



# Community-Based Health Information System Guide

Approaches and Tools  
for Development

May 2019



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## Approaches and Tools for Development

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## **ABBREVIATIONS**

CBHIS	community-based health information system
CHW	community health worker
HMIS	health management information system
ICT	information and communication technology
M&E	monitoring and evaluation
TWG	technical working group
USAID	United States Agency for International Development

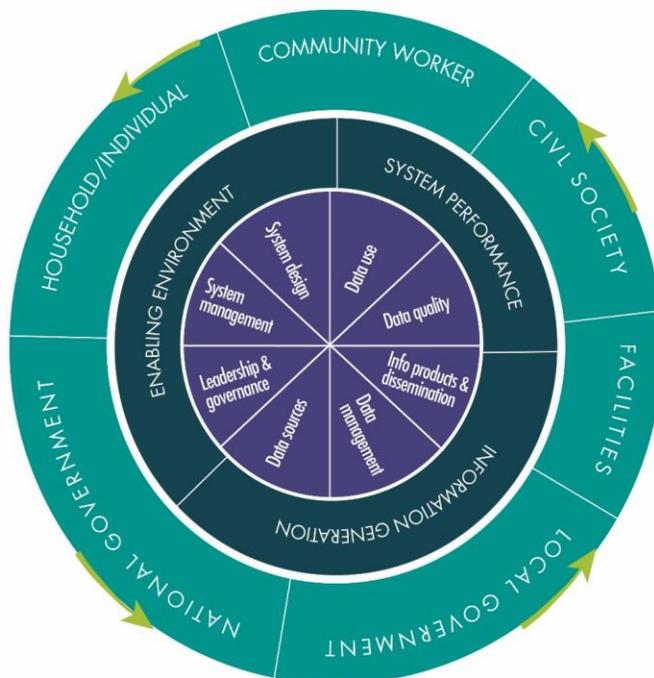
# INTRODUCTION

A community-based health information system (CBHIS) is a dynamic system that includes information on how data are collected, how they flow, how to assess and improve their quality, and how they are used—as defined in the Model of a Community-Based Information System: Essential Components and Functions (<https://www.measureevaluation.org/resources/publications/tr-18-243?searchterm=tr+18+243>). This system involves collection, management, and analysis of data on health and related services provided to communities outside of facilities. Figure 1 shows MEASURE Evaluation’s model of a community-based information system.

Historically, health management information systems (HMIS) have been fragmented, owing to siloed funding and programs. Frequently, CBHIS and national HMIS do not have standardized data elements, which has hampered efforts to harmonize systems and include community health data in the national HMIS.

This guide does not cover specifics of the CBHIS and its different components. MEASURE Evaluation, which is funded by the United States Agency for International Development and the United States President’s Emergency Fund for AIDS Relief, developed this guide to focus instead on approaches, tools, and action items for developing areas under the enabling environment to work towards a harmonized health information system. We will look in depth at how to develop areas under leadership and governance, system design, and system management. For certain components (e.g., data quality and data demand and use), there are substantial resources already developed, so we will reference those resources and where to locate them.

**Figure 1. MEASURE Evaluation model of a community-based information system**



## **BENEFITS OF HARMONIZATION WITH HMIS**

1. Leverages human and financial resources
2. Reduces duplication and inefficiencies in the collection, reporting, storage, and analysis of data
3. Standardizes data definitions and indicator measurements
4. Provides access to actionable health data to improve health outcomes
5. Reduces data quality issues

# LEADERSHIP AND GOVERNANCE

## CBHIS Strategy, Frameworks, and Plans

Vetted policies, frameworks, and plans are key to having a sustainable CBHIS that all stakeholders use. These policies, frameworks, and plans might include an overarching CBHIS policy or strategy linked to the HMIS strategy, a CBHIS monitoring and evaluation (M&E) plan, eHealth [electronic health] strategies, and security and confidentiality guidelines. If there is a CBHIS technical working group (TWG), or a sub-TWG through an HMIS TWG, it should ensure that a representative group of stakeholders is part of the development and review of the strategies and plans as a means to align their interest and reduce the use of parallel systems. If there is not a formal CBHIS TWG, then there should be a governing body with authority over how data are collected and reported from the community. Stakeholders could include national government staff, local government staff, donors, international nongovernmental organizations, and local community-based organizations. The following are examples of potential governance documents and what they could include.

**CBHIS strategy**—a situational analysis of current CBHIS, CBHIS goals and objectives, key stakeholders, actions to be taken, and collaboration mechanisms, e.g., a TWG, linkages with the HMIS, capacity building or national training plans, and financial investments

**CBHIS M&E plan**—performance indicators and indicator reference sheets, a data-flow diagram and operating procedures for how data will flow, data quality procedures, data collection tools, and a CBHIS assessment method

**eHealth strategy**—a vision mission, challenges, an analysis of the current eHealth landscape, objectives of eHealth for CBHIS, and a roadmap for implementation

**Security and confidentiality guidelines**—security crisis management, asset security, communication and Internet security, identity and access management, and software development security

Once the policies and plans have been finalized and launched, including capacity building, the CBHIS TWG should routinely review their implementation for accountability purposes. Developing an annual performance plan that includes benchmarks and performance indicators for the strategies and plans will help TWG members monitor implementation. A team within the TWG should be nominated to assess routinely whether the partners are adhering to the policies outlined in the strategies and plans and report back to the larger TWG. If aspects of the policies and plans are not being adhered to, the TWG must determine whether the plans and policies must be changed—because they are inherently challenging to implement as written—or if further capacity building or development of standard operating procedures are necessary.

## Data Standards

Whether paper or digital, establishing data standards that apply to both the CBHIS and the HMIS allows the creation of systems in which data can be readily shared and used across platforms. Standardization can help streamline data collection between community and facility-based programs, ease the reporting burden, and increase the likelihood that community data will be used in decision making.

The first step in developing data standards is to harmonize the indicators across programs, using globally recognized or country-specific indicators where applicable.

After their indicators are harmonized, programs need to define what data elements need to be collected to respond to indicators, and the data elements should be defined the same across community health programs and facility-based programs. In defining the data elements, programs need to determine how to represent the data. For example, data may be represented numerically or as text and may be encoded using universal or national medical codes.

Next, the programs should ensure that the data collection tools are harmonized across programs and reflect the agreed-upon definitions of data elements.

Three main steps define the process to develop data standards:

- Engage relevant stakeholders to determine the common information needs across community and facility-based programs
- Compare how stakeholders are defining the data elements of the indicators and discuss ways to harmonize the indicators
- Review current data collection tools and ensure they reflect the data element definitions or update them to reflect the new standard definitions

## SYSTEM DESIGN

A strong system design is crucial to a functional CBHIS that produces quality information to inform decision making. Through the system design process, a program will understand the following:

- The purpose of the CBHIS and data requirements, including what data are and are not collected
- The different workflows within a community health program, including the different roles and responsibilities of the various players, how the data flow through the system, and what information is needed by whom and when
- The way frontline workers interface with clients and collect data during a client visit, their challenges and motivations, what they perceive as strengths and weaknesses of the existing system, and what they want
- The technology that is currently being used or could be rationally used for the CBHIS
- The interoperability and integration potential with the HMIS

### Steps to system design

- Develop a CBHIS framework
- Conduct a landscape analysis
- Conduct a CBHIS assessment
- Assess stakeholder and user information needs
- Choose the solution (this could include paper)
- Develop a plan for scale and sustainability
- Map the work and dataflows
- Storyboard the system including system requirements
- Refine storyboard and system requirements based on feedback
- Build in security and privacy protocols
- Develop a prototype to test
- Test the prototype with users
- Refine the prototype
- Deploy the system

## CBHIS Framework and Vision Document

The initial step to designing the CBHIS is to develop a framework or vision document drawing on the CBHIS strategy that puts forth the goal and objectives for the CBHIS, defines who the stakeholders and end users of the CBHIS are, and identifies the key performance indicators for success. By developing this document, the CBHIS TWG ensures that stakeholders are on the same page regarding the goal and purpose of the CBHIS and determines how they will know if the development has been successful. The process of developing this document will start to lay out the roadmap for the CBHIS, which will be added to by other pieces detailed in this section. This can be an internal working document for the TWG that is later formalized for the CBHIS.

Step 1: Convene the CBHIS TWG to brainstorm and discuss the different pieces of the CBHIS framework and vision documents

Step 2: Develop a matrix or working document to detail what is agreed upon. Below is an example that could be a starting point with descriptions of each area.

**Table 1. CBHIS framework worksheet**

<b>TWG organizations and chair</b>	Which ministries, departments within ministries, and implementing partners make up the TWG? Is there a ministry or department that has been designated as the chair for the TWG to spearhead the process?
<b>Goal of CBHIS</b>	What is the overarching goal of the CBHIS, e.g., to develop an interoperable, national, multisectoral CBHIS that will provide quality data to inform decision making?
<b>Objectives</b>	To implement a national framework for community-based HIV programs ( <a href="https://www.measureevaluation.org/resources/publications/tr-18-270/CBHIS">https://www.measureevaluation.org/resources/publications/tr-18-270/CBHIS</a> ), improve the use of community data for decision making, and promote access to community-based data
<b>Coverage of program</b>	National, regional, project-specific
<b>Stakeholder organizations</b>	Ministry of health (departments of community health, HIV, M&E, HMIS); ministry of education; ministry of finance; and the prime minister's office
<b>End users</b>	Community health workers (CHWs), CHW supervisors, facility staff, community-based organization staff, district or regional staff, and national-level program managers
<b>Data sources</b>	Case management tools, HMIS, logistics management information system, ministry of education management information system
<b>Interoperability</b>	Data standards and data exchange architecture
<b>Key performance indicators</b>	System landscape analysis complete, interviews with end users on digital skills and information use complete, platform chosen
<b>Benchmarks with timeframes</b>	<ul style="list-style-type: none"> <li>• Landscape analysis—1 month</li> <li>• Qualitative interviews for human-centered design—1–2 months</li> <li>• Storyboard the system—1 month</li> <li>• Outline technical requirements—1 month</li> </ul>

## Landscape Analysis of the Systems to Be Included in the Multisectoral CBHIS

Before laying out the design of the CBHIS, one of the first steps is to conduct a landscape analysis of all of the systems—paper and digital—currently being used in a country that would need to link to or interoperate with the CBHIS. The design team needs to know what systems are available, what platform a country is using, what data elements a country is collecting and how those data elements are defined, how frequently the data are input into the system, and how the quality of the data is being checked.

Step 1: Call together the steering committee to brainstorm about the systems that are known. Where there are potential gaps in known systems, assign someone to follow up with ministry staff or implementing partners

Step 2: Assign individuals to follow up with the owners of the systems to obtain details about the systems

Step 3: complete landscape matrix

**Table 2. Landscape matrix template**

System name	System implementer	System stage*	System platform and interoperability requirements	Data elements (relevant to the CBHIS)	Definition of data elements	Frequency of data collection	Data quality checks	Potential pain points in the system	Trusted source

\*5 Stages of health information systems: Stage 1—paper-based system for collecting community health indicators; Stage 2—optimization of paper system by simplifying indicators and reducing duplication; Stage 3—migration of paper systems to electronic database; Stage 4—introduction of operational information and communication technology (ICT) systems as a source of data for CBHIS, e.g., mobile case management; Stage 5—fully comprehensive and integrated national CBHIS<sup>1</sup>

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<sup>1</sup> Adapted from eHealth Strategy South Africa 2012–2016. Department of Health.

## Design and Development Team

The TWG should establish a team that will work on the design and development of the CBHIS. The team—depending on the solution—could be composed of a business analyst or program manager, designers, an M&E specialist, and programmers. Examples of skills for the different positions follow.

### **M&E specialist**

- Oversees the landscape analysis, information needs gathering and CBHIS assessment, and any other necessary assessments to develop and deploy the CBHIS
- Maps and creates data standards for the data elements in the different systems to be integrated
- Works with the business analyst to develop the tools in the system
- Works with the business analyst and programmer to ensure the system is collecting quality information in the required format
- Works with the business analyst and programmer to ensure the data analytics and dashboards meet the needs of the users

### **Business specialist**

- Analyzes and models CBHIS processes and identifies opportunities for improvement
- Plans and manages the requirements of CBHIS, including control of requirements changes and scope
- Works with the team and other sources to understand and identify all requirements information that is relevant to CBHIS
- Organizes, structures, and understands the identified requirements by putting them into an appropriate form and performing necessary verification and validation
- Plans and implements all requirements-related communication activities, including elicitation, validation, reporting status, resolution of conflicts, and gaining approval
- Collaborates with the technical and quality assessment teams to ensure that the results of the project fully satisfy the needs embodied in the requirements

### **Systems analyst and programmer**

- Translates business and information requirements into specifications for the digital information system
- Programs the system based on the specifications using the chosen solution
- Validates that the system meets the requirements at the proper scale. Stress tests the system based on potential volume

## Principles for Digital Design

If a CBHIS incorporates a digital solution, this solution should draw on the principles of digital development (<https://digitalprinciples.org/principles>). These nine principles integrate best practices in the process of creating or refining information systems or other digital solutions in the development arena.

### Design with the User

To create a system that meets the information needs of the users, system designers must consult the users to understand their information needs. Specifically, designers must understand when users need information to make decisions. Information needs can vary at the national, subnational, nongovernmental organization, and community levels, so designers should talk to a sample of users at all levels to ascertain the main information needs for the CBHIS.

Step 1: Put together a list of all potential users of the CBHIS at each level (national, regional, district, and community)

Step 2: Identify a sample of the end users to set up interviews about information needs

Step 3: Interview individuals in the sample

Sample questions for information needs interviews:

1. Are there any planning decisions to be made each year? If so, what types of decisions, e.g., decisions about program reach and coverage, new recipients, or service offerings?
2. Are there budgeting questions that must be answered, such as number of clients served, procurement of goods and materials, cost for printing, or costs for Internet?
3. Is there specific information that must be reported to donors?
4. What information do you need to know your program is being implemented as planned?
5. What information do you need to know to determine if the program is successful?
6. How do clients enter the program and how many are entering during a reporting period?
7. What information do you need to track clients and determine if they are still active or lost to follow up?
8. How do you track referrals in the system?

Step 4: After the information has been collected from the end users, analyze it for commonalities in information needs

Step 5: Convene a meeting with the end users to prioritize information needs. For national and subnational governments, a meeting can be held to present the synthesized information needs and discuss what the priority information needs are and why they are priorities. The system development team should ask the following questions during the meeting:

- Does the information have programmatic relevance, i.e. is the question of interest programmatically relevant or of a public health interest? Are others in the community interested in the information?
- Are the data currently being collected to meet the information needs? If not, could they easily be collected?
- Do stakeholders have the authority to act upon the information if it shows a need for change in the current course of action or can the stakeholders influence change based on the information?

- Can the information be obtained in a timely manner to address decisions that need to be made, e.g., budget deadlines. Should the information be collected routinely or can it be collected less frequently?

For CHWs and their supervisors, system designers can use cards to prioritize the information needs. The cards can contain words or pictures depending on literacy levels. Show the CHWs and CHW supervisors the cards and have them prioritize the cards based on their priority information needs. Ask them why they considered certain information more important than other information.

By collecting information on what the stakeholders consider priority information, the designers can not only design a better system, but also start thinking about dashboards that can be put in place for each level of the system.

## Align Users' Needs with the Information System

Once the information needs of the end users are clear, designers can work with the TWG to map the current tools to the information needs and begin to understand the dataflows in the current system and any potential gaps in the system.

Step 1: Work with the TWG to determine what tool or database currently collect the information

Step 2: Talk with TWG members and other stakeholders to understand how the information is collected, is reported into the system, and flows through the system

Step 3: Map out the work or information flow for the system based on the priority information needs and highlight any possible bottlenecks and feedback loops that the design should address. Share with the TWG for revisions and to brainstorm solutions to any bottlenecks identified

Step 4: Develop an initial storyboard of the CBHIS based on the information needs and information flow map. The designers will update the storyboard when stakeholders provide more input and the understanding of the data ecosystem becomes clearer

## Understand the Existing Data Ecosystem

The landscape analysis will inform a mapping of the existing systems and connections and potential pain points that the team should address as it starts to design the CBHIS and plan for interoperability of current systems with the HMIS. This map can be overlaid with the information flow map to obtain the full picture of the current systems that will feed into the CBHIS.

Step 1: Present the landscape analysis. Discuss with the TWG if the information captured in the landscape analysis is correct or if they think anything is missing

Step 2: Have the TWG draw out the linkages between the systems. Detail which systems are current interoperable with each other or have staff from other departments or ministries request data from the system to be input into their systems

Step 3: Overlay this with the storyboard from the dataflow for the second iteration of the storyboard

## *CBHIS Assessment*

Before developing the final design for the system, a CBHIS assessment should be conducted to ensure that what is being designed can be supported by the infrastructure. Areas to assess include Internet speed; Internet access at the offices where the system will be used and in areas where data will be captured; capacity of computers, tablets, or cell phones of potential end users; ICT support available for end users; human resources to support the CBHIS, including positions and skills/capacity; financial resources for the CBHIS, including recurring costs, regulatory considerations, culture or politics that could affect the development of the system, strategies in place to support the CBHIS, and local protocol (women's use of cellphones and technology).

Step1: Develop or adapt the assessment tool. Have the TWG review it before implementation, to make sure all relevant questions are being asked and determine if any need to be reworded based on country context

Step 2: Select a sample of sites at each level of the system to be assessed. This can be a purposeful sample based on time and resources; the information collected is to inform the system design, not for publication. The sample should still be representative in terms of urban, peri-urban, and rural locations to ensure the system can work in the program coverage area

Step 3: Analyze and present the findings to the design team to inform the CBHIS design

## *Choosing the Solution*

Based on the information collected, the TWG needs to determine if the system will be completely paper, completely digital, or a hybrid of both. From the landscape analysis, the TWG knows the different systems currently being used in-country and should also determine if the CBHIS could be developed using one of those systems. The following questions can help guide this discussion: Is a particular system well-liked by the majoring of stakeholders? Do the systems meet the security and privacy standards laid out in eHealth strategies or policies? If the TWG decides to use digital solutions, they need to determine which type of software model is best for their system. Detailed below are benefits and risks of several common software models.

**Table 3. Benefits and risks of different software models**

Model	Benefits	Risks
Custom software	<ul style="list-style-type: none"> <li>Control over technology, functionality, and design</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to manage within time and budget</li> <li>Control over design does not guarantee satisfaction with the end product</li> <li>Long-term support with continued availability of individuals</li> </ul>
Commercial off-the-shelf software	<ul style="list-style-type: none"> <li>Shorter lead time from selection to implementation</li> <li>Can evaluate before buying</li> <li>Product is maintained and upgraded (at a cost)</li> <li>Normally tested and refined through other implementations</li> </ul>	<ul style="list-style-type: none"> <li>Often expensive</li> <li>Not often designed for use in low-resource settings</li> </ul>
Free packaged software	<ul style="list-style-type: none"> <li>Shorter lead time</li> <li>Can evaluate</li> <li>No upfront costs, but may be costs for maintaining or customizing</li> </ul>	<ul style="list-style-type: none"> <li>No contract means service and warranty for fixing bugs depends on goodwill of individuals</li> <li>Can be hidden costs</li> </ul>
Open-source software	<ul style="list-style-type: none"> <li>Can make changes to the software</li> <li>Benefit from communities dedicated to the software and development costs shared with other organizations</li> </ul>	<ul style="list-style-type: none"> <li>Can end up with a poorly supported product</li> <li>Loosely knit community may not be able to provide the business relationship you need</li> <li>Can be hidden costs</li> </ul>
Software as a service	<ul style="list-style-type: none"> <li>Feasible to implement and maintain in low-resource settings</li> <li>Costs to implement and run are more straightforward</li> <li>Investment to improve the software can be shared among customers</li> </ul>	<ul style="list-style-type: none"> <li>Several companies require data to be hosted on remote server—cloud server</li> <li>Often involve a service fee for hosting data, which MOHs aren't always in the position to pay</li> </ul>

Adapted from: World Health Organization and Path. Planning an information system: A toolkit for public health managers, 2013. <https://path.org/resources/planning-an-information-systems-project-a-toolkit-for-public-health-managers/>

## Design for Scale

“An info system no matter how robust or how many people use it, only successfully scales when it is embedded or institutionalized into the workflow of the health system service deliver” (Wilson, Gertz, Arenth, & Salisbury, 2014).

What does it take to scale an information system? It takes the right leader (one who works with a shared vision and partners and engages with stakeholders, not a single innovator); the right digital solution; the right approach (supportive policy, regulation and standards, and effective program management); and the right capacity (human and financial).

Design for scale from the start.

Step 1: Define what scale means to the project. Will the system cover every community in the country and every district or region? Or will it cover every community in one region or all communities within a given project?

Step 2: Develop a roadmap to achieve the desired scale. Where will the pilot occur and how big of a pilot will it be? How will the system expand beyond the pilot—e.g., regionally, with key partners—and to how many sites? How will new areas be added progressively? How will the system be assessed to determine if it is functioning well in current areas before being rolled out in new areas?

Step 3: Keep the solution simple and flexible. This means choosing open-source solutions that can function well in the ICT infrastructure of the program such as including online and offline options for mobile reporting in rural areas. When designing the user interface, ensure it is intuitive and does not have too many data points being collected, but just enough to address the information needs.

Step 4: When designing the CBHIS, build on existing platforms identified in the landscape analysis. Do not bring in completely new platforms unless the current systems are proprietary or will not provide the functionality needed. For example, if the HMIS is using DHIS 2 for its information system, the CBHIS can be built on the DHIS 2 platform with add-ons such as Oracle and MySQL for business intelligence or dashboards. If you are designing a system that will interoperate with several information systems, consider using a data warehouse where the data can be integrated before entering the CBHIS platform.

Step 5: Plan for costs beyond the initial investment. Do not confine the CBHIS budget to the costs to design, develop, and roll out the system. Budget for continued capacity building; reoccurring Internet costs; ICT support; and replacement costs for computers, tablets, and phones.

Step 6: Identify partners that can help with scaling. Including the right partners at the national, subnational, and community levels is key to rolling out and scaling the solution. Outside of the TWG members, partners could include local community-based organizations that will implement the solution, local council members who can provide credibility in the community for the system, and health facility staff who support the work of CHWs. A partner assessment can be conducted to determine which partners are essential to implementing and scaling the CBHIS. The MAPS Toolkit: mHealth Assessment and Planning for Scale has a partner assessment that can be adapted to assess partners for the CBHIS (<http://www.who.int/reproductivehealth/topics/mhealth/maps-toolkit/en/>).

Step 7: Identify capacity building needs of those that will be using the system, to ensure the system can scale. Use the findings from the CBHIS assessment to determine the capacity building needs of the end users. These could range from training on data entry and interpreting dashboards to training on how to

use mobile devices. Include continuous refresher trainings, which could occur monthly for those new to using digital solutions.

Step 8: Identify any risks for scaling. For example, can facility staff absorb the influx of clients if referrals are completed and those who were lost to follow-up return to the facility?

## Build for Sustainability

The TWG should define sustainability and address long-term ownership from the start of the design process. Through rollout and implementation, the TWG should aim to strengthen the capacity of the CBHIS, and those using the CBHIS, in an effort to create a sustainable and equitable system. When defining sustainability, the TWG should consider whether sustainability means the entire life of the program or the just until more advanced systems or technologies are developed to replace the existing system? Is a partner going to finance the system design and initial implementation and transfer the system to the government or is the government going to finance the system from the start? As mentioned above, the government human resources system needs to include positions that are responsible for the CBHIS and building capacity of other staff to ensure continued support of the system and new enhancements.

Step 1: Convene the TWG and discuss what CBHIS sustainability means to the group

Step 2: Synthesize the responses on the following worksheet and develop a plan based on the input

Step 3: Incorporate the sustainability plan into the overall CBHIS development and implementation plan

## Sustainability of CBHIS Worksheet

What does sustainability mean in the context of CBHIS?

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What partners will support the sustainability of the CBHIS?

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Are there current positions within the government system whose role is to support the CBHIS? Y/N

If yes, list the positions, their roles, and locations:

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Are there capacity building needs to support the CBHIS? Y/N

If yes, please list the cadre and the capacity building needs:

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Are there sufficient financial resources to support the CBHIS? Y/N

If yes, list the source:

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If no, detail a strategy to secure the needed resources:

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## Address Data Security and Privacy

Privacy of information and security of the data collected is paramount when collecting health data, because it may contain sensitive information about clients. The use of digital solutions to collect and store health and social service data has expanded rapidly over the past several years. Designers should work with the TWG and programmer to ensure the systems are designed to minimize the collection of personal information and protect confidentiality of the information that is collected. They should consider the following:

**Define data ownership and access:** Determine who will house the data and where it will be stored, e.g., a local server or cloud-based server. Determine who has access to certain data in the system and assign permissions

**Minimize the collection of personal information:** Determine what personal information must be collected to best serve the client and determine program success. Weigh the risk to the clients if any of the information collected was accessed by third parties, to determine if the information is necessary to collect in the system

**Protect data based on national data protection standards including data sharing agreements:** Follow any rules and regulations laid out in eHealth strategies and understand the consequences of failing to follow the policy

**Identify team members responsible for data mgmt. and security:** Through the design process, the team can determine program staff at different levels of the system that will be responsible for data management and security. These people will be responsible for ensuring that data are stored and backed up properly and only those with permission have access to information within their level of the system

## SYSTEM MANAGEMENT

System management includes the financial and human resources necessary to implement and maintain the system. For a CBHIS to function well, the TWG should ensure they understand the costs of developing, deploying, and maintaining the system and the human resources necessary to implement the CBHIS at each level of the system.

### Financial Resources

When planning for a CBHIS, the development team should budget not only for the development and initial deployment, but also for reoccurring costs to maintain the system. The team should work with the TWG to hold costing exercises: one for development and initial deployment and one for system maintenance.

### Costing of Development and Deployment of CBHIS

Step 1: Call a meeting of the TWG and other key stakeholders that would be key to providing costing information for the development of the CBHIS, e.g., staff from the finance department or ministry of finance.

Step 2: Write out the cost items. Below are some of the main items to consider.

**Table 4. Cost categories for CBHIS development and deployment**

Cost category	Description
Software	Includes actual costs of the software, if not open-source, and technical assistance for customizing or building out the software based on the design
Equipment	Includes any hardware needed to run the CBHIS, e.g., computers, tablets, cell phones, and servers as well as accessories, such as cables, extension cords, uninterruptable power supplies, and stabilizers
Infrastructure	Includes connectivity of the system including Internet (Wi-Fi and cellular), back-up generators in areas with unstable Internet, solar chargers or other charging points for CHWs, and space to house the servers and computers
Staff	M&E staff, program manager, ICT staff, and trainers
Meetings	Depending on meeting room availability within the representative organizations, rooms may need to be procured for design meetings, budgeting meetings, and trainings. The team should determine the number of attendees at each meeting and whether to procure tea, or coffee, snacks, or lunch.
Training materials	Includes cost to prepare for trainings, e.g., printing of materials, developing training materials including PowerPoints or videos, and developing and loading test material into the CBHIS for training purposes
Transport/travel	Includes transport and travel costs (driver, fuel, per diems, hotels) for the information needs assessment, CBHIS assessment, and trainings

Step 3: After all of the costs have been determined, put them in the ministry budget template to determine the total costs of the CBHIS

## Costing of the System Maintenance

Once the system has been developed, tested, and deployed, there will be costs to maintain the system over time including software updates and fixes, maintaining and replacing of equipment, user support systems such as help desks, and continuous refresher trainings. These costs should be included in annual budgets of stakeholders supporting the system.

Costing of system maintenance can be done at the same time as costing for system development and deployment. However, system maintenance costing calls for discussion of different cost categories and a separate budget template.

**Table 5. Cost categories for system maintenance**

Cost category	Description
Software maintenance and licensing	Includes ongoing costs to maintain and license the software. If open-source, includes costs for adding new features or updating existing software as needed to bring a company back on or hire a programmer
Equipment maintenance and replacement	Includes the cost to maintain and replace the hardware needed for the system. How frequently will computers, tablets, phones, etc. need to be replaced based on wear and tear and the functionality needed to run the system
Infrastructure	Includes the costs for Wi-Fi, data and voice for cell phones, fuel for generators, desk/chairs.
Staff	Includes M&E staff, data entry clerks, IT support staff, trainers,
Meetings	Includes room rental and tea/coffee/lunch for stakeholder meetings about the system as well as continuous trainings. Some of the training costs may be shared with program costs if the trainings can be held with other program trainings
Training materials	Includes producing training materials, print outs for workshop style trainings and on-the-job trainings
Transport/travel	Includes transport and travel costs for meetings and trainings (fuel, drivers, per diems and hotel costs)

Once the budgets have been developed, the TWG should review the budgets and determine if they are in line with the current funding envelop. If not, the TWG may decide to seek or additional resources or scale back. An example of an area to consider for scaling back is cell phone provision. Consider whether the program must purchase phones or if CHWs can use their own phones.

## Human Resources

The other key element of system management is human resources. To effectively implement the CBHIS, there needs to be staff at all levels of the system to support it, including MIS specialist, M&E specialist, data entry clerks, and ICT staff. Ensuring adequate staffing involves developing career paths, training, skills, and retention strategies that will build up the workforce to develop, deploy, maintain, and support the CBHIS. Standard competencies should be developed for each position spelling out the level of knowledge and skills a person filling that position should have. National training curriculums should be developed based on the standard competencies, to ensure that staff in one part of the country learn the same information as those in other parts.

Step 1: Develop a CBHIS workforce strategy that outlines the key positions for developing, deploying, maintaining, and sustaining a CBHIS. The strategy should outline the competencies needed for each key position.

Step 2: The TWG needs to determine if the key positions are currently recognized within the government system with written job descriptions. This includes government staff at national and subnational levels (at minimum, there should be staff at the national and district levels to support the CBHIS), facility-based staff, and CHW supervisors and CHWs.

Step 3: Once it is determined if there are the needed positions within the system, the TWG should assess whether the positions have been filled or if they need to be recruited for.

Step 4: The TWG, along with stakeholders, should assess the capacity of the staff to perform their jobs and the capacity of their organizations to support them. The steering committee can adapt assessment tools such as the MEASURE Evaluation Monitoring and Evaluation Capacity Assessment toolkit (<https://www.measureevaluation.org/pima/m-e-capacity/me-capacity>) or develop their own assessment tool.

Step 5: After the assessment has been implemented and the findings analyzed, the TWG, along with key stakeholders, can develop capacity building plans for the different levels of the CBHIS, e.g., the national, district, community, and community-based organization levels. Capacity building can include a mix of classroom style trainings, on-the-job trainings and supportive supervision, and eLearning.

**Table 6. CBHIS capacity building plan template**

CBHIS functions	Level of capacity	Target level of capacity in a year	Actual level of capacity after 1 year	Strategies to build capacity	People involved	Person responsible	Timeline

**Capacity Building Plan Template**

**CBHIS functions:** This will detail the different functions captured by the capacity building assessment, e.g., training plan in place, process for reviewing data quality, appropriate forms for data collection and reporting, feedback mechanisms in place, M&E skills.

**Level of capacity at time of capacity assessment:** The levels of capacity are dependent, assisted, guided, and independent. The scoring method of the assessment tool will determine the cutoffs for the different capacity levels.

**Target level of capacity in a year:** The TWG must determine what level an organization should reach for each CBHIS function during the specified period. For example, if the organization were to start at "dependent," would it be expected to move to "guided" by the end of the specified timeframe.

**Level of capacity after one year:** After one year, what level of capacity does the organization have for that CBHIS function? This will be assessed through a follow-on capacity assessment.

**Strategies to build capacity:** This is the capacity building mix that will be used to enhance the organization's capacity. This could include mentoring, structured on-the-job training, partner-to-partner exchange (team learning), team building around CBHIS or M&E, off-site training, technical assistance, eLearning, etc.

**People involved:** Remember this process involves a systems or learning institutions approach. Activities for CBHIS capacity building should involve a broad group to help develop the data culture within the organization, not just the person responsible for reporting.

**Person responsible:** Establish a lead on the activity responsible for ensuring its completion. This could be a TWG member or the main contact within the organization.

**Timeline:** The deadline by which an activity should be completed

## Infrastructure

A CBHIS requires infrastructure to support it to function properly. Electronic systems rely on, power, Internet connectivity, network capacity, working computers, and mobile devices. During the CBHIS assessment, the infrastructure to support the CBHIS should be assessed and the TWG should use the findings to develop a plan to strengthen the infrastructure.

The following known constraints should be assessed:

1. Network capacity and reliability: Is the current network capacity and reliability sufficient to support the CBHIS (cell networks and Wi-Fi)? Are there secure network connections within and between organizations?
2. Power constraints: Are there constraints on the power supply, e.g., regular blackouts, no power in rural areas? If so, how are the constraints being addressed, e.g., solar power or backup generators?
3. Functioning computers or mobile devices: Do computers or mobile devices meet the system requirements to run the CBHIS? Do computers and mobile devices work properly, free from issues such as freezing? Do computers have the necessary virus protection?
4. Work space: Do staff have desks and chairs to sit at to do their work? Is space shared or do staff have individual work stations? Does everyone who needs a computer or mobile device have his or her own, and if staff share, do they have unique logins.
5. Physical security of equipment: Do computers and mobile devices sit in rooms that can lock? Are the cabinets with locks to store mobile devices when not in use?
6. Where the system still includes paper, are there filing cabinets with locks to store completed paper tools?

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