, and Baseline values and targets, and is part of the standard operating procedures.

The M&E framework will dictate what indicators stakeholders have available to them and it will form the foundation of conducting performance review and developing action plans.

Below is a template for a community M&E Framework:

M&E Framework - Key Performance Indicators								
Program	Key Indicator	Numerator	Denominator	Baseline (Date)	2020 Target	Data Source	Frequency	Responsible Person
Antenatal Care (ANC)	1st visit coverage	ANC 1 st visits	Expected Pregnancies	72%	80%	CHIS	Monthly	CHW
	LLITN ANC coverage	ANC LLITN distributed	Expected Pregnancies	62%	80%	CHIS	Quarterly	CHW
Delivery and Postnatal Care	Facility delivery rate	Facility Deliveries	Expected Deliveries	43%	55%	CHIS	Monthly	Facility
	PNC coverage	PNC <48 hours	Expected Deliveries	52%	70%	CHIS	Monthly	CHW / Facility
PMTCT	ANC HIV test rate	ANC HIV tested	ANC 1 st visits	72%	90%	HMIS	Monthly	Facility / CHW
EPI	Measles coverage	Measles dose given	Children <1 year	53%	75%	HMIS	Monthly	Facility
Malaria	Malaria test rate	Malaria case treated	RDT performed	47%	70%	CHIS	Quarterly	CHW

Table 1 Template for Community M&E framework

7. Build community Capacity for data use

There are many creative ways to encourage data use at the local level. In this section, we identify some that have been seen to be effective. These include:

Storytelling

Storytelling is a skill that exists in all communities and has been passed through generations. It is a good way to communicate information as telling stories is a basic way for our brains to process and organize information and stories help to connect the “Why,” the core value of what we do to the “What” and “When” of the database.

- Story telling
- Friendly competition
- Empower community champions
- Stimulate local action (rewards and punishments)

The CHIS, and training should be designed to help CHW stakeholders to tell relevant data-related stories to their communities as a major part of feedback. The CHIS should help CHWs to understand the context of the audience, choose an appropriate visual that focuses attention on key issues and then to tell the story. Constructing a story is important and each story should have:

1. The beginning – Introduce the plot and build context
2. The Middle – Spend time here. Talk about “what could be” with the goal of convincing your audience the need for action
3. The End – End with a call to action

Storyboarding is a useful skill that helps to establish structure, find focus of the story and highlights important points

Encourage friendly competition

Comparison between similar reporting units allows competition at the community level and is another way to prompt data use. If CHWs or communities understand specific actions that could be taken to resolve a community health issue, then enabling communities to compete and providing a “prize” to the best performing.

Competition - The Zambia Indoor Residual Spraying Example

The National Malaria Control Center and partners using DHIS2 are able to track in real-time CHW performing indoor residual spraying of insecticides. They then provided a prize to the CHW that sprays the most houses and a prize to the village with the most houses sprayed. Then villages and CHW are encouraged to monitor the performance of their peers in real-time. This type of competitive game has a profound impact for minimal costs.

Empower Community Champions

Identifying “champions” of data use within the communities is essential to sustaining the CHIS. The champions will vary from community to community, but all should be actively connected to the program leads and be given data that can promote the uptake of the program. In most communities, there are traditional or religious leaders that have tremendous influence and are able to speak to a large number of community members on a regular basis. Empowering them with data and specific actions the community could take to improve may be the best way of broadcasting the program to a large number of people.

Community Champions (traditional, religious leaders etc.) should have influence to mandate that community members follow through on actions. Community members that did not comply with the action plan or were found to be the bottlenecks may be punished.

Empowering Community Champions -The Zambia Sanitation Preachers

In Zambia community pastors were given prepared sermons in local language with references to specific Bible passages on the value of community sanitation. These highly respected religious leaders are then able to reach a broad audience of community members.

Stimulate local action

Getting community stakeholder, leaders, and changes agents to do what they planned to do is often a major bottleneck unto itself. If the organization at community level is poor or the CHWs are themselves unresponsive or simply overwhelmed it can be very difficult to get the community to perform the activities they have set out to do. It is critical to instill a sense of accountability and ownership for the outcomes of these activities. Below are some best practices to establish to this:

Local Action - Punishment to Improve Sanitation Access

In Zambia, community members that would not build latrines were made to build latrines at the chief's palace every month until they built one at their own house. The latrines at the Chief's palace could then be available for traditional ceremonies, community meetings, and weddings, that often happen at the chief's palace.

- Phone calls from supervisors to CHWs or community members with responsibilities.
- Track key indicators that show impact of the actions.
- Show key indicators from other communities so they can gauge their performance and create competition.
- Reward the best performing community with a ceremony, certificate, or trophy.
- Produce a district/state newsletter that ranks communities based upon their performance and includes stories about successes and best practices.

Case study: Local use of Information in Indonesia

Indonesia is a densely populated countries with estimated population of 260 million people and a well- developed infrastructure with regional variations. Administratively, the country is divided into 36 provinces and 514 districts. The Ministry of Health (MoH) (also known as Kementerian Kesehatan) is a government institution, which organize public health affairs within the Indonesian government. The basic health care within the country depends highly on the provision of services at the health facilities, which are managed by the districts. Larger health facilities such as public hospitals are managed directly by the hospital service department under the MoH. The involvement of community level to improve health provision service was adopted in Indonesia through the Community Based Health Services (UKBM). This involved the establishment of pustu (Sub health center), posyandu (Integrated Health Post) and poskesdes (Village health post) (Indonesia Health Profile 2014). As is typical in most countries, health data in Indonesia is collected at the lower level mostly in a monthly basis and send to the higher level with most of the decision making and planning are done at the higher level with top down push of regulation and policies.

In its ambition to strengthen the CHIS, the MoH in Indonesia with its stakeholders embarked in a mission to introduce district dashboards as an integrated dissemination platform. The initiative composed of a situation analysis activity where an assessment was conducted to establish the existing infrastructures and create awareness to the district dashboards. The assessment revealed several findings, however this report attempts to document the finding observed in relation to local information use at the lower level.

Data Flow

At the community level, the data collected is central on the mother and child health as these are the two family members who need to be prioritized in health service care. At the health facility, outpatient and inpatient data are collected together with other data from health programs (HIV, TB, Malaria, etc.). Data at the health facilities are usually aggregated and sent to the higher administrative level for processing and analysis. The use of health information system to manage data was observed to be highly used with disparities on the level, which the systems starts. For example, some community posts had access to the health information system for data collection and reporting generating while other communities' posts in other districts were collecting and reporting using paper and books.

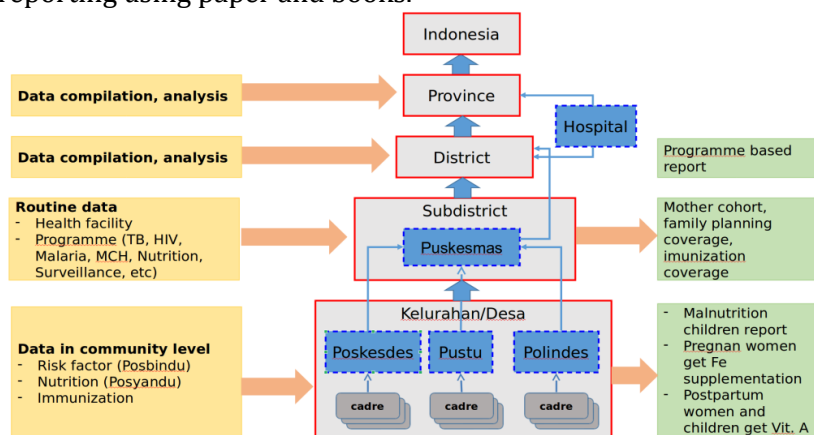


Figure 1: Data Flow from Community level to national level

Local Information Use- Approaches Observed during Assessment

- **Data dissemination strategies:** The health facilities and community level posts had a structured means of documenting the maternal and child cases within the community. Figures 2 & 3 demonstrate the graphical and textual based reports which the facilities use to track maternal cases within their community. The graphical mechanism also categorizes the cases into three cases (i.e. red, green, and yellow). Red cases are those exposed to risk factors, yellow cases have intermediate risk factors, and green cases are low risk. The cases are also positioned within their villages and street locale for easy follow ups.



Figure 2 & 3: Local use of data

- **Monthly meetings in PHC:** Data from health workers in the community level usually are collected by the Program Manager at the end of the month. Regular meetings are conducted where the Program Managers present the coverage by the villages and discuss the health problems in that month and the priorities. More discussions were done on how to improve the achievement and areas of low coverage e.g. immunization coverage.
- **Quarterly meeting with stakeholders:** Quarterly, a cross sectorial meeting is conducted at the district level, Head of health facilities present health data at the current quarter, discuss the role of cross sectorial stakeholders (head of sub-district, head of villages, religious leader, schools, etc.) to improve community service.

Chapter 4: Sustainable CHIS DHIS2 Design and Architecture

Introduction

A sustainable CHIS needs to be well designed to meet the information needs of the relevant stakeholders and flexible enough to evolve with changing information needs of the system. Architectural considerations are important for the CHIS to not be standalone and capable of speaking with other systems. This requires a well-designed data model to guarantee outputs and outcomes of the envisioned CHIS. This chapter discusses considerations to build sound architecture and design for a CHIS using the DHIS2.

Learning Objectives:

- Understand the CHIS design, test, and deploy process.
- Appreciate major considerations in building a technical design for the CHIS using DHIS2.
- Understand aspects to consider when introducing mobile based reporting in CHIS and recognize the most appropriate mobile reporting tool for their use-case.
- Recognize some approaches to design for interoperability of systems with DHIS2 based CHIS.

Step-by-step guidelines for customizing DHIS2 have been well documented and available on DHIS2 website (www.dhis2.org/documentation), along with discussions and recommendations on DHIS2 as system design, database development, data harmonization, analysis, deployment, human resources needed and integration with other systems.

Without repeating existing material, this chapter discusses the specific characteristics of CHIS design. The following chapter concerning the design and architecture of CHIS was written with the following assumptions in mind:

- Person leading the data model design has extensive working knowledge of DHIS data models: aggregated, events, and tracker
- Person leading the roll out has extensive knowledge of the national infrastructure and previous experience on similar roll-outs

CHIS System Design, Develop, Test, and Deploy Process:

The process of designing a CHIS in DHIS2 is composed of a nine step process.

1. Mapping Current State Business Processes

The worst configuration of a CHIS in DHIS2 is typically where the current community health program business processes are simply digitized into DHIS2 without any modifications to optimize them. To avoid this mistake the first step to designing a well-functioning CHIS in DHIS2 to perform a thorough mapping of the current state of the community health program M&E data flow. The principal goal of mapping the current state are to:

1. Harmonize CHW reporting tool into as few as possible (1 or 2).
2. Standardized the harmonized reporting tools across the whole country.
3. Identify what is working well.
4. Identify what is not working well and how it could be improved.

There are essentially two steps to mapping the current business process.

1. Compile all current data collection forms. For each form identify:
 - a. What are the data elements and indicators on this data collection form? Are these in the CHIS M&E framework? If not, should we still capture them?
 - b. Who is responsible for capturing the data and how long does it take complete?
 - c. What is the frequency of the completing the reporting form?
 - d. What are the common mistakes or difficulties with completing the data collection form?
 - e. What job aids or workflow support tools are built into the data collection form? Do they work? Are more needed?
 - f. Map the electronic or paper data flow from point of collection to central level
 - i. What organizational unit is the data captured against?
 - ii. What are the points of aggregation? Who performs the aggregations?
2. Compile all current data analysis/data use tool. For each tool identify:
 - a. What is the level of granularity of the data presented?
 - i. Organizational level of aggregation (i.e. community, facility, district, or national)

- ii. Periodicity level of aggregation (i.e. daily, weekly, monthly, ex.)
- b. What decisions are made or actions performed based on that tool?
- c. What are the problems or issues with the tool?
- d. What could be done to address these problems or issues?

2. Considerations in Translating Business Process to DHIS2

Translating the data flows of community in DHIS2 is the most crucial step in the design process. There are nine critical elements that must be considered. These are:

1. Logic of data aggregation
2. Reporting periods and frequency
3. Organizational hierarchy
4. Vertical health programs vis-à-vis HMIS
5. Partner reporting
6. Outputs: Internal and External
7. Infrastructure considerations
8. Technology considerations for data acquisition = tool selection
9. Security

Logic of Data Aggregation

While designing the aggregation, there could be five typical scenarios

1. **Extending from the existing facility system** to community health workers needs to ensure that the logic for data aggregation stays synchronized within the existing CHIS, in both ways of:
 - a. **CHW Aggregate data reporting:** If aggregate data is being collected at facility level, and CHWs are also submitting aggregate numbers, the summed value of facility and CHW needs to represent a meaningful figure. For example:
 - i. Case 1 – CHWs is solely responsible for reporting on all pregnant women registered for ANC in the area. This data element should be reported by all

CHWs and its aggregate should be taken as facility reported number: i.e.
Number of pregnant women registered for ANC at facility = CHW1+ CHW2 ...

- ii. Case 2 - In case CHWs are to report on this data element of community services and the facility is also providing similar services, then the total count of services provided is the sum of CHWs + facility: i.e. Number of pregnant women registered for ANC = facility + CHW1+ CHW2 ...

Note on keeping CHW and facility data sets separate:

It is generally considered a best practice to have separate data sets for facilities and CHWs. Meaning, the CHW should not be submitting data via the facility data set. This is to minimize potential for double counting of patient between facility and CHW, and it enables better performance monitoring of CHWs and facilities.

- b. **Case based (tracker) data reporting where case location is not important:** In case aggregate data is being collected at facility and CHWs are to collect name/case based data for the same, in such case aggregation of all case/names should be done at facility level. Meaning cases should be enrolled as tracked entities against the facility even if CHWs are capturing the data.
For example, if there are 10 records of individual ANC cases captured by the CHW in the ANC tracker program for one month, then the facility value for ANC cases is 10. In DHIS2, this process of aggregation is automated.

An example organizational hierarchy:

|__ Facility (Org unit level)
 ANC Case 1 (Tracked entity)
 ANC Case 2 (Tracked entity)
 ANC Case 3
 ANC Case 4

- c. **Case based (tracker) data reporting where case location is important:** In situations where the case location is important (i.e. village, community, etc) for epidemiological disease control (ex: malaria active case detection) or door-to-door outreach services (ex: immunization campaigns) it may be best for the case to be enrolled in the tracker program against the lowest level organizational unit that reflects their location of habitation, where they live. In this situation aggregated facility reporting will typically be a separate data set and only capture aggregated cases that happen just at the facility. Often in the case of epidemiological control programs facilities will also be performing individual case reporting.
For example, in a malaria program where CHW are performing active case detection

to villages of people who test positive for malaria the individual case should be enrolled against the village. This allows CHWs to know the location of cases for active case detection. Example organizational hierarchy below:

- |__ Facility (Org unit level)
 - |__ Village (Org unit level)
 - Malaria Case 1 (Tracked entity)
 - Malaria Case 2 (Tracked entity)
 - Malaria Case 2

- d. **Case based (tracker) data reporting where case association with CHW is important:** In situations where it is important to associate specific cases with a CHW that is providing services (ex: health education program) the case may be enrolled into the tracker program against the CHW which is actually configured as an organizational unit. To accommodate for high CHW turnover it is very important that the organizational unit for the CHW represents the CHW's position and not necessarily the specific name of the CHW, meaning the actual CHW working as an organizational unit can change without having to change the name of the organizational unit itself.

For example, in a HIV/AIDs education program where a CHW will provide young women with STI education, contraceptives, and counseling and testing it may be very important to associate an individual case with a specific CHW. The example organizational hierarchy is below:

- |__ Facility (Org unit level)
 - |__ CHW 1 (org unit level)
 - Girl 1 (Tracked entity)
 - Girl 2
 - |__ CHW 2
 - Girl 3 (tracked entity)

- e. **Designing a new CHIS** when it is not required to feed into an existing facility HIS, then it leaves space for the defining aggregation logic to be relatively independent of the need to synchronize with bringing aggregation to the facility. An example of this could be a CHIS being set up from scratch for a specific campaign or event, then this is relatively independent of the aggregation logic of the facility.

Reporting Periods/Frequency

Important when the reporting period for CHWs is different from the reporting period at the next level which is the facility. The CHW reporting should be at the same frequency or more frequent than facility reporting. Facility reporting should not be more frequent than CHW. For example:

CHW data element:

- Number of mosquito bed nets distributed today (daily reporting)
- Number of mosquito bed nets distributed this week (weekly reporting)

Facility data element:

- Number of mosquito bed nets distributed this month

In the first case (a) 30 daily reports will make monthly aggregate for bed nets distributed: Total nets distributed = Facility (Month) + CHW Day 1 + CHW Day 2 + CHW Day 30

In the second case (b) 4 weekly reports will make the monthly aggregate for bed nets distributed. Total nets distributed = Facility (Month) + Week 1 + CHW week 2 + CHW week 4

If the reporting periodicity is same for CHW and facility, then we must ensure that the aggregation logics must be matched, as discussed above.

Organization Units and Hierarchy

Another important consideration is how to add CHWs in the reporting hierarchy. Given the scale and number of CHWs, this becomes one of the fundamental decisions in CHIS design.

A organizational tree represents the administrative or geographical division located inside a hierarchy. For example:

```
|__ Country, HQ [L1]
    |__ Province, district (administrative unit) [L2]
        |__ Facility, clinic, hospital (providing services) [L3]
```

In this example above the organizational unit hierarchy follows the administrative and geographical division. The hierarchy is then divided into organizational units such as a province, district, or individual facility. Organizational units drive: data entry, security: capture and outputs, and analytics: data is aggregated/rolled up through the hierarchy (**Gold Rule: Aggregation should always be meaningful**).

The when properly configured the organizational hierarchy should enable the user to know:

1. **Where** the data is associated with (i.e. individual patient, household, village, health facility, community health posts, etc.).
2. **What** the data means. Is the data able to be aggregated up the hierarchy in a meaningful way? Is data captured at that organizational unit meaningful to that level?
3. **When** is the data captured. The period assigned to the data set or the program should be aggregable up the hierarchy to larger and larger periods. For example, you can not have a monthly reported data element at community level aggregating into a weekly data element

at its parent facility.

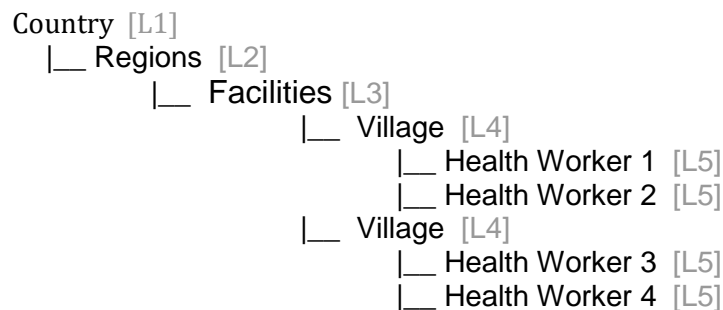
4. **Who** captures the data and provides the services. This is especially important for community health programs where we need to know the actions and services delivered by individual CHWs. This is possible to configure in the hierarchy.

Every hierarchy should pass the CHIS hierarchy test:

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
2. Does the organizational hierarchy enable security and access controls?
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)

Based on the empirical experiences from various country setting, we understand that could be found the following organizational hierarchy scenarios:

Case 1 - One or more CHW work in specific villages (BUT NOT in other villages).



Does it pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Yes, data can be captured at Health Worker level [L5], which is only present under one Village [L4]. This represents that data was collected by the specific Health Worker and that it belongs to one specific Village unequivocally.
2. Does the organizational hierarchy enable security and access controls?
Yes, every health worker will be assigned to its own organization unit, which is the lowest level. It implies that s/he will be able to see only data that him/herself has collected.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
Yes, aggregation at each level will accumulate data into health worker, villages, facilities, regions...

4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
Yes, data can always be associated to the level where it was captured, which in this case is the CHW.

Yes, it passes the test.

Case 2 - CHW works in several villages/communities. CHWs DO NOT share villages.

Country [L1]
 |__ Regions [L2]
 |__ Facilities [L3]
 |__ Health Worker 1 [L4]
 |__ Village A HW1 [L5]
 |__ Village B HW1 [L5]

 |__ Health Worker 2 [L4]
 |__ Village C HW2 [L5]
 |__ Village D HW2 [L5]

Does it pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Yes, data can be captured at Village level [L5], which is only present under one Health Worker [L4]. This represents that data was collected in the specific Village and that it belongs to one specific Health Worker unequivocally.
2. Does the organizational hierarchy enable security and access controls?
Yes, every health worker will be assigned to its own organization unit [L4], being able to see data that belongs to that organization unit and its children [L5]. In this case children are Villages in which the health worker works, hence, s/he will be able to access only to data that him/herself has collected.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
Yes, aggregation at each level will accumulate data into village, health worker, facilities, regions...
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
Yes, data can always be associated to the Health Worker level [L4].

Yes, it passes the test on the web or Android, but does not work for SMS data capture.

Case 3 – CHW works in more than one village/community

Country [L1]
 |___ Regions [L2]
 |___ Facilities [L3]
 |___ Village A [L4]
 |___ Health Worker 1 [L5]
 |___ Health Worker 2 V-A [L5]
 |___ Village B [L4]
 |___ Health Worker 2 V-B [L5]
 |___ Health Worker 3 [L5]

Does it pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Yes, data can be captured at Health Worker level [L5], which is under one or more Villages [L4]. This represents that data was collected by the specific Health Worker and that it belongs to one specific Village unequivocally.
2. Does the organizational hierarchy enable security and access controls?
Yes, every health worker will be assigned to its own organization unit, which is the lowest level. It implies that s/he will be able to see only data that him/herself has collected.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
No, we can aggregate by village, facility, region... , however, due to the repetition of health workers in different villages (Health Worker 2 in the example) we cannot aggregate data by Health Worker using the hierarchy.
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
Yes, data can always be associated to the Health Worker level [L5].

No, it does not pass the test because CHW work cannot be aggregated because of repeated names. This will also not work for SMS.

Case 4 - CHW goes to more than one village.

Country [L1]
 |___ Regions [L2]
 |___ Facilities [L3]
 |___ Health Worker 1 [L4]
 |___ Village A HW1 [L5]
 |___ Village B HW1 [L5]

 |___ Health Worker 2 [L4]
 |___ Village B HW2 [L5]

Does this pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Yes, data can be captured at Village level [L5], which is only under the Health Worker [L4]. This represents that data was collected in the specific Village and that it belongs to one specific Health Worker unequivocally.
2. Does the organizational hierarchy enable security and access controls?
Yes, every health worker will be assigned to its own organization unit [L4], being able to see data that belongs to that organization unit and its children [L5]. In this case children are Villages in which the health worker works, hence, s/he will be able to access only to data that him/herself has collected.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
No, aggregation at each level will accumulate data into health worker, facilities, regions... but we cannot aggregate data by Village using the hierarchy (see Village B).
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
Yes, data can always be associated to the Health Worker level [L4].

No, it does not pass the test. Village data cannot be aggregated. This will also not work for SMS.

Case 5 - CHW is assigned to a village as a user but not represented in the hierarchy.

Country [L1]
|___ Regions [L2]
 |___ Facilities [L3]
 |___ Village A [L4]
 |___ Village B [L4]

Does this pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Partially, data can be captured at Village level [L4] but there is no organization unit to relate to the Health Worker.
2. Does the organizational hierarchy enable security and access controls?
Partially, as long as the Health Worker is allowed to access all data in the Village to which s/he is assigned.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
Partially, as long as we don't need aggregation by Health Worker. Aggregation at each level will accumulate data into villages, facilities, regions...
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
No, CHW is not present in the Hierarchy and we cannot filter data by Health Worker using the

hierarchy.

Partially (first 3 questions but not 4). The work of a single CHW is not defined in the hierarchy and will not be able to be viewed in the analytics. Custom analytics could be made to produce this, but these analytics will require significant development and maintenance.

Case 6 - Community data is submitted as aggregate at facility or higher level.

Country [L1]

|___ Regions [L2]

|___ Facilities [L3] ← Aggregated village data

Does this pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
No, we cannot register data against the community or the village.
2. Does the organizational hierarchy enable security and access controls?
No, all village and community data will be accessible from all users assigned to the Facility level [L3]
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
No, aggregation at each level will start accumulating at facility level, we cannot have data aggregated by village or community.
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
No, CHW is not present in the Hierarchy and we cannot filter data by Health Worker using the hierarchy.

No, it does not pass the test. The data for an individual community cannot be disaggregated.

Case 7 - Representing a CHW as Category Option

In small CHIS where there are less than 250 CHWs it is possible to use configure CHWs as category options. This configuration will satisfy the test. The graphic below illustrates how this option can associate a village with many CHWs:

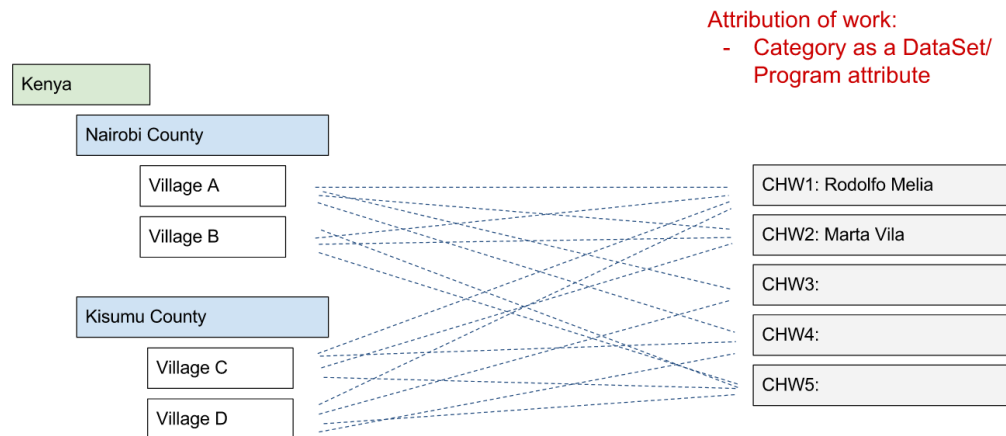


Figure 4.1: Relationship possibilities when CHWs are represented by category options.

Does this pass the test?

1. Does it enable data to be captured against an organizational unit that represents where and who the data is associated?
Yes, data can be captured at Village level [L4] and we can relate it to the Health Worker using the Health Worker Category as a filter.
2. Does the organizational hierarchy enable security and access controls?
Partially, if the Health Worker is allowed to access all data in the Village to which s/he is assigned.
3. Does the aggregation produce the desired outputs: indicators, analytics, dashboards, maps, etc.
Yes, aggregation at each level will accumulate data into village, facilities, regions... And data can be discriminated by Health Worker by using the Category as a filter.
4. Is the data able to be associated with a single CHW? (Not necessary, but highly recommended)
Yes, data is linked to the Health Worker through the Category Option selected in Data Entry.

Yes, it passes the test. However, **this configuration is not scalable for large CHIS with many CHWs**. It also is not currently enabled for SMS or Android Data Capture without a custom application.

Keeping the Organizational Hierarchy Clean

DHIS2 does not support multiple organizational hierarchies. To enable data mining at scale each level should represent a single type of reporting unit. Different types of reporting units at a single level make it virtually impossible to perform analytics in DHIS2. For example:

BAD	GOOD
<ul style="list-style-type: none"> __ Facility [Org unit level] __ CHW 1 [Org unit level] __ Village 1 __ CHW 2 __ Village 2 __ Borehole 1 __ Borehole 2 __ Village 3 __ Village 4 __ Borehole 3 __ Borehole 4 __ Borehole 5	<ul style="list-style-type: none"> __ Facility [Org unit level] __ CHW 1 [Org unit level]<ul style="list-style-type: none"> __ Village 1<ul style="list-style-type: none"> __ Borehole 1 __ Borehole 2 __ Village 2<ul style="list-style-type: none"> __ Borehole 3 __ CHW 2<ul style="list-style-type: none"> __ Village 3<ul style="list-style-type: none"> __ Borehole 5 __ Borehole 6 __ Village 4

Figure 4.2: Bad vs. Good Ways to Structure Organizational Units

WARNING: If CHWs are included in the hierarchy it is best practice to name the organizational unit with the position and not the actual name of the CHW. For example, if Peter Banda is a CHW working as a CHW under Choma Health Facility; his organizational unit would be named, “Ndola CHW 01,” and not “Peter Banda CHW.” In this example if Peter leaves the role of a CHW then a new CHW can be trained to replace him and can then fill the organizational unit Choma CHW 01. If 20% of CHWs need to be replaced annually and the name of the CHW is the name of the organizational unit they represent then 20% of the CHIS organizational unit will have to be changed annually.

Scale - How big is too big for the hierarchy?

If CHWs or individual communities are included in the hierarchy and the CHIS is taken to national scale it is very likely that the CHIS/HMIS will contain tens of thousands of organizational units. As long as the organization units are well defined and organized it is very possible to have a huge number of organizational units. For example, the Zambia CHIS contains nearly 45,000 organizational units representing all villages in the country.

In dealing with the above multiplicity of conditions presented, CHW can be created as an organization unit in DHIS2 or as a user for the org unit. In each case, it is important to consider and evaluate vis-à-vis the complete organization hierarchy for the country or project, to ensure the hierarchy is manageable, typically not going beyond 7-8 levels.

Vertical Health Program vis-à-vis HMIS

In case CHWs are being introduced to report on health program specific data (malaria, HIV, infant feeding habits, contraception counselling, etc.), and this data needs to be included in the facility reporting system / routine HMIS, in such case additions need to be made in the facility dataset reflected in the DHIS2.

Partner Reporting

In case CHWs are being introduced to report on specific projects being run by a partner (and not the routine facility HIS), in such a case project specific data sets and data flows should be defined and followed, which would be independent of the routine HIS.

Outputs: Internal and External

Dashboards, visualizations, internal reports, donor reports, other agencies reports - One of the crucial element running the CHIS system design is the expected outputs and analytics from the system. Though this is a general rule of thumb in the design of any information system at any level, but becomes a crucial consideration in a CHIS when the scale of data is very large and has immediate implications on the workload of a CHW.

Infrastructure Considerations

- **Backend Infrastructure & Hosting- Local vs Cloud DHIS:** Sizing- Server hosting becomes crucial in case of CHIS if mobile based reporting using SMS is to be used. SMS based reporting will not work if the server is hosting on a cloud outside the country, as it will involve international messaging. As such, it is in such the server must hosting within the country.
- **SMS Gateway Setup and Maintenance:** To enable SMS based reporting, integration with SMS gateway is a primary requirement. Local/country based gateway providers should be contacted and APIs checked for enabling integration.
- **Toll Free vs. User Paid:** In case of making SMS' free for the sender/CHW, mobile service provider or gateway service provider with toll free subscription is required for integration. In this case, the cost needs to be borne by the MoH centrally and provided toll free for the CHWs
- **Airtime Management & Reimbursement to Workers:** In case of using mobile based reporting for CHWs (SMS or internet based), use and management of airtime is to be allocated for reporting planned. An effective system of reimbursement for CHWs must be defined, as if CHWs do not receive the money in time for what they have spent, they could resist the use of the phone.

- **Assessing Network Connectivity and Power Supply:** While initiating reporting from CHWs using mobile phone, an assessment of network coverage needs to be considered, especially in rural and border areas. The timings of internet supply is often variable and needs to be considered in defining reporting routines. Often, CHWs must deal with intermittent power supply which impedes reporting and also the charging of their phones and other devices.
- **Device Ownership and Usage:**
 - Right at the time of giving the devices (phones, tablets, etc.) to CHWs, it is important to clarify the 'ownership' of the devices along with responsibilities of maintenance, upkeep and loss. There is often confusion on whether the device is owned by the institution or the individual, and what the respective responsibilities are.
 - However, if the CHWs are expected to use personal devices for reporting, it is all the more important to clarify issues on airtime/data cost along with the reimbursement mechanism.

Technology Considerations for Data Acquisition I.e. Tool Selection

	Paper	SMS/USSD	Simple phones	Smart Phones	3rd party integration	Computers
When to use it	Always an option, especially when digitizing data is not a priority	Digitizing data at source is priority, reporting burden is very low, mobile internet is not available or phones are not able to be provided.	Digitizing data at source is priority, higher reporting burden, CHWs have a low ability to use smart phones, and mobile internet is available	Digitizing data at source is priority, reporting, mobile internet is available, and CHWs are able to use smartphones.	Digitizing data at source is priority & a data collection solution is implemented	Digitizing data depending on the level of computer availability
Scalability (geography, service, users, domains)	Scalable across all three elements	Technically east to scale, while training of users will required when adding new elements	Easy to scale geography & users, but not in terms of increasing reporting requirements	Easy to scale in terms of geography, users, and increasing data	Managing integration is an ongoing task; Scaling across users is easiest, while scaling on services & domain will need to be built within the integration approach	Easy to scale across all 3
Data Granularity	Possible to design for deeper dis-aggregation	Not advised for very disaggregate data or long forms	Not advised for very disaggregate data or multistage tracker programs.	Possible to design for deeper dis-aggregation and complex tracker programs.	Integration approach should build in all capturing whatever is reported	Possible to design for deeper disaggregation
Sustainability (Initial cost, ongoing cost)	Initial & ongoing printing; Training cost	Low cost solution; but at extremely high-volume of SMS costs can become significant Training is a cost Reporting incentives to CHWs	Initial & ongoing training cost; Procurement Ongoing internet costs Reporting incentives to CHWs	Initial & ongoing training costs; Procurement Ongoing internet costs Reporting incentives to CHWs	Integration of systems is a big cost	Initial training costs; Ongoing hardware maintenance
Human Capacity	Needs training on forms & logic of forms vs. registers	Needs training on forms & logic of SMS. Significant issues can be expected with short codes for SMS and timeout errors for USSD.	Training on forms, training on reporting using the application. CHWs should be able to troubleshoot basic application and phone problems	Training on forms, training on reporting using application. CHWs need to be able to troubleshoot basic application and phone problems	Training of CHWs is not required, as the integration is happening at server level	Training on forms: Training on the logic of forms vs. registers

Figure 4.3: Conceptualizing Data Acquisition

Security

DHIS2 is inherently a very secure software. Furthermore, many countries have strict laws on data security especially in terms of patient level data. Make sure you are aware of all national laws and policies around data security prior to developing a CHIS in DHIS2. As it is applied to CHIS in DHIS2 generally there are several considerations:

- If CHWs are tracking individual patients ensure that CHWs are only able to see the patients that are assigned to them.
- Ensure users are only able to see data as it applies to their role, actions, and decisions. Do not give users access to more data than they need.
- Access to data should always be protected by at least one level of access control. (i.e. password, pin code, etc) Simply swiping a mobile device to “unlock” it is not considered access control.
- Interception of unencrypted data via mobile signals is possible for SMS, USSD and J2ME. There are measures possible to prevent this. Please contact the core DHIS2 team for more information.
- Servers should be in a secure setting.
- Users should not be given more access to DHIS2 applications or features than what is necessary based on their duties.
- Sharing and privacy settings in DHIS2 can significantly increase security but must be carefully managed. For more information please see the DHIS2 User Manual.

3. Develop Mock-Ups and Prototypes of Analytics Outputs (Feedback Mechanisms)

All information systems should be designed for data use. An architect does not start constructing a building before he knows exactly what it will look like and the features it will have by making a blueprint and a mockup or prototype. Likewise, for a CHIS prior to system configuration all of the stakeholder analytics, feedback mechanisms, and dashboards must be designed and have mockups and prototypes.

In chapter two, these guidelines introduced the process for identifying stakeholders and in chapter three the process for selecting a feedback mechanisms for stakeholders was covered. Now that you know the data-use framework (who needs data and how it needs to be presented) the final step is to create mockups and prototypes of what those feedback mechanisms actually will look like.

A mockup is a scale model of what the feedback mechanisms looks like. For example, below is a mockup of a district ICCM dashboard. This mockup was developed prior to the configuration of the data base.



Figure 4.4: Prototype of a CHIS District Dashboard

The mockup is then used to:

- Ensure all data elements and indicators necessary for the stakeholders is being included in the system.
- All indicators are able to be presented in the analytics shown considering the degree of granularity of the analytics. For example, the mockup of the bar charts above is weekly counts at community health post (CHP) level. That means we are able to calculate those indicators given the data we have available at the frequency desired (weekly) at CHP level. Alternatively, if we only had the data elements available to create that indicator captured monthly at facility level we would not be able to calculate the indicator to a sufficient degree of granularity as what is required (weekly and at CHP level).
- Guide the actual development of the live analytics and feedback mechanisms.

4. Drawing CHIS Data Flow in DHIS2

The goals of this process are:

1. Develop a clear idea of the desired state of the CHIS in DHIS2
2. Formulate how to harmonize parallel or redundant existing data flows
3. Resolve overly burdensome or unclear standard operating procedures
4. Formulate how to reconcile multiple reporting hierarchies into one.
5. Identify job aids or workflow support that could be incorporated into the DHIS2 data capture tools.
6. Develop new data flow diagram/wireframe

5. Developing Reporting Guidelines

From the assessment and system design chapters, data flow from beginning to end is clearly defined. To develop data capture guidelines, start with the first event of the data flow and move upwards including all events, whether they utilize paper, mobile applications, or computers. **For each point at which data is captured or transmitted the exact process and responsibilities for how that event is achieved needs to be defined.**

For each step in the data flow define each event in the format in Figure 4.4.

Event:	<i>Event name</i>
Dataset/Reporting tool(s):	<i>The name of the data set or reporting tool(s)</i>
Modality of transmission or entry:	<i>Name the application that is used and on what device or outline the paper trail to data entry. (Remove this if the event is only data capture and not transmission or entry into DHIS2)</i>
Responsible person:	<i>This is the person/role that is ultimately responsible for the completion of this event.</i>
Periodicity:	<i>The frequency with which this event takes place. For example, "monthly," "weekly," or "quarterly"</i>
Event deadline:	<i>When the event should be completed. For example, "The 10th of the current month," "By 17:00 on Tuesday of the Current Week", or "By the 5th of the first month in the new quarter."</i>

Data transmission or entry incentive	<i>What is the reporting incentive and how is the incentive delivered? (if applicable):</i>
Data quality checks performed:	<i>Outline what are the checks that are performed during this event. This does not include the quality checks performed after the data has been submitted.</i>
Access to reporting tools	<i>: How are necessary reporting tools (e.g. registries, reporting forms, applications, phones, etc.) stored, accessed, and replenished?</i>
Narrative:	<i>The narrative describes the event in long text. It is very specific. This could include best practices, instructions on completing the paper registries, instructions for ordering or making new registries, instructions for using mobile phones, etc. Think practically on what could form bottlenecks for data submission.</i>

Figure 4.5: Data Capture SOPs

Frequent Questions on Data Capture Guidelines

What if my CHIS has a paper trail from CHW or community levels to facility or district level?

Some CHIS do not have data submission at CHW or community level. In this event, paper records or registries are produced at community level and then physically transported to facilities or higher levels. It is important for the protocol to include *all* CHIS activities, even if they are paper trail, as the timeliness and quality of one reporting stage directly impacts the success of the next.

Can the data capture guidelines be made to follow the roles of CHIS users?

Yes. You may be more use to seeing SOPs based on programmatic roles, while these data capture guidelines are based on the data flow. Many countries and programs incorporate the data capture guidelines into a larger programmatic SOP organized by stakeholder roles/titles (e.g. CHW, CHW Supervisor, District Health Officer, etc). The data capture guidelines can be incorporated into this format as long as a sufficient level of detail is provided for each event performed by the stakeholder.

What if my CHIS uses paperless patient registries at CHW level?

In some CHIS, CHWs may be tracking individual patients completely paperless via DHIS2 tracker application or similar application on an android or feature phone. In this event, there will not be a paper registry where information is initially recorded and there will be no production of periodic, aggregate reports. In these cases, typically it is best to consider the patient-CHW interaction and the

capturing the patient data as a single event to be included in the data capture guidelines. Keep these factors in mind:

- In some cases, tracker use significantly increases the reporting burden of the CHW, so in high patient volume settings patient tracker may be too burdensome. However, configured as job aid for the CHW employing program rules and skip logic using the tracker application can reduce the reporting burden, increase data quality, and support CHW service delivery.
- Tracker will provide much more granular data and has shown to be appropriate at community level in disease elimination, epidemic control, expanded immunization programs, referral tracking, and neonate tracking.
- At community level, tracker should only be used if there is a targeted action requiring data from a single tracked entity. The specific response to that data should also be defined in the data capture guidelines.

6. Develop CHIS Meta-Data Dictionary

A meta-data dictionary is used to describe all of the meta-data attributes. The enables that system users and administrators understand the meaning and purpose of each meta-data item.

For more information on how to develop a DHIS2 meta-data dictionary please see: the Logical Outcomes website (<http://logicaloutcomes.net/using-a-meta-data-dictionary/>)

7. Perform DHIS2 Configuration

The final step after compiling a meta-data dictionary to actually perform DHIS2 system configuration. Step-by-step guidelines for configuration of DHIS2 have been well documented and available on DHIS2 website (www.dhis2.org/documentation).

8. Populate Prototype Database and Test

Thoroughly testing a CHIS is critical prior to deployment. There are several goals of testing:

- Test indicator calculation - mock or legacy data should be imported into the prototype database to test if all the indicator calculations are correct.
- Use acceptance (analytics) - to test if all stakeholders are satisfied with the analytics, dashboards, and feedback mechanisms user experience.
- User acceptance (data entry) - to test if all stakeholder performing data entry are satisfied with the data entry user experience. It is also necessary to test if any skip logic, validations, alerts, workflow support, or job aids are working and users are satisfied.
- Bug capture and reporting. With virtually all new database there will be glitches or bugs. It

you are thoroughly testing your database then most of these bugs will be noticed. It is best to resolve all bugs before you deploy your CHIS to scale. Bugs can be reported DHIS2 JIRA (<http://jira.dhis2.org>)

Have a “sandbox” database for testing:

It is a very good idea to have a clone of your production database to perform testing in. Any change you make to your production database should be tested first in your “sandbox” prior to being done in your production.

DHIS2 version updates:

It is best to keep up to date on versions of DHIS2. There is a new version of DHIS2 released every six months. Typically, it is best to keep one or two versions behind the latest releases. If you do not keep up with the releases then you may find it difficult to find people to support your version of DHIS2 when you do have serious problems. Upgrades need to be planned well in advance for. The same testing process outlined here for a new database can be employed when you have upgraded. Please remember that something almost always breaks or stops working when you upgrade a large production database so please be plan and test thoroughly before upgrading.

9. Deploy

There are many ways to deploy a CHIS. The deployment strategy is dependent on many things like training strategy, scale of the CHIS, etc. In general, there are two deployment strategies, “The big bang and a phased roll-out. Both strategies tend to ultimately cost the same amount of resources.

1. “The Big Bang” - This deployment strategy is often used in situations where development, testing, and initial training of users can or must be achieved quickly. This typically a CHIS small in scope with a lot of implementation support staff working initially on it. This strategy is preferred in situations where rapid crisis response is necessary like in a disease outbreak where community data is needed for epidemic control. Because of the rushed nature of this strategy, there will be technical issues that are identified post deployment that may hinder system use.
2. Phased Roll-out - This is the most typical approach to deployment of the CHIS where deployment is done region by region. Depending on the scale of the CHIS this may take years, but it will result in a much more stable, well tested CHIS.

Tiered Technical Support to CHISs

To provide support to the CHIS, the technical central unit must be able to capture, catalogue, and process all support requests, system errors, and flaws (also known as “bugs”). In most large information systems, a multi-tiered support system is required. Multi-tiered means simple issues are able to be addressed by lower level supervisors and more difficult or complex issues are moves up the tiers until they reach someone who is able to address them. Below is model of a CHIS tiered support system with an example issue that that tier may be expected to address.

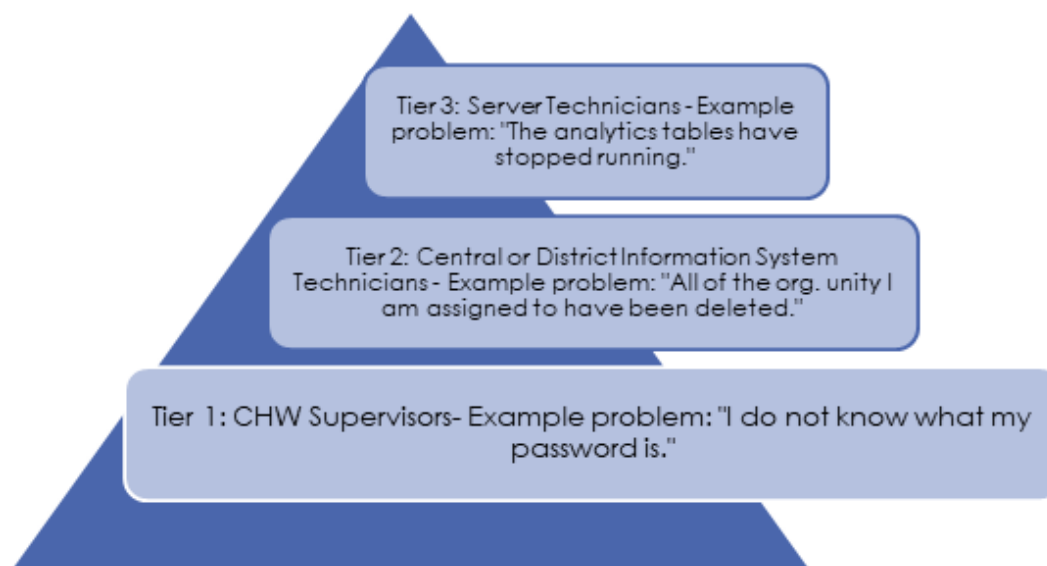


Figure 4.6: Model of a CHIS Tier Support System

The vast majority of issues requiring support will be simple issues that should be able to be addressed by the first tier of support. Often this first tier is the CHW’s direct supervisors. This tier should be able to address simple hardware and software issues. If the CHW supervisors cannot resolve the issue that will then have to escalate it to a higher tier.

Tier Two requests are addressed by are often addressed by district level or sub-national information systems officers, who are trained to manage system configuration issues and all advanced issues around the user interface, data imports and exports.

Tier Three requests are typically addressed by central level IT support persons. They should be able to respond to any back-end maintenance requests.

Many countries with very large-scale CHIS will have more tiers than three. While, smaller programs may have fewer. Regardless of the number of tiers, it is essential that support requests can be submitted by any user directly through either their DHIS2 instance, phone or by email. Using the messaging application, a user may message to the ‘Central Technical Support’ user group for their sub-national technical support group depending on how the tiers are composed. The “Technical Support” user group is typically made up of central level technicians. Similarly, they could call or email the technical team directly. Once a request for support has been sent to the technical team

should acknowledge receipt of the request within a short time period like 12 hours

Best Practice

Have a 24-hour technical support hotline and support desk user group in DHIS2 managed by central level HMIS support staff. When users of the system have difficulties using the system if they feel that they have no avenue to receive technical support they may ultimately quite using the system. A 24-hour, toll free technical support hotline and support desk can give users a sense of support and resolve issues on the fly. Additionally, for CHIS users with a computer they can use the DHIS2 messenger to send support requests to the support desk user group. Below is an example of South Africa's guide to using their support desk build into DHIS2 messenger.

Write new message

Organisation Unit Selection

To org unit

To user: Support Helpdesk (1)

Subject: NC Namakwa District - Any subject Related to webDHIS (2)

Text: Dear Helpdesk support
May you please assist in the following (Any problem you may need help with concerning webDHIS)
Regards
Therima Davids (3)

Send Discard (4)

The **Write new message** window displays where you must compose your message.

! Please do not select OrgUnits.

1. In the **To user** box type in "Help". As you are typing, various options will display in the dropdown. Click on **Support Helpdesk**.
2. Type in the **Subject** of your message in the format **Location – Helpdesk question**.
NOTE:
 - The subject must contain the prefix of your province e.g. EC, FS, GP, NW, NC.
 - If you're lodging a question for districts and sub-districts include the full name of your district, sub-district and facility e.g. NC, Namakwa District, Nama Khoi Sub-district, Komaggas Clinic.
3. Type in your question in the **Text** box as shown in the image above.
4. Click on **Send**.

Some Design Guidelines for More Sustainable CHIS

In this section, we discuss some design guidelines to develop more sustainable CHIS. A running theme across these guidelines is our effort to shift the focus from a more supply side approach to one that is more grounded in a demand side based thinking that is human-centered and focused to reducing the data burden of CHWs and adding value to their everyday work. These design guidelines include:

1. Build the CHIS based on a participatory design approach
2. Have an architectural thinking to design at the core
3. Design CHIS based on an overarching framework of data governance and standards
4. Design CHIS to support local action rather than enabling more control and surveillance from the top
5. Build CHIS based on existing infrastructure conditions, that necessarily must be hybrid in nature
6. Plan for incremental evolution of the systems, and not seek to design based on a “clean slate” approach

These guidelines are now discussed in some greater detail.

Participatory Design Approach

A participatory design approach assumes that the end users are not just passive providers of data and recipients of systems that are “designed from nowhere,” but are actively engaged in their co-construction together with the design and development teams. While traditionally, various techniques have been described to enable participatory design (storytelling, focus groups, interviews, mock ups, etc.), these techniques have been developed based on assumption of co-location, single systems, largely situated in single organizational settings. However, the diverse settings of CHIS in terms of scale, prior experience with computerization, levels of literacy and extreme diversity, require these techniques to be sensitively adapted and extended.

The advent of web-based systems implies that the designers and developers become more geographically and culturally remote from the users, and further challenges the use of traditional participatory design techniques. Appropriate approaches to enable participatory design need to be customized to existing contextual conditions, which may also involve the use of online methods coupled with some co-located means. This is of course easier said than done, given some of the challenges discussed, but needs to become an integral part of the project planning process.

Case Study: Participatory Design in India

A HISP project in rural India ongoing is aimed at building patient centric systems for primary health care. This project was carried out by a collaboration of the HISP team from the University of Oslo and India, and a public health team from the Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh, India. This collaboration enabled the creation of multi-disciplinary expertise required for system design.

To ensure the active involvement of the CHWs a “living lab” was established in one rural clinic, which was a designated study area for PGIMER. The living lab has become a site for the design study team to work with the CHWs and medical doctors to understand their everyday challenges and needs. By situating the living lab in the clinic, the CHWs also developed a strong ownership of the system, as they saw themselves integral to its process of evolution, and both sides could mutually understand the perspective of the other. The developer team could gain insights into the world of the CHW which they otherwise would never have obtained through the use of traditional design approaches.

For example, during a discussion the CHWs said they wanted the system to generate the primary registers. This was a novel insight, as the assumed approach took the primary registers as a given to the situation, and started the design based on existing data collection formats. This insight structured the design of the system in a novel way, which when completed provided more value and increased job satisfaction to the CHWs.

The important takeaway from this excerpt is the need to develop approaches to design in context which represents the world of work of the CHW. The living lab is one such approach, and there will surely be others. In different contexts, appropriate approaches will need to be constructed to enable these processes of contextualized design.

Architectural Thinking at the Core of Design

Architectural thinking in simple terms implies a systems and holistic thinking which seeks to ensure that the different existing systems can “speak with each other” in a relatively seamless manner. This speaking with each other is not just a technical problem requiring technical solutions, but involves complex institutional challenges of getting health programs and people to speak with each other. This undoubtedly is more challenging than building the technical solutions, and needs to come as the primary effort.

Another characteristic of the architectural thinking is that the system development is seen as a long term and evolutionary approach, and thus decisions should not be taken based on a static and one time thinking. An implication here is not to take decisions at one point which will prevent you from taking other choices in the future which may become available and be preferred.

For example, taking the decision to use a proprietary platform may prevent you from building interoperability with other systems in the future. This requires a forward-thinking approach, which seeks to predict future informational requirements, and also be on top with technological trends, and what kind of new opportunities that come up in the future. The system design should ensure we are able to keep on top of these challenges and are able to leverage on the opportunities when they do come up.

Case Study: Collaborative Design in the Living Lab

Taking another example from the living lab project, a starting point of the design was to first understand the different systems the CHWs were currently engaged with.

CHWs were dealing with 9 different systems (computer and paper based) which involved 22 primary registers, and 30 monthly reports, with a lot of overlaps and redundancies between them. A process of mapping the redundancies listed out all the data elements in these registers, identifying the existing duplicates and creating a consolidated list of all the non-repeating data elements. This list was then used to develop the metadata definitions to be customized in the DHIS2 database. Further, this metadata was then adapted to the national MDDS (Metadata and Data Standards) to ensure scalability. In this way, linkages between the different systems were identified, ensuring linkages at the data collection level, which then enabled generation of the primary registers, the main concern of the CHWs.

This process was carried out jointly by CHWs and the system designers, who as a team could identify unwanted or unused elements which would not have been possible by the designers alone. This process also ensured that the designed CHIS would be integrated with the everyday work practices of the CHWs, was primarily aimed at providing added value to CHWs through reducing their work burden. Further, it was designed to be expanded in the future, for example by aligning to the national standards, in terms of generating all required reports for upward reporting and to support local action.

An important takeaway from this excerpt is that system design is not just about creating technical artefacts as solutions, but should be grounded in the everyday work practices and artefacts in use by the CHWs.

Design to Support Local Action

Local action refers to all the work being carried out by the CHW, which includes all information related work which relates to the recording, reporting and tracking functions performed by the CHWs. Local action represents the CHW doing recording and reporting, as well as local analysis of data and taking steps to improve health services delivery. While analysis is an important aspect of the CHW work, and one which we actively seek to enhance, we should not lose tracking of the recording and reporting functions which the CHW is obliged to perform. Expecting her to enhance her action taking function, while ignoring her recording and reporting functions, will be unfair to the CHW as she will be reprimanded by her seniors.

An important aspect of the design process is to understand from the perspective of the CHWs what

they consider relevant local action (spanning her three key functions), and what outputs she needs from the CHIS to support her different functions.

From the example given above of the living lab, a primary need of the CHW was to support the generation of primary registers, as that would dramatically reduce their work burden, and free up time for provision of more effective care. Such an approach also exemplifies the advantage of taking a holistic systems approach rather than a narrow program specific and standalone. The benefits of adopting a holistic approach influences all the different roles of the CHW and all the health programs. On the contrary, an isolated stand-alone approach enhances fragmentation with limited benefits.

Chapter 3 provides more specific example of local use, so we are not repeating those issues here. The reader is advised to read that chapter for more specific examples of approaches to enhance local use.

Adopt Hybrid Approaches

Hybrid approaches are those that cater to a multiplicity of settings, political conditions, and infrastructures. This is key to ensuring scalability and with it sustainability. Community conditions by design are variable, multiple, and relatively dynamic. The CHIS design process must necessarily be hybrid in nature and be capable of catering to this multiplicity. The hybrid approaches encompass technical, institutional and project management approaches.

For example, building a system that relies completely for its operations on internet connectivity only caters to a single environment – the presence of continuous and reliable internet supply – and is unable to functions in settings where this condition is not met. Such a system is unlikely to succeed in a scalable manner, as ideal internet condition is unlikely to be available throughout a province, or even all sub-districts within a district. An approach here would be to design a hybrid system which can run in both regions of internet availability or not. Allowing for offline data entry, and subsequent syncing of data with the server when internet is available, is a practical solution to deal with these multiple environments. The DHIS2 has adopted such functionality, which has contributed to its widespread use in a multiplicity of environments and settings.

Case Study: Different approaches in South Africa and Cuba

Different political settings also call for hybrid approaches. For example:

- The HISP project in South Africa, experienced great success with bottom up, participatory approaches in the changing post-apartheid environment of where enhancing health worker environment was at the core of the health reform agenda.
- This same approach when transferred to the HISP project in Cuba turned out to be dramatically unsuccessful as the environment was extremely top down, driven by the office of the President. In hindsight, in this environment, HISP should have first obtained buy-in from the top, used this buy-in to create spaces to work with participatory design approaches at the field level, and gradually build ownership using that approach. In the

absence of top-down approval, the bottom were fearful of engaging with the alien approach of bottom up design of HISP, and reacted by rejecting the project.

A takeaway from this discussion is the need to first analyze the given contextual conditions, then identify feasible approaches for design and implementation. Always be open to adapt and improvise on the way, and not to be dogmatic to a certain approach which may have worked in a different setting and time frame.

Design CHIS based on existing strengths

The HISP approach to CHIS design has always emphasized the importance of the installed base, existing work practices and the CHIS history which exists, and seek to nurture or cultivate it over time. This approach uses the basis that all systems have a history and past, and there are deeply embedded systems and human behavior and attitudes, which can never be done away with.

This HISP approach is the opposite to the “clean slate” approach popularized by management consultants in North America in the nineties, and operationalized through the methodology of “business process reengineering (BPR).” This clean slate approach has been adapted by designers of CHIS where they are not sensitive to what already exists, but has not had much success, such as when adopted in Ethiopia in early 2000 during the health sector reform process.

The dominant assumption of BPR system development is based on a clean slate approach, which

1. Seeks to “obliterate” existing processes and systems and start from scratch, creating a clean slate.
2. Assumes that the existing work practices and attitudes of the CHWs is irrational, not modern, needs to be killed and replaced with techniques and technologies that are more modern and rational.

Case Study: CHIS design in Mocambique

A HISP project was introducing DHIS in the community health system in Mozambique. While conducting training at the community level, various strengths of the CHWs were seen.

1. CHWs had strong abilities to multi-task, developed through decades of working in extremely resource constrained environments. For example, they could engage in providing care in addition to doing administrative tasks at the same time.
2. CHWs were very strongly linked to multiple local and non-work environments, such as the church. So, when the printer of the health facility was not working, they would go to the nearby church to print out the urgently required report.

Instead of seeing the practices of the CHWs as being irrational and impediments to the introduction of new systems, it was recognized that these should be seen as potentials that should be leveraged upon to support the system introduction.

This exposed the limitations of existing approaches to design and implementation using the “clean slate” approach.

The takeaway from this discussion is the need to seriously consider history in the system design process, what the positive and negative potentials that come with it are, and how the positive potential can be incrementally leveraged upon and cultivated over time.

Interoperability with DHIS2 in CHIS

Why Interoperability?

Community settings have particularities such as poor internet coverage, uneven infrastructure and largely manual systems that make it very difficult to deploy a complete web-based system. There may be also multiple pre-existing systems, owned by different stakeholders which are performing distinct functions, and which have a high degree of user acceptance. As a result, there is a significant need for finding alternative ways through interoperability to bring the data into DHIS2 so required aggregations can take place, analytical dashboards can be created, and for tracking of patient based care. Interoperability aims at sharing data between two systems without disturbing them. In contrast, integration involves the merging of two systems into one, so only one system continues and the other one is not needed anymore. Given that in general there will a reluctance of a system owner to give up their system, integration will often meet resistance in the context of CHIS.

In summary, interoperability can be seen to respond to the following use cases:

- Systems like ODK and CommCare are being used in various contexts to collect individual and aggregate data, and this needs to be interoperated with DHIS.
- Due to ease of portability and better mobile network coverage (than internet), mobile phone could be used to collect data, and can be most easily transmitted through SMS. This SMS data then needs to be imported to the DHIS2, and further processed.
- Where manual systems dominate, Excel sheets could be used to enter data, and then these Excel files need to be sent into DHIS2 for further processing.
- Community based data could also be collected in hospital systems, where residents go to receive referral care. This hospital data, typically collected in an Electronic Medical Record kind of system, then also needs to be interoperated with DHIS2.

We provide examples of use cases that represent these above conditions, and then provide a technical overview of how interoperability was achieved with DHIS2. For each of these use cases, we also present some technical guidelines on how interoperability can be achieved in other contexts.

Use Cases of Interoperability

Open Data Kit (ODK) – DHIS2

The National Institute of Epidemiology, Chennai India is building a system on DHIS2 for fever surveillance. The aim is to record all cases of fever reported in a district to understand epidemiological patterns that underlie these fever cases. For this, they need to capture name based data on fever surveillance which they are doing using ODK. Each case records required demographic information and fever details. This data is then required to be pushed into DHIS2 for further tracking, generation of hotspots and creating required reports and indicators displayed through the dashboard. Thus, building interoperability between the ODK and DHIS2 was a core task in the system development process.

CommCare – DHIS2

In Nepal the Hellen Keller Institute (HKI) is using DHIS2 as a nutrition tracking system. Derived from census population of households in selected districts of Nepal, DHIS2 captures individual level data on demographics and selected nutrition parameters. Based on this data interventions are carried out and impact on nutrition parameters need are monitored at the individual level. To collect this programmatic data HKI is using CommCare. The programmatic CommCare data needs to be interoperated with the census based data in DHIS2. Furthermore, DHIS2 is also being used for various other data reporting formats for other program needs. There is thus the requirement to build a common warehouse of data where these multiple programs data together with the nutrition data could be analyzed for cross-cutting indicators, and displayed through attractive and easy to use dashboards.

Excel Import – DHIS2

While the use of Excel sheets for community level data is a common use case in the context of CHIS, the use case discussed concerns comprehensive case based management of malaria. This project, implemented in Odisha state in India, involves the collection of data on malaria cases in a name based format using Excel due to low internet availability. The Excel files with name-based data is periodically sent to the higher authorities through emails or pen drives etc. At central levels the excel file is converted into a CSV and manually imported into DHIS2 via the data import application. DHIS2 is then able to automatically aggregating to higher levels in the HMIS. The DHIS2 thus contains both name based and aggregate data. Thus, there is a requirement to send the data in these Excel sheets to DHIS2 for monitoring and maintaining the data quality and also enable the connection between the different elements of entire longitudinal record of the patient. The challenge here was to develop a methodology for importing the Excel data into DHIS2.

SMS Data Import – DHIS2

The use of SMS based reporting is another common means of data collection and transmission in community health settings. WHO India initiated the use of SMS based system for supporting their Mass Drug Administration for LF in a campaign spanning 34 rural districts of India over an intensive one week period. SMS rather than web-based transmission was selected because many of the CHWs did not have the resources to access smartphones, so were not oriented to its use. Further, SMS was selected because data needed to be collected only for few elements (such as number of households visited, males, females and children administered the drug, and side effects observed). In this campaign, the CHWs would go house to house administering the drugs, recording the data on their phones, and then sending it by SMS which was received by the DHIS2, where dynamic dashboards were constructed to monitor coverage by day and geography.

Open MRS and DHIS2 Interoperability

OpenMRS is the platform on which an EMR was customized for an integrated hospital management system for district hospital in Himachal Pradesh, India. The system collects individual level data as a patient goes through different encounters in a hospital including registration, billing, OPD, IPD, lab tests, pharmacy etc. This individual level data needs to be aggregated (by hospital, department, period, etc.) and then sent into DHIS2 where aggregate reports, for morbidity and mortality can be prepared, hospital management and administrative indicators (for example, average length of stay and bed occupancy rates) can be generated, and comparisons across the different hospitals in the state can be made. This would not have been possible through the OpenMRS system alone, and so the technical task involved building interoperability between the two applications, and ensuring a process to synch the two databases at predefined intervals.

After presenting these different use cases of interoperability with DHIS2, in the next section the technical approach for this is discussed including guidelines for implementing the interoperability solution.

Technical Approach for Interoperability

For ODK and CommCare Cases

A similar process of building interoperability was followed in both the cases. A tool (Data Motor) was designed that requests for data from the CommCare/ODK application. Data is pulled out from the API through this pool and is pushed through the API again to DHIS2 application. The diagram below depicts this process.

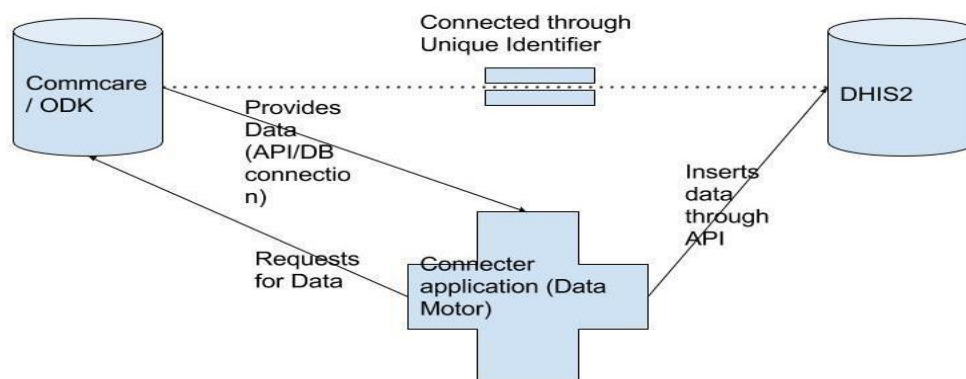


Figure 4.6: DHIS2 Interoperability Model with CommCare and ODK

Guidelines for Implementation

1. Identify "**data points**" which needs to be shared from the data collection system.
2. Find out where they fit in the data model of the system from which they are to be **pulled**.
3. Find out where they fit in the data model of the system into which they are to be **pushed**.
 - In case of DHIS2 these are Data Elements, Periods and Organization Units
 - In case of ODK and CommCare these are questions/data entry prompts.
4. Map the two data models based on a **unique identifier** between the two.
5. Make the data motor
 - Fetch data from one data collection system,
 - Restructure the data to fit the data model of the other data collection system
 - Push the restructured data in the other system

- Keep unique identifier in both systems for integrity checks
- 6. Set up the data motor to auto run periodically
- 7. Keep a log of all activity that the motor does for monitoring and debugging.

Excel Import to DHIS2

An Excel micro has been created in DHIS2 with a predefined Excel template. The data from Excel is mapped to UIDs for data elements, organization units and periods for which the data which needed to be imported in DHIS2. The mapping in Excel should only have to be completed one time. Once the mapping is done the data can be maintained in the Excel sheets and imported in DHIS application when internet is available. The data is sent to DHIS2 through the UIDs being mapped in the Excel sheet and sent to respective program and program stages in DHIS2 in the case of name based data.

Guidelines for Implementation

- To maintain the data quality, minimum open text fields should be used in the format. More of drop-down options should be created so that user can select the required options which can be easily linked to DHIS2 data values.
- The sheet should be protected so that the user cannot add any new fields or make any changes in the application.
- Validations same as in DHIS2 need to be built in the Excel sheets.
- Organization unit codes are a preferred option for sending the data to DHIS2 to avoid any mismatch in the organization unit names.
- It is important to have a unique identifier for each record in DHIS2. This unique identifier can then be used to link the longitudinal records (program stages) of the patient so that the patient can be updated as and when visits are made and duplicates are not created.

For OpenMRS-DHIS2 Interoperability

The interoperability module from the EMR based on OpenMRS to the DHIS2 was developed by the HISP India team to support an architecture where the name based encounter data was stored in the individual hospital's server, would be aggregated through queries and the data would be moved to the state repository (DHIS2) through a data exchange module. The architecture envisaged was that the name-based data was retained at the facility and aggregated data moved on to the state DHIS2 portal through the data exchange module.

The interoperability standard (SDMX - Statistical Data and Metadata Exchange, initially promoted by WHO and later replaced by the ADX standard), data was exchanged between OpenMRS and DHIS2, and all metadata (data elements and facilities) were synchronized taking DHIS2 as the base and aggregated information into it using DHIS2 API services on periodic basis. The reports exchanged included all national disease program reports, reports on disease profiles for the population, and stocks and inventory reports. Implementing this module was a tremendous challenge. Technically, creating the data transfer required writing hundreds of queries to aggregate and push the data into DHIS2. Initially, it was done manually, where some staff had to just push the export button. When this was not done regularly, this transfer process was automated to enable it at a fixed time everyday where the data would be synched. This too was problematic, because of the intermittent and unreliable internet and power supply.

The architecture for this data exchange is sketched out in Figure 4.7.

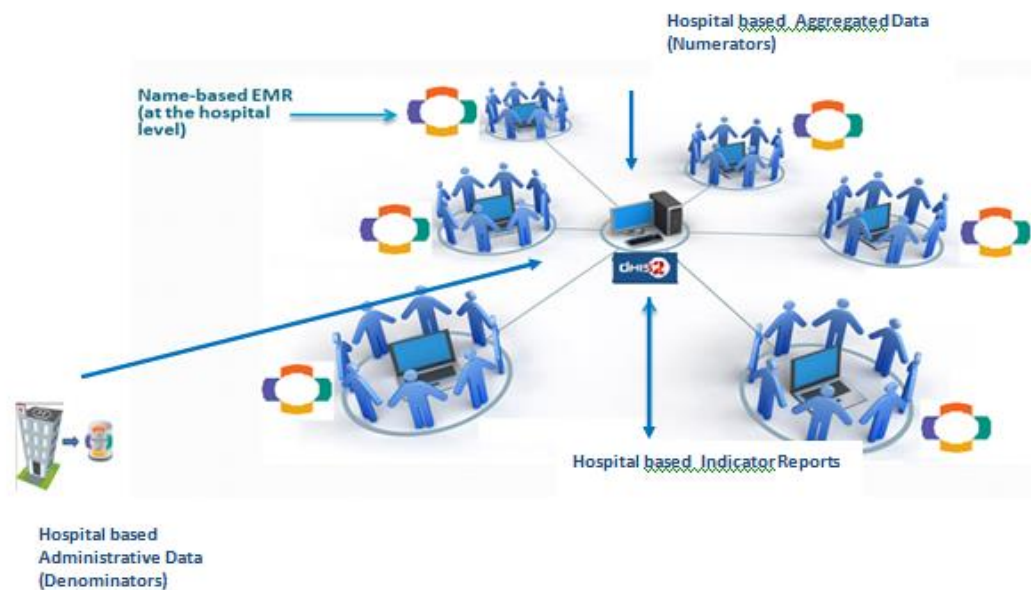


Figure 4.7: DHIS2 interoperability with OpenMRS

Guidelines for Implementation

- All the data which needs to be transferred to the DHIS2 requires to be defined as data elements in the DHIS2. Data sets need to be created for the aggregate reports required.
- All indicators need to be created in the DHIS2, and also all numerator data (such as number of beds and number of doctors) need to be stored in the DHIS2 which are then used for the generation of indicators.
- Queries need to be written to aggregate the name based data from the OpenMRS database, and then post it into DHIS2 as the defined data elements.
- Reports and dashboards need to be customized in the DHIS2
- An automatic scheduler should be created to enable periodic data exchange.

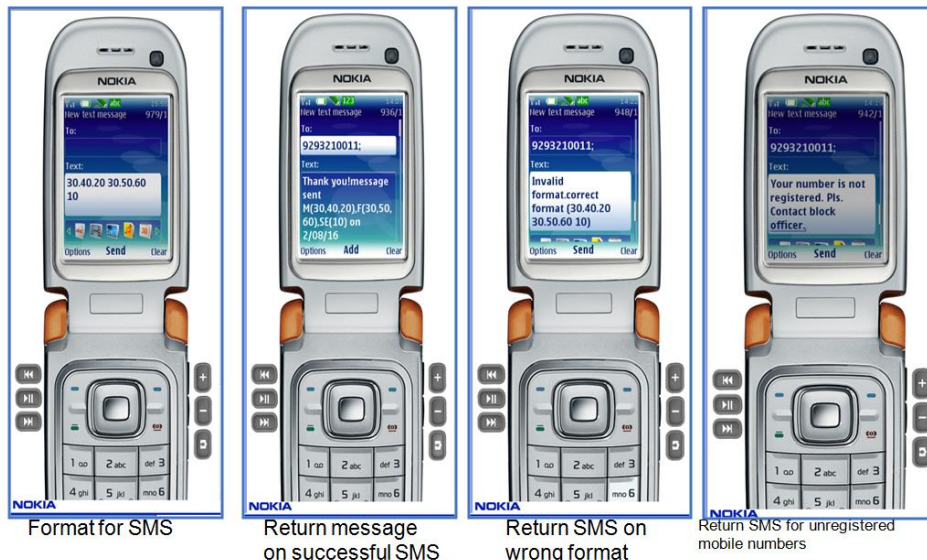
SMS Import in DHIS2

SMS gateway and APIs are required for receiving the SMS in the DHIS2. If feedback messages also need to be sent (to confirm receipt or not of the SMS in the DHIS2) to the user, an API for sending messages will also be required. The messages need to be sent on a specific number and the same could be read for a predefined set of data items. Separator such as dot (.) or space () could be used for separating the data elements while sending the messages to make them easier for the user to understand. The phone number of the users need to be registered for the respective organization units to which they belong, such that when the SMS is received from the same number, it can be registered at the organization unit.

Guidelines for Implementation

- While using the SMS functionality, the data elements to be reported should be minimal for the user to remember the sequence. The sequence and format should be provided written on paper to the CHW for ease of use.
- It is significant to have the phone numbers registered for all the users, and it should be ensured that the user sends the message through the same numbers for the data to be registered at the correct organization units.
- The pictures below describe the different screen shots the user will see in the process of sending the SMS and receiving the confirmation message.

SMS Application



Everyone who sends SMS receives an auto-generated SMS back on successful, invalid or un-regd no.

Figure 4.8: Example SMS Import into DHIS2

India Use Case - Mobile Based Reporting by CHWs

Mobile based reporting is a vital part of CHIS in many contexts. In this section, we discuss three different modes of mHealth based reporting from the community level in India.

1. SMS based reporting for HMIS in Punjab, India.
2. SMS based reporting for supporting cancer survey in Punjab, India.
3. GPRS based reporting for HMIS in Himachal Pradesh, India.

In each case we provide details of the technology, the implementation and capacity building processes, the issues and challenges faced and how they were resolved.

SMS-Based Reporting for HMIS in Punjab, India

In 2011, the national MoH initiated a pilot project across 5 blocks in 5 different states covering about 200 CHWs, to test the technical efficacy of mobile based reporting from the community level.

A simple JAVA based application was developed in J2ME and installed in the mobile phone of the CHW. A modem with a SIM was installed at the block (sub-district) level to receive the messages. A software “SMS Listener” was installed in the computer of the Block Program Manager along with the offline DHIS2 application. When the CHW sends the report through the mobile application, it comes through a SMS. The SMS listener installed received this SMS in Binary form and imported the data into respective organization unit by recognizing the mobile number from which the message has been received. The mobile number of a particular health worker was entered in DHIS2 offline application for their respective organization units. Some useful lessons were learnt from the pilot. There were technical issues encountered such as the clogging of modems, signal issues in hilly areas, and some data loss. Some CHWs were reluctant to use the mobile as they felt more comfortable with paper based reporting.

Overall, the pilots were seen to be successful, and two states Punjab and Himachal Pradesh came forward for a full statewide scaling for this mobile based reporting

MHealth-Based Reporting for HMIS in Punjab

Punjab state has about 5000 CHWs, with each sub-center having 2 ANMs (Auxiliary Nurse Midwife), one regular and the other contractual. The state provided each ANM with a mobile phone (Nokia 2330 Classic) to enable reporting the monthly routine HMIS data.

Unlike the pilot which was based on the offline DHIS2, Punjab went for an online application, developed in J2ME (JAVA) and in Punjabi language. The application was installed via Bluetooth in the mobile phone of the ANM. This was a simple SMS based solution. It included three forms to be filled by the ANM: Daily Reporting, Monthly 1 & Monthly 2. After filling these forms, the ANM sent

her data through SMS on a number for which the SIM was installed in the Modem at the state's server. After importing the data in DHIS2 an Acknowledgement SMS was is sent back to the ANM for the confirmation of the report. There were two modems installed at state server one modem each for 10-10 districts.



Figure 4.9: Example J2ME Data Entry Application

This was an online DHIS2 application with the three datasets. The mobile number of every ANM was registered on the sub-center on which the ANM was posted. As soon as the message is received from a number it is converted into an XML file and imported in DHIS2 for the respective organization unit on which the respective number is registered. Since every sub-center had two ANMs, under each sub-center two more organization units were created ANM1 & ANM2 and the numbers were registered in their respective user names. This mobile project ran in parallel to the state HMIS application on DHIS2, and it was expected that after a few months of reporting all community data in the DHIS2 would only come through the mobile reporting.

Along with mobile phones a CUG connection was provided which included a Rs 200 credit for the ANM to enable SMS reporting along with free calling facility.

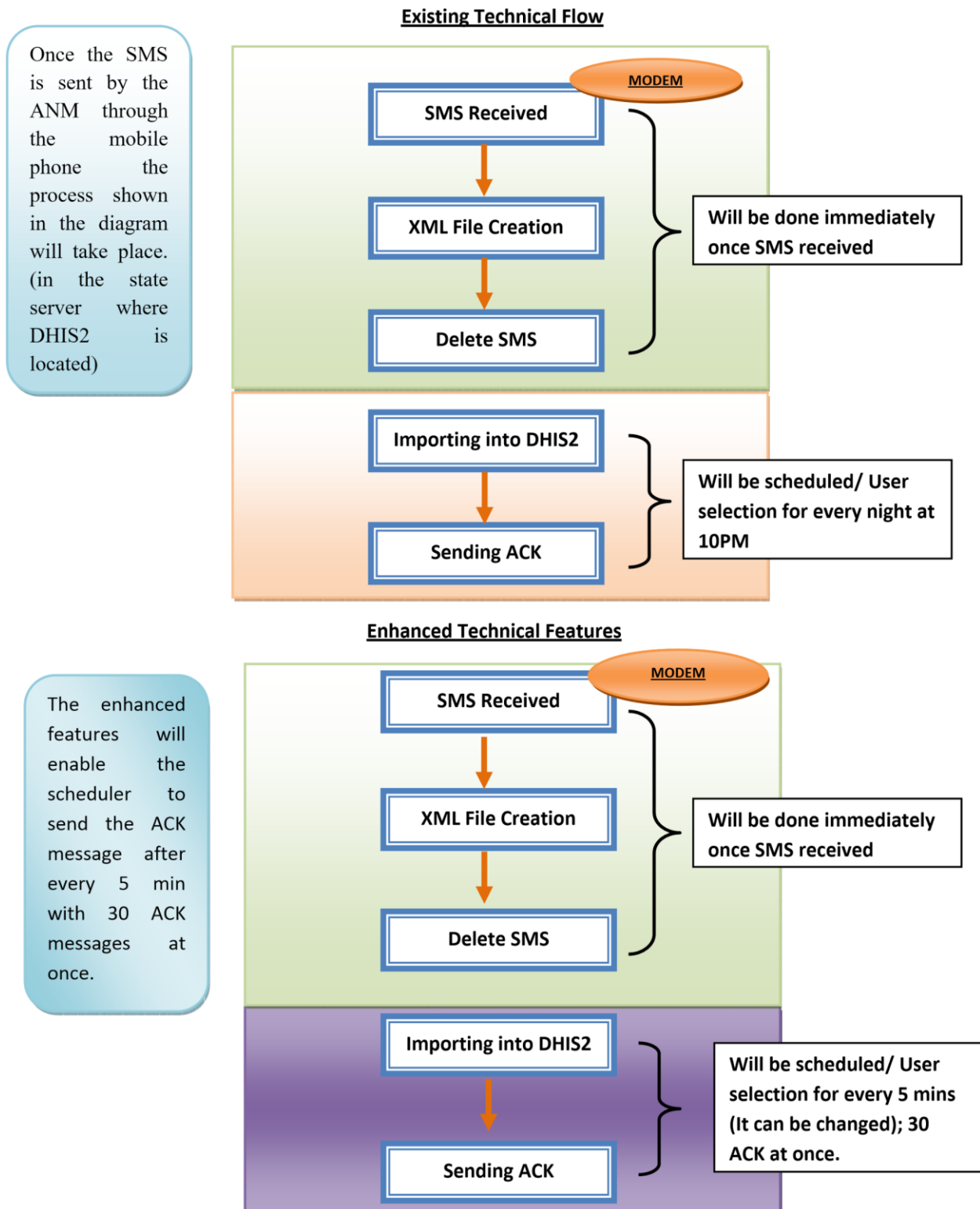


Figure 4.10: Punjab Use-Case Data Flow Model

The process of implementation involved the following steps:

- Procurement of Hardware: Nokia 2330 Classic with SIMS card and EZ-SMS model modem for receiving the SMS.
- Finalization of formats: Three formats were finalized: Daily Dataset, Monthly 1 and Monthly 2 with 10, 56, and 83 data elements respectively.
- ANM Classification: The ANMs were classified as ANM 1 and ANM2.
- Installation: The JAR file of the three datasets were installed using Bluetooth in 5000 mobile phones and pasting of stickers on the back of mobile phones mentioning ANM names and sub centers. This process took place at state head quarter over one and a half months.
- Distribution of mobile phones in districts: After installation, the mobiles were sent in the respective districts and distributed to the ANMs prior to the trainings.
- Preparing Training Manual: The training manual in Punjabi was then prepared demonstrating the use of application through screen shots and diagrams, and these were distributed during the training session
- Capacity Building: The trainings on the use of the application were carried out over 2 months covering 4545 health workers and done at state/district/block/sub center levels. Two-member teams were created each covering 5-7 districts. On the first day, a district TOT was done, followed by block level trainings.
- Handholding Support: One-year handholding support was provided through a 3-member team placed at the state head quarter.

Issues and Challenges Experienced

Daily Dataset: Initially the ANMs showed resentment towards the application, which became easier with time. Key to this resentment was the Daily reporting which included data elements representing activities done on mainly on Wednesdays in the EPI sessions, which meant that other than on Wednesday, the elements were reported as zeros. This pattern, the ANMs felt would be perceived by the administrators that they were slacking off on other days. To deal with this rising resistance, the administrators had to ultimately scrap daily reporting.

Age Factor: The elderly ANMs were resistant, as they had not used a mobile phone before. So, making these ANMs learn the application was a difficult task.

Other Issues: Signal issues, balance related issues and delays in confirmation reports from the server side was experienced due to load on application

Modem Clogging: The modems were receiving nearly 5000 SMS daily which put a huge load on the state server and modem, which delayed the sending of the acknowledgement message which created a panic among the ANMs if their reports were received or not. Also, the messages started failing because the mobile operator kept the unreceived messages only for 3 days on its server. Two more modems were installed for sending the acknowledgement messages to enable huge load sharing.

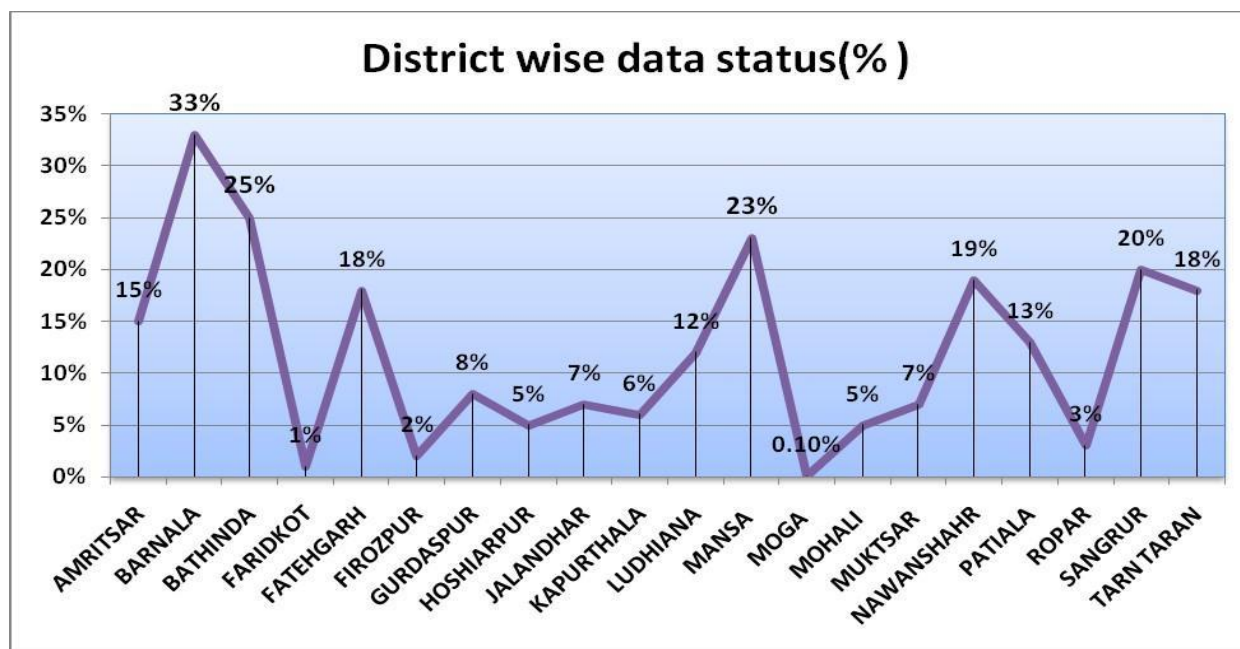


Figure 4.11: A district wise data status percentage showing the reporting percentage in initial days.

A district wise data status percentage showing the reporting percentage in initial days.

Key Take-Aways:

- Increasing reporting frequency just because the technology enabled that is not a good idea as it increased the sense of surveillance for the ANMs.
- Modems seemed ill-equipped to handle large scale SMS traffic, and a SMS gateway solution would have been more appropriate for a full-scale project.
- State is considering Android based application for HMIS reporting.

Punjab SMS-Based Cancer Survey Reporting Use Case

After the success of the routine HMIS reporting in 2011, the state initiated in 2012 a new SMS based project for cancer survey for:

- To generate awareness on warning signs and symptoms of Cancer.
- To enable early detection of the disease based on the symptoms
- To identify disease incidence (actual number of cases) for further planning

The implementation process for the survey is briefly outlined:

- Survey in rural areas was done by CHWs, while in urban areas by nursing and medical college students
- The surveyor went to each and every household of his/her own area
- Survey was done using a questionnaire including proformas: One, for capturing basic information of each and every family member of a household, such as name, age group, education and family history of cancer, etc.; Two, if any person was found cancer positive or with symptoms of cancer name based details specific to the disease was collected, and reported through the mobile phone (JAVA SMS application) into the DHIS2.
- Same mobile phones (Nokia 2330) and modems were used for the survey.

The previously existing list of old mobile numbers were used, and then the new numbers used were added and registered in the DHIS2 application. The surveyor sent the SMS of a particular case, which was converted into a XML file and then imported in the respective organization unit, where a Unique ID of that particular case was generated and sent back on the acknowledgement SMS. The surveyor then noted this unique number on the particular form to track the case in the online application. The mobile application was used in the rural areas, whereas in the urban areas where the internet was more reliable, data was entered directly into the online application.

Data flow

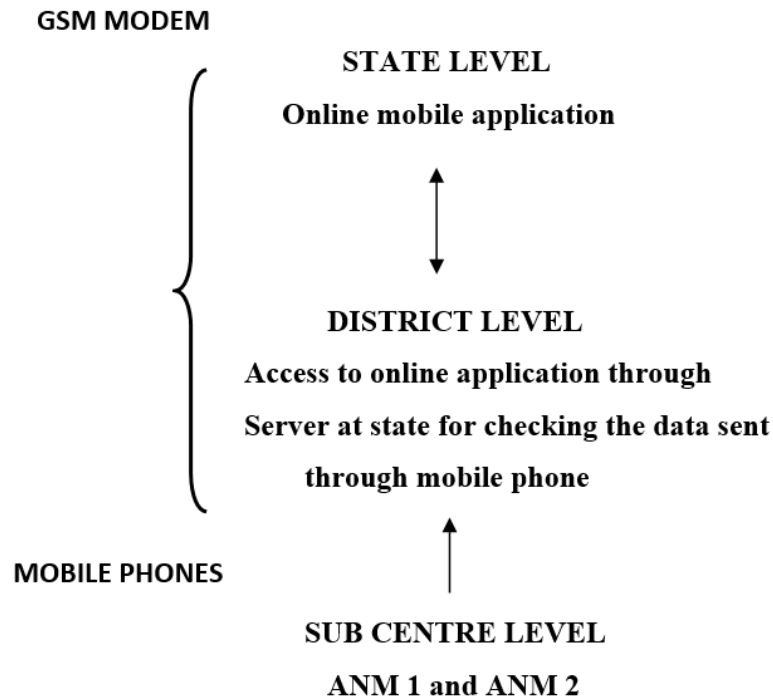


Figure 4.12: Data Flow from Sub-Center Level to State Level.

The Capacity Building Process

Before a state-wide roll out a pilot was done in one district over 2 blocks, and a similar implementation process to the HMIS was initiated. A 150-member training team was constituted, and state-wide training was completed in 2 weeks.

- Trainings were conducted at the district HQ or at the block level
- Two-three-member training team conducted training at each site.
- Attendance of the training participants was taken
- CHWs collected the mobile phones when they came for the training
- One member did the application installation, while the other focused on training, using an Emulator followed by a PowerPoint presentation
- In the hands-on session, the field worker was trained on how to fill all the fields included in the dataset, and send the data through the mobile.

- For urban areas, the form was designed on the DHIS2 Tracker. The individual record was entered on the patient registration screen and the output in form of reports can be viewed through reports available in the application

The data from rural area through mobile reporting was done smoothly but still the issue of modem clogging persisted. To cater to this issue one server administrator was placed at the state server room to monitor the SMS traffic on a real-time basis. In urban areas, the user was not able to save the data in the online application because of the huge database. To address this, an Excel import functionality was introduced to enter proforma 2 data in the Excel sheet which was then pulled into DHIS2.

Himachal Pradesh SMS-Based HMIS Reporting Use Case

After a one block pilot, the state agreed to go for a whole state pilot. Learning from Punjab led to a change from SMS to a GPRS based application. Some of the learnings from the HP pilot included:

- GPRS recharge was more expensive than SMS
- GPRS connectivity poor in hilly and remote areas.
- State did not give phones to the ANMs, and their existing phones were used.
- The GPRS based solution was not compatible on many of the user phones and also incompatible with the Opera mini browser. Out of 201 mobile phones only 74 phones were compatible i.e. only 37%.
- The ANMs found it difficult to operate a web based solution and the GPRS settings to be done on the phone were cumbersome for the ANM

After the learnings from the pilot, the state agreed to go for a J2ME application. The Monthly Sub Centre form was selected for the reporting. The state subsequently decided to buy phones for the ANMs, and chose Nokia C1-01, and Rs 50 was given to each ANM for charging. Similar to Punjab, a J2ME SMS based application was developed for sending the reports. But the formats chosen were not only for sub-center like in Punjab, but multiple formats were selected:

- SC Form– For sub center health worker (monthly)
- IDSP – For sub center health worker (weekly)
- PHC Form 1 & PHC Form 2 – For PHC health worker (monthly)
- CHC Form 1 & CHC Form 2 – For CHC health worker (monthly)
- Mortality – For SC, PHC, CHC health worker (monthly)

JAR files for all these formats were created, and installed on respective facility phones.

SMS Gateway Solution

From the learnings of Punjab implementation, it was found that modem was not a good choice for a full state wide roll out hence instead of Modem, SMS gateway solution was used.

- State's Department of Information Technology (DIT) already had a SMS gateway solution bought from a private player.
- The implementers contacted this provider to build the integration with DHIS2. But then the State changed the provider to the government IT department. This required the integration to be redone.
- The server and SMS gateway were both placed in the state IT office which created many logistical challenges.
- The final application integrated with SMS gateway was deployed.

Some of the issues experienced included:

- In testing it was found that the government IT department did not support the compressed SMS which was previously used in Punjab.
- The server only supported the basic SMS length of 160 characters and for some operators it was only 110/120 characters. This was often insufficient, as our SMS was prefixed with a keyword HP NRHM.
- At the 161st character, the server could not understand the second SMS which was not prefixed with HP NRHM and as a result the second SMS got lost, leading to complete data not being reported.
- So, the SC form was divided into three parts containing 100 characters each, but was not an optimal solution to divide one form into three parts.
- The application was then reworked with the second SMS at the 121st character also being prefixed with the keyword HP NRHM. The second SMS would cut at 121st character and the reporting became smoother.
- In some of the blocks, the ANM was responsible for multiple sub centers, but in the application only one mobile number could be assigned to one organization unit. To address this, a 4-digit Facility Code was introduced for every organization unit, which enabled one health worker to report from multiple organization units from the same mobile phone.



Figure 4.13: ANMs going through the application in one of the training sessions in Kangra District.

Capacity Building Process

- The training was done mainly at block level, through a 2-3-person training team.
- Attendance of training participants along with their mobile numbers was taken.
- Health workers collected their mobile phones when they came for training.
- One member was responsible for the application installation while the other was for the training on formats and the application.
- Mobile numbers were registered in the respective organization unit in DHIS2.
- One member sensitized the health worker to send the report using mobile phone through the Emulator, followed by hands on training.
- Orientation was provided on the formats, and described in the training manuals which were distributed to all health workers.
- Respective facility codes were also given to the health workers, and they were asked to send a dummy SMS to check the working of the application.
- Then this dummy data was deleted from the server side and the health workers were asked to start their monthly reporting on the reporting date.

Issues and challenges

- The vendor of SMS gateway was changed implying a rework of the whole integration process.
- The SMS was relatively expensive on the short code.
- The short code was changed which implied changing the short code in 201 mobile phones

again

- Deployment and maintenance of the server was difficult due to the strict government norms such as no remote access to the server was provided, requiring a physical update to the server each time.

The table below summarizes the differences in approaches to the mobile health application in Punjab and Himachal.

Difference in Punjab & Himachal Pradesh	
Punjab	Himachal Pradesh
J2ME SMS based	J2ME SMS based
Modem	SMS gateway solution
Only SC Form	Multiple forms for SC, CHC, and IDSP form S
Training State initiated the training dates	Training: State conducting their own HMIS trainings along with Mobile district TOT. In district TOT dates for block trainings were taken. Application is being installed in block trainings itself
Postpaid CUG Tariff plan of Airtel	Pre-paid , no CUG, BSNL
Training only given to ANM and supervisor.	All health workers and supervisors were trained.

Figure 4.14: Difference among India Use Cases.

Chapter 5: Training and Supervision

Introduction

This chapter describes how to operationalize the design principle, “[Capacity strengthening of CHWs](#)” for CHIS. This involves a number of processes to support the developing of CHW knowledge, skills and support, improving decentralized use of data and feedback to CHWs to increase data quality. Most CHIS in developing countries are still paper-based, though many are moving towards more digitized systems. This requires that CHIS training is introduced and is continually followed up through all stages of the information cycle.

Learning Objectives:

- Describe the capacity strengthening requirements for a sustainable CHIS.
- Explain different domains of capacity strengthening.
- Identify the technical and public health skills CHWs need to use CHIS.
- Make protocols for training and supervision from the provided templates.
- Explain pre-service, in-service and supervision and support modes of training.
- Describe diverse ways to evaluate a training program.

Training needs assessment

The first step in any new CHIS capacity development program has to be a Training needs Assessment that looks at the existing situation surrounding the CHIS and the needs to improve this situation. Ideally this should be done as an integral part of the overall CHW training plan, with CHIS experts forming part of the overall CHW training needs assessment

This assessment needs to look at the existence of basic requirements for a CHIS and answer a number of practical questions about what is needed to address these requirements

Requirements for a Sustainable CHIS Training Strategy

Capacity strengthening of CHWs is a significant challenge and lies at the core of developing a sustainable CHIS. There are some inherent limiting conditions to effective capacity strengthening programs including:

- *Decentralization:* To ensure sustainability, CHWs should receive support and training locally in a decentralized approach, as close to their place of work as possible.

- *Training Conflicts:* CHWs because of the nature of their work are continually being pulled into different kinds of training programs, and CHIS skills tend to receive relatively lower priority.
- *Literacy:* CHWs, especially the older ones, typically come with weak computer literacy, and sometimes even basic literacy skills, making learning about information and computers a difficult task.
- *Acknowledgement of CHIS skills:* CHWs typically do not get recognized for building CHIS related skills, and that does not show in their job advancement or annual appraisals.
- *Scale:* This, in particular, is a very significant challenge. While there be a few dozen districts in a province, there may be a thousand villages and hundreds of CHWs. Training cannot be done through traditional means of classroom, and requires the use of different and innovative training methods such as mentorship, in-service training and online media.
- *Attrition:* loss amongst CHWs means that the CHIS is continuously challenged by the exodus of trained staff.
- *Refresher Training Budgets:* The continuity of CHIS is normally subject to limited training budgets, implying that new CHIS do not receive adequate training, particularly after the initial training. Therefore, a sustainable CHIS requires a continuous stream of refresher trainings for old CHWs and comprehensive trainings for new CHWs.

Some questions to address in the CHIS training needs assessment

CHIS Training	Supervision
<ul style="list-style-type: none"> • How many CHWs need training in CHIS <ul style="list-style-type: none"> ○ How often should they be trained ○ How long will training be? • Who will train them? Who will train the trainers? • How is CHIS training related to other CHW training? • Who will do the CHIS training? <ul style="list-style-type: none"> ○ how will they be trained?... ○ what curriculum will they use? 	<ul style="list-style-type: none"> • Who will do supervision ? <ul style="list-style-type: none"> ○ Who will support the supervisors? • How will supervision be done? <ul style="list-style-type: none"> ○ How many CHWs per supervisor? ○ How often?

Table 2 CHIS Training and supervision training

Planning CHW training requirements

Sustainable CHW training is an ongoing exercise that starts with pre-service training, and is supported by an active program of supervision, support, and mentorship. New CHWs need to learn the CHIS in the institutions where they receive their other training, which could be an institution like a CHW college. CHIS training needs need to be planned, based on the desired density of CHWs, the skills needed, and their retention rate.

This calculation is explained in detail in Figure 5.5.

Training Requirements Calculation
<p>In a country of 10 million people, CHWs are to be trained to a planned density of 1: 1,000 population:</p> $\frac{10,000,000 \text{ pop.}}{1,000 \text{ CHW:pop. ratio}} = 10,000 \text{ CHWs required}$ <p>Training is to be carried out in classes of 30 with two trainers:</p> $\frac{10,000 \text{ total CHWs}}{30 \text{ per class}} = 333 \text{ training classes required}$ <p>If each class is 2 weeks long and requires one week of preparation for a total of 3 weeks per class:</p> $333 \text{ classes} \times 3 \text{ weeks} = 999 \text{ weeks of training}$ <p>There are 45 weeks in a year for training and all training need to happen in the first year:</p> $\frac{999 \text{ weeks of training}}{45 \text{ weeks for training}} = 22.2 \text{ training teams}$ <p>There are 3 trainers per team:</p> $22.2 \text{ training teams} \times 3 \text{ team members} = 67 \text{ trainers}$
<p>If 20% of CHWs resign annually after the first year:</p> $10,000 \text{ CHWs} \times 0.20 = 2,000 \text{ newly trained per year}$ $\frac{2,000 \text{ new CHWs}}{30 \text{ per class}} = 70 \text{ training classes required}$ $70 \text{ classes} \times 3 \text{ weeks} = 210 \text{ weeks of training}$ $\frac{210 \text{ weeks of training}}{45 \text{ weeks for training}} = 5 \text{ training teams required after the first year}$

Table 3 Training Requirement Calculation

Physical requirements for training

CHIS training requires four conditions to be met:

1. CHW colleges should have lecturers who can teach CHWs CHIS competences.
2. Local CHW supervisors can provide regular support to handle the 10 most common requests of CHWs. Supervisors also review the reporting systems.
3. CHW supervisors and CHW college lecturers can get help from the national level.
4. There should be SOPs providing protocols and explanations of the data capture and transmission events. Supporting documentation provides explanations of data fields; the app they use are available in the language the CHW college lecturers know best.

CHW college lecturers teach the reporting systems regularly and should know the CHW tasks. They are the right staff to carry out the initial in-service training when the system is introduced. This contributes to the institutionalization of the training for reporting in the CHW colleges. If more trainers are needed during the initial training, CHW supervisors can assist.

The national team adapting the CHIS to the needs of the country should be as representative as possible. Some CHW college lecturers, CHW coordinators, and CHWs should participate as well as national level HMIS and program officers. This team should provide the training of all CHW lecturers and participate in parts of the training for the CHWs.

Training Plan

A training plan to strengthen CHIS capacity should be developed, based on the needs assessment. The plan needs to answer certain basic questions around a number of Capacity Strengthening Domains raised in the needs assessment

Domain	Questions to be answered
Who to train?	CHWs, CHW supervisors, Facility in-charges, District program managers, Trainers
What to train?	Public health skills and Technical CHIS skills
When to train?	Frequency and Duration of training
Where to train?	Pre-service, In-service, Supervision and support
How to train?	Training materials and methodology
What will training cost?	Budget

Who to Train?

Various kinds of staff, such as CHWs, their supervisors, and CHS managers will have different training needs.

- CHWs need to have appropriate training if they are able to effectively use the CHIS to perform their everyday tasks of recording, reporting, micro-planning and data driven actions. In addition to CHWs,
- CHIS training also needs to be imparted to supervisors, which is often the most neglected part of most CHIS programs. Data use training for supervisors needs to be integrated into overall supervision skills training and become the focal point of problem identification, support and monitoring of CHWs. Supervisors need to be able to use data before, during and after supervision.
- Similarly, CHIS managers perform different functions and will need training adapted to their specific needs. They may already have advanced knowledge in public health and available computer skills, and may need specific training on the use of DHIS2 for data analysis and dissemination of analyzed information. For this, they could request training materials specifically tailored to their DHIS2 database.
- Community leaders and stakeholders may also need to be trained in the use of data or to be able to discern data quality issues. Community stakeholders and leaders need specific training according to their roles and responsibilities. These actors need to put into context the data they receive from the CHW and feedback they receive from DHIS2 and take the appropriate actions to improve service delivery.

Involving leaders in data use can have dramatic impact on a community program, as can be seen from the Zambia case study (see Chapter 6). Community leaders understand the local context and they should be involved in setting the local targets for the individual CHWs, adjusting these targets each year based on performance and population. Community leaders should also be involved in local management of the CHWs and use data on incentives, density, and attrition rates to ensure that the program is working effectively. Training to them should address these needs.

What to Train?

We divide the skills required into two broad categories of technical and public health related. These are briefly discussed.

1. Technical skills
 - a. Use of DHIS2
 - b. Use of mobile devices
 - c. Hardware and software support skills
2. Public health skills
 - a. Understanding data, indicators and supporting concepts
 - b. Understanding how data is used to inform local action.

Technical skills

DHIS2: Skills in the use of DHIS2 is fundamental. However, DHIS2 is a large piece of software, and the CHW needs to know only particular functionalities, such as:

- **Mobile Devices:** Many CHWs use mobile devices for data collection and reporting. They need to know how to use the device for recording data, send it either by SMS or the web, and to confirm receipt of reports. Further, if equipped with a smartphone, they should be able to use the value-added services available such as SMS, MMS, WhatsApp, Facebook and other social media tools. This not only helps them to access technical support when needed, but also stimulates interest in the devices when they are able to communicate with friends and family.
- **Data Quality Checks:** CHWs should be able to assess data for correctness, currentness, consistency and completeness (the 4Cs) both on paper and on mobile devices.
- **How to Generate and Transmit Reports:** CHWs have large reporting requirements, and they should be able to use the DHIS2 to generate their required reports, and transmit them to the next level. For this they need to understand reporting formats and mode and times of transmitting reports.
- **Hardware and Software Support:** Typically, the CHW is located remotely and far away from easily accessible means of technical support. Hardware support is never easy, and long periods of non-functioning equipment can significantly erode the interest of the CHW in the CHIS. The CHW should be as self-sufficient as possible, able to do basic troubleshooting tasks with the hardware and software (DHIS2).

These skills include ability to:

- Reset passwords.
- Reboot the hardware.
- Reinstall applications on mobile devices
- Logging into mobile applications
- Diagnose why a printer is not working and provide basic maintenance.
- Read a user manual or SOP to diagnose a problem.
- Accurately communicate with the supporter on the problems they experience and the solution required.

Public Health skills

Public health skills should be related to the scope of work and should include:

- Understanding data elements, indicators, and public health concepts: Understand the meaning of data, indicators, and supporting concepts such as coverage, and data quality parameters. For this, she can be aided with appropriate data and indicator dictionaries which describe each term used, its meaning, how it is collected (or generated), data sources and procedures for its collection and reporting. Concepts such as coverage are useful for her to understand her targets and the proportion she is able to reach or not. Understanding of data quality parameters can help the CHW interrogate the quality of data that she is collecting and take corrective actions closest to the source, which is most desirable.
- Use of data to inform local action: Unless CHWs understand the data to be entered, the CHIS tends to be useless. This is the reason for including the ability to take informed action on the CHW's competences. Without experiencing use from the CHIS, the CHWs will stop using it or they may enter data carelessly, hence the importance of understanding data flow. Also, if staff at higher levels of the health services do not respond to the data CHWs enter (by providing required support), the CHWs lose their sense of the CHIS being useful.

As the role of a CHW varies from broad-based IEC and community development to specific programs for MCH, Malaria and home-based care, their use of data will vary accordingly. "Data use" is different at higher and lower levels of the health system and training must recognize that and develop appropriate curricula for each level, linked to SOPs.

Whoever is being trained, exercises should be practical for the audience, referring to "real life" data analysis scenarios, versus theoretical or academic cases.

While data use is a skill that is learned in the field under mentorship of a more experienced CHW or during formal supervision from the facility staff, it is something which can also be supplemented with more formal training on concepts. For example, use the DHIS2 to plot graphs to:

- Match achievements versus targets to identify her areas of improvement.
- Compare their facility and neighboring facilities.
- Gain a better understanding of their performance over time and space.

The competences listed above constitute some elements of the repertoire needed for CHWs to use the CHIS. These competences, combined with support and encouragement from their supervisors and colleagues, provide them with a sense of ownership of the CHIS and the data.

When and Where to train? Modes of Capacity Strengthening

A successful training strategy requires:

1. Pre-service training that provides new graduates with an integrated package of skills that includes CHIS.
2. Continuous support and supervision from decentralized teams of supervisors who themselves have necessary CHIS skills.
3. In-service training where needed to address specific CHIS issues.

These three approaches to CHIS training need to be adopted and approached in an integrated and cohesive process, starting with comprehensive pre-service training, followed by regular in-service training, with continuous supportive supervision, mentorship and continuous learning woven into all activities.

This three-pronged training strategy requires different modes of capacity strengthening. For example, while pre-service training is best done through institutionalized approaches of CHW colleges, continuous support requires supportive supervision from nearby facilities and peer-to-peer learning.

Skills for CHWs should be built through continual training, and it is important to transfer these competencies to the everyday work of the CHW.

There are many factors that improve the likelihood that transfer actually happens:

1. Learners are motivated during the training.
2. Learners imitate practice shown by trainers, videos

A common myth is that competence learnt in a training course is practiced at work after training.

In general, the opposite is true: competence is NOT transferred from training to work.

or written material during training.

3. Learners solve problems requiring more than imitation during training.
4. Learners improve self-efficacy during training.
5. The training environment is as realistic as possible.
6. There are opportunities for practicing newly acquired competence at work after training.
7. Colleagues, superiors and others put social pressure on workers to perform.
8. Support is available after training when needed.

The first five factors are taken into consideration in the pre-service CHIS training. The three last factors concern the circumstances at work during in-service training and supervision.

1 *Pre-Service Training*

CHW pre-service education varies enormously between countries, from a few weeks up to a year, and CHIS skills also have great variations. After pre-service training, CHWs should have basic CHIS skills such as knowing how to use SOPs, how to capture and record data, how to use the mobile applications, and how to contact support.

Timing of CHIS training is essential and should happen at the time the CHIS becomes functional.

- Training before the system is up and running means that CHWs forget all they have learned when the CHIS is launched and the training was probably not as practical as it should have been.
- Training after the system is up and running results in frustrated, angry and disappointed CHWs appearing for training. The trainers will have a very hard time changing their negative attitude.

While there is no one way to train CHWs in CHIS, the following principles should be adhered to for better learning outcomes

1. Training should focus on practical data collection and data use skills. Regardless of the amount of time available, more than half of the training needs to be practice.
2. CHIS training should be fully integrated into other programmatic training. Service delivery, data collection, data analysis and data use should thus be part of the process of client care and systems management.
3. Repeating the activity for each program strengthens CHIS competence. Rather than including reporting activities in just one session, it is better to repeat reporting activities throughout the training.

4. The different tools need to be introduced in the first program. The CHW practices summarizing and entering data in the collection tools (paper or electronic) and acting on feedback received using role play.
5. Training should include both the paper based forms and ICT device, interpreting the reports on health status, and service performance.
6. Looking up help in the SOPs or in the device, and contacting the CHW coordinator for support are problem solving methods best taught in separate sessions.
7. Length of training should be tailored to CHW knowledge
 - a. CHWs who are already familiar with paper reporting and feature phones can be easily trained on routine reporting in a short amount of time. Possibly even in one day.
 - b. CHWs who have not used smartphones before will require more time, one to several additional days
 - c. If the training includes many health programs, a week or more of CHIS training is appropriate.

Generic CHIS training material in English for CHWs will be handed out to participants at the CHIS Academy and will be downloadable. The material needs to be adapted to local needs and translated into local languages. Sample outlines of a training program and examples of training materials are available at dhis2.org

Best Practice: Training Session

Each training session should include one topic, e.g. Comparing health in my village with the neighbor villages, and it should last for 30±10 minutes. A session should be structured like this:

1. Introduction. Plenary presentation
 - a. Introduction of the topic, including a demo where learners watch, not do.
 - b. Explain new functionality and data structure, include demo.
2. Practical hands-on exercises, individuals, or pairs. More than half the time of the session. Trainers walking around helping the learners when necessary.
 - a. Hand out Minimal Manual and SOPs
 - b. Make the learners follow the instructions in the Minimal Manual.
 - c. Give the learners two exercises which differ slightly from the Minimal Manual.
3. Summary. Plenary discussion with the participants.

- a. Discuss functionality/data structure and confront misconceptions
- b. Discuss usefulness

Making the users follow the Minimal Manuals and SOPs during training has the advantage that they become familiar with written materials and are more likely to look up in the manuals and successfully solve problems on their own after training.

Training Protocols

As community health programs expand and decentralize, training quality may decline, resulting in diminished project outcomes and poor data quality. Having a robust set of training protocols in place can help prevent this situation. A training protocol helps to develop training material and events that are standardized, scalable, and reproducible.

Additionally, it is important to capture institutional knowledge from past supervision and trainings. To learn from successes and avoid repeating the same mistakes, use the SOPs as living documents where institutional knowledge is captured on what works and what doesn't in your particular setting.

Training approaches will vary from country to country or even project to project. The best practice is to have an integrated approach in which the training protocol and materials are harmonized across programs. The shared location for these documents should be clear for each training defined in the training protocol.

The training protocol template below is not a complete training package, but should be used to outline all CHIS trainings, from community up to national level. It defines critical information about planned trainings, both for pre-service and in-service training.

Training Name	Standardized name
Purpose of Training	Why it is being carried out, backed up by concrete, action-oriented learning objectives
Duration:	Days / weeks / months of training
Frequency:	Some training may be once off, but some others may need to be repeated periodically epically at district and facility level where there is typically high staff turn-over.
Venue/ Location	: Where will the training take place in general (district office, chief's palace, ministry of health HQ, etc.)?
Attendees:	Who is being trained, and how many attendees are expected?
Facilitators:	Who are these and how many are required? What are their minimum qualifications, and what training should they have received?
Training program	Goals and Objectives for the overall training and learning objectives for each presentation or exercise
Participant assessment:	How are you assessing that the participants understand all the materials? This is typically best done with a pre-exam, grading of exercises, and post-exam. What is the pass rate for the participants?
Links	Links to standardized materials, presentations, exams, facilitator's manual, etc.
Post training follow-up:	After trainings, it is often necessary to conduct a follow-up or supervision visit to reinforce training materials and if possible directly support the first round of data submission.
Guidelines for editing materials:	All training materials will need to be edited over time as the program matures and the system is updated. Define who has control over the standard materials, how edits can be made, how new materials will be updated, and when new materials will be announced to everyone conducting trainings
Training best practices:	List of best practices developed from conducting the training event.
Access to training materials	Where are training materials both electronic and physical stored? Who is responsible for maintaining an adequate supply of training materials? How are stocks of training materials controlled or distributed?

Table 5.1: Training Protocol Table

2 *In-service training*

Initial in-service training on CHIS may require from a day to a week, depending on the CHWs pre-service training, the scope of the information systems and their familiarity with IT if mobile devices are used.

Initial in-service training should aim at the CHWs being comfortable with CHIS with help from their supervisors. In-service CHIS training for CHWs should wherever possible be done by the same people doing supervision for other CHW activities. CHIS training, like CHW training should be decentralized as low as possible, while still ensuring adequate quality.

In addition to CHWs, other CHIS stakeholders may also need an orientation to data use

1. Community leaders such as chiefs and others who have the power to influence program activities and can be empowered through data
2. Community health committees might need to know how to interpret data.
3. District level and local government officials involved in the program and some implementing partners will need to be trained on web-based DHIS2 analytics and management.

For each of these, you will have to develop a training protocol and organize the logistics.

It is vital to make sure the appropriate people come to each training. Failure to do so results in project failure or require an additional training in the future. Government personnel can assist in selecting the appropriate participants. At District-level DHIS2 trainings, for example, a District officer should serve as the lead point-of-contact for all training related guidance on invitation lists, scheduling, and provide guidance on government protocols for inviting attendants to a training. CHIS project timeline should have a general outline for trainings. Allow yourself adequate time for planning and communication prior to each training.

Each administrative level should have a point person for CHIS training. Refer to this and work with your district point person to coordinate schedules for these trainings.

Best Practice: Learning in Pairs

Making the participants work in pairs after gaining initial skills has positive effects on learning.

1. They discuss, which helps people understand.
 2. Participants who have a low confidence with tech devices see their colleague manages, and this is the strongest incentive for improved confidence.
 3. Spectators watching others explore, experiment and trouble shoot can imitate their ways of doing it.
-

Post-Training Supervision and Support

Supervision and support is the key to sustainable CHIS functioning, yet often is neglected, underfunded, and given low priority by supervisors, who themselves often do not have adequate skills to support CHIS.

The CHIS training should feed into a strong data system with well-trained users. However, no system or individual is perfect, and there should be regular, structured follow-up to monitor data quality. This follow-up will be ongoing in supervision visits.

Best Practice

CHIS users should have one point of support, which means that CHIS supervisor should be integrated into the general CHW support team. Since they know the CHW supervisor and get support them for other issues, having them supporting the CHIS is an advantage.

To ensure an efficient continuous training and surveillance system, periodical Supervision Visits (SV) are performed to community health workers by the CHW direct supervisor and possibly implementing partners or other Ministry staff.

How supervision is conducted varies from country to country or program to program, but there are three core goals of any type of supervision:

1. Ensure quality, timely reporting from the community and feedback from the CHIS to the community.
2. Review program principles, SOP, and service delivery with the reporting cadre.
3. Troubleshoot program, hardware, and software challenges

To achieve these core goals, a supervision visit should examine at least these aspects of CHW functioning:

- The CHW's ability to perform service delivery (Diagnose and treat diseases, conduct community sensitization events, etc.).
- The CHW's ability to capture data, record data, and perform data quality checks.
- The CHW's ability to submit data and troubleshoot data transmission/application problems.
- The CHW's ability to perform basic data analysis and communicate that analysis to community change agents.
- The CHW's major bottlenecks in service delivery, reporting, or communicating.
- Any additional issues faced by the CHW (Lack of community support, distances too far to travel, not enough time to perform activities, etc.).

Best practice

Introduce the CHWs and the CHW SOP to community leaders during supervision. Community leaders are often key agents of community behavior change. They must understand and support the role of the CHWs working for their constituents. You can support their engagement by helping them understand the role CHWs and their data play in preventing and treating diseases in the community.

- If community leaders do not support the CHWs the community health program in many countries is more likely to fail.
- Engage community leaders from the start.
- If possible, request their support to monitor CHW reporting rates or conduct data verifications.

In some community health programs, large community orientation sessions are held to introduce CHWs, explain their roles and the services they provide, and have community leaders publicly support CHWs. This elevates the role of the CHW and provides them with the necessary credibility to do their job well.

Types of Supervision:

There are many ways in which to conduct supervision. The style and approach will change over time as the process is refined and becomes tailored to the specific needs and desired outcomes of the supervision. For the purposes of these guidelines we have outlined two broad types of supervision: In-person and Remote.

In-Person Supervision

A common type of supervision is direct face-to-face meetings with CHIS supervisors or the CHWs. An in-person meeting will directly impact the program performance and provides an opportunity to provide on-the-job support or address complex problems or issues. It is also the best way to provide direct technical support in the field that cannot be done remotely. In person supervision, however, is costly to maintain.

In-person supervision can be central or local:

1. **Central** or regional level (government or partner organization) supervisor travels to meet with the CHW supervisors or CHWs with district and local staff and other key stakeholders.
 - Pros: Excellent at capturing and addressing issues in a timely manner. Able to provide expert support directly to CHWs. Highly promotes status of CHWs
 - Cons: Costly and ultimately unsustainable
2. **Local:** The district, clinic, or CHW supervisor staff meets directly with the CHW without partners.
 - Pros: Inexpensive and capable to sustain. Captures and addresses more routine, simple problems. Provides CHW with continuous sense of support.
 - Cons: May not be capable of addressing complex technical problems

Remote Supervision

In addition to on-site supervision visits, remote supervision through phone calls, Skype, WhatsApp, or another platform can be used to discuss with CHW supervisors or CHWs. When the topics to be discussed are simple and uncontroversial, remote supervision saves time and resources. This may work well on following-up tasks and status reports.

Remote support works best for:

- Support to CHW supervisors who are on track and do not need problem solving support
- Preparation to ensure readiness for an on-site visit could also be done remotely.

Remote support is less effective for:

- Introduction of changed or new practices or discussion of controversial or complex issues are less likely to succeed through remote communication.
- Improving poor performing or deteriorating community health programs or CHIS.

Two types of remote supervision are described below:

1. **Remote supervision to districts and CHW Supervisors:** The partner or central or provincial government has a remote Skype or phones call with the district office or sub-district actors to support healthy program implementation.
 - Pros: Inexpensive and capable to sustain. Captures problems as they are interpreted from the CHW supervisors. Provides supervisors a feeling of accountability.
 - Cons: Does not hear problems directly from CHWs.
2. **Remote supervision to CHW:** The Supervisor contacts the CHW.
 - Pros: Enables CHWs to directly express problems and concerns. Provides CHWs a sense of accountability and support. Can be done whenever a CHW has a specific technical problem that local supervisors are unable to address.
 - Cons: In large scale programs, it may not be possible to contact for all CHWs.

Supervision Protocol

CHIS supervision (in-person and remote) should be clearly described through a supervision protocol that provides oversight to each supervisor, embedded within a larger programmatic CHW supervision protocol.

The protocol defines the type and frequency of how supervision and support is provided to all levels of the CHIS. Just as with the training protocol, it is necessary to clearly define the supervision so that they are standardized, scalable, and reproducible. A CHIS supervision visit protocol outlines in detail the following for each type of supervision:

Supervision Type:	<ul style="list-style-type: none">• In-person or remote• Central or local
Purpose	<ul style="list-style-type: none">• Aims and objectives of the supervision
Target Audience:	<ul style="list-style-type: none">• Who receives the supervision? How many participants should be in a session?• Where will supervision take place
Team Members:	<ul style="list-style-type: none">• Who conducts the supervision?• How many supervisors are required?
Frequency:	<ul style="list-style-type: none">• How often should this event take place? Insert the supervision calendar as described. Take note if this frequency is meant to decline over time and outline that schedule here.
Objectives:	<ul style="list-style-type: none">• Clearly define targets, with associated performance or outcome indicators that can be monitored for effectiveness of the supervision.
Pre-supervision	<ul style="list-style-type: none">• Tasks or activities prior to supervision (e.g. gather materials, send invitations, run validation rules, get phone credit, print dashboards, etc.)
Activity Checklist:	<ul style="list-style-type: none">• Activities or topics to cover during supervision (e.g. check ability of CHW to describe data elements, use phone for reporting, review data quality issues, describe health indicators, troubleshoot application issues, etc.)• Post supervision reporting requirements by the supervisor. These could describe outcomes of the supervisions, findings, next steps, etc.• Budget for the supervision. Describe what is and what is not an acceptable expense.
Narrative:	<ul style="list-style-type: none">• Describe the events of the supervision in narrative form.
Common Findings:	<ul style="list-style-type: none">• Keep a running list of common findings, questions, issues, or experiences had during supervision.• This list can serve to prepare new CHW supervisors, plan additional supervisions, and document institutional knowledge.
Feedback on Best Practices:	<ul style="list-style-type: none">• How do CHWs and other stakeholders benefit most from supervision?• What worked well? What did not work?• Best practices of supervision so other CHIS supervisors can learn from others.

Figure 5.2: Supervision Protocol Template

Targeting Supervision

Typically, supervision employs a blanket approach in that every CHW receives the same supervision regardless of the specific issues that they face. This antiquated approach is uninformed and does not address or uncover all of the problems that CHWs may be experiencing. CHWs must feel like their issues are being heard and taken seriously, and they must see specific actions that address their issues. Targeted supervision is a cycle of planning supervision, conducting supervision, solving problems, capturing new problems, solving those problems, and planning supervision again. Figure 5.3 summarizes this:

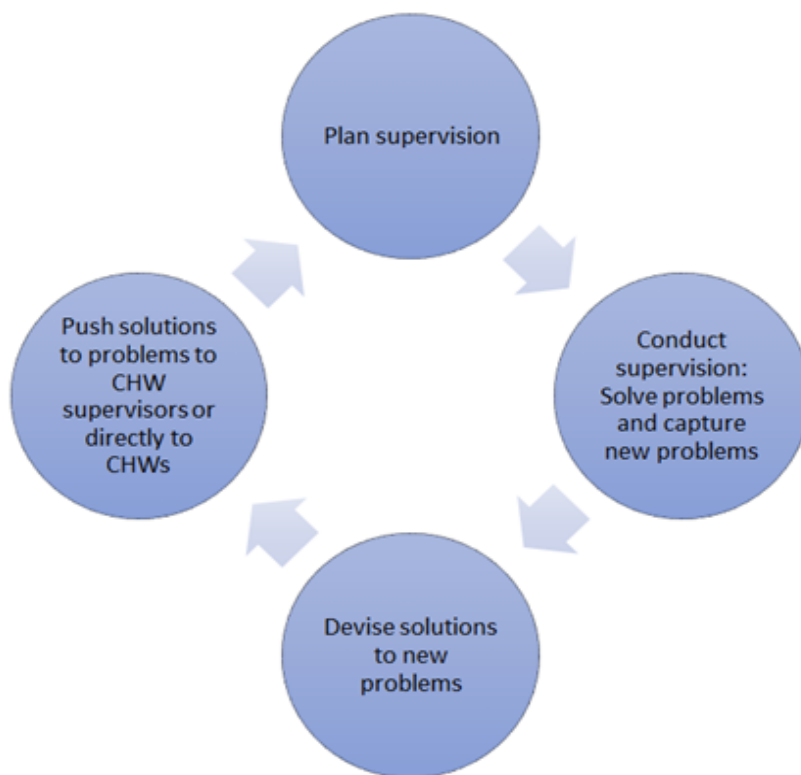


Figure 5.3: Targeted Supervision Cycle

- **Planning Supervision:** Before a CHIS supervision visits the supervisor should analyze data from each community and community health worker to be visited. Analysis should focus on data quality as well as key output, outcome, or impact indicators. As you plan, keep a list of key issues and data errors to address during the field visit. Dashboards for comparison between wards/villages/communities will be helpful in guiding targeting. These points can guide you in making list of
 - Areas where data shows problems that need personal supervision
 - Medium/low priority areas where remote supervision can be given
- **Conducting supervision:** CHW supervisors should provide solutions to known existing issues and capture new capture the priority issues faced by CHWs.

- **Post supervision:** After supervision has occurred, analyze the problems that have been identified and develop solutions to them. Then push these solutions to the CHWs. It may be possible to directly push devised solution to CHW's or their supervisors via a feedback mechanism prior to conducting another supervision visit.
- **Planning supervision again:** While planning the next round of supervision target CHWs based upon the problems they have reported and during supervision ensure that CHWs are receiving solutions.

Best Practice

Before supervision, run validation rules for each CHW or community you are going to visit. Print out the specific data quality issues you want to share with the CHW.

- Results of the validation rule analysis s.
- Dashboards, scorecards, or any analytics.

Best Practice

Use DHIS2 event capture or tracker to record the details of every supervision visit.

- Use mobile applications to capture the most pressing problems faced by CHWs
 - Observe a CHW actually perform the action they are trained to do.
 - Always ensure that there is a free text box in which the supervisor can record an issue that is not included in the pre-existing option set.
-

Data Quality during Supervision

Supervision should aim to maintain and support the 4Cs of data quality:

1. **Correctness: (Accuracy)** Submitted data is believable based on the context; the units and ranges for the data are what is expected. Note that validation rules can be built in DHIS2 to help guide data correctness.
2. **Currentness: (Timeliness)** The reported data is current and was collected during the correct time frame; the figures are not identical to last month's data, which may indicate falsification of data or submitting an old data set.
3. **Completeness:** All forms are completed, and within each form, all required data elements are filled out.
4. **Consistency:**
 - a. High quality data does not usually vary over time for most PHC activities, apart from seasonal variations.
 - b. Always check data for “outliers” that may reflect data entry errors.
 - c. Data is submitted regularly and on time. Data reporters are consistent in their adherence to data submission practices.

These are the items field officers should train their eyes for once data collection begins. Issues in data quality could reflect poor or inadequate training.

On-the-Job Support during Supervision

Supervision visits should cover issues identified prior to the visit, but supervision visits are also ideal times to conduct on-the-job support to address program performance, resolve issues in real time, and enforce SOPs. On-the-job support should include:

1. A general overview of performance at all levels to give the CHW or the Supervisor a better sense of perspective and motivate them to better performance:
 - a. How CHWs performance (key indicators, reporting rates, reporting completeness) compares to other CHWs, district performance, national performance, etc.
 - b. How CHW supervisors perform in relation to national performance:
 - i. Average reporting rate for the CHWs under the supervisor compared to national.

- ii. Average program performance for the CHW supervisor compared to national levels.

Specifically discuss performance of those groups that are present. Present the data and ask them for feedback on why they think they are performing better/ worse than their peers.

2. Discussion of common data errors as identified by your pre-visit data analysis. Explain what those errors are, and clarify them. Review data entry forms, focusing on data elements that are commonly entered incorrectly. Correct data errors and resubmit the corrected data during the supervision visit.
3. Identify challenges if there is a noticeable difference between CHW performances. The team should create specific tasks to address those challenges.
4. Hardware and software troubleshooting should be addressed. Any outstanding issues should be resolved and CHWs should be shown how to resolve those issues themselves in the future. CHW supervisors should travel with extra phones/tablets during SVs.
5. If community workers have data entry that is late or outstanding, they should be encouraged during these visits to submit the missing data.
6. The visit should conclude with a summary to the entire group, based on discussions in the small groups, key findings, challenges, successes, and action points. These should be documented in a supervisory report that is left on site, as well as on DHIS2.

After Supervision

After a supervision visit, it is important to capture what was discussed and learned during the visit. A formal report containing this information should be completed shortly after the visit and submitted into the CHIS. The report should capture where the visit took place, who was met, which activities were discussed, and what the findings and recommendations were. These reports should be specific, as they will guide program surveillance officers and other staff in how to follow-up on issues and with whom. They might also inform program staff of larger patterns that require attention.

Best practice

CHWs become motivated when issues they communicate to their supervisor are resolved. This could include diverse things like hardware and internet, understanding of health indicators and fear of making mistakes. Also, issue or resources and public health competence resolved motivate the CHW to improve their performance, CHIS work included. Facility and district management as well as partners need to help the CHW supervisors resolving CHWs' issues.

Scheduling

Developing long-term schedule for supervision is important for budgeting, planning, and supporting the success of the system. Scheduling of supervision often happens prior to project implementation. While the frequency of your supportive supervision depends on the scale and scope of your intervention, we recommend for a large community health programs,

- The first supervision visit should happen during the first or second reporting period to assist CHWs complete their initial data submission.
- For the first six months to one year supervision should take place every 4-8 weeks.
- Once consistent competency and quality have been attained, visits can be reduced to quarterly or less.
- A district or area that is performing particularly well, may not require such frequency.
- CHWs should receive supervision and support whenever they visit the health facility or district offices to receive commodities or materials.
- If the program is launched by a partner organization and is intended to transition to government control ensure that the frequency of supervision is of a type and at the frequency that the ministry can sustain.

With the point person in each district, establish an appropriate schedule of visits.

Example of a Supervision Schedule

Figure 5.4 is an example of a three-year supervision schedule for a district that is implementing a CHW ICCM program by a large NGO that will transition to government control by the end of year three.

Chipata District Supervision Schedule												
Year 1												
	1	2	3	4	5	6	7	8	9	10	11	12
Training												
Refresher Training												
Partner-led in person supervision to CHW												
Local-led supervision to CHW												
Partner-led supervision to CHW supervisor												
Remote supervision to district and CHW supervisors												
Remote supervision to CHW												
Year 2												
	13	14	15	16	17	18	19	20	21	22	23	24
Training												
Refresher Training												
Partner-led in person supervision to CHW												
Local-led supervision to CHW												
Partner-led supervision to CHW supervisor												
Remote supervision to district and CHW supervisors												
Remote supervision to CHW												
Year 3												
Months	25	26	27	28	29	30	31	32	33	34	36	36
Training												
Refresher Training												
Partner-led in person supervision to CHW												
Local-led supervision to CHW												
Partner-led supervision to CHW supervisor												
Remote supervision to district and CHW supervisors												
Remote supervision to CHW												

Figure 5.4 - Example Supervision Schedule

- In the first year, partner-lead in-person supervision to CHWs and CHW supervisors is conducted three times. This is important because partner-led supervision will be very effective, but it will also be expensive to sustain.
- In year two, partner-led supervision only happens twice.
- In year three, partner-led supervision happens just once.

You also see the local-led supervision to CHWs happens monthly. This is because in this example CHWs must visit the health facility monthly to get resupplied on commodities. During that time the CHW also received supervision from the Clinic In-Charge.

In this example for years one and two the implementing partner with central government staff conduct bi-annual remote supervision to CHW supervisors and directly to CHW themselves. In year three bi-annual, remote supervision continues to CHW supervisors while remote supervision to CHWs offices once. It is envisioned that the supervision schedule for year three is sustainable by the government without direct support from partners or donors.

Budgeting

Keep in mind the same best practices principles as when budgeting for training.

Figure 5.5 is a sample budget for surveillance visits is below. All unit costs listed are arbitrary and not necessarily representative of real costs.

It is typically necessary to produce a detailed budget for supervision visits so that supervisors clearly understand what is and is not an allowable, budgeted cost.

Trip to district for following-up on reporting. Includes time at district offices, and time in the field visiting community health workers submitting data. 5 days on site, plus 2 travel days

Item	Local Unit Cost	Units	Number	Total Cost per District	Cost for all Districts	% of Total
Fuel	1.2	1200	1	1,440.00	280,800.00	8%
Vehicle Hire	800 /day	7	1	5,600.00	1,092,000.00	32%
Per-diems for partner staff	220 /person day	5	1	1,100.00	214,500.00	6%
Per-diems for partner staff (75%)	165 /person day	2	1	330.00	64,350.00	2%
Transport staff type 1	50 /person day	1	50	2,500.00	487,500.00	14%
Lunch staff type 1	30 /person day	1	50	1,500.00	292,500.00	8%
Transport staff type 2	50 /person day	1	20	1,000.00	195,000.00	6%
Lunch staff type 2	70 /person day	1	20	1,400.00	273,000.00	8%
Lodging	300 /day	6	1	1,800.00	351,000.00	10%
Transport Refunds				-	-	0%
Printing, reproduction	100	1	1	100.00	19,500.00	1%
Conference Hall				-	-	0%
Misc.	950	1	1	950.00	185,250.00	5%
Subtotal				17,720.00	3,455,400.00	100%

Figure 5.5: Example In-person Supervision Visit Budget

Training CHW College Lecturers and CHW Coordinators

Lecturers at all CHW colleges should be able to teach the CHWs effectively and follow them up in the field. If the teachers have a background of M&E or public health, they should be familiar with indicators, reporting systems, and evidence based health management. If CHW lecturers come from a clinical background, they will need to learn these topics.

All trainers need thorough training on new IT systems. The rule of thumb is trainers should know the subject matter 10 times as well as the learners. This means 10 times as long training as the CHWs. Trainers need:

1. A wide selection of training data and examples.
2. To learn the pros and cons of various reports and also how to interpret reports.
3. To know the 10 most common support requests from users. Note that these requests will not be known until a pilot has been run for a couple of months.

To become effective CHIS trainers and supporters, explicit explanations, and practice are essential. This includes:

- Knowing how to carry out operations on your own phone while giving instructions to the CHW.
- Helping the learner rather than taking over the learner's device during on-site training.
- Convincing CHW about personal and organizational usefulness through the trainer telling personal stories. This helps the learners relate to their own practice.
- Being aware of common mistakes and misconceptions which should be collected internationally.

Training material for CHW college lecturers and coordinators should be available for download and adaptation.

Core team

Implementation of the CHIS needs a core team to train the CHW college lecturers and coordinators and to follow through implementation. This requires a multidisciplinary team with broad knowledge base with skills in CHW, public health and IT and its members should be members of the team managing the overall CHW program, rather than a separate team. They should have several years of experience and preferably also be people who have been CHW or CHIS champions in some respects in their work.

The team adapting the reporting system to national needs participants from CHWs, CHW college lecturers and coordinators, public health, and IT people and should have strong stakeholder representation from decentralized levels. Some countries tend to pick juniors for such tasks, since the seniors are too busy with other projects. However, for the CHIS to succeed, system implementation has to be anchored in the top level, put pressure on the colleges and health services to select the right people and ensure continued monitoring and feedback of project activities.

Preparations for Training

Budgeting

Efforts should be made to keep costs low and existing resources be used wherever possible. Some guidelines on preparing the budget include:

- Follow organizational policies in using approved budget templates and rates (indirect, DSAs, etc.) for all expenses including:
 - Travel (e.g. fuel, car hire, lodging)
 - Personnel (e.g. per diems, meal costs)
 - Venue (e.g. conference space, tea breaks)
 - Materials (e.g. printing, hardware, projectors)
 - Miscellaneous items
- Build budget based on in-sheet calculations of materials needed, unit cost of that material, and number of units needed. You can also build in additional multipliers to illustrate number of units per attendee. This allows flexibility in updating the budget if unit costs change, or number of participants increases or decreases.
- Budget anticipated expenses in local currency, with a conversion rate built in (that can be updated as needed) to convert to the desired currency of your organization or funder.

A sample budget for a five-day training using hypothetical costs is given in figure 5.6:

Community worker and supervisor mobile surveillance training (5 Days - include sentence summarising costs) - Costs: DSAs, transport, venue, teas and water, printing, SIM cars with talk time, staff days and time						
Item	Local Unit Cost	Units	Number	Total Cost per District	Cost for all Districts	% of Total
Fuel	1.2	800	1	960	16,320	1%
Vehicle Hire	800 /day	7	1	5,600	95,200	4%
Per-diem for partner staff	220 /person day	5	3	3,300	56,100	3%
Per-diem for partner staff (75%)	165 /person day	2	3	990	16,830	1%
Per diem type 1(incl lodging)	500 /person day	4	20	40,000	680,000	31%
Per diem type 2(incl lodging)	300 /person day	4	50	60,000	1,020,000	47%
Lodging	300 /day	6	3	5,400	91,800	4%
Transport Refunds	100 /return trip	1	100	10,000	170,000	8%
Printing, reproduction	500	1	1	500	8,500	0%
Conference Hall	400	5	1	2,000	34,000	2%
Misc.				-	-	0%
Subtotal	400	4	1	128,750	2,188,750	100%

Figure 5.6: Sample 5-day Training Budget

Technical Preparations

When preparing for the training, ensure all the practical technical requirements including computers and a router are in place. This means knowing whether to use a cloud based DHIS2 training instance or local DHIS2 training instance. The availability of internet connectivity influences such a decision.

If the training location is rural and might have problems with internet connectivity, it is best to have a local DHIS2 training instance set up on a computer. A local instance allows users to access the DHIS2 training server via computer IP without the need for internet connectivity. However, the number of users that can work effectively from one computer IP is limited by the router size; it is important to know the number of attendees, to select a router that can support the number of participants. You should familiarize yourself with local network providers and hardware capacity (mifis, etc.) they produce.

To use a local instance, you need to have it set up ahead of time on a computer. Your technical experts should help you set this up; the CHIS DHIS2 community of practice, www.knowledge-gateway.org/dhis2-chis-community, includes three guides on the necessary steps for this set up (A1.i. Setting up a Virtual Machine, A1.ii. Building your DHIS2 Local Instance, A1.iii. Sharing Your DHIS2 Server). The use of a production instance of DHIS2 should be avoided for training purposes. Before doing the training, the exercises should be tested in the chosen instance (local or cloud based) to ensure everything is working. Troubleshoot issues detected during testing so they do not arise during training. You may have a second person repeat the test to spot any issues missed in the first round.

Best Practice

If training with a local server connection, at the end of the training, let the learners access a remote server, to experience delays in the network for operating the system and for challenging their patience. Without experiencing the delays, they may later interpret network delays as faults in their device.

Event Space and Agendas

Be aware of the number of attendees you expect at each training, as providing sufficient materials and space will be necessary. Event space should be large enough for the group and also appropriate for the planned activities. Consider:

1. The type of seating you require (round table, individual desks, etc.).
2. Technological requirements (computers for all, Wi-Fi bandwidth, etc.),
3. Finance for conference center allowances, participant food and beverages
4. Trainers need space to walk around to observe and help each participant.

Materials

Sample Material List

Training of community-based, aggregate DHIS2 system with mobile data entry.

- Minimal Manuals to be distributed to each participant.
- Standard Operating Procedures as relevant to the participants.
- Projector(s).
- Flip chart(s).
- Markers.
- Notepads and pens for each participant.
- 1 set of hardware for each attendee (Smartphone, tablet, feature phone).
- Printed copies of..... (list will vary):
 - Attendance Sheet.
 - Participant's Agenda (1 copy per participant).
 - Hardware Agreement Forms (2 copies per person receiving hardware, one for them to keep, one to be collected).
- DHIS2 App Configuration Guide (1 copy per data collector supervisor and district officer).
- Village/Community ID Form (used in determining organizational unit hierarchies).
- Practical Exercises.
- Data Collection Form(s) that will stay on paper, (multiple copies per participant).
- Aggregate Data Collection Form (to be put on paper then into DHIS2).

The materials you will need for your trainings will depend on your activities. To ensure you are planning for everything, walk through your training agenda with a partner, and discuss what will be done for each part of the training, taking note of the materials needed.

The agenda for training sessions should be defined well-ahead of the training and included in materials distributed. See sample agenda for community supervisor/facility staff training.

Best Practice: Phone Tracking System

When distributing phones for mobile surveillance, have a tracking system for this hardware.

1. Number each phone box and two copies of the phone agreement (i.e. #1 on a box and on both agreement forms) and hand both to a community health worker supervisor to fill in the forms against the details of that phone.
2. Ensure that the phones and boxes do not get mixed up.
3. Collect the agreement forms, and have a council sign and stamp both copies. One copy will remain with the district, and the other will be returned to the partner and kept in the district box file in the office.
4. Use a QR code generator to generate a QR code with the phone's information (number, CHW, SIM number, district, etc.). You can then print this QR code onto a heavy-duty label sticker and apply the sticker to the back of the phone or inside the phone in the battery compartment.
5. If providing SIM cards with phones, document the associated SIM card and phone.
6. To prevent tampering of the SIM card is provided with the phone, glue the SIM into the phone by placing the SIM card in the phone and applying glue to the back.

Best Practice: Minimal Manuals for Tasks

User documentation should be packaged in Minimal Manuals. These manuals explain a specific work task (e.g. enter monthly data from village health register or compare health in your village with the neighboring villages). After explaining the work task, the Minimal Manual provides numbered step-by-step instructions with screenshots, so that users recognize what to do. Keep in mind that Minimal Manuals do NOT explain the functionality of the app, one by one, like a typical vendor user manual.

Note: Since users prefer doing and not reading, the manuals should be as short as possible while still containing all steps.

Evaluation of Training

Evaluation of training is essential, both during training and afterwards. Evaluation may be either qualitative (feelings of trainees about quality of training) or quantitative (data quality). Some options for evaluation are included below:

1. **Feedback during Training:** It is important to know whether your participants feel they are or are not benefitting from your trainings. This can inform future trainings and lead to improvements.
 - a. Get participants to write their feelings anonymously on paper or “post its” at the end of each day - Green for Good and red for bad.
 - b. Facilitators then review the responses from the “post its” at the end of the day and modify the training accordingly based upon responses.
2. **Competence Assessment:** Performing an assessment at the end of the training is another source of knowledge. This can be used to:
 - a. Tie work performance to learning outcomes after training.
 - b. Evaluate the training as a whole.

These assessments should be similar to, but not identical to, the exercises done during the training, and should require trainees to apply rather than recite what they learned. Make sure the test is accompanied by a rubric to ensure fairness if responses are graded.
3. **Data Quality:** A cost effective evaluation of transfer of competence from training to practice is to assess the quality of the data entered by the CHWs and to link this data quality with the training.
 - a. Data quality can be assessed automatically in the database.
 - b. Interviews with the CHWs can tie their performance to the training, software, hardware, support, social pressure and other factors.
4. **Impact Assessment:** These are complicated and expensive assessments and need specialized training, technologies and skills so are not covered here.

Chapter 6 Sustainability and Governance

Introduction

Ensuring sustainability, broadly concerning how the CHIS endures over time and space is one of the most difficult challenge that policy makers and implementers have to deal with.

The key to long term sustainability rests with governance of data management, which is a cross-cutting issue that involves formal management structures, policies and procedures, staffing, and workforce development, monitoring and evaluation of the CHIS program. By the end of this chapter, readers should be able to:

Learning Objectives

- Describe sustainability of CHIS, and its important facets.
- Explain what “designing for sustainability” means and the important considerations in this process.
- Explain the important role of governance in enhancing sustainability of the CHIS.
- Describe the four components of governance for CHIS data management.

What Do We Mean by Sustainability?

Sustainability of HIS in general, and CHIS in particular, is one of the most significant challenges facing designers, implementers, and policy makers of CHIS. Sustainability is a “wicked” problem, implying that if you try to address one of its facets, other problems will arise elsewhere. For example, to address the problem of CHIS continuity, a donor may be approached for funding. However, this may lead to other dependencies that can further put pressure on sustainability.

Some relevant characteristics of a sustainable CHIS include:

1. The CHIS must be well integrated into existing organizational routines of work practices, budgeting, training, reporting, and infrastructure provision.
2. On one hand the CHIS has to be well institutionalized, on the other hand, it must remain flexible, so that it can continue to evolve with the changing informational needs of the health system. This often leads to a dilemma of ensuring both stability and change, which designers and implementers have to constantly engage with.
3. The CHIS must be integrated with other systems like the routine facility HIS to ensure it does not remain standalone and lead to double work for the CHWs. A standalone CHIS is a sure recipe for unsustainability.

4. The outputs of the CHIS must provide real value to the key stakeholders, particularly the CHWs and their supervisors, but also mid-level and senior system managers.

Ensuring CHIS Sustainability

To address sustainability the primary focus of CHIS design should be on strengthening the “demand side” conditions such as how the CHIS adds value to the CHW, how it is integrated with their everyday work practices, and their needs for ongoing technical and public health support, rather than the dominant “supply side” approach of merely providing computers, internet and training.

To make a CHIS sustainable, planners need to address key technical, organizational and behavioral factors. These are explained in detail in the Performance of Routine Information Systems (PRISM) framework⁸ and shown schematically in Figure 6.1 below.

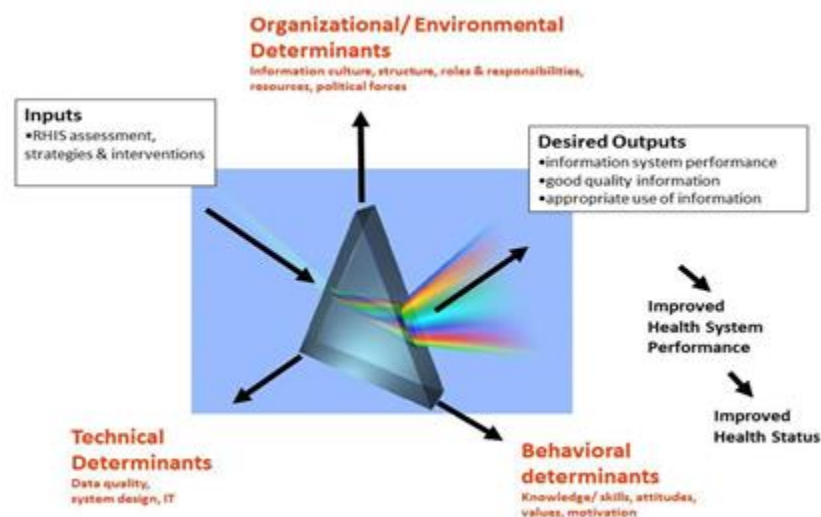


Figure 6.1: The PRISM framework

In this approach, CHIS inputs such as assessments, interventions and strategies need to be addressed by technical, organizational, and behavioral determinants in order to achieve the desired outputs of a sustainable system that produces good quality information used to improve overall health system performance. A few aspects focused specifically on CHIS sustainability are detailed below.

⁸ [2] MEASURE Evaluation, “PRISM: Performance of Routine Information System Management Framework,” <http://www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems/prism>.

1. Technical Design

- a. ***Integrated CHIS***: There are a number of examples of CHIS developed as an integrated part of the overall HMIS, linked directly to other systems in the community, particularly the routine facility information systems. Using an architectural approach, the CHIS becomes part of the system, reducing CHW workload and adding value,
- b. ***Increasing ICT infrastructure***: MHealth projects are increasingly based on internet connectivity, which is increasing exponentially allowing the use of android devices and mobile phones. However, This infrastructure must be carefully assessed, ensuring that the CHIS projects use available connectivity to its maximum while becoming fully operational.
- c. ***Free open Source software (FOSS) systems***: Successful CHIS projects are developed based on free open source software such as DHIS2, ensuring interoperability with other systems. FOSS flexibility and iterative design processes allow ongoing changes required for the application. As a result, the CHIS can evolve with changing needs, constantly adapted to the needs of the end users.

2. Human Behavior

Human behavior is the most difficult aspect of implementing a sustainable CHIS, and this aspect needs consistent attention. This phenomenon is increasingly being addressed by dealing with common issues with CHIS such as:

- a. ***Changing Facility Staff attitude to CHWs***. Many health workers do not understand the role of CHWs and look down on their work as being second class. Major effort needs to be put into encouraging facility level workers to support the community health services, the CHIS and providing CHWs with necessary feedback, support and supervision. Facility staff also need to be involved in addressing sustainable remuneration of CHWs, building this into the budgets, to increase motivation, reduce dropout, and minimize attrition.
- b. ***Providing targeted feedback*** CHIS stakeholders need to see the practical value of data and increase data use through regular, targeted feedback that demonstrates data driven actions based on data. This further increases local demand for and use of data, stimulates ownership and promotes a culture of information use, creating the virtuous data cycle. (see figure 3.1)
- c. ***CHIS provides added value to end users***. For the CHIS to add value to the CHWs, the system design must be integrated with their work practices, reduce their work burden and add value for them to perform their work. A CHIS that is designed for local use and program monitoring rather the surveillance needs of administrators, means that CHWs and stakeholders are motivated to use the system.

- d. **Ongoing CHIS support and capacity strengthening.** CHIS should focus on ongoing training, and provide support to CHWs in the many challenges they face when they use the system, providing feedback and support rather than criticism. CHIS supervision needs to encourage CHWs to use the system and make it sustainable.

3. Organization

- a. **Strong Data governance:** Governance is key to sustainability of any CHIS. All community level stakeholders must agree to common data standards and high-level coordination based on accountability, transparency and local participation. Key to these standards, are common data collection formats that reduce the data burden of the CHW and minimise the fragmentation of the CHIS. These in the long run contribute to systems becoming sustainable and enduring.
- b. **Plan for scaling up:** Many CHIS projects are initiated as pilots with a limited timeframe and funding, known as “pilotitis”. This needs to be avoided and scaling up planned for from the beginning with adequate resources and support. CHIS is about bringing about long term institutional and human behavior change, and systems take a long time to mature, usually beyond the short term “project” timeframe.

In summary, various reasons, technical, institutional, and human related, contribute to the CHIS becoming sustainable. Many of the reasons are inter-connected, requiring a holistic design and a health systems based approach to address sustainability.

Unsustainable systems do not scale, do not add value to the administrators who want data on the entire catchment population and not just from pilot areas. This challenge has been called the “all or nothing” consideration in HIS. Because the CHIS are not able to surmount these challenges, they don’t add value, and thus do not attract the required support from the administrators. This vicious cycle of unsustainable systems that do not scale and thus add limited or no value to users, leads to poor support and further adds to the unsustainability of the CHIS.

CHIS Governance

Information systems are not what they used to be and are becoming more important as interdependence among systems increases and demands for social accountability increase. Health information systems are becoming more important as information and communication technology spreads and have a greater impact on health workers lives, with pressures growing for more and better quality data. This trend is occurring at the same time as other significant changes are taking place with demands for greater transparency, participation and accountability and a reduction in the “digital divide” between countries. The challenge to CHIS designers and implementers is to build relationships of trust between stakeholders and to deliver effective social accountability.

The growing expectation that it is right to be involved in decisions that affect one’s future and the increasing knowledge about what is going on in the health system are a powerful combination to pressure health managers to improve trust between different levels of the system. Civil society,

health workers and other stakeholders are increasingly demanding participation in decisions that are made about them, insisting on transparency about allocation of resources and using the internet and social media to voice these demands. At the same time international organisations are insisting on accountability, demanding value for money for aid projects.

These three concepts – participation, accountability and transparency – are the core principles of good governance and need to be applied to any development of a CHIS.

Participation in CHIS governance emphasizes the broad participation of stakeholders in the direction and operation of information systems to develop a degree of consensus around decision making rules and capacity development processes. Participation implies increased citizen participation and greater community representation than traditional systems, creating opportunities for stakeholders to make meaningful contributions to decision-making, and seeks to broaden the range of people who have access to such opportunities. Technology may provide important forces leading to empowerment in participatory models, though face to face meetings remain important

Transparency refers to the availability of information to the general public and clarity about government rules, regulations, and decisions. Transparent procedures include open meetings, financial disclosure statements, freedom of information legislation, budgetary review, and audits. Transparent CHIS governance, therefore, means not hiding things from community stakeholders, not engaging in shady deals and not making discretionary decisions. There should be clear guidelines to adhere upon, based on openness.

Accountability in governance refers to the collective responsibility of officials to preserve the public's trust in government by delivering on policy outcomes and safeguarding public funds. Accountable governance of a CHIS involves systems and coordinated actions through which the MoH (with donors) ensures the effectiveness, efficiency and economy of expenditure. It relies on tools that promote value-for-money, integrity and transparency in government, such as external control, internal control, sanctions, and enforcement. These tools create an enabling environment for greater accountability and improved governance.

Governance implications for donors and government

While governance is ultimately the role of government, accountable governance is not the responsibility of one institution, but many entities and individuals across all levels, particularly local government for the CHIS.

The donor community (development partners) has a distinct role in supporting government to develop and implement CHIS governance guidelines around transparency, accountability and accountability. The donors wield considerable influence over the availability of resources and need to support the design principles, harmonize CHIS and end pilotitis.

Governance of Data Management

Effective data governance is the key to sustainability and is essential to all forms of routine HIS, including CHIS.

Data management governance is at the core of all information systems and is crucial for the sustainable functioning of a CHIS. This section is adapted from “Guidelines for Data Management Standards in Routine Health Information Systems⁹” and readers are encouraged to refer to that for further details.

This section defines CHIS governance, provides an overview of governance of CHIS, and proposes standards for data management governance which, when applied, can strengthen CHIS performance.

Governance in data management can be defined as: The development and implementation of administrative policies, procedures, and processes that define workflow, program inputs and outputs, management structure and oversight functions, and the methods and frequency of performance evaluation.

Data management governance dictates how the different components of the CHIS, at the same or different levels of the health system, work together to achieve a common goal - quality health data for decision making. For the purposes of this guideline, governance is applied largely to CHIS and is seen as a core function of high level management at all levels -that is, to monitor, assess, and strengthen these systems to facilitate improvements in service delivery

Data management governance ensures that data is of high quality - current, correct, consistent, and complete - as well as readily available to stakeholders (i.e., ensuring access to consumers, or those who require health information to inform decision making). In practical terms, that means putting personnel, policies, procedures, and organizational structures in place to ensure that data is accurate, consistent, secure, and available.

The process of data management governance for a CHIS should foster cross-organizational collaboration, facilitate structured policy making and balance ad hoc or narrow information needs with the interest of the Community health system. Interventions to improve governance should address the institutional, behavioral, and technical determinants of CHIS performance described above and focus on improving the desired CHIS output of good-quality data that is regularly used to improve service delivery.

Good governance requires commitment at all levels. It is not enough to have good structures, policies and procedures at the top. They need to be implemented by a dedicated team of well-trained stakeholders at the lower levels who have the motivation and skills to monitor and evaluate the CHIS based on the principles of participation, accountability and transparency.

⁹ Heywood & Boone Guidelines for Data Management Standards in Routine Health Information Systems Measure evaluation 2013

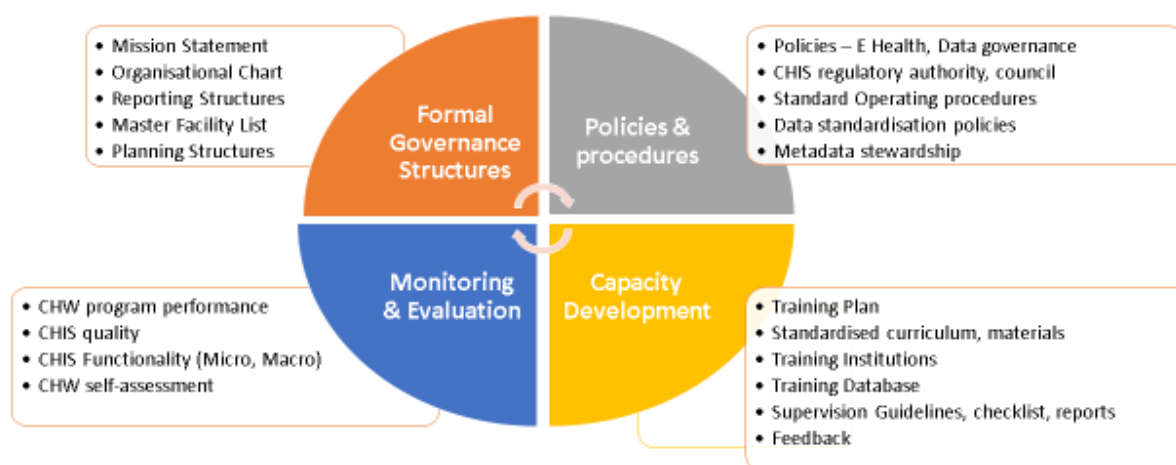


Figure 6.2 Governance of Data management

This model brings together in one place a number of concepts dealt with in other places in this guideline including:

- Formal governance structures such as SOPs and strategic planning and financial systems, as well as oversight mechanisms such as technical working groups (TWG).
- Workforce development, training, and supervision to identify best practices pertaining to CHIS staffing. (Chapter 5)
- Policies and procedures for data management, with particular regard to standard operating procedures, data and metadata stewardship. (Chapter 4)
- CHIS assessment, starting with general assessment questions and then exploring the Performance of Routine Information Systems (PRISM) model to see how CHIS converts inputs into appropriate outputs by influencing determinants of health outputs (organizational, behavioral, and technical) and their influence on overall health system performance.(Chapter 2)
- Ways to promote a culture of information use is the core theme of this manual.

Formal Governance Structures

CHIS governance is the oversight and monitoring function necessary to ensure that the CHIS functions as designed. Adequate governance allows the system to identify threats to performance and make necessary corrections, as well as to find opportunities to improve the CHIS and advance the aims of the system.

Governance structures are the formal mechanisms through which this oversight and local management takes place, including organizational frameworks, TWG (Technical Working Groups), and boards of directors. Governance structures oversee the management functions and inputs to ensure optimal system functioning

Mission Statement

A mission statement is a formal expression of the purpose of the CHIS and its reason for being. A good mission statement states the reason for the organization's existence and includes goals, names primary stakeholders, and articulates how the organization provides value to stakeholders.

Organizational Chart

An organizational chart is a diagram used to depict the CHIS structure and personnel. It helps organize personnel by identifying management control within the organization.

An organizational chart is useful for planning, resolving disputes, and managing change. It can be used as a baseline for planning, budgeting, and workforce modeling as it gives a succinct overview of the organization.

Effective participation structures

CHIS oversight committees should be formed at each level of the system—that is, in each district and facility, to monitor CHIS system performance. The committee should be made up of CHIS stakeholders from health care institutions, implementing partners, local governments, and, where possible, civil society. These committees should facilitate the CHIS mission in their area of influence by monitoring performance, alerting CHIS management to strengths and weaknesses, and facilitating capacity building.

Village Health Committees are crucial to spread participatory processes to the lowest levels and these need capacity development, funding and regular feedback to become effective

The CHIS regulatory authority and data governance council (see policies and participation section) also need to have effective representation of community stakeholders

Reporting Structures

In a CHIS, data and information begin at the service delivery point in the community and then flow toward the center to be shared with stakeholders to ensure that relevant information, based on quality data is available to those who need it in timely fashion.

Reporting structures include directives (SOPs) from CHIS management, which state who reports what and to whom, when reports are due, in what format and by which mechanisms.

In the context of CHIS, reporting structures clearly define:

- The source document for reporting—that is, the individual client record
- The standardized, aggregate, periodic report for reporting to the next level
- Reporting deadlines—the date reports of various types are due to the next level.
- Indicator calculation guidelines and compilation, and completing the forms
- Reporting Procedures for sending the data to the next level.
- Data quality review procedures
- Sanctions (if any) for failure to meet reporting obligations.
- Responsibilities of staff members to monitor reporting of performance and compliance, and enforcement of these standards?

Master Facilities List

A master facilities list, in DHIS2, is a complete listing of all health service delivery sites in a country, including CHIS reporting units, with information about capacity and services available. It is dynamic and should be kept up to date as reporting units (CHWs) are added to or subtracted from the system.

A master facilities list improves record keeping by improving transparency and reporting efficiency. It minimizes duplicate reporting and promotes analysis and synthesis of data to improve decision making and health system functioning.

Planning Structures

Planning is critical to ensure that CHIS resources are targeted efficiently and according to need, so that maximal benefit is achieved from CHIS investments. Planning *structures* refers to mechanisms for planning, such as periodic program reviews and needs assessments, combined with financial reviews and budgeting. Setting targets and situational analyses are also aspects of regular planning.

Policies and Procedures for Data Management Governance

The management of CHIS data should be standardized such that the steps performed in turning data into information are the same throughout the system—from one district or CHW to another.

These policies and procedures are an integral part of governance and should be well defined, detailed, written down, and made accessible to all staff and other stakeholders in the data management process. Processes should be supported by policies that are well known and enforced, so that standards are applied uniformly across the system. The following are standards and best practices for data management policies and procedures.

CHIS Regulatory Authority

For a CHIS to function effectively, all community role-players should routinely report, using standard mechanisms, to the CHIS. Regulatory authority often takes the form of public institutions empowered to regulate public health practice according to government imposed standards. This is necessary to ensure complete reporting from all sources of health service delivery including CHWs. However, the MOH often has no formal influence over CHWs to ensure reporting, other than the regulatory authority provided through government.

To efficiently target resources for disease control and prevention, CHIS managers need to understand where disease is occurring in the population and where services are being utilized. Without accurate targeting based on complete, reliable data, resources can be wasted by sending too much to areas that do not need it or too little to areas that do.

E- Health and Information and Communication Technology Policies

ICT governance is essential to ensure that there are rules and regulations guiding use of electronic tools for managing and transmitting data and information, such as computers (hardware and software), networks, tablets, personal data assistants (PDAs), flash media, and communication tools, such as cell phones, modems, e-mail, instant messaging, and social networking.

A policy framework should be developed by the MOH to manage ICT resources in the system. What resources to acquire, how they should be used and by whom, when they should be upgraded or replaced, and how they are maintained should all be codified into the framework to ensure efficient stewardship of CHIS resources.

Because CHIS personnel should not be expected to have knowledge of maintenance and repair of ICT hardware and software, outside resources can be utilized. Reputable, licensed computer hardware and software vendors and repair firms can be contracted to maintain the ICT resources in the CHIS, reducing the burden on HMIS personnel and allowing them to focus on data collection, analysis, and use for planning and management.

CHIS Data Governance Plan Based on Best International Practices

A CHIS governance plan refers to roles and processes that serve as a guideline for fulfilling, sustaining, and extending CHIS planning. A governance plan crosses all organizational layers, including stakeholders, administration, maintenance, strategy, policy, and support. ^[1]

A CHIS governance plan should clearly state who does what, when, and how with regard to CHIS management, to management of data and information, and to decision making. A governance plan is useful in times of transition or change in the CHIS, since it provides a reference tool to clarify roles and settle disputes.

Data Standardization Policies, Framework, and Procedures

Most countries still lack policies that bring together the various components of CHIS under a single unifying framework and provide clear lines of responsibility and functionality. CHIS management structures should be strengthened centrally and resources and authority decentralized to serve the specific needs of the people involved in implementing CHIS, particularly at the periphery.

The CHIS framework in both national health policies and strategic plans should encapsulate an integrated CHIS as part of overall health systems strengthening and governance reform, with buy-in to the plan from local government, political authorities, the MOH, and donors. The framework should recommend the pooling of CHIS expertise and resources into “one plan, one framework and one funding mechanism.”¹⁰

Countries also need a practical CHIS operational plan wherein all CHIS activities within the MOH are centrally guided, with clear lines of decentralized responsibilities in the spirit of administrative, financial, and operational decentralization toward districts.

As defined in the CHIS framework, institutionalized mechanisms should be developed for integrated CHIS data quality assurance (as measured by its completeness, accuracy, timeliness, and consistency), with validation rules for electronic systems and a team approach to data quality. In addition, these policies should:

1. Specify interoperability of CHIS subsystems.
2. Define human resource needs and capacity strengthening requirements.
3. Define responsibilities for data collection, information flow, and use.

National policies should provide for a balanced, limited set of national CHIS indicators, which are regularly reviewed in a participative manner, with clearly defined numerators and denominators, data sources, baselines, and national targets. There should be a regular indicator review process in which program and subnational managers participate to ensure that the existing indicator set

¹⁰ Paris Declaration on Aid effectiveness 2005

fulfills their needs.

Most countries have policies, laws, and regulations governing health services that, if applied, would greatly improve health system functioning. Too often inadequate resources or a lack of incentives mean that these policies are not enforced. Their implementation could be strengthened by the application of SOPs.

Metadata stewardship

In CHIS, stewardship of metadata, or responsible planning and management of data about data, is needed to foster consistent use of data management resources and facilitate data mapping among computer systems. A data steward holds responsibility for maintaining a data element in a metadata registry. Data stewardship roles are common when organizations need to exchange data precisely and consistently among computer systems and to reuse data-related resources.

A data steward ensures that each assigned data element:

1. Has a clear and unambiguous definition.
2. Does not conflict with other data elements in the metadata registry.
3. Is being used and is being used consistently in all interlinked computer systems; unused data elements are removed.
4. Has adequate documentation on appropriate usage and notes.
5. Is documented with regard to its origin and sources of authority.

Assignment of data elements to an individual promotes trust in systems where users can contact a specific staff member with questions on specific data elements.

Data Quality Assessment and Auditing

CHIS data quality should be assessed periodically to enhance confidence in data and promote use of the data for decision making. Data quality should be assessed routinely for high-priority indicators as a part of regular supervision, and less often for other indicators. A periodic assessment of CHIS performance should include a data quality assessment.

Data Standards

Governance refers to a process which outlines the process and mechanisms of how decisions are taken. In the CHIS case, the governance decisions concern how and why new systems are introduced, and their implications. As emphasized throughout this document, the CHIS is not a standalone system, but is linked by standards with other data collection processes and systems based on the six WHO building blocks.

Data standards are multifaceted in nature, involving both technical and semantic standards:

1. Technical (syntactic) standards such as data transfer protocols.
2. Semantic (nomenclature) aspects. Important semantic standards in the context of CHIS include metadata stewardship issues such as :
 - a. Meta data naming conventions for data elements, indicators, organizational units, shape files and others.
 - b. Reporting periods for different elements and the formats in which they are reported, that enable ease of compilation of data for the CHW.

A universal governance problem is that donors and NGOs want to introduce their own parallel community systems and data collection formats without being accountable to other standards and systems in the community setting. This lack of governance adds to the workload of the CHWs since all data collection work converges on them, and magnifies the fragmentation.

This situation is primarily due to the absence of a higher level mechanism for governance of data and standards. A typical governance mechanism is the establishment of a steering committee at the MoH level, and all proposals for the introduction of new systems should be approved by them. For example, they should need ensure that the new system being proposed is feasible, how it overlaps with other systems, what duplications are involved, the implications on data collection burden, compliance with laid out standards, and whether the required outputs can be met through existing systems. Such a systematic and thorough process of governance goes a long way to control duplications and redundancies and reducing the work burden of the CHW. However this governance needs to be enforced at lower levels, with responsibility and authority being given to districts and facilities to prevent parallel systems proliferating.

These guiding principles generated a community driven framework of standards, as contrasted with those which are typically imposed from the top with most often sub-optimal results. A framework of standards which represent everyday work, and are bottom up driven are more likely to add value and be accepted by the CHWs.

Standard Operating Procedures (SOPs)

SOPs are the translation of policies and procedures into day to day life of the CHIS stakeholders. All stakeholders need their roles and responsibilities clearly defined in a set of SOPs that form part of the organizational culture of the CHIS. SOPs should describe clearly who should do what, when, and with what resources, to manage and maintain the CHIS.

There are many ways to define SOPs, and the actual SOPs vary tremendously from country to country and project to project. The SOPs outlined below represent some very basic, practical SOPs that could serve as the foundation for country or program specific SOPs.

Overview

There are three, basic SOPs outlined in this manual:

1. Reporting Guidelines in Chapter 4
2. Training protocol in the Chapter 5
3. Supervision protocol in Chapter 5

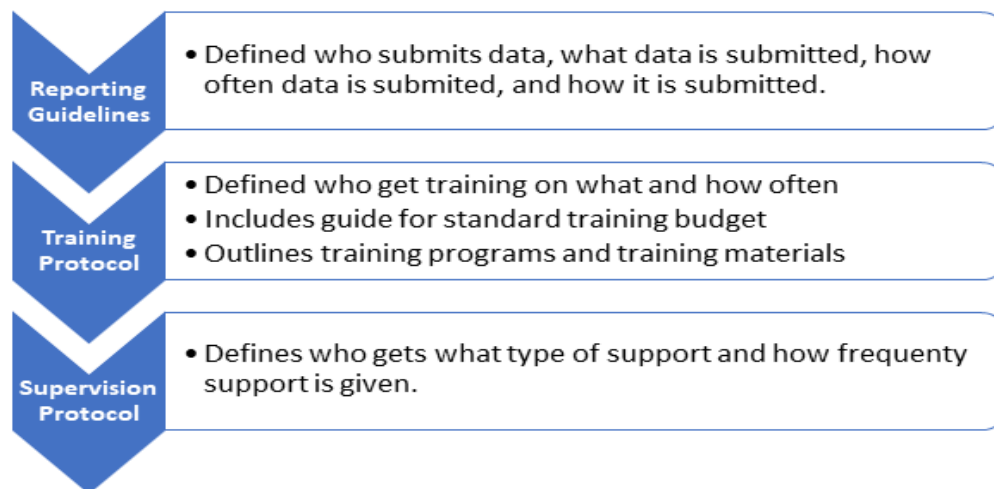


Figure 6.3: Standard operating procedures outlined in this manual.

SOP Best Practices

1. **Harmonize multiple programs into a single protocol.** This is especially true for the data capture protocol described in this chapter and the training and supervision protocols in the training chapter.
2. **Develop SOPs for each individual community project** especially if multiple data flows exist from.
3. **Turn the SOP into illustrated posters** and have the facility staff post them on their walls for public viewing.
4. **Print SOPs and make sure all CHWs, facility staff, and district staff have copies**
5. **Stakeholders to sign the SOPs** at the completion of training.
6. **Stakeholder participation in the creation and approval of SOPs.** The SOPs must institutionalize the best practices and workflow of the actors in the CHIS. Include representation from all relevant stakeholders in the process of developing SOPs.
7. **Ensure all data elements and indicators are captured.** The project should have an

M&E framework (see Chapter 3) that should clearly define all data elements and indicators. The CHWs should clearly understand the meaning, and measurement of each data element and indicator to remove ambiguity

8. **Use data capture guidelines at trainings.** To build accountability, CHWs and facility staff need to know they are part of a larger system. They need to know how their data is used for planning at higher levels and specific actions at lower levels.
9. **Have the CHWs explain the data capture guidelines.** This teach-back method is an effective adult learning practice. By explaining the data capture guidelines, this elevates the CHW's credibility with the health committee.
10. **Produce, simple-to-use, local language guidelines.** CHWs and facility staff need guides and instructions on what to do. Consider making posters or small laminated portable data capture guidelines for CHWs and facilities to put on the wall or carry with them that outline their role and responsibilities based upon the data capture guidelines.
11. **Have CHWs, facility, district staff and national staff sign guidelines.** This is a symbolic "commitment" measure. The aim is that they have read it, understand their reporting responsibilities as defined in the data capture guidelines, and will carry out these responsibilities.
12. **Produce simple videos or audio and upload them to phones.** Responsibilities and actions for every event are made easier with a simple, local-language videos or audio guides that facility staff and CHWs can refer to.

CHIS Staffing and Workforce Planning and Development

People are the lifeblood of CHIS, and even the best system would generate no information products without the combined efforts of all CHIS staff. An entire chapter of these guidelines are dedicated to capacity development, but the topic outline is repeated here to reinforce its importance in CHIS governance.

- Training needs to be carefully planned and costed, with the appropriate infrastructure, equipment and curriculum, trained teachers
- CHIS staff must have the training they need to perform the tasks expected and to produce the data and information necessary to monitor the community health system.
- Adequate numbers of staff is also necessary. A staff that is too small risks underperformance, while a staff that is too large wastes precious CHIS resources.
- The staff and its training should be organized, efficient and of high quality.

- Certain standard elements of CHIS staffing and training help ensure high quality output from the workforce while avoiding redundancy or wastage.

Components of CHIS planning and development that should be covered by this planning and development process include

Training Infrastructure and staff	<ul style="list-style-type: none"> • Costed training plan • Standardized training curriculum/materials • Equipped training institutions • Adequate numbers of competent, trained trainers
Supportive Supervision and Mentoring:	<ul style="list-style-type: none"> • Guidelines for standardized, effective supervision • Standardized supervisory checklists • Targeted feedback mechanisms • Standardized supervision reports—tracking results and monitoring trends • Schedule of supervisory visits • Data quality checks

Table 6. 5 Requirements for CHIS capacity development

Monitoring and Evaluation

Monitoring and evaluation (M&E) is the final, but crucial component of Data Governance and concerns maintaining data quality and ensuring quality of the overall CHIS as well as regular assessments of CHIS functionality. This is in addition to the standard programmatic M&E, which is not covered here.

Maintaining CHIS Quality

CHIS quality is essential and the determinants are similar to those already described for sustainability -technical, organizational, and behavioral factors that convert CHIS functions into the key outputs in the form of quality data that is regularly used so as to improve health system performance. (PRISM framework¹¹)

Technical Determinants

These are the specialized know-how and technology to develop, manage, and improve CHIS processes and performance. Affecting CHIS performance both directly and via behavioral factors, they include: CHIS design, computer software, as well as the complexity of information technology, reporting forms and procedures.

Organizational Determinants

These relate to organizational structure, resources, procedures, support services, and work environment that promote a “culture of information”—the capacity and control to promote values and beliefs within the organization by collecting, analyzing, and using information to achieve the organization’s goal and mission. Organizational factors include: governance, planning, resource availability, training and capacity development, supervision, finances, information distribution, and the culture of information.

Behavioral Determinants

These include: the CHIS users’ demand for data, data quality checking skills, competence and problem-solving skills for CHIS tasks, confidence levels in their ability to perform CHIS tasks, and motivation to perform at peak ability. These behavioral factors are influenced by both technical and organizational determinants (above).

Assessing CHIS Functionality

Assessment has been dealt extensively in Chapter 2 and is summarised here.

¹¹ MEASURE Evaluation, “PRISM: Performance of Routine Information System Management Framework,” <http://www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems/prism>.

A major test of the effectiveness of CHIS governance is regular participatory assessment to see whether CHIS is improving health program outputs and health impacts. Yet, surprisingly, this aspect of performance is rarely formally evaluated.

CHIS impacts on health programs can be measured by four simple questions:

- Is the information relevant?
- Is the information of good quality? (Is it timely, consistent, complete, and accurate?)
- Is the information presented in a user-friendly way? (Is it easy to access and easy to interpret?)
- Is there capacity to act on the information provided?

The answers to these questions need to be approached in a way that addresses the health systems framework and should be further elaborated by asking:

- Has the CHIS been decentralized, and have lower-level program managers contributed to decision making?
- Have the systems been integrated and contributed to broader program integration?
- Has CHIS contributed to evidence-based decision making and more effective health outcomes?

Assessment methods

Here we provide an overview of some of the popular methodologies to assess CHIS functionality, including:

Decentralised Self-Assessment

To strengthen data management, countries should institutionalize regular self-assessment data use meetings, particularly at facility and district levels. Self-assessment should use local data to calculate indicators in order to review performance against targets for client, facility, and system indicators and to compare the results to those of similar institutions, other geographic areas, and national norms. Self-assessment meetings should be conducted at least quarterly and should be made part of routine SOPs for work and management procedures.

Health Metrics Network Assessment Framework

This comprehensive assessment framework, considered the gold standard for HIS assessment, is the basis for the Macro-assessment described in chapter 2. The HMN framework deals with the holistic HIS (the CHIS being just one aspect) and is not discussed further here, but constitutes a valuable tool for evaluating overall HIS functionality, in which CHIS plays a significant role.

The full HMN assessment asks stakeholders approximately 200 questions regarding all six HIS components—HIS resources, indicators, data sources, data management, information products, and

data dissemination and use —and scores the answers electronically, producing a series of graphs for each component.

The PRISM Framework

The PRISM framework and toolkit takes a holistic approach to CHIS monitoring and evaluation, seeking to assess system performance by investigating CHIS performance determinants (the technical, organizational, and behavioral factors described above). Performance, as assessed by the PRISM methodology, is measured by the level of data quality, the extent of data use for decision making, and the management capacity.

PRISM assessments can be used to establish a baseline measurement of performance and can then be repeated after interventions to gauge their effectiveness. PRISM tools can also be used for routine monitoring of CHIS performance (such as conducting data quality checks as part of routine supervision).

Conclusion

Many of the governance issues dealt with above are illustrated in a case study from Zambia in which an NGO- initiated project transitioned to government ownership while achieving remarkable results for community sanitation.

Case Study: Community Led Total Sanitation from Zambia

This case study describes the development of an information system for Water and sanitation for Health (WASH) based on the DHIS2 platform. This system was built by Akros, an NGO, and were engaged with the challenge of sustainability after successful implementation of the system. The case illustrates the approach they adopted in transition the system from the NGO to the government in their bid to establish sustainability. This case is thus unique in illustrating the challenges of transitioning systems to establish robust government ownership.

In 2013, DFID funded a Water and Sanitation for Health (WASH) program in Zambia. Community led total sanitation (CLTS) conducted by the Zambian Ministry of Local Government and Housing (MLGH), UNICEF, and an implementing partner. In response to concerns of poor data reporting and targets which were not being achieved, the team layered a unique mobile-to-web application (M2W) using DHIS2, over traditional paper based CLTS data collection methods, resulting in an innovative service delivery and monitoring system dubbed “CLTS M2W”. CLTS M2W uses mobile feature phones, automated data feedback loops, and engagement of traditional leaders to provide communities with the ability to clearly see their progress towards sanitation goals.

These tools require data collection at the community level by Sanitation Action Groups in each village, data entry onto phone by community champions, and the management of this process by local chiefs and at district level. CLTS M2W paved the way for unprecedented CLTS uptake in Zambia, facilitating the creation of over 1,500,000 new users of sanitation over 18 months.

Government involvement and Ownership

The leadership of the Ministry of Local Government and Housing was critical from the beginning of the project, but most important was the leadership of the local government in the districts and the traditional leadership of chiefs in the villages, where the intervention was ongoing. When a CLTS program is first introduced in a district, the intervention, technology, and supervision is initially led by the implementing partners with the goal of ultimately transitioning ownership of the program fully to the government. Though the initiation visits were led by the governments’ partners, the following visits and all supervision visits were led by the district government officials with each subsequent visit involving less outside partner involvement than the prior.

Focal Point Persons (FPP) are the local or national government employees who coordinate these activities and channel knowledge and communication for programs in the field and at the district level. To promote their ownership and engagement of the data, FPPs receive DHIS2 data analysis training during supervision visits. Long term sustainability requires fully trained ministry staff and community champions, who understand and can troubleshoot the system.

Capacity Development

Trainings were conducted by partner staff to district staff, who then trained community champions (CCs) and Sanitation action groups (SAGs) in a training of trainers approach. There were different trainings at every level of data collection and regular feedback to ensure that data collection tools were properly used and understood.

- The Sanitation Action Groups required an understanding of the paper-based data collection tools, what was being monitored and why;
- Community Champions needed to operate feature phones for data reporting, understand the data being collected and the feedback loops they were receiving;
- Environmental Health Technicians (EHTs) required training to understand the mobile platform and how to troubleshoot minor problems. EHTs and other government officials also benefited from data use trainings.

District Water Sanitation and Hygiene Education (DWASHE) committees were created in districts with staff from all government ministries to review sanitation progress at quarterly meetings. They are trained in the use of DHIS2, using specially developed dashboards and other visualization tools to enable them to inspect the sanitation state of the districts and make district WASH plans based on these data.

Feedback to Stakeholders

Custom-developed reports with DHIS2 data are sent to partners monthly, giving an overview of “open defecation free” (ODF) status, and reporting rates. There are several iterations of these html based reports, designed to communicate the necessary information to the receivers.

- EHTs receive information on total reports received out of the total expected within their assigned catchment area.
- UNICEF and MLGH receive reports on sanitation progress of each data element per district.

These reports were designed to help EHTs target their activities based on which CCs need help reporting, and respectively can help UNICEF and MLGH in resource allocation.

Involvement of chiefs

After a few months of monitoring data and not seeing a dramatic effect on latrine construction, a program manager proposed incorporating the power of traditional leadership into the protocol design of CLTS. A tablet-based chieftdom widget was designed to enable chiefs to view relevant information without logging in to DHIS2 and requiring minimal mobile data to support. This information is presented in charts, tables, and graphics, that exist on the home screen of the tablets.

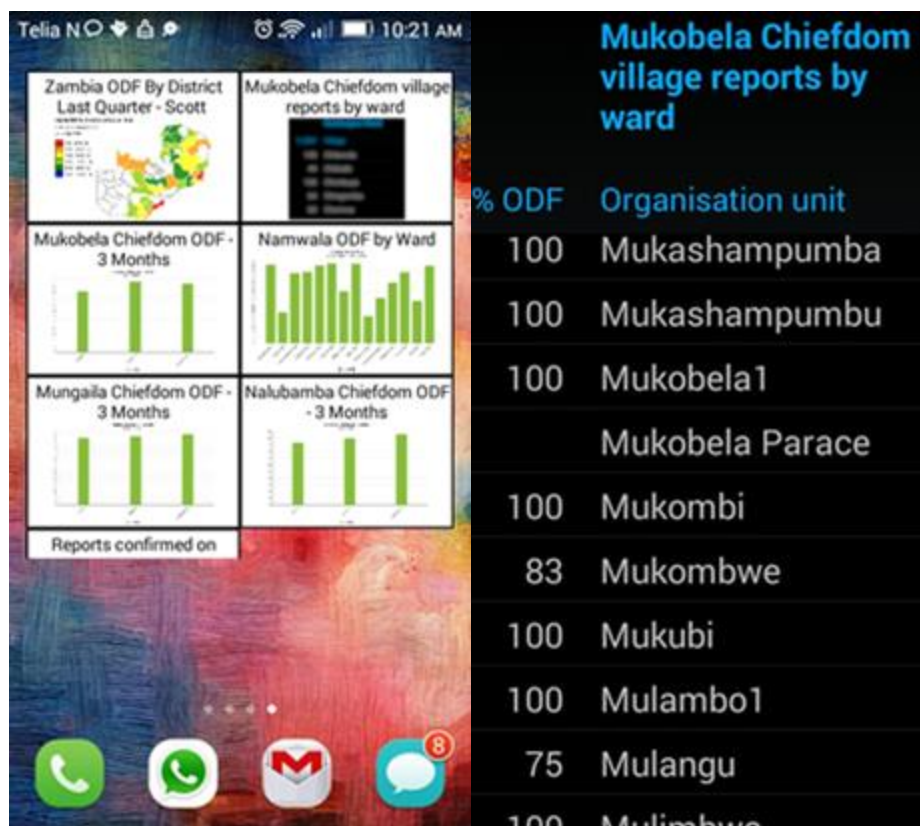


Figure 6.5 (left): Snapshot of the Chief's Visualization App active on a tablet home screen.

Figure 6.6 (right): Enlarged list of sanitation performance of individual villages of the chiefdom.

Armed with this information, chiefs could compare the performance of their villages to their neighboring chiefdoms villages' performance, combining the power of community behavior changes, with the traditional authority chiefs must instigate that change. Following tablet distribution came positive change in open defecation free status, as chiefs used their influence to encourage their headman and villages to build more latrines (see figures 6.7 & 6.8).

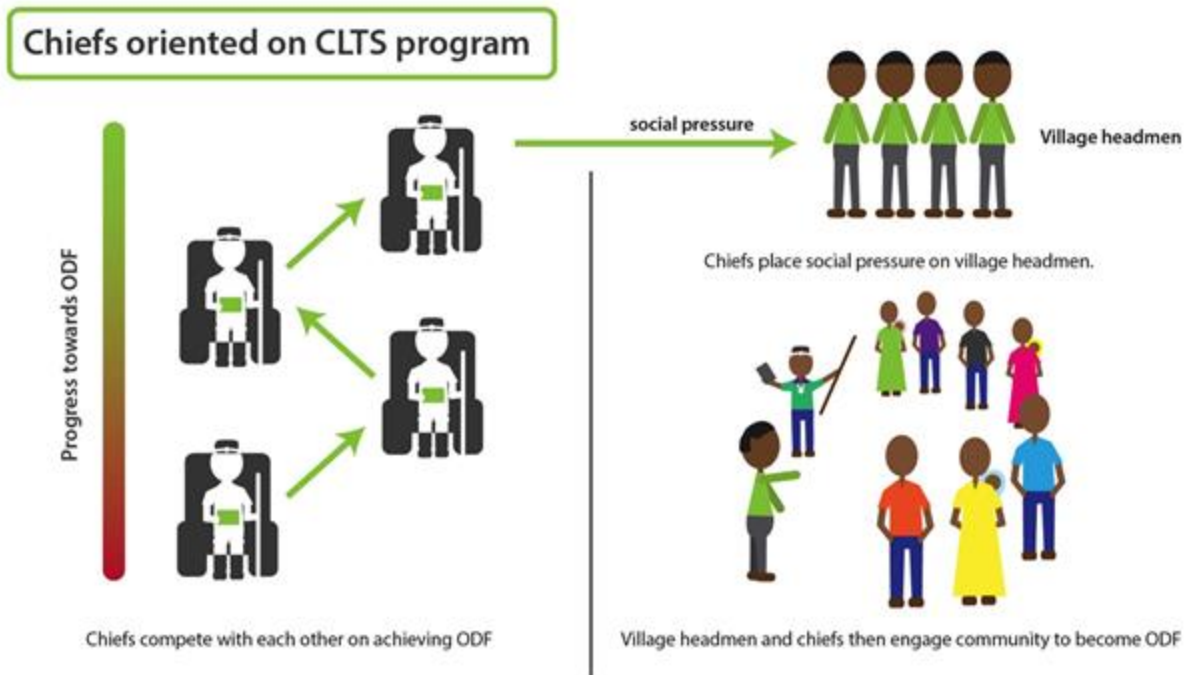


Figure 6.7: Figure illustrating the influence and process of chiefdom orientation

Effects of DHIS2 driving down data to community change agents

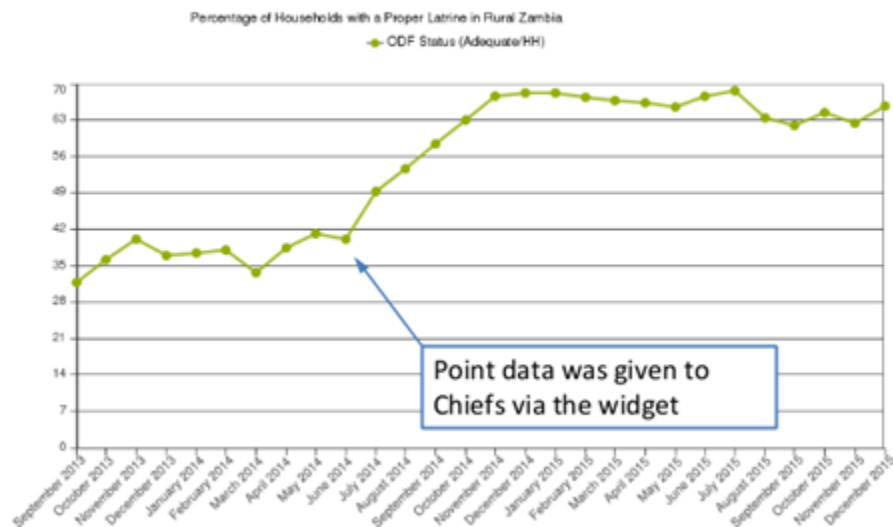


Figure 6.8: Sanitation Uptake over Time. Ministry of Local Government Republic of Zambia

CHIS Development

The development process benefited from a “boots-on-the-ground” approach at district level and below in Zambia. This local understanding combined with DHIS2 skills enabled an agile development approach that allowed for flexible platform creation and modification as needs and priorities shifted. This flexibility allowed the data collection process to mature as needs developed. As the program grew and donor interest expanded, data collection was able to expand to include monitoring of water access, face washing and environmental cleanliness.

The paper tools themselves also changed: originally, paper sheets were printed on single-sided documents and distributed to SAGs, but as the program grew, notebooks were printed for SAGs to collect their monthly reports and share with the CC. The notebooks included helpful tools and guides for implementing CLTS in their communities on the front and back cover and prevented the loss of paper records.

One key example of agility that the development approach facilitated was the selection of the most appropriate hardware for data collection. Smart phones were piloted in the first year, but were not working well due to the low literacy level of the CCs and the added costs associated with more expensive and fragile phones. The pilot approach allowed procurement and training strategies to shift to use simpler feature phones, a more fitting option for the data collection tool.

The CHIS development strategy also relied heavily on the CHIS pillar that stressed balancing the reporting burden. Pushing against the tendency to collect more, do more, and learn more is tough work. As stakeholders learn of a successful program, they want to be involved. Keeping the reporting burden of village SAGs and CCs light enables reporting incentives to remain low, reporting rates high and training costs low. Nowhere was this more evident than in the roll out of water access monitoring. Initial requests had CCs collecting an additional 12 new data elements. It took months of negotiation, a pilot, and subsequent data collection revisions to keep the list of new data elements reasonable.

Historically, a paper to Excel system was used for CLTS, requiring community facilitators to collect and aggregate hand-written reports for each village Sanitation Action Group (SAG). Environmental Health Technicians (EHTs) collected aggregated paper records from community facilitators and reported to the district to enter Microsoft Excel. These Excel records were submitted to the central level for manual aggregation into one master Excel file for data analysis. This process was error prone, extremely slow, and only offered basic analytical functions.

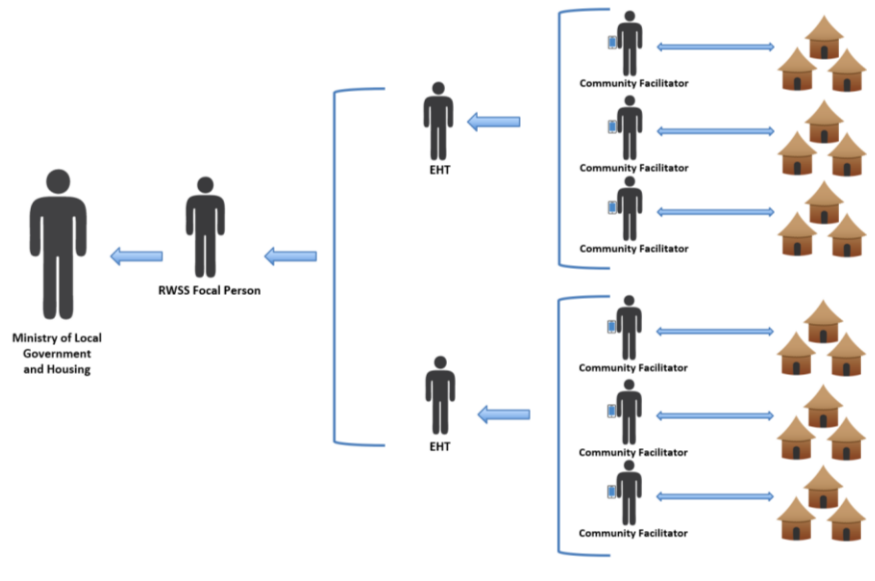


Figure 6.9: Data flow of CLTS reports. Sanitation action groups (SAGs) in each village report data to community champions (CCs). CCs submit data to the DHIS2 via mobile phones. EHTs oversee CC cadres.

The new system depicted above in Figure 3 was designed to maintain the paper-based village SAG forms containing 14 data elements on latrine construction. Data burden was reduced by reporting only data for a set of indicators developed with MLGH for performance of village-level sanitation. CC's were given mobile feature phones with a java app to report SAG data directly onto the DHIS2 database, minimizing reporting duplication.

SOP Development

Strong protocol development and implementation also helped move the program towards sustainable success. These protocols (e.g. Supervision Visit Protocol, Surveillance Protocol, Event Protocol, Exit Protocol, and Final SV Checklist) were developed together with MLGH, based on improving existing practices and are the basis for activities that Surveillance Officers, Environmental Health Technicians, and traditional leaders undergo for successful implementation.

A key protocol that ensured government engagement throughout all parts of the reporting process was the Event Protocol. This protocol provides a foundation for government transition support as well as structured approach to each necessary task that delineates for each event: who is responsible, when it should occur, why it should occur, and what the goal of that event is. Within the WASH program, these events are Community Mobilization, Mobile Surveillance Training, SAG Data Collection, CC Data Collection, EHT Feedback, District Monitoring, ODF Verification, Quarterly Ward Meetings, and Quarterly DWASHE Meetings.

Two examples are given in Figures 6.10 and 6.11:

Community Mobilization	
Responsible Person	Chief and/or Senior Headmen
Periodicity	Ongoing
Purpose	To continue building village-level awareness of and support for community-led total sanitation
Outcome	Continued propagation of improved latrines
<p>CLTS community mobilization includes any event that involves a SAG, CC, EHT, Headman and/or Chief pushing the CLTS agenda at the village-level.</p> <p>On a monthly basis, the SAG mobilizes each household in the village, fills out the CLTS Data Collection Sheet while monitoring latrine propagation and conducting sensitization.</p>	

Figure 6.10: Table illustrating community mobilization.

ODF Verification	
Responsible Person	District CLTS Focal Point Person
Periodicity	When a village claims ODF status
Purpose	To verify if villages are open defecation free
Outcome	Villages that claim ODF are verified to be ODF or not
<p>This process helps maintain data quality. When the District CLTS FPP logs into DHIS, he/she will see a notification on the Dashboard for any villages that claim ODF status. The notification will indicate the name of the village and prompt the District CLTS FPP to mobilize the verification team to conduct a field visit to the village.</p> <p>It is the EHT's responsibility to coordinate a verification team, acquire funds from the District Office and verify the village. After the verification visit, the EHT reports their findings through the DHIS2 mobile application's ODF Verification Form.</p> <p>Once a village has been verified for 3 months, a team of District Officers then visits the village to conduct a spot-check certification. Districts are able to monitor ODF progression through DHIS2 visualization tools.</p>	

Figure 6.11: Table illustrating ODF verification.

These protocols strengthen operations, and streamline reporting by standardizing expectations for all roles, and providing people with needed tools to meet these expectations.

Lessons learned

1. Government sustainability was fostered from the very inception of the program as program implementers worked hand-in-hand with MLGH at all levels of the hierarchy. Surveillance visits always incorporated local government staff.
2. Visualization of data by key 'change agents', in this case local chiefs and traditional leaders creates ownership and motivation. These change agents were provided a means to understand the performance of their villages in relation to sanitation practices and not only had the data, but the leadership authority to encourage village level improvement.
3. Clear documentation through SOPs is essential for clear system functioning and management of all parties.
4. Multi-ministerial collaboration is important. In this case, Ministry of Chiefs and Traditional Affairs (MOCTA) and MLGH collaborated to ensure chiefs and traditional leaders were engaged in sanitation at local level. This was a success.

A future goal is to better link data from MLGH with data from the Ministry of Health. Specifically, MLGH data (CLTS intervention data) is currently captured within an instance of DHIS2, with health-outcome data (e.g. diarrheal disease incidence) captured in a separate instance of DHIS2 (Ministry of Health). By linking the two systems, it will be easier to understand the impact of the CLTS program on health outcomes.

Case Study Liberia Community Based Information System (CBIS)

The National Community Health policy and programs

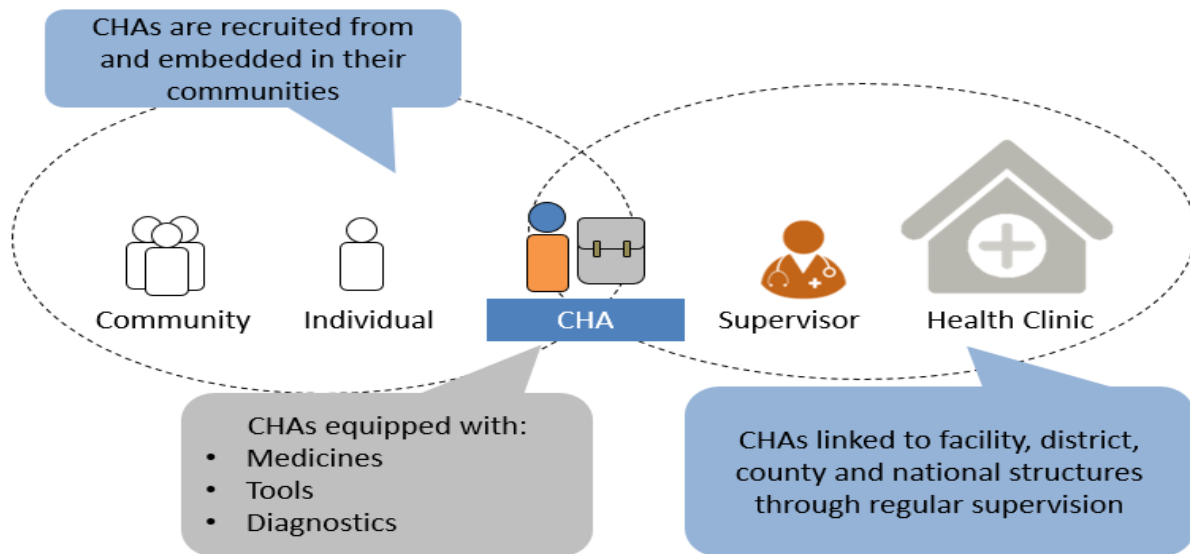
In 2015, the national policy on Community Health Services was revised to fully reflect the community health components of the National Health Plan. The Revised National Community Health Services Policy aims to strengthen Liberia's health system and health services that were lost due to the Ebola Virus Disease (EVD) crisis, to provide health security by reducing risks due to epidemics and other health threats' to accelerate progress towards universal health coverage by improving access to safe and quality health services and to narrow the equity gap for Liberia's most vulnerable populations that live in the last mile.

Community-based services are vital to the health and wellbeing of these communities. Additionally, the recent Ebola epidemic in Liberia and across West Africa highlighted the critical role that communities play in addressing their own health needs and changing their own health behaviors.

A key feature of this revised policy is the institution of a new cadre of Community Health Assistants (CHAs), who are selected from and serve communities located more than a one-hour walk (more than 5km) from the nearest health facility. Through established criteria, CHAs are selected by their respective communities to undergo an integrated and standardized CHA training. Upon successful completion of the training, these individuals will be certified as CHAs. Throughout training and continuing after certification, CHAs will be supervised to deliver an integrated and standardized service delivery package—which includes curative, preventive, promotive, rehabilitative and palliative services as well as epidemic surveillance services—to households in their communities.

Community Health Services Vision

A coordinated national community health care system in which households have access to life-saving services and are empowered to mitigate potential health risks.



Key figures in Liberia's CHA program structure

Community

The Community Health Committee (CHC) is elected by the community with guidance from the catchment Health Facility. The CHC is to oversee and assist in the selection of CHAs and provide administrative support for health activities in the community. The committee shall comprise of a total number of 5 - 9 elected members depending on the size of the community. Every attempt should be made that at least 30 % of the members are women

The Health Facility Development Committee's (HFDC) primary responsibility is to act as a governing body for all CHCs in the facility catchment area. The CHSS, in consultation with the OIC, shall serve as secretary to the HFDC. The HFDC is to meet monthly, providing a direct connection between community members and the District Health Team (DHT)/County Health Team (CHT), as well as local representatives and coordinating bodies of the Ministry of Internal Affairs

Community Health Assistant (CHA)

CHAs is recruited by the community, trained and supervised the formal health system (Facility) to deliver an integrated and standardized service delivery package, which includes preventive, curative, promotive, rehabilitative and palliative services and epidemic surveillance to households located more than a one-hour walk (>5km) from the nearest health facility. CHAs will be responsible for recording information on individuals in each household during visits when conducted and services are provided. These data are reported into an aggregated monthly service report and sent to the facility at the end of each month.

Profile of CHAs

- Permanent resident in the community which s/he serves, between 18 and 50 years of age
- Involved in community project/s in the past, trustworthy and respected
- Able to read and write and to add, subtract and multiply
- A good mobilizer and communicator fluent in the village dialect

Community Health Services Supervisor (CHSS)

Community Health Services Supervisor (CHSS) is a clinically trained professional assigned to the health facility to supervise the CHAs. The CHSS shall provide field-based supervision to CHAs working in remote catchment communities of the health facility. One CHSS shall supervise up to 10 CHAs and is responsible to manage the CBIS system and serve as first point of contact for CHAs at facility level, provide leadership and clinical supervisions to CHAs, ensure logistics (forms, commodities, etc.) and to aggregate data from the CHAs and submit to the relevant facility.

Officer in Charge (OIC) of the Facility

The OIC is responsible for coordinating all health-related activities in all catchment communities for each health facility. He/she is responsible to supervise the CHSS and provide feedbacks to health facility development committee (HFDC) on which he/she serve as secretary.

Community Health Services Focal Point (CHFP)

The Community Health Department of each CHT shall be responsible for integrating all community health activities into their county operational plan. The Community Health Focal Person (CHFP), assigned by the CHT, work under the supervision of the Community Health Department Director (CHDD) to coordinate all community health activities in the county. He/she work with the District Health Teams and facilities in the implementation of the community health programs.

The CBIS

During the Ebola epidemic it became clear that the fragmentation of the current health information system made it impossible to have the “right information at the right time and in the right place”. Many HIS subsystems were not interconnected, and stakeholders did not coordinate, contributing even further to the fragmentation by setting up separate reporting systems. After the Ebola crisis, strengthening the National Health Information System (HIS), and the Monitoring and Evaluation (M&E) system was recognized by the Ministry of Health of Liberia as one of the key interventions of the Investment Plan.

In 2016 as the National Community Health Assistant (CHA) Program was created, the need for a CHIS became apparent. With the support of development partners, the MoH developed a comprehensive community-based information system (CBIS) as a subsystem within the HIS. These partners formed an M&E sub-group, which informed the system and development of tools to capture information from the

CHA Program.

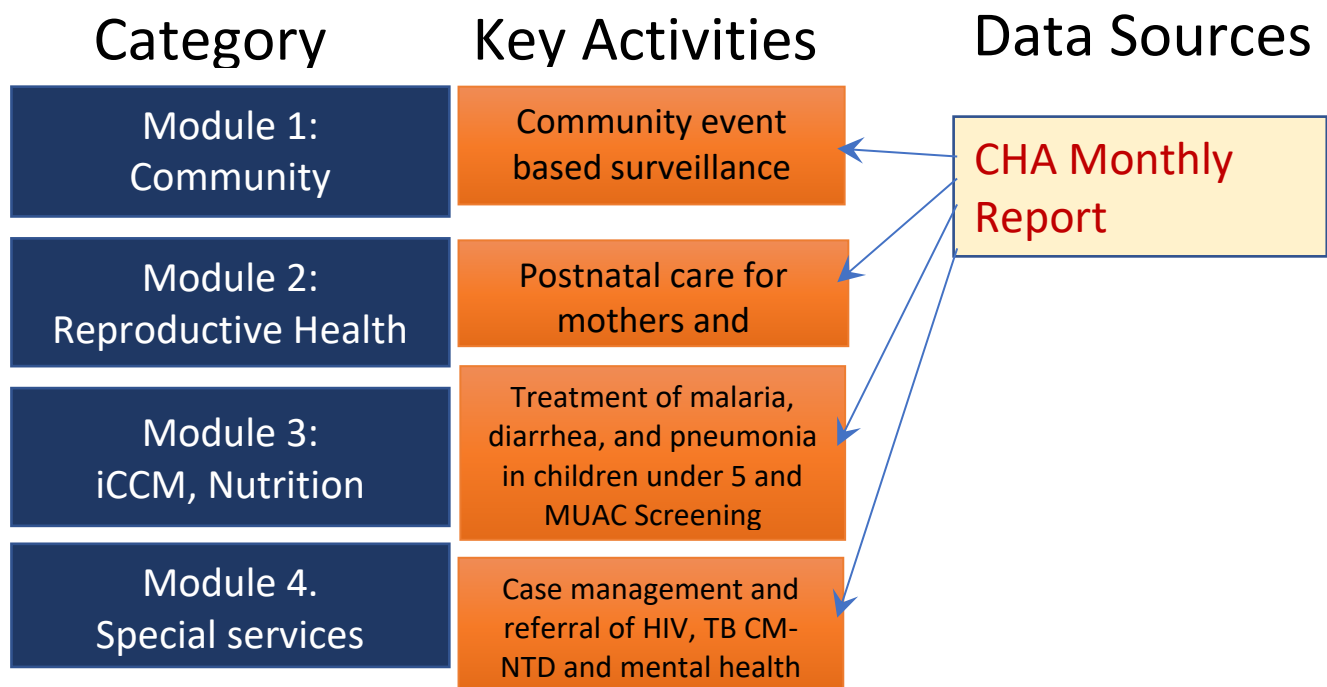
The CBIS connects community-level health services with national health system, the lowest tier where service is provided. MOH attaches great importance to the preventive, curative, awareness, etc services provided by CHAs

Data collection and reporting forms and ledgers were develop and built in the DHIS2 system. Future efforts include integrating CBHIS, LMIS and HRIS to improve management of community-based health services, produce supply chain efficiency gains and reduce stock-outs.

Service Delivery Package and Data Sources

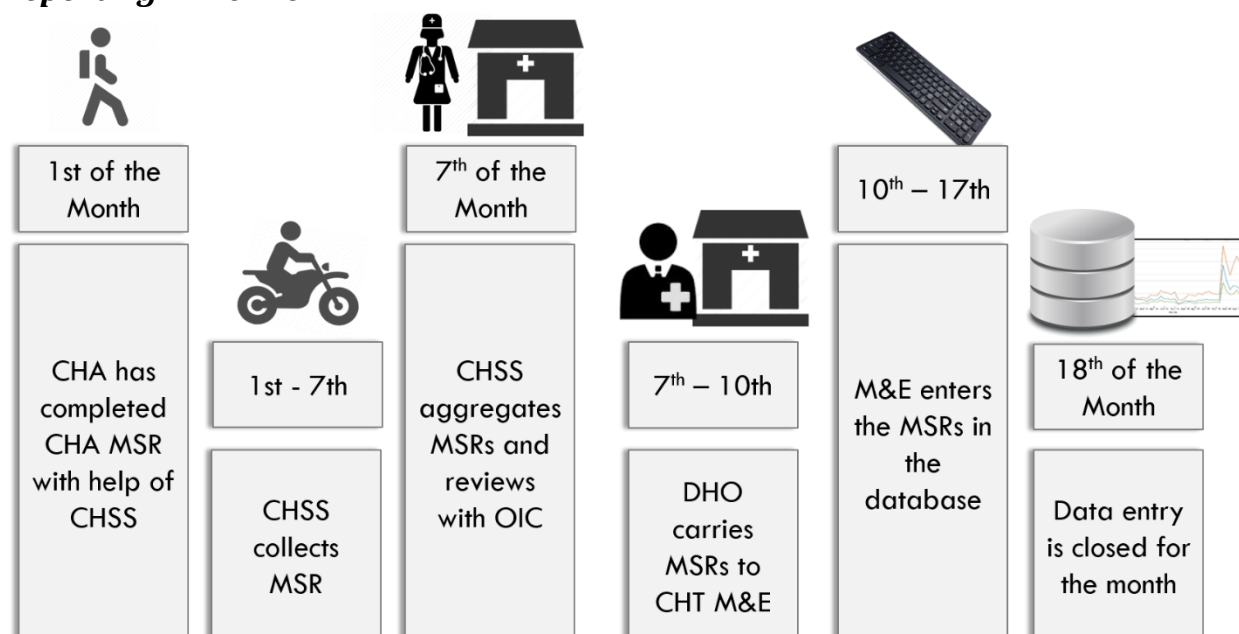
The ministry, with support from development partners, developed an integrated service delivery package for the Community Health Assistant (CHA) program, using modular packages. The CHA service package focuses on disease prevention, surveillance, reproductive, maternal, neonatal and child health, including integrated Community Case Management and its main approach is community mobilization, health education and health promotion. The goal is help residents realize that they are responsible to manage their own health matters; communities are empowered to create structures and identify and put together resources for health.

Liberia Data Flow



Data collection tools from each of these module-based service delivery area were developed. Each of these service specific tools will be aggregated into the monthly service report each month at the level of the community health assistant (CHA) and at the level of the community health services supervisor (CHSS). The graphics illustrate this process.

Reporting Timeline



Data Use

CBIS was designed as a streamlined flexible system to allow for decentralized data entry and local use.

Data Use at the CHA level

Data forms (ledgers) are kept in the community once completed, to keep an accurate record in the community of the work of the CHA. The CHA aggregates the ledgers into the CHA Monthly Service Report. This report is per community catchment area and can be entered into DHIS-2 to show indicators at the community level. For example, The CHA Monthly Service Report can be used in DHIS-2 to show a spike in the incidents of malaria in children under five in a given catchment area.

Data Use at the CHSS (facility) level

Each CHSS is responsible for analyzing CHA Forms to make informed decisions and targeted remedial supervision based on findings. For example: if the number of patients treated for malaria is much lower than the number of patients treated for malaria, the CHSS can coach the CHA on the value of routine visits and community education on malaria. Or if the number of home births is high compared to number of facility births the CHSS can coach the CHA to encourage facility delivery.

The CHSS Monthly Service Report shows the aggregated indicators across all the CHAs, aggregated at the Health Facility level. They use this data to see the status of the communities around health facilities. For example, any maternal death in a CHSS catchment area is investigated.

Data Use at County level

The M&E Officer is responsible for providing information to various line managers, program supervisors and other stakeholders in the county. CBIS data should be analyzed and used in coordination and other management meetings. For example, the M&E Officer can provide data or help the stakeholders understand the data for the CHA program such as high numbers of diarrhea in certain facilities.

Data Use at Central level

The Central Level CBIS builds the capacity of the County Teams, training county level M&E staff how to create and run reports. He / She analyzes the data to troubleshoot and strategize for the programs. The data and reports should be accessible to the Ministry of Health and partners to use for decision making at all levels of the health system.

[1] *Technopedia*, “Governance Plan,” <http://www.techopedia.com/definition/2910/governance-plan>.

[2] “Paris Declaration on Aid Effectiveness: Ownership Harmonization, Alignment, Results and Mutual Accountability,” in *The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action* (Paris: Organization for Economic Co-operation and Development, n.d.), 4–13, <http://www.oecd.org/dac/effectiveness/34428351.pdf>.

Appendices

Assessment at the macro level: using the CHIS assessment tool

A short example can be used to highlight how the assessment tool can be used for assessing the macro, policy level.

A country is in the process of examining its community health services, and in that regards wants to assess the strengths and weaknesses of the overall CHIS before planning specific interventions. The first step they take is to form a steering committee that will oversee the assessment and analyse the results. The steering committee conducts a stakeholder identification exercise to see who should take part in the assessment, and aiming for a rather small group due to logistical reasons, the identify the following.

A community health worker and a representative from a community health committee are selected to bring in the viewpoint of the community itself. They are selected since they have experience with how the data collection and feedback is working between the CHW and the facilities to which they report, and how the CHW interacts with the community at large.

An information officer from a facility is included since this person handles the flow of data between the CHWs and the wider health management information systems, as well as having knowledge of the facilities' challenges with medical stock distribution.

Each district has a Community Health program officer, and the participation of one of them is secured to get the input from this level. This person will, in addition to managing the community health services in the district, also liaise between the CHWs and the other health program managers that are based in the district headquarters, so this is considered adequate participation from the district level.

From the national level, the head of the community health programme, as well as the IT technician, is joining. Finally, a representative from a large international NGO, who are supporting the CHWs in some of the districts, is invited.

Conducting the assessment

The steering committee, consisting of staff at the community health programme, then invites the identified stakeholders to a one-day workshop in the capital. Due to logistical challenges, the community, facility, and district representatives are selected from the same district, though the group would ideally bring in representatives from at least two districts. However, the NGO agrees to invite one more CHW from another district as they are piloting new processes around CHW reporting there.

The group goes through the tool question by question in plenary, since they are not so many. This is also a chance for those who are familiar with the issue in question to inform the others on the team.

An example of how they answered one of the questions now follows:

The group is discussing the question: Do traditional health providers report through the CHIS?

The scoring scheme for this question is:

	Highly adequate	Adequate	Present but not adequate	Not adequate at all
Items	3	2	1	0
Do traditional health providers report through the CHIS?	Yes, all traditional health providers working at the community level report their activities to the national CHIS.	Most traditional health providers working at the community level report their activities to the national CHIS.	Some traditional health providers working at the community level report their activities to the national CHIS.	Traditional health providers are not part of the CHIS.

First, the head of the community health program informs the team that, no, this is not taking place. They have tried to incorporate data from traditional birth attendants (TBA) in the CHW reporting, but due to the lack of formalized acknowledgment and collaboration, the TBAs see little incentive in reporting neither to the CHWs or the facilities. This is something they would consider, but for now they would need to give this question a score of 0.

However, both the attending CHWs can then attest to that, sometimes, they do collect data from the TBAs. They know at least one TBA themselves, who is based in one of the villages they serve. They have a good relationship, and sometimes communicate with the TBA to confirm a visit there since there is no community health committee in this particular village. When they so do, they can inform that they get relevant data on the TBA activities, and include in their reporting if this is appropriate. However, one of the CHWs says that this is included, and thus part of, her report, while the other says she is adding it on the side of the paper as performed by the TBA.

The team then decides that a score of 1 is appropriate for this question, but make a note in the scoring sheet that how this TBA reporting is done varies and is not standardized at all.

Interpreting the results

And so they go through the questions of the assessment tools. In the end, they have a list of scores for all the questions, as well as a number of notes clarifying certain issues. The scoring will itself highlight the strengths and weaknesses of the CHIS, but the steering committee is then charged with further analyzing the data and deciding on the priorities. For instance, since they don't have electronic reporting from CHWs, they realize an improvement in score on automatic reminders

when reporting is slow is far away. So even if they set the score to 0 here, this is not seen as a major weakness that needs to be addressed at the present moment.

A report with the findings and such interpretations of the results is then shared with the team who conducted the assessment, to get feedback. They decide to use a three-level prioritization scheme (high, medium, low priority) for all of the questions, and present it at the next executive meeting for all health programs, as well as sharing it with health partners.

CHIS Assessment Tool

		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
Themes	Items	3	2	1	0		
Government ownership							
1	Is there an established CHIS Technical Working Group (TWG) lead by ministry senior staff and including representation from key stakeholder groups?	Yes, There is a CHIS TWG with clear leadership and active participation from all key stakeholders that manages the development, implementation, and sustainability of the CHIS	Yes, There is a CHIS TWG with clear leadership and active participation from most key stakeholder organizations	Yes, there is a CHIS technical working group but it does not have clear leadership or it is not able to manage all CHIS development, implementation, and sustainability.	There is not a CHIS technical working group or it is inactive.		
2	Is there a long-term sustainability plan for the CHIS?	Yes, a government approved CHIS policy document and committed resources exist for government ownership of the CHIS which is widely distributed and adhered to.	Yes, a CHIS policy document and committed resources for government ownership of the CHIS exist, but is not widely distributed and not always adhered to.	Yes, a CHIS policy document and committed resources for government ownership of the CHIS exist, but is not widely distributed and seldom adhered to.	No plan for government ownership of the CHIS exists.		
3	Is there an annual budget for supporting the CHIS?	Yes, an adequate budget exists.	Yes, budget exists but only just sufficient	No the annual budget is not sufficient.	No budget exists.		

4	Is there a project budget to develop and launch the CHIS?	Yes, an adequate budget exists.	Yes, budget exists but only just sufficient	No the annual budget is not sufficient.	No budget exists.		
5	Is there a project budget for support and supervision?	Yes, an adequate budget exists.	Yes, budget exists but only just sufficient	No the annual budget is not sufficient.	No budget exists.		
6	Is there a project budget for training?	Yes, an adequate budget exists.	Yes, budget exists but only just sufficient	No the annual budget is not sufficient.	No budget exists.		
7	Are technical skills and hosting facilities available within the country?	Technical skills and hosting facilities for a fully electronic CHIS, for both aggregate and patient-level data, exist in the country.	Only hosting facilities for a fully electronic CHIS, necessary for both aggregate and patient-level data, exist in the country. Technical skills are not available.	Only hosting facilities suitable for a backup server for a fully electronic CHIS exist in the country. Technical skills are not available.	All CHIS development and maintenance has to be carried out by external consultants.		
8	Is there a country e-Health policy for transmission and storage of community health data?	Yes, Policy exists covering all aspects of CHIS legality, confidentiality, and privacy.	Yes, policy covers most CHIS aspects of legality, confidentiality, and privacy.	Yes, but inadequate CHIS policy covering some aspects of legality, confidentiality, and privacy.	No e-Health policy exists for CHIS		
9	Are roles and responsibilities of all community HIS stakeholders clearly defined?	All (100%) CHIS stakeholders have been identified, together with their roles and responsibilities.	Most (50-75%) CHIS stakeholders have been identified, together with their roles and responsibilities.	Some (<50%) CHIS stakeholders have been identified, together with their roles and responsibilities.	No overview of CHIS stakeholders exists.		

Community engagement		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
10	Are relevant stakeholders from civil society involved in the development and use of the CHIS?	Stakeholders from civil society are regularly consulted on CHIS-related activities.	Stakeholders from civil society are sometimes consulted on CHIS-related activities.	Stakeholders were consulted on CHIS-related activities at the beginning of the project but have not been consulted since.	Civil society is not involved in any CHIS activities or decisions.		
11	Are relevant stakeholder from civil society, traditional structures, and community change agents receiving targeted, actionable data feedback mechanisms?	Yes, All stakeholders, traditional leaders, and community change agents receive specific, actionable data feedback that prompts community engagement and ownership of community health outcomes	Only some stakeholders, traditional leaders, and community change agents receive specific, actionable data feedback mechanisms.	Some stakeholders, traditional leaders, and community change agents receive data feedback mechanisms but these are not specific or actionable.	There are no feedback mechanisms sent to community level stakeholders, traditional leaders, or community change agents		
12	Are traditional structures and bodies, such as chiefs, engaged in the development and use of the CHIS?	Yes, traditional structures are regularly consulted on CHIS-related activities.	Traditional structures are sometimes consulted on CHIS-related activities.	Traditional structures were consulted on CHIS-related activities at the beginning of the project but have not been consulted since.	Traditional structures and bodies are not involved in any CHIS activities or decisions.		
13	Do traditional health providers report through the CHIS?	Yes, all traditional health providers working at the community level report their activities to the national CHIS.	Most traditional health providers working at the community level report their activities to the national CHIS.	Some traditional health providers working at the community level report their activities to the national CHIS.	Traditional health providers are not part of the CHIS.		

14	Is there a public webpage with relevant indicators on community health?	Yes, a public webpage displaying relevant and up-to-date indicators exists. All stakeholders are aware of it and have access to it.	Yes, a public webpage displaying some relevant and up-to-date indicators exists. Most stakeholders are aware of it and have access to it.	Yes, a public webpage displaying a few relevant, but not up-to-date indicators exists. Few stakeholders are aware of or have access to it.	No information is available for any community member beyond the CHW.		
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Reporting structure		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
15	Is CHW reporting integrated in one system, linked to national HMIS?	All CHW reporting is integrated in one system, linked to national HMIS	All CHW reporting is integrated in one system, but not linked to national HMIS	CHW reporting is standardized but fragmented, using different forms or ICT tools	CHW reporting does not follow any standard tools		
16	Is data from all community health activities available in one system?	All data is available in one system. All stakeholders have adequate access	All data is available in one system, but not all stakeholders have adequate access to it.	Data is spread across different systems. Stakeholders only have access to some systems.	Data from various programs are not easily available to stakeholders.		
17	Is there a list of essential community indicators available?	An essential list is available, and community reporting is done only on these indicators.	An essential list is available, but community reporting also covers other data.	A list is available but is not used to define reporting requirements.	No list available.		
18	Are improvised data capturing tools (such as registers, tally sheets, reports) used?	No, all reporting takes place through standard reports and channels.	Standardized reporting tools exist, but are not always available, forcing CHW to create their own	Some program datasets have standard reporting tools while others do not	Most data that is reported is done so with improvised tools.		
19	Is all data on community health activities reported on time?	Yes, all data is completely reported, on time, and to the next level.	At least 90% of data reports are sent, of which at least 90% are on time.	Less than 90% of data is reported, and timeliness is below 90%	Reporting and/or timeliness is below 70%.		
20	What is the burden of data collection and reporting?	A CHW spends 30 minutes or less on monthly reporting.	A CHW spends 30 minutes to 1 hour on monthly reporting	A CHW spends 1 to 3 hours per month on reporting	Time spent reporting data slows down CHW from providing care services.		

21	Is there a sustainable incentive structure for a CHW?	A sustainable incentive structure exists, is followed, and has long-term financial support.	An incentive structure exists, is followed, but does not have long-term financial support	An incentive structure exists, but is infrequently followed, and does not have long-term financial support	No incentive structure is available.		
22	Do CHWs get automatic reminders when reporting is late or lacking?	CHW gets automatic reminders when reporting is late or lacking.	CHW receives automated reminders when a report is due, but no reminders when a report is late or lacking	CHW receives manual reminders when a report is due or when a report is late or lacking	No reminders are used.		
23	Are there automatic tools or procedures available to ensure high data quality before reporting ?	There are automatic features in the reporting tool to help identify data quality issues when reporting.	There are manual procedures to identify data quality issues in the reporting process. They are followed.	There are manual procedures available to identify data quality issues within the reporting process , but they are infrequently used.	There are no data quality procedures available for the data reporting process .		
24	Are phones, reliable electricity and network coverage, available for CHWs reporting?	All CHWs have phones for reporting, and coverage and electricity is reliable for all communities, either for SMS or through mobile internet reporting	All CHWs have phones for reporting. Coverage and electricity are not reliable but are sufficient for all communities	Not all CHWs have phones for reporting. Coverage and electricity are not reliable but are sufficient for all communities	Not all CHWs have phones for reporting. Coverage and electricity are not sufficient for all communities		

25	What are the mechanisms for financing and topping up phone subscriptions or credits?	CHWs' phones are automatically updated with credits, or rely on free services. An adequate budget exists	CHWs' phones are automatically updated with credits, or rely on free services. There is not an adequate, sustainable budget	CHWs' phones are manually updated with credits, or rely on free services. There may or may not be an adequate, sustainable budget	CHWs' are not updated with credits, nor do they rely on free services.		
26	To what extent are CHWs familiar with feature phones and/or smart phones?	CHWs know how to operate feature phones and/or smart phones, adequate for reporting and receiving feedback and communicating with their supervisor/facility	CHWs know how to operate feature phones and/or smart phones, adequate for reporting and receiving feedback and communicating with their supervisor/facility but experience occasional technical phone issues which are resolved locally	CHWs know how to operate feature / smart phones, adequate for reporting and receiving feedback and communicating with their supervisor/facility but experience frequent technical phone issues which can not be resolved locally.	CHWs do not know how to operate feature phones and/or smart phones.		
27	To what extent are CHWs' supervisors familiar with feature phones and/or smart phones?	CHWs' supervisors are familiar with feature / smart phones for receiving reports, sending feedback, and communicate with the CHWs. Supervisors can solve 90% of phone technical issues locally.	CHWs' supervisors are familiar with feature / smart phones for receiving reports, sending feedback, and communicate with the CHWs. Supervisors can solve 75% of phone technical issues locally.	CHWs' supervisors are familiar with feature phones and/or smart phones for receiving reports, sending feedback, and communicate with the CHWs. Supervisors are able to solve 50% of phone technical issues locally.	CHWs' supervisors are not familiar with feature / smart phones for receiving reports, sending feedback, and communicate with the CHWs.		

28	Is pre-service training on CHIS available for CHWs?	CHWs receive adequate training for reporting and feedback mechanisms during their institutionalized (government owned) and standardized (all CHWs receive the same training) vocational training	CHWs receive adequate training for reporting and feedback mechanisms during their institutionalized vocational training, but the approach is not standardized.	CHWs receive adequate training for reporting and feedback mechanisms during their vocational training, but the approach is not standardized or institutionalized	CHWs do not receive adequate training for reporting and feedback mechanisms during their vocational training.		
29	Is refresher training on CHIS available for CHWs?	All CHWs have access to refresher trainings on CHIS	Nearly all (80%+) CHWs have access to refresher trainings on CHIS	Some (50% - 80%) CHWs have access to refresher trainings on CHIS	Few (<50%) CHWs have access to refresher trainings on CHIS		
30	Is supervisor training available for CHWs?	All CHW supervisors are trained in CHIS, including CHW reporting and feedback	Nearly all (80%+) CHW supervisors are trained in CHIS, including CHW reporting and feedback	Some (50% - 80%) CHW supervisors are trained in CHIS, including CHW reporting and feedback	Few (<50%) CHW supervisors are trained in CHIS, including CHW reporting and feedback		
31	Is decision-support for patient management available?	CHWs use decision support tools for all programs when seeing patients	Most CHWs (>80%) use decision support tools when seeing patients.	CHWs mostly (50-80%) use decision support tools when seeing patients.	Few (<50%) CHWs use decision support tools when seeing patients.		
32	Are CHWs using standardized tool for reporting and requisition on commodities?	A standardized tool for commodity reporting and requisition is used, connected with the national LMIS	A standardized tool for commodity reporting and requisition is used, but is not connected with the national LMIS	Standardized tool for commodity reporting and requisition exists, but is not used, and is not connected with the national LMIS	No commodity reporting and requisition exists		

Standard operating procedures (SOP)		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
33	Are SOPs for community reporting available?	SOPs for community reporting are available, up to date, and followed.	SOPs for community reporting are available, but are out of date or not fully adhered to.	SOP is available but isn't used.	No SOP available.		
34	Are there SOPs for community Monitoring and Evaluation (M&E) available?	SOP for community M&E is available, is up to date, and is followed	SOP for community M&E is available but is out of data or not fully adhered to	SOP for community Monitoring and Evaluation (M&E) is available but is not used.	No SOP available.		
35	Are there SOPs for making action plans at community level available?	SOPs exist and are followed by CHW, community stakeholders, and their supervisors	SOPs exist and are mostly followed by CHW, community stakeholders, and their supervisors	SOPs exist but are seldom followed by CHW, community stakeholders, and their supervisors	No SOP available.		
36	Are there SOPs for making action plans at facility and district level for community intervention available?	SOPs exist and are followed by CHW program managers at facility and/or district level.	SOPs exist and are mostly always followed by CHW program managers at facility and/or district level.	SOPs exist but are seldom followed by CHW program managers at facility and/or district level.	No SOP available.		

37	Are there SOPs for data quality assurance, with clear responsibilities and procedures for handling data quality issues?	SOPs exist and are followed for data quality assurance at all levels, outlining responsibilities and procedures for handling data quality issues	SOPs exist and are mostly followed for data quality assurance at all levels, outlining responsibilities and procedures for handling data quality issues	SOPs exist and are seldom followed for data quality assurance at all levels, outlining responsibilities and procedures for handling data quality issues	No SOP available.		
38	Are there SOPs for sharing of data among stakeholders?	SOP exists outlining information needs of stakeholders and how they will access it	SOP exists outlining information needs of some stakeholders and how they will access it	SOP exists outlining information needs of most stakeholders and how they will access it	No SOP available.		
39	Are there SOPs for managing users and stakeholder access to the CHIS?	SOPs in place and mostly adhered to for managing CHIS user access, including CHWs, civil society, and other stakeholders	SOP is in place and is seldom adhered to for managing all CHIS user access, including CHWs, civil society, and other stakeholders	SOP is in place and is adhered to for managing all CHIS user access, including CHWs, civil society, and other stakeholders	No SOP available.		
40	Are there SOPs for commodity reporting and requisitioning available to CHWs?	SOP is available, is followed, and is tied to the national Logistics Management Information System (LMIS) and the National Supply Chain.	SOPs available, mostly followed, and tied to the national Logistics Management Information System (LMIS) and the National Supply Chain.	SOPs available, but seldom followed, tied to the national Logistics Management Information System (LMIS) and the National Supply Chain.	No SOP available.		

System design and development		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
41	Is sufficient capacity available for maintaining and developing the CHIS?	A core, permanent CHIS technical support team with adequate capacity on information system design, software solutions and customization, and training is in place	A core, permanent CHIS technical support team is in place but has limited capacity on information system design, software solutions and customization, and training	A core CHIS technical support team is in place, but does not have necessary skills, permanent positions or funding	There is not a core CHIS technical support team.		
42	There is a SOP for conducting routine CHIS functionality audits to identify additionally needed features.	A SOP for routine CHIS functionality audits is in place and followed. Finding are translated into new system features.	A SOP for routine CHIS functionality audits is in place and followed. Finding are very often translated into new system features.	A SOP for routine CHIS functionality audits is in place and followed. Finding are rarely translated into new system features.	No SOP for routine CHIS functionality audits is in place or it is never followed.		
43	A multi-tiered technical support system exists that is able to capture, catalogue, and resolve user issues and system bugs.	All users are able to report issues and bugs which are resolved in a timely manner. Users are able to track the status of their issues at any given time.	All users are able to report issues and bugs which are resolved in a timely manner. Users are not able to track the status of their issues.	All users are able to report issues and bugs which are not resolved in a timely manner. Users are not able to track the status of their issues.	All users are not able to report issues and bugs.		

44	There is a strategy and budget for updating training materials and re-training when the reporting and feedback forms and routines are changed?	All major CHIS development projects have adequate budget and strategy for re-training in the use of new tools	All major CHIS development projects currently have sufficient budget and strategy for re-training in the use of new tools, but future budgets are not certain.	Some (50-80%) major CHIS development projects currently have a budget and strategy for re-training in the use of new tools, but future budgets are not certain.	CHIS development projects do not have a budget and strategy for re-training in the use of new tools.		
45	Is the introduction of new CHIS tools supported with adequate resources for printing/customizing software, and distributing/updating tools for CHWs?	Channels and resources exist for distributing new tools to all CHWs	Channels and resources exist for distributing new tools to all CHWs, but a few CHWs do not receive updated materials in a timely manner.	Channels and resources exist for distributing new tools to all CHWs, but a many CHWs do not receive updated materials in a timely manner.	Channels and resources do not exist for distributing new tools to all CHWs		
46	Is the introduction and use of new technology supported by mechanisms for user guidance, troubleshooting, and replacement of technology and hardware over time	Adequate user support, including support "hotline", software responsibility, and channel for replacing hardware is in place, with fast response and high level of confidence	User support, including support "hotline", software responsibility, and channel for replacing hardware is in place, but there is delayed response and high level of confidence	Adequate user support, including support "hotline", software responsibility, and channel for replacing hardware is in place, but sometime delayed response and low level of confidence	Adequate user support, including support "hotline", software responsibility, and channel for replacing hardware are not in place.		

47	Is a reliable and robust server in place to support CHIS online data reporting and feedback?	A nationally owned CHIS server, adhering to security and confidentiality regulations, is in place, with minimal downtime	A partner owned CHIS server, adhering to security and confidentiality regulations, is in place, with minimal downtime	A CHIS server, adhering to security and confidentiality regulations, is in place, but with frequent downtime	No adequate server, adhering to security and confidentiality regulations, is in place.		
48	Is there a channel for CHWs to give input to CHIS development and improvement?	CHWs were consulted when developing CHIS, and a channel for subsequent feedback on the CHIS is available	CHWs were consulted when developing CHIS, a channel for subsequent feedback on the CHIS is available, but it is seldom used.	CHWs were consulted when developing CHIS, but no channel for subsequent feedback on the CHIS is available.	CHW do not have the opportunity to inform CHIS development		
49	Are the target populations for CHWs clearly defined?	All CHWs have clear target populations, which are routinely updated	CHWs have target populations, which are seldomly updated	CHWs have vague target populations, which are seldomly updated	No target population figures are available for communities		
50	Are the baseline indicator values known?	Relevant baseline values exist for all CHIS indicators at all levels.	Relevant baseline values exist for most (80%+) CHIS indicators at most levels.	Relevant baseline values exist for 50-80% of CHIS indicators at most relevant levels.	Less than 50% of CHIS indicators have baseline values.		
51	Do goals and targets exist for all CHIS indicators?	Targets and goals cover all CHIS indicators	Targets and goals cover most indicators, but may be out of date	Targets and goals are set for few indicators, and are out-of-date or not evaluated	No goals or targets exist for CHIS indicators		

52	Are targets for CHIS indicators SMART (specific, measurable, appropriate, relevant, and time-bound)?	All indicators adhere to the SMART principles.	Some indicators are SMART, most indicators adhere to at least four of the SMART principles.	Few indicators are SMART, most indicators adhere to only three or less of the SMART principles.	None of the indicators adhere to the SMART principles.		
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Feedback		Highly adequate	Adequate	Present but not adequate	Not adequate at all	Score	Comments
53	Do CHW get automatic feedback when reporting data?	Yes, automatic replies inform the CHWs that their data pass validation rules and that reports have been submitted. CHWs know if their data has been received.	Yes, automatic replies inform the CHWs that their data pass validation rules and that reports have been submitted. Some CHWs report issues knowing if data has been submitted.	Manual replies inform the CHWs that their data pass validation rules and that reports have been submitted. Many CHWs report issues or confusion in knowing if data has been submitted.	Manual replies inform the CHWs that their data pass validation rules and that reports have been submitted. Most CHWs report some issues or confusion in knowing if data has been submitted.		
54	Do CHW registers provide supporting for intervention or service delivery (automatic decision support)?	Decision support is incorporated in both registers and data capture application, aiding the CHW in service delivery	Decision support is incorporated in the registers but not in the data capture application.	Decision support is incorporated in the registers but not in the data capture application and it does not aid the CHW in service delivery	No, decision support is not incorporated in the registers or the data capture application.		
55	Are referrals by CHW notified to the referral facility/hospital?	The CHIS supports referrals, sharing information with the referral facility/ hospital and notifying stakeholders. CHWs are notified of outcome of referred patients.	The CHIS shares information with the referral facility/hospital and notifies stakeholders. CHWs are not notified of outcome of referred patients.	The CHIS supports referrals, sharing information with the referral facility/ hospital. No feedback is provided to any other stakeholders.	The CHIS does not supports referrals.		

56	Do CHW supervisors provide regular feedback on reporting and data quality to the CHWs?	CHW supervisors provide monthly feedback related to reporting and data quality to all CHWs	CHW supervisors provide quarterly feedback related to reporting and data quality to all CHWs	CHW supervisors provide intermittent (less-than quarterly) feedback related to reporting and data quality to all CHWs	CHW supervisors do not provide feedback related to reporting and data quality to all CHWs		
57	Do CHW supervisors provide regular feedback on indicator values, achievement towards goals and targets, to the CHWs?	CHW supervisors provide monthly feedback on indicator values, achievement towards goals and targets, to all CHWs	CHW supervisors provide quarterly feedback on indicator values, achievement towards goals and targets, to all CHWs	CHW supervisors provide less-than quarterly feedback on indicator values, achievement towards goals and targets, to all CHWs	CHW supervisors do not provide feedback on indicator values, achievement towards goals and targets, to all CHWs		
58	Are dashboards on community indicators defined and available to all stakeholders?	Dashboards have been created for relevant stakeholders based on their information needs, and are regularly used by the stakeholders	Dashboards have been created for all relevant stakeholders based on their information needs, and are used by the stakeholders	Dashboards have been created for stakeholders, but are rarely used by the stakeholders	Dashboards have not been created for all relevant stakeholders.		