THE UGANDA NATIONAL HEALTH RESEARCH SYMPOSIUM

'Digital Technologies for the Advancement of Health and Research Systems''

WEDNESDAY, 28TH MARCH 2018, HOTEL AFRICANA, KAMPALA

EDCTP

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UNHRO
Uganda National Health Research Organisation

UNCST
Uganda National Council for Science and Technology

UGANDA NATIONAL DRUG AUTHORITY
Safe Drugs Save Lives

IDI
INFECTIOUS DISEASES INSTITUTE

THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH
Mbale Regional Referral Hospital

THETA
African Solutions for Better Health

The Digital Health Symposium Report

Contents

Acronyms

ART	Anti Retroviral Therapy
BCC	Behavioral Change Communication
CDC	Centre for Disease Control
CREDU	Consortium for clinical research regulation and ethics capacity development in Uganda
DGHS	Director General of Health Services
DHIS	District Health Information System
DHIS2	District Health Information System2
DHO	District Health Officer
DSS	Demographic Surveillance System
EAC	East Africa Community
EAHRC	East African Health Research Commission
EAOSCH	East Africa Open Science Cloud for Health
EDCTP	European and Developing Countries Clinical Trials Partnership
eHTWG	eHealth Technical Working Group
EMR	Electronic Medical Records
FP	Family Planning
HDSS	Health Demographic Surveillance System
HDSS ID	Health Demographic Surveillance System Identifier
HepB	Hepatitis B
HIS	Health Information System
HIV	Human Immunodeficiency Virus
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HIWA	Health Initiatives in Workplace activity
HMIS	Health Management Information System
HRIS	Human Resource Information System
ICT	Information Communication Technology
iHRIS	Integrated Human Resource Information System
IT	Information Technology
mADDS	Mobile Assisted Data and Dissemination System

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MNCH	Maternal and Child Health
MOH	Ministry of Health
AHSPR	Annual Sector Performance Report
MoU	Memorandum of Understanding
MTN	Mobile Technology Network
NBI	National Backbone Information
NDA	National Drug Authority
NDC	National Data Centre
NIN	National Identification Number
NITA-U	National Information Technology Authority-Uganda
NMS	National Medical Stores
PNFP	Private Not-for-Profit
REACH	Regional East Africa Community Health
SAGES	Suite for Automated Global Electronic bioSurveillance
SDGs	Sustainable Development Goals
SMS	Short Message Services
SPH	School of Public Health
TMCG	The Medical Concierge Group
UBOS	Uganda Bureau of Statistics
UHMG	Uganda Health Marketing Group
UNAIDS	United Nations AIDS
UNCST,	Uganda National Council of Science and Technology
UNHRO	Uganda National Health Research Organisation
UNICEF	United Nations Children Education Fund
US	United States
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
VCT	Voluntary Counseling and Testing
VL	Viral Load
WHO	World Health Organisation

Acknowledgements

The first Digital Health Research Symposium in Uganda was rated a great success with over 80% attendance. There was great enthusiasm exhibited by participants from a wide range of organisations and disciplines.'

We therefore take this opportunity to thank our partners for the various forms of contributions made towards the success of the symposium. We are grateful to the European and Developing Countries Clinical Trials Partnership (EDCTP) for the financial support. We acknowledge the support provided by Dr. Joseph Baguma from THETA Dr. Grace Nambatya, Uganda, the Natural Chemotherapeutics Research Institute, Assoc. Prof Peter Olupot-Olupot, Mbale Clinical Research Institute (Mbale Regional Referral Hospital), MOH and Mr. Delius Asiimwe, Kabano Development and Research Centre. We would also like to thank Dr. Sam Okware Director General, UNHRO for spearheading this important event.

Our sincere appreciation go to Dr. Henry Mwebesa, Director General Health Services, MoH, Kampala who presided over the opening ceremony and Dr. Yonus Tegegn, WHO Country Representative who honored the closing ceremony. Their commitment to continued support of digitalized healthcare to ensure timely cost effectiveness of health service delivery in the country and beyond was a great inspiration to symposium participants.

The rich experiences and great insights shared at the symposium were the relented efforts of special resourceful persons that we must appreciate: Dr. Harriet Nabudere, Deputy Director General, UNHRO, who presented an overview of the Digital REACH initiative Roadmap which is a plan for a regional digital health system for the East African region; Prof Makumbi, School Public Health, College of Health Sciences, Makerere University who delivered a key note address focusing on digitalized health research. Our heartfelt appreciation goes to the presenters of the original research on Digital Technologies and speakers on the enabling environment for Digital Technology and Solutions in Health. To the participants, we commend your most knowledgeable contributions throughout the symposium

We are very grateful to the organizations and individuals that spared their valuable time, resources and knowledge to be a part of the steering committee. Mr. Delius Asiimwe (Chair), Dr. Harriet Nabudere, Mr Robert Apunyo, Mr. Mark Kashaija, Ms. Hilda Rukundo, Ms. Angella Asiimwe, Ms. Vivian Amito, Mr. Henry Tumusiime, Ms. Nambejja Cissy, Mr. Simon Dembe Kasango and Mr. Isaac Kyeyune. We shall always be indebted to you and look forward to sharing the fruits of your great contributions at all times.

1.0 Introduction

The use of digital health technologies is an emerging field and research on it in Uganda has been recorded since the early 2000's. [Google Scholar for 'digital' AND 'health' AND 'research' AND 'Uganda' gives a score of 45,000 hits, while PubMed using the same search string gives 19 hits. Both accessed 01 December 2017].

More recently, there have been a series of national, regional and global events that have brought digital health to the forefront of the public conversation. MEASURE Evaluation presented a report at a regional conference on a cross-sectional study to describe the health status and behaviors of mobile and vulnerable populations living in and/or travelling through 12 cross-border sites in the East African countries of Kenya, Rwanda, Tanzania and Uganda; (Kampala, June 20170. One of the key findings across all health facility programs examined (HIV care and treatment, PMTCT, ANC, immunizations, and TB treatment), was that health facilities could not easily distinguish loss to follow-up from silent transfers to a new health facility, particularly if the health facility was on the other side of an international border. The main barrier to communication with facilities in neighboring countries is the lack of a mechanism or platform to support such communication.

A follow-up international conference, "the Regional East Africa Digital Health RoadMap" was organised and held with participation from Uganda, Kenya, Tanzania, Rwanda, Burundi, USA, Canada, Netherlands, Belgium, and international organisations – United Nations Broadband Commission, Fio Corporation (global digital technology leader), UNICEF (CO), PATH, and Vital Wave; (Kampala, September 2017). The outcome was code-named the 'Digital Regional East African Community Health Initiative (Digital REACH Initiative) Roadmap' which has already been endorsed by the East African Health Research Commission's (EAHRC) governing board and approved by the EAC Sectoral Council of Ministers of Health. This is a Ten year, Digital REACH Initiative Roadmap that is already approved by a recent Summit of Heads of State for the East African Community (Feb.2018) which also directed its implementation.

The vision for the Digital REACH initiative, a 10 year Roadmap is an; 'Interconnected health system for a healthier and prosperous East Africa'. The desire is to have health systems that communicate with each other's Health Information Systems (HIS) for the East African partner states. The Mission is to; 'Maximize the power of digital health in East Africa by ensuring an enabling environment and implementing scaled, coordinated transformational and innovative approaches'.

In Uganda, the National Regulatory Authorities for health research; Uganda National Health Research Organisation (UHNRO), Uganda National Council for Science and Technology (UNCST) and the National Drug Authority were successfully awarded a 24-month EDTCP grant – the Consortium for Clinical Research Regulation and Ethics Capacity Development in Uganda (CREDU); (July, 2017).

The purpose of this symposium was to show case on the capacity, developments and framework on the basis of which the current e-health is premised.

The key objectives of the symposium were:

- To share information, kick starting a learning process and networking among researchers, regulatory officials, research ethics committees, policy makers, civil society, media, private sector and other stakeholders in order to improve the use of e-health instruments.

- To present an opportunity to participants to develop linkages to advance e-health at national and regional levels with the East African Health Research Commission (EAHRC)

The target audience included stakeholders from the health information and communications technology (ICT) sectors, Researchers from academia and other research institutions, policymakers, health managers and practitioners as well as civil society representatives. Government entities such as Ministry of health, Ministry of ICT and Ministry of Science and Technology, National Information Technology Authority (NITA-U), Ministry of Finance, Ministry of Internal Affairs, Ministry of Justice and Constitutional Affairs and Ministry of the Presidency were also targeted. Others were Private-Not-For-Profit (PNFP) organisations, Private Sector and Development Partners.

The sponsors of the first symposium on health research were Uganda National Health Research Organisation (UHNRO), Uganda National Council for Science and Technology (UNCST), National Drug Authority and Mbale Clinical Research Institute (Mbale Regional Referral Hospital), and MOH with financial support from EDTCP grant – the Consortium for Clinical Research Regulation and Ethics Capacity Development in Uganda

The organisation of the symposium was steered by a committee comprising of representatives from UNHRO, Kabano Research and Development Centre (KRDC), Natural Chemotherapeutics Research Institute (NCRI) and THETA

It is envisaged that regular annual or biennial health research symposia will be convened by UNHRO and Partners depending on availability of funds.

2.0. Opening Remarks

2.1 Welcome Remarks

The Director General, Uganda Health Research Organisation (UNHRO), Dr. Sam Okware extended his warmest welcome to all the participants and partners to the first ever Digital Health symposium in Uganda. In his opening remarks, he highlighted a number of development in Uganda and the East African region that support the development of e-health. Key among these are several top level meetings in the country in the last 3 or so weeks, and recent Summit of East African Heads of States that prioritized digital environment to address challenges of technology advances. The issue of use of digital technology for health and research came out very prominently. It was considered that once the whole region is connected via digital technology, it is going to be easier for all of us to dig up information and deliver services on a timely basis.

Dr. Okware pointed out that "e-Health" or "Digital Health" is part of technological advances intended to make life easier for everybody. In this respect is useful in medicine, logistics and research. For example it facilitates sharing research tasks, management of research; analysis of findings, knowledge evaluation, and knowledge translation. He reported that e-health and health research was one of the reasons that the East African Health Research Commission (EAHRC) held a meeting of stakeholders here on the March 26, 2018.

However, he cautioned that digital health can make life more complicated if it is not well handled. For example e-health can undermine professional standards and confidentiality since there is potential risk of data leakage or exposure. In cases where these are poorly managed they cause breaches in ethics. He noted that in advancing the e-health a number of challenges persist at the national level. Key among these is the host of stakeholders such as National Drug Authority (NDA), Uganda National Council of Science and Technology (UNCST), THETA Uganda, UNHRO as well as private researchers and academia among others. Consequently we need to agree jointly to work as a team, have a joint plan, stand together and produce a consortium for research ethics and management practices. The aim is to develop a strong collaboration and be able to use the technology, have well managed research in the country on timely basis in real time.

He reported that the CREDU project supported by EDCTP tries to answer most of these challenges and provides opportunities for training researchers in ethics. On the research front we are going to start to link up everybody to digital platform where we will be able to view your research, approve it and even make instant decisions to manage research in this country with a more reasonable, a more open, and in a more realistic way. He therefore took the opportunity to thank EDCTP, who considered their proposal to be very important and provided the necessary support for this symposium.

Given this background, the symposium has been organised for sharing information, networking and kick starting a learning process to improve the use of e-health instruments. It is expected that there will be better, faster regulation and faster approvals as well as real time reviews with digital technology. This is expected to lead to embracing of digital technology in all our work and its integration in research and health development.

The purpose of this symposium is to show case on the capacity, developments and framework on the basis of which the current e-health is premised. He informed the participants that they were here develop linkages to advance e-health at national and regional levels with the East African Health Research Commission which is coordinated by Dr. Harriet Nabudere, as the national focal officer.

In conclusion, Dr. Okware assured the participants of the Ministry of Health readiness for e-health and encouraged them to catch up with these developments in the country.

2.2 Opening remarks

Dr. Henry Mwebesa, Director General Health Services (DGHS), Ministry of Health was represented by Dr. Sam Okware, Director General, UNHRO. In his written Speech, Dr. Henry Mwebesa informed the participants that the government of Uganda has recognised the use of information and communication technology (ICT) in the national development plan II 2015/2016-2019/2020 as an enabler to improve the delivery of services to its citizens across its sectors. Equally the ministry of health has also prioritised e-health in the Health sector Development Plan 2015/16-2019/20 as a key enabler for supporting the health system in order to deliver good health to the population.

He pointed that "e-Health" or "Digital Health" refers to the use of information and communication technologies (ICT) in healthcare. This is in line with WHO has defined e-health as a cost effective and secure use of ICT in support of health and support of health related fields, including healthcare services, health surveillance, health literature, health education, knowledge and research. He reported that the National e-health Policy provides guidance on how to use ICT to facilitate improvement in the flow of information, through electronic means, to support the delivery of health services and the management of the health system in a bid to facilitate universal access to care, health sector efficiency and social transformation.

However, Dr. Mwebesa noted that the success of e-health is hinged on proper policy, planning, implementation and regulation. To ensure that the country realises the potential from e-health, it is important to establish an effective governance, effective management and effective implementation structures. He further informed the participants that currently e-health leadership and governance function at the national level is executed by the e-health Technical Working Group (eHTWG) of the ministry of health. He said, data connectivity and networking in Uganda covers 100% of the whole country including; urban, rural and other remote areas. This has been achieved through optic fibre connectivity for the major towns and wireless (mobile phones) networks to the districts, rural and remote areas provided through the government National Data Transmission Backbone, and the private sector fibre and wireless networks. Mobile phone penetration is over 57.6%, and internet penetration is close to 40% of the national population. The government and private sector have also invested in e-infrastructure that can be used to support e-health, like the National Backbone Infrastructure (NBI), the National Data Centre (NDC), and other computing infrastructure.

He reported that Uganda has made several policies and enacted a number of regulations to support the use digital technologies. The e-health draft policy has been developed to address the challenges unique to the utilisation of ICT for health. In this scenario ICTs are used for accessing health services and sharing health information, in order to achieve long term goals of the universal health coverage. The goal of the draft policy is to create an enabling environment for the development/deployment, and utilisation of sustainable, ethically sound and harmonised e-health approaches/initiatives at all levels of the healthcare systems in order to promote health and improve health services delivery. The other regulatory aspect is the data protection and privacy bill. The data protection and privacy bill includes among other things; the principles of data protection, data collection and processing, security of data, right of data subjects, data protection register, and complaints and offences when legislations have been breached.

He enumerated other major policies, accompanying strategies and pertinent supporting legal and regulatory frameworks for e-health, which are very relevant for discussion today;

Other Major Policies	Accompanying Strategies	Pertinent supporting legal and regulatory frameworks
1. National ICT policy of 2015 2. Rural Communications of Development policy, 2001 3. Uganda National Council for Science and Technology, national guidelines involving research into human beings, 2007	1. The National Development Plan II 2. The Health Strategic Plan 2015/16-2019/2020 3. The ICT Sector Strategy and Implementation Plan.	1. NITA-U Act 2009 2. Computer Misuse Act of 2010 3. Electronic Transactions Act of 2011 4. Electronic Signatures Act of 2011, 5. National Databank Regulation of 2015 6. Registration of Persons Act of 2015 7. The Uganda Communications Commission Act of 2013 8. The Uganda National Council of Science and Technology Act of 1990 9. Copyrights and Neighbouring Rights Act, 2006 10. National Record and Retention Act, 2001

This, he noted is the platform and background against which participants should be discussing this very important topic of e-health. As shown, there is a sea of so many stakeholders who need to be coordinated justifying the purpose that brought you here today, to appreciate the complexity of what country is about to embark on.

He further said the challenges that come out of this is that e-health leadership and governance at the district and community levels is not very clear. This has led to bottlenecks in information flow between the various levels of the healthcare system leading to poor performance and sometimes confusion. There other challenge is of several silos of e-health solutions that are not integrated. There are also isolated mobile applications developed by local innovators which have not gone fully to the market. While several telemedicine projects initiated in the country over the years have seldom gone beyond the pilot phase.

There are also many of the existing e-health services development partner funded projects and have tended to be proof-of-concept by pilots, where ICT is introduced or imported to demonstrate innovative use of technology in a limited context and they lack local ownership, support and funding for roll-out. The other challenge is of complementary infrastructure such as green and affordable back-up power to support e-health. There is need to consider options like solar energy and inverter systems to support e-health.

He pointed out that one of the biggest issues facing healthcare organisations is the ability to train, ability to attract and retain e-health and IT professionals. Most health workers and consumers are not unfortunately computer literate. In addition most of our staff overwhelmed by their routine work feel that ICT is an extra burden that will draw them away from their core duties.

Dr. Mwebesa acknowledged that digital health implementation in Uganda is at its infancy but affirmed that government is cognizant of the challenges and will make every effort to support the advancement and use of ICT for better healthcare quality, safety and outcomes. He emphasised that the digital technologies will improve the efficiency, productivity and effectiveness of healthcare delivery for the satisfaction of citizens, patients and providers.

Finally Dr. Henry Mwebesa took a special honour, to officially open the First Uganda National Health Research Symposium.

3.0 Overview of Digital Health System

Session Chair: Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST

Presenter: Dr. Harriet Nabudere, Deputy Director General , Uganda Health Research Organisation, (UNHRO) and National Coordinator, East African Health Research Commission(EAHRC)

Dr Harriet Nabudere presented an overview of the digital health system based on the Digital REACH initiative Roadmap which is a plan for a regional digital health system for the East African region. The overview she presented covered the vision, mission, outcome goals for this initiative, and an overview of the work streams or work packages as well as the way forward.

The overview, she said is a theoretical presentation about these systems intended to provide a basic understanding to symposium participants speaking to the different functions and perspectives of a digital health system. This is expected to tie in well with initiatives and original research done by some researchers testing digital mobile health tools and technologies some of whom are presenting at this symposium.

She clarified that "digital health" is synonymous with "e-health". This she said is essentially a way of augmenting health services through the use of ICT technologies that include mobile health technologies, health information technology, electronic health records, and telemedicine, among others. While the clinical health benefits for digital health are still being determined, data has started to emerge on its ability to reduce the cost of health services. Technologies on the other hand include medical equipment, computers, satellite communication, cloud technology, and mobile phones as well as other devices such as tablets.

The vision for the Digital REACH initiative, a 10 year Roadmap is an; 'Interconnected health system for a healthier and prosperous East Africa'. The desire she said is to have health systems that communicate with each other's Health Information Systems (HIS) for the East African partner states. The Mission is to; 'Maximize the power of digital health in East Africa by ensuring an enabling environment and implementing scaled, coordinated transformational and innovative approaches'.

The overall health system goals she noted is what we want these digital technologies to do for us or help us to do. Broadly, she said that there are a variety of usage scenarios for digital health evident at the country level and at the regional levels. For instance, individual Partner States are responsible for providing medical care throughout the country, including border zones; however, cross-border emergency surveillance and response capabilities ensure greater public health security on a regional basis. An example of region-level surveillance and response would be cross-border disease management for infectious disease tracking and community surveillance.

The EAC's EAIDSNet Initiative – a network of national ministries of health and national health research and academic institutions in East Africa – plays this role through the exchange and dissemination of information on emerging diseases.

Other regional examples include supply-chain management, cross-border access to insurance coverage, and integrated mobility tracking.

However, she emphasized that in order to realize the impact of digital health in any of these usage scenarios in a scaled and sustainable way, solutions need careful and contextualized implementation within a robust enabling environment.

The Population Health Status goal is to optimize data sharing, track regional priority patient indicators, and promote use of health research to support health policies and further health agenda.

The proposed East African political union is supported by the free movement of people, services and goods across the region relies on a healthy population. With the use of digital technologies and political will, the region can realize seamless access to improved healthcare services for all its citizens, market-driven distribution of the health workforce to achieve a healthy and wealthy East Africa. Additionally, the regional implementation of digital-health infrastructure, research findings and knowledge can be shared among Partner States to create efficiencies and capabilities that would be otherwise unattainable.

The Public Health Education and Awareness goal focuses on improving direct-to-patient care, community knowledge and services, patient education for preventive care, and behavior change. Through systems designed for health consumers, patient knowing when to seek care, where to demand for services, how improve on patient initiated behavior, provide-patient education and behavior change can be greatly enhanced.

The Health Worker Education and Training goal is an online intended to improve health worker services, capacity building, and performance monitoring to provide platforms for training, e-learning, knowledge sharing as well as provide standardized and recognized training capacity building position.

The Diagnostic and Treatment Support goal is to enhance sharing of health records to improve access, continuity, efficiency of care and support portability of health insurance at regional level. When online information and records are entered in a system, the next preferred provider can access information, telemedicine services and support capability of insurance. Needless to say, operational and access of information at different health system levels, and referral processes are made easy instead of people moving around with physical chits.

The Resource Allocation and Management goal is for development of a long-term sustainable financing strategy and facilitate resource planning, management and tracking that optimizes resource mobilization and deployment. This is to enable managers and policy makers to know what is the top level of various medical materials or supplies or drugs or even human resources at any one time at anywhere in real time for faster decision making.

The Surveillance and Response goal is to strengthen security by capacity building to prevent, detect and respond to infectious diseases and address one at a time, in a coordinated manner. This could be where community health workers using mobile technologies are able to report symptoms of an epidemic outbreak such as hemorrhagic viral fever in a specific location in the country to a decision maker for action. The goal is ensure a faster response to outbreaks and improved disease surveillance across the region.

The Supply Chain Management goal is to improve supply chain efficiency, drug procurement, and achieve economies of scale through better tracking and bulk purchasing. Operation health starters optimize the data for programs and track regional priority indicators at patient level and support health research and use of evidence to create policies and promote health agenda.

The Digital REACH Initiative focuses on creation of an enabling environment to create economies of scale that will result in efficiencies and capabilities that Partner States would not be able to achieve individually because of the cost of achieving such. The Initiative will direct the building and use of this enabling environment through a number of strategic health programs.

There are a total of 9 work streams. Work stream I is the Organization Formation and Management of the digital health system across the region envision to have a central hub and then national hubs at each country.

While each work stream will have its own leadership and management structure it will report to the central hub. The hub will also manage and pursue financing throughout the life of initiative through involvement of government, development partners and private sector.

Work stream II, Health Program is meant to drive the design and use of the infrastructure and common goods that are being developed through the Digital REACH Initiative to scale uptake and use of digital health for improved health service delivery and outcomes.

In its implementation health programs will drive the needs and mandate for the other seven work streams. In addition to establishing an East Africa Open Science Cloud for Health (EAOSCH) - (a real-time regional data warehouse for capturing, storing, retrieving, analyzing, and managing national and regional health data) it will drive the standardization of care. Health programs will also include regional and cross-border as well as country-specific implementations that will receive technical support and guidance to better align with regional health programs. This work stream also supports the application of disruptive technologies to benefit national and regional healthcare.

Work stream III is the Infrastructure that establishes the foundational technical components that support all the other work streams, allowing for timely data access, sharing and services and applications to function. This includes data dictionaries, registries, sharing platforms, and repositories. This work stream also defines the technical architecture to support regional implementations and regional technical support. It is driven by needs that have been identified through the health program work stream.

Work stream IV is the Services and Applications that supports the access, exchange, and management of data and content for the EAC region through specific service offerings and software tools used by Partner States. This includes coordination of health surveys to collect foundational data as well as support for quality assurance in the supply chain, data analytics and intelligence. This work stream also includes activities to publish and localize messages to health workers across the region. The design and use of services and applications is driven by needs identified through health program work stream. This shows how central is the health program work stream and its influence on how the technologies are used or how they are modified to adapt to the needs required at health service delivery.

Work stream V, on Leadership and Governance includes activities to coordinate the actions of Partner States and negotiate collaborative partnership with donors, research bodies, and the private sector. The work stream also supports other work streams through advocacy for policies, standards, and practices that support health programs within Partner States and across the EAC region.

Work stream VI, Strategy and Investment includes activities to align various EAC initiatives and negotiate agreements on behalf of Partner States, leveraging economies of scale to derive greater economic benefits for the region.

Work Stream VII, Legislation, Policy, and Compliance establishes common policies, guidelines, and protocols to facilitate digital health program implementation. An important function of this work stream is that it supports the alignment and harmonisation across all countries.
Work Stream VIII, Workforce supports building the capacity of health workers across the region. It includes working with educational partners and accreditation bodies to remove roadblocks to human resource sharing across borders. It promotes harmonised regional practices and guidelines for health curricula, licensure, accreditation, and performance management.

Work stream IX, Harmonisation, Standards, and Interoperability sets common and shared standards for digital health that enable cross-border healthcare across the EAC region.

This includes developing and promoting regional principles for data sharing, system interoperability, and digital tool design. Focus areas for this work stream include the development of unique IDs and EAC passport linkage with medical centres, as well as alignment of standards with country-level data policies. The unique IDs for East Africans is to help accessing more healthcare service anywhere in the region and of much later other social services.

Dr. Nabudere then reported on the way forward. A Ten year, Digital REACH Initiative Roadmap was developed in 2017 and the recent Summit of Heads of State for the East African Community has directed its implementation. The first and second quarter of 2018 is slated for its first 5 year Strategic Plan development and costing. Thereafter the third and fourth quarter is set aside for resource mobilization. Finally, it is planned that the end of 2018 will see the launch and execution of the Digital REACH Initiative Roadmap.

She informed participants that roadmaps and strategic plans are living documents. It is expected that this roadmap and the detailed strategic plans will continue to evolve over a ten-year period. A process to revisit and revise these plans in detail will be built in at the five-year mark. In addition, the EAHRC and Partner States can continue to keep the contents of this document fresh. This will be undertaken by the organizational management team detailed in Work stream 1.

In conclusion she said the roadmap lays the groundwork for the development of a comprehensive strategy and costing plan that can be used to align and coordinate donor, government, and investor financing based on the priorities set by the region. Financing strategies should consider a wide range of stakeholders, across the public-private continuum, identifying the incentive and value proposition for all those involved and forming partnerships that reduce dependence on one single partner. Developing a long-term financing strategy for the implementation of the Digital REACH Initiative is essential to its success.

4.0 Key Note Address

Session Chair:	Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST
Presenter:	Prof. Fred Makumbi, School of Public Health , Makerere University

Prof. Fred Makumbi, key note address focused on digital technologies with respect to health research. He appreciated the speakers on opening remarks and overview of the digital REACH initiative as well as the relevancy of the Symposium theme on advancement of health and research systems. He informed the participants that already the country is employing digital technologies such as routine HMIS collected using DHIS tool the purpose of which was to significantly improve service delivery to the clients or patients. In this respect the focus is certainly on healthcare delivery.

Prof Makumbi noted with concern that healthcare provision and research still lags behind business in use of digital technologies.

He cited the use of mobile phones and internet in communication that moved away from word of mouth, to letters, to landline telephones, to faxes, to mobile phones, internets and what's up. One other example is of that of flight online check in that reduce the amount of time you have to be at the airport to process exactly that. Again health has not moved as fast as business where mobile money is operating everywhere. Yet health is an important thing that even sending mobile money one ought to be healthy. So, why do we need digital technologies? Drawing on his experience of about 25 years working with a program in Rakai district focusing on HIV research, he reported that there has been a move away from the use of paper. The timely delivery of your research data is as good as the study findings he asserted. In 2007 when they did health research in Rakai on circumcision they found out clearly with orange farmers that male circumcision was able to prevent HIV acquisition among none infected. Had they not been relevant technologies and they were using paper, it would have taken them maybe 10 years and perhaps the research findings would have been irrelevant but thanks for the digital technologies that enabled timely delivery, he concluded.

This symposium, he said is not about promoting modernisation but tools that ensure timely delivery of evidence for those in research that provide appropriate evidence for policy to program and policy makers in a timely manner. A case in point is the researcher who is interested in injuries surveillance. He is looking at a possibility of working with police to be able to get traffic accident data electronically. Since much of the data is never reported in the system that information is considered useful to those constructing roads and in identifying hot spots for accidents so that police can be vigilant and prevent such unwarranted accidents.
He guided the participants on the mind set with regard to digital technologies that computers are not merely laptops or desk tops which requires a big budget. He said that currently computers have been squashed in these small items called SMART phones that has enabled researchers to move the data research tools from paper to electronic form.

He said in one of studies he is involved in, data is being collected from 206 health facilities all over the country using smart phones, goes into the information cloud and in less than a day we are able to know things that would have been known possibly 5/6 days later.

Apart from data collection, there is technology advancement in analysing the data that have been collected. These systems are overtaking data entrants which is a good thing in terms of efficiency but reduces employment. In Uganda where 70% of the population is below the age of 35 and 80% of these don't have jobs, such technological advancement poses a considerable challenge.

Prof Makumbi, presented an elaborate use of digital technologies under the Performance Monitoring and Accountability 2020 a global project in about 20 countries. This is a collaborative project between the School of Public Health, Makerere University, John Hopkins University, MOH and Uganda Bureau of Statistics (UBOS). The project designed in 2011 was meant to see how they could increase availability of contraceptive use, family planning to over 120 million women globally. The challenge was how to monitor whether the money put on table is creating an impact. The survey is being conducted among females in the selected communities as well as assessing supply and access of Family Planning commodities in health facilities.

Finally it was agreed to monitor in an innovative manner using digital technologies to pick the data working together with UBOS in terms of selecting communities for the survey and MOH for the required indicators and Family Planning (FP) stakeholders. In addition, working with districts as well as local communities to monitor and generate evidence for the first since 2014 it has been possible to speak to the MOH programmers and inform them about the redistribution mechanisms of FP commodities. The survey identified stock outs areas which don't have distribution mechanisms and MOH know by use of this evidence it improves healthcare delivery.

He said, using the system called mADDS a mobile assisted data and dissemination system, enables one to overcome the challenges and problems of paper based such as data collection, data entry and many more. Using these smart technologies which programmed with ODK, one is able to minimize to a great extent, many of the errors and have quick rapid reports as well as feedback.

When data come in, it is aggregated, analyzed, disseminated and get a feedback. In 2014, the focus on FP primary indicators. After dissemination, the teams asked us to provide more information on sanitation and hygiene.

After feedback more information is generated in next surveys to inform the programs and MOH and other stakeholders to make the necessary changes. Using digital technologies, Uganda Bureau of Statistics (UBOS) was able to share out the data information of Demographic Health Survey of 2016 within 5 months which previously would have taken 1-2 years.

. Makumbi enumerated a number of key advantages that come with use of digital technologies in research. One is the eliminating physical storage of the tools and the questionnaires which has cost implications. The second is the speedy turnaround and frequency of results, but also the quality definitely improves because when an interviewer conducts business and keys in information, you are able to see whether there is an error or not, and be able to follow them up other than dealing with paper to deploy them and send a Quality Controller to the field. The data platform is very traceable and mobile assisted data and dissemination systems is affordable

He informed participants that people in Uganda have the ability and the skill as long as they are exposed to what should be done. This is evident that after one training, our partners said Uganda is one place they don't want to come back because the teams here know what they are doing. So we have quality human resources in this country what we need is to identify what the issues are, and assign them what to do. Since 2014 we have come out with 6 surveys and 80% of the ladies are still the same. Even if we do this every one year, when you call them to come up they still come thereby creating a critical mass in use of digital technologies in the country.

Prof. Makumbi noted that though digital technologies are critical in advancement of health and research systems, a number of challenges persist. The use of digital technologies begins with significant training for people to appreciate how to use them. And of course you program all these tools on the phones, using the Open Data Kit, however this significantly reduces the bulk of about 5,000 women doing interviews using paper based interviews. In this particular project we were working in a 110 enumeration area and interviewing females. So we looked for females in those enumeration areas, to be the interviewers. These had to be ladies with education level of senior six and above who have ever used smart phones. We could only get about 60% and the other 40% were ladies coming from such communities but who were residents elsewhere.

The deployed enumerators in the communities interviewed women in selected households, people responsible at research points. Using smart phones we are dealing with 110 enumerators and that information is downloaded at the School of Public Health (SPH), as well as to our partners John Hopkins in real time, and we can provide a feedback to the ladies who are collecting data in the community to rectify issues quickly. Then data can be analysed, visualised and then can be shared and disseminated. However, Prof. Makumbi cautioned participants that use of a smart phone does not guarantee quality data and the processes whether paper based or digital technologies you still need to do quality assurance and quality control.

There is an issue of cost. One can argue that you have to buy smart phones and pay for internet connectivity. Equally an average well designed paper questionnaire will be about 10 pages calling for a discussion on cost efficiencies and cost benefits. However, the long term cost effective of smart phones that cost around $143 in 2004 and are still being used usually once in a year does not match the cost of paper, printing and photocopying as well as handling and storage.

The inadequate supply of electrical power is another challenge. About 30% of Ugandans do not power in their households which makes charging of digital technologies a problem particularly in rural and remote areas. However, the teams have improvising by using solar power and power banks making it possible without giving lots of excuses to really roll up and embrace and engage the use of digital technologies.

Confidentiality; of course people sign consent forms like any other research putting approvals from the various authorities, research assistants are being trained in ethics, and publically the letter is shared but only after being identified.

On the issues of security, SMART phones are exposed to theft and this particular project has lost 2 phones so far. Though by programming, once data has been sent to the cloud, the phone memory clears all that data. Theft of tools as well integrity of the cloud service providers remain security issues for information being collected. While its unlikely to eradicate them, concerted effort is needed to minimize them. There are many cloud providers who are providing oversights where the data goes into their control and may end up giving away the data, inadvertently or because of ignorance.

On the way forward, Prof. Makumbi said that there is need to continue ensuring quality assurances and training as well as quality control. The supervisors go through this with control teams in the field to be there to ensure that they do physical follow up. So regulations ought to come in and ensure cross training. The School of Public Health now has got masters in health informatics and across Makerere University main campus they have ICT training, the issue is to bring these together to make a difference? It has been identified as a problem and the program masters in health informatics in Uganda was started that would enhance and speed up with digital technologies for advancement of health.

On the issues of ethics stakeholders need to start thinking about how to handle it without stalling the research. Related to this are issues of data sharing with partners all over the world. There is need for guidance in terms of laws and policies that can help us strengthen this and minimize the risks as have been indicated.

The dissemination of results is still very traditional where it is expected one to come communicate the results which requires you to spend so much time in various places. There is need to move away into embracing the electronic disseminations sharing data and results on the website and other digital spaces.

Prof. Makumbi said that this could be one of examples and that most researchers here have probably done similar surveys. In the event of multiple players trying to do the same thing, there is need to ensure integration. So integration is extremely important because it is one thing to use technologies to have all the data available, but can we utilize it? Data usage has been a huge and continues to be a huge problem. So that may not be part of this yet but extremely important because the end point may not be availability of that information through digital technologies, but are we able to use it to advance health and research systems. Prof. Makumbi concluded with words of encouragement to participants. He said that it is going to be very feasible to employ digital technologies and requested them to continue discussing and doing things that will take us forward irrespective of the challenges.

4.1 Plenary discussion: Digital REACH Initiative Roadmap and Key note address

• It was observed that there has been a lost opportunity of prevention in the health sector that has to start from the community. There is need to look at patients as co-producers of health other than the usually information that we give that pits them as mere receivers which does not permit them to have a role and responsibility for their own health with regard to prevention, reporting and advocacy. Key challenges that have been found to undermine this critical area are failure to generate qualitative indicators, be it on maternal and new born health, DHIS and even family planning. The other is ethics and rights of consumers as mentioned. The opportunity is now for stakeholders to examine the kind of information, but also empowerment of community to take over to prevent and monitor as well as hold us accountable.

There was concern on the usual bureaucracy where issues take time to get implemented. The question was are the possibilities that the Digital REACH Initiative road map presented here have software and systems to permit most organisations represented in this symposium to fast track most aspects of this roadmap?

• The issues of whether there are any plans to change the mindset of some of the health workers especially in terms of training and education was raised. It was observed, much of health workers training is face to face versus electronic and wonder what concrete program can change that kind mindset of some high level and other agitated health workers when you talk about changing from face to face to electronic.

• The presentation on the overview of the Digital REACH Initiative roadmap seemed to focus on aggregated data such as that collected by DHIS tool. While this is appreciated to have taken big strides or even to have that to manage our data, but wondered whether there are intentions or plans of collecting individualised data at facility level. Apart from aggregated data, implementing medical records at the facility level have advantages in providing quality data in a fast way for decision making at service delivery points.

• Diagnosis and Treatment Support is one of the goals of the roadmap. Given that each health facility has their own identifiers for their patients, the question is how are we going to manage to integrate these systems with the digital system that you are proposing such that you can facilitate the patients to be treated across the borders.

• Experience working with communities show that a good number of people seek care from private sector. Most people first go to the private sector before they come to public health facilities but private sector service providers did not come out clearly in the framework presented.

• Most of the interventions in Uganda have challenges of implementation in terms of sustainability with most never going beyond a pilot stage. Now that this is at the level of the East African Community, what strategies are in place to address that anomaly. In addition there are so many interventions running say 3 counties in a district or 2 districts supported by our development partners but don't see scale. They also lack government ownership to sustaining them in terms of investment, but also in terms of human resource. Given this scenario what can be recommended to an East African country like Uganda to buy in and implement?

Responding to the issues of cloud security, Dr. Nabudere narrated the mobile money technology that was actually discovered by a Kenyan. As a regional innovation, initially people wondered how one can put money on the phone and it is safe? However, currently we are using it and security features have been integrated into the systems to protect data, information and passwords. While this is not foolproof as already pointed out by Prof. Makumbi, even when Pentagon and Google in US can be hacked but measures continue to be made towards that. Knowing that we live in social systems that are not entirely perfect we need to keep improving. When a system is designed it has security and privacy features making it possible to take advantage of these technologies. It's a balance between the pros and cons of these technologies. Certainly we benefit more from them when we use them than when don't use them and the way forward is to mitigate the risks as new features and ways of protecting data and information emerge.

The inclusion of consumer qualitative data, calls for system design to improve participation of the community in terms of contributing to information systems. Having a system that actually allows other users, who already have IDS, it is possible to be identified and be given specific permissions within the systems, perhaps to enter information but not may be to enter other people's spaces and edit information there.

Certainly bureaucracy, is expected in such a big system. The roadmap recently adopted by the EAC heads of states who directed the ministers to go ahead and implement is envisaged to be realised over the next 10 years. It is also envisaged to involve a number of partners such as development partners, private sector and civil society organisations that will need to communicate with each other and the central DHIS2 operating system for the MOH. All those players really need a regional management structure guided by strategic plans. This will be responsible to identify the various partners at national level, and they will participate depending on expertise in this field because they all have various expertise and experience in this area. For example there is one player who may be presenting today, something called smart applications. They develop clinical software systems and they have their own servers where they store patient data, data not just on patient condition but also on health insurance packages. They provide access to these data for a number of private healthcare providers purchasing these services.

In the case of education and training while the change seems difficult, this system will be good for virtual education and training services for health workers; albeit practical medical and clinical exposure within facilities is still required for training. The online education could include pre-service and in-service training particularly for achieving professional development. Online courses are very many and exist in other systems around the world from which to take advantage of without having to 're-invent the wheel'.

To avoid bias, researchers ought to get it correct right from the design and implementation of the study in order to have very clear quality control of assurances. Digital technologies may not significantly act on the bias issue. It is how you train and how you do your quality assurance and quality control that really matters. For this specific survey, the ladies much as they interview people from the setting where they come from because of language, we endeavour to train that in the event of an interview with anybody they are related to or they know very well, they excuse themselves and the supervisor takes over.

We have electronic health records in using ICT technology in provision of healthcare services.

It is not just the aggregated information at the centre for HMIS but right from the point of care to diagnose and treat patients. When a patient arrives at the reception, he/she is given an identification number whose information is entered in the system. The identifier indicates whether the patient is registered with the facility or registered with a particular insurance program, the kind of scheme, who is paying and other information on the patient. This so far is working well in the private sector and needs to be extended to the public sector.

The process is that the doctor examining the patient enters information, may order for some lab investigations if required. The information then goes to the lab for specific investigations that have been ordered. The patient moves from the doctor's room to the lab and required tests are made and results are entered into the system. Where drugs are prescribed, the patient record goes to the pharmacy where the patient's identifier indicates drugs or medication to be dispensed. Ideally this has been found to work in networks of facilities under the private sector and helps eliminates movement of health workers and paper work between various departments/units and also between health facilities.

This is known as seamlessness of provision of healthcare services with no interruptions with physical paper referral notes and done in real time. The moment information is posted by a provider it is immediately available on the system. Of all information entered by the doctor, the only information available to the laboratory staff is the investigations ordered, while pharmacy staff can only access information on prescriptions. Doctor level information is only accessible by other doctors.

At the regional level, we could have a regional identification number for you to access those services in the region. Again, the integrated health information systems are across the countries, a doctor in Kenya, can access a doctor's information about me in Uganda, a lab or pharmacy staff cannot except for the information that is pertinent to the task they are required to perform. This provides some level of protection for information access and permissions in delivery of health care.
The regionally registered patient or client identifiers will be used to access services at a regional level. Though we are currently using different identifiers for various services, if that comes through and the national government now decides that is the identifier going to be used for services both at national and regional levels then it is simply becomes that.

The answer to the question on whether this intervention is likely to go beyond a pilot phase given the required resources is most likely yes given the political will and donor interests. The digital REACH initiative roadmap has had high level political commitment at the level of EAC heads of states recently in February 2018 when they met in Munyonyo Resort, Kampala and committed to this roadmap infrastructure and financing. Key donors at the meeting also committed to support its implementation over the period of 10 years. Some funding has already come through to enable implementation to start for this year.

5.0 Original Research on Digital Technologies

5.1 Sub-theme: 1:	Disease surveillance, Disease outbreak Detection and Response and; across border mobility and disease tracking
5.1.1 Topic:	Suite for Automated Global Electronic bio surveillance, free soft ware tools for Disease surveillance in developing countries

Session Chair:	Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST
Presenter:	Mr. Derrick E. Mimbe, Makerere University Walter Reed project

Mr. Derrick Mimbe, Manager for the Emerging Infectious Diseases Program, Makerere University Walter Reed Project made a presentation on the Suite for Automated Global Electronic bioSurveillance (SAGES). SAGES he said, was developed by the John Hopkins University in the US in partnership with the global emerging Infections and Surveillance System that is department of Defense among others. This system is an open-source collection of modular flexible, freely-available and has software tools for electronic disease surveillance that can be used in resource-limited settings. He further elaborated that SAGES tools are interoperable meaning it can interface with various platforms for existing surveillance systems providing a platform for efficient resource use and better compliance with not only the WHO International Health Regulations, but also the global health security agenda.

SAGES system collects syndromic data; fever, cold, flue, and enables analysis, where one is able to conduct further investigation. SAGES is a customized version of the Open Electronic Surveillance System for Early Notification of Community based Epidemics (OpenESSENCE). It is has a data analysis software which is in full a visualization application on the client side and is used to monitor disease syndromes and also formally in diagnoses to help rapid identification of unusual disease events in the population.

Mr. Mimbe elaborated on how the SAGES system works and how it can interface with existing surveillance systems say in Uganda or any other developing country as well as provide a platform for efficient resource use. The SAGES tools comprise of three stages; the first stage is data collection stage, second is analysis stage and finally visualization and communication stage.

He informed the participants that SAGES is designed to work with a simple phone or an Android smartphone placed at health facilities to collect aggregate data that is normally summarized in a logbook like the HMIS system. The data is then sent via SMS to a receiver phone/Android smartphone that is place at work station where it is fed into a database system on a server. From this database system this can be connected to various computers and at a click of a button various users look at the data and to see if there is anything ongoing and a statistician can actually analyze the data.

The data report and system coding are kind of short message on phones that have been integrated into the system to capture information on health centers; status of the patients and whatever symptom or syndrome is affecting the patient.

The pilot activities of this project were done with the Uganda Peoples' Defense Forces (UPDF) in Uganda, and the defense forces in Kenya. It provided valuable insight into how electronic disease surveillance systems can successful be used in a resource limited environment. And also how patient information system can be sent on a daily basis via SMS, using standardized texting protocols and abbreviations at a minimal cost.

He concluded that, SAGES system is intended to enhance electronic disease surveillance capacity in resource-limited settings. And the suite of tools are expected to improve and provide real-time disease reporting and timely response.

5.2 Sub-Theme:	Innovative technologies and solutions for improvement of health service delivery and outcomes
5.2.1 Topic:	Improving Retention in HIV Care and Treatment services through the Development of a Network of ART Clinics within Fishing Communities on Koome Island, Uganda

Session Chair:	Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST
Presenter:	Dr. Francis Kiweewa, Makerere University Walter Reed project

Dr. Francis Kiweewa presented an on-going project in the fishing communities to improve retention of HIV Care and treatment services through a META-ART clinic approach. This project is funded through the Military Infectious Disease Research Program of the US military HIV Research program in collaboration with a PEPFAR by the Henry M. Jackson Foundation for the Advancement of Military Medicine.

He reported that the National Strategic Plan for HIV/AIDS in Uganda lists fishing communities among the key populations and key populations that is at very high risk of acquiring or transmitting HIV. Other key populations listed include commercial sex workers, men have sex with men and discordant couples among others. However, in the benchmark notes of the Strategic plan, you find data to be determined meaning that there is very little information about these communities. Yet HIV incidence in fishing communities is about 4.9-5.0/100 (which is 4-5 times the national average).

He elaborated that several factors contribute to this increased vulnerability for fishing communities. This segment of the population keep moving from place to place searching for fish. The high prevalence of high risk sex, high prevalence of commercial sex work, poor health seeking behavior as well as the poor infrastructure for health services and fatalistic attitudes where they think about HIV being less fatal to them than drowning add to high risk to HIV infection in fishing communities.

Consequently, he noted that access to care for these fishing communities is limited due to inadequate health care system (few health facilities, and often the hard to reach locations) and retention in care is limited due to the high mobility. This poor retention tend to lead to poor adherence and therefore increase the risk of HIV drug resistance mutations.

Dr. Kiweewa reminded the participants on the set up of the current Anti-Retroviral Therapy (ART) program. When an individual is HIV infected and need services, he/she has to register at clinic A and from that point he/she will be expected to always come back to clinic A to get refills. Considering fishing communities which are mobile and that they are likely to be in different location each month accessing ART at clinic A where they first registered seem impossible, however to access ART at Clinic B, they require either a transfer in or referral from Clinic A. It was then reasoned that such an arrangement was unsuitable for mobile communities and could be contributing to the high fallout rates from the ART program.

This formed the basis of the idea of the project set out to evaluate the impact of the META-ART Clinic Network Approach on the rate of retention in HIV clinical services among the fishing communities.

This project is being conducted among fishing population and health facilities offering HIV services on Koome and Buvuma islands. Buvuma Island - another fishing community is being is used as a control area for comparison purposes.

This he said makes it a quasi-experimental, prospective control impact evaluation study divided into two main phases. Phase 1 is a household HIV sero survey mainly designed to determine the burden of HIV and predictors are on these islands, but also to verify the main assumption we made as we were coming up with this META-ART clinic. One key assumption was that these communities are mobile and that they move in a predictable way following specific migratory routes. It is further assumed that probably those migratory routes have health facilities along them that can be combined and networked to form an ART Network referred to as Meta-Art Clinic.

After identifying the migratory routes in phase 1 and the health facilities along those routes where these fishing communities could potentially go, then a centralised EMR system will be introduced and connected to one common server. Each of those health facilities will also be equipped with a finger printing technology to be able to identify each registered patient such that when he/she moves from clinic A to clinic B, the same information can be obtained to enable him/her access services in a seamless way without the need to come with identifiers. The project will implement and establish access control mechanism to ensure that only qualified people are able to access particular information that is necessary to manage that patient, and also provide infrastructural support to ensure connectivity. He noted that HIV related services will still be provided as recommended by MOH as if this was one ART clinic. Monitoring and evaluation will continue and periodic evaluations will be conduct to look at aggregate data and monitor retention, adherence and other clinical outcomes.

He reported that the project which started implementing phase in May 2017 has so far completed phase 1 and is analyzing the data to determine the various aspects and verify the various assumptions. The available preliminary results for now are data for HIV, Hepatitis B, Syphilis prevalence. Presenting a bar graph, Dr. Kiweewa said that the total overall HIV prevalence for both Islands is about 15.8%, with significant differences between Koome at 20% and Buvuma at 10%. There are also marked differences in HIV prevalence when you control for different main occupations on the islands. The proportion of HIV infected patients that knew their HIV status was as low as 60%, and equally condom use as very low.

He further reported that the ongoing analysis is looking at migratory routes with a plan to create maps as well as characterize the fishing communities and analyze the household and individual drivers of HIV risk and vulnerability. The project is also looking at the geospatial relatedness of HIV prevalence cases between household members and community cases. Thereafter, plans are underway to begin the META-ART clinic as phase 2 of the project.

The preliminary results show that there is a need to adapt population-specific HIV interventions that address the unique needs of specific populations. The proposed the META-ART Clinic intervention seem to put into context the realities of these populations and is expected to offer tailored care to this hard to reach population, improve retention of the fishing communities in HIV related services and contribute to the 2nd and 3rd UNAIDS 90 target.

5.2 Sub-Theme:	Innovative technologies and solutions for improvement of health service delivery and outcomes
5.2.1 Topic:	Electronic health system for morbidity surveillance in a health and demographic surveillance site in rural Eastern Uganda

Session Chair:	Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST
Presenter:	Mr. Dan Kajungu, Makerere University Centre for Health and Population Research

Mr. Dan Kajungu, from Makerere University Center for Health and Population Research presented on-going work on electronic health system for mobility surveillance in a health facility within a Demographic Surveillance System (DSS) in Iganga and Mayuge the districts in Eastern Uganda.

The key objective is to strengthen the collection of morbidity data in a defined Health Demographic Surveillance system (HDSS) population through linking that data on the population demographics, with the health facility data. The other objective is to have a streamlined system for morbidity surveillance within the population that is under surveillance and get the cause-specific inclination, which gives measurements both on the diseases and death.

The demographic surveillance area has 65 villages with homes, houses, schools where households are visited every 6 months. The project deals with a general population from the person aged 0-age to the one aged 100. In 2005 a census was conducted and each individual was given an identifier and have been followed up since. Every 6 months home visits are made to collect core information about demographic events; deaths, births, marriage and a few others. People enter into the population by birth, by in-migration, however a migrant becomes a member after 4 months. Others exit by out-migration or death and for death, a verbal autopsy is made. For every pregnancy that happens, it is registered and make follow up on the pregnancy outcome and gives a dynamic cohort to work with. Currently a total of 90,000 individuals from 17,000 households in 65 villages are being followed up and there are only 15 public health facilities and over 100 private facilities.

The cohort population includes all the individuals who are either healthy or sick. Those who are sick go a health facility and that information about household for different indicators is picked during the HDSS routine visits. When an individual visits a health facility, he/she is identified and then linked the database using the card and in its absence a thumb.

This could be done by first pre-load all the HDSS numbers but it turns out to be expensive. When an individual comes to the facility, he/she is initially identified by household head and location where he/she is coming from. Then the individual is given a health card to use whenever he/she is visiting the facility. The card has a barcode and information that clearly identifies an individual. There is also a DSS collecting all the data and an equally important health information system at the facility which are linked using the HDSS ID.

In order to run a HDSS, power supply is ensured by installing solar power, inverter and server at the facility and tablets which are based in different clinics. The project established networking, provided a barcode reader, a fingerprint reader and programmed the system.

As a result, since July 2017 3,000 patient visited the facility and 681 patients have been linked using the HDSS. This is in one health facility but the project intends to cover up at least 5 health facilities. Currently malaria, upper respiratory tract infection, ulcers, and hypertension are top four diseases reported. The project picks multiple of diseases and captures kind of drugs people are utilising say antibiotics which points to the hotspots of certain diseases based on weekly reports. Unfortunately, it is not possible capture herbal medicine utilisation though people do use herbal therapy.

Consequently, he said, it is now easy to report monthly statistics from the facility to the DHO and DHIS2 which is reliable morbidity data for public information and disease surveillance; by village in different households within a locality. On the other hand, the DSS gives you accurate denominator when calculating disease prevalence and specific statistics can also be got.

On the part of patients, they do not have to carry exercise books while re-visiting the facility since they can use the ID or thumb. The health providers can access all medical history within seconds unlike when patients would come with books missing papers or no books at all. Equally a pharmacist can keep track of drug inventory with ease while the facility in-charge can now submit monthly reports to district office on time.

The electronic health records and the HDSS linkage facilitate case finding, contact tracing risk, identification of risk factors and those at risk for optimization of disease control strategies. Service provision is expected to improve in rural settings where active data collection and vital information is limited. The fact that every birth is registered, it is possible to track safety pregnancy products and outcomes such as drugs pregnant women are exposed to in their early pregnancy.

It is also possible to get suspicious adverse events in the database records and follow specific people at home. It provides information about the progress or monitor SDG's indicators, all those that need information from health facilities and then any diseases and ADRs that show risk factors.
It strengthens the health facilities and provides quality morbidity and mortality data, pharmaco-vigilance, Vaccino-vigilance and product effectiveness studies - since all potential AEs can be captured through household follow-ups and provides public health planners with evidence-based data. A good linkage system between health facility morbidity data and HDSS population helps to answer scientific questions on determinants of health outcomes as well facilitating quality research.

While summing up Mr. Kajungu said that this is a system that provide alerts in real time on disease burden, drug utilisation, health seeking behaviours, ante and postnatal care, vaccination, contraceptive use, risk factors and ADRs in the target population. It also gives a platform to build the capacity as to where put more pharmacovigilance both passive and active. He emphasized that continuous morbidity surveillance information is vital in planning for health products at facility and; enhances adherence to guidelines, informs policy and guide future health care interventions and as such it can be used to monitor SDG indicators which are measured at health facility.

5.3 Sub-Theme:	Accurate, Comprehensive and Efficient Health Data: point-of-care digital diagnostics, treatment, adherence, big data aggregation and predictive analytics
5.3.1 Topic:	Use of interactive SMS reminders to improve reporting timeliness at health facilities

Session Chair:	Dr. Maxwell Onapa-Otim, Deputy Executive Secretary, UNCST
Presenter:	Mr. Joseph Hayuni, RTI International, USAID/Uganda HIV/Health Initiatives in Workplaces Activity

Mr. Joseph Hayuni from the USAID /Uganda HIV/Health Initiatives in Workplaces Activity (HIWA) noted that there is an increasing demand for real-time data-driven decisions. She emphasized that timeliness is one of the five US Agency for International Development (USAID) data quality standards. Equally she said the Ministry of Health in Uganda has timelines for; data submission and entry into the DHIS2 which is the 7th and 15th of the subsequent month respectively.

The USAID/Uganda HIV/Health Initiatives in Workplaces Activity is a 5-year national program implemented in 50 districts in Uganda. The project is implemented by a consortium led by World Vision whose partners including RTI International and The Medical Concierge Group (TMCG) that operates the mHEALTH platform. Others are The AIDS Support Organization (TASO), Uganda Health Marketing Group (UHMG), and Eco-trust. Currently it supports 18 health facilities to implement and report on a comprehensive package of health services. 15 of these health facilities are of the Uganda Police force while 3 are of Uganda Wildlife Authority (UWA).

The project targets the Uganda Police force, Uganda wildlife authority, private security guards, and selected patients, including those of Hotel Africana. The overall objective is to improve their lives through increased availability and accessibility of HIV and other health services, increased quality of these services, and also increased uptake of the services.

As of October 2015 to June 2016, an average of 33% of the 18 facilities were reporting on time. In fact 10 of them were not even in the system. These are small facilities that were providing services, but whose data were not being captured. The project then worked with the Resource Center, MOH and included them in the system. But still they were new to the reporting and use of tools such that their reports has lot of missing data.

To address this challenge, in June 2016 HIWA implemented an interactive SMS reminder system through an mhealth platform. The monthly SMS reminders are sent on the 30th of the completed month and the 1st of the new month. They are automated from the mhealth platform whether it is a weekend, Sunday, Easter they will get them. Messages are sent to both records officers and health facility in-charges, in some instances more than 2.

Since the messages are interactive, it is possible to communicate with the health facilities and quickly understand if they have reported. There is a dashboard in the DHIS2, for checking on who has reported, and who has not and be able to know how many health facilities have submitted to the district level how many have entered the data in the DHIS2.

I is again possible to establish why some facilities may delay in compiling and/or submitting reports.

When the SMS reminders were introduced, timely reporting shot up with all the facilities reporting on time and maintained it. The project has been able to view, download and use data from these facilities from as early as on the 7th day of the new month. It coming in early enables downloading, checking the data, correcting mistakes if any, before closing the system which was never possible before.

In conclusion, she said, the HIWA monthly interactive SMS reminders improve timeliness of submitted health facility reports, in terms of reporting to the district, but also entering data in the DHIS2. She recommended adoption of this approach wherever possible.

5.4 Sub-Theme:	Innovative technologies and solutions for improvement of health service delivery and outcomes
5.4.1 Topic:	Use of Mobile Health Technologies to improve compliance to appointments and retention in care among HIV+ clients on antiretroviral Therapy (ART)

Dr. Louis Kamulegeya of Medical Concierge Group presented the work the Group is doing to support the USAID/HIWA project, regarding to retention and adhering among our HIV positive clients. He said that, a recent survey in Uganda showed that 6.2% of adults aged between 15 to 49 years were HIV+. Of these only 67% are on antiretroviral drugs while the HIV viral load suppression that is regularly monitored is around 60%.

He said as already mentioned by my colleague from USAID/HIWA project the Uganda Police force, private security companies, hotels, UWA population is mobile one posing retention and care challenges. The transfers and movement to different workplaces affect honouring facility appointments. He reported that before implementation of the intervention between October to December 2017 retention was about 48% and 75% compliance to health facility appointments among the clientele. Though routinely, the client will honour the facility appointments but due to different daily stresses, forgetting the appointments is high and with this mobile population relocation to another workplace is an added challenge.

As a result, the intervention was started at all the facilities that offer services that is Arua police health facility, Gulu, Jinja, Masaka, and Nsambya police health center whereby every ART client who comes in and has access to a mobile phone is talk to and consented about this intervention. Those who agree to subscribe to a Mobile health mHealth, their phone numbers are collected and followed up.

The implementation is such that the client would have given us their mobile numbers, the facility where they are getting ART care are also known as well as details regarding to their agenda, relationship status and disclosure among others.

This set of information is customized to suit the project and is used at the resource center for interacting with the client.

He reported that the SMS reminders are sent out at intervals of at least 2 days before and the day of the expected visit and of course also these clients get information on positive living for HIV+ clients. This information encompasses areas of nutrition, areas of safe sex, and areas of alcohol and medication side effects. The information shared was generated to suit mobile use, and also it was customised to suit the language preference. Given that different regions of this country speak different local languages, at the time of sign up, the consent form has a provision for language choice.

Therefore the SMS will be tailored to preferred language. The project then sends SMS reminders to the clients and also has a 24/7 call centre, where these clients have access to a doctor to call in and seek health advice. The call centre is run by licensed doctors and provides a toll free voice line that is free of charge.

By December 2017, he said, they were up to 1,010 clients that had consented for mhealth accounting for about 70.3% of the total clients who had consented at the facility. The toll free voice line has also offered a platform whereby clients have real time 24/7 access to doctors where they can seek clarification regarding health inquiries. These small individual inquiries are the ones which have been found to affect adherence or retention and coming back to the health facility for appointment.

The result show that majority of the inquiries were on the drug side effects, that required simple counselling and acquiring that knowledge which routinely may not be available. The long working hours, long lines at the facility and short time the health worker would offer to the clients to suit and tailoring individual information is being overcome by such kind of practice.

In short, he said mHealth interventions were acceptable and adopted by the ART clients and as a result a noticeable improvement in compliance to health facility appointment visits rose from 75% to 95% with implementation of SMS reminders.

Similarly higher retention rates of ART clients were noted in health facilities with more numbers being clients on mHealth support package. He reported that, the remote access to health workers via mHealth modalities offers more timely resolution of ART client's inquiries that are known to cause poor adherence if not addressed.

Finally, Dr Kamulegeya advised that integrating such mhealth interventions in other public health programs like immunisation, MNCH or any other health program can help in addressing similar challenges in VL monitoring, improving performance and EID among others,.

5.5 Sub-Theme:	Innovative technologies and solutions for improvement of health service delivery and outcomes
5.5.1 Topic:	Using automated attendance-tracking tools to strengthen management of health worker absenteeism in the health sector

Dr. Imara Roy Chawdrey of IntraHealth Strengthening Human Resources for Health Project presented the Use of Automated Attendance-Tracking tools for strengthening management of health Workers Absenteeism in the Health Sector. She noted that health worker absenteeism is a key barrier to providing quality health care leading to reduced health worker productivity, disruption of health care delivery and poor access to health care services. This contributes to low access to key services in that when people go to a health facility and there is no one to treat them it is an indication of poor performance. For example health facility deliveries stood at 58.1% while Antenatal Care four visits stood at 37% in 2017 (MOH AHSPR, 2017).

Basically health workers scan their finger at the beginning and end of their shift, data is sent from the biometric scanner to a local computer and the computer conducts analysis automatically using biometric scanner software. The automated system feed into a nationwide integrated human resources information system (iHRIS, uploaded into servers at Ministry of Health (MOH) using the national ID numbers that were registered earlier to help records in iHRIS. This enables analysis from management offices at each level such that the in-charges, district and managers at the ministry can be able to know who is present or absent.
The iHRIS with a record of health workers in Uganda, generates reports against online duty rosters in the MOH and IntraHealth to show who was supposed to be in the facility, who is supposed to be on leave. Then the data can be integrated to understand who is absent without authorization and able to take higher-level action.

She said the causes of absenteeism in health facilities include; Leave (all forms of leave: study leave, sick leave, maternity leave, etc.), Official assignments, Trainings/Workshops, and Work climate factors (e.g. weak leadership & management (governance), delayed pay, lack of equipment, tools and supplies, lack of accommodation), Personal leave such as family responsibilities, burials, pregnancy and others.

The project data for February 2017 show that absenteeism is around 78% but huge decrease of abseentism in the bigger and higher level facilities and management. Interestingly, the PNFP generally have higher attendance than the public facilities, however it does not tell us the reasons for the difference.

Generally, she said the automated attendance monitoring tool has improved tracking and timely generation of credible evidence on absenteeism of health workers and help managers to take action. She added that it has increased availability of skilled healthcare providers at the health facilities which is one of our ultimate goals.

She reported that management action is critical to the success of absenteeism reduction strategies. Most of the causes of health worker absence from the health facility are within management control (e.g. leave, off duty, workshops) and can significantly reduce absenteeism if effectively addressed and coordinated. The use of technology based tools reduces manipulation and fraud in collection and reporting absenteeism data, and increases management confidence to take action.

Dr Imara Roy Chawdrey made a number of recommendations related to improving reporting rates of health workers.

• The scale up of automated tracking tools (biometric machines) to lower facilities to ease data collection, analysis and reporting on absenteeism

• Implement management incentives to improve reporting rates, analysis and utilization of absenteeism data at all levels through strengthening supervision, rewards and sanctions

• Link absenteeism tracking tool with other Health Management Information Systems (DHIS2), and Human Resource Management Systems to monitor improvement in service outputs, and link pay to performance for sustainability

• Continue to improve tools and processes for attendance tracking & analysis including use of smart phones and dashboards

• Future research needs to be conducted to measure impact of absenteeism reduction on health worker productivity and service. It is not about attendance, it is also about productivity and service quality.

5.6 Plenary discussion: Original research on digital technologies

Questions/comments

The plenary wanted to know experience, data quality issues and lessons learnt in Using SMS that are coded for disease surveillance in low resource settings since low resource settings are synonymous with low entrusted levels.

In a developed network of ART clinics patients can access medicine at other facilities other than the ones where they were registered. In the accounting for those medicines, do these other facilities request for more medicines from NMS, than their catchment population? Development of a Network with ART clinics project is working with consenting households, but how does this data get affected by non-consenting households and what is being done about it? How many of the clients appear to be reporting in multiple site centres to justify the need for using special identifiers and tracking.

In automating the absenteeism and tracking absenteeism, is there a way to automate tools to capture those who want to go for leave, or go for workshop? How are you catering for absenteeism whereby somebody comes in and sign in the morning and then leave to come back and sign out at the end of the day? In other words how do you evaluate signing in versus productivity? Majority of health workers go to the same training facilities and provide services either under the Private Not-for-Profit (PNFP), private or public sector. However, the focus on absenteeism seem to be on the public health facilities what about the private sector? Again why focus on the use of the stick only, without considering the carrot as well?

What measures or incentives have been put in place to encourage the residents to willingly participate in the research? In morbidity surveillance, patient IDs are accessible to health centre staff what precautions are in place to ensure confidentiality?

In establishing public pipelines for reporting in real time for database decisions, there is a risk of controlling health workers and not to empower them. There is a chance of receiving HMIS, receiving data from these health centers which is not real data. Commenting on a particular experience during support supervision, it was found that actually what was being reported from health facilities was not exactly what was happening on the ground. It was proposed that there is need to add to our training motives something that will change our culture of responsibility. In addition provide assistance of supervision, not only at the district but also those that are establishing these systems at the ministry. The general assumption from all presenters is that all Ugandans go to health facilities for health services. We need to remind ourselves that WHO reports that 60% first go to traditional medicine and; Cancer Institute reports that traditional healers are contributing a lot to the burden of cancer. Given the scenario, how can we make mobile digital technologies handy to save the situation?

Responses

While the beginning is always a bit difficult, we shall begin to know which facility receives how many patients and those outside the one they usually support. In this way we can utilise a buffer system to make sure that facilities provide additional medications that the mobile patients may consume during the period. This is possible and through training, facilities should be able to cater for that kind of buffer system.

In mobilizing for consent, each household within the sampled EAs was approached. In case of refusal by the household head, then we would go to the next household in same area. The non-consenting households were very few to have considerable impact.

The experience using biometrics both in research and health care show a number of problems even when we use the clock-in systems.

There are on-going discussion on how best to improve that for ART clinic while for research we use other identification mechanisms to try to make sure that the person we have is the right one. In case the system fails we are able to get them through this other system.

Under the current setup it's difficult to justify identification because once you are registered at ART Clinic A you are always expected to go back to ART Clinic A. and those that are moved to ART Clinic B either go in with a different identification and they are registered as new creating duplication of records, or they are officially referred from ART Clinic A to ART Clinic B. so right now we are looking at the phase one data to see how much they actually moved to be able to answer that question in more specific.

Dr. Oketcho responded that the absenteeism tracking is just a tool to help management track and have objective data for deciding on reward or sanction in respectable manner. The absenteeism tracking is part of the wider performance management system being implementing and is supervised. Dr. Oketcho further reported that they are linking to performance management and specifically these tools to the DHIS2 to generate service statistics in respect of particular categories of health workers with attendance to duty. This will be a proxy indicator and then we plan to do a survey that would neatly link the attendance to duty with the productivity. IntraHealth is currently working primarily with the public facilities because of their partnership with the ministry of health does not target the private facilities.

In response to confidentially, Dr. Gyezaho clarified that the health card/IDs are belongs to the patients. After patient registration the health worker or any health provider will access the data that they are supposed to access; say lab technicians will access on the lab results they tested.

The morbidity surveillance project uses an integrated kind of model of mobile health care delivery in that the behavioural change communication (BCC) angle of the project will meet these people at the community and other social gatherings. On top of the face to face interventions of BCC, they also get automated mobile health information not only for HIV as private partners consenting but for behavioural change. They also have an access to toll free line and also use of social media and reach those low income communities.

On incentives to encourage people to continue participating, project has created rapport, through community sensitisation and health education include information on non-Communicable Diseases (NCDs). The sensitisation involve religious leaders since we know that they have access and influence to their congregations more easily.

In response to controlling vs empowering health workers, it was reported that workshops on HMIS tools management, data management and data use have been held. Continuous memberships at the health facilities and facility-based training after the workshops have also been done. They ensure that registers are complete, monthly data verifications and that the reports have been compiled in conformity with the registers as well as conduct six monthly data quality assessments for selected indicators.

They have done specific training in e-reporting, and each project facility has the Uganda EMR installed. There is continuous mentorships with health workers on entering backloads and empowering them in all respects since we know we are going away anytime.

6.0 Enabling Environment for Digital Technology and Solution in Health

6.1 Thematic area:	National Standards, interoperability, responsible data practice and digital health implementation initiatives
6.1.1 Topic:	Uganda's framework for integration of e-health systems

Session Chair:	Assoc. Prof. Peter Olupot-Olupot, Mbale Regional Referral Hospital, MOH
Presenter:	Dr. Moses Bagyendera, WHO Country Office presenting on behalf of the Ministry of Health (MOH)

Dr. Moses Bagyendera, WHO Country Office, Kampala, representing Ms Carol Kyozira (MOH) presented the framework for the integration of e-health systems specifications focusing on the roles of government, leadership policies and regulations. He informed the participants that e-health is a key priority area right from national development plan II, which clearly states that ICT will be used to enhance or start economic development in the country where health is one of the pillars. The Ministry of Health through a consultative multi-stakeholders model has been able to develop the e-health policy, and strategy as well as a costed technological framework. Currently this has gone through different levels of approvals include that of the ministry and is awaiting cabinet approval.

Mr. Bagyende draw the attention of participants to a map of Uganda showing what he called pilotitis. He explained that across the country there are different innovations especially mobile innovations most of which are not interoperable.

They are not integrated and most of them don't link to the DHIS2, and other recognised national innovations in the ministry of health that support digital health. Consequently most of these applications supported by development partners will be implement in two or three districts and after say three years it's not scalable and just goes with a partner. He said that practice has been starting over and over again leading to duplication and other issues of e-investment. The biggest challenge with digital health, are therefore issues of interoperability and integration; systems not talking to each other. The only national systems that talk to each other are the 'M-track', the mobile tool used to collect weekly reporting on a daily basis and then DHIS2 which is for analysis and dissemination of information as well as open Health Information Exchange (HIE) despite the mushrooming applications. The pitfall has been lack of standards that lead to the accreditation of these tools in the country. While there are global standards that could be adopt or adapt for the Uganda, these needs to be customised. The hope is that the e-health policy and strategy talks of developing standards.

As earlier stated by DGHS, Uganda is not devoid of regulatory framework or policies but has the challenge of implementation of the policies to address a host of issues such as What is the solution of these mushrooming applications?; What is a solution of having different data?; Having different tools in the sector?;

What is the solution of having different data sets that you can't use to analyse these different data sets in different situations? And; what does health information exchange (HIE) entail?

He acknowledged that a lot work was being done such as the development of a master list which is manual but now we are able to know a master list of how many facilities are in the country, where they are located, who works there, and all that information. There are also e-registers for the health facility, patient/client and service provider/ health worker. Others also generate different information or different data from different sources; a health community initiative, the laboratory and logistics. The Uganda Electronic Medical Record (EMR) is clear example where the EMR a record in Mulago hospital and another record in Kawempe hospital which is also part of Mulago, cannot share information meaning that an individual with records in Mulago, cannot access services in Kawempe. All these need to be linked to enable generation and analysis of right information on the interoperable platform. Using a unique identifier, such as NIN every client will be identified, linked to the facility and practitioner to access services anywhere in the health facility.

This is expected to be rolled out once the policy and strategy has finally been approved by cabinet, then the MOH will be able to go into details of building the enterprise architecture so that all the applications and tools are able to be built in together and talk together

6.2 Thematic area:	Workforce for digital technology and solution in Health
6.2.1 Topic:	Accelerating uptake and use of digital tools to improve health workforce management

Session Chair:	Assoc. Prof. Peter Olupot-Olupot, Mbale Regional Referral Hospital, MOH
Presenter:	Dr Vincent Oketcho, Strengthening Human Resources for Health/IntraHealth International

Dr. Vincent Oketcho of Strengthening Human Resources for Health/IntraHealth International focused on the workforce for digital solutions. He considers this very important given its complexity requiring information sharing that is reliable, credible and timely among others.

Talking about the emerging workforce digital solutions, Dr. Oketcho shared the experience around it. He said the integrated human resource system is an open source platform, freely available, zero-rated access on MTN and with portal. It is usable and can access the database. It also addresses the issue of free service training, and intern training, registration and licensure, human resource management and human resource planning.

He explained that there are five components of the suite; 'manage' mainly used for workforce management. This is the one that picks all the records of individuals in every institution and agency. The 'Qualify' is the one that picks records on licensure and registration that are used by the professional councils and the 'Plan' is used by everybody who is in workforce planning and modelling; 'Retain' is basically for estimating the cost of retention interventions. Finally the 'Train' is for training both in-service and pre-service training. The project he said, deals with very large volume of data in the health workforce for example the qualified, that is registration and licensure covers 97,000 records while training are 73,000 records. The information on workforce is highly fragmented and all over the place such as in the commissions, ministries, private sector agencies, health facilities and districts. Each of these have their own sort of databases for information management which are paper based in most cases. Again these records of human resources change, requiring a workforce that is competent to manage the digital solutions to generate information needed for the right decisions at the right time.

Dr. Oketcho emphasized the need for quality workforce for better management of data and data sharing in a timely manner. He also said the workforce is need to link information systems that have been alluded to earlier as well as capacity to continuously customise information and maintain data quality assurance in view of the more and more stakeholders coming on board with slightly different needs. He enumerated the kind of workforce need among which are champions. These are not necessarily ICT people, but those with a vision. They want to be good planners; good managers such that thinking about a solution that can help them do that. The other category are informative experts, these are ICT experts in institutions that include data end users as well as managers of all sorts at various levels.

Given the background a number of strategies were used to develop the workforce for digital solutions. An internship program taking in four interns per year coming out of the computer science school, Makerere or elsewhere was established to train them in particular solutions to be able to manage data. The ultimate goal was to make available a critical mass employable by the ministries, district and others that will be using digital solutions.

The other strategy was to mainstream the solution in the training program at Makerere and Nkozi Universities such that by time the students graduate, it would be of some help to have a bit of orientation and therefore ready to work. Finally an integrated training of various key stakeholders from districts was conducted to ensure that they have a feel of digital solutions and are able to know and ask for data. Technical support teams were also trained at the central level and regions to backup districts and other institutions using this particular solution. Globally there is a backup support from the Global Human Resource System Foundation and Global Resource Centre both in the US which has been very useful for this to continue to work.

He showed participants how the solution tried to overcome the issue of fragmentation and improving data sharing. He reported that the data sources are now converging into aggregate information centres of some kind. For example ministry of health pools from various central level divisions and institutions and the in-service training one is also pooling from various areas as shown in the PowerPoint slide. He also said that it now possible to pair the staffing level by district, health facility and cadre among others very efficiently. This data can also be present in all sorts of forms including in the GIS map. Again at the national level, registry is being developed that will recruit from all the various databases to share the data. He further said, that it is possible to find out if a health worker registered or is licensed using a mobile phone. To do so just type in the health worker and type in his/her name starting with surname and then first name and then send SMS to 6400 and; you will receive an instant response. Another, one he showed was just to flash a duty roaster and attendance tracking the he had alluded to earlier.

Dr. Oketcho highlighted a number of key workforce challenges for digital solutions. Key among them he said is the lack of confidence in use of digital solutions. Experience has shown that the DHOs or senior officers at the ministry tend to consider digitalization of record as time wasting that they are better off signing something on paper. Consequently most of these digital solutions are in very few hands and most of them are project based. Regarding the human resource for data management, there high demand for those few highly skilled people leading to high turnover due to vast employment opportunities. Others are low usage and management, lack of skilled systems managers and lack of establishment in the structures. He reported that sustainability is another major issue; because for most stakeholders it is not clear where to base the system. Now that there is need to transition to the ministries; the question is should it move to Ministry of Public Service or should it be left at the Ministry of Health?

Despite the challenges, he said, the benefits are real in that use of mobile technology makes it easier in terms of demand on the workforce, use of dashboards to share reports and does not need a lot of skills to navigate through the whole system but just pick the reports that you want very easily. Others are open source; zero rating and building capacity for peer to peer support that makes it less demanding on specialised workforce.

Finally Dr. Oketcho submitted that linking the various systems reduce having multiple specialised people operating various systems and ICT staff in organisation will do much better using low cost appropriate technology such as mobile phones. Equally important is engaging leadership at all levels at every stage of implementation for buy in and allocation of resources as well as establishment of the necessary staffing structure.

6.3 Thematic Area:	Status and Gaps in digital health: capacity for data analytics, privacy, security, investment, uptake and utilization
6.3.1 Topic:	Status and Gaps in digital health: legal and technical enabling environment

Session Chair:	Assoc. Prof. Peter Olupot-Olupot, Mbale Regional Referral Hospital, MOH
Presenter:	Mr. Osbert Osamai National Information Technology-Uganda (NITA-U)

Mr. Osbert Osamai stated that National Information Technology Authority-Uganda (NITA-U) is a government agency under the ministry of ICT and National Guidance, whose key role is to promote and coordinate ICT development in the country. In so doing it coordinates and monitors health operations and utilisation of ICT in public and private sector. The authority also does skills development to government agencies that require support in terms of ICT and have a pool of experts in security and software and much more in technology.

The strategic direction for the country is to achieve an interoperable environment. In order to achieve that NITA-U has gone through stages, creating an enabling environment which is both legal, regulatory and technical as well as the infrastructure known as the national backbone infrastructure (NBI). NITA-U is also building a government cloud which is funded by government where government agencies with systems that have been approved by the responsible parties host these applications free of charge. Thereafter, there is need to promote e-government services and to interact with most of the solutions that have been presented.

The overall objective of the NBI project was to; create a secure high speed network that connects all government ministries, departments and agencies, district local governments, municipal councils, and special target groups. This is work that has been on-going since 2011 and has so far covered 2,400KMs. These are cables that are put underground or sometimes on poles and transmission sites, and a monitoring centre to monitor the network on security matters, cyber-attacks or a broken link.

The creation of government network has been put in 5 phases and 3 phases have so far been completed. The backbone taps from Mombasa, then gets to Malaba and spreads around passing through major towns. Starting from central, Phase 4 will be in West Nile, Albertine region. So far a number of government agencies including hospitals have been connected and moving towards regional and district hospitals and then to health centres. He said they are connecting what is called the redundant link such that when the link is down, one can still access services using the Tanzania route, Kenya and Rwanda considering that Uganda is a landlocked country it has to rely on its neighbours.

He showed a number of agencies that are connecting so far using a free Wi-Fi. He informed participants that there are also a number of hotspots around Kampala and Entebbe where free internet can be accessed from 6pm to 6am, and on Saturdays from 3pm to Monday 6am.

The challenges, he said include duplication of IT systems/infrastructure and high operating costs that are unsustainable. The focus is how to work with existing platforms to eliminate duplication of systems or applications. There is issue of data Protection and Privacy, whose proposed law is still at the bill stage hoping to become a law by next year.

He report that a number of issues need to be addressed to ensure secure, efficient and valuable technology use. The issue of open source technologies, the open source policy is in the offing to help guide the use of open source technologies. The other issue is of systems where building systems thinking about the future, interacting with other existing systems is vital.

In terms of information security, the issue of cloud has a gap. NITA-U is working on the cloud policy for this country to provide protection. This will be similar to the European data protection regulations coming into effect August 2018 which will require compliance in case you are holding data that belongs to a European citizen, its misuse attracts heavy fine even when you are in Uganda.

6.4 Thematic Area:	Status and Gaps in digital health: capacity for data analytics, privacy, ecurity, investment, uptake and utilization
6.4.1 Topic:	Status and Gaps in digital health: capacity for data analytics, privacy, security

Ms Caroline Mugisha of National Information Technology Authority-Uganda, Directorate of Regulation and Legal services; informed the participants that her invitation to the symposium was an opportunity to promote NITA-U's key mandate of promoting electronic transmission or to technology ideas in the country. Having heard that most sectors have adopted IT and are architects of their business what is required now is to put up an e-platforms well knowing the benefits of efficiency and effectiveness of government.

She reported that since 2011, a number of legislations were put in place to ensure that people can utilise digital technology that is already well provided. The Electronic Transactions Act, 2011 is the law that enables an individual to do everything he/she wants to do on a digital platform such as uploading individual records, patients' records, health records and all other applications. The Electronic Signatures Act, 2011, provides the methods to handle and obtain the security since one needs to secure whatever is put on an electronic platform. The Computer Misuse Act, 2011 is one that prescribes penalties for those who abuse the use of computers.

On the status in digital health capacity for data analytics, she recognized that there is no substantive or single legislation on data analysis in Uganda. However, different sectors have something small in their legislation, maybe none at all. However the Electronic Transactions Act 2011 mentioned earlier at least provides a platform to be able to use and innovate around that.

The Data Protection and Privacy Bill that is before Parliament mentioned earlier by previous speakers will provide an environment within which to share or receive information in the first place, whether it is on the patient or whether employees or whatever form of information, as long as it touches on the individual. That law will govern its collection, its processing, its transmission and sharing; and consent.

For example where you have an e-health platforms and irresponsible staff share unauthorised information, there is penalty that is prescribed. She elaborated further that in an event where a newly married couple, where one has gone to check his/her health status but don't want to share the information to the other spouse, despite the campaign to share the information disclosure without his/her consent to another party is an offence as well.

Equally, the modification of health records, to give a result which is not, is also an offence. She said that it is important to take advantages of the provisions of this law to make our systems more strong and enhance confidence in the health sector. In the Table below, Ms Mugisha listed a number of offences prescribed under this law not very relevant to health but an individual.

	OFFENCES	Financial Penalty (Currency Points)	Imprisonment
1	Unauthorized access	240	10yrs/both
2	Unauthorized use or interception of Computer Service	240	10yrs/both
3	Unauthorized obstruction of use of computer	240	10yrs/both
4	Unauthorized disclosure of access code	240	10yrs/both
5	Unauthorized disclosure of information	240	10yrs/both
6	Unauthorized modification of computer material	360	15yrs/both
7	Electronic Fraud	360	15yrs/both
8	Child pornography	360	15yrs/both
9	Cyber harassment	7	3yrs/both
10	Cyber stalking	120	5yrs/both
11	Offensive communication	24	1yr/both

6.5 Thematic Area:	Public Private Partnership (PPP): role of Private Sector, development partners, investment opportunities, and cooperation between health and ICT sectors
6.5.1 Topic:	Network Effects of Public Development-Private Partnership in the Health ICT Ecosystem

Session Chair:	Assoc. Prof. Peter Olupot-Olupot, Mbale Regional Referral Hospital, MOH
Presenter:	Dr. Davis Musinguzi, The Medical Concierge Group

Dr. Davis Musinguzi, Medical Concierge Group presenting on the Network Effects of Public Development-Private Partnership in the Health ICT Ecosystem noted that a lot of people on the internet that have been driven by the mobile phone adoption. He further noted that Uganda population demographics show that 70% of its population is under the age of 35. This means that you have a very mobile generation that is waiting to adopt and utilise all these categories of technologies in every single aspect of their lives be mobile money, social media or e-health. The benefits to them are almost self-explanatory in that using digital technology means to engage on any kind of health issue such as privacy and timely service by merely having a device with you.

He reported that the company put together a team of different expertise since digital health projects require diversity from the realm of public health, research, software engineering as well as monitoring and evaluation. This is to ensure that teams really work in a multi-disciplinary manner to maximize the benefits of all the profession in the program.
The focus is on a wider communication aspect by operating a medical call center serving facilities and pharmacies. This is done by customising different initiatives around existing technologies such as SMS, Voice idea, mobile and chat boards and allow for intelligent conversations over platforms such as facebook and mobile money banking systems.

Specifically to e-health, the company has worked with the USAID/HIWA program targeting mobile population and the police force to facilitate healthcare reporting, Voluntary Counselling and Testing (VCT) amongst HIV patients and to enhance adherence to ART. He said the company also have a lot of programs that are focused on interoperability, specifically integrating Uganda EMR with an open source system already used for mtrack to facilitate messaging with the Uganda EMR.

There is also an extremely narrow focus on research given the lack of sufficient local research around digital health to generate empirical evidence for policy in a very effective way. Working with research capacity building organizations, the Group is currently running through the approved research projects.

Dr. Musinguzi, said that they are having success stories in terms of how partnerships have been developed across private sector development and public sector. He elaborated this using the of DHIS entrant I 2011-2012.

In this particular case UNICEF needed to contract MTN to deploy internet to all the district health officers. In the negotiations UNICEF in partnership with WHO, CDC and the MOH managed to get MTN to make all these different government services like HMIS, mtrack, iHRIS, eventually to be zero rated across all these different district health officers.

Dr. Musinguzi said that a very simple lesson to take home is that everything needs to start from the perspective of health system challenges. In other words, we need to take on a technology bearing in the mind the problem so as to empathize problem definition. Using that specific problem then identify what challenges are across several different areas of a healthcare system.

The next step is how we actually engage different players within the healthcare value chain; it could be the clients, providers, health system managers or the data managers in addressing the problem. The last bit would be what kind of IT system categories could help us and link those different challenges to be able to solve the problem. He noted that while there are several different systems, several of them talked about throughout this day, we need to make sure that for every single challenge that there is actually a digital health intervention. And that we can apply it well and that there is an IT system that is currently existing or may need to be developed to enable us to solve all those challenges and make sure that we achieve interoperability across all those different systems and categories. He concluded.

6.6 Plenary discussion: Enabling environment for digital technology and solutions in health

Questions:

Referring to the challenge of sustainability and the failure of ownership between MOH and the public service raised by Dr. Oketcho, one wonders whether when initiating the whole process of Human Resource Information System (HRIS), the beneficiary ministries were not engaged before or what could be the problem that one is not sure who likely to take it up?

As for NITA-U, is there a way any institution can own some space and NITA-U facilitates the process to ensure its security?

Currently there are no standards of e-health. The question is how you deal with that very important aspect and who is to lead it?

• The Data Protection and Privacy Bill that is said to be before Parliament seem to be focusing on health care, what about research?

• What is the plan for integrating human resource information system into the service provider registry mentioned earlier?

• Given very successful stories in health innovations, what is the plan to enhance datives since at national level we are good at collecting data but too poor at using data for soliciting information?

• Is NITA-U a service provider of the internet and at what cost?

• Kindly comment on the President's directive for all the public institutions to use internet provided by Uganda Telecommunications Limited (UTL).

• Government seem to be moving to strengthen public-private partnership. Private Not-for-Profit (PNFP) health providers work closely with ministry of health. However, every time NITA-U was talking of their plans to strengthen different areas, they don't mention anything to do with private sector. Why?

• There is a host of early innovators that are invisible and this is in the docket of our young students in schools who happen to come up with great innovations. How do we capturing such in the environment where we don't have supportive policies?

Comments

The idea of the network and integration of the systems beyond health was applauded by one of the national planners. She acknowledged that one of the challenges facing them as planners is lack of integration beyond a theme such as health leaving out a number of determinants such as income, housing, nutrition and sanitation that affect health. It then becomes difficult to really analyze the health issues at a level of planning noting that such an integration will certainly help to move forward in terms of addressing challenges related to health.

Responses

The issue of transitioning HRIS either to ministry of health or ministry of public service. Why is it difficult if they were involved from the beginning? The real challenge is more policy-like or legal because the ownership of public personnel data are more with ministry of public service. However as systems developed, the ministry of health found it more and more useful and they actually wanted it integrated within the resource centre so that they can use it for planning for the health workforce and relating some statistics with human resource numbers among others. The question is, how do we integrate without causing a mess in the government bureaucracy? Discussions with both sides are on-going and the ministry of public service is actually re-visiting the IPPS to re-organize it completely. We have had meetings to identify what in HRIS can go into IPPS, and what could remain with ministry of health. In the same way we are discussing with ministry of health as to what they would need to keep helping them plan better, and we are certainly working to integrate with the health service registry as required.

Research activities clearly need an electronic platform given the collaborations with other institutions /agencies that have done research, made discoveries or innovating in many areas. So definitely the legal framework also applies to researchers. RENO is an organisation that is focused on the development of the information space for the education and research and they indeed offer internet at affordable prices or discounted rates in collaboration with NITA-U. NITA-U has a MoU with RENO to provide service including research and education.

Yes, NITA-U is a service provider, however, it provides services to government. The focus is on government and with respect to the Presidents directive, we are having collaborative discussions at the Prime Minister's level to ensure that the directive and the current mandate of NITA-U is streamlined.

For the information on security, there is a law as earlier said but also we have a search called the emergency response, in case you have an issue even if you are in the private sector and had a cyber-attack, we do help. NITA-U also monitors the whole network of this country and if anything fishy is coming from your side, we actually notify but also offer technical and sensitization support.

The question on how do we go about capturing innovators where we don't have policies? I think we need to identify pockets of innovations and what exactly are challenges. The process could start amongst research students, private sector or government itself. It is important to talk to people that are experiencing these problems because that is where the innovation trigger is actually going to be.

On how do we plan to enhance datives? Yes, there is a lot of focus and a lot of tools on how data should be collected, how it should be analyzed, transmitted, but very few people eventually talk about datives. Again the people that are going to eventually use this data should be asked what kind of challenges they are experiencing in order to develop a prototype that will actually move the need on decision making. Make sure that whatever it is you are building is something that is from the beginning appreciated, is enabling them to make decisions based on certain data that they are seeing.

Uganda has a Bureau of Standards that should even be coordinating the formulation of different standards including e-health standards across the country. There are global standards for e-health and there are also standards that are fronted by WHO. However, these standards need to be customized to our needs. The way to do so is by looking at what our needs are, the problem we intend to address and processes involved. First you develop a policy and the strategy and then standards that guide implementation.

7.0 Closing Remarks

Dr. Moses Bagyendera, delivered the closing remarks on behalf of Dr. Yonus Tegegn the WHO Country Representative who was out of the country.

Ladies and gentlemen, the role of WHO is to provide leadership on matters critical to health, engaging in partnerships where joint action is needed. It is also supposed to shape the research agenda and stimulate the generation, translation and dissemination of valuable knowledge. But again, WHO is supposed to articulate ethical and evidence based policy solutions.

For the organisers of this symposium, this is a very important day. Research for health in general, is very, very important, it needs generation of new knowledge using scientific methods to assess the impact of policies, programs, processes, actions; to solve events originating from any sector. Developing interventions that prevent or mitigate that impact and contributing to improved health and health equity is very important. National Health Research Systems are vital for research generation, dissemination and utilisation in addressing the health needs of the population hence one of key focus of this symposium. The functions will involve the governance, developing and sustaining research capacities producing and using research knowledge and resource mobilisation, and financing of research.

The African region bears a high double burden of communicable and non-communicable diseases, and faces health system challenges in achieving the SDGs; a situation which may hinder the achievement of universal health coverage. Health research, ladies and gentlemen, is critical in providing evidence based solutions for the much needed improvement in health and development. Investing in research and development to discover and develop medicines and vaccines is key to improving access to medicines, and quality healthcare for people across the world and to achieving universal health coverage.

Health research and development need to make use of the existing data, and reports from a wide range of resources, as well as newly gathered information to provide an accurate picture of a current restless situation and enable informed decision making on priorities.

The national system in the region requirements to facilitate, conduct and use research finding are weak. This has led to the region's low contribution to global research output, and limited tools and products against diseases that inappropriately affect the region. Hence there is an urgent need to prioritise research in order to close the existing gaps.

The regional research for health strategy aims at improving national health research systems through interventions derived from recent developments in research, and includes an enabling environment, sustainable financing, human resource capacity building, knowledge translation, and effective coordination and management.

Ladies and gentlemen, with a rapid development and expansion of information and communication technology, and this particular with the fast penetration of the internet, government services the world over are being transformed from traditional manual and passive services to active, enhanced, consolidated and automated services.

In line with such, a trend in ICT, government agencies in many parts of the world are now taking advantage of ICTs to improve administration services, satisfy people's demands in services and enhance competitiveness through proactive services.

WHO believes that the MOH and other government agencies in Uganda today should recognise the importance of ICT, in the delivery of its services to citizens and initiate major steps to promote its development and use. MOH should utilise ICTs to move into an era of electronic health that is aimed at supporting health and health related issues including healthcare services, health surveillance, health literature and health education, knowledge and research.

E-health or digital health can hence simplify procedures to enhance transparency and accountability and make available information and services to all stakeholders in an efficient, timely and cost effective manner.

Today, there are a number of e-health services that are either have been implemented or are currently being implemented across the health sector, in form of e-health management information system, integrated human resource information system, open medical records system, warehousing management system and computerized logistics management information system among others.

Ladies and gentlemen, a dictionary system and other mobile applications that work in isolation, have been coming a lot in the market. These e-health systems projects in most cases that stand alone have been funded by various donor agencies. Most of these are not interoperable, people have talked a lot about interoperability and they are not compatible, that is, information is not shared as well as services and systems are not integrated.

Recently, as we all know, the MOH developed its e-health policy and strategy that aim at the strategic use of ICT to bring the human resource and infrastructure in colleges that exist in the health sector. As part of e-health policy and strategy which was largely supported by WHO and other UN agencies, there is increased focus to rationalise and standardise IT services and solutions used by various health units leading to sharing of resources and services. The MOH should consider optimising its business processes and enhancing interoperability in a way of improving information access to improve productivity of its staff and simplify systems degradation.

This meeting therefore is timely and important. It looks to strengthen research and development in e-health, to revamp economic development in this country.

To make health decisions for the 40 million people in Uganda and beyond, we need data. Data that is timely, data that is accessible for evidence and decision making and a focused investment.

Ladies and gentlemen, thank you very much for coming, I believe from now, we will be able to work jointly, and achieve something for this country.

Thank you very much and ladies and gentlemen and allow me to declare the first ever Uganda National Health Research Symposium closed.

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