Digital Skills User Needs Assessments for Healthcare Workers in Laikipia County

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Acknowledgement

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Project Summary

FCDO Program & objectives:	Digital Access Program (DAP) that seeks to promote digital inclusion for underserved communities, in collaboration with key local stakeholders and partners in Kenya
DAP Implementing Agency:	ACWICT and OPWAK Consortium
Project Title:	Improving access to the locally relevant digital content for excluded women and youth in Laikipia County, Kenya.
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Project Location:	Kenya (Laikipia County)
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Project Impact

The healthcare workers in Laikipia County become digitally empowered and are able to access and use ICT resources for effective delivery of clinical and administrative services for better health outcomes for all especially during this Covid-19 period and beyond.

Project Outcomes

1. Increased understanding of the digital skills user needs of the healthcare workers in Laikipia County.
2. Increased digital devices accessibility and utilization, digital content creation, accessibility and digital content platforms utilization by healthcare workers.
3. Enhanced efficiency and effectiveness in health services delivery in the health system of Laikipia County

Table of Contents

List of Tables

List of Figures

Acronyms & Abbreviations

ACWICT	African Centre for Women Information Communication and Technology
BOYD	Bring Your Own Device
CEO	Chief Executive Officer
CHU	Community Health Unit
CO	Clinical Officer
COVID-19	Coronavirus Disease-19
DAP	Digital Access Program
EMR	Electronic Medical Records
FCDO	Foreign, Common wealth Development Officer
HMIS	Health Management Information System
ICT	Information Communication Technology
ILO	International Labour Organization
LT	Laboratory Technologist
MO	Medical Officer
OPWAK	Online Professional Workers Association of Kenya
RN	Register Nurse
SDG	Sustainable Development Goals
UKAid	United Kingdom Aid
UN	United Nations
UPS	Uninterruptable Power Supply
URL	Uniform Resource Locator
WHO	World Health Organization
Wifi	Wireless Fidelity

Executive Summary

Improving access to locally relevant and development-oriented digital content in Laikipia county Project ('Maudhui Digiti' project) in Kenya is implemented by ACWICT and OPWAK consortium with funding from UKAid Digital Access Program (DAP) fund. The project commissioned a study to assess Digital Skills User Needs to help understand the digital skills needs of healthcare workers in Laikipia County and their abilities to access and use of the Internet in the delivery of clinical and administrative services for better health outcomes for all especially during this Covid-19 period and beyond. In addition, the assessment was also to help identify the ICT infrastructure required to anchor the delivery of online clinical and administrative of services. Further, the survey was to provide policy-relevant evidence on skills requirements, skills use and skills mismatch in workplaces if any for purposes of policy formulation and project planning for the improvement of the healthcare deliveries.

The assessment approach used international comparability methodology while taking into account the diversity of healthcare system in Laikipia and the variability of the roles and functions played by the different categories of healthcare workers in Laikipia County. The approach was able to include new types of healthcare workers in response to new technologies, new models of care and the changing needs and expectations of the population.

The survey findings established ta 74% of the respondents are able to access Smartphones followed by 42.1 % who are able to access desktop computers. Other ICT devices accessible to the healthcare workers include Laptop Computers (21.8%) and Tablet Computers (12.9%). It was also established that as significant number of healthcare workers who have access to Smartphone devices had very good knowledge on its usage. The level of knowledge levels was dependent on gender and age with male in the 18-35 age bracket being the most knowledgeable at 69% followed by female in the 36-60 age bracket at 52%. In overall, the male healthcare workers in the 18-35 age bracket are able to access the ICT devices for their work as compared to the female healthcare workers in Laikipia County.

The assessment focused on transversal digital skills that enable the healthcare workers to be adaptable in any department in the healthcare workplace. Specially, it was established that 22.4% of the respondents couldn't perform basic digital operational tasks most likely due to lack of requisite digital skills. On the communicational digital skills, its was established that 12.1% of the respondents couldn't handle information using ICT enabled devices effectively. This could potentially cause breakdown in the communication channel and delay in the provision of services. On the data projection and handling skills, 61.7% of respondents lacked sufficient skills to handle quality and confidentiality. Since, the data handled in a healthcare workplace requires great care and integrity, lack of the data projection and handling skills is critical. This is closely tied with the online

safety skills which could be enhanced through institutionalized cyber hygiene programs. Furthermore, 21.8% of the respondents indicated that they have challenges of utilizing and working in an Internet-worked environment. This is attributable to lack of the requisite Internet operational skills.

For the health department of the County Government of Laikipia to leverage on ICT to deliver on quality services to its clients/residents some of the immediate proposed solutions could include:

- Development of BYOD policy and standards to effectively support the utilization of devices like Smartphones in services delivery and to tackle challenges associated with non-institutional based devices.
- Upskill the healthcare workers on transversal skills more so on interpersonal digital skills and analytical skills to enable then work and use digital devices effectively and efficiently.
- Tackle emerging data protection and cyber hygiene challenges by establishing continuous capacity building programs.
- Deployment of Internet connectivity and wireless access programs in the health facilities to ensure a complete networked healthcare environment.

1 INTRODUCTION

1.1. Background

Delivery of health services is undergoing rapid and significant transformations from a disease-centered clinical care approach to patient-centered (personalized-care) and value-based approach. At the center in all the changes taking place in the health sector is the integration and diffusion of Information Technology and Communication (ICT) in the provision of health services. The transformations taking place in the health sector present a unique challenge and potential risk that may result in a skills mismatch among the healthcare professionals. This is likely to intensify with increased innovations and reforms in the health systems in the country.

Most healthcare workers in Kenya, just like in other developing countries have inadequate ICT skills related to their professional duties. It is noted that ICT knowledge can enable healthcare providers to enhance patient-care delivery as well as the practice and safety of care. It can give them the opportunity to access reliable information. Therefore, knowing the ICT skills levels of healthcare providers would establish the competency levels and hence the basis for developing the desired skills to enable them perform their duties optimally.

Whilst health is an increasingly information intensive sector where ICT adoption can significantly contribute to improved quality of service, efficiency and accessibility; there seems to be low levels of ICT adoption particularly among the health care providers in Kenya. One way to change this trend is through training the health workers on ICT technologies adopted in the health sector. The kind of training needed must be tailored to the needs of the healthcare worker. It is however imperative to have an in-depth understanding of the skills needs of the health workers, and the context in which they work so as to plan for digital skills development.

1.2. Global View of Digital skills in Health and Kenya's Vision 2030 Perspective on Digitals skills

European Commission's Joint Action Health Workforce Planning and Forecasting, 2016 report[1] highlights drivers of change in the health sector and the need for new skills and competencies among health workers. The UN through its agencies, WHO and ILO has called upon countries and other global agencies to implement a Five-year action plan for health employment and inclusive economic growth (2017-2021)[2] for better health outcomes. The action plan is aimed at enhancing progress towards universal health coverage as part of the 2030 Agenda for

[1] http://healthworkforce.eu/wp-content/uploads/2016/11/WP2_FINAL_GUIDE_final_version.pdf
[2] https://apps.who.int/iris/bitstream/handle/10665/272941/9789241514149-eng.pdf

Sustainable Development[3], which emphasizes on equipping healthcare workers with appropriate skills development through training. The aim is to enable health workforce develop and apply skills that match the evolving healthcare needs of the populace.

The government of Kenya, through the Kenya Vision 2030[4], considers health sector as one of the core pillars of her development agenda. This has also been underscored in the current development agenda of the country commonly referred to as the "big-four" development agenda of the country. It is noted in both development blueprints that technology will facilitate the realization of the objectives spelled out in the document. For instance e-health and m-health models are considered to be the accelerators towards the realization of Universal Health coverage in Kenya and thus improving the well-being of the Kenyan populous[5].

Kenya has also recognized digitization as a driver of economic development across all sectors. The country views the Digital economy in the entirety of sectors that operate using digitally-enabled communications and networks leveraging internet, mobile and other technologies, and seeks to promote development and achievement of Vision 2030, and the SDGs through its Digital Economic Blueprint, whose mission is to oversee a nation where every citizen, enterprise and organization has digital access and the capability to participate and thrive in the digital economy[6].

Kenya has developed a development master plan commonly referred to as Vision 2030. In it ICT is identified as one of the key development enablers[7]. Further, the county has also released a Digital Economy Blueprint framework detailing core digital skills that will promote the creation of jobs for the youth & women and hence spurring economic development[8]. The framework has identified five pillars upon which the country will enhance economic growth. The pillars include; Digital Government; Digital Business; Infrastructure; Innovation-Driven Entrepreneurship and Digital Skills and Values. Central in all the five pillars is the requisite digital skills and competences among the citizenry.

1.3. Overview of Health Sector in Laikipia County

The needs assessment was conducted in Laikipia County, one of the 47 counties in Kenya. Laikipia County lies between latitudes 0^0 18" South and 0^0 51" North and between longitude 36^0 11" and 37^0 24' East[9]. The county borders six

[3] https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

[4] Kenya Vision 2030 is the long-term development blueprint for the country and is motivated by a collective aspiration for a better society by the year 2030.

5 http://cn.invest.go.ke/wp-content/uploads/2018/12/Government-of-Kenya-Big-Four-Plan.pdf

6 https://ca.go.ke/wp-content/uploads/2019/05/Kenyas-Digital-Economy-Blueprint.pdf

[7] http://vision2030.go.ke/inc/uploads/2018/05/Kenya-Vision-2030-Newsletter..pdf

[8] https://www.ict.go.ke/wp-content/uploads/2019/05/Kenya-Digital-Economy-2019.pdf

9 Laikipia County Integrated Development Plan 2018-2022

counties namely; Meru and Nyeri to the south, Nyandarua to the southwest, Samburu to the north, Isiolo to the northeast and Baringo to the west. According to the Kenya Population Census 2019, Laikipia county population was estimated at 518,000. The county is cosmopolitan and inhabited with multiple ethnic communities; Kikuyus, Maasai, Borana, Samburu, Kalenjin, Meru, Somali, Turkana with European and Asian settlers. Laikipia County covers an area of 9,462 square kilometers, and is ranked as the 15th largest county in the country by land size[10]. Figure 1 shows the geo-location of Laikipia County in the map of Kenya.

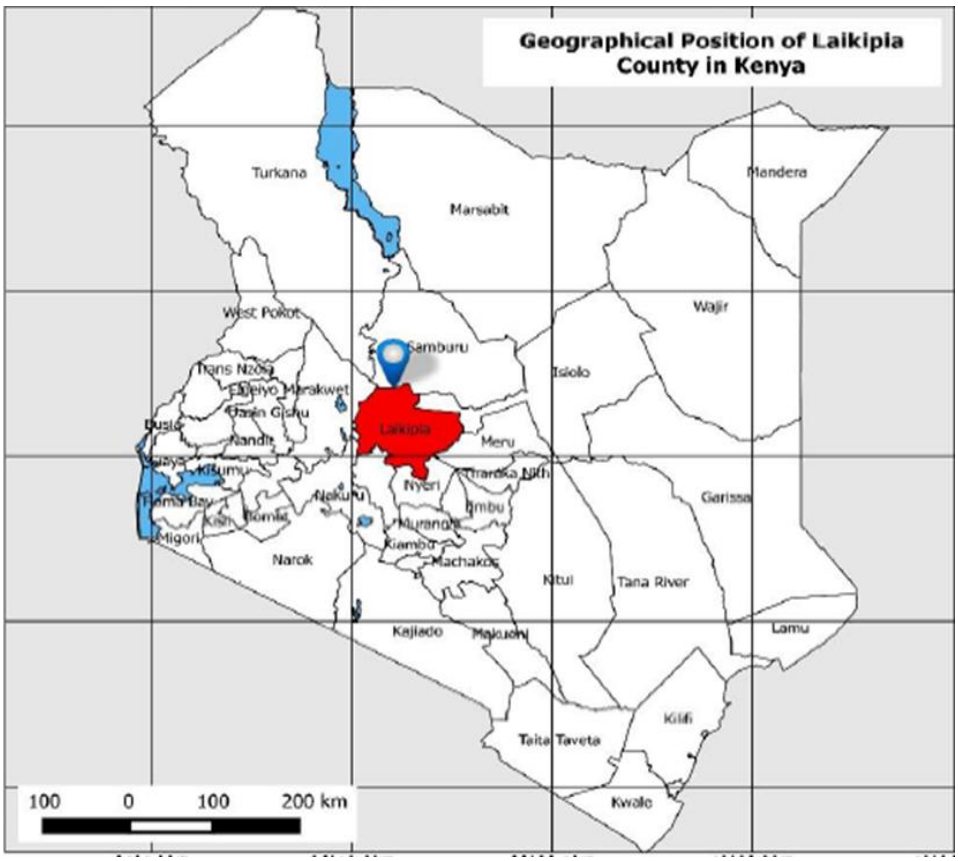

Figure 1: Map of Kenya Showing Laikipia County

(Source: Laikipia County Integrated Development Plan (2018-2022))

Lakipia County like many other counties in Kenya is facing significant health workforce challenges partly because of the rising demands for and growing complexities of healthcare due to increasing population. The rapid diffusion of new technologies has also placed some additional demands on the health workface to acquire new digital skill sets required of the modern health workers.

In view of the above, Maudhui Digiti project aims at establishing the digital skills needs of the healthcare workforce in Laikipia County and their abilities to access and use of the Internet enabled platforms in the delivery of clinical and administrative services for better health outcomes for all especially the vulnerable and underserved residents of Laikipa County. The assessment will

10 Laikipia CDP, 2013

also help in formulating policy recommendations on the interventions that will promote the development of appropriate digitals skills for the healthcare workforce in Laikipia County.

1.4. Defining the digital skills in the context of Laikipia County

The assessment sought to identify the digital skills sets that are highly relevant for front-line health workers for different categories of health professionals in Laikikipia County. A review of the existing competency and digital skills assessment frameworks and after consulting the experts and stakeholders, we established the types of cross-cutting digital skills that will promote patient-centered care for Laikipia County. The identified cross-cutting skills include *interpersonal skills*, such as communication and *analytical skills* such as the ability to use ICT and other forms of technology effectively. These skills are referred to as transversal skills since they are generic and not job-specific.

In the healthcare environment in Laikipia county transversal skills will be effective in the application of technical skills and knowledge. Moreover, the transformations taking place in the heath sector, transversal skills will be key enablers of the change from a disease-centered clinical services delivery to patient-centered and value-based clinical services delivery approach. These skills will also help health workers in Laikipia to adapt easily to an ever-changing technology-faced and new rules and health standards of healthcare.

Most researchers have considered digital skills appropriate for healthcare workers to be more of technicalities of Internet usage. These technicalities are sometimes called 'button knowledge.' To effectively determine the Internet skills needed by the healthcare workers, there is need to assess both basic skills necessary to use the Internet, and skills required to comprehend and use online content[11]. In this survey, the medium-related Internet skills and content-related Internet skills were considered so as to avoid a technologically focused view. Moreover, communication and socio-emotional skills required for the use of social media were also considered as they enhance the utilization of Internet enabled technologies[12]. Other digital skills assessed in this survey included content creation skills, or creative skills, which are critical in this technological error[13].

In general, the definition of digitals skills adopted in this study borrows from definition by Ferrari (2012) who considers digital competence as a combination of Information skills, Communication skills, Content Creation skills, Safety skills, and Problem Solving skills. In the context of Laikipia County, the digital Communication skills focused on the devices used for online communication, the

[11] Brandtweiner, R., Donat, E., & Kerschbaum, J. (2010). How to become a sophisticated User: a two- dimensional approach to e-literacy. *New media & society*, *12*(5), 813-833.
[12] Calvani, A., Fini, A., Ranieri, M., & Picci, P. (2012). Are young generations in secondary school digitally competent? A study on Italian teenagers. *Computers & Education*, *58*(2), 797-807.
[13] Ferrari, A. (2012). *Digital Competence in practice: An analysis of frameworks.* Sevilla: JRC IPTS.(DOI: 10.2791/82116).

Content Creation focused on the skill to produce content in different formats, platforms, and environments.

The study also considers Internet skill using the following domains: Operational, 'the skills to operate digital media'; Formal, 'the skills to handle the special structures of digital media such as menus and hyperlinks'; Information, 'the skills to search, select and evaluate information in digital media'; and Strategic, 'the skills to employ the information contained in digital media as a means to reach a particular personal or professional goal[14].

In general, the assessment aimed at establishing the needs for a healthcare worker to have the relevant digital abilities that encompass not only technical proficiency with the equipment and software but also ease in sharing information, understanding of privacy and confidentiality policies, managing or influencing others through electronic means of communication.

1.5. Theory of Change

The assessment was based on the principles of the Theory of change. The ultimate goal of the project is to improve healthcare services delivery using digital platforms to the residents of Laikipia County, through overcoming the barriers to digital inclusion.

The project is therefore expected to make change along the following interrelated change pathways; digital devices accessibility and utilization, digital content creation, accessibility and digital content platforms utilization relevant to healthcare workers. The Theory of changes adopted in this project is built on the following assumptions:

1) **Stakeholder engagement change pathway:** If all stakeholders in the healthcare are involved in the determination of appropriate digital skills required will lead to more digital devices accessibility and utilization, digital content creation, accessibility and digital content platforms utilization by healthcare workers. This will improve health outcomes in Laikipia County. It is expected with an established long-term engagement with stakeholders and other development partners working in the county will development of relevant and adoptable interventions for promotion of digitalization of healthcare services in Laikipia County.
2) **Quality of healthcare delivery pathway:** If appropriate digital skills of healthcare workers are well developed and positioned along the health services delivery framework in Laikipia County, there will be enhanced efficiency and effectiveness in the health system. This will improve on the quality of life for the residents of Laikipia County.

[14] Van Deursen, A.J.A.M. & Van Dijk, J.A.G.M. (2010). Measuring Internet skills. *International Journal of Human-Computer Interaction*, *26*(10), 891-916.

Table 1 shows the expected outcome based on the Theory of Change assumption adopted in this project.

Table 1:Theory of Change Assumptions

Outcome and Impact of assumptions 1. If all stakeholders in the healthcare are involved in the determination of appropriate digital skills required will lead to more digital devices accessibility and utilization, digital content creation, accessibility and digital content platforms utilization by healthcare workers. 2. If appropriate digital skills of healthcare workers are well developed and positioned along the health services delivery framework in Laikipia County, there will be enhanced efficiency and effectiveness in the health system.	
Stakeholder engagement change pathway	**Quality of healthcare delivery pathway**
1. Better understanding of the healthcare workers needs and functioning between donor and the community leading to better delivery and sustainable projects	1. Increased knowledge/understanding to support efficient digital healthcare services to the underserved communities in the Laikipia county
2. Better understanding of the ICT ecosystem in the healthcare workplace	2. Better programming and ICT resourcing of the healthcare environment
3. Workers digital skills matching with existing ICT resources and tasks	3. Increased throughput and productivity
4. Connected healthcare Stakeholders leading to effective project programming	4. Data and Patient-centred healthcare provision
5. Increased understanding on the digital skills needs of healthcare workers	5. Effective digital skills training intervention for healthcare workers

2. PURPOSE, OBJECTIVES, SCOPE AND METHODOLOGY

2.1. Purpose

The purpose of the assessment is to help understand the digital skills needs of healthcare workers in Laikipia County and their abilities to access and use of the Internet in the delivery of clinical and administrative services for better health outcomes for all especially during this Covid-19 period and beyond. In addition, the assessment will also help identify the ICT infrastructure required to anchor the delivery of online clinical and administrative of services.

2.2. Objectives

The aim of the survey was to examine the digital skills needs of healthcare professionals that will provide policy-relevant evidence on skills requirements, skills use and skills mismatch in workplaces. Therefore the survey will help in policy formulation and project planning for the improvement of the healthcare deliveries.

Furthermore, the assessment provides empirical basis of describing the digital skills needs of healthcare workers in Laikipia County and their abilities to access and use of the internet in delivery of clinical and administrative services for better health outcomes for all especially the vulnerable and underserved citizens. In addition, the assessment has helped identify the ICT infrastructure required to anchor the delivery of online clinical and administrative of services in Laikipia County.

Specifically, the survey tackled the following specific objectives:

1. Defining the characteristics of the ICT ecosystem of the healthcare workplace in Laikipia County
2. Determination of the digital skills users needs of the healthcare workers in Laikipia County
3. Establishment of the Internet skills and competencies of the healthcare workers in the utilization of ICT tools to delivery clinical and administrative services to the residents of Laikipia County

2.3. Scope

The Digital Skills User Needs Assessment for Healthcare Workers in Laikipia County focused on the assessment of the digital skills for healthcare workers in government owned Health Centres in Laikipia County. The survey also included community health workers within the vicinity of the government owned health centres. The healthcare workers and community health workers targeted by the

study were those that carry out direct patient care as well as managerial functions within their units. Therefore the survey was limited to digital skills assessment, the accessibility to the Internet competencies and the usability needs of the ICT resources in the healthcare work environment.

2.4. Methodology employed to assess the digital skills for healthcare workers

2.4.1. Methodology overview and study design

To assess the digital skills needs of the healthcare workers, the study adopted a quantitative survey design approach with questions that asked for the use of the ICT technologies or the applications used in the Internet mediated environment. The use of applications and Internet based applications are assumed to provide indirect evidence for the command of the requisite digital skills for healthcare workers. It was also presumed that when an individual uses an application that is conceived to be difficult to use, this is maybe a direct indication of a good command of digital skills.

In the study, a Likert scale was used due to its flexibility to measure different subjects in a study and its ability to allow for the selection of response items using truth claims. In most of the responses, the study used the scales "Not at all true of me," "Not very true of me," "Neither true nor untrue of me," "Mostly true of me," and "Very true of me," in terms of the respondents' behaviour related to digital skills as proposed by Spitzberg[15]. Therefore, the healthcare workers assessed themselves the extent to which they believed each item to be true of them. The study adapted the derived digital skills assessment items based on the proposed internet skills measurement items by Van Deursen, Van Dijk & Peters[16].

2.4.2. Inception phase

During the inception phase Desk-based reviews of available digital skills measurement models were conducted. Models adopted at other countries[17] and at the national levels[18] for assessment of digital skills were examined and they informed on the structuring of the response items considered in the survey tools. Further during this phase the context of the study was clarified between FCDO, the consortium and the Laikipia County representatives. At this phase, the tools for the study and modality of administering them were agreed.

[15] Spitzberg, B. H. (2006). Preliminary Development of a Model and Measure of Computer-Mediated Communication (CMC) Competence. Journal of Computer-Mediated Communication, 11(2), 629-666.
[16] Van Deursen, A., Van Dijk, J., Peters, O. (2012). Proposing a Survey Instrument for Measuring Operational, Formal, Information and Strategic Internet Skills. *International Journal of Human-Computer Interaction*, *28*(12), 827-837.
[17] Measuring Digital skills. From Digital Skills to Tangible Outcomes project report. Alexander J.A.M. van Deursen, Ellen J. Helsper and Rebecca Eynon (2014)
[18] MOH Standard and Guidelines for Electronic Medical Records Systems in Kenya (2010)

2.4.3. Study phase

The study phased was conducted in a transparent and interactive manner with regular consultation between the consortium, County representatives and the DAP programme Manager. The meetings helped clarify on the timelines and roles of each party to the study. The challenges experienced in the data collection were addressed during these meetings. Further, the meetings helped to adjust on the survey tool administration to enhance response rates.

2.4.4. Target Population and Sampling

The target population consisted on all healthcare workers in Laikipai County. According to the Laikipia County Health Service Act 2014[19], the health sector is structured to have County referral Hospitals, Sub-county Hospitals, Health centres, Dispensary and Community Health Units (CHU).

A mixture of Purposeful sampling and Proportionate sampling strategies were employed to obtain the ideal sample for the survey. By applying these strategies the targeted numbers of health facilities sampled for the survey are distributed as shown in table 2.

Table 2: No of health Facilities Sampled for the Survey

Health Facility category	No. of facilities sampled
County Referral Hospital	2
Sub-county Hospital	5
Health Center	4
Dispensary	30
Community Health Units	30

The targeted respondents spread in the sampled facilities are as shown in table 3.

Table 3: Sampled Target Respondents

Job Category	No. of Respondents per hospital
CEO (County Referral Hospital)	1
Medical Superintendent	5
Hospital Managers	4
Hospital administrator	5
Specialist (Consultants)	5
Medical Officer (MO)	9
Registered Nurse (RN)	6
Nursing Officer (NO)	72

[19] https://laikipia.go.ke/resource/the-laikipia-county-health-services-act-2014

Clinical Officer (CO)	45
Laboratory Technologist (LT)	44
Pharmacist	7
Technologist	2
Social Worker	7
Community Health worker	30
Total	**242**

2.4.5. Data collection procedures and Analysis

Data collection was conducted in using self-administered questionnaire. Most of the respondents used the online version of the questionnaire while others used the hardcopy version of the questionnaire particularly those who could not access the Internet.

By taking into consideration of all the ethical, legal and data privacy concerns, data was collected after all participants gave consent to proceed with the filling-in of the questionnaire. All necessary precautions were undertaken to conceal the identity of the respondent after the questionnaires were submitted, more so during the data-decoding phase. Data privacy concerns were addressed by ensuring any personal data was stored in a coded format.

Only respondents who fitted into the study scope was allowed participate in responding to the questionnaire. This ensured reliability of the data collected. Data quality was the responsibility of the lead consultant in the project guided by the study questions. The consultant conducted regular de-briefing of the questionnaire administrator to ensure all agreed procedures were adhered to.

Descriptive data analysis was conducted to establish the various statistical measures of the survey objectives.

3. SURVEY RESULTS

3.1. Demographic characteristics of the respondents

3.1.1. Gender, age and marital status

A total of 209 respondents participated in this survey. This consisted of 47.5% male and 52.5% female respondents. Of this, 53.7% were between18-35 age bracket and 46.3% were between 36-60 age bracket as shown in table 4.

Table 4: Gender Distribution

Gender	Age Bracket		
	(18-35)	(36-60)	
Male	47	50	97 (47.5%)
Female	62	45	107 (52.5%)
	109 (53.7%)	95 (46.3%)	

From the above distribution, the healthcare workforce in Laikipia is in favour of the youth and majority of the workforce consist of the female. Majority of the respondents are married (72.5%), 24% are single. The rest are either separated or widowed.

3.1.2. Comparison of Gender, Age and Education Level

It was also noted that all the respondents in the survey Laikipia had formal education with 56.9% having a diploma level qualification, 15.3% having a degree level qualification, 12% Secondary level qualification, 5.7% Tertiary level qualification and 1% Masters level qualification. Therefore, the larger percentages of the workforce in Laikipia County have the requisite qualification. It is however noted that majority of the workforce with higher qualification, that is diploma and above are the workforces between the age bracket of 18-35. Table 5 shows the distribution of education qualification across the gender divide.

Table 5: Education Qualification

Gender	Age Bracket		Education Level
	(18-35)	(36-60)	
Male	**47**	**50**	**97 (47.5%)**
	1 (2%)	1 (2%)	Masters
	13 (28%)	8 (16%)	University degree
	3 (6%)	0 (0%)	Higher Diploma
	29 (62%)	22 (44%)	Diploma
	1 (2%)	5 (10%)	Tertiary Certificate

Gender	Age Bracket		Education Level
	(18-35)	(36-60)	
	0 (0%)	14 (28%)	Secondary Certificate
	0 (0%)	0 (0%)	Primary Certificate
Female	**62**	**45**	**107 (52.5%)**
	0 (0%)	0	Masters
	17 (27%)	4 (9%)	University degree
	0 (0%)	0 (0%)	Higher Diploma
	38 (61%)	30 (67%)	Diploma
	3 (5%)	3 (7%)	Tertiary Certificate
	4 (6%)	8 (18%)	Secondary Certificate
	0 (0%)	0 (0%	Primary Certificate
Overall	**109 (53.7%)**	**95 (46.3%)**	

From the survey, it was noted that majority of the respondents (26.3%) are stationed in the sub-county hospital, followed by those working at dispensary level (25.9%). Figure 2 shows a workforce distribution on the category of the workstation in Laikipia County.

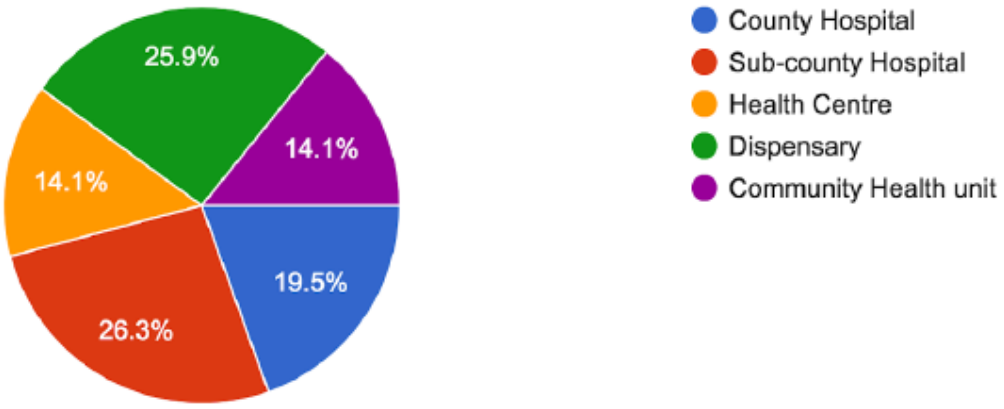

Figure 2: Proportionate Representation of the Category of Workstations

3.2. ICT Ecosystem in the Healthcare workplace in Laikipia

3.2.1. ICT Devices Accessibility

The survey sought to determine the kind of ICT devices the healthcare workforce in Laikipia County are able to access for purpose of undertaking their work. It was established that the following ICT devices desktop computers, Laptop

computers, Tablet devices and smartphone devices characterize the general ICT ecosystem in Laikipia County.

It was noted that the most accessible device for the healthcare workers in Laikipia County was the Smartphone device (74%) followed by a desktop computer (42.1%). Table 6 shows the various combinations of devices accessible to the healthcare workforce for purpose of work and figure 3 gives the aggregate device accessibility in the county.

Table 6: ICT Devices Accessibility

Gender	Age Bracket		Devices Accessed for purposes of work
	(18-35)	(36-60)	
Male	8 (17%)	4 (8%)	Desktop Computers
	1 (2%)	1 (2%)	Laptop Computer
	0 (0%)	2 (4%)	Tablet Device
	18 (38%)	20 (40%)	Smartphone Device
	5 (11%)	0 (0%)	Desktop, Laptop, Smartphone
	3 (6%)	1 (2%)	Desktop, Tablet, Smartphone
	0 (0%)	1 (2%)	Desktop, Tablet
	3 (6%)	1 (2%)	Laptop, Tablet, Smartphone
	1 (2%)	2 (4%)	Tablet, Smartphone
	0 (0%)	0 (0%)	Desktop, Laptop, Tablet, Smartphone
	3 (6%)	2 (4%)	Laptop, Smartphone
	5 (11%)	6 (12%)	Desktop, Smartphone
	0 (0%)	0 (0 %)	Laptop, Tablet
Female	19 (31%)	3 (6%)	Desktop Computers
	1 (2%)	2 (4%)	Laptop Computer
	0 (0%)	2 (4%)	Tablet Device
	23 (37%)	26 (58%)	Smartphone Device
	1 (2%)	0 (0%)	Desktop, Laptop, Smartphone
	0 (0%)	0 (0%)	Desktop, Tablet, Smartphone
	0 (0%)	0 (0%)	Desktop, Tablet
	0 (0%)	0 (0%)	Laptop, Tablet, Smartphone
	1 (2%)	1 (2%)	Tablet, Smartphone
	0 (0%)	0 (0%)	Desktop, Laptop, Tablet, Smartphone
	3 (5%)	1 (2%)	Laptop, Smartphone
	5 (8%)	4 (9%)	Desktop, Smartphone
	0 (0%)	1 (2%)	Laptop, Tablet

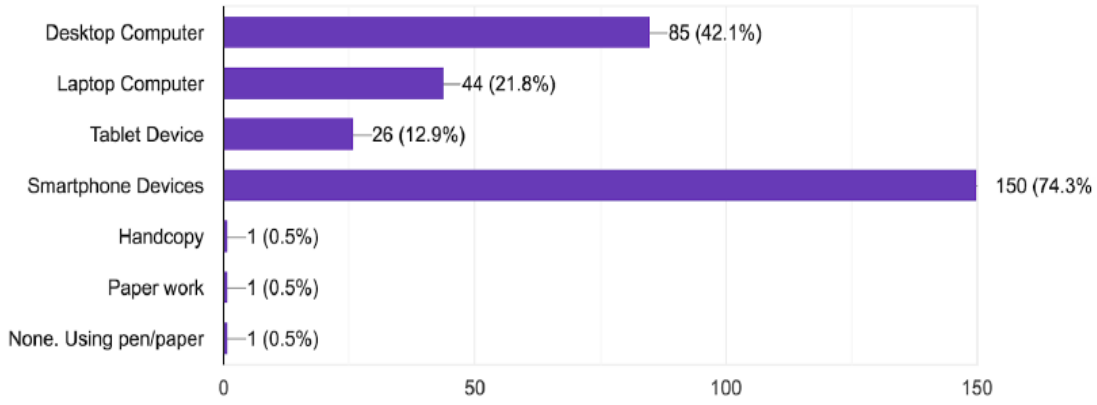

Figure 3: Information and Communication Technology Devices Accessible to Healthcare workers in Laikipia County

3.2.2. Level of knowledge of the Healthcare workers in using ICT Devices in Laikipia County

The ability to use the available ICT devices in the healthcare ecosystem is critical for the success of the services delivery. The survey sought to determine the level of knowledge of the healthcare workers in the utilization of ICT devices in Laikipia County. From the survey, it was established that most of the healthcare workers have very good knowledge on the use of Smartphones. This was followed by those who had very good knowledge on the use of Tablet devices. Figure 4 shows the level of knowledge on usage of ICT devices.

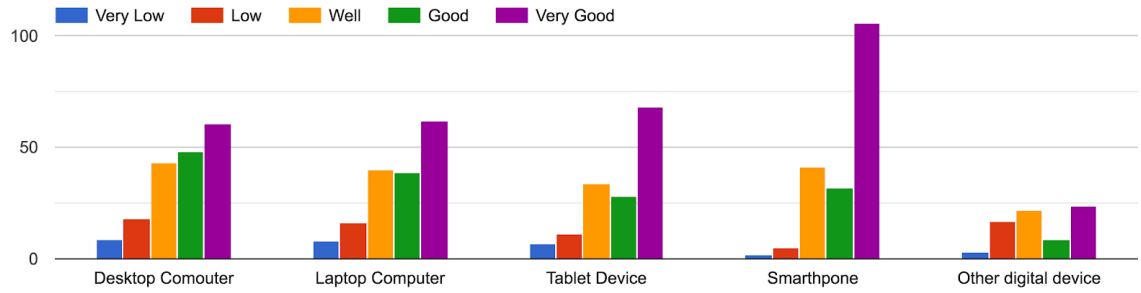

Figure 4: Level of Knowledge in using ICT devices

In terms of distribution on the level of knowledge per age bracket, table 7 and table 8 show how different healthcare workers usage the various devices within their workplace in Laikipia County.

Table 7: Knowledge level in the 18-35 Age bracket

Gender	Device	Level Knowledge
Male	**Desktop**	Very good (55%)
		Good (24%)
		Well ((11%)
		Low (4%)
		Very Low (2%)
	Laptop	Very good (58%)
		Good (20%)
		Well (16%)
		Low (4%)
		Very Low (0%)
	Tablet	Very good (58%)
		Good (16%)
		Well (18%)
		Low (4%)
		Very Low (0%)
	Smartphone	Very good (69%)
		Good (11%)
		Well (18%)
		Low (2%)
		Very Low (0%)
Female	**Desktop**	Very good (37%)
		Good (27%)
		Well (11%)
		Low (8%)
		Very Low (3%)
	Laptop	Very good (37%)
		Good (16%)
		Well (13%)
		Low (8%)
		Very Low (3%)
	Tablet	Very good (39%)
		Good (10%)
		Well (10%)
		Low (8%)
		Very Low (3%)
	Smartphone	Very good (50%)
		Good (11%)
		Well (18%)
		Low (0%)
		Very Low (3%)

Table 8: Knowledge level in the 36-60 Age bracket

Gender	Device	Level Knowledge
Male	**Desktop**	Very good (18%)
		Good (26%)
		Well ((28%)
		Low (2%)
		Very Low (2%)
	Laptop	Very good (20%)
		Good (16%)
		Well (30%)
		Low (2%)
		Very Low (4%)
	Tablet	Very good (16%)
		Good (22%)
		Well (20%)
		Low (0%)
		Very Low (2%)
	Smartphone	Very good (52%)
		Good (16%)
		Well (24%)
		Low (0%)
		Very Low (0%)
Female	**Desktop**	Very good (4%)
		Good (16%)
		Well (38%)
		Low (22%)
		Very Low (9%)
	Laptop	Very good (4%)
		Good (27%)
		Well (22%)
		Low (18%)
		Very Low (9%)
	Tablet	Very good (20%)
		Good (9%)
		Well (22%)
		Low (9%)
		Very Low (9%)
	Smartphone	Very good (38%)
		Good (27%)
		Well (22%)
		Low (9%)
		Very Low (0%)

From the survey, the level of knowledge on ICT devices in the workplace was influenced by gender and the age. It was established of all the respondents in the age bracket 36-60, female respondents had low level of knowledge of ICT devices in their workplace with on average 16.5% registering very good level of knowledge on ICT devices against the female counterparts in the age bracket of 18-35 who registered 40.75% very good level of knowledge on ICT devices.
In comparison with the male healthcare workplace, 26.5% of the respondents in the age bracket of 36-60 registered very good level of knowledge on ICT devices, 60% of the respondents in the age bracket of 18-35 registered very good level of knowledge on ICT.
Table 9 shows the level of knowledge in an age bracket as compared with the gender.

Table 9: Good-Very good Knowledge level across the age bracket

Gender	Age bracket	Average of Good-Very good knowledge level
Male	18-35	77.75%
	36-60	46.5%
Female	18-35	56.75%
	36-60	36.25%

From table 9, it is clear that the female are disadvantaged in comparison to their male counterparts across the age bracket even though they constitute the majority of the healthcare workforce in Laikipia County.

3.2.3. ICT Device usage for Daily Routine

It was established that Smartphones devices were the most frequently used ICT devices by the healthcare workforce in Laikipia. Other ICT devices used everyday by the healthcare workers included desktop and Laptop devices. Table 10 shows the device usage on daily routines across the gender and age brackets.

Table 10: ICT Device Usage for Daily Routine

Device	Frequency of usage	Male		Female	
		18-35	36-60	18-35	36-60
Desktop	Everyday	21%	14%	30%	4%
	Often	26%	18%	18%	11%
	At least once a week	6%	14%	10%	13%
	At least once a month	2%	6%	5%	4%
	Sometimes	17%	20%	10%	38%
	Never	17%	6%	11%	11%

Device	Frequency of usage	Male		Female	
		18-35	36-60	18-35	36-60
Laptop	Everyday	28%	16%	29%	4%
	Often	15%	12%	10%	4%
	At least once a week	11%	10%	11%	13%
	At least once a month	4%	6%	0%	0%
	Sometimes	13%	14%	18%	29%
	Never	17%	8%	8%	13%
Tablet	Everyday	4%	12%	13%	11%
	Often	13%	12%	13%	7%
	At least once a week	13%	0%	6%	2%
	At least once a month	2%	6%	0%	0%
	Sometimes	9%	18%	18%	16%
	Never	32%	8%	16%	24%
Smartphone	Everyday	77%	86%	74%	84%
	Often	5%	2%	8%	4%
	At least once a week	5%	0%	0%	2%
	At least once a month	0%	0%	0%	0%
	Sometimes	2%	4%	2%	0%
	Never	2%	2%	2%	2%

From, the table it can be observed that 81.5% male respondents used the smartphone devices for their daily routine as compared to 78% of the female respondents. On those who used desktop computers 17.5% of the male respondents used the desktop computers as compared to 17% of the female respondents. Figure 5, shows the distribution of technologies usage on the daily routine of the healthcare workers in Laikipia County

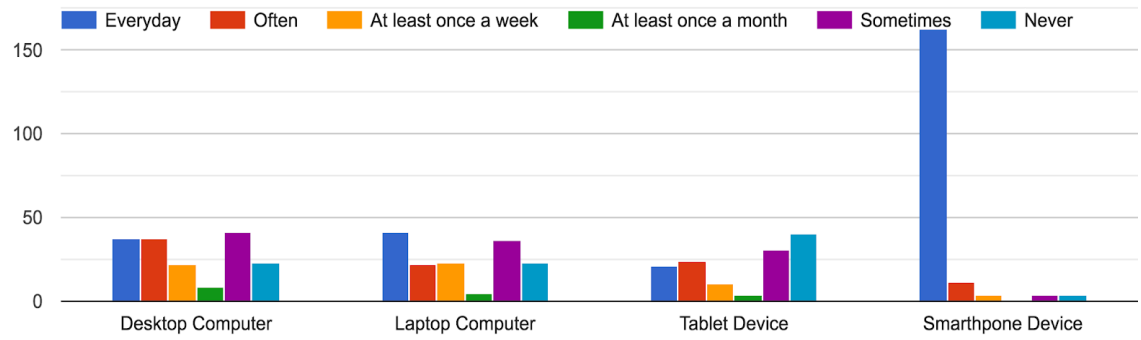

Figure 5: Usage of ICT devices in Daily Routine

The survey further established that most healthcare workers in the County were confident in the usage of Smartphone (94.1%). Workers were also confident in

the usage of Touch screen technologies (75.1%). Figure 6 shows the confidence expression by the respondents.

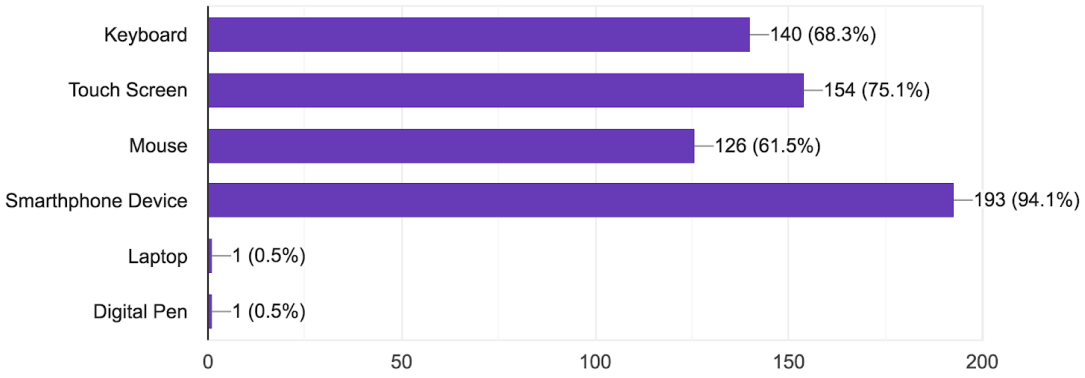

Figure 6: Level of confidence in the usage of ICT devices

3.2.4. Other Digital Resources that support healthcare in Laikipia County

The survey established that a number of digital resources that support healthcare delivery are available in the County. The most common digital resource was found to be Mobile Health Applications (52.5%). Health Information Management System (HMIS) was also found to be available in the county with 36.2 % of the respondents indicating they have the resources in their workstations. Figure 7 shows other resources found in the county.

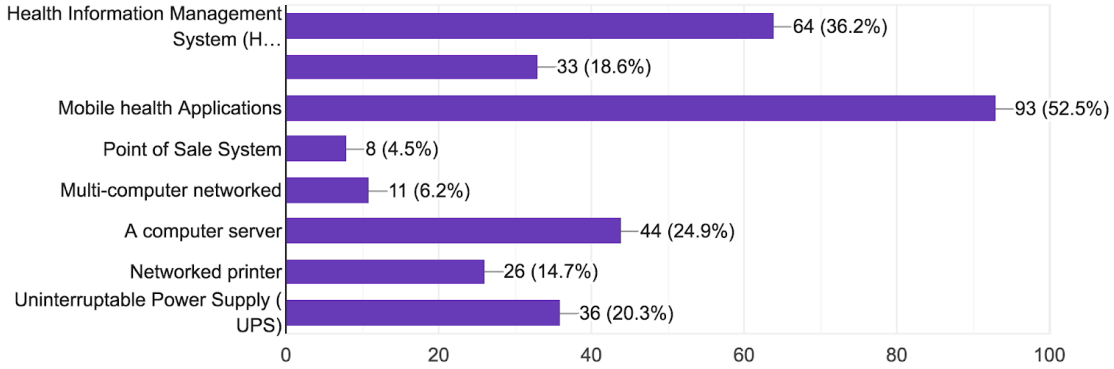

Figure 7: Digital Components found in workplace in Laikipia County

Since most of the digital resources require Internet connectivity, the survey sought to establish is the healthcare workers are having Internet connectivity and wireless access at their workplace. It was established that a majority of the workers do not have Internet connectivity nor do they have wireless access points. This may influence the level of digitalization in the county. Figure 8 shows the levels of connectivity in the county.

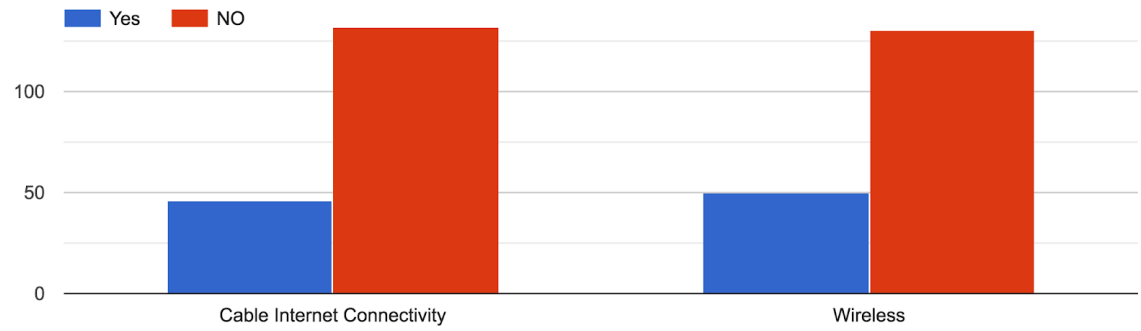

Figure 8: Internet Connectivity and Wireless Access at workplace

78.5 % of the respondents indicated that they used the Internet for purposes of seeking Information to promote health or prevent illness, 69.5% used Internet for communication purposes and 60. 5% used Internet for seeking Information about a medical treatment or procedure. This could point to the central role the Internet technology plays in the responsibilities of the healthcare professional in Laikipia County.

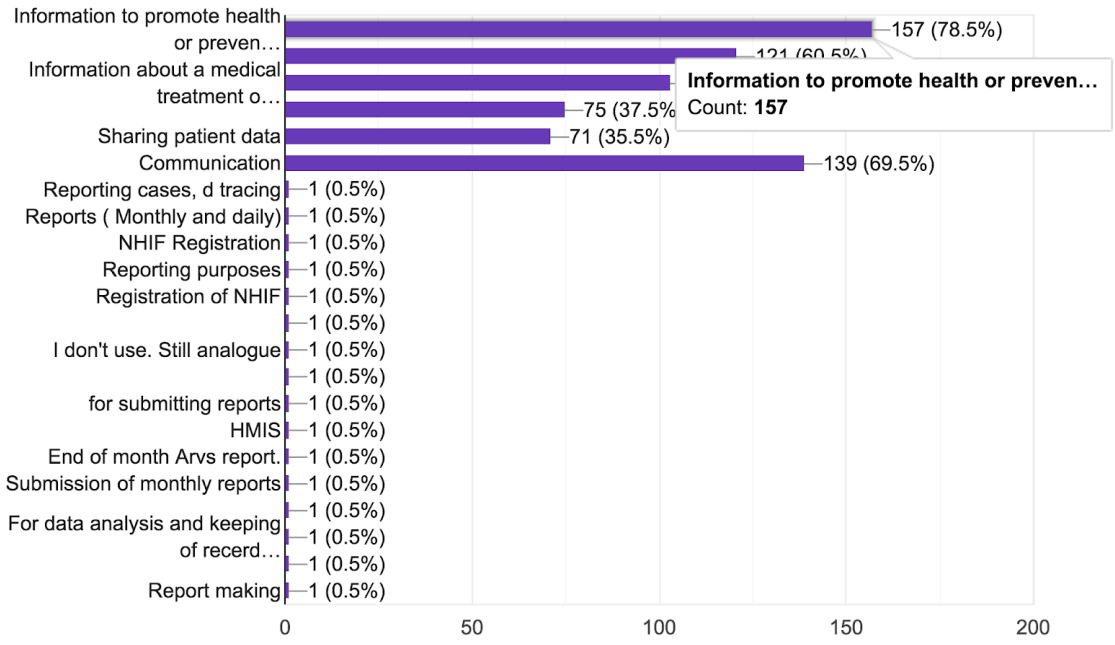

Figure 9: Reasons for Internet usage in workplace

3.3. Digital skills in Healthcare workplace in Laikipia County

3.3.1. Basic Digital Operational skills for Healthcare workers in Laikipia County

According to the MOH Standards and Guidelines[20] a healthcare worker is expected to have some basic digital operational skills to perform their work effectively in the modern healthcare environment in Kenya. To measure these basic skills, the survey adopted a digital skills measuring matrix as documented in report "*From Digital Skills to Tangible Outcomes project report" by Alexander et*

[20] MOH Standard and Guidelines for Electronic Medical Records Systems in Kenya (2010)

al[21]. Figure 10 shows the basic digital operational skills for the healthcare workers in Laikipia County. From the analysis it can be inferred that whereas a number of workers could be able to perform some basic operations, there is still a number who cannot perform the basic operations that involves the use of ICT. It is observed from the survey that on average, 22.4% of the total respondents do not have the basic digital operational skills to perform the tasks involving ICT technology in their workplace. 5.8% are marginally able to perform basic operations involving ICT devices in the work place. This shows a potential challenge in the digitalization process of the health sector in Laikipia County.

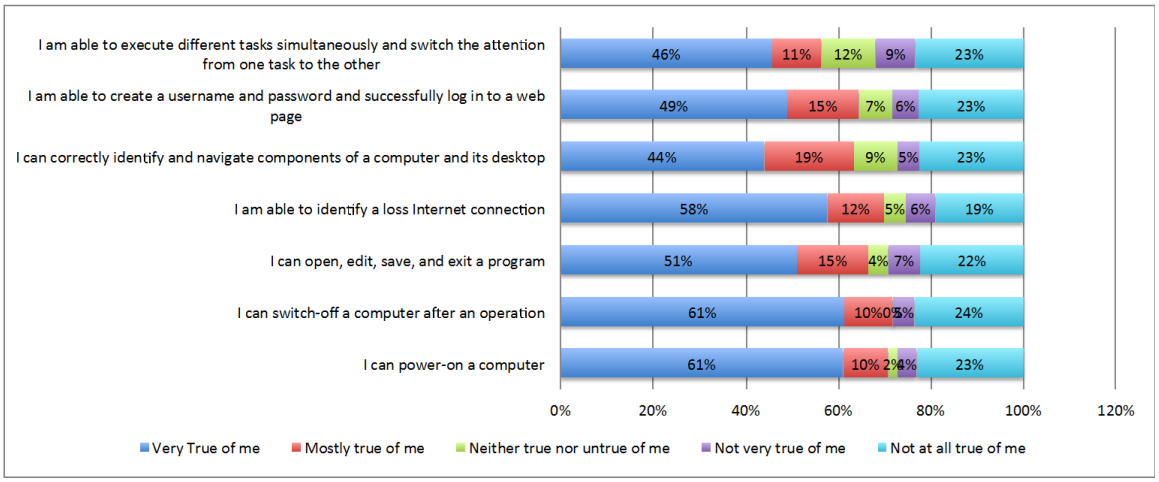

Figure 10: Basic Digital Operational Skills

3.3.2. General EMR System Knowledge

One of the key resources as identified by the healthcare workers in Laikipia County is EMR System. Moreover, EMR system is considered an entry point for digitalization of the healthcare operations. The survey sought to determine the digital knowledge level of the healthcare workers on the EMR system. It was established that on average 16% of the respondents have limited knowledge about the EMR system knowledge. Whereas 26.1% indicated they have good knowledge of EMR, it is till low for effective digitalization of the healthcare operations in Laikipia County. Figure 11 shows the distribution of the EMR system knowledge level in Laikipia County.

[21] Measuring Digital skills. From Digital Skills to Tangible Outcomes project report. Alexander J.A.M. van Deursen, Ellen J. Helsper and Rebecca Eynon (2014)

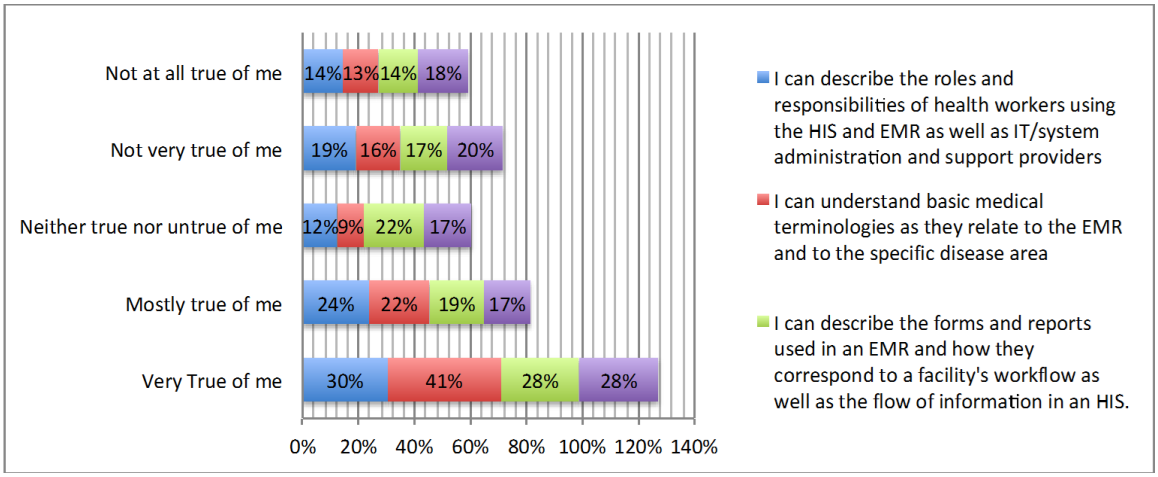

Figure 11: General EMR system Knowledge

3.3.3. Digital skills on Information Use

Healthcare environment is characterized by the higher level of utilization of information to make critical decisions in a healthcare set-up. The survey sought to establish the ability of the healthcare workers in Laikipia County to effectively handle digital information in their workplace. It was established that 12.1% of the respondents couldn't effectively use and handle healthcare related information as compared to 21.4% who indicated could handle effectively healthcare related information using ICT technology. This clearly shows a gap that needs to be filled through capacity building. Figure 12 shows Information handling in ICT enabled environment in Laikipia County.

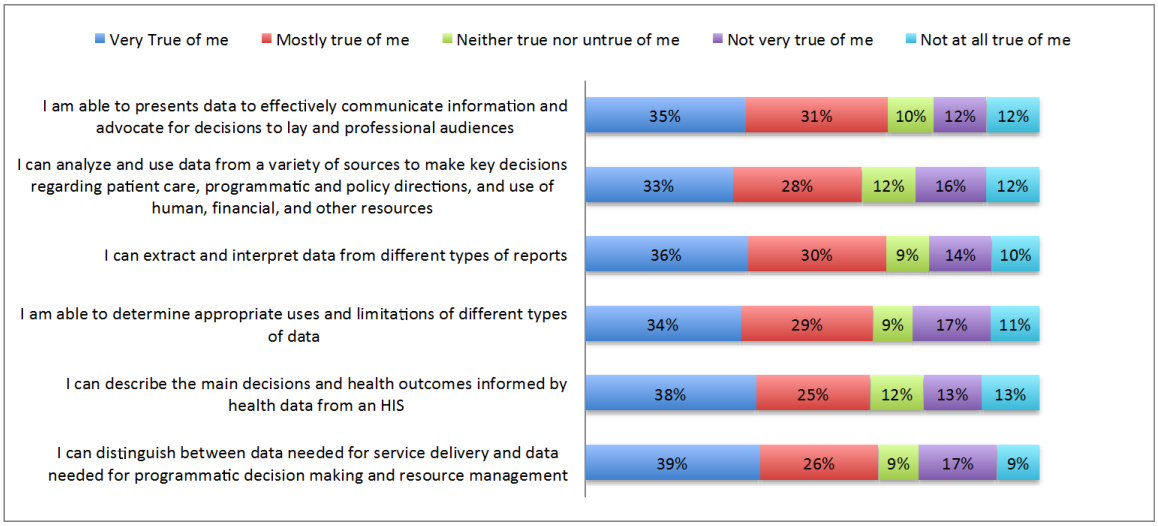

Figure 12:Information handling in ICT enabled environment

3.3.4. Skills on Data Quality and Confidentiality issues using ICT technologies

Data integrity continues to be a central theme in any automation process. The integrity of the data is dependent on the data quality and privacy/confidentiality. The data integrity is even more central in the automation of the healthcare environment due to the patient confidentiality principle. The survey sought to find out if the healthcare workforce in Laikipia County had the requisite digital

skills on how to handle data quality and confidentiality. From the survey, it was found that 38.3% of the respondents have the necessary skills to ensure data quality and confidentiality. Whereas, those respondents who are able to handle data quality and confidentiality issues are more as compared to those unable, the levels are still low. This shows a significant gap that needs to be handled through training on how to manage and handle data in the modern networked working environment. Figure 13, shows the skills on data quality and confidentiality handling in Laikipia County.

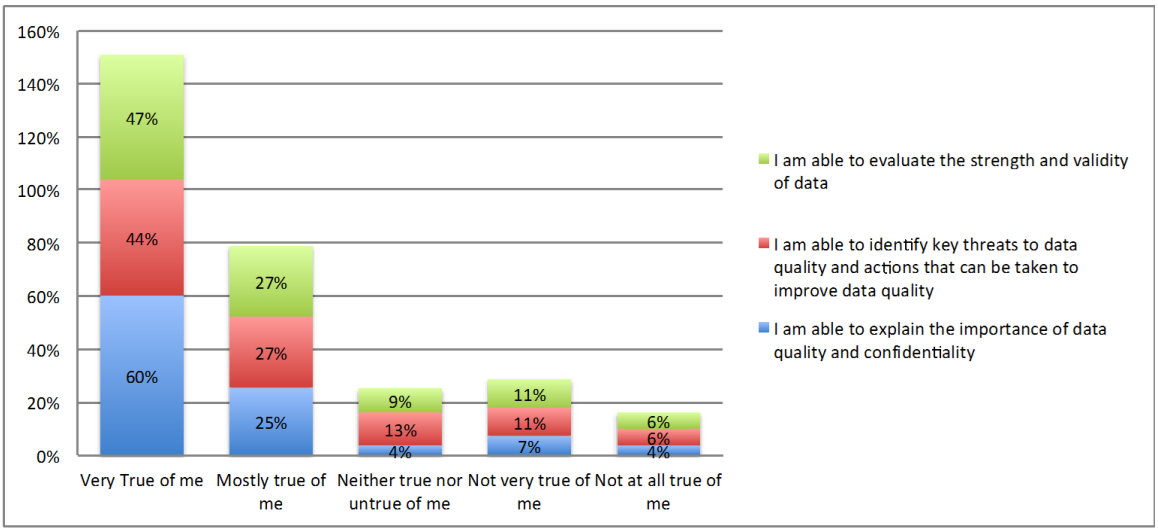

Figure 13: Digital Skills on Data Quality and confidentiality

3.3.5. Digital Communication Skills

One of the key usages of ICT technologies is for communication. In the healthcare workplace, ICT technologies are used to ensure exchange and sharing of information between the healthcare workers. This can only occur if the entire workforce is able to utilize the communication tools available to ensure no breakdown of the communication channels. The survey therefore sought to determine the competence of the healthcare workforce in Laikipia County to utilize available ICT technology to communicate with their colleagues. It was found that 44.7% of the respondents are able to use the ICT technologies to communicate effectively in their workplace. This further shows a gap that needs to be addressed to ensure the usage of technology is effectively utilized as a communication tool to enhance service delivery. Figure14 shows the level of usage of ICT tools for communication in the healthcare environment in Laikipia and figure 15 shows the ability to communicate effectively using the Internet mediated platforms among the healthcare workforce in Laikipia County.

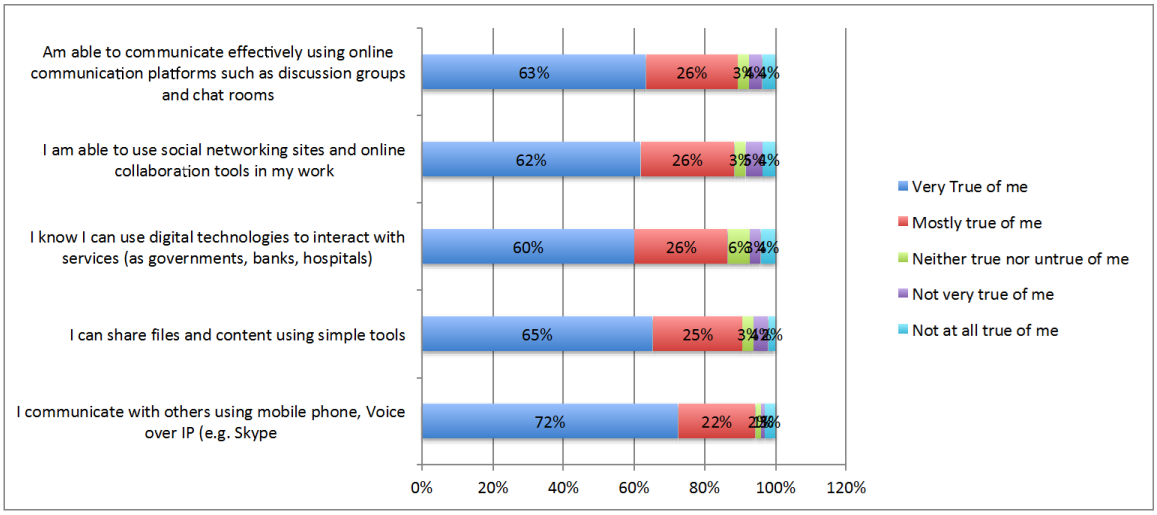

Figure 14: Level of usage of ICT Tools for Communication

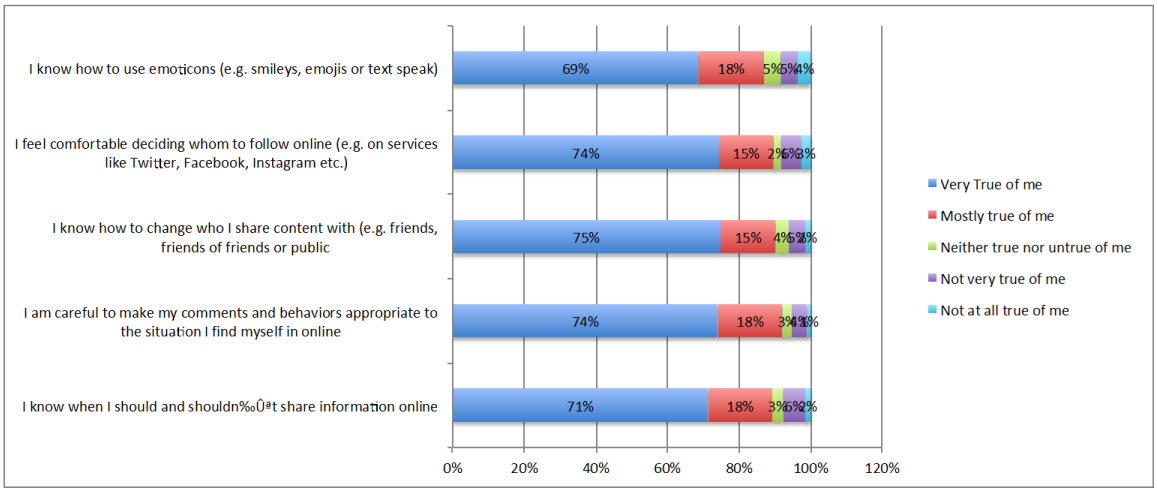

Figure 15: Communication using Internet-mediated Platforms

3.3.6. Online Safety Skills

In the current networked working environment where most resources are online, it is imperative that workers are enlightened on the basic safety skills they must possess to not only work effectively but also protect the resources transmitted through the Internet. The survey assessed the online safety skills for the healthcare workers for Laikipia County. From the survey, it was found that a majority of the respondents have some knowledge and skills to understand and handle the safety issues that may exist in an Internet enabled environment. Figure 16 shows the online safety skills distribution in Laikipia County.

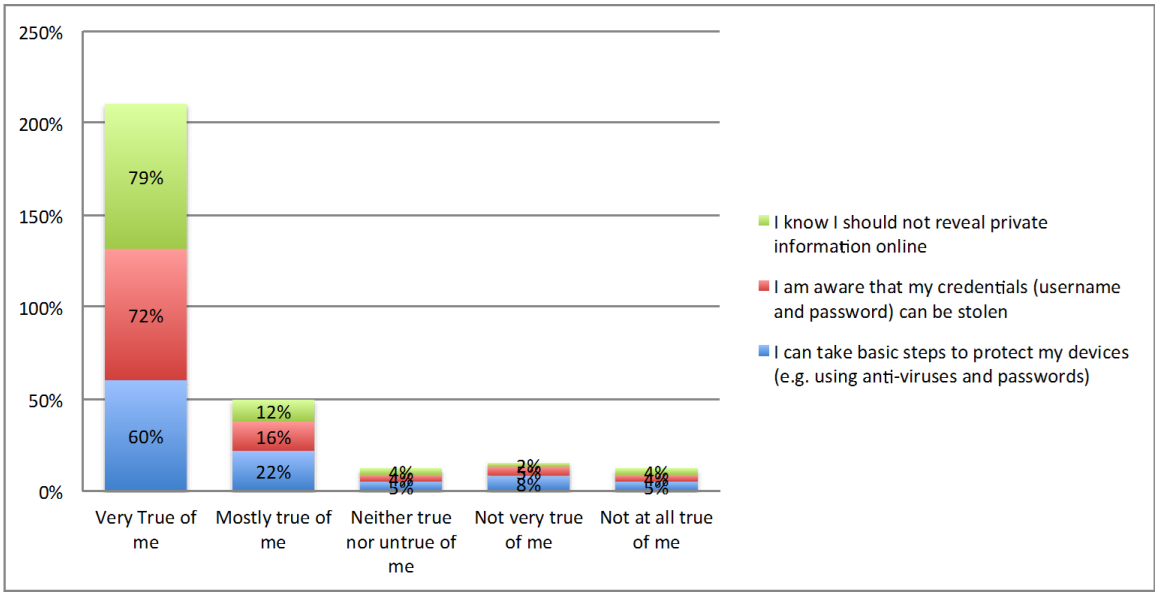

Figure 16: Online safety skills

3.3.7. Socio-emotional digital skill

Healthcare environments are characterized by sometimes long working hours with some extraneous undertaking. This calls for a good support mechanism to ensure the healthcare workers are emotionally well protected. ICT tools have been used to support workers to cope with the emotional issues associated with their work. The survey thus sought to assess the ability of the healthcare workers in Laikipia County to use the digital tools for the common good in the work place. Figure 17 shows the ability of workers to use ICT for the common good.

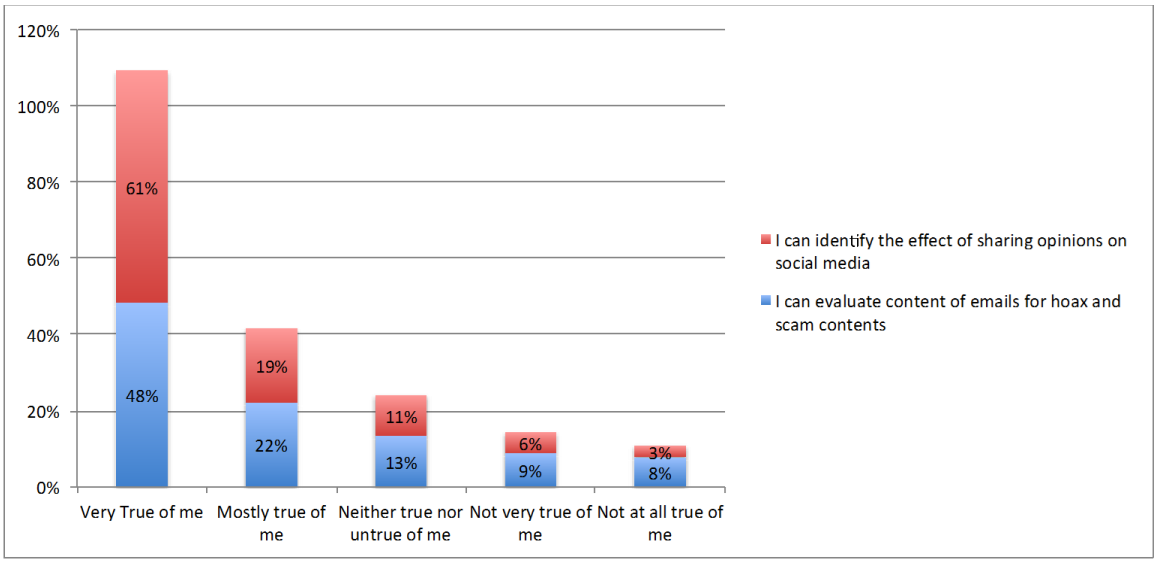

Figure 17:ICT for the common good in a workplace

3.4. Internet Skills

3.4.1. Skills for operating mobile Internet

One of the most revolutionizing Technologies that has permeated in the Kenyan society and generated great impact is mobile Internet technology. Therefore, the ability to use this technology for a healthcare worker is critical since the people who seek the healthcare services are either using this technology or are migrating to Internet enabled environments and platforms. It was therefore imperative to assess the ability of healthcare workers in Laikipia County to operate mobile Internet. From the survey, it was noted that generally the workers are able to perform basic operations associated with mobile Internet. A significant number of the respondents indicated they are able to Wifi Network (82%). This means they can be able to get connect in a networked working environment that uses Wifi technology. We still notice a few on the healthcare workers who cannot be able to connect to Wifi. This may present a challenge when such a technology is deployed in a working environment. Figure 18 shows the ability of healthcare workers to operate mobile Internet.

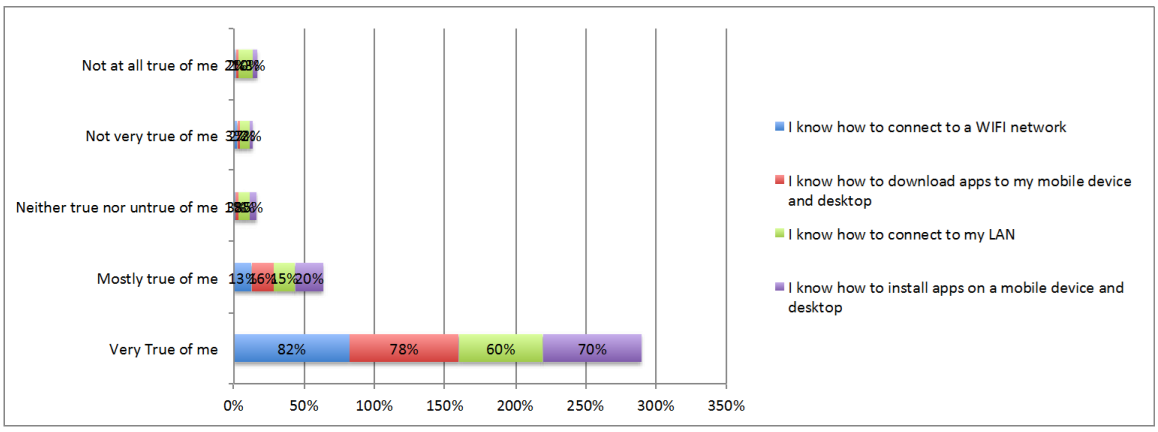

Figure 18:Operating Mobile Internet

3.4.2. Operating the Internet environment

The connected nature of the healthcare work and operations requires the working environment is structured to facilitate the seamless interaction among the workers. This can only occur if the environment is Internet enabled (internet-working) and that the ICT resources are able to communicate with each other. This will ensure follow of information and effective decision-making. The ability to work in such an environment is critical and therefore the survey sought to determine the ability of the healthcare workers to work in an Internet enabled environment. 60.7% of the respondents indicated that they are able to work very well in an Internet enabled environment, 17.5% indicated they can mostly work in an internet enabled environment, the rest (21.8) indicated they are likely not to or cannot be able to work in internet enabled environment. A corrective measure should be instituted by the Laikipia County management to capacity build the digital competences of the 21.8% to ensure effective service

delivery using Internet technology. Figure 19 shows the spread of the abilities of the healthcare workforce to operate in an Internet enabled environment.

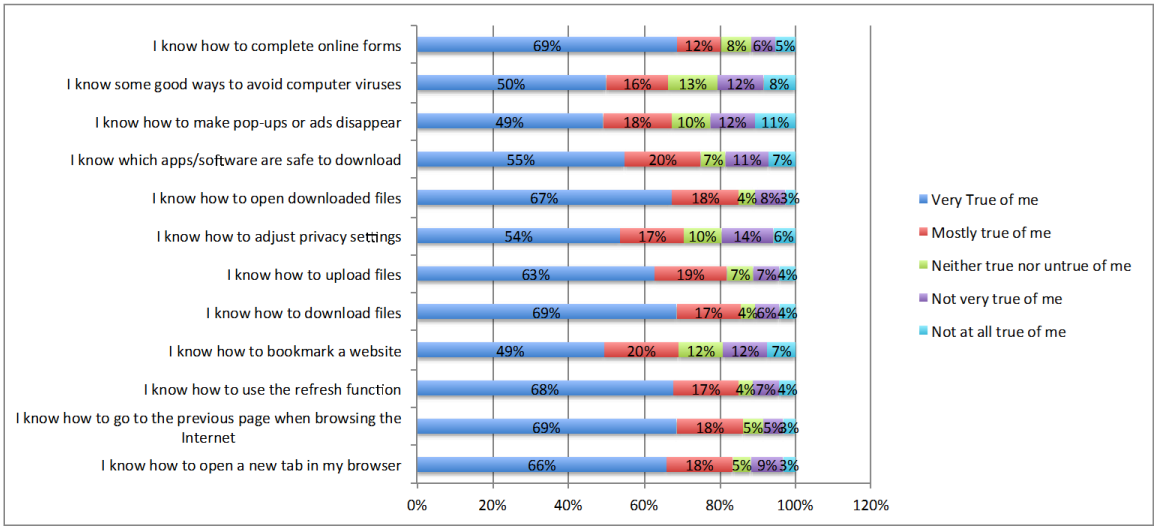

Figure 19: Working in an Internet enabled environment

3.4.3. Operating Internet-based search engines

With the advert of Internet technology, most organizations have had their resources stored in online repositories and databases. To access these resources, one needs to have the ability to navigate and locate the information needed using the Internet technology. The survey therefore sought to determine the ability of the healthcare workers to operate the Internet-based search engines to obtain the required information. It was established that most of the healthcare workers in Laikipia County have limited abilities across the measures to operate the Internet-based search engines. Figure 20 shows the ability distribution to use Internet-based search engines in Laikipia.

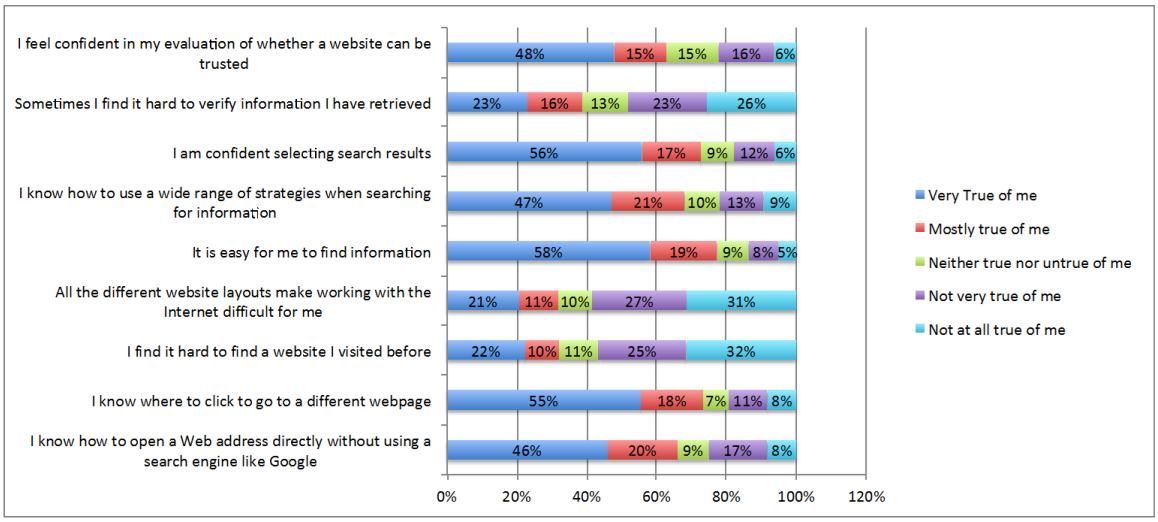

Figure 20: Internet-based Search Engines usage

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

In general, health professionals need ICT skills in their daily practices to benefit from technological advances, such as electronic patient records or quality indicator databases. In the context of the person-centred and inter-professional team-based models of care, ICT skills are crucial as technological advances – for example, patient-reported outcomes in mobile applications – allow patients to become more engaged in and self-manage their own care. ICT proficiency also facilitates communication with other caregivers, teamwork, and all forms of distance inter-professional collaboration.

The survey adopted an assessment approach that used international comparability methodology while taking into account the diversity of healthcare system and the variability of the roles and functions played by the different categories of healthcare workers in Laikipia County. The approach was able to include new types of healthcare workers in response to new technologies, new models of care and the changing needs and expectations of the population.

From the survey, it a number of digital skills gaps were established. Some these gaps are highlighted as follows:

- At 74% Smartphones are the most accessible ICT devices by the healthcare workers in Laikipia followed by desktop computers at 42.1%. Further, in overall it was established that most of the respondents have very good knowledge of Smartphones. Whereas this can be explained by the fact that mobile telephone in Kenya has expanded in the recent past and most of the phones are affordable, the challenges still exist given that most applications used in hospitals are still in desktops computers.
- Gender and age tend to influence the kind of ICT devices utilized by the healthcare workers in Laikipia County. It was observed that male in the 18-35 age bracket tend to be more likely to use of the ICT devices as compared to the female.
- It was established that 22.4% of the respondents couldn't perform basic digital operational tasks. This shows lack of requisite digital skills which effectively affect the utilization of other digital based resources in a healthcare set-up like EMRs.
- 12.1% of the respondents indicated that they couldn't handle information effectively using the ICT enabled devices. This could ultimately affect their work performance in the long run.
- It was established that 61.7% of the respondents do not have skills on how to handle data quality and confidentiality and yet they deal with highly confidential data that also requires high integrity.
- 55.3% of the respondents indicated that they couldn't effectively use

digital content and communication tools at the workplace. This effectively means communication can break-down if a person in the communication channel is not able to pass the message to the next person.

- 21.8 % of the respondents have challenges of working in an Internet-worked environment. This is due to lack of the requisite Internet operational skills.
- The skill deficit across the age barckets

4.2. Recommendations

Based on the digital skills user needs assessments and desire of the health department of the County Government of Laikipia to leverage on ICT to delivery on quality services to its clients/residents, we propose the following recommendations:

1. Provide some of the healthcare services using mobile-based health applications/systems since a majority of the healthcare workforce are very familiar with mobile devices and are able to access them. But to do this, there is need to develop BYOD policy and standards to effectively tackle challenges associated with non-institutional based devices.
2. Considering 42.1% of the healthcare workforce in Laikipia have access to the desktop and 44% have a good and above knowledge on the usage of desktop, we recommend the acquisition and distribution of the desktop as an ICT tool for the healthcare workers in Laikipia
3. Develop digital capacity building framework/modules to upskill healthcare workforces. Deliberate effort must be made to encourage female healthcare workers to take basic digital skills programs in order to bridge the work-gap which currently exist in favour of their male counterparts. The capacity building module for the healthcare workers could also cover the utilization of digital technology tool like social media on the dairy work of a healthcare provision.
4. Immediate capacity building programs on internet operating skills be mounted to enable those who are unable to use internet based applications catch-up with the rest so as to complete the operational-chain in the health provision in the county's health sector.
5. Mount training on techniques and mechanisms of collecting, handling/process of data to ensure data quality and confidentiality. This is very critical in this era where most of the data is stored online/cloud.
6. Regular training on existing/new ICT resources so as to have everybody on board.
7. As the health departments moves into the provision and the delivery of services using intermediated platforms and considering the limited capacity of it healthcare workforce on the online safety, we strongly recommend a capacity building program on cyber hygiene to equip the workforce with appropriate skills to tackle emerging cyber challenges.