



MINISTRY OF MEDICAL SERVICES  
MINISTRY OF PUBLIC HEALTH AND SANITATION

# NHIS INFRASTRUCTURE ASSESSMENT REPORT

February 2013



February 2013

**Recommended Citation:** Government of Kenya. 2013. NHIS Infrastructure Assessment Report. Nairobi, Kenya: Ministry of Health, AfyaInfo Project.

This report is part of the Government of Kenya’s Health Information Systems infrastructure improvement plan. It was created with assistance from the AfyaInfo project. AfyaInfo is a technical assistance program to support the Government of Kenya to strengthen their health information systems. The program is implemented by Abt Associates, Inc. in partnership with Training Resources Group, ICF International, the University of Oslo, Knowing Inc., the Kenya Medical Training College, and the University of Nairobi. It is funded by the United States Agency for International Development (USAID), under the AIDS Support and Technical Assistance Resources (AIDSTAR) Sector II IQC, contract number GHH-I-00-07-00064-00 AID-623-TO-11-00005, Kenya Health Information System.

**DISCLAIMER:**

The author’s views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.



# Table of Contents

EXECUTIVE SUMMARY .....	1
1. INTRODUCTION .....	3
1.1. Critical Success Factors for Proposed NHIS .....	3
2. GOALS OF THE ASSESSMENT .....	6
2.1. Primary Objectives of the Infrastructure Assessment .....	6
2.2. Secondary Objectives of the Assessment.....	6
3. ASSESSMENT METHODOLOGY .....	8
3.1. Sampling for the Infrastructure Assessment .....	8
3.2. Data Collection Tools and Methods .....	10
3.3. Data Analysis.....	11
4. KEY ASSESSMENT FINDINGS.....	12
4.1. ICT Infrastructure Availability and Reliability .....	12
4.1.3. Physical & Virtual Security and ICT Support.....	13
4.1.4. Reliability of Available ICT Infrastructure.....	14
4.2. Computer Literacy Amongst Health and Data Staff .....	19
4.3. Availability of HIS Data Collection Tools .....	20
4.3.1. Availability of Storage Space for Tools and Records.....	21
4.4. Availability of Power and Sources .....	21
5. CHALLENGES IN DATA COLLECTION AND ANALYSIS .....	24
6. CONCLUSION.....	25
ANNEX A: Infrastructure Assessment Questionnaire for the Management Unit .....	27
ANNEX B: Infrastructure Assessment Questionnaire for the Health Facility .....	34
ANNEX C: Infrastructure Assessment Questionnaire for the Community Unit .....	41
ANNEX D: Details of Sampling Methodology .....	47
Sampling Proposal .....	47
Proportion to Size Sampling of Health Facilities for Infrastructure Assessment....	49

## List of Tables

Table 1: County locations of units sampled in the assessment .....	8
Table 2: List of District locations of units sampled in the assessment .....	9
Table 3: Total number of units assessed by level .....	10
Table 4: Availability ICT equipment and infrastructure elements by unit level.....	12
Table 5: Internet connectivity availability .....	13
Table 6: Availability of physical and virtual security .....	13
Table 7: Reliability of available internet connection .....	17
Table 8: Proportion of staff reported as computer-literate .....	19
Table 9: Proportion of units that reported availability of ALL data collection tools ..	20
Table 10: Storage space availability .....	21
Table 11: Availability of power source and type.....	22

## List of Figures

Figure 1: Proportion of desktops reported as functioning out of those available .....	14
Figure 2: Proportion of laptops reported as functioning out of those available.....	15
Figure 3: Proportion of designated mobile phones reported as functioning out of those available.....	16
Figure 4: Proportion of LCD projectors reported as functioning, out of those available .....	16
Figure 5: Proportion of printers reported as functioning out of those available.....	16
Figure 6: Graphs illustrating reliability of connectivity .....	18
Figure 7: Average number of power-outage days reported.....	22

## List of Abbreviations

---

<b>3G</b>	Third Generation GSM Network
<b>CU</b>	Community Unit
<b>DHIS</b>	District Health Information Software
<b>DivHIS</b>	Division of Health Information Systems (of MoH)
<b>DivICT</b>	Division of Information and Communication Technology (of MoH)
<b>EDGE</b>	Enhanced Data rates for GSM Evolution
<b>GSM</b>	Global System for Mobile Communication
<b>HF</b>	Health Facility
<b>ICT</b>	Information and Communication Technology
<b>IT</b>	Information Technology
<b>KEPH</b>	Kenya Essential Package for Health
<b>LAN</b>	Local Area Network
<b>MFL</b>	Master Facility List
<b>MoH</b>	Ministries of Health
<b>MU</b>	Management Unit
<b>NHIS</b>	National Health Information System
<b>WAN</b>	Wide Area Network

# EXECUTIVE SUMMARY

---

The Ministries of Health (MoH), supported by the AfyaInfo project, are collaborating in building a unified National Health Information System (NHIS). The implementation of this integrated NHIS will depend largely on the development of optimal HIS infrastructure systems. When applied appropriately, information systems drive efficiency by optimising workflows, and by providing timely and accurate information as well as channels for feedback.

Recent literature reviews identified four intertwined factors as key in determining the performance of an integrated web-based NHIS. These are the availability of:

1. Information and Communication Technology (ICT) infrastructure,
2. An information technology (IT)-literate workforce,
3. HIS data collection and reporting tools, and storage space for these, and
4. Other physical infrastructure.

A countrywide cross-sectional survey was undertaken to establish: the current status of existing ICT infrastructure, the proportion of IT-literate staff amongst the Kenya health workforce, availability of tools and storage facilities, and availability of other physical infrastructure such as electricity. A total of 250 sites were selected for on-site assessment. These were health facilities at different levels (e.g., dispensaries, health centres, hospitals), as well as community units (CUs) and management units (MUs) across 18 counties in the country. The assessment was carried out by reviewing available documents and reports, conducting key informant interviews during field visits, and direct observation. It took 10 teams a period of 10 days during April and May 2012 to complete the exercise.

This report presents the findings of the assessment, and seeks to identify the disparities in infrastructure at the different Health Facility (HF) levels, in order to:

- i. Inform the MoH on the infrastructure requirements for optimal NHIS functionality, to enable the government to prioritise its investments.
- ii. Enable the MoH to determine the most suitable technology to apply at the various service provision levels in the country.

The findings established that at the hospital and MU levels, ICT infrastructure was more often available compared with the other levels. Of the hospitals surveyed, 94% reported that they had a desktop computer, while 78% of MUs surveyed had one. The currently functional ICT equipment available at all levels including community consisted of desktops (of which 91% on average were working at the time of the survey), printers (89% on average working), and mobile phones (76% on average working)—this suggests that these were the most reliable forms of equipment. Laptops were found to be the least reliable, as only 2% were reported as still functioning.

Internet connectivity was a major challenge at all levels. Nevertheless, the most available medium of connectivity was found to be Global System for Mobile Communication (GSM) modems, especially at the hospital level (61%) and MU level

(75%). Other options found at the hospital and MU level were Local Area Network (LAN), Wide Area Network (WAN), and fibre optic. Of all the units reporting they have internet connectivity, over 75% connect using the GSM modem across all levels.

IT literacy amongst the health workforce was reportedly highest amongst administrative staff (over 65%) and data management staff (over 90%), and generally low amongst clinical and support staff (below 50%). ICT support officers were generally not available on site, and when they were it was in a minority of facilities (e.g., only 39% of hospitals reported they had these officers available on site).

While it is expected and required that all data collection and summary tools be available at all health facilities, this was not the case. An average of 4% of all health facilities assessed reported that they had no registers or summary forms available. Of those who had registers, only an average of 73% reported that they had all registers available, while only an average of 78% had all summary tools available. At the community level, 90% reported that they collect routine data, and out of these an average of 67% reported that they had all required data collection and summary tools.

Over 50% of units assessed at all levels reported having access to either the main power grid, a generator, or solar power, except at the community level, where only 6% on average of community units assessed had power. Generators were reported to have been more reliable over the previous 2 weeks than the electricity grids: 46% of generators had performed consistently compared to only 36% of those powered from the electricity grid. Most of the generators were reportedly used as backup sources of power. At least 57% of the hospitals had two options for power source (grid and generator), while 7% had all three, including solar power.

A general limitation of the assessment was that it was not feasible to verify most of the information provided; hence the data collected is based on what respondents reported. This includes information on the numbers of different kinds of health staff who are computer-literate, number of days without a functioning power source, and number of pieces of ICT equipment currently functioning.

A challenge faced in undertaking the assessment was that the sample listing originally included some areas that were found to be inaccessible due to insecurity, e.g., Turkana. Some teams had to find alternative sites to assess at short notice so as to achieve the desired number of sites to visit. Another challenge was that some of the enumerators variously presented incomplete questionnaires; were reluctant to use the online tool to key in data directly or at the end of each day (which affected data quality when staff were updating the system from Excel sheets); and made unexplained visits to sites not originally included in the data collection plan.

Overall, the findings show that while the management and hospital levels appear to be better resourced with ICT infrastructure, there are also significant gaps to be filled at these and all other levels assessed. The findings will therefore be very useful in developing a gap analysis, which could later inform an infrastructure road map to guide the procurement and distribution of ICT infrastructure across the country, where feasible.

# 1. INTRODUCTION

---

The MoH, supported by the AfyaInfo project, are collaborating in building a unified NHIS. The implementation of this integrated NHIS is largely dependent on the development of optimal HIS infrastructure, as the NHIS backbone.

The HIS infrastructure assessment was conducted by the MOH through the DivHIS and Division of Information and Communication Technology (DivICT), with the support of USAID through the AfyaInfo Project. The assessment aimed to establish the existing ICT infrastructure, level of IT literacy amongst the Kenya health workforce, availability of tools and storage facilities, and availability of other physical infrastructure such as electricity. The following sections of this report provide the details of the process applied, the survey findings, and related challenges in data analysis.

According to the Kenya Vision 2030, the country's journey towards prosperity involves building a just and cohesive society, and enjoying equitable social development in a clean and secure environment. This will mean transforming various sectors including health. This transformation will be founded on all-around adoption of Science, Technology and Innovation.

In line with the Kenya Health Policy Framework (2012-2030), Policy Orientation No. 7 outlines health infrastructure improvements needed to support effective delivery of services. These include the needed physical infrastructure, equipment, transport, and technology (including ICT). These should be functional, efficient, safe and sustainable health infrastructures based on the needs of the consumers. The policy outlines the strategies to be adopted, which among others include:

- Adopting evidence-based health infrastructure investments, maintenance, and replacement, by using norms and standards in line with government/institutions' policies.
- Providing the necessary logistical support to establish an appropriate and efficiently functioning referral system, including transport, communication and IT, e-Health, and medical devices.

Consequently, among the priorities identified in the Kenya Health Sector Strategic Plan are supply of ICT equipment to all public and faith-based organisation facilities, as well as investment in maintenance of equipment.

## 1.1. Critical Success Factors for Proposed NHIS

According to the WHO Health Metrics Network Framework<sup>1</sup>, several physical and structural changes need to be made before a strong NHIS can be built. From this and other literature reviews, it emerges that there are four critical key intertwined factors that determine the performance of an integrated web-based NHIS.

---

<sup>1</sup> [http://www.who.int/entity/healthmetrics/documents/hmn\\_framework200803.pdf](http://www.who.int/entity/healthmetrics/documents/hmn_framework200803.pdf)

**a. Availability and reliability of ICT infrastructure**

In general, integrated web-based information systems rely on stable Internet connections, first for the completion of client-to-web-based database transactions and feedback, and second, to provide public information transparently to the users. In this kind of setup, devices such as computers, scanners, smart phones, regular phones and other handheld devices are required for data entry, data validation or data dissemination.

**b. Availability and adequacy of skilled workforce**

People are the fundamental pillars of any system. Information systems need the right number and skill mix of qualified staff for information collection, processing and analysis. Most importantly, they require champions and leaders. Skilled staff are required, not only to interact with information systems as users, but also to manage/troubleshoot the hardware, software, networks, recovery systems and overall ICT environment to ensure they are well maintained and functional.

**c. Availability and distribution of HIS data collection and reporting tools**

The DivHIS keys in and collates aggregate data from the summary tools that are completed at the facility level and community units. Currently, the proper functioning of the HIS depends on the availability of data collection tools (ranging from the primary registers through tally sheets to summary tools) and the correct use of these tools. The availability of the tools and the correct summarisation process, as well as adequate storage space for the tools (both filled-in and blank), pose critical challenges to ensure that data is available when needed. The required tools should also have been standardised and rationally distributed to all sites, to avoid interruption in data collection, summarisation, or submission of reports to the next levels, due to stock outs or to lack of proper know-how.

**d. Availability and reliability of general ICT infrastructure**

To function optimally, ICT equipment needs a reliable power source; in Kenya the main power source is the national grid, which is available in most areas but certainly not in all. Access to the grid does not equal a consistent power supply, because there are frequent power brownouts and blackouts. Generators and solar power are also used as backup or secondary power sources to reduce power interruption caused by blackouts; where there is no electricity available from the grid, generators and solar power are sometimes used as the primary or alternative source of power.

This infrastructure assessment exercise was undertaken to establish the availability of:

- Hardware, such as computers, printers, photocopiers, etc. – and their current state of functionality.
- IT-literate health staff, data management staff, and on-site ICT support.
- Data collection and reporting tools, storage space, and data dissemination mechanisms.

- Power source and alternatives as well as their extent of reliability.

The findings are intended to provide the MoH with an understanding of the availability, accessibility and functional status of ICT hardware and the data exchange and transmission media in use, and availability of working space at the various identified levels of the NHIS. The survey was also aimed at projecting estimates of the ideal requirements for optimal functioning of the NHIS.

The findings will be useful in developing a plan that will support the flow and processing of information in the unified NHIS at the different organisational levels. The situational analysis will help determine the gap between the current status and the optimal status of data collection, flow, storage and dissemination of health information.

## 2. GOALS OF THE ASSESSMENT

---

To establish the availability and functional status of ICT equipment, proportion of IT-literate staff, availability of on-site ICT support, data transmission mechanisms, and power sources at the various identified levels of the NHIS.

### 2.1. Primary Objectives of the Infrastructure Assessment

1. Establish the availability and status of the health information ICT infrastructure that exists across the different levels of health care:
  - a. Determine the availability and functionality of the ICT equipment.
  - b. Establish the capacities that exist to handle ICT in the health sector.
2. Prepare gap analysis, i.e., quantify the space between where we are and where we want to be in building the National Health Information System. This will help determine the extent of the gap, and, thus, how to bridge it, by highlighting which requirements are being met and which are not.

### 2.2. Secondary Objectives of the Assessment

1. Prepare system improvement roadmap. This will be the plan that will match short-term and long-term goals with specific technology solutions to help meet our goal of building the National Health Information System. The major uses of the developed roadmap will be to:
  - a. Help reach a consensus about the set of needs and the technologies required to satisfy those needs.
  - b. Provide a mechanism to help forecast technology developments, and provide a framework to help plan and coordinate these developments.
2. Generate cost projections, which will be an approximation of the probable cost of the system and infrastructure needed in establishing the NHIS on the basis of the available information.



### 3. ASSESSMENT METHODOLOGY

The assessment was conducted as a cross-sectional survey aimed at establishing the current state of systems and infrastructure supporting a Health Information System. The Infrastructure assessment was conducted across all the levels of the health sector: National, District, Facility and Community.

#### 3.1. Sampling for the Infrastructure Assessment

Purposeful sampling was employed for this assessment, with a focus on:

- i. MUs at both province and district levels
- ii. HFs at different levels
- iii. Community Units

The districts located within the counties selected were used as the entry point for selecting Management Units to assess, while the health facilities sampled were used as the entry points to identify linked community units to assess. The importance of factoring in county constituencies in the sampling was underscored, in light of the new constitutional dispensation dictating that services delivery will now be managed at the county level.

Twenty-four counties were purposively selected using the Kenya County Fact Sheet 2011 as a reference that categorised counties according to the poverty index and geographical zones (quartiles). The level of urbanisation of the counties guided their selection, with every quartile contributing counties proportional to its size.

**Table 1: County locations of units sampled in the assessment**

#	County	#	County	#	County
1.	Bungoma	9.	Kisii	17.	Murang'a
2.	Busia	10.	Kisumu	18.	Nairobi
3.	Embu	11.	Kwale	19.	Nakuru
4.	Garissa	12.	Laikipia	20.	Nyamira
5.	Homa Bay	13.	Machakos	21.	Nyeri
6.	Isiolo	14.	Makueni	22.	Taita Taveta
7.	Kakamega	15.	Meru	23.	Trans Nzoia
8.	Kiambu	16.	Mombasa	24.	Uasin Gishu

Out of the total of 158 districts within the 24 counties, 47 districts (30%) were selected (see Table 1: County locations of units sampled in the assessment. See also Annex D: Details of Sampling Methodology for details of the sampling methodology.

**Table 2: List of District locations of units sampled in the assessment**

#	District	#	District	#	District	#	District
1.	Balambala	13.	Garissa	25.	Kisumu East	37.	Naivasha
2.	Borabu	14.	Gatanga	26.	Kwanza	38.	Nakuru Central
3.	Bungoma East	15.	Githunguri	27.	Lagdera	39.	Ndhiwa
4.	Bungoma West	16.	Imenti North	28.	Laikipia North	40.	Nyeri South
5.	Butula	17.	Imenti South	29.	Lari	41.	Nzaui
6.	Changamwe	18.	Kahuro	30.	Machakos	42.	Thika West
7.	Dagoretti	19.	Kakamega North	31.	Makindu	43.	Tigania East
8.	Eldoret East	20.	Kibwezi	32.	Muhoroni	44.	Tigania West
9.	Embakasi	21.	Kieni East	33.	Mukaa	45.	Transnzoia West
10.	Embu West	22.	Kieni West	34.	Muranga North	46.	Voi
11.	Fafi	23.	Kinango	35.	Muranga West	47.	Westlands
12.	Garbatulla	24.	Kisii Central	36.	Mvita		

The facilities within these districts were sampled by randomly selecting 10% of the facilities in each district from the MoH Master Facility List (MFL), found at [www.ehealth.or.ke](http://www.ehealth.or.ke). However, the sampling was not completely random in that the type, location and stakeholder status were considered in selecting the facilities, to improve the representativeness of the data. These sampling criteria included urban versus rural status, and the economic development status of the location as described by the economic index of the Ministry of State for Planning & Vision 2030.

This gave a total of 148 health facilities, plus the 3 referral hospitals and 9 Provincial Level 5 hospitals, for a total of 160 health facilities. One to two community units in each of the selected districts were also randomly selected, making a total of 52 CUs assessed. For each district within the sample area, the management units were also assessed. The management units were at provincial or district levels. A total of 36 MUs were assessed, bringing the total sample size to 250.

A pilot assessment was conducted in selected facilities in Nairobi. The pilot acted as a test for the assessment tool, as well as a training and orientation vehicle for the assessment teams who were to participate in the nationwide exercise. The results of the pilot were reviewed, and identified errors were corrected on the tools.

The total units assessed at the different levels are presented in Table 2.

**Table 3: Total number of units assessed by level**

Type of Unit Assessed		# of units Assessed	Total units	% Units Assessed	Source of data for Total units
1	CU	52	2,500	2%	Estimates as per Current CU registry
2	Dispensary	51	2,896	2%	MFL filter: all MoH + Armed forces Level 2 HF's
3	Health Centre	55	669	8%	MFL filter: all MoH + Armed forces Level 3 HF's
4	Hospital	54	254	21%	MFL filter: all MoH + Armed forces Level 4,5,6 HF's
5	MU	36	293	12%	285 DHMTs + 8 PHMTs
6	Standalone VCT Centre	2	125	2%	MFL filter: all Standalone VCT
TOTAL		250	6,737	4%	

**Notes:**

DHMT - District Health Management Team  
 PHMT - Provincial Health Management Team  
 VCT - Voluntary Counseling & Testing

### 3.2. Data Collection Tools and Methods

The assessment was carried out through review of available documents and reports, key informant interviews during field visits, and direct observation. The data collection tools used were interview guides with embedded checklists.

The assessment sought to establish the current status of:

- Availability of storage space
- Availability of data collection tools
- Security measures in place
- ICT equipment available
- Software applications in use
- Data transmission methods
- Proportion of staff trained on data management
- Availability of on-site ICT technical support
- Any backup plans and devices available
- Power sources
- Internet connectivity
- Availability of transport and resources

Provision was made for both paper-based and direct electronic data capture. A beta version of an online assessment tool was developed, and underwent testing and refinement. The skip logic was tested in a trial field test before the final version was posted online. The assessors were also provided with paper questionnaires as a back-up in case they were unable to connect to the online system. Every team was

tasked with ensuring quality of the data they collected by converging at the end of each data collection day to check it for completeness and accuracy. For all data entered online, there was a printable output in both Microsoft Word and Portable Document Format (pdf) for filing and for future data verification. The checklists used were customised according to units to be assessed, i.e., one each for MU, HF and CU, and they can be reviewed under Annexes A-C.

### 3.3. Data Analysis

In order to meet the stated objectives, the following questions relating to the key strategic areas of HIS infrastructure were compiled:

1. What percentage of facilities and management units have the requisite infrastructure to enter data and/or extract information or reports from a web-based information system? Which HFs/MUs/CUs have access to:
  - i. Functional computing equipment
  - ii. Networking equipment
  - iii. Internet equipment
  - iv. ICT technical support (on-site or otherwise)
2. In areas without internet connectivity (due to lack of either infrastructure or GSM coverage), what are the existing alternatives to using web-based applications?
  - i. Paper-based
  - ii. Mobile-enabled
  - iii. Other
3. What is the proportion of IT-literate staff amongst the health staff (to assess potential capacity to use a web-based NHIS)?
4. Is electricity available and are there alternatives, as primary or secondary sources of electric power?
5. How do we determine the optimal infrastructure gap? For example, how will we say that now, we need n number of this type of computers or this type of ICT hardware in these types of health facilities?
6. Do we have requirements analysis information (even a proxy) that tells us what ICT infrastructure is actually needed to fulfill clearly identified needs, or to enable the MoH to achieve certain needs (improved health outcomes, etc.)?

While questions 1 to 4 were to be addressed primarily by the data from the assessment, answering questions 5 and 6 will address the secondary objectives of collecting the data, and together with other sources of data will define what the optimal infrastructure would be, in order to determine the gap between where we are and where we need to be.

## 4. KEY ASSESSMENT FINDINGS

### 4.1. ICT Infrastructure Availability and Reliability

#### 4.1.1. Available Computing and Connectivity Infrastructure

**Table 4: Availability ICT equipment and infrastructure elements**

Column No:		1	3	4	5	6	7	11	12
Type of Unit Assessed	# Units Assessed	Desktop	Laptops	Modem	Mobile Phone	Projector	Photocopier	Television	Printer
Community Unit	52	6%	2%	8%	19%	0%	0%	0%	0%
Dispensary	51	12%	4%	6%	25%	0%	4%	10%	8%
Health Centre	55	49%	4%	25%	53%	0%	9%	36%	29%
Hospital	54	94%	48%	61%	67%	31%	67%	69%	87%
Management Unit	36	78%	58%	75%	47%	36%	39%	28%	58%

by unit level

**Key:**

- Percentage = Proportion of those assessed who answered “yes” to the question asking whether they had the different types of infrastructure available.
- Yellow highlight is above 80%, while green highlight is the “best” situation under each infrastructure category across all levels;
- Red font is below 20%.
- ICT equipment findings are in Columns 1-12, while findings involving networking infrastructure elements are in columns 16-20 below.

Notes on findings shown in Table 3:

- Desktop computers are the most available equipment, especially at the hospital (94%) and MU levels (78%).
- At the relatively better-resourced hospital level, printers and designated mobile phones are available at over 65% of units assessed.
- The MU level was better resourced in terms of laptops and GSM modems.

#### 4.1.2. Available Connectivity Infrastructure

- From Table 5: Internet connectivity availability we can see that for internet connectivity, the most resourced units are at the hospital level (70%), followed by management units (64%); the least resourced are at the dispensary and community unit level (both at 8% only).
- Wherever there is connectivity, regardless of level, the most common type of equipment reportedly used was the GSM modem. For example, of the units at

the community and management unit level that reported they have internet access, 100% use modems.

- c. Some units use LAN, WAN and fibre-optic for internet access either as their main option or as a backup to others available.

**Table 5: Internet connectivity availability**

Column No:		16	17	18	19	20
Type of Unit Assessed	# Units Assessed	Internet Connectivity	Fibre-optic	LAN	WAN	Modem
Community Unit	52	8%	0%	0%	0%	100%
Dispensary	51	8%	0%	25%	0%	75%
Health Centre	55	25%	0%	7%	0%	86%
Hospital	54	70%	8%	39%	16%	82%
Management Unit	36	64%	4%	26%	4%	100%

#### 4.1.3. Physical & Virtual Security and ICT Support

Notes on findings shown in Table 5:

- a. Physical security: Over 75% of HFs and MUs have lockable doors, windows, and security guards on site.
- b. Virtual security: Over 70% of hospitals and MUs use antivirus software and passwords, while this was at or below 50% at the other HF levels. Additionally, only 50% of hospitals have backup and restore procedures documented. The variety of media used for backup included external drives, USB disks, CDs and filed hardcopies.
- c. On-site ICT technical support: This was largely not available at dispensaries or health centres. It was available at less than 40% of hospitals and less than 20% of the MUs.

Table 6: Availability of physical and virtual security

	Column No:	24	25	26	27	28	46	48	49
Type of Unit Assessed	# Units Assessed	Documented Backup	Lockable Cabinets	Lockable Doors	Lockable Windows	Security Guard	Antivirus Software	Passwords on	ICT Technical Support
Dispensary	51	10%	37%	84%	78%	88%	50%	33%	0%
Health Centre	55	16%	73%	93%	89%	96%	48%	33%	4%
Hospital	54	50%	59%	96%	89%	98%	75%	71%	39%
Management Unit	36	42%	78%	86%	78%	92%	82%	64%	17%

#### 4.1.4. Reliability of Available ICT Infrastructure

As seen in Section 4.1.1, varied types of ICT equipment were available across the board. However, it was important to assess the reliability of the available equipment, and this was checked by asking how many of the machines were currently functioning at the time of the assessment. Though the reported data was not verified, the inference on reliability was as follows:

- a. Desktops were highly *reliable* across the board—even where there were few available, e.g., 6% at CU level, most were still functional (86%). Of the available desktops, over 85% were still functioning across all units (Figure 1).

Figure 1: Proportion of desktops reported as functioning out of those available

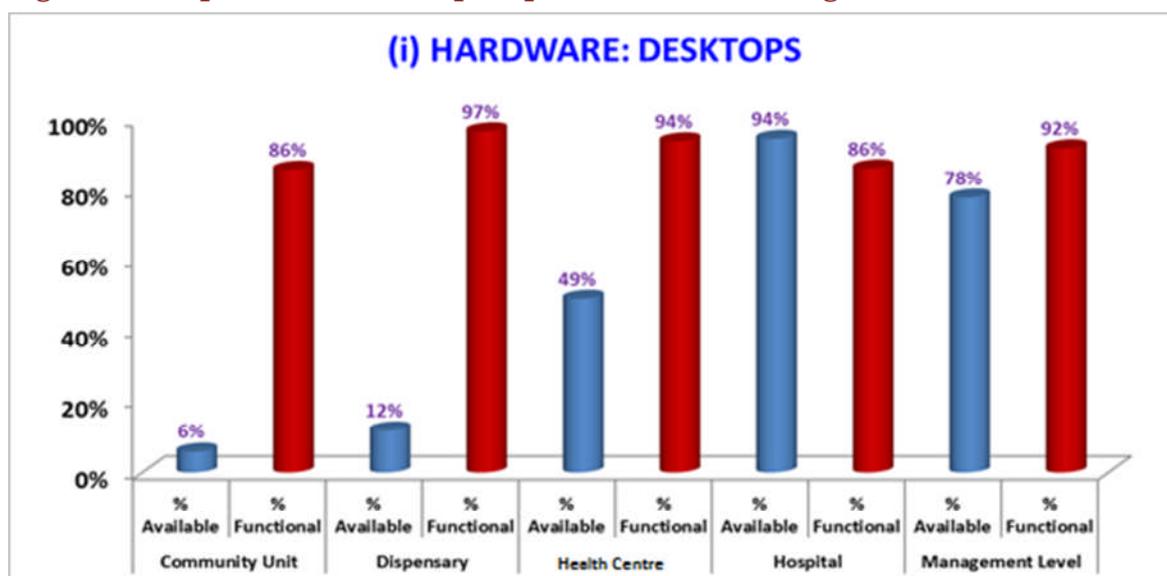
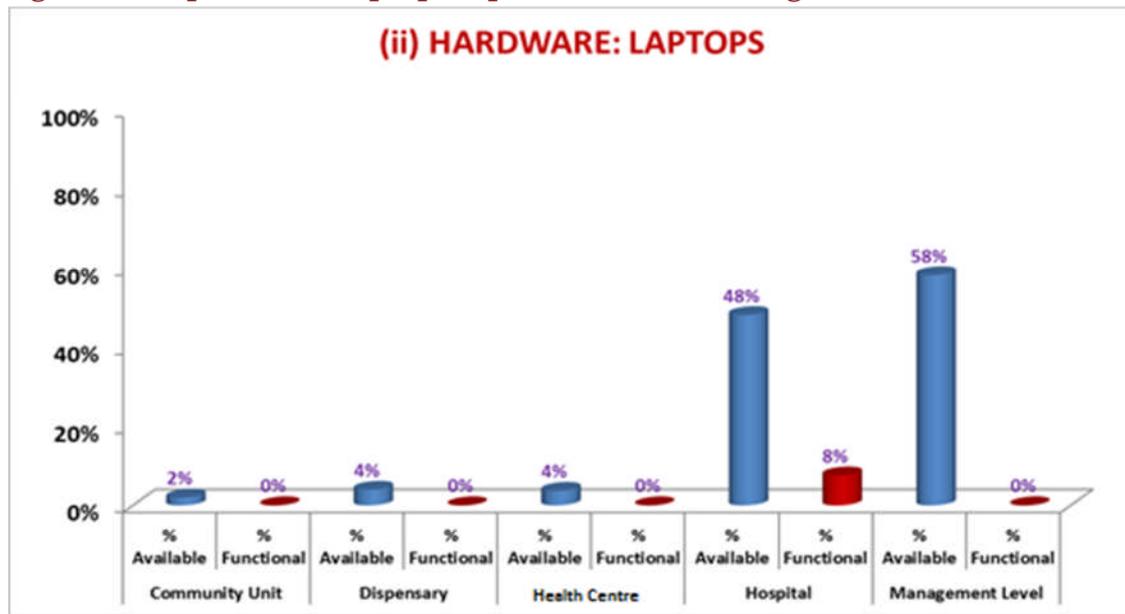


Figure 2: Proportion of laptops reported as functioning out of those available



- b. Laptops were mostly unreliable and unavailable across the board. Wherever they were available (48% at hospitals and 58% at MUs), they were reported as highly unlikely to remain functional over the long term (less than 8% at hospital level, and 0% at MU level were reported as still functional). See Figure 2.
- c. Mobile phones were reported as highly available and reliable across the board, except at the community unit level. Wherever they were available, they were highly likely to remain functional over the long term. See Figure 3.
- d. Projectors were largely unavailable and relatively unreliable across the board: i.e., wherever they were available, they were not likely to remain functional over the long term. See Figure 4.
- e. Printers were more available at the higher levels of the system, and were highly reliable across the board—i.e., wherever they were available, they were more likely to remain functional over the long term (see Figure 5).

Figure 3: Proportion of designated mobile phones reported as functioning out of those available

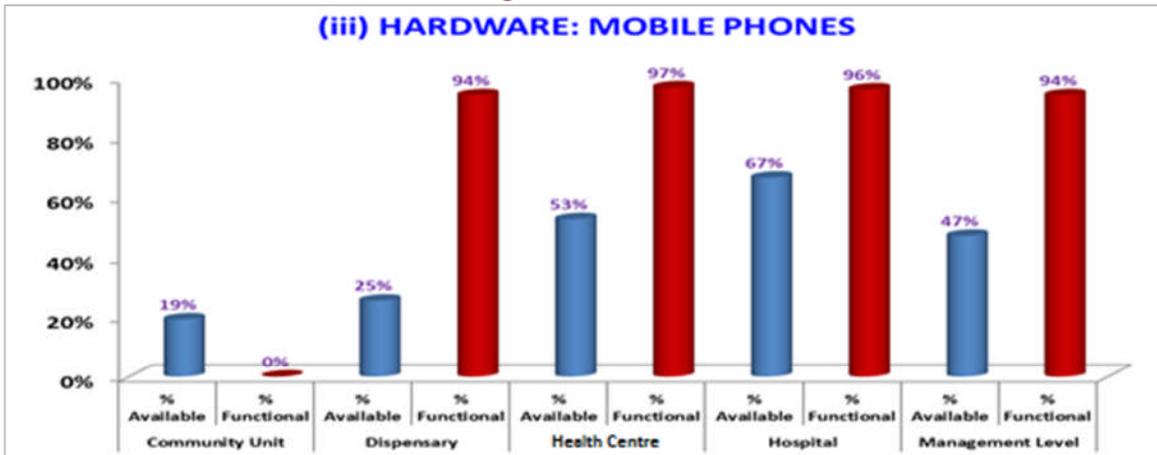


Figure 4: Proportion of LCD projectors reported as functioning out of those available

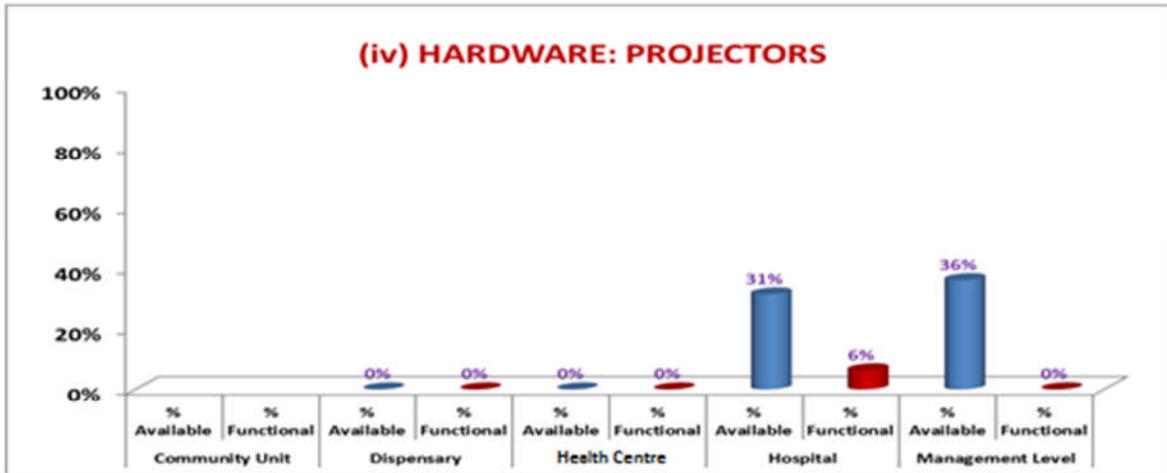
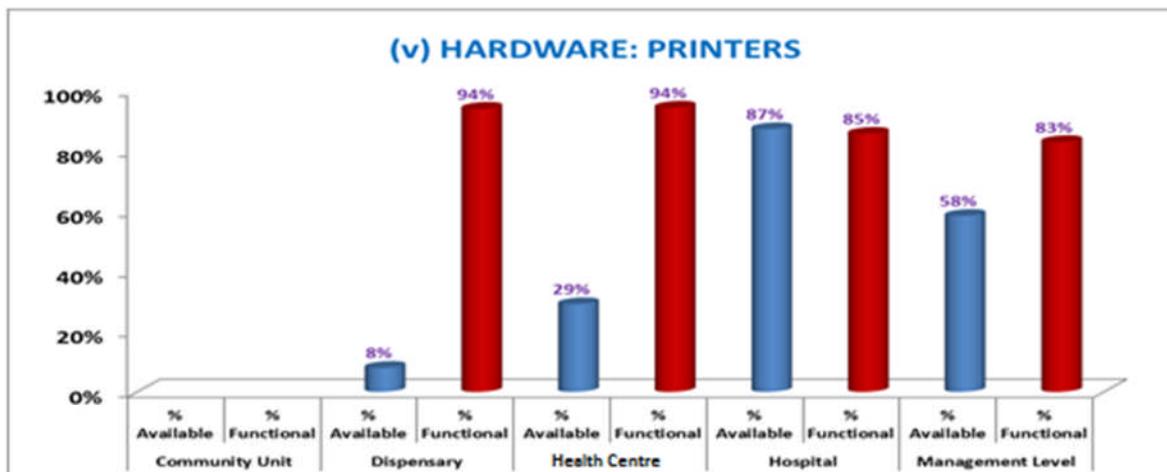


Figure 5: Proportion of printers reported as functioning out of those available



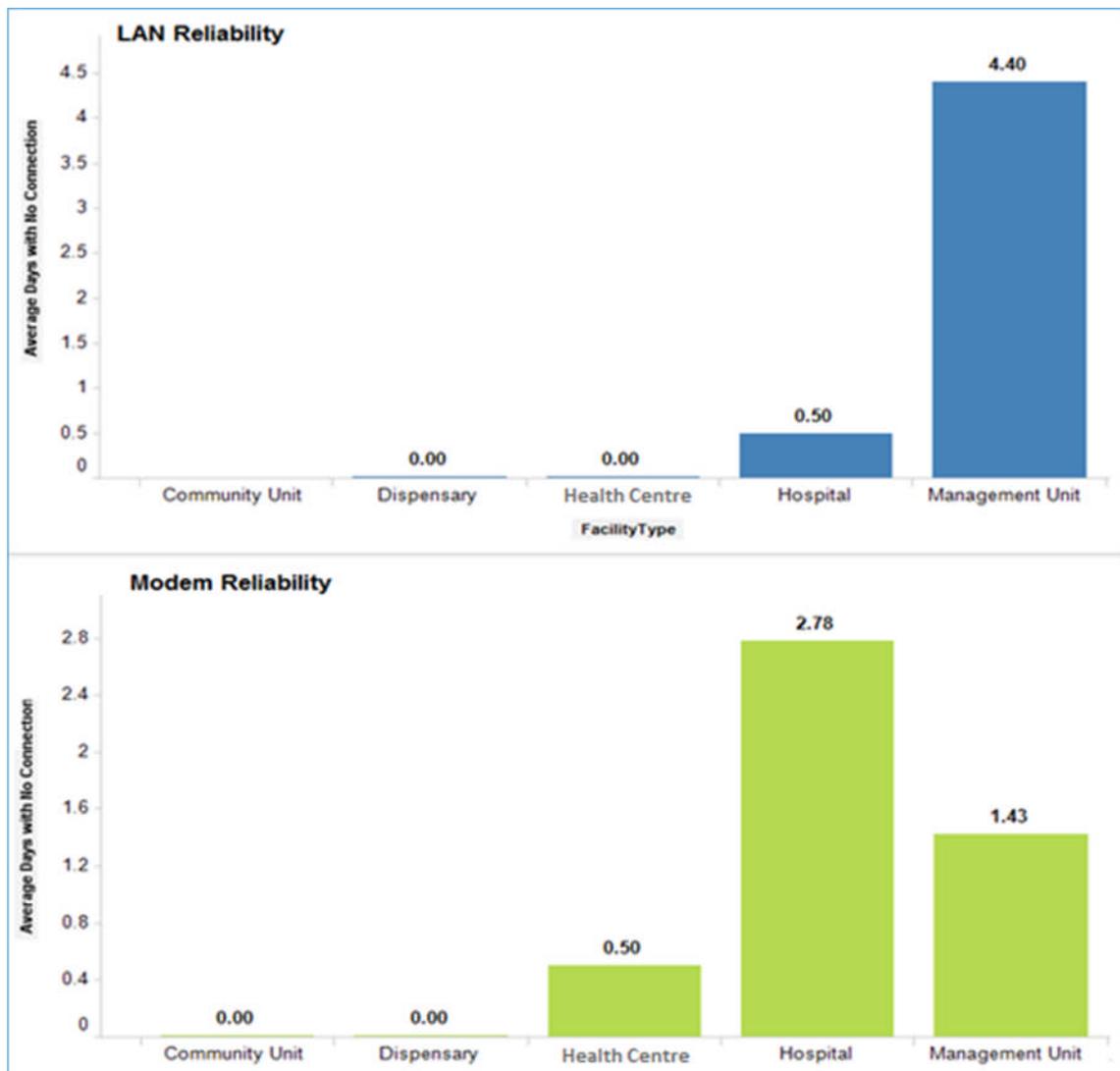
- f. In the area of internet connectivity, the most commonly available medium was the GSM modem, at 61% in hospitals, 75% in MUs, and less than 20% in the rest. However, even the fastest internet connection is only as good as it is reliable. To determine reliability the respondents were asked how many days in the previous two weeks that Internet services had been interrupted.
- g. Table 7 shows the proportion of health facilities where number of days without internet was reported as = 0 (i.e., they did not experience any interruption in connectivity). The reliability of internet connectivity appears best at the MU level, where out of the 3% who have fibre-optic and Wide Area Network (WAN), 100% reported that there had been no interruption over the previous two weeks; of the 17% MUs using LAN 33% reported no interruption; of the 64% using modems only 39% reported no interruption during the same period. For the other unit levels the proportion less than 60% have internet equipment, and for those that had, less than 20% of them reported that there was no interruption over the past two weeks. However, the cause of interruption was not clear, and could be related to such factors as interruption of electricity, GSM network failure, or other non-technical factors such as lack of airtime for modems.

**Table 7: Reliability of available internet connection**

Column No:		17	18	19	20	82	83	84	85
Type of Unit Assessed	# Units Assessed	Fibre-optic	LAN	WAN	Modem	Fibre-optic, No Interruption	LAN, No Interruption	WAN, No Interruption	Modem, No Interruption
	Community Unit	52	0%	0%	0%	8%			
Dispensary	51	0%	2%	0%	6%		0%		0%
Health Centre	55	0%	2%	0%	22%		0%		17%
Hospital	54	8%	28%	11%	57%	0%	7%	17%	10%
Management Unit	36	3%	17%	3%	64%	100%	33%	100%	39%

Another way of looking at internet connectivity reliability is assessing, on average, the number of days that different units had experienced interruption as reported by respondents.

**Figure 6: Graphs illustrating reliability of connectivity**



From the graphs shown in Figure 6 based on the average number of days that interruption was experienced, it can be concluded that using a LAN was less reliable than using a modem. However, the cause of interruption was not known, and could be based on various factors.

## 4.2. Computer Literacy Amongst Health and Data Staff

**Table 8: Proportion of staff reported as computer-literate**

	Column No:	49	191	194	197	200	203	205	207
Type of Unit Assessed	# Units Assessed	ICT Technical Support	Administrative Staff, Computer Literate	Clinical staff, Computer Literate	Support Staff, Computer Literate	Non-Clinical Staff, Computer Literate	HRIOs, Computer Literate	Statistical Clerks, Computer Literate	Data Clerks, Computer Literate
Community Unit	52			62%	0%	0%			
Dispensary	51	0%	71%	22%	36%	17%	100%	-	95%
Health Centre	55	4%	67%	38%	44%	12%	92%	-	70%
Hospital	54	39%	75%	35%	45%	23%	94%	98%	86%
Management Unit	36	17%		100%	-	0%			

Computer literacy is the knowledge and ability to use computers and technology, but it can also involve the comfort level someone has with using computer programmes and other applications that are associated with computers. Another valuable component of computer literacy is being familiar with how computers work and operate.

Findings on computer literacy (Table 8):

- ICT technical support—This is critical for ensuring continuity in IT-related operations. As was evident, this was largely unavailable, and even where it was (hospitals, with 39% having access to it) it was not available on site. This is a great challenge in implementing ICT systems.
- Statistical staff—These include Health Records & Information Officers, statistical clerks (in hospitals) and data clerks. Wherever these data management staff were available, their computer literacy was reported as very high (typically 90%-100%).
- Clinical and Admin staff—Computer literacy was highest amongst administrators (average of 71%), found generally within health facilities.
- Non-clinical staff—As expected, computer literacy was lowest amongst these cadres, below 50% across the board.

- e. Assessment of computer literacy amongst staff was not done at the MU level.

### 4.3. Availability of HIS Data Collection Tools

**Table 9: Proportion of units that reported availability of ALL data collection tools**

Column No:		61	62	63	64	65	71	72	73	74	75
Type of Unit Assessed	# Units Assessed	Registers available? (Y/N)	Registers available (All / Some)	Summary forms available? (Y/N)	Summary Forms available (All / Some)	Chalkboard, Community	CU Data Collected	CU, Availability of MOH513	CU, Availability of MOH514	CU, Availability of MOH515	CU, Availability of MOH516
Community Unit	52					2%	90%	75%	65%	65%	67%
Dispensary	51	96%	88%	96%	88%	18%					
Health Centre	55	95%	71%	96%	64%	35%					
Hospital	54	98%	75%	96%	81%	24%					
Management Unit	36	94%	59%	94%	79%	31%					
		"Yes"	"All"	"Yes"	"All"						

Findings as per Table 8:

- Availability of tools (HF/MU level) – Across all levels assessed, over 90% of units reported that they had registers and summary forms, while 24% on average reported not all were available.
- Community level tools – At least 90% of CUs confirmed that they collect routine data. However, out of those collecting, only 68% on average had all the tools available.
- The study also assessed the extent to which information was shared with the public; The Chalkboard, which was used to summarise data and share it with the public, was reportedly available in less than 40% of the community units assessed.

### 4.3.1. Availability of Storage Space for Tools and Records

Table 10: Storage space availability

		Column No: 86	87	88	89	90	91
Type of Unit Assessed	# Units Assessed	Files & Folder Storage	Cabinet Storage	Shelf Storage	Box File Storage	Computer Storage	Other Storage Available
	Community Unit	52	58%	23%	13%	35%	
Dispensary	51	59%	45%	33%	18%		14%
Health Centre	55	49%	75%	36%	25%		18%
Hospital	54	61%	57%	76%	44%		24%
Management Unit	36	78%	78%	58%	75%	58%	14%

Storage space for used-up tools or unused stocks was relatively better at the hospital and MU level, in the form of cabinets and shelves, while relatively limited at the lower levels. Computers were also used as a form of storage at the MU level.

Other forms of storage reported were cartons or boxes, cupboards, drawers, and electronic media.

### 4.4. Availability of Power and Sources

Most units at the hospital and management level are on the electricity grid (Table 10). At least 57% of the hospitals have two options for a power source, and 7% had three. Generators were mostly found at the hospital level, and, where available, they appeared to be much more reliable than the electricity grid (fewer outages reported).

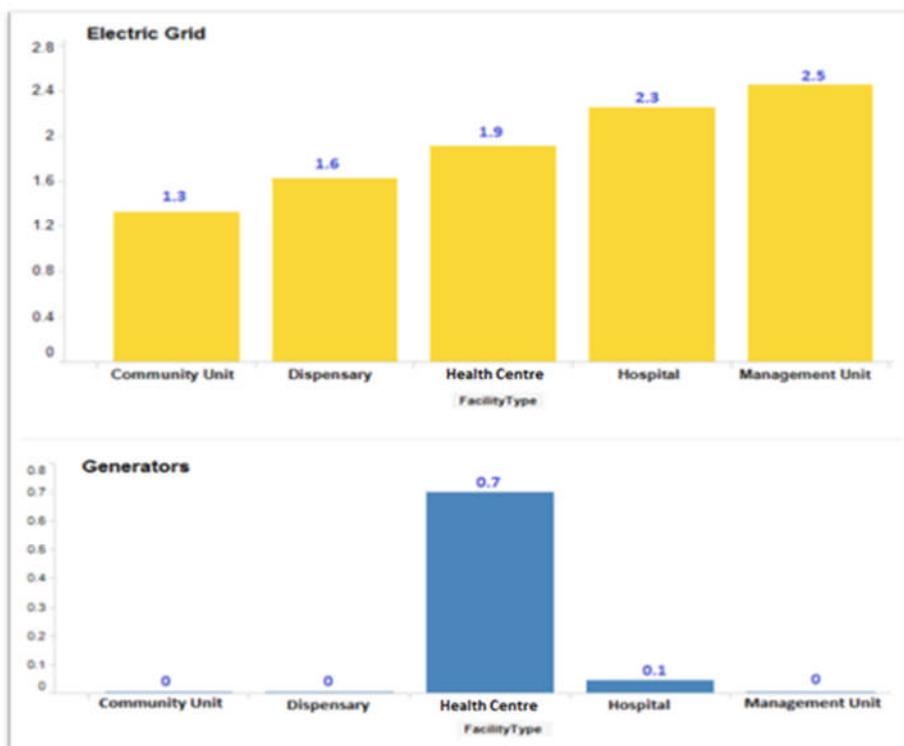
**Table 11: Availability of power source and type**

Type of Unit Assessed	# Units Assessed	Column No:	38	39	40		
		Electricitygrid	Generators	Solar	Electricity + Generator	Electricity + Generator + Solar	
Community Unit	52	13%	2%	2%	2%	0%	
Dispensary	51	57%	2%	18%	2%	0%	
Health Centre	55	71%	16%	22%	16%	2%	
Hospital	54	93%	61%	17%	57%	7%	
Management Unit	36	94%	31%	19%	28%	6%	

To assess power reliability, the respondents were asked the number of days that different units had experienced power outage during the previous two weeks.

As seen in Figure 7, electricity from the grid is most reliable at the community level (where average number of power-outage days was lowest,) and generators least reliable at Health Centre level (where average number of such days was highest).

**Figure 7: Average number of power-outage days reported**



### Notes on power reliability

- The data on power outages do not tell whether the outage was a blackout or a brownout, or how long it lasted.
- Question relied on respondents' recall, which may not be all that reliable with regard to power interruptions.
- The question did not specify whether the generators or solar equipment were used as primary or backup sources of power.

## 5. CHALLENGES IN DATA COLLECTION AND ANALYSIS

---

Whereas all efforts were made to prepare adequately for the exercise in terms of pretesting and planning, many challenges had to be faced in the field when it came to the actual data collection. The key ones are outlined below:

### **Accessibility limitations:**

- a. Some areas originally included in the sample listing were found to be inaccessible due to insecurity, e.g., Turkana; some teams had to find alternative sites to assess at short notice, so as to achieve the desired number of sites to visit.
- b. High utilisation of health facilities by the public at times slowed down the exercise.

### **Data entry/collection:**

- c. Though an online tool was developed to enable direct data entry, the use of the tool was at times not possible due to interruption in internet connectivity.
- d. Some enumerators were reluctant to use the online tools, and instead accumulated data in Excel sheets to key in later. This was a factor that negatively affected data quality.
- e. Some enumerators presented incomplete questionnaires.

### **Data verification and analysis:**

- f. A general limitation of the assessment was that it was not feasible to verify most of the information provided; hence the data collected is based on what respondents reported. This is true of the data on the numbers of:
  - health staff who are computer-literate
  - days without functioning power source
  - pieces of ICT equipment currently functioning
  - days with interruption in internet connectivity, etc.
- g. Some sites not originally included in the sample list were visited, while others that were included were not, and it was not clear why.

## 6. CONCLUSION

---

Overall, the findings show that while the management and hospital levels appear to be better resourced with ICT Infrastructure, there are also significant gaps to be filled at these and all other levels assessed. The findings will therefore be very useful in developing a gap analysis which could later inform an infrastructure road map to guide the needs for procurement and distribution of ICT infrastructure across the country, where feasible.



# ANNEX A: Infrastructure Assessment Questionnaire for the Management Unit

## Introduction

The Ministry of Health is conducting a public health facility survey as part of Planned Activities as Kenya prepares to implement the National Health Information System (NHIS). The survey is collecting information on resources available, required and the subsequent resource gaps focusing on infrastructure, equipment and health personnel categorized as immediate, medium and long term. Utilization levels will also be captured. In keeping with the objectives of the health facility survey, the ultimate analysis will be to calculate costs of the resource gaps in the samples facilities and then extrapolate costs to national level.

## 1. INTERVIEW INFORMATION

### a. Date of this Assessment

Day	Month	Year

### b. Lead Person Interviewed at Assessment Site

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

### c. Lead Person Interviewing

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

## 2. DEMOGRAPHIC INFORMATION

### a. Management Levels

Province Name	
County name	
District name	

### 3. INFORMATION

a. Does this management unit have a HIS office?

- Yes
- No

b. What tools are available on data collection and reporting?

(Please check where applicable)

	Applicable?	If "YES"
Data collection registers	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Summary forms	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Whiteboard/chalkboard for community	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Whiteboard/chalkboard for health facility	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Stationary (Markers, pens, pencils, etc.)	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some

c. Do you store your records?

- Yes
- No

d. Where do you store your records?

(Please check where applicable)

<input type="radio"/> Files folders
<input type="radio"/> Cabinets
<input type="radio"/> Shelves
<input type="radio"/> Box Files
<input type="radio"/> Computers
<input type="radio"/> Other

e. What are the physical security at this location?

(Please check where applicable)

	Response
Lockable cabinets	<input type="radio"/> Yes <input type="radio"/> No
Lockable doors	<input type="radio"/> Yes <input type="radio"/> No
Lockable windows (or bars on windows)	<input type="radio"/> Yes <input type="radio"/> No
Security guard(s)	<input type="radio"/> Yes <input type="radio"/> No

f. Do you have adequate

(Please check most appropriate for each entry)

	Response
office space to store records	<input type="radio"/> Yes <input type="radio"/> No
locked container	<input type="radio"/> Yes <input type="radio"/> No
Locked room	<input type="radio"/> Yes <input type="radio"/> No
space for sharing information (e.g. notice board, white board)	<input type="radio"/> Yes <input type="radio"/> No
space for meeting or conference room	<input type="radio"/> Yes <input type="radio"/> No

g. Are the management at this level trained on data management?

- Yes
- No

h. If yes, how many have been trained on data management?

	# Available	# Trained
1		
2		
3		
3		

#### 4. COMMUNICATION/TECHNOLOGY

a. What is the available ICT equipment at this management level?

(Please fill out all that apply)

	Applicable?	# Number Available	# Fully functional	# Non-functional
Desktops	<input type="radio"/> Yes <input type="radio"/> No			
Laptops	<input type="radio"/> Yes <input type="radio"/> No			
Handheld devices (PDA, smartphone, or cell phone)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Mobile)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Fixed)	<input type="radio"/> Yes <input type="radio"/> No			
Camera	<input type="radio"/> Yes <input type="radio"/> No			
Projector	<input type="radio"/> Yes <input type="radio"/> No			
Photocopier	<input type="radio"/> Yes <input type="radio"/> No			
OCR Scanner	<input type="radio"/> Yes <input type="radio"/> No			

	Applicable?	# Number Available	# Fully functional	# Non-functional
2-Way Radio	<input type="radio"/> Yes <input type="radio"/> No			
Television	<input type="radio"/> Yes <input type="radio"/> No			
Printer	<input type="radio"/> Yes <input type="radio"/> No			
Duplicator Machine (Mass production)	<input type="radio"/> Yes <input type="radio"/> No			
Scanner	<input type="radio"/> Yes <input type="radio"/> No			

b. Does this management level use software to manage health information?

- Yes
- No

c. If yes, name the software used and area if application

	Software	Area of application
1		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
2		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
3		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
4		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
5		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other

d. How do you transmit your data?

<input type="radio"/> Email
<input type="radio"/> Direct entry on the web
<input type="radio"/> Hard copies
<input type="radio"/> FTP
<input type="radio"/> Other: hhg

e. Is there any source of power in this management level?

- Yes
- No

f. If yes, select all the sources of power used at the management level

	Applicable?	# of days in last two weeks without power
Electric grid	<input type="radio"/> Yes <input type="radio"/> No	
Solar	<input type="radio"/> Yes <input type="radio"/> No	
Generators	<input type="radio"/> Yes <input type="radio"/> No	
Batteries	<input type="radio"/> Yes <input type="radio"/> No	
Gas	<input type="radio"/> Yes <input type="radio"/> No	
Others	<input type="radio"/> Yes <input type="radio"/> No	

g. Does the management level have any ICT technical support for its computers or Internet?

- Yes
- No

h. If "No" from above, where do they get its ICT technical support?

(Please check all that apply)

<input type="radio"/> Facility-based tech support
<input type="radio"/> Remote tech support from (please specify):
<input type="radio"/> Outsourcing

i. Do you have documented backup and restoration procedures for HIS data?

- Yes
- No

j. If yes, which backups are available?

<input type="radio"/> Tape
<input type="radio"/> External hard drives
<input type="radio"/> USB disk
<input type="radio"/> CDS
<input type="radio"/> Hard Copies
<input type="radio"/> Other

- k. Which of the following security measures are enforced on computers at this management level?

Variable	Response
Antivirus software	<input type="radio"/> Yes <input type="radio"/> No
User-specific passwords on computers	<input type="radio"/> Yes <input type="radio"/> No

## 5. CONNECTIVITY

- a. Is there internet connectivity used at this management level?
- Yes
  - No

- b. If yes, what do you use for connectivity

(Please check all that apply)

	Applicable?	# of days in last two weeks without connectivity
Fibre optic	<input type="radio"/> Yes <input type="radio"/> No	
Local area network (LAN)	<input type="radio"/> Yes <input type="radio"/> No	
Wide area network (WAN)	<input type="radio"/> Yes <input type="radio"/> No	
Modem (wireless 3G, landline modem, etc.)	<input type="radio"/> Yes <input type="radio"/> No	
Other	<input type="radio"/> Yes <input type="radio"/> No	

- c. Do you have a designated mobile phone for communication?
- Yes
  - No
- d. If yes, does the phone have internet capability?
- Yes
  - No

## 6. TRANSPORT

a. What means of transport do use for collecting information?

(Please fill out all that apply)

	Applicable?	# Number	# Fully functional	# Non-functional
Bicycle	<input type="radio"/> Yes <input type="radio"/> No			
Motorcycle	<input type="radio"/> Yes <input type="radio"/> No			
Utility Vehicles	<input type="radio"/> Yes <input type="radio"/> No			
Ambulance	<input type="radio"/> Yes <input type="radio"/> No			
Motorboat	<input type="radio"/> Yes <input type="radio"/> No			
Donkey cart	<input type="radio"/> Yes <input type="radio"/> No			
Others	<input type="radio"/> Yes <input type="radio"/> No			

b. Do you have resources designated for HIS?

- Yes
- No

c. If yes, what type of resources do you get?

d. What are your main challenges in data management and information system?

# ANNEX B: Infrastructure Assessment Questionnaire for the Health Facility

## INTRODUCTION

The Ministry of Health is conducting a public health facility survey as part of Planned Activities as Kenya prepares to implement the National Health Information System (NHIS). The survey is collecting information on resources available, required and the subsequent resource gaps focusing on infrastructure, equipment and health personnel categorized as immediate, medium and long term. Utilization levels will also be captured. In keeping with the objectives of the health facility survey, the ultimate analysis will be to calculate costs of the resource gaps in the samples facilities and then extrapolate costs to national level.

## 1. INTERVIEW INFORMATION

### a. Date of this Assessment

Day	Month	Year

### b. Lead Person Interviewed at Assessment Site

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

### c. Lead Person Interviewing

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

## 2. DEMOGRAPHIC INFORMATION

Variable	Response
County Name	
District Name	
Facility Name	
Facility Code(MFL code)	
Facility Type	<input type="radio"/> Hospital <input type="radio"/> Dispensary <input type="radio"/> Health Centre <input type="radio"/> Clinic <input type="radio"/> Standalone VCT

## 3. INFORMATION

a. Does this facility have a records office?

- Yes
- No

b. What tools are available on data collection and reporting?

(Please check where applicable)

	Applicable?	If "YES"
Data collection registers	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Summary forms	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Whiteboard/chalkboard for community	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Whiteboard/chalkboard for health facility	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some
Stationary (Markers, pens, pencils, etc.)	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> All <input type="radio"/> Some

c. Do you store your records?

- Yes
- No

d. Where do you store your health facility records?

(Check all that apply)

- Files folders
- Cabinets
- Shelves
- Box Files
- Other \_\_\_\_\_

e. What is the physical security at this location?

(Please check where applicable)

	Response
Lockable cabinets	<input type="radio"/> Yes <input type="radio"/> No
Lockable doors	<input type="radio"/> Yes <input type="radio"/> No
Lockable windows (or bars on windows)	<input type="radio"/> Yes <input type="radio"/> No
Security guard(s)	<input type="radio"/> Yes <input type="radio"/> No

f. Do you have adequate

(Please check most appropriate for each entry)

	Response
office space to store records	<input type="radio"/> Yes <input type="radio"/> No
locked container or room	<input type="radio"/> Yes <input type="radio"/> No
space for sharing information (e.g. notice board, white board)	<input type="radio"/> Yes <input type="radio"/> No
space for meeting or conference room	<input type="radio"/> Yes <input type="radio"/> No

g. Are you trained on data management?

- Yes
- No

#### 4. COMMUNICATION/TECHNOLOGY

a. What are the available ICT equipment for the Health Facility

(Please fill out all that apply)

	Applicable?	# Number Available	# Fully functional	# Non-functional
Desktops	<input type="radio"/> Yes <input type="radio"/> No			
Laptops	<input type="radio"/> Yes <input type="radio"/> No			
Handheld devices (PDA, smartphone)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Mobile)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Fixed)	<input type="radio"/> Yes <input type="radio"/> No			
Camera	<input type="radio"/> Yes <input type="radio"/> No			

	Applicable?	# Number Available	# Fully functional	# Non-functional
Projector	<input type="radio"/> Yes <input type="radio"/> No			
Photocopier	<input type="radio"/> Yes <input type="radio"/> No			
OCR Scanner	<input type="radio"/> Yes <input type="radio"/> No			
2-Way Radio	<input type="radio"/> Yes <input type="radio"/> No			
Television	<input type="radio"/> Yes <input type="radio"/> No			
Printer	<input type="radio"/> Yes <input type="radio"/> No			
Scanner	<input type="radio"/> Yes <input type="radio"/> No			

b. Does this facility use software to manage health information?

- Yes
- No

c. If yes, name the software used and area if application

	Software	Area of application
1		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
2		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
3		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
4		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other
5		<input type="radio"/> Financial Management <input type="radio"/> Human resource management <input type="radio"/> Health Information Management <input type="radio"/> Logistic management <input type="radio"/> Other

d. Is there any source of power in the health facility?

- Yes
- No

e. If yes, select all the sources of power used by the health facility

	Applicable?	# of days in last two weeks without power
Electric grid	<input type="radio"/> Yes <input type="radio"/> No	
Solar	<input type="radio"/> Yes <input type="radio"/> No	
Generators	<input type="radio"/> Yes <input type="radio"/> No	
Batteries	<input type="radio"/> Yes <input type="radio"/> No	
Gas	<input type="radio"/> Yes <input type="radio"/> No	
Others	<input type="radio"/> Yes <input type="radio"/> No	

f. Does the facility have any ICT technical support for its computers or Internet?

- Yes
- No

g. Does the facility have documented backup and restoration procedures for HIS data?

- Yes
- No

h. Which backups are available

- Tape
- External hard drives
- Tape
- External hard drives
- USB disk
- CDS
- Hard copies
- Other (please specify)\_\_\_\_\_

i. Which of the following security measures are enforced on computers at this facility?

Variable	Response
Antivirus software	<input type="radio"/> Yes <input type="radio"/> No
User-specific passwords on computers	<input type="radio"/> Yes <input type="radio"/> No

## 5. CONNECTIVITY

- a. Is there internet connectivity used at the Health Facility?
- Yes
  - No

- b. What do you use for connectivity

(Please check all that apply)

	Applicable?	# of days in last two weeks without connectivity
Fibre optic	<input type="radio"/> Yes <input type="radio"/> No	
Local area network (LAN)	<input type="radio"/> Yes <input type="radio"/> No	
Wide area network (WAN)	<input type="radio"/> Yes <input type="radio"/> No	
Modem (wireless 3G, landline modem, etc.)	<input type="radio"/> Yes <input type="radio"/> No	
Other	<input type="radio"/> Yes <input type="radio"/> No	

- c. Is the health facility having designated mobile phone for communication?
- Yes
  - No

- d. If yes, does the phone have internet capability?
- Yes
  - No

- e. Do you have resources designated for HIS?
- Yes
  - No

- f. If yes, what type of resources do you get?

## 6. WORKFORCE

### a. Available Human Resources

	# Available (B)	# computer literate	% computer literate
Administrative (finance, supplies, CEOs)			
Clinical (Doctors, Nurses, RCOs)			
Support departments(Lab, Pharmacy)			
Non Clinical staff (Cleaners, secretaries, clerks)			

### b. Health Information Personnel

	# Available (B)	How many know how to use a computer?
Health Records & Information Officers		
Statistical clerks		
Data clerks		
ICT officers		

### c. What are your main challenges in data management and information system?

Thank you for your corporation.

# ANNEX C: Infrastructure Assessment Questionnaire for the Community Unit

## INTRODUCTION

The Ministry of Health is conducting a public health facility survey as part of Planned Activities as Kenya prepares to implement the National Health Information System (NHIS). The survey is collecting information on resources available, required and the subsequent resource gaps focusing on infrastructure, equipment and health personnel categorized as immediate, medium and long term. Utilization levels will also be captured. In keeping with the objectives of the health facility survey, the ultimate analysis will be to calculate costs of the resource gaps in the samples facilities and then extrapolate costs to national level.

## 1. INTERVIEW INFORMATION

### a. Date of this Assessment

Day	Month	Year

### b. Lead Person Interviewed at Assessment Site

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

### c. Lead Person Interviewing

(For follow-up and clarification purposes)

Variable	Response
Name	
Title/Designation	
Phone	
Email	
Signature	

## 2. DEMOGRAPHIC

a. Person interviewed:

- Community Health Extension Worker (CHEW)
- Community Health Committee Member
- Community Health Worker
- Other, please specify: \_\_\_\_\_

b. Community Unit Name

c. Link facility code (MFL)

d. Community unit link Facility Name

## 3. INFORMATION

a. Does the link facility have an office for the CHEW?

- Yes
- No

b. Is there a community health office for the community unit?

- Yes
- No

c. Do you collect community health data?

- Yes
- No

d. What are the current data collection and reporting tools available?

	Response
Household register (MOH 513)	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> </ul>
Log book (MOH 514)	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> </ul>
CHEW Summary (MOH 515)	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> </ul>
White board/chalkboard (MOH 516)	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> </ul>
Stationary (Markers, pens, pencils, etc.)	<ul style="list-style-type: none"> <li>○ Yes</li> <li>○ No</li> </ul>

- e. Do you store your community health records?
  - Yes
  - No
  
- f. Where do you store your community health records?
  - Files Folders
  - Cabinets
  - Shelves
  - Box files
  - Other

g. Do you have adequate

(Please check most appropriate for each entry)

	Response
office space to store records	<input type="radio"/> Yes <input type="radio"/> No
locked container	<input type="radio"/> Yes <input type="radio"/> No
locked room	<input type="radio"/> Yes <input type="radio"/> No
space for sharing information <i>(Notice board where information about the community health can be shared)</i>	<input type="radio"/> Yes <input type="radio"/> No

- h. Have you undergone training on data management?
  - Yes
  - No

#### 4. COMMUNICATION

- a. Is there a community resource centre?
  - Yes
  - No
  
- b. Do you have access to the community resource centre?
  - Yes
  - No
  
- c. Is there any source of power in the community resource centre?
  - Yes
  - No

d. If yes, select all the sources of power used by the community resource centre

	Applicable?	# of days in last two weeks without power
Electric grid	<input type="radio"/> Yes <input type="radio"/> No	
Solar	<input type="radio"/> Yes <input type="radio"/> No	
Generators	<input type="radio"/> Yes <input type="radio"/> No	
Batteries	<input type="radio"/> Yes <input type="radio"/> No	
Gas	<input type="radio"/> Yes <input type="radio"/> No	
Others	<input type="radio"/> Yes <input type="radio"/> No	

## 5. TECHNOLOGY

a. What are the available ICT equipment for the community unit

(Please fill out all that apply)

	Applicable?	# Number Available	# Fully functional	# Non-functional
Desktops	<input type="radio"/> Yes <input type="radio"/> No			
Laptops	<input type="radio"/> Yes <input type="radio"/> No			
Handheld devices (PDA, smartphone, or cell phone)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Mobile)	<input type="radio"/> Yes <input type="radio"/> No			
Phone (Fixed)	<input type="radio"/> Yes <input type="radio"/> No			
Camera	<input type="radio"/> Yes <input type="radio"/> No			
Projector	<input type="radio"/> Yes <input type="radio"/> No			
Photocopier/Scanner	<input type="radio"/> Yes <input type="radio"/> No			
OCR Scanner	<input type="radio"/> Yes <input type="radio"/> No			
2-Way Radio	<input type="radio"/> Yes <input type="radio"/> No			
Printer	<input type="radio"/> Yes <input type="radio"/> No			

## 6. CONNECTIVITY

a. Is there internet connectivity used by the community unit?

- Yes
- No

b. If yes, what do you use for connectivity

(Please check all that apply)

	Applicable?	# of days in last two weeks without connectivity
Modem		
WAN/LAN		
VSAT		
Other		

c. Is the community unit having mobile phone?

- Yes
- No

d. If yes, does the phone have internet capability?

- Yes
- No

## 7. TRANSPORT

a. What means of transport do use for doing your community health work?

(Please fill out all that apply)

	Applicable?	# Number	# Fully functional	# Non-functional
Bicycle	<input type="radio"/> Yes <input type="radio"/> No			
Motorcycle	<input type="radio"/> Yes <input type="radio"/> No			
Utility Vehicles	<input type="radio"/> Yes <input type="radio"/> No			
Ambulance	<input type="radio"/> Yes <input type="radio"/> No			
Motorboat	<input type="radio"/> Yes <input type="radio"/> No			
Donkey cart	<input type="radio"/> Yes <input type="radio"/> No			
Others	<input type="radio"/> Yes <input type="radio"/> No			

b. Do you have resources designated for HIS?

- Yes
- No

c. If yes, what type of resources do you get?

d. What are your main challenges in data management and information system?

Thank you for your corporation.

## ANNEX D: Details of Sampling Methodology

### Sampling Proposal

The importance of factoring in county constituencies in the sampling was underscored, in light of the new constitutional dispensation dictating that services delivery will now be managed at the county level. Using county structures as the entry point in selecting health facilities to sample resulted in applying the Probability Proportional to Size cluster sampling method, as follows.

Twenty-four counties were purposively selected, using the Kenya County Fact sheet as a reference. The level of urbanisation of the counties guided selection of counties, with every quartile contributing counties proportional to the size of the quartile.

The tables below show the 24 counties sampled:

#	County	#	County	#	County
1.	Bungoma	9.	Kisii	17.	Murang'a
2.	Busia	10.	Kisumu	18.	Nairobi
3.	Embu	11.	Kwale	19.	Nakuru
4.	Garissa	12.	Laikipia	20.	Nyamira
5.	Homa Bay	13.	Machakos	21.	Nyeri
6.	Isiolo	14.	Makueni	22.	Taita Taveta
7.	Kakamega	15.	Meru	23.	Trans Nzoia
8.	Kiambu	16.	Mombasa	24.	Uasin Gishu

From the 24 counties, 47 districts were initially planned (highlighted below) for the assessment out of the total of 158 districts. The planned sample districts represented 30% of the total districts.

#	County	Districts (Planned)	#	County	Districts (Planned)
1.	Bungoma	Bungoma East	80.	Laikipia	Nyahururu
2.	Bungoma	Bungoma West	81.	Machakos	Machakos
3.	Bungoma	Bumula	82.	Machakos	Athi River
4.	Bungoma	Bungoma Central	83.	Machakos	Kangundo
5.	Bungoma	Bungoma North	84.	Machakos	Kathiani
6.	Bungoma	Bungoma South	85.	Machakos	Masinga
7.	Bungoma	Cheptais	86.	Machakos	Matungulu
8.	Bungoma	Kimilili Bungoma	87.	Machakos	Mwala
9.	Bungoma	MtElgon	88.	Machakos	Yatta
10.	Busia	Butula	89.	Makueni	Kibwezi
11.	Busia	Bunyala	90.	Makueni	Makindu
12.	Busia	Busia	91.	Makueni	Mukaa
13.	Busia	Nambale	92.	Makueni	Nzau
14.	Busia	Samia	93.	Makueni	Kathonzweni
15.	Busia	Teso North	94.	Makueni	Kilungu
16.	Busia	Teso South	95.	Makueni	Makueni
17.	Embu	Embu West	96.	Makueni	Mbooni East
18.	Embu	Embu East	97.	Makueni	Mbooni West

#	County	Districts (Planned)	#	County	Districts (Planned)
19.	Embu	Embu North	98.	Meru	Imenti North
20.	Embu	Mbeere North	99.	Meru	Imenti South
21.	Embu	Mbeere South	100.	Meru	Tigania East
22.	Garissa	Balambala	101.	Meru	Tigania West
23.	Garissa	Fafi	102.	Meru	Buuri
24.	Garissa	Garissa	103.	Meru	Igembe North
25.	Garissa	Lagdera	104.	Meru	Igembe South
26.	Garissa	Dadaab	105.	Meru	Meru Central
27.	Garissa	Hulugho	106.	Mombasa	Changamwe
28.	Garissa	Ijara	107.	Mombasa	Mvita
29.	Homa Bay	Ndhiwa	108.	Mombasa	Kisauni
30.	Homa Bay	Homa Bay	109.	Mombasa	Likoni
31.	Homa Bay	Mbita	110.	Murang'a	Kahuro
32.	Homa Bay	Rachuonyo North	111.	Murang'a	Muranga North
33.	Homa Bay	Rachuonyo South	112.	Murang'a	Muranga West
34.	Homa Bay	Suba	113.	Murang'a	Kandara
35.	Isiolo	Garbatula	114.	Murang'a	Kigumo
36.	Isiolo	Isiolo	115.	Murang'a	Kiharu
37.	Isiolo	Merti	116.	Murang'a	Mathioya
38.	Kakamega	Kakamega North (Malava)	117.	Nairobi	Dagoretti
39.	Kakamega	Butere	118.	Nairobi	Embakasi
40.	Kakamega	Kakamega Central (Lurambi)	119.	Nairobi	Westlands
41.	Kakamega	Kakamega East (Shinyalu)	120.	Nairobi	Kamukunji
42.	Kakamega	Kakamega South (Ikolomani)	121.	Nairobi	Kasarani
43.	Kakamega	Khwisero	122.	Nairobi	Langata
44.	Kakamega	Likuyani	123.	Nairobi	Makadara
45.	Kakamega	Lugari	124.	Nairobi	Njiru
46.	Kakamega	Matete	125.	Nairobi	Starehe
47.	Kakamega	Matungu	126.	Nakuru	Naivasha
48.	Kakamega	Mumias	127.	Nakuru	Nakuru
49.	Kiambu	Gatanga	128.	Nakuru	Gilgil
50.	Kiambu	Githunguri	129.	Nakuru	Kuresoi
51.	Kiambu	Lari	130.	Nakuru	Molo
52.	Kiambu	Thika West	131.	Nakuru	Nakuru North
53.	Kiambu	Gatundu	132.	Nakuru	Njoro
54.	Kiambu	Gatundu North	133.	Nakuru	Rongai
55.	Kiambu	Kiambu	134.	Nakuru	Subukia
56.	Kiambu	Kikuyu	135.	Nyamira	Borabu
57.	Kiambu	Limuru	136.	Nyamira	Manga
58.	Kiambu	Ruiru	137.	Nyamira	Masaba South
59.	Kiambu	Thika East	138.	Nyamira	North Masaba
60.	Kisii	Kisii Central	139.	Nyamira	Nyamira
61.	Kisii	Gucha	140.	Nyamira	Nyamira North
62.	Kisii	Kenyeny	141.	Nyeri	Kieni East
63.	Kisii	Kisii South	142.	Nyeri	Kieni West
64.	Kisii	Marani	143.	Nyeri	Nyeri South

#	County	Districts (Planned)	#	County	Districts (Planned)
65.	Kisii	Nyamache	144.	Nyeri	Mathira East
66.	Kisii	Sameta	145.	Nyeri	Mathira West
67.	Kisii	South Gucha	146.	Nyeri	Mukurweini
68.	Kisumu	Kisumu East	147.	Nyeri	Nyeri Central
69.	Kisumu	Muhoroni	148.	Nyeri	Tetu
70.	Kisumu	Kisumu West	149.	Taita Taveta	Voi
71.	Kisumu	Nyakach	150.	Taita Taveta	Taveta
72.	Kisumu	Nyando	151.	Taita Taveta	Mwatate
73.	Kwale	Kinango	152.	Taita Taveta	Wundanyi
74.	Kwale	Matuga	153.	Trans Nzoia	Kwanza
75.	Kwale	Msambweni	154.	Trans Nzoia	Trans Nzoia West
76.	Laikipia	Laikipia North	155.	Trans Nzoia	Trans Nzoia East
77.	Laikipia	Laikipia Central	156.	Uasin Gishu	Eldoret East
78.	Laikipia	Laikipia East	157.	Uasin Gishu	Eldoret West
79.	Laikipia	Laikipia West	158.	Uasin Gishu	Wareng

Total = 47 districts out of a total of 158 districts

Total number of facilities in these counties is 1,888

### Proportion to Size Sampling of Health Facilities for Infrastructure Assessment

- List all the counties on column 1 -
- Calculate the running cumulative population of facilities as listed in the MFL in column 2.
  - We shall visit facilities in 30% of the 158 districts (47 districts).
  - To determine which districts we shall visit, we compute the Sampling Interval (SI) by dividing the total number of districts (1,888) by the number of districts we have decided to visit (47), and that gives us an SI of 158.
  - We then choose a number between 1 and the SI at random. This is the Random Start (RS). In this sample, the RS is randomly selected as 74.
- We then select out of the MFL only those 47 districts selected in the previous step.
- Remove a few districts that are not feasible to visit due to insecurity or logistical difficulty remains with 40 districts
- Results of that sampling by county are shown below for a total of 138 facilities.

#	District Name	Facility Name
1	Bungoma East	Kayaya Dispensary
2	Bungoma East	Lugulu Mission Hospital
3	Bungoma East	Mukhe Dispensary
4	Bungoma West	Malakisi Health Centre
5	Bungoma West	Sirisia District Hospital
6	Butula	Bumala A Health Centre
7	Butula	Bumala B Health Centre
8	Butula	Khunyangu D. Hospital
9	Butula	Masendebale Dispensary
10	Butula	
11	Balambala_Garissa	Balambala Sub-district Hospitals

#	District Name	Facility Name
12	Fafi	Alinjugur
13	Fafi	Bura District Hospital
14	Fafi	Galmagalla
15	Fafi	Kamuthe Dispensary
16	Fafi	Nanighi
17	Garissa	Balich
18	Garissa	Saka Health Centre
19	Garissa	Sankuri Health Centre
20	Lagdera	Daadab Sub-district Hospital
21	Lagdera	Kulan
22	Lagdera	Saretho Health Centre
23	Ndhiwa	Amoyo Dispensary
24	Ndhiwa	Got Kojowi Health Centre
25	Ndhiwa	Ndhiwa District Hospital
26	Ndhiwa	Pala Health Centre
27	Garbatulla	Barambate
28	Garbatulla	Boji Dispensary
29	Garbatulla	Garbatulla District Hospital
30	Garbatulla	Kinna Health Centre
31	Garbatulla	Kula Mawe Dispensary
32	Garbatulla	Rapsu
33	Kakamega North	Chombeli Health Centre
34	Kakamega North	Malava District Hospital
35	Kakamega North	
36	Gatanga	Gathanji Dispensary
37	Gatanga	Gatura Health Centre
38	Gatanga	Ithangarari Dispensary
39	Gatanga	karangi Dispensary
40	Gatanga	Kigoro Dispensary
41	Gatanga	Kirwara Sub-district Hosp
42	Gatanga	Ndunyu Chege Dispensary
43	Githunguri	Githunguri Health Centre
44	Githunguri	Gitiha Dispensary
45	Githunguri	Kingumo Health Centre
46	Githunguri	Ngewa Dispensary
47	Lari	kangwe Dispensary
48	Lari	Kereita Dispensary
49	Lari	Lari Health Centre
50	Lari	Uplands Dispensary
51	Kisumu East	Airport Dispensary
52	Kisumu East	Kibos Sugar
53	Kisumu East	Kisumu District Hospital
54	Kisumu East	Masogo Sub-district Hospital
55	Kisumu East	Nyalunya Dispensary
56	Kisumu East	Rabour Health Centre
57	Muhoroni	Muhoroni Sub-district Hospital
58	Muhoroni	Ogen Dispensary
59	Muhoroni	Tamu Health Centre
60	Laikipia North	Arjjo
61	Laikipia North	Doldol District Hospital

#	District Name	Facility Name
62	Laikipia North	Ewaso
63	Laikipia North	Ilpolei
64	Kibwezi	Gwata Health Centre
65	Kibwezi	kibwezi District Hospital
66	Kibwezi	Masongaleni Health Centre
67	Kibwezi	Mtito Andei
68	Makindu	Makindu Sub-District Hospital
69	Mukaa	Sultan Hamud District Hospital
70	Nzau	Emali Model Health Centre
71	Nzau	Kikumini Health Centre
72	Nzau	Matiliku Hospital
73	Nzau	Mwanyani Dispensary
74	Imenti South	Kanyakine District Hospital
75	Imenti South	Kinoro Sub-district Hospital
76	Imenti South	Mikumbune Sub-District Hospital
77	Imenti South	Mutiokiana
78	Imenti South	Ntemwene District Hospital
79	Imenti South	Uruku GK Prison
80	Imenti South	Uruku Health Centre
81	Tigania East	Miathene District Hospital
82	Tigania West	Kiandui Dispensary
83	Tigania West	Mbeu Sub-district Hospital
84	Tigania West	Mutionjori Health Centre
85	Changamwe	Jomvu Model Health Centre
86	Changamwe	Miritini CDF Dispensary
87	Kahuro	Gatara Health Centre
88	Muranga	Kanyenyaini Health Centre
89	Muranga North	Kangema Sub-District Hospital
90	Muranga West	Kiruri Dispensary (Muranga North)
91	Dagoreti	Dagoretti Approved School
92	Dagoreti	Mutuini Sub-district Hospital
93	Dagoreti	NASCOP VCT
94	Dagoretti	Afya House
95	Dagoretti	Mbagathi District Hospital
96	Embakasi	GSU Embakasi
97	Embakasi	JKIA
98	Naivasha	Karagita Dispensary
99	Naivasha	Longonot Dispensary
100	Naivasha	Mai Mahiu
101	Naivasha	Mt. Longonot Hospital
102	Naivasha	Naivasha District Hospital
103	Naivasha	Oserian
104	Nakuru Central	Annex Hospital
105	Nakuru Central	Kimanjo Dispensary
106	Nakuru Central	Lanet Health Centre
107	Nakuru Central	Nakuru West PCEA
108	Nakuru Central	Prison Dispensary
109	Nakuru Central	Valley Hospital
110	Borabu	Chepngombe Health Centre
111	Borabu	Isoge Health Centre
112	Borabu	Kijeuri Sub-district Hospital
113	Borabu	Nyankono Dispensary

#	District Name	Facility Name
114	Borabu	Rigoko Dispensary
115	Borabu	Tindereti Dispensary
116	Kieni East	Naromoru Health Centre
117	Kieni West	Bellevue Health Centre
118	Kieni West	Endarasha Rural Health Centre
119	Kieni West	Lamuria Dispensary (Nyeri North)
120	Nyeri South	Gichiche Health Centre
121	Nyeri South	Island Farms Dispensary
122	Nyeri South	Kahaaro Dispensary
123	Nyeri South	Karaba Health Centre (Nyeri South)
124	Nyeri South	Mukurweini Sub-District Hospital
125	Nyeri South	Kamoko Health Centre
126	Nyeri South	Kinunga Health Centre
127	Nyeri South	Wamagana Health Centre
128	Tait Voi	<i>To be determined</i>
129	Taita	<i>To be determined</i>
130	Voi	<i>To be determined</i>
131	Kwanza	Endebess District Hospital
132	Kwanza	Kwanza Health Centre
133	Transzoia West	Kitale District Hospital
134	Eldoret East	Ainabkoi Health Centre
135	Eldoret East	Chepkanga Health Centre
136	Eldoret East	Mediheal Hospital
137	Eldoret East	RCEA Plateau Mission Hospital
138	Eldoret East	Uasin Gishu District Hospital

The 138 sampled facilities are listed above. In addition, there are 3 national referral hospitals and 9 Provincial General Hospitals, to make a total sample of 150 facilities.

National referral hospitals according to the most current MFL listing are:

1. Kenyatta National Hospital
2. Moi Teaching Referral Hospital
3. National Spinal Injury Hospital

Provincial general hospitals according to the most current MFL listing are:

1. Coast Province General Hospital
2. Kakamega Provincial General Hospital
3. Machakos Level 5 Hospital
4. Nakuru Provincial General Hospital
5. Nyanza Provincial General Hospital
6. Nyeri Provincial General Hospital
7. Garissa Provincial General Hospital
8. Embu Provincial General Hospital
9. Thika Level 5 Hospital

