



Ministry of Health and Sanitation
in collaboration with
Ministry of Information and Communication
The Republic of Sierra Leone

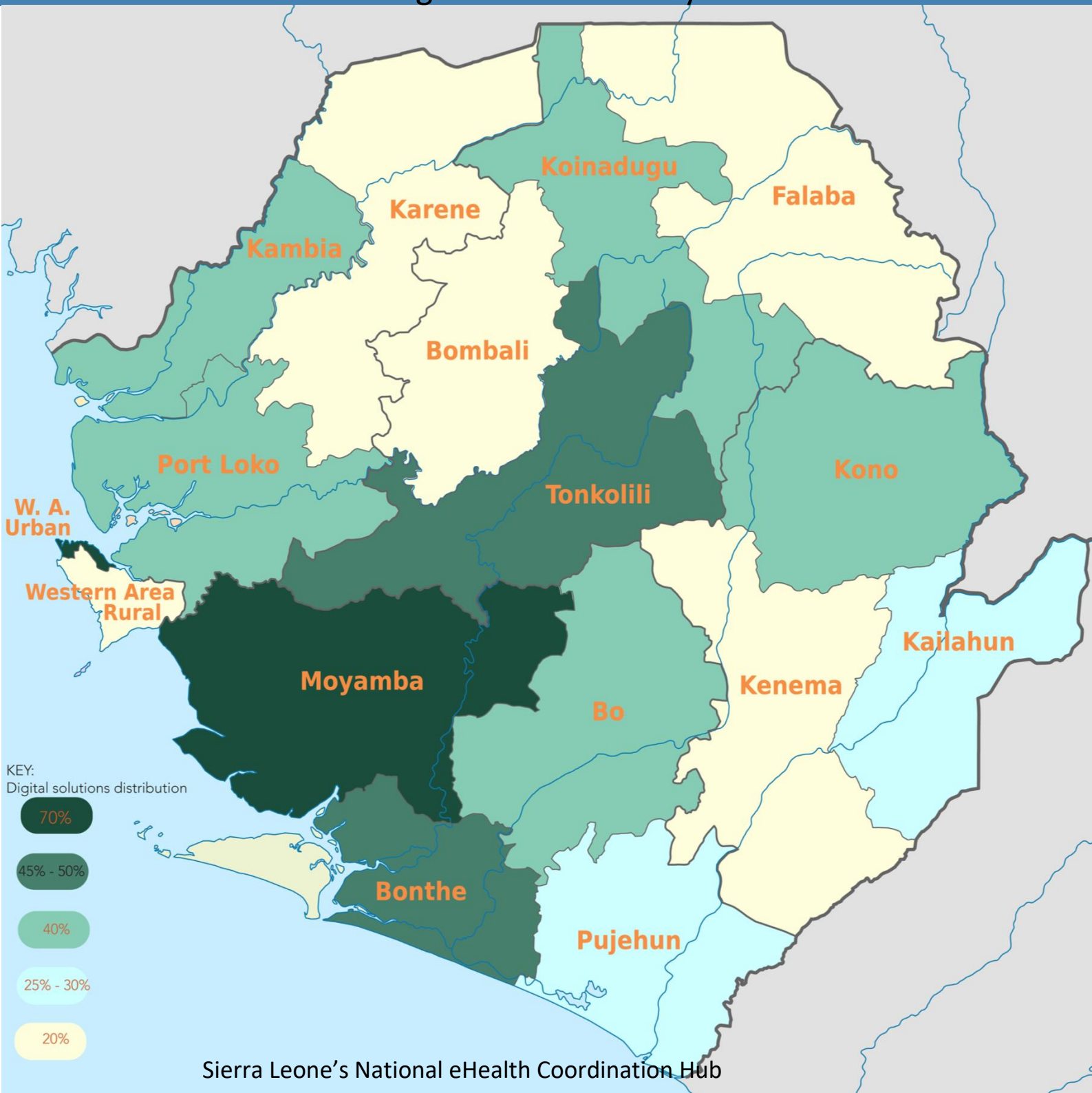
Digital Health in Sierra Leone: Field mapping



December 2019



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Acknowledgements

This document reports the results of a mapping of the state of digital health solutions and the enabling environment in Sierra Leone. It describes the critical next steps to improve the country's health indicators through the strategic use of technology. We have demonstrated our willingness and capacity to provide the necessary leadership and support to our partners, who are assisting us in our drive to achieve health for all Sierra Leoneans facilitated by the use of digital technologies.

We are grateful to the United Nations Children's Fund (UNICEF) and the United States Agency for International Development (USAID) for funding this mapping exercise. We thank our partners, government agencies, district medical officers (DMOs), the health superintendents at the district hospitals surveyed, and the officers in charge at the different primary healthcare units (PHUs) for making time available to provide the information that enriched this report. We also appreciate the data collectors and the consultant for analysing the data and compiling this document.

This report provides a snapshot of the current state of digital health solutions and the enabling environment, including the gaps and key recommendations. We have no doubt that this will improve coordination and collaboration as we work toward the common goal of achieving the national vision for health, as outlined in the National Digital Health Strategy 2018 – 2023 and the National Health Sector Strategic Plan 2017 – 2021.

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Acronyms

CHC	community health centre
CHP	community health post
DHIS	District Health Information Software
DHMT	district health management team
DMO	district medical officer
DPPI	Directorate of Policy, Planning and Information
GDHI	Global Digital Health Index
HIS	health information system
ICT	information and communication technology
ISP	internet service provider
IT	information technology
LAN	local area network
MCHP	Maternal and Child Health Post
MIC	Ministry of Information and Communication
MoHS	Ministry of Health and Sanitation
NGO	non-governmental organization
PHU	primary healthcare unit
SOP	standard of practice
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Executive summary

Introduction

Sierra Leone collaboratively drafted its first National Digital Health Strategy 2018 – 2023 under the leadership of the National eHealth Coordination Hub, which is hosted at the Directorate of Policy, Planning and Information (DPPI) of the Ministry of Health and Sanitation (MoHS). This mapping was commissioned as the first step to implementing the digital health strategy. The report presents the current state of digital health solutions implementation and enabling environment in Sierra Leone.

Methodology

A mixed methods survey was conducted for the field mapping, using three tools administered at health facilities, district health offices, and implementing partners offices. The health facilities surveyed included district hospitals and primary healthcare units (PHUs) in all 13 districts. All 13 district health offices were surveyed. Implementers of digital health solutions were identified by either the district health office or the National eHealth Coordination Hub and were interviewed. The data collection questionnaires were coded in a mobile application.

The digital health ecosystem (findings)

The results of this exercise are organized according to the components of the digital health enabling environment: governance and implementation compliance; infrastructure; services and applications (digital health solutions); standards and interoperability readiness; digital health workforce; and funding. A section on data management is included because of its importance in the delivery of healthcare services. This report can be read in the order presented; it is likewise intended to serve as a reference guide on the current state of the digital health enabling environment in Sierra Leone.

Sixty-two per cent of the districts surveyed had nominated a digital health focal person. Over 80 per cent of the district health management team (DHMT) offices were involved in planning,

deployment and implementation monitoring of digital health solutions. All 13 districts had an active digital health presence. Only one solution to the knowledge of district and facility representatives had scaled nationally. More than one-half of the PHUs used solar panels as their main power source, and all hospitals had main and alternate backup power. Nine of the Maternal and Child Health Posts (MCHPs) surveyed used solar power as their main electricity source; however, the remaining six had no power source. Digital health solutions were accessed either by computer-with-internet or tablet/smartphone at the district hospitals. The PHUs accessed digital health solutions primarily via tablets. The health facility survey revealed that Freetown-Western-Urban and Moyamba were the two districts with the greatest density of digital health solutions implemented, in terms of the number of solutions at a health facility and their spread in the district. However, based on the number of solutions operating per district as reported by the DHMTs, Freetown-Western-Urban, Freetown-Western-Rural, Moyamba, Pujehun, Kailahun, Kenema and Karene all reported having four or more digital health solutions. Sierra Leone has an active digital health landscape, with 15 implementing partners operating in the country. Most of the digital health services and applications identified were for data services and were either for providers or health system managers. All districts shared health information with different stakeholders. All but one district had a fulltime health information system (HIS) officer. Over 80 per cent of all health facilities surveyed reported having no personnel trained in computer skills. Although 50 per cent of the digital health budgets at the district level had been released, the total budget for digital health in the eight districts that provided information accounted for less than one per cent of the 2019 budget documented in the National Digital Health Strategy 2018 – 2023.

Recommendations

According to respondents at the health facilities, the biggest threats to digitization are inadequate power supply followed by the theft of electronic equipment meant for healthcare delivery. Other gaps

across the digital health enabling environment components include inadequate digital health training, poor electric power infrastructure, network issues and poor digital health budget and funding release. This report's recommendations to address the gaps include strategic implementation of the workforce plan in the national digital health strategy; targeted improvement in electricity infrastructure at health facilities; deployment of energy efficient digital health solutions; coupling research with future digital health pilots to generate evidence of solution's fit for purpose and effectiveness. Also, the report proposes increased funding and better funding coordination for scalable digital health implementation in Sierra Leone.

Introduction

Background

The Government of Sierra Leone inaugurated the National eHealth Coordination Hub in 2017. Its mandate is to coordinate and regulate digital health in the country. The Hub is a collaboration between the Ministry of Health and Sanitation (MoHS) and the Ministry of Information and Communication (MIC). In 2018, the Hub led the collaborative drafting of the first National Digital Health Strategy, which aims to facilitate coordination and improve collaboration among digital health stakeholders in Sierra Leone. The National eHealth Coordination Hub commissioned an exercise to ascertain the state of digital health services and applications being implemented by stakeholders in the country using the Digital Health Atlas, which is a World Health Organization (WHO) global technology registry platform that aims to improve coordination, and facilitate institutionalization and scale.¹ Only a few stakeholders self-reported, making the use of Digital Health Atlas' content impractical and incomplete. Using the set of questions given on the Global Digital Health Index (GDHI) website for the GDHI indicators, the Hub determined the high-level state of digital health in Sierra Leone for each of the seven enabling environment components (leadership and governance; strategy and investment; legislation, policy and compliance; workforce; standards and interoperability; infrastructure; and services and applications).² The results indicated that Sierra Leone had progressed in leadership and governance, but lagged behind on other enabling environment components (i.e., strategy and investment; workforce; infrastructure; standards and interoperability; and legislation, policy and compliance). To validate these high-level findings, a field mapping exercise was commissioned, consistent with activity plans in the National Digital Health Strategy 2018 – 2023.

This field mapping serves as the first inventory of the implementation of digital health solutions and the enabling environment in the

¹ <https://digitalhealthatlas.org/en>

² http://index.digitalhealthindex.org/country_profile/SLE

country. It complements the initial self-reported exercise and stakeholders' categorization of Sierra Leone's digital health enabling environment using the Digital Health Atlas and the GDHI, respectively, mentioned above.

Interest in the implementation of digital health solutions is growing in Sierra Leone. Digitized health systems have been shown to drive the optimum use of scarce health system resources. This report is designed to be read in the context of the National Digital Health Strategy.³ The strategy can be consulted for the definition of key terms.

Objectives

The goal of this mapping exercise was to assess the current state of digital health solutions and their associated enabling environment (electricity and network infrastructure, computing capabilities, governance, human resource for digital health, data management and information sharing) in Sierra Leone, including the role of implementing organizations. The information collected provides the essential baseline data for implementing the National Digital Health Strategy 2018 – 2023.

Methodology

Sierra Leone has 13 district health offices, 24 district hospitals and approximately 1000 primary healthcare units (PHUs). The PHUs are classified into community health centres (CHCs), community health posts (CHPs) and Maternal and Child Health Posts (MCHPs). The scope of this mapping exercise included interviews with representatives from all 13 district health management teams (DHMTs); all identified digital health implementing organizations (government, partners and private implementers); representatives from at least one hospital per district; and representatives from PHUs selected through a multi-stage sampling process. Each district representative was interviewed to obtain information on the state of the digital health infrastructure,

³ [Sierra Leone National Digital Health Strategy 2018 - 2023](#)

leadership and governance, workforce, funding, data use, and standards and interoperability in their district. Respondents also provided relevant information on digital health services and applications (or software solutions) deployed at health facilities and in communities in their district.

A sample of health facilities were visited and the state of digital health infrastructure (electricity, computing and connectivity) at each one was captured through interviews with facility representatives. Digital health services and applications used at each health facility were recorded, as reported by the health facility representatives. Details about each software solution were structured according to the recent WHO classification of digital health services and applications.⁴ Information about how each health facility visited collected, used and shared health data was documented. The state of health information and communication technology (ICT) and the availability of ICT support staff were likewise assessed.

The implementing organizations were identified by the Head of the DHMT, in collaboration with the National eHealth Coordination Hub. Implementing organizations were interviewed either at their head offices in Freetown or at their district headquarters in each district. Information gathered from these interviews was merged during the analysis stage. Public sector implementing organizations were identified from within government agencies and departments of the MoHS and MIC. Private and not-for-profit implementing partners were also interviewed. All implementing organizations provided information about the state of digital health infrastructure, services and applications used, funding, governance, data use and interoperability in the districts in which they operated.

⁴ World Health Organization, *Classification of digital health interventions v1.0: a shared language to describe the uses of digital technology for health*, World Health Organization, Geneva, 2018. <https://apps.who.int/iris/handle/10665/260480>.

Data collection tools

Three tools were used for data collection. They were adapted and updated from the Nigeria Health ICT Phase 2 Field Assessment⁵. The tools used are given in Table 1.

Table 1: Tools used for the digital health mapping exercise

Tool name	Target respondent	Alternate	Where applied
Assessment Survey for DHMT	DMO	Authorized representative	District level
Assessment Survey for Implementing Partners	Implementing partners or implementing ministries, departments and agencies leads	Authorized representative	National or district level
Health Facility Checklist	Hospital superintendent or PHU officer in charge	Representative	Health facility

The tools were coded into an android-based CommCare mobile application to facilitate data collection and to maintain the quality of data collected by reducing errors.

Health facility sampling strategy

The mapping exercise used a multistage sampling strategy that involved multiple stakeholder interviews and observations of the infrastructure at the sampled sites. Questions about digital health solutions deployed and the enabling environment components were prepared and posed to the different stakeholders. Health facilities were initially classified as either urban or rural for spread and inclusion, based on information from the Department of Policy, Planning and Information (DPPI) at the Ministry of Health and Sanitation (MoHS), working in conjunction with the respective DHMT heads. Health facilities were further classified according to the level of their digital health activity. For the purposes of this mapping exercise only, health facilities were classified as ones with low, medium or high digital health activity. Additional details are provided in Table 2.

Table 2: Health facility classification criteria, by level of digital health activity

Classification	Number of digital health solutions
Low digital health activity	None (0) digital health solutions

⁵ Nigeria Health ICT Phase 2 field assessment, <http://www.health.gov.ng/doc/FieldAssessment.pdf>

Medium digital health activity	1 or 2 digital health solutions
High digital health activity	3 or more digital health solutions

A minimum of five health facilities per district were identified for mapping visits by the study's data collectors. A minimum of two health facilities each were selected from urban and rural locations in each district, as pre-categorized. Each district prioritized at least one facility with high digital health activity (as described in Table 2), followed by at least one health facility with medium activity, followed by one with no activity. Because each district had a minimum of one district hospital, one district hospital was selected in each district. Additional health facilities were selected by repeating this selection technique until the desired number was achieved in each district. Where categories did not exist (like where there is no high activity digital health facility), the required numbers were filled with available other categories. Seventy-two health facilities were visited for this mapping exercise, 17 urban and 55 rural, as shown in Figure 1. This sample gave a 95 per cent confidence level and a confidence interval of 11. This means that the findings in this report were statistically generalizable.

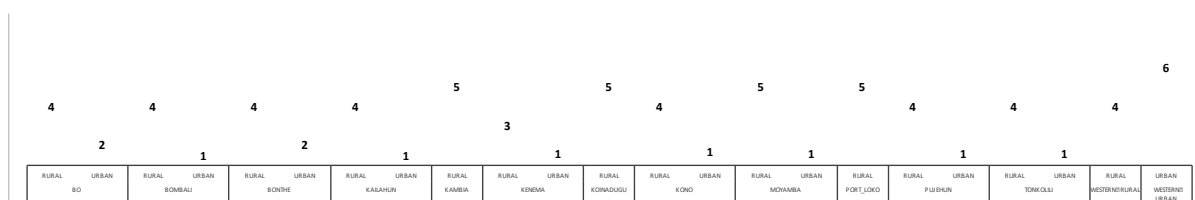


Figure 1: Distribution of health facilities surveyed, by location (health facility interview form)

The health facilities surveyed and their distribution, by ownership and type, are given in Figure 2. Ninety-six per cent (n=69) of the health facilities were public sector, which aligns with the National Digital Health Strategy and the current state of health facility distribution in the country.

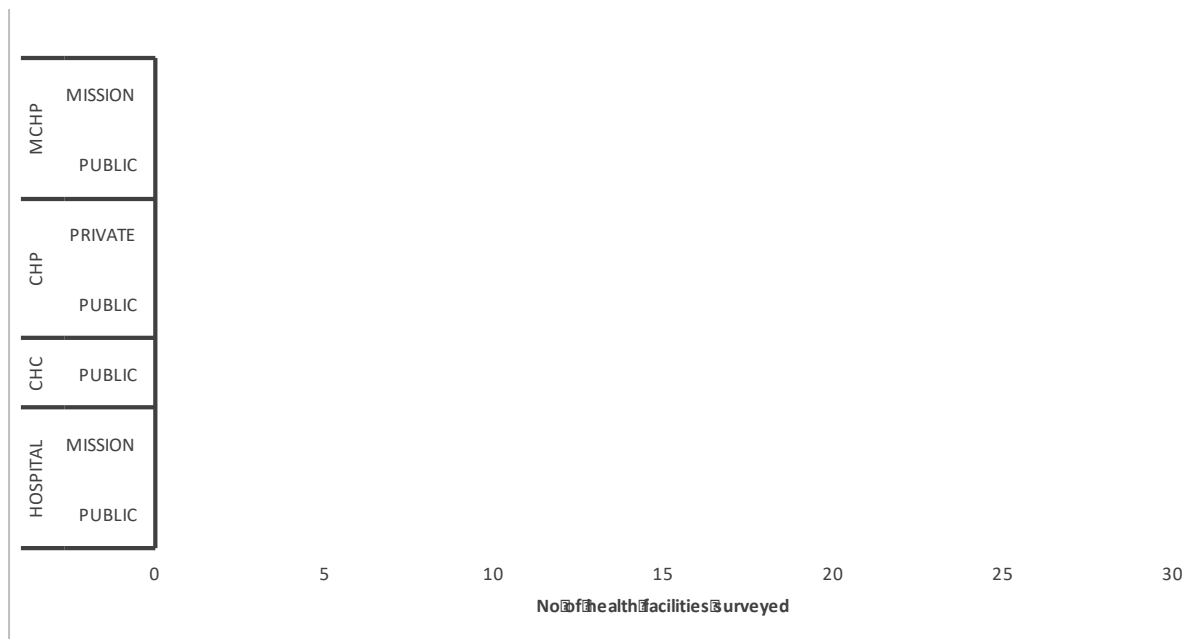


Figure 2: Health facilities surveyed, by ownership and type

Data collection procedures

The minimum requirements to participate as a data collector or as study personnel were a national diploma and appropriate experience with health or social science surveys. The data collectors were also selected based on their ability to use smart devices. The coded questionnaires were pre-tested during a series of meetings and brainstorming sessions for appropriateness and coherence. Study personnel participated in a one-day training and received hands-on experience with the coded questionnaires using mobile devices. Ambiguities were addressed during the training session. Ten study personnel were trained. They all participated in the data collection process. Where possible, the infrastructure reported was observed by study personnel.

Study personnel interviewed targeted respondents starting at the national level, and then moved to the district and health facility levels. Data collection and interviews were done using the CommCare mobile application, which facilitated automatic data transmission to the cloud for easy access.

Data analysis

The collected data were exported in comma separated values from the CommCare web portal and were analysed using 'pandas' and 'matplotlib' libraries in python programming language. Interpretations were then drawn between the survey objectives and the collected data to feed into this report.

Findings: Sierra Leone digital health ecosystem

The findings from this field mapping provide a snapshot of the current state of digital health solutions and the enabling environment for digital health in Sierra Leone. Results from the health facility visits were triangulated with responses from the districts and implementing partners. This report prioritizes findings from the visits to the health facilities and highlights conflicts where they occurred.

The results are grouped and presented by the digital health enabling environment components, like those used in the National Digital Health Strategy, the WHO and International Telecommunication Union National eHealth Strategy Toolkit⁶ and other digital health resources:

1. Governance and implementation compliance
2. Infrastructure
3. Services and application (solutions)
4. Standards and interoperability readiness
5. Digital health workforce
6. Digital health funding
7. Data management and use

Governance and implementation compliance

This section presents findings from the survey of DHMT representatives and implementing partners.

DHMT survey responses

This subsection presents data on the status of formal or informal digital health governance by assessing the availability of a dedicated digital health focal point in the DHMT and other government agencies. Implementation compliance was evaluated by the level of involvement of the DHMTs in the planning, deployment and monitoring of digital health solutions. Information on the status of National eHealth Coordination Hub engagement with the DHMTs was

⁶ https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-E_HEALTH.05-2012-PDF-E.pdf.

also collected. Aggregate data based on the DHMT responses are given in the charts in Figure 3.

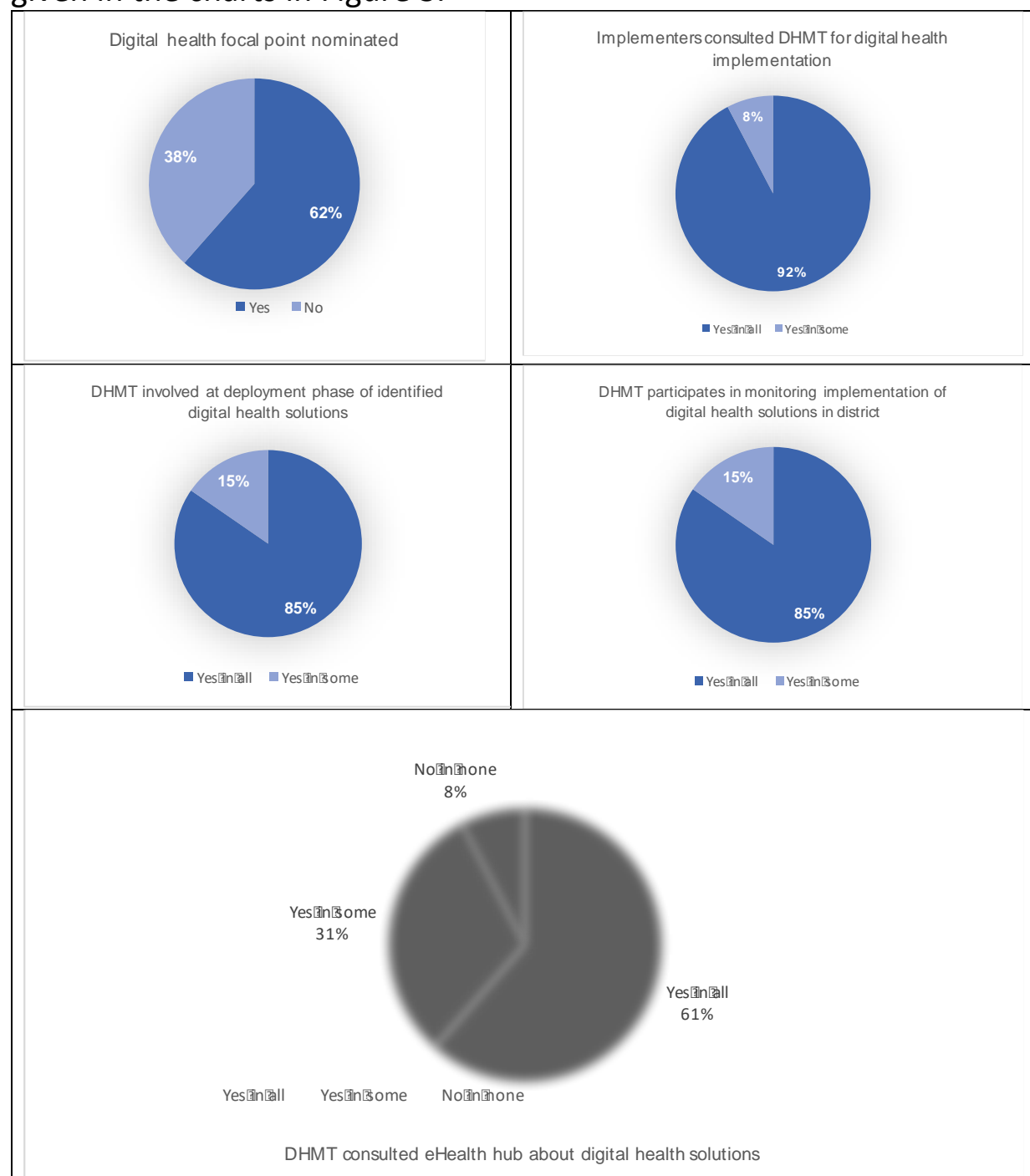


Figure 3: Governance and awareness of services and applications (DHMT survey)

Implementing partners

All implementing partners surveyed reported engaging with the relevant government programme at the central office in Freetown before deploying digital health solutions in each district. Others engaged at the district level, whereas a few also engaged at the facility

level. Fifteen implementing organizations reported deploying digital health solutions in the country. All were aware of the National eHealth Coordination Hub and had attended at least one meeting of the Hub.

Infrastructure

Information about the state of digital health infrastructure (i.e., computing hardware [phones, tablets, and computers]; electricity [solar, generator and utility], and connectivity [local network, 3G and other internet service provider]) was assessed based on interviews and site observations at district health offices and at the health facilities visited. Information about infrastructure providers was also collected.

Infrastructure at DHMT offices

The charts in Figure 4 present data on the availability of infrastructure at each DHMT office. All districts surveyed had at least one working computer and a mobile device. Twelve of the 13 districts had power supply equipment — either a generator, national utility or other power source. The central government provided at least one of the digital health infrastructure components in all 13 districts. Non-governmental organizations (NGOs) or private partners provided infrastructure in 10 of the 13 districts surveyed.

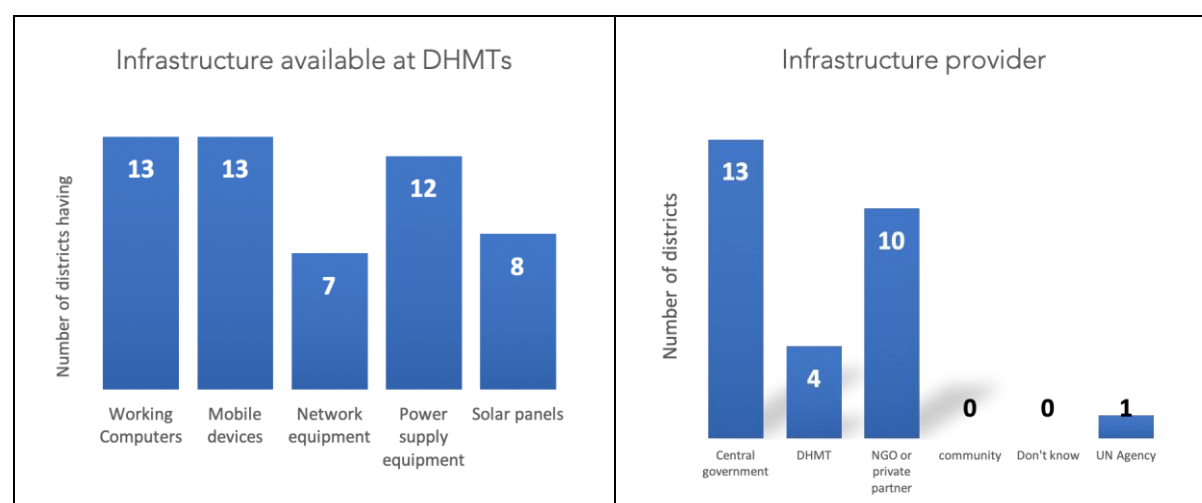
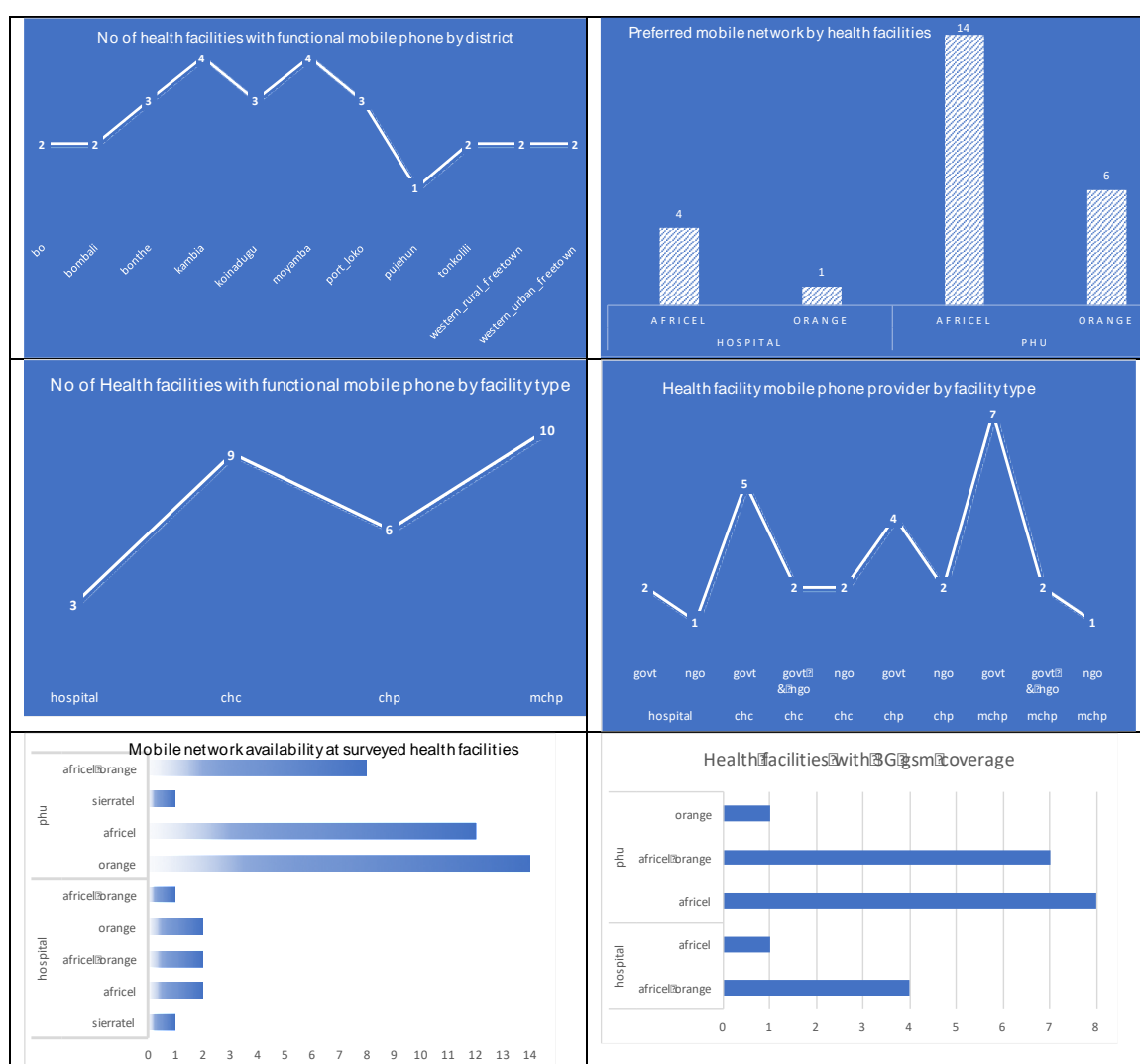


Figure 4: Infrastructure at DHMT offices (DHMT survey)

Infrastructure at health facilities

Information on the status of digital health and related infrastructure at the health facilities surveyed was captured through interviews and observations at the facilities and interviews at the DHMT offices. Only four hospitals had a local area network (LAN) for networked computer communication. As expected, no PHU had a LAN. As shown in Figure 5, the availability of infrastructure and its distribution varied across the health facilities. Internet availability was evenly divided between the two major service providers. Only about 40 per cent of health facilities surveyed had a working computer.



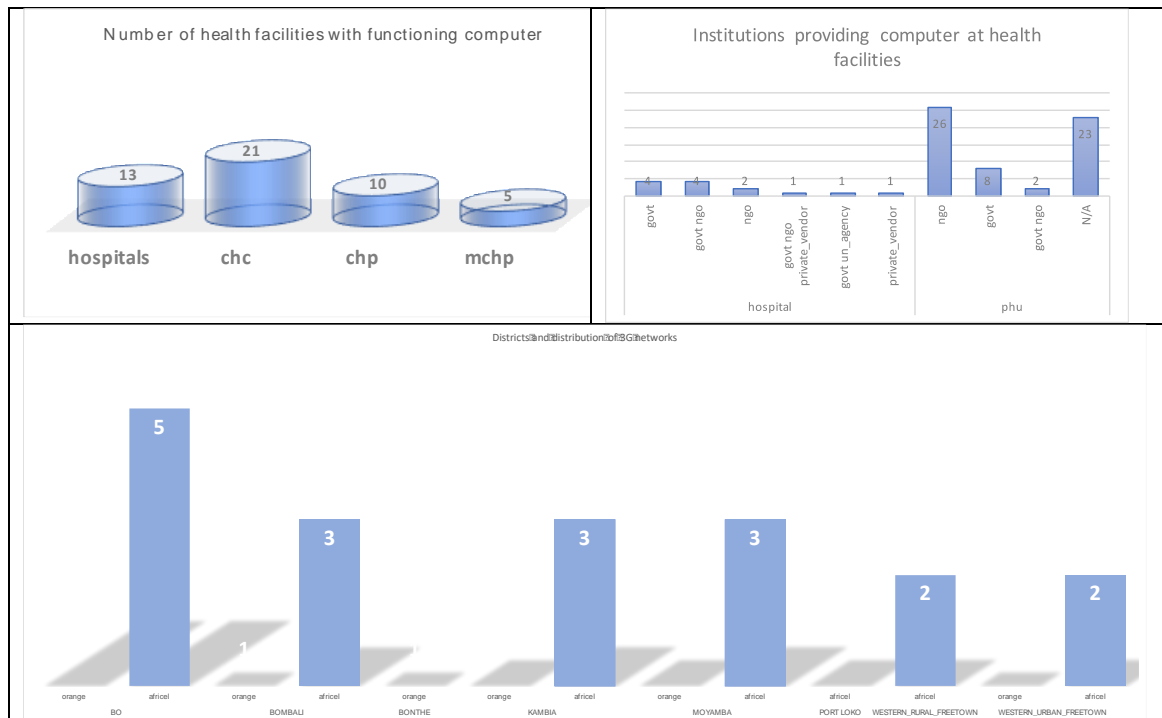


Figure 5: Infrastructure - general at health facilities (health facility survey)

Respondents at 19 of the 72 health facilities surveyed reported having unofficial, private internet access at work, including at six of the 13 district hospitals surveyed (see Figure 6).

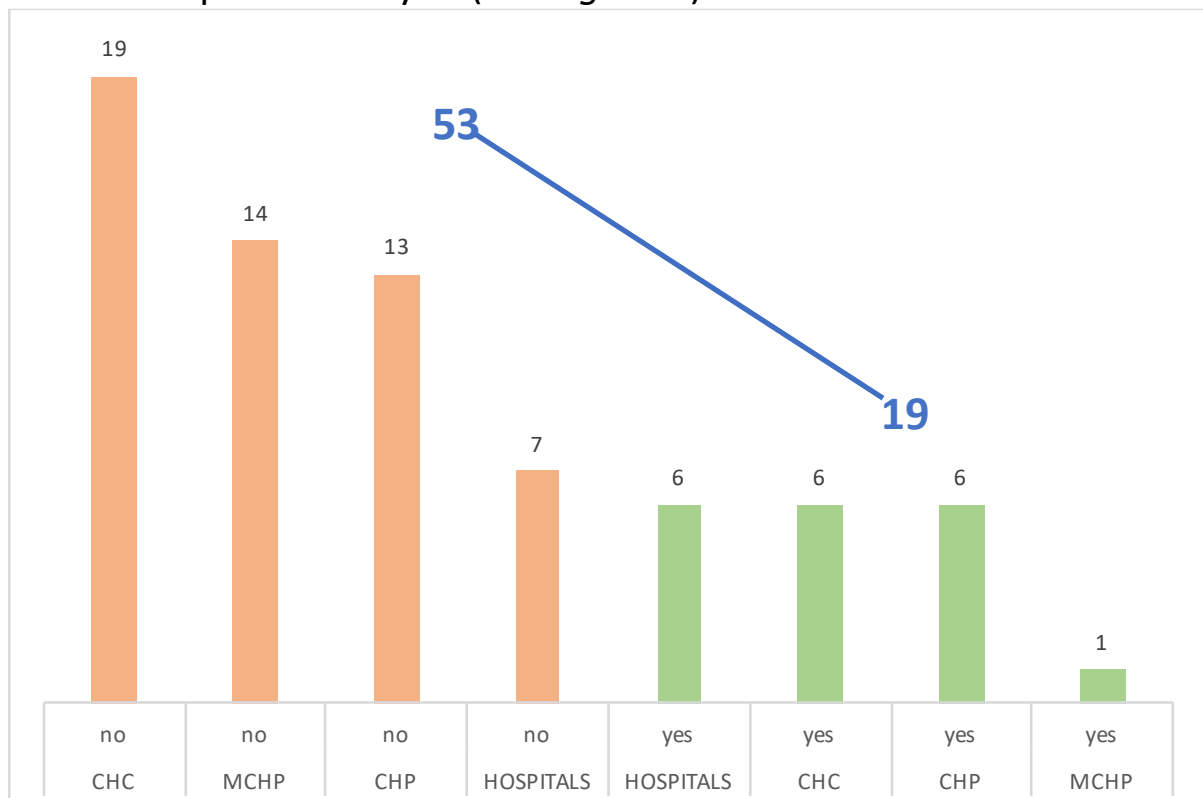


Figure 6: Infrastructure - private internet at health facilities (health facility survey)

Approximately 90 per cent of the PHCs surveyed did not have official internet. One-half of the hospitals likewise did not have official internet. A negligible number of health facilities had non-functional official internet (*see Figure 7*). Among facilities having official internet, the source was evenly distributed among the three major internet service providers (ISPs) in the country (*see figure 5*).

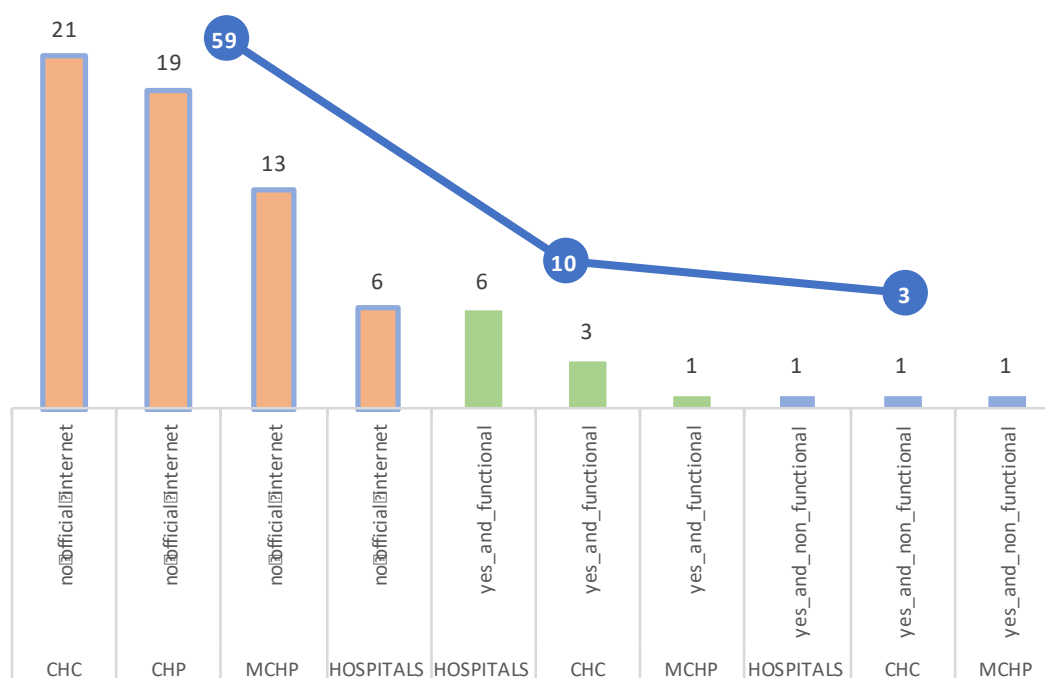


Figure 7: Infrastructure - official internet at health facilities (health facility survey)

All hospitals surveyed had an electric power source. The majority of CHCs and CHPs had a source of electricity, as shown in Figure 8. However, more than one-third of the MCHPs did not have any source of electric power (*see Figure 8*).

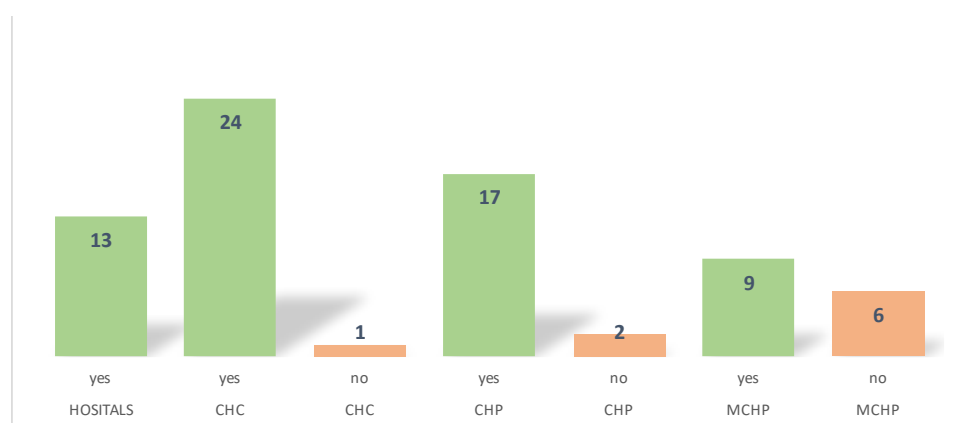


Figure 8: Infrastructure – electric power source (health facility survey)

The facilities were further reviewed for their primary source of electric power. The results are presented in Figure 9. A key trend was that the majority of PHUs used solar panels as their primary source of electricity. All nine MCHPs that reported having electric power were using solar panels.

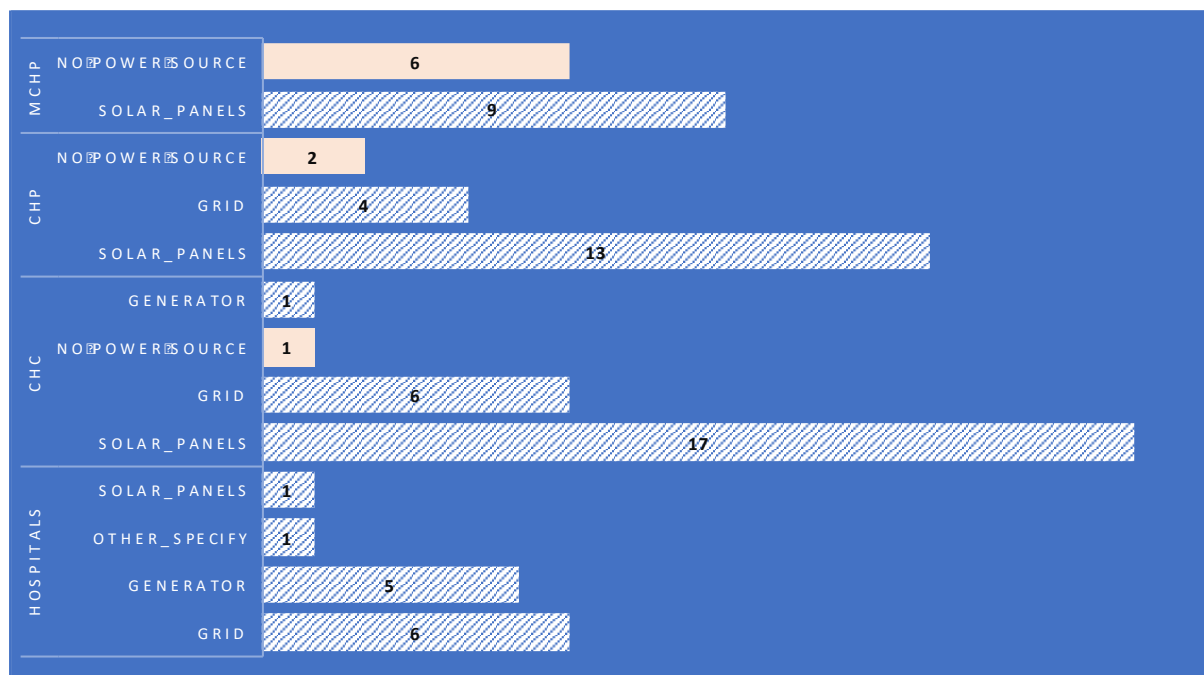


Figure 9: Infrastructure – primary electric power source (health facility survey)

Respondents were asked about the main use of the primary electricity supply at their health facilities. PHU respondents reported for ‘stand-alone purpose,’ whereas hospital respondents said that it was used for all health facility needs. The PHU response correlates with the health facilities having solar panels as their primary electricity source (see Figure 10).

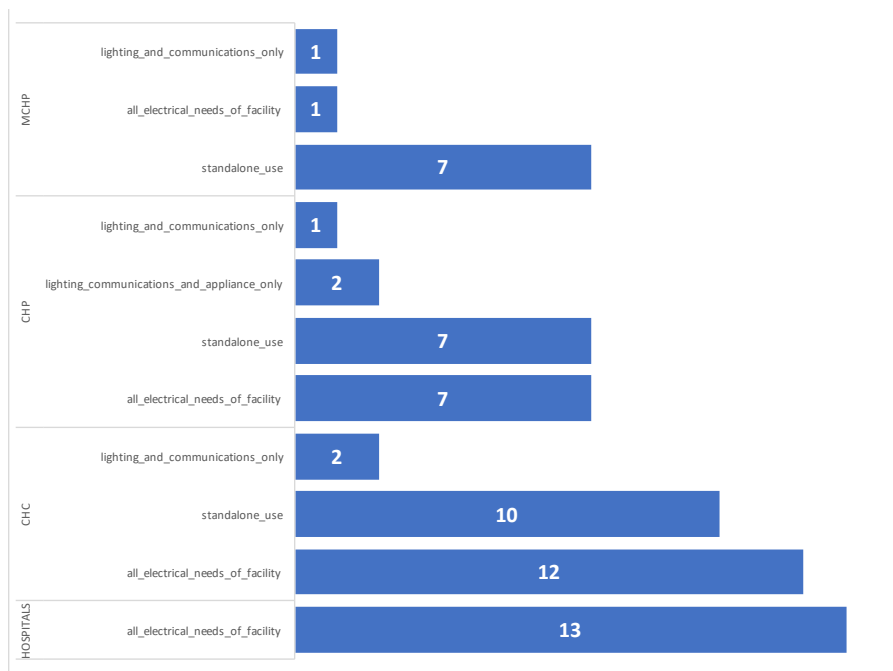


Figure 10: Infrastructure – use of primary electric power (health facility survey)

Approximately one-half of the PHUs surveyed did not have an alternative electricity supply source. All hospitals had one or more alternative electricity supply sources, as shown in Figure 11.

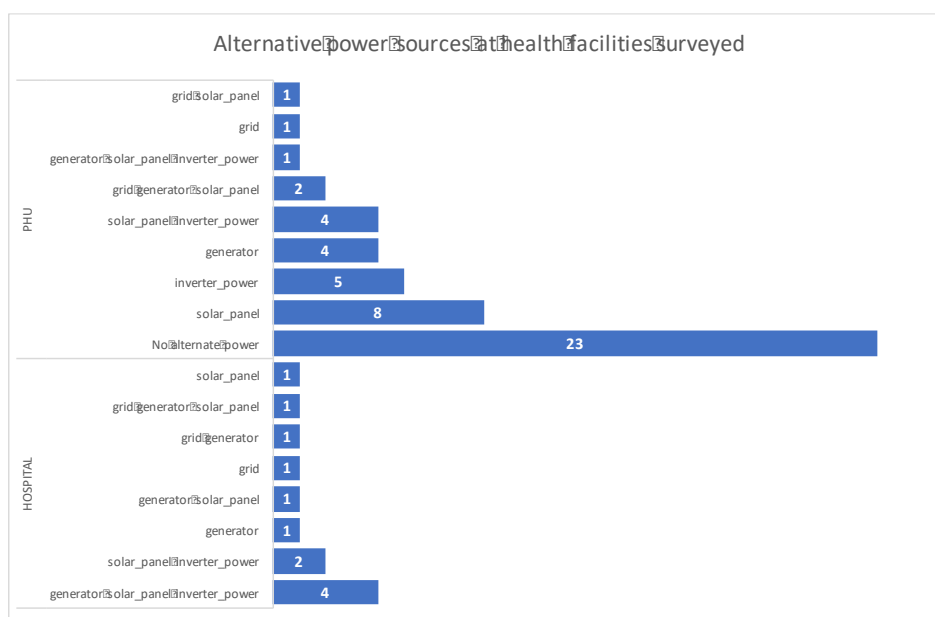


Figure 11: Infrastructure – alternative electric power sources (health facility survey)

Respondents were asked for how long electricity was available at their health facilities, using their recall about availability in the seven days before the survey. Approximately two-thirds of the hospitals surveyed indicated that they had uninterrupted power supply in the previous

seven days. Moreover, none of the hospitals surveyed reported consistently unavailable electricity. The results for the PHUs were mixed, with the MCHPs having the worst findings (see *Figure 12*).

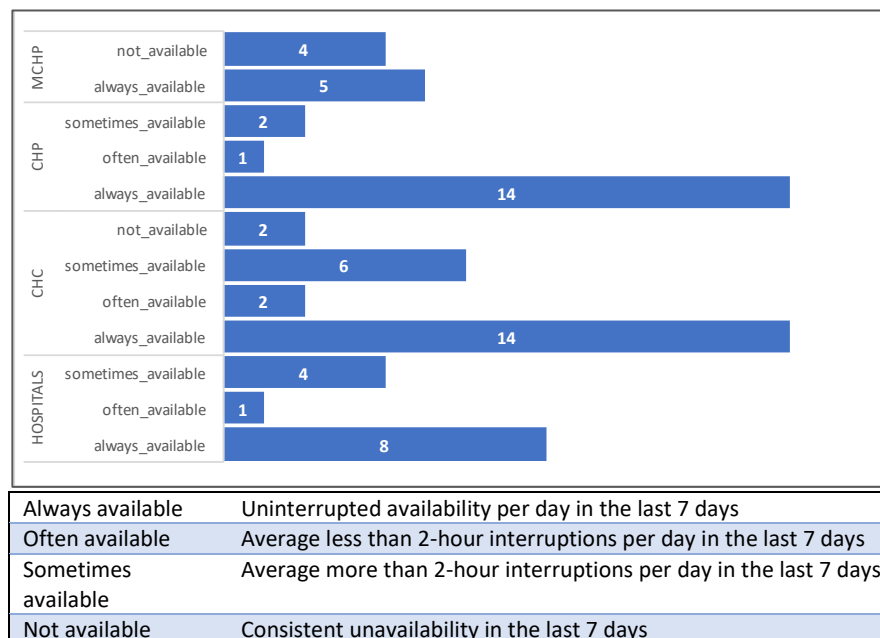


Figure 12: Infrastructure – electric power availability (health facility survey)

Figure 13 shows the status and distribution of health facilities that had generators. Eleven of the 13 hospitals had a generator and most of the generators at these hospitals were functional. One hospital had a non-functional generator and one had no generator. At the time of survey visit, only eight of the 11 hospitals with a functional generator had fuel in the event of a power outage. Similarly, only one of the six PHUs with functional generators had fuel at the time of survey.

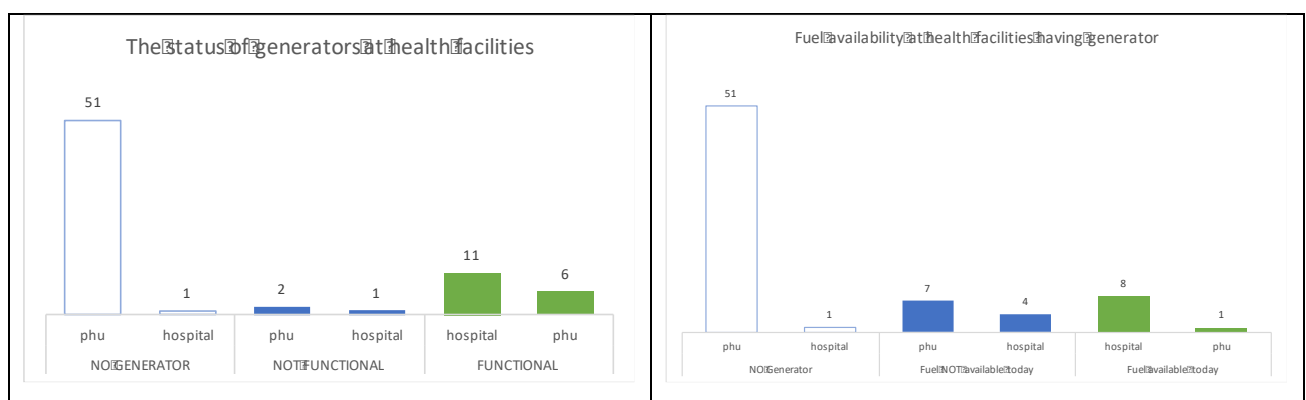


Figure 13: Infrastructure – status of generator and fuel (health facility survey)

The survey found that a majority of the PHUs and hospitals with solar or inverter installation were fully functional (see Figure 14).

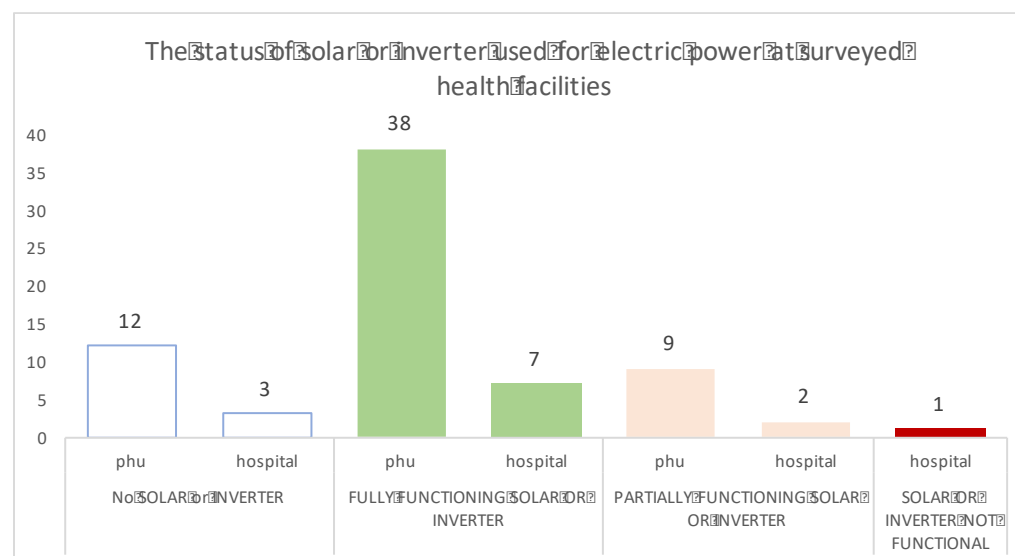


Figure 14: Infrastructure – status of solar and inverter (health facility survey)

Figure 15 shows the health facilities with computers and the number of working computers at each health facility.

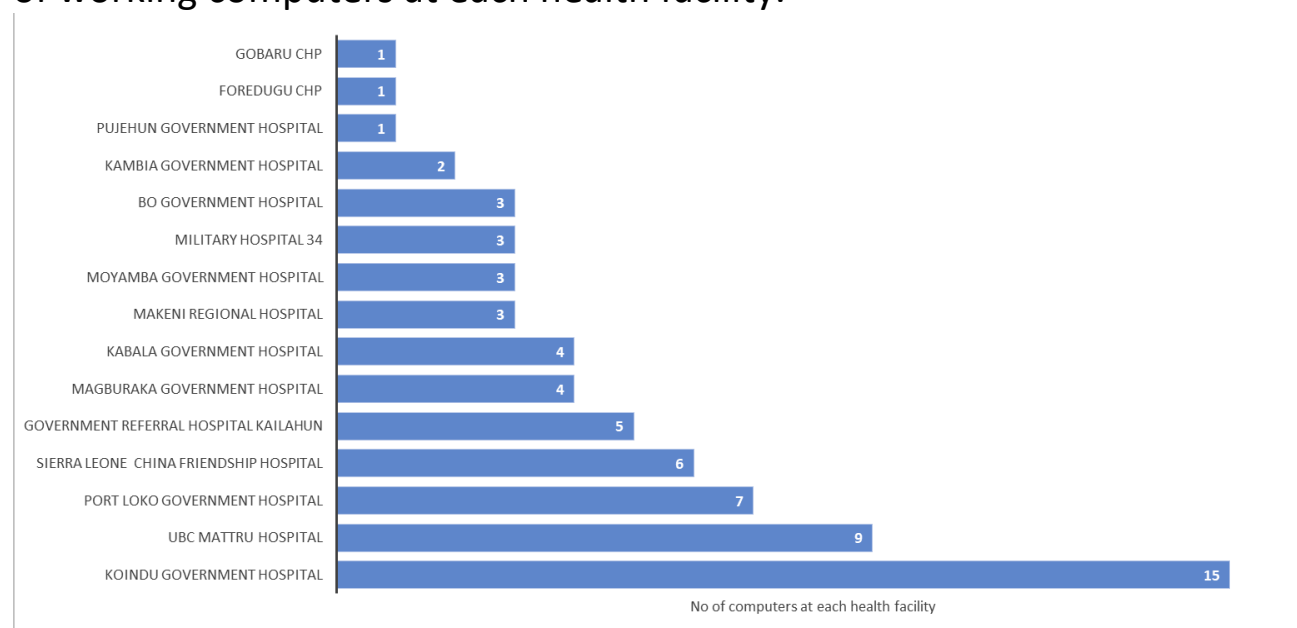


Figure 15: Infrastructure – number of working computers (health facility survey)

Thirty-seven of the health facilities with tablet-based digital health solutions had just one tablet (see Figure 16). Eight PHUs had one smartphone. Conversely, one hospital had eight smartphones. One PHU had two feature phones, and one hospital had one feature phone. Six PHUs had one basic phone that could only be used for calls

and SMS. Three hospitals had internet modems. One hospital had one modem, one hospital had two modems, and one hospital had three modems (chart not shown).



Figure 16: Infrastructure – number of tablets (health facility survey)

To complement the responses from the health facilities, the status of computing infrastructure at the health facilities was captured at the DHMT offices. The respondents' estimates, based on their best knowledge, are given in Figure 17.

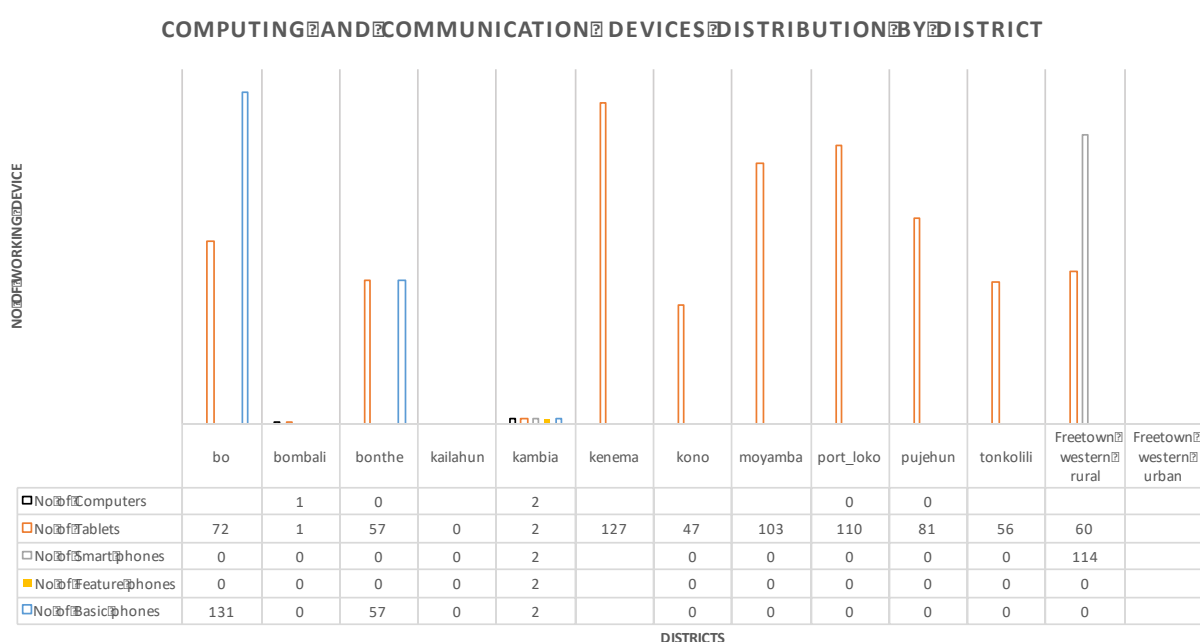


Figure 17: Infrastructure – computing and communication devices (DHMT survey)

Digital health solutions (services and applications)

Solutions (district responses)

The map in Figure 18 shows the number and distribution of digital health solutions deployed by districts based on responses from district

representatives. Kailahun, Kenema, Karane, Pujehun, Moyamba, Freetown-Western-Rural and Freetown-Western-Urban reported having four or more services and applications. Bo and Kono districts had three and the remaining districts had two or fewer. Among the digital health solutions, every district had the national District Health Information Software (DHIS).

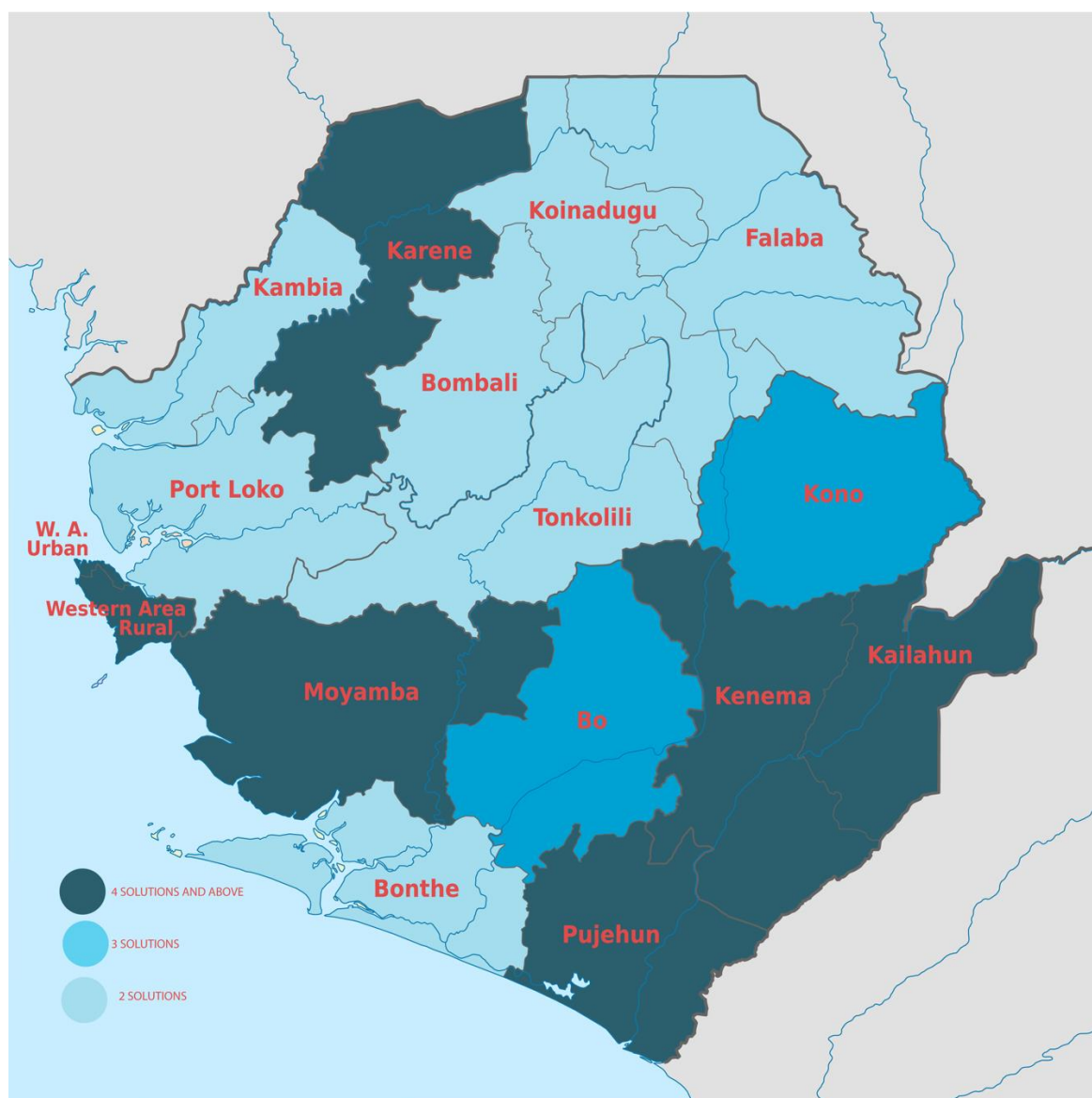


Figure 18: Number of operational services and applications per district (DHMT survey)

Solutions (health facility responses)

When the data collected from health facilities were weighted on a scale of 20, Freetown-Western-Urban and Moyamba were the two districts that had 70 per cent of digital health solutions.⁷ The districts

⁷ See map on cover page.

with the least distribution of solutions, according to this weighting, were Karene, Falaba, Bombali, Freetown-Western-Rural, and Kenema.

Only five health facilities among the 72 surveyed had three or more digital health services and applications (see *Figure 19*).

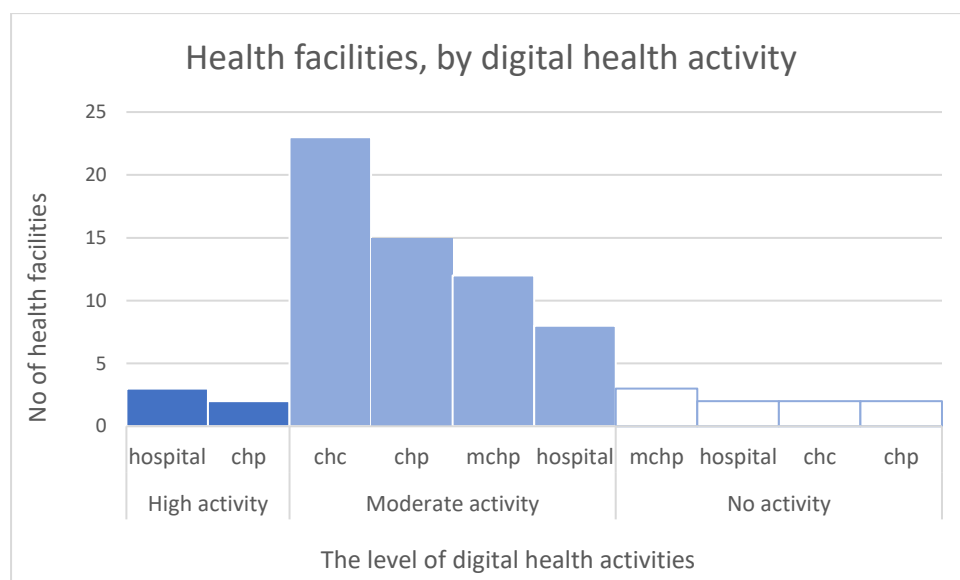


Figure 19: Health facilities, by type and level of digital health activity (DHMT survey)

Similarly, the health facility survey showed that only three health facilities had four or more digital health services and applications in use, four facilities had three solutions in use, and the majority had two services and applications in use or only the DHIS2. Figure 20 gives a breakdown of this distribution, by hospitals and the different PHUs.

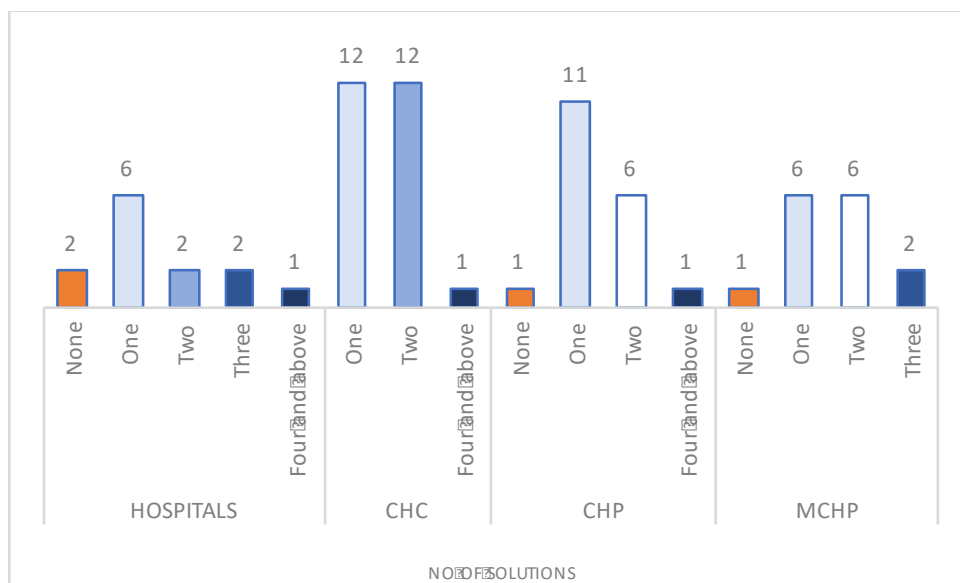


Figure 20: Health facilities, by number of digital health activities (health facility survey)

Almost all facilities reported that the services and applications were functional, except a negligible few, which were reported to not be working at the time of data collector's visit. The majority of the services and applications deployed were either for data services or for healthcare providers. A few digital health solutions for clients and for health system managers/administration existed at the health facilities surveyed. Table 3 presents information on the distribution of the services and applications and their types, categorized using the WHO classification of services and applications, like those used in the National Digital Health Strategy for Sierra Leone.⁸ Though out this report, 'services and applications' is used interchangeably with digital health 'solutions'. In table 3, SA_1 – SA_5 are pseudonyms for services and applications 1 – service and application 5. Respondents were asked to choose whether the digital health solutions at their health facility were for clients, healthcare providers, health system managers or for data services. Multiple answers were allowed for this question. The numbers signify how many health facilities indicated the characteristics of the services and applications. Tables A, B and C in the Appendix provide further details on the classifications for each digital health solution reported.

⁸ <https://apps.who.int/iris/handle/10665/260480>

Table 3: Purpose of the services and applications (health facility survey)

Health facility type	Purpose of the services and applications	Number of health facilities				
		SA_1	SA_2	SA_3	SA_4	SA_5
Hospitals	data_services	5	0	0	1	1
	healthcare_provider data_services	4	3	0	0	0
	client data_services	1	1	0	0	0
	client healthcare_provider health_systems_administrator data_services	1	0	0	0	0
	health_systems_administrator	1	0	0	0	0
	healthcare_provider health_systems_administrator data_services	1	1	0	0	0
	health_systems_administrator data_services	0	0	2	0	0
	client	0	0	1	0	0
CHCs	healthcare_provider data_services	8	1	0	0	0
	healthcare_provider health_systems_administrator data_services	8	4	0	0	0
	data_services	4	5	0	0	0
	client data_services	2	0	0	0	0
	client healthcare_provider health_systems_administrator data_services	1	2	1	0	0
	health_systems_administrator data_services	1	1	0	0	0
	healthcare_provider	1	0	0	0	0
	client healthcare_provider	0	0	0	1	0
CHPs	healthcare_provider data_services	10	2	0	1	0
	data_services	2	0	0	0	0
	client	1	1	0	0	0
	client data_services	1	1	0	0	0
	client healthcare_provider data_services	1	1	0	0	0
	client healthcare_provider health_systems_administrator data_services	1	0	1	0	0
	client health_systems_administrator	1	0	0	0	0
	health_systems_administrator	1	0	0	0	0
	health_systems_administrator data_services	1	1	0	0	0
	healthcare_provider	1	0	0	0	0
MCHPs	data_services	4	2	1	0	0

Health facility type	Purpose of the services and applications	Number of health facilities				
		SA_1	SA_2	SA_3	SA_4	SA_5
	healthcare_provider data_services	4	0	0	0	0
	client data_services	2	1	0	0	0
	healthcare_provider health_systems_administrator data_services	2	2	0	0	0
	health_systems_administrator	1	1	1	0	0
	health_systems_administrator data_services	1	1	0	0	0
	healthcare_provider health_systems_administrator	1	0	0	0	0
	client healthcare_provider health_systems_administrator data_services	1	0	0	0	0

Respondents at the health facilities surveyed were asked about how the services and applications were accessed at their facilities. Table 4 summarizes the responses. The hospitals accessed their digital health solutions mainly using computers and through the internet or a smart device (smartphone or tablet). Similarly, the PHUs accessed their digital health solutions primarily using tablets (or smartphones) (see *Figure 21*), although the MCHPs used more basic phones than the other PHUs, on average, as shown in Table 4.

Table 4: Access techniques used for services and applications (health facility survey)

Health facility type	Access method	Number of health facilities				
		SA_1	SA_2	SA_3	SA_4	SA_5
Hospitals	computer_with_internet	5	1	1	0	0
	computer_with_internet smart_phone_or_tablet	3	1	1	0	0
	smart_phone_or_tablet	3	3	1	1	1
	none	2	0	0	0	0
CHCs	smart_phone_or_tablet	14	4	1	1	0
	computer_with_internet smart_phone_or_tablet	8	7	0	0	0
	basic_phone	3	1	0	0	0
CHPs	smart_phone_or_tablet	13	4	0	0	0
	basic_phone	2	1	0	0	0
	computer_with_internet smart_phone_or_tablet	2	2	1	1	0
	standalone_computer smart_phone_or_tablet basic_phone	0	1	0	0	0

Health facility type	Access method	Number of health facilities				
		SA_1	SA_2	SA_3	SA_4	SA_5
MCHPs	computer_with_internet network_computer standalone_computer smart_phone_or_tablet	1	0	0	0	0
	none	1	0	0	0	0
	basic_phone	5	1	0	0	0
	smart_phone_or_tablet	5	2	1	0	0
	computer_with_internet smart_phone_or_tablet smart_phone_or_tablet basic_phone	4	4	1	0	0
	smart_phone_or_tablet basic_phone	1	1	0	0	0

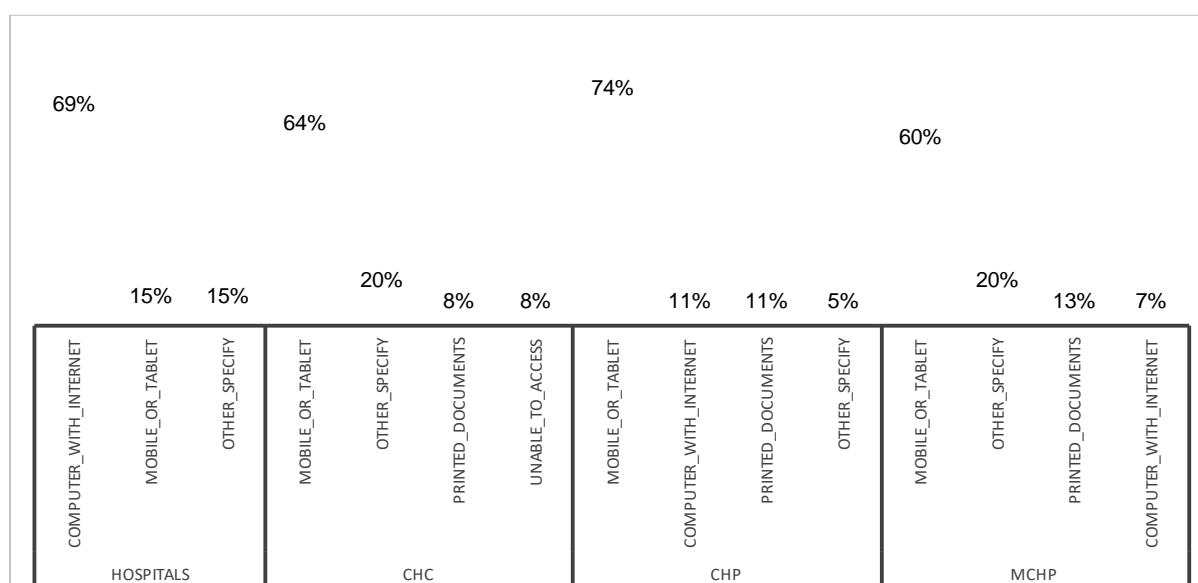


Figure 21: Access techniques used for digital health services and applications (health facility survey)

Solutions (implementing partners' responses)

Implementing partners used the solutions shown in the word-art in Figure 22.⁹ The majority of the tools used were for data collection, processing and reporting. The majority of the implementing partners supported the use of the DHIS, either through the national instance or a different instance. The digital health solutions used by implementing partners captured in this report are listed in Table E.

⁹ The size of the software solution names indicates how many times each one was repeated by respondents.



Figure 22: Names of digital health services and applications used by implementing partners (implementers' survey)

Standards and interoperability readiness

This subsection presents the results of the assessment of the state of readiness of each district or health facility surveyed with respect to standards and for the digital exchange of health information.

District perspective

Respondents at the health facilities were asked whether there was a written standard of practice (SOP) or guidelines for data sharing at the district level. As seen in Figure 23, although the majority of the districts had a SOP, only six had fully implemented the SOP.

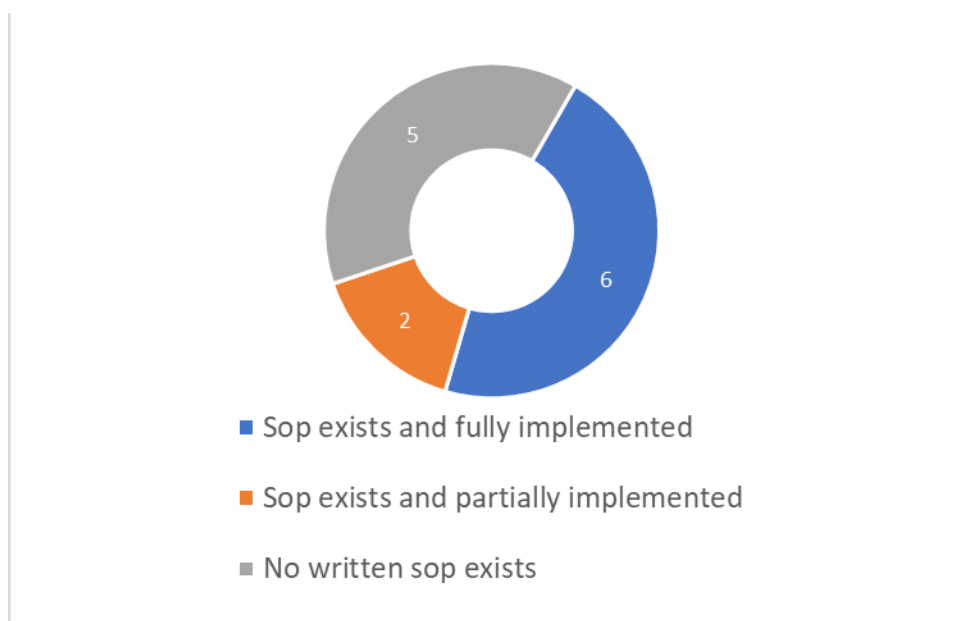


Figure 23: Existence and use of a data management SOP in districts surveyed (DHMT survey)

All but one district shared implementation and service delivery data with the central government, NGOs and health facilities (see *Figure 24*).

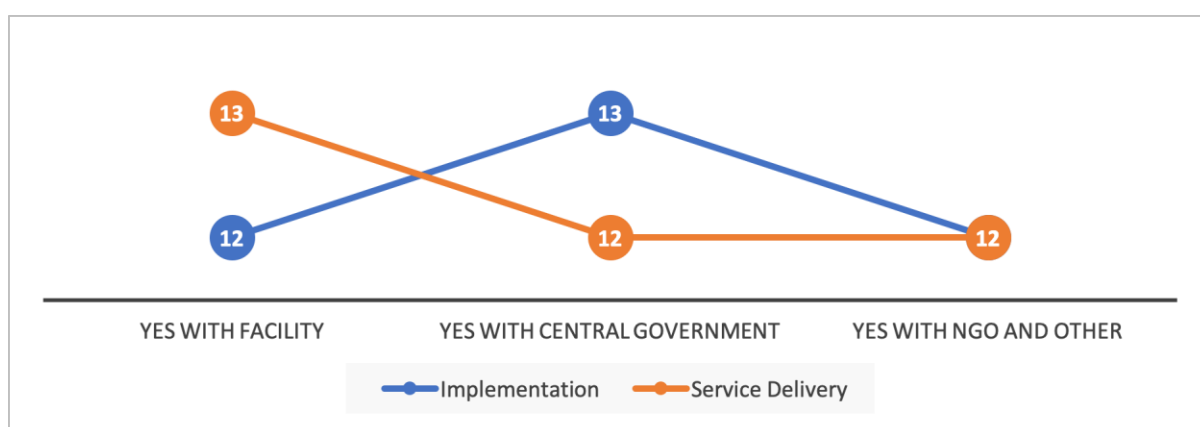


Figure 24: Data sharing by districts surveyed (DHMT survey)

The formats for data sharing used by the districts were: six of the 13 district offices still shared data by email; six also shared data in print format. Seven districts shared data only in the government-approved format, whereas six shared data using both government-approved and partner formats. Three districts reported sharing data by SMS.

Health facility perspective

The charts in Figure 25 present information on the recipients of data, based on reports by the hospitals and PHUs. Although the PHUs

shared data only with their DHMT and NGOs, the hospitals reported sharing in a much less coordinated way. The independence of hospitals may be responsible for the varied data sharing strategies compared with the PHUs and DHMT reporting lines.

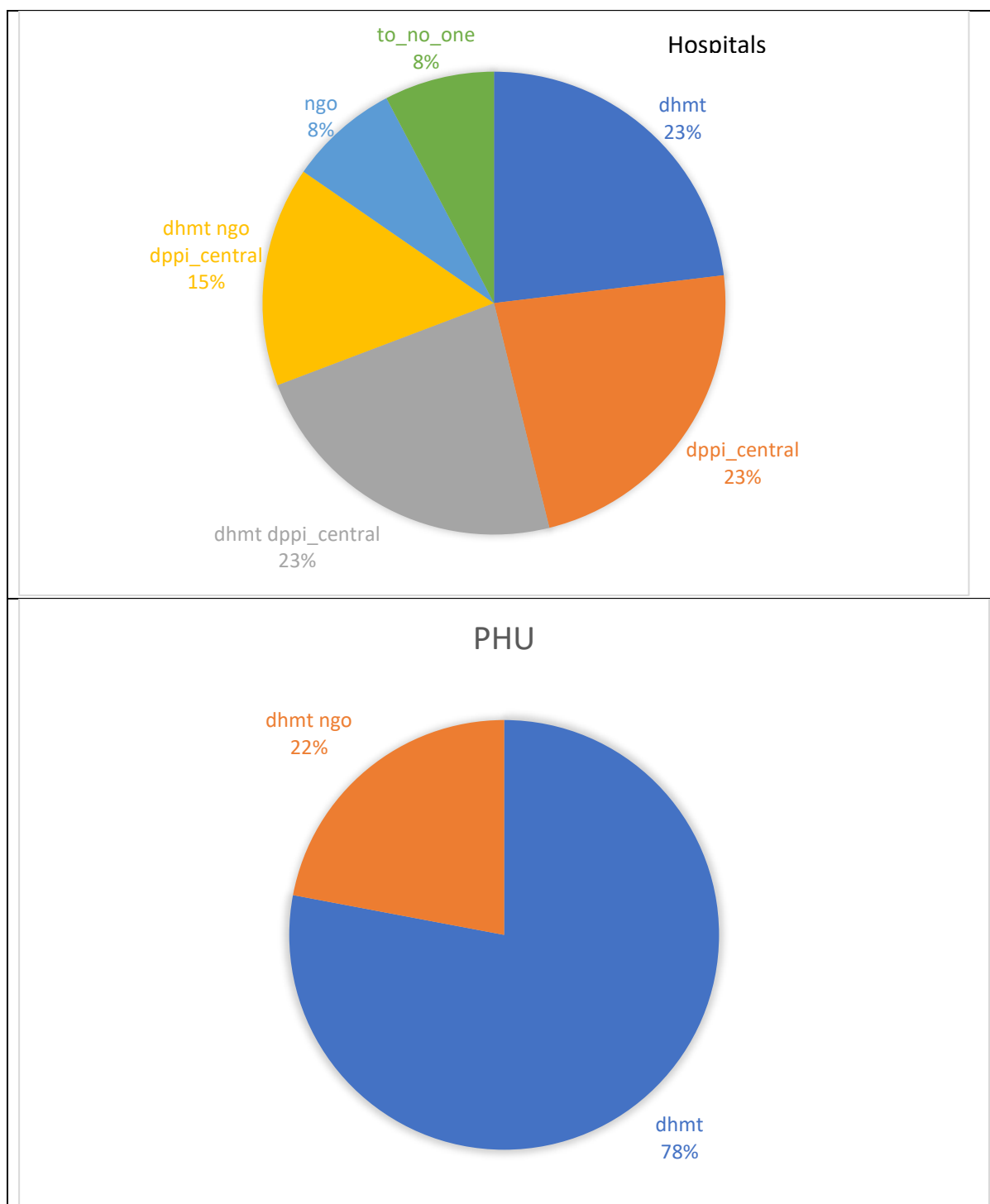


Figure 25: Distribution of where data are sent by health facilities (health facility survey)

Implementing partners' perspective

The majority of the implementing partners reported having a written SOP to facilitate data exchange at the health facilities they supported. Almost all partners surveyed shared data in a government-approved

format, in addition to other formats. The majority of the partners shared data with health facilities, DHMTs and the MoHS.

Digital health workforce

This subsection describes the digital health workforce, from the district to the health facility level.

DHMT workforce

All but one district had a fulltime HIS officer (*see Figure 26*). The survey did not distinguish whether this person played only a health information and information technology (IT) support role or whether she/he played another role, like monitoring and evaluation. Six districts reported receiving digital health training one year before the survey (chart not shown). Five districts reported that the training was provided by an implementing partner, and only one district reported that the training was provided by the government. The remaining seven districts had received limited or no digital health training or capacity building in the last year (*see Figure 26*).

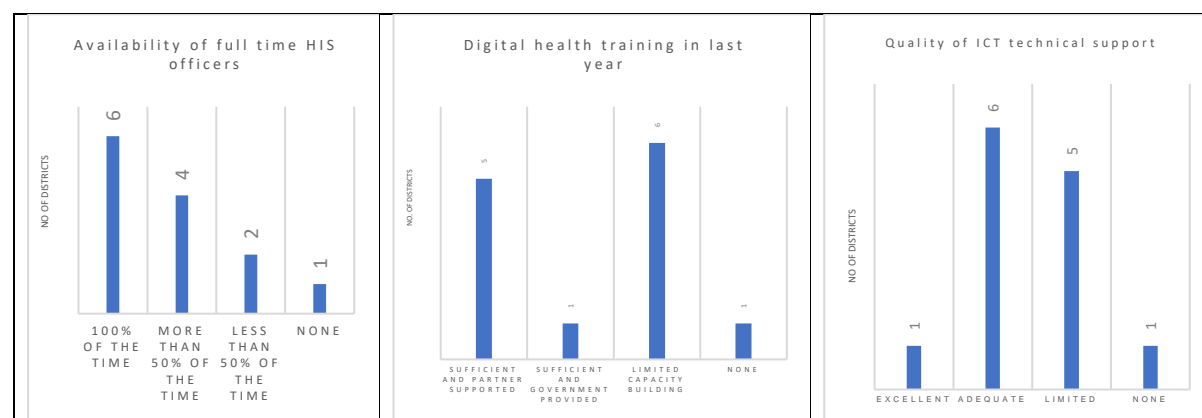


Figure 26: Digital health workforce in the districts and training received (DHMT survey)

Health facility workforce

Information on the availability of technical assistance to support the deployed services and applications showed that about one-half of the health facilities had it (*see Figure 27*). All surveyed hospitals had at least one doctor, midwife, and other allied and support staff. None of the surveyed PHUs had a medical doctor.

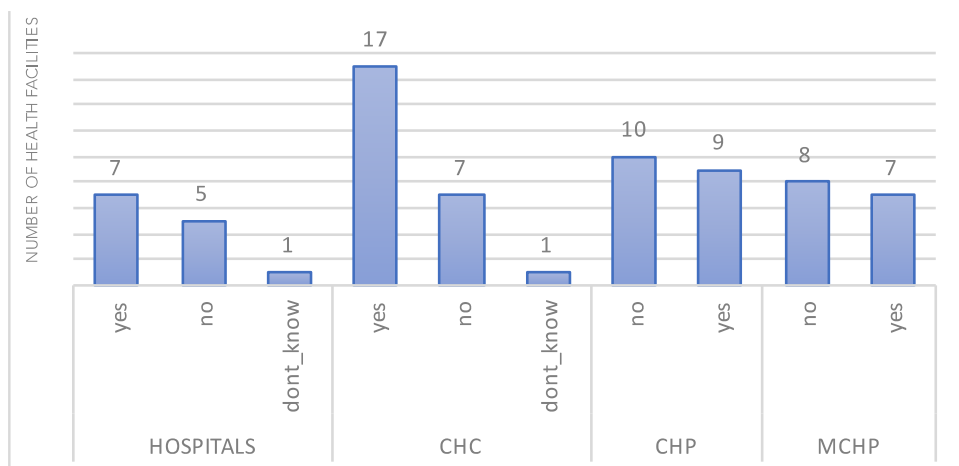


Figure 27: Availability of technical support at health facilities (health facility survey)

Nine of the 13 district hospitals surveyed did not have dedicated data personnel. Twenty two CHCs, 19 CHPs and 12 MCHPs reported not having any dedicated personnel for data management. Based on the responses of health facility staff, the majority of all types of health facilities did not have personnel trained in computer skills in the year preceding the survey. Lack or inadequate digital or computer training is a function of digital ability and perception. Figure 28 details this skills gap based on the responses of health facility staff.

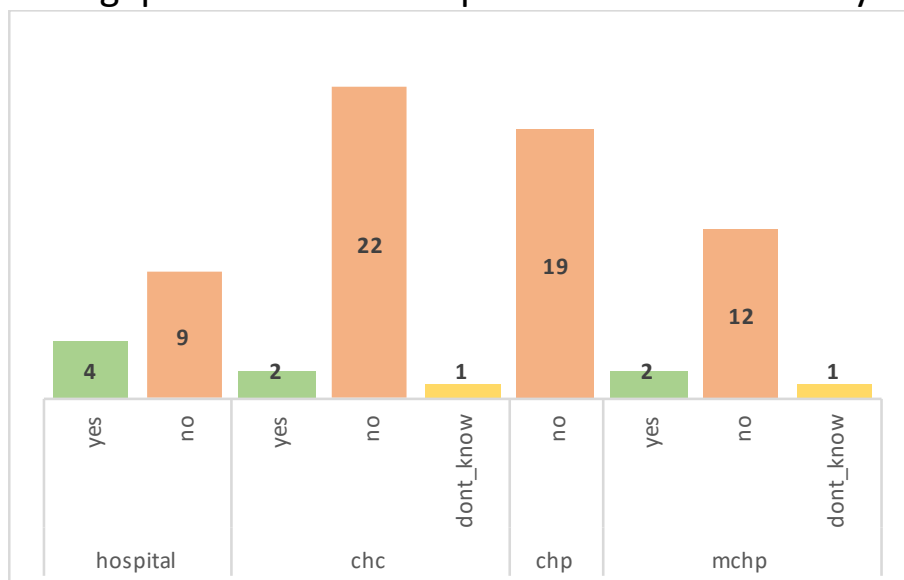


Figure 28: Availability of trained computer personnel (health facility survey)

Information on the organization responsible for maintaining the digital health solutions was also collected (*see Figure 29*). The majority

were maintained by the government, either at the DHMT or at the facility. A few were maintained by an NGO partner.

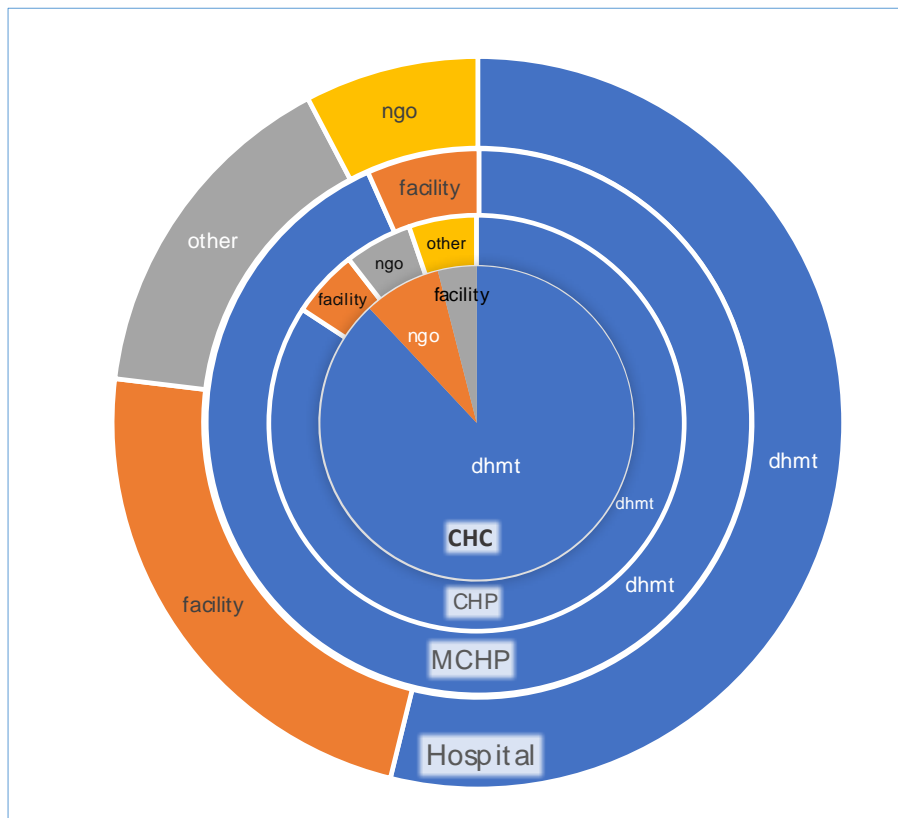


Figure 29: Software maintenance personnel by health facility distribution (health facility survey)

Funding

This section presents the findings on funding for digital health solutions among the districts visited and insights about funding from implementing partners. Some districts had funding for internet access, power supply, IT equipment and IT repairs (*see Figure 30*). Figure 31 shows that nine of the 13 districts reported the release of the digital health budget in their districts.

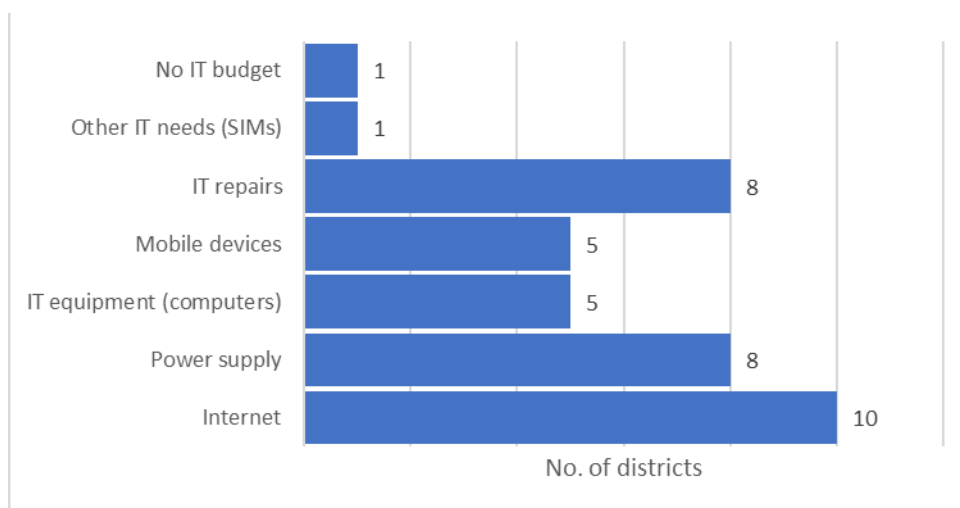


Figure 30: Digital health-related budget (DHMT survey)

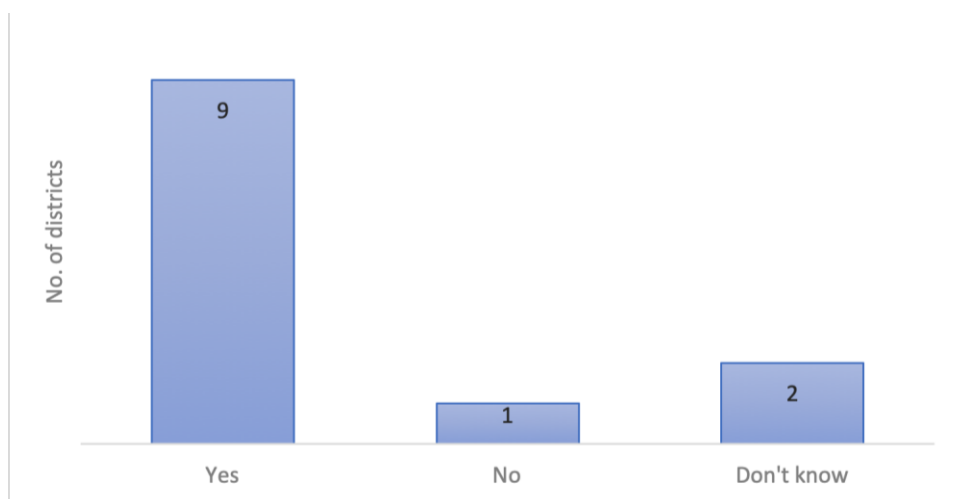


Figure 31: Status of the release of the digital health budget (DHMT survey)

The amount budgeted for digital health across the districts appeared to be grossly inadequate for the appropriate deployment of digital health solutions in the country. For example, the total sum of the digital health budgets for the eight districts that provided information was 202,680,000 Leones (estimated US\$23,323), which is less than 1 per cent of the expected US\$1.2 million budgeted for 2019 implementation of the National Digital Health Strategy. Moreover, only 50 per cent of this inadequate budget was eventually released, as shown in Figure 32.

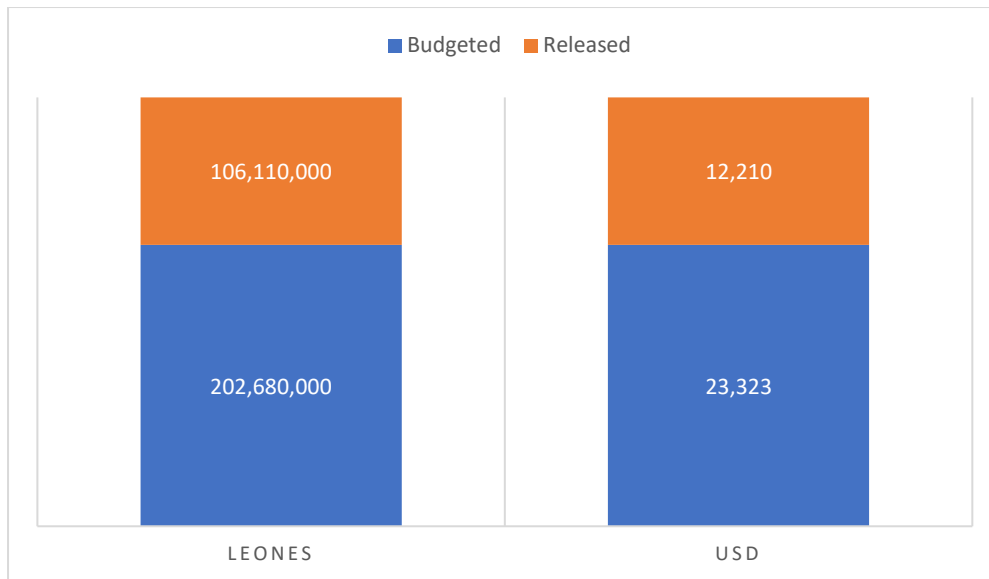


Figure 32: Sum total of all digital health budgets released in eight districts (DHMT survey)

Data management and use

All DHMTs reported entering data in the DHIS web portal and 12 of the 13 districts reported that all datasets used the national recommended format (see Figure 33). However, the districts differed on how they used data, as illustrated in Figure 33. Six districts noted that they systematically used the data they collected for decision making; another six regularly used the data on an ad-hoc basis; but one district did not use data for decision making.

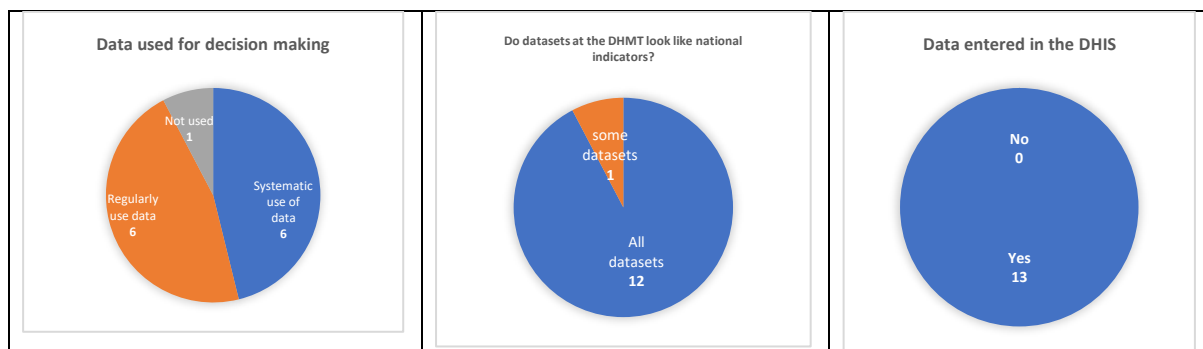


Figure 33: The status of data use at DHMTs (DHMT survey)

The state of data —its collection, accuracy, and the perception of data collected by health facilities — is described in Figure 34, by the different types of health facilities surveyed. The mechanisms for reporting the data from these health facilities are presented in the charts in Figure 35.

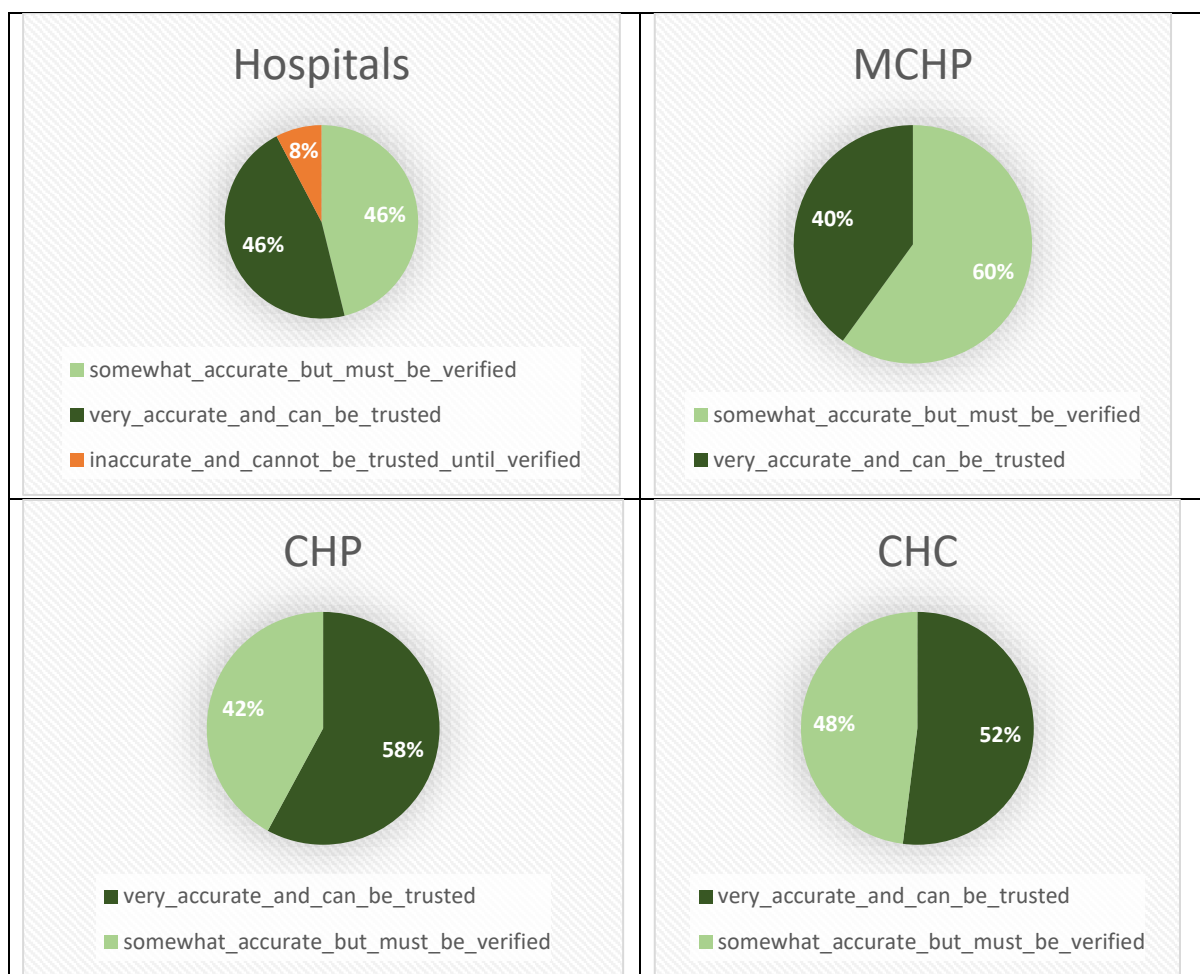
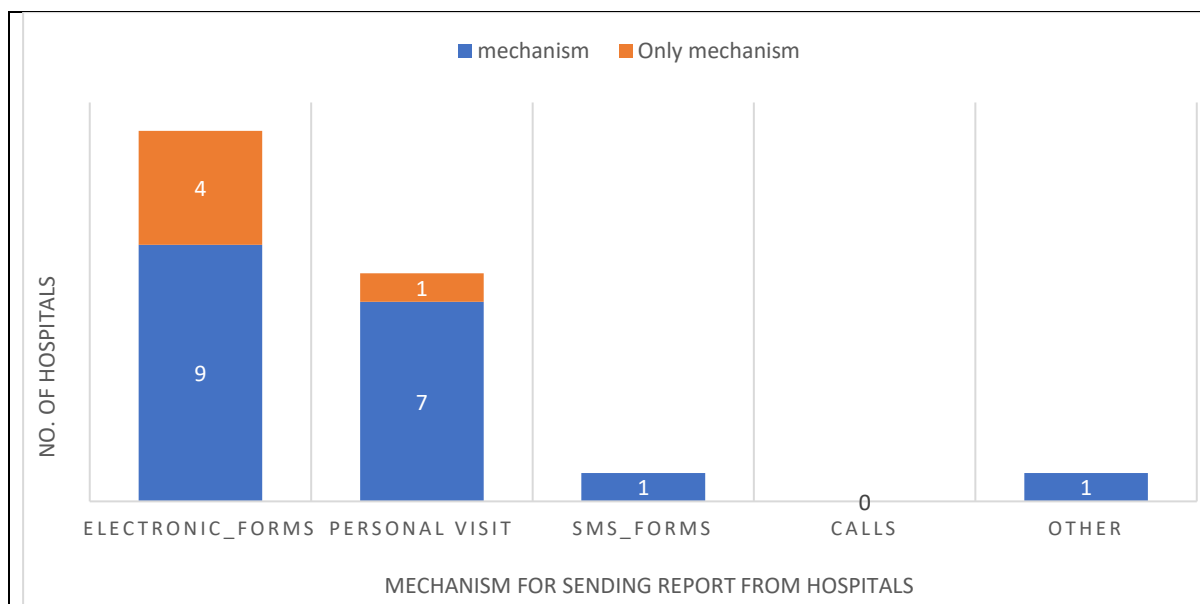


Figure 34: The state of data at health facilities (health facility survey)



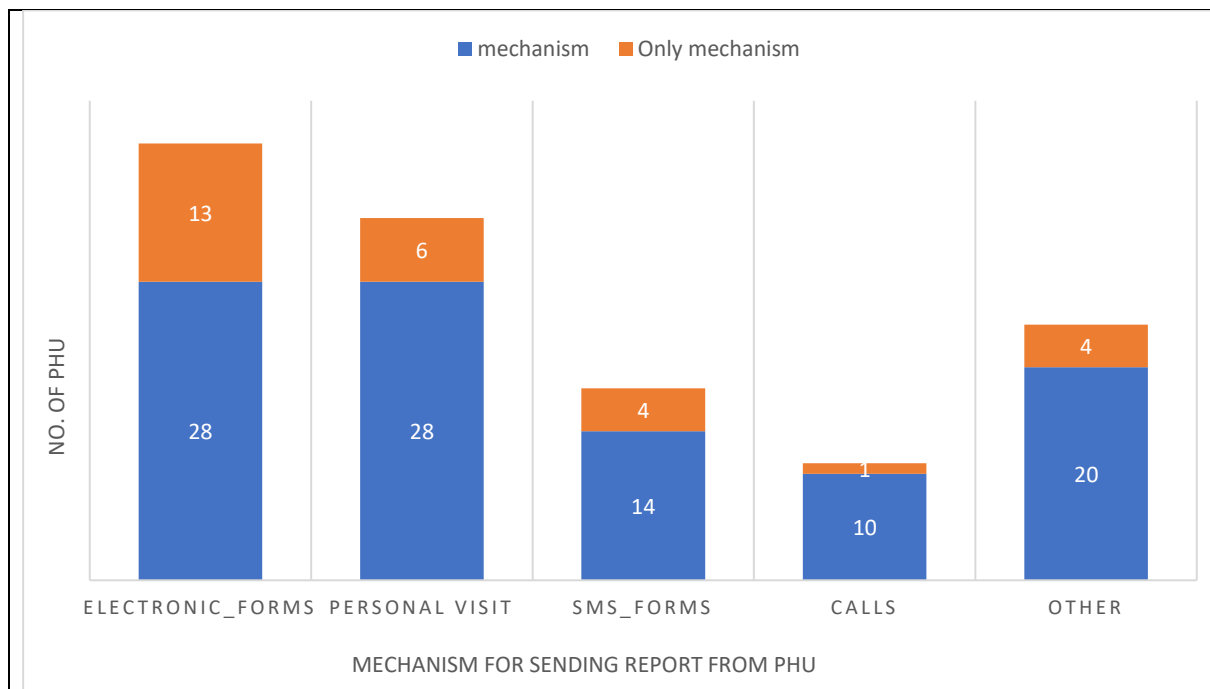


Figure 35: Mechanisms for reporting data by health facilities (health facility survey)

Recommendations and conclusion

The recommendations for key actions and next steps for the implementation of improvement measures are based on the findings in this report and from the responses of health facility personnel surveyed. Respondents were asked their opinions about what posed the greatest threat to ICT efforts at their health facilities. The summary responses are given in Figure 36. The lack of adequate power supply and stealing of ICT equipment topped the list. Insufficient training was another big challenge mentioned by respondents.

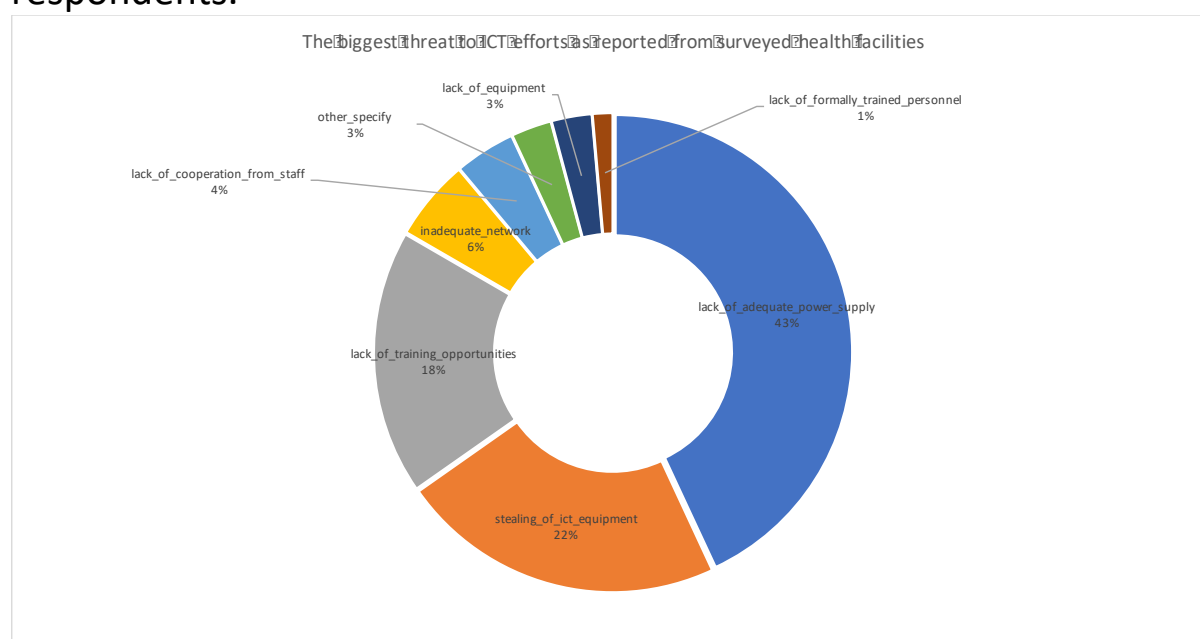


Figure 36: The biggest threats to ICT efforts at the health facilities surveyed

Health facility evaluation

Health facility respondents were asked the question: “Does this system meet your current needs?” The question was deliberately open-ended. Figure 37 presents the unedited free text from this open-ended question using the word-art engine. The size of each word or phrase indicates the level of emphasis and how many times the word or phrase was repeated by respondents. Themes that emerged can be seen from the words like: making work easier, in addition to faster, timely data reporting.



Figure 37: Does this system meet your current needs? (health facility survey)

Table 5 summarizes the gaps and the associated recommendations, organized by the different enabling environment components.

Table 5: Key gaps and associated recommendations

Component area	Gaps	Recommendations
Governance	Not all districts have personnel responsible for digital health. All partners engaged the relevant programmes, while some engaged the DHMTs.	For better coordination, the National eHealth Coordination Hub needs to work with all districts and health programmes to have digital health focal persons. Advocacy and adequate guidelines should be put in place that mandate the notification of the National eHealth Coordination Hub before the deployment of digital health solutions.
Infrastructure	Advances has been made in electricity infrastructure. Significant gaps persist; some health facilities, especially the MCHPs, do not have any electricity supply source.	Implementing partners planning health facility based digital health investment should consider bridging this infrastructure gap, as there is no digital health without electricity. Energy efficient solutions should be prioritized for deployment, especially at the PHUs.
Services and applications	Most of the solutions are data-based systems and they are either for providers or for health system managers. Little evidence exists of effectiveness of different solutions	Solutions should be evaluated and the implementation research results should be shared with the digital health community in Sierra Leone and beyond. Besides data collection, other solutions for decision support, communication, self-service, and telemedicine are essential for the proper functioning of a health system should be considered.
Data management, use, and interoperability readiness	Although stakeholders share information within and across institutions in government, datasets, the structure and format of these data vary greatly.	To reduce duplication among implementing partners, there should be coordination around a standardized data format. Data intensive digital health solutions should facilitate improvement of feedback loop and data use especially at health facility levels

	An insufficient feedback loop was identified by the surveys, especially at health facilities.	
Funding	Funding for digital health remains grossly inadequate. The total budget for technology in all district is about 20,000 USD per annum (only half released) when compared to average 1 million USD required per annum for digital health as in the strategy.	The government and its implementing partners should prioritize digital health investment to reduce waste and improve efficiency in health systems programming. The report recognise that the district is not the only funding source for digital health. There should be better coordination to effectively utilize current digital health funding. In addition, more funding is critical if the vision of digital health is to be achieved.
Digital health workforce	Inadequate trained personnel for digital health solutions support.	Digital health focal points can be trained to provide support across the multiple systems in their districts. Leveraging digital tools for high frequency and low dose digital health training, starting from computer skills, will be impactful.

Appendix

Table A: Types of applications for providers and their health facility distributions

Types of applications for providers	Number of health facilities	Percentage distribution
Hospitals		
client_identification_and_registration	2	15%
client_health_records		
health_provider_decision_support		
client_identification_and_registration	2	15%
client_health_records		
health_provider_decision_support		
provider_to_provider_communication		
referral_coordination	2	15%
health_provider_decision_support		
provider_to_provider_communication		
client_health_records	1	8%
health_provider_decision_support		
client_health_records	1	8%
health_provider_decision_support		
provider_to_provider_communication		
referral_coordination		
client_identification_and_registration	1	8%
client_health_records		
health_provider_decision_support		
referral_coordination		
CHCs		
health_provider_decision_support	7	28%
provider_to_provider_communication		
client_identification_and_registration	2	8%
client_health_records		
health_provider_decision_support	2	8%
health_provider_decision_support		
provider_to_provider_communication	2	8%
referral_coordination		
client_health_records	1	4%
health_provider_decision_support		
client_health_records	1	4%
health_provider_decision_support		
provider_to_provider_communication	1	4%
client_health_records		
referral_coordination	1	4%
client_identification_and_registration		
client_health_records	1	4%
client_identification_and_registration		
client_health_records	1	4%
health_provider_decision_support		
provider_to_provider_communication		
referral_coordination		
client_identification_and_registration	1	4%
client_health_records		
health_provider_decision_support		
telemedicine		
provider_to_provider_communication		
referral_coordination		
CHPs		
health_provider_decision_support	4	21%
provider_to_provider_communication		
client_identification_and_registration	2	11%
client_health_records		
health_provider_decision_support		
provider_to_provider_communication		
referral_coordination	2	11%
health_provider_decision_support		
client_health_records	1	5%
health_provider_decision_support		

Types of applications for providers	Number of health facilities	Percentage distribution
provider_to_provider_communication	1	5%
referral_coordination		
client_identification_and_registration		
client_health_records	1	5%
client_identification_and_registration		
client_health_records		
health_provider_decision_support	1	5%
client_identification_and_registration		
client_health_records		
health_provider_decision_support	1	5%
referral_coordination		
client_identification_and_registration		
client_health_records	1	5%
health_provider_decision_support		
telemedicine		
provider_to_provider_communication	1	5%
referral_coordination		
health_provider_decision_support		
provider_to_provider_communication	1	5%
referral_coordination		
MCHPs		
client_identification_and_registration	3	20%
client_health_records		
health_provider_decision_support		
provider_to_provider_communication	2	13%
referral_coordination		
health_provider_decision_support		
provider_to_provider_communication	1	7%
client_health_records		
health_provider_decision_support		
client_identification_and_registration	1	7%
client_health_records		
health_provider_decision_support		
telemedicine	1	7%
provider to provider communication		

Table B: Types of applications for health system managers and their health facility distributions

Types of applications for health system managers	Number of health facilities	Percentage distribution
Hospitals		
human_resources_management	3	23%
human_resources_management	2	15%
public_health_events_notifications		
facility_management		
CHCs		
human_resources_management	7	28%
supply_chain_management		
public_health_events_notifications		
civil_registration_and_vital_statistics		
equipment_and_assets_management		
facility_management	2	8%
human_resources_management		
public_health_events_notifications		
human_resources_management	1	4%
civil_registration_and_vital_statistics		
facility_management		
human_resources_management	1	4%
supply_chain_management		
public_health_events_notifications		
equipment_and_assets_management		
facility_management		
CHPs		
public health events notifications	2	11%

Types of applications for health system managers	Number of health facilities	Percentage distribution
human_resources_management	1	5%
supply_chain_management		
public_health_events_notifications		
civil_registration_and_vital_statistics		
equipment_and_assets_management		
facility_management	1	5%
supply_chain_management		
public_health_events_notifications		
civil_registration_and_vital_statistics		
equipment_and_assets_management		
facility_management	MCHPs	
human_resources_management		
human_resources_management		
supply_chain_management		
public_health_events_notifications		
civil_registration_and_vital_statistics		
equipment_and_assets_management		
facility_management		
facility_management		
human_resources_management		
supply_chain_management		
equipment_and_assets_management		
facility_management		
human_resources_management	1	5%
supply_chain_management		
public_health_events_notifications		
equipment_and_assets_management		

Table C: Types of applications for data services and their health facility distributions

Type of data service application	No of health facilities	Percentage distribution
Hospitals		
data_collection_management_and_use	7	54%
data_collection_management_and_use	2	15%
data_exchange_and_interoperability		
data_exchange_and_interoperability	2	15%
data_collection_management_and_use	1	8%
data_coding		
data_collection_management_and_use	1	8%
data_coding location_mapping		
data_exchange_and_interoperability		
CHCs		
data_collection_management_and_use	14	56%
data_collection_management_and_use	3	12%
data_exchange_and_interoperability		
data_collection_management_and_use	3	12%
location_mapping		
data_exchange_and_interoperability		
data_collection_management_and_use	2	8%
data_coding		
location_mapping		
data_exchange_and_interoperability		
data_collection_management_and_use	2	8%
location_mapping		
CHPs		
data_collection_management_and_use	14	74%
data_collection_management_and_use	2	11%
data_exchange_and_interoperability		
data_collection_management_and_use	2	11%
location_mapping		
data_exchange_and_interoperability		
MCHPs		
data collection management and use	10	67%

Type of data service application	No of health facilities	Percentage distribution
data_collection_management_and_use	3	20%
data_exchange_and_interoperability		
location_mapping	1	7%
data_exchange_and_interoperability		

Table D: Information shared externally by health facilities

Facility type	Types of data shared externally	Number of health facilities
Hospitals	clinical financial aggregate_report logistics data_use	2
	clinical financial aggregate_report logistics data_use referral_patient	2
	aggregate_report	1
	clinical	1
	clinical aggregate_report logistics referral_patient	1
	clinical financial logistics referral_patient	1
	clinical logistics data_use referral_patient	1
	data_use referral_patient	1
	financial	1
	financial aggregate_report logistics data_use	1
	referral_patient	1
	clinical financial aggregate_report logistics data_use referral_patient	13
	clinical logistics referral_patient	12
	clinical referral_patient	6
PHUs	clinical financial aggregate_report logistics data_use	4
	clinical financial logistics referral_patient	3
	referral_patient	3
	clinical aggregate_report logistics data_use	2

Facility type	Types of data shared externally	Number of health facilities
	clinical aggregate_report logistics data_use referral_patient	2
	clinical financial logistics data_use	2
	logistics referral_patient	2
	aggregate_report	1
	clinical	1
	clinical aggregate_report logistics referral_patient	1
	clinical financial aggregate_report logistics other_specify	1
	clinical financial aggregate_report logistics referral_patient	1
	clinical financial logistics	1
	clinical logistics data_use referral_patient	1
	financial	1
	none	1
	other_specify	1

Table E: Digital health solutions deployed by implementing partners

Organization	Tool	Tool description
Care International	DHIS2	Data collection and reporting
CHW Hub	DHIS2	Data reporting
DPPI, MoHS	DHIS2	Data reporting
eHealthAfrica	EIDSR	Data collection
	AVIDAR	Community polio detection
	VaxTract	Child Immunization registration
	DHIS2	Data collection and reporting
	117	Death registration and outbreak reporting
EOC	EIDSR	Electronic Integrated Disease Surveillance and Response
Focus1000	DHIS2	Data collection and reporting
	ODK	Data collection and reporting
GIZ	EIDSR	Enhance surveillance data
Goal Ireland	DHIS2	Data collection and reporting
HKI	ONA	Coverage data
MA	DHIS2	Patient tracker tool
PIH	HIV/TB-app	Integrated facility and community HIV and TB case management application
	TRIAGE	Early patient screening at hospitals
	EMR	Patient registration and medical record organization

Organization	Tool	Tool description
UNICEF	DHIS2	Data collection and management
	IHRIS	Human resource information management
	Rapid-Pro	SMS-based reporting and visualization platform
UNFPA	WiTok	SMS and IVR mobile messaging for young people
	Firefly	Family Planning Logistics Information System
WHO	DHIS2	Data collection and reporting
	IHRIS	Human resource information management
	IDSR	Integrated disease surveillance
World Vision EBODAC	MOTS	Mobile training and support for Ebola preparedness

Table F: Digital health mapping contributions

Contributor	Activities
Emeka Chukwu (University of Malta)	<ul style="list-style-type: none"> • Draft mapping concept note • Mapping tools development • Code tools into mobile application • Analyse collected data • Write report
Edward Foday Telli Kororma (eHealth Coordination Hub)	<ul style="list-style-type: none"> • Provide leadership for the mapping exercise • Review and provide guidance to the process • Facilitate tools pretest • Train data collectors on tools • Facilitate field visits for data collection • Review draft report
Royston Wright (UNICEF)	<ul style="list-style-type: none"> • Review draft report • Facilitate copy editing and printing