Embracing e-health systems in managing the COVID 19 pandemic in Sub-Saharan Africa

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A B S T R A C T

The COVID-19 pandemic and the policy responses adopted to curtail it have drastically altered how health services are delivered around the globe. To enable the public to continue accessing health care, e-health innovations have become the most viable tool to provide convenient, timely, effective and safe care, while reducing the spread of the virus. This paper utilized data from existing literature to explore the benefits and challenges of implementing e-health technologies in Sub Saharan Africa (SSA) amid this pandemic. Evidence suggests that these technologies have the potential to strengthen public health systems in SSA as they have in First World countries. However, there are a number of challenges that need to be addressed first in order to realize the full promises of e-health on the continent. The paper proposes that African governments should come together and implement similar e-health policies, share software, expertise and other critical ICT infrastructure as it can result in the successful implementation of e-health innovations, while reducing the financial burden associated with their set up.

1. Introduction

Recently, studies on e-health have been recommending that e-health applications be researched in accordance to the health issues being addressed and their target users (Maramba et al., 2019; Smith et al., 2020). Prior to the COVID-19 pandemic many SSA governments had started rolling out e-health pilot projects to strengthen their public health systems as a commitment towards the attainment of both the now defunct Millennium Development Goals (MDGs) and the current Sustainable Development Goals (SDGs). E-health innovations, although mentioned in numerous SSA health strategies, were still to go beyond the stage of sensitisation, experimentation and small-scale implementation towards pervasive availability and operation (Chawarura et al., 2019). However, the emergence of the COVID-19 pandemic has increased the importance of e-health innovations in health service delivery and as a result embracing e-health innovations is becoming of paramount importance for SSA amid this current pandemic (Nuwagira & Muzoora, 2020).

Research conducted in industrialized countries such as China, the United Kingdom and America who were already integrating e-health technologies in service delivery (although not much as during the pandemic) suggests that e-health technologies are vital assets with significant benefits across the entire healthcare provision spectrum (Bokolo, 2020). Health care delivered through e-health platforms is proving to be timely, cost effective, patient-centred, conducive to those in quarantine, and reduces the risk of direct person to person transmission of COVID-19 (Nuwagira & Muzoora, 2020). Additionally, e-health is helping with remote consultation and post care to those patients requiring medical attention which does not involve physical examination therefore reducing unnecessary hospital visits (Bokolo, 2020). Such evidence is again reminding governments particularly in SSA of the importance of investing in digital technologies and implementing them proactively rather than reactively.

Whilst the potential benefits of e-health are clear even for low income settings such as the SSA, the uptake of these technologies during this pandemic has remained limited (Kamulegeya et al., 2020). Impediments to e-health adoption in Africa amid the pandemic are closely linked to challenges that existed prior to the pandemic. In fact, governments in SSA are affected by a general scepticism regarding the feasibility of e-health on the African continent based on numerous

factors which include volatile political environments and technological, financial and social challenges (Chawarura et al., 2019). In this regard, the aim of this paper is to explore the benefits and challenges of implementing e-health technologies in SSA during this COVID-19 pandemic so as to contribute to Evidence Based Practices for sustainable long term solutions.

1.1. Research questions

Literature was reviewed to the answer the following questions:

1. What are the benefits of adopting e-health technologies amid the COVID-19 pandemic in SSA?
2. Are there any e-health innovations being currently used to manage the pandemic in SSA?
3. What are challenges militating against the adoption of e-health technologies in SSA?
4. What are the potential solutions to these challenges?

2. Literature review

2.1. Defining COVID 19

According to the Muzvidziwa-Chilunjika et al. (2020) citing WHO (2020) noted that COVID-19 is an infectious respiratory disease caused by a newly discovered coronavirus which is believed to have first manifested in a Chinese province called Wuhan in December 2019 and has since spread throughout the world. On March 11, 2020, the WHO declared it a Public Health Emergency of International Concern. By the 1st of December 2020 cases confirmed in 206 countries stood at 61.8 million with a death toll of over 1.4 million (WHO 2020). Due to its highly contagious nature, health experts believe that the best way to prevent and slow down transmission is to be well informed about the virus, its causes and how it spreads. In addition to this, stringent public health measures were implemented including physical and social distancing which has resulted in many nations imposing national lockdowns (Kaseje, 2020).

2.2. E-health

As a concept, e-health operates in the confluence of medical informatics and public health (Furusa & Coleman, 2018). The WHO (2004) defines it as the cost-effective and secure use of Information Communication and Technologies (ICTs) in support of health and health related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research. Depending on how scholars choose to define it, e-health encompasses a wide variety of sub-domains of digital health such as mobile health (m-health), telemedicine and electronic health records. M-health is a medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices (Global Observatory for eHealth 2011). Additionally, m-health involves the use and capitalisation on a mobile phone's core utility of voice and short messaging services (SMSes) as well as more complex functionalities and applications including general packet radio service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system (GPS), and bluetooth technology (Global Observatory for e-health (GOe), 2011:1b). The utility of mobile technology in health therefore rests in its capacity to enable users to have unrestricted access to information thereby enhancing ease of access, networking and knowledge sharing (Samusodza, 2016).

Telehealth is another key component of e-health and the term is used interchangeably with telemedicine. Originally the term telemedicine was coined in the 1970s which literally means "healing at a distance" (Idoga & Toycan, 2016). Similarly, Jolly (2011:2) adopts the following broad definition from the WHO (2010):

> "Telemedicine is the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of diseases and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities."

As such, telemedicine as component of e-health therefore refers to the provision of healthcare using modern ICTs when clinicians and patients are not directly in contact and their interaction is facilitated by electronic means.

E-health is credited for paving new prospects for information exchange between the health consumers and health care providers. With the use of advanced information technology and the integration of information systems through telecommunication networks and services, including internet applications there has been a marked improvement in the operational efficiency and effectiveness in decision-making in the health sector over the years (Shaw, 2017). This has raised awareness on the 'big data' approach to collecting and analysis of health data across the globe, as a measure to bridge the gap between health care delivery, policy response and population health outcomes (Hilbert & Lopez, 2011). The introduction and use of graphical tagging through Geographical Information Systems (GIS) by crowdsourcing has also further enhanced the richness of information flows in health (Sanyanga, 2015). E-health has thus shown it has the ability to customise the provision of health information to health users and policy makers at the appropriate place and time using secure electronic tools that boost research and knowledge sharing (Deloitte and Touch Tohmatsu, 2011).

E-health can also be understood within the broader theoretical framework of mediatization, a term referring to the establishment of digital internet-based services and the related overall transformation of the media environment (Hepp et al., 2015). Mediatization is an evolving social process enabling human experience and social exchange to be facilitated either wholly or partially through engagement with media technology, for example through social media, online platforms, applications and body media (Hjarvard, 2013; Krotz & Hepp, 2011). In effect, Santana (2010) argues that the internet is a new global "town square" where individuals around the globe with similar health experiences or concerns can encounter one another and learn from each other through this interaction. Moreover media technology in health is being widely used to facilitate awareness campaigns on health matters and promote health initiatives. However Zheng (2005) states that e-health use in health service delivery is an important research area with multilayer complexity, as it involves human, social and political concerns.

3. Methodology

For this study a review of secondary sources on the use of e-health technologies before and after the emergence of the COVID-19 pandemic in SSA and beyond was performed. The study used articles, commentaries, reports, theses, published and unpublished reports covering the entire Sub Saharan Africa in general published on recognised and high impact factor websites such as PubMed, Wiley, Google Scholar, Taylor and Francis and Inderscience among others. Literature used ranged from 2011 to late 2020. This time line is relevant to review whether the accelerated importance of e-health technologies during the COVID-19 pandemic should lead to their increased uptake in SSA taking into account the previous political, economic and social challenges associated with their set up. Additionally searches for grey literature were also done on the internet for conference papers, opinion pieces and reports as there was a paucity of scientific articles pertaining to e-health use in SSA amid the pandemic.

In employing the search, specific keywords were used to query the online using Boolean operators (OR/AND) to improve the search

relevance. The key words comprised "telemedicine", "e-health", "digital health", "mobile health", "COVID-19", "Sub-Saharan Africa." At the end of the search over 1000 papers were retrieved, and after going through titles and abstracts 57 papers were purposively selected as they could directly answer the research questions being reviewed. Due to the severity and the rapid changing dynamics associated with the pandemic, the authors had to contend with constant and regular updates of information and figures on the rising number of cases and potential new mitigating strategies to combat the spread of the virus. Moreover due to the nature of the study (desktop research) which heavily relied on pre-existing data, the authors avoided plagiarism by acknowledging sources of information. Data was then analysed using manual thematic and matrix analysis on the Microsoft Word platform.

4. Findings

4.1. The benefits of adopting e-health systems SSA during the COVID-19 pandemic

Global pandemics and natural disasters create many challenges in delivering routine essential health care (Kaminski, 2020). The COVID-19 for instance, has greatly altered the programming landscape of health service delivery around the globe. One of the key transformations is the transition from predominant in-person hospital visits towards online consultations. Consequently, unique innovations are required to address the critical needs of COVID-19 patients (Muzvidzi-wa-Chilunjika et al. 2020; Okereafor et al., 2020). As a measure to curb and manage the virus, COVID-19 patients need to be monitored after being discharged from quarantine centres to ensure that they fully recover to avoid reinfection. E-health solutions may make this possible through video consultations, while protecting both the patient and clinician from COVID-19 exposure in health centres equipped with the infrastructure. E-health technologies could also provide advantages particularly in settings where services may not require in person hospital visits such as out-patient consultations and follow-ups in multiple situations such as, pre and post abortion care and psychological care (Monaghesh & Hajizadeh, 2020). This is a harbinger that COVID-19 patients and other individuals in need of other health services will continue to access health care despite the lockdowns and travel bans that limit in-person hospital visits.

In low income settings such as the SSA where health systems are already fragile to fight the virus due to lack of critical resources such as ventilators, oxygen, Personal Protective Equipment (PPE) and reliable electricity supply, e-health systems are a critical initiative that help reduce the use of limited resources (Nuwagira & Muzoora, 2020). The use of basic technologies such as mobile phones for non-COVID-19 related consultations makes in-person hospital visits unnecessary thus reducing the use of PPE. In this regard, e-health initiatives offer innovative solutions to Third World countries that result in the economic use of limited resources.

Critical to COVID-19 management is the collection of data in real time to feed health databases and make informed policy decisions (Kaminski, 2020). If m-health systems are to be embraced more in Africa then data needed to trace and monitor patients with COVID-19 can easily be made available to health providers at national, district and community levels. Presentably, First World countries are successfully using contact tracing applications. For example the TraceTogether application being used in Singapore and the Flu Tracking applications rolled out in Australia and New Zealand. Moreover, some African countries though minimally are now also making use of "big data" monitoring and analysis platforms which use harmonised data standards to analyse the trail of confirmed patients, track their contact history and predict the development trend of the pandemic situation (Padmanablam, 2020). These platforms enable sufficient data processing which is key to a more successful response in dealing with the virus.

Despite the gravity of the COVID-19 pandemic SSA governments cannot afford to lessen efforts in eradicating communicable disease such as HIV, Malaria and Tuberculosis which already burden their health systems (Okereafor et al., 2020). This emphasises the need to prudently allocate the already inadequate health workers to attend to both the COVID-19 and other communicable disease patients. As the pandemic continues to progress staffing shortages are likely to intensify on the continent due to illness and transport shortages. Introducing e-health innovations to maintain health services will enable health workers to attend to more patients in real time through virtual consultations, while decreasing burnout associated with physical examination. In China for example, it was observed that since the increased uptake of the e-health due to the pandemic physicians now can consult hundred plus patients a day, which is a very significant increase in the daily cases they handled in person in the past (Nittas, 2020). This therefore ensures that the health personnel have manageable workloads while minimizing inadvertent exposure to COVID-19 during patient examination.

Additionally, these technologies are seen as a means of enhancing the quality of rural health care as they improve the accessibility of scarce specialists, support rural clinicians, facilitate research and deliver educational services in rural areas where geographical access is a barrier (Samusodza, 2016). According to Manyati and Mutsau (2020) citing the WHO (2018) half of the population in SSA live in rural areas, but only one quarter of doctors are deployed to these rural areas. E-health technologies are a potential solution to fill the void created by the dearth of health personnel in many rural areas of SSA.

4.2. E-health technologies being used to mitigate and control the COVID-19 pandemic in SSA

This section examines the e-health technologies that have been adopted in dealing with the COVID19 pandemic in the SSA. Below are examples of how e-health systems are playing a fundamental role in limiting the spread of the virus, assisting in the treatment of infected individuals, tracking the travel record of those infected and gathering data needed for sound and coordinated governance in SSA. Many health experts are hopeful that the positive impact of these technologies will further accelerate the adoption and implementation of digital innovation in healthcare in the future since their use has been growing slowly than expected over the past years on the continent (Okereafor et al., 2020).

4.2.1. M-health

The mass availability and use of mobile phones in SSA provide a significant potential for such technologies to be integrated into health systems to support the provision of care. Statistics on the penetration of mobile phones in SSA by the end of 2017 was on 44% and projected to reach 52% by 2025 (Olayiwola et al., 2020). Some recent mobile usage statistics on selected SSA countries from GSMA found out that 91% of adults in South Africa own mobile phones, 80% was reported in Ghana, Nigeria and Kenya, followed by Senegal with a 79% ownership rate and Tanzania with 75% (GSMA, 2019). The number of people in SSA living within reach of operational fibre optic network is estimated to be over 556 million about 54.2% of the population (GSMA, 2019). However, many countries in SSA still have bandwidth as slow as 63 kilobits per second compared to 270 000 megabits per second in More Economically Developed Countries (MEDCs) like the USA (Addo, 2019). Although internet access is still low and there are still significant segments of the population without access to broadband technologies and related services, African governments are showing commitment to expand internet access to their populations. This is seen through the various telecommunication projects being undertaken in the continent such as the broadband plan for universal and affordable connectivity and access (Africa Regional Initiatives Africa Regional Initiative Report, 2018). Considering the availability of internet access and high usage of mobile phones in SSA as shown by the above statistics, m-health technologies are slowly being adopted to complement traditional healthcare delivery

tools during the COVID-19 pandemic in the following ways:

- *M-health and data collection*

According to Garai (2011) the rapid growth of mobile use in countries has provided opportunities for policymakers to use this technology in the health sector for data collection. Data collection is a crucial component of public health programmes which policymakers and health providers at the national, district, and community level can make use of in order to gauge the effectiveness of existing policies and programmes in order to shape new ones (Garai, 2011). In the wake of COVID-19 there is an urgent need to strengthen data and statistical capacity, notably in relation to health. In the context of SAA were surveillance systems rely on delayed reports by health care providers and laboratories, the use of m-health technologies facilities is facilitating real time data gathering (Olayiwola et al., 2020). Nigeria is one country that has invested in mobile positioning data technology during this pandemic to monitor and track mobile phones of those affected with the virus, their confirmed contacts and suspected cases (Ekong et al., 2020). The collaboration between the government of Nigeria and private mobile network providers has made this project a success (Ekong et al., 2020).

The Digital Earth Africa online platform facilitated by satellite technologies has also been a crucial tool used to share COVID-19 related data across the continent during this pandemic. Governments like Botswana, Nigeria, Uganda and South Africa have assimilated this system with other information platforms involved in COVID-19 response (Ekong et al., 2020). It is important to note that partnerships between these governments, private IT organisations and mobile network companies have been the bedrock for successful mobile positioning projects during this pandemic. This should be a lesson that other African governments should emulate as to ensure sound data collection.

- *M-health and health education*

Health education is of great importance in the fight against COVID-19, and m-health is a powerful tool to disseminate real-time healthcare information to educate people on the information they need to know in regards to the virus. Numerous mobile applications have been developed to provide trustworthy information and guidelines to the public and these include the WHO-Health Alert application which provides latest news and information on the virus including details on symptoms and prevention protocols (WHO 2020).

In SSA health education using SMS-based communication to disseminate useful information was a popular trend prior to the COVID-19 pandemic. Countries such Zimbabwe (Maisha by Econet) and Burkina Faso (Hello Health by AlloLaafia) already have functional SMS based communication which are now being used to publicise information on the virus. A study that was conducted in 2012 by Chib and team in Uganda demonstrated that the use of SMSs to disseminate health education is effective, less costly and has extensive coverage in HIV and AIDS prevention. In this regard there is a high probability that SMS-based communication will be effective in SSA during this current pandemic (Ekong et al., 2020).

Besides SMSs, African governments are also encouraging citizens to use toll-free numbers to ask questions on the virus and for a more proper diagnosis to curb unnecessary hospital visits. Countries including Zambia, Botswana and Malawi had functional call centres and hotlines during the time literature was reviewed (Muzvidziwa-Chilunjika et al., 2020; UNICEF, 2020). However, worth noting is that setting up toll free numbers and public call centres is not enough, the effectiveness of these platforms heavily rely on government funds to ensure adequate staff and quality operation.

Additionally, the WhatsApp platform has also been adopted to disseminate health information by the public as it is widely used and less expensive to them (Ekong et al. 2020). A survey conducted by GeoPoll on South Africa, Kenya and Nigeria revealed that WhatsApp was the top

information source for news on the virus (Elliot, 2020). The major challenge of such platforms is the reliability and validity of information distributed through them (Mahmood et al., 2020). The public is vulnerable to misleading and non-expert advice distributed through social media as these applications lack security features that flag incorrect information. IT engineers and mobile application specialists should thus design mobile applications with gate keeping features that detect and prevent the circulation of inaccurate information (Mahmood et al., 2020).

- *M-health and medication adherence*

Although health care practitioners are currently concerned with mitigating the Corona virus and attending to those affected by it, patients with critical and chronic diseases such as Diabetes, HIV and Tuberculosis still deserve quality care. In the SSA where there are shortages of healthcare workers m-health platforms such as SimMed are being piloted for use in the area of medication adherence among patients during the COVID-19 pandemic in countries like Kenya, Lesotho and Nigeria (Nyoni & Okumu, 2020). SimMed is a cheap and simple SMS-based system that requires patients to log into a central server each time they take their medication, and reminds them when they forget. The system also alerts the patient's physician to make follow ups in cases when patients fail to adhere to their medication.

Before the COVID-19 pandemic pilot studies of such applications in Cape Town (SimMed) and in rural southwest Uganda (Wise pill) demonstrated treatment success rates of 94% and 60% respectively (Kunutsor, Walley et al., 2011). Health experts in Africa are hopeful rolling out such platforms during the pandemic will ensure that chronic diseases patients with conditions not requiring physical consultation during lockdowns will receive quality health care while protecting physicians from the virus without sacrificing effectiveness of health systems (Nyoni & Okumu, 2020).

4.2.2. Telehealth/telemedicine

Telemedicine technologies have become an important component of healthcare systems since the outbreak of the COVID-19 pandemic (Bokolo, 2020; Kamulegeya et al. 2020). With key health authorities such as the WHO strongly lobbying for ways to minimize physical contact between patients and healthcare providers, "medical distancing" (Nittas, 2020) telemedicine has become a strategic weapon in the battle against the COVID-19 pandemic. These technologies include live interactive video-conferencing through Zoom, Skype, Facebook, and emails, digital photography and electronic health records.

Telemedicine is minimizing the effects caused by dire shortages of healthcare professionals in SSA. According to David and Adebisi (2020) 31 out of 54 countries on the continent have a patient to physician ratio of about 1:10 000 compared to MEDCs such as Italy with a ratio of 1:270. Through telemedicine, patients are getting access to clinicians around the country and in some cases from beyond borders in real time, thereby addressing staff shortage challenges. Furthermore, David and Adebisi (2020) note that telemedicine interventions are enabling clinicians in SSA with mild symptoms to continue attending to patients, and this has also helped ease staff shortages. As other countries on the continent such as Ghana, Kenya, Zambia and Zimbabwe are slowly taking these technologies, this could mean staff shortages will have a temporary solution, on a continent with a long standing of dire staff shortage challenges.

It was also observed that telemedicine bridges the gap between health personnel in remote areas and experts in urban areas and abroad. According to Kamulegeya et al. (2020) telemedicine is facilitating continuous online training for health workers in many remote areas in Africa where mobile networks are available during this pandemic. Moreover these health workers are able to seek expert opinion for treating patients with severe symptoms in real time, in so doing exchanging experience and information critical in managing the virus.

Additionally, telemedicine services are being used by clinicians in

SSA during the on-going pandemic to identify and manage patients critically in need of care through tele-triage. In general triage in health refers to the process of categorizing and prioritizing patients based on the severity of their health condition in order to determine priority for treatment (Mohammadi, Jeihooni, Sabetsarvestani et al., 2022). Tele-triage is similar to traditional triage however it uses digital technologies to substitute elements of in-person person interactions. In this regard, tele-triage enables clinicians to screen patients remotely and determine their condition and the treatment needed through technologies such as telephone and video conference platforms. In light of this, it minimises unnecessary in-person hospital visits, thus reducing the spread of the virus while at the same time protecting health personnel and saving PPE.

Literature reviewed also noted that telemedicine technologies can be used to relieve stress and anxiety in health workers. The COVID-19 pandemic is causing an increase in mental health issues among medical staff due to exhaustion, stigma, and separation from families (Kang et al., 2020; Huang & Zhao, 2020). Evidence from studies conducted in China review that these mental issues are seriously affecting the quality of caregiver-patient interactions and undermining clinicians' decision making abilities (Huang & Zhao, 2020). Under such circumstances the use of video calling applications and social media platforms can be used to address social isolation, loneliness and offer mental health support for health personnel. The Vula platform for instance currently being used in South Africa has been effective in offering helpful mental health support for health workers (David & Adebisi, 2020).

While measures adopted to maintain social distancing including banning of social gatherings and studying and working from home has proven to be highly effective in reducing the transmission of the virus, they have heightened the sense of anxiety, loneliness and abandonment among the general population (Adepoju, 2020). As a result of this, there has been a worrying increase in mental health issues among those living in SSA. A study by David and Adebisi (2020) notes that the social support needed to reduce dire psychopathological outcomes of the COVID-19 pandemic can be provided by telehealth solutions. As such many mental health technology start-ups are emerging on the continent and these include WAZI in Kenya, PsyndUP in Nigeria, MindIT in Ghana and MEGA project in South Africa (Adepoju, 2020). These platforms have been providing free online mental health support and consultations to ensure unrestricted access to mental health care in the face of COVID-19 pandemic. Nevertheless, despite the potential benefits that telemedicine has on Africa's health systems during the COVID-19 pandemic this is not without challenges and these will be discussed in detail below.

4.3. Challenges militating against the use of e-health during the COVID-19 pandemic in Sub Saharan Africa

4.3.1. Determining cost-effectiveness and inadequate funding

Although the benefits behind the increased importance of using e-health technologies are clear for SSA, there is currently limited evidence on their cost effectiveness compared to other health interventions being used during the COVID-19 pandemic in the region (Nuwagira & Muzoora, 2020). Establishing the cost effectiveness of e-health initiatives is a priority at a time like this since poor funding of health systems is a recurrent problem in SSA. A cost effectiveness study conducted in Amansie-west district Ghana by Otsen and Agyei-baffour (2016) showed that when compared to the cost of building a conventional Primary Health clinic, the setting up costs of an e-health based clinic was 4.3% more expensive. The study revealed that the equipment required for the establishment of such a clinic in a district of about 149 437 people costs at least $700 000. When considered in terms of the whole province, e-health seems impossible given that most countries on the continent have failed to adhere to at least 15% of their annual budgets to health as agreed upon in the Abuja Declaration of 2001. In view of this, most African governments are unlikely to invest in the development of

emergency digital health technologies to use during the pandemic.

Furthermore, prior to this catastrophe, many e-health pilot projects implemented in numerous African countries like Cameroon Genesis (Telecare), Thamini Uhai (Tanzania), WelTel (Kenya) did not translate into widespread community use largely because they were externally funded by Non-Governmental Organisations and private companies which then withdrew their services due to the constrained budgets during the COVID19 pandemic era (Mahmood et al., 2020). E-health technologies in SSA heavily depend on grants and donor funds and this is different in First World nations where the majority of e-health initiatives being used are government funded and driven (Olayiwola et al., 2020). Thus, grants and loan schemes at the disposal of SSA governments during the pandemic are likely to be channelled towards procuring PPE and other critical medicines needed by patients and health workers and not e-health technologies.

4.3.2. Sustainability of e-health services

E-health technologies are high maintenance, and the combination of high internet costs, the absence of high speed internet connectivity across many cities, unreliable and inadequate electricity supply challenge e-health initiatives in Sub Saharan Africa (Africa Regional Initiative Report, 2018). A report by the Alliance4Affordable Internet (A4AI) in 2020 reported that Africans face the most expensive internet charges in the world. Accordingly, A4AI asserts that affordable internet is 1GB of mobile broadband data costing no more than 2% of monthly earnings. However, the average cost of the same across SSA is about 7.2% and in some cases more than a fifth of average income (A4A1 2020). Lack of affordable data means that the use of e-health technologies is not feasible to the 40% of the SSA population living in extreme poverty (Manyati and Mutsau 2020). This means that the cost of online consultations is currently affordable only to the people in the middle and upper classes in SSA hence raising the issues of digital divide among the populace.

Furthermore, studies conducted in First World countries show that e-health innovations are subsidised by governments and private health insurance companies (Umeh, 2018). However the narrative is the exact opposite in SSA, health insurance organisations across SSA mainly pay for conventional healthcare services and even if they wanted to subsidise e-health services patient willingness to pay to access these services is generally low (Arize & Onwujekwe, 2017). Although selected countries such as Rwanda (STL partners, 2019) and South Africa (Discovery online 2020) have integrated telemedicine services in health insurance schemes since the onset of the pandemic the same cannot be said for most countries on the continent. This may be as a result of a general belief among Africans that effective treatment is only achieved when one has been physically attended to by a clinician. In addition to the above, SSA countries are largely donor technology dependent, particularly in the health sector (Olayiwola et al., 2020), and therefore the implementation of e-health systems relying on donor funds makes it unsustainable.

4.3.3. Lack of ICT skills, knowledge and language barriers

Work reviewed also showed that the perpetual lack of technological skills among health workers and many of the rural population in SSA makes e-health ineffective in service delivery (Furusa & Coleman, 2018; Umeh, 2018). Very few public health colleges in Africa offer modules on e-health technologies and as a result most health personnel on the continent lack ICT related skills and knowledge to use these innovations on a day-to-day basis. Furthermore, a study by Chawarura et al. (2019) on the uptake of digital health in Africa discovered that there is inadequate awareness on the importance and use of e-health among the African population which results in the low uptake of e-health systems by health workers and the public. Moreover language barriers also hinder the use of e-health systems in SSA. It is estimated that over 80% of the content online is in English and this poses a huge barrier to e-health use in SSA for two main reasons (Abolade & Durosinmi, 2018). Firstly,

familiarity with the English language is low and mainly concentrated in highly educated and high income segments of the SSA societies and secondly, online content is not readily available in native languages. This could result in a cultural technological misfit that impedes e-health use at personal and community levels. Taking such evidence into account, such circumstances are likely to hinder the successful uptake of e-health interventions for service provision during the pandemic.

4.3.4. Security and privacy concerns

Lack of requisite governance frameworks, capacity and political will for addressing ethical issues such as data ownership, consent to use and security of patient information are recurrent hurdles which appear in many e-health studies for African countries (Chikuni, 2016; Ekong et al., 2020; Furusa & Coleman, 2018). According to Iiori (2020) data protection in Africa can still be described to be in its nascent stage as only 28 out of 55 countries have data protection laws and 15 have set up data protection authorities to enforce the law. The safety of patient information is one of the most crucial ethical values in the medical field (Furusa & Coleman, 2018), the lack of adequate legal frameworks to curb privacy breaches and the misuse of health information remains a barricade to the broader use of e-health by health practitioners and patients in Africa.

Amid this pandemic, numerous countries in the developed world have revised regulations to curtail the unauthorized use of patient information and to standardise guidelines for e-health use. The USA government for example, has enacted the Stafford Act 2020 and the Coronavirus Preparedness and Response Supplemental Appropriation Act 2020 to permit health institutions to extend the use for e-health innovations and the guidelines that should be strictly followed when using them. Failure by most SSA governments to adequately address concerns about privacy and security of data as revealed by the status of the 2014 Malabo Convention on data security (which has currently been signed by 14 African Union member states, endorsed by five and deposited to the African Union Commission by six out of 55 members) could mean their wide use may be resisted by users for clinical services in response to the pandemic (Ekong et al., 2020; Iiori 2020).

4.3.5. Coordination and interoperability challenges

E-health systems operate in the nexus of two key sectors (health and information technology), as a result of this they are knowledge and coordination gasps that hinder their success in Less Economically Developed Countries (LEDCs) (Chikuni, 2016). A study by Chikuni (2016) on m-health technologies in Zimbabwe revealed that many government policies are drafted in isolation with one another. The fact that e-health involves numerous disciplines, it is important to have it work in tandem with other policies and programmes like national ICT policies as well as rural electrification projects to ensure coordination, interoperability of platforms and the involvement of various stakeholders. Due to the fact that such challenges remain unaddressed in most African countries, Adenuga et al. (2020) are of the view that hastily adopting and using e-health in SSA during the pandemic is not likely to result in the development of multiple e-health applications which are integrated nor interoperable which again makes e-health systems redundant in the SSA context.

5. Discussion

The COVID-19 pandemic has drastically changed how healthcare is delivered around the globe. In this time of a global healthcare crisis, and forced behavioural change, either due to government-imposed lockdowns or in response to individuals avoiding social contact in crowded medical facilities, health systems are being forced to harness e-health systems more than ever before. Literature suggests that prior to the pandemic, e-health applications were not embraced as the most effective tool for delivering health care as they sometimes fail to provide vital information as physical examination and diagnosis (Bokolo, 2020). This

is generally the case when there are no present clinicians to conduct the physical examination. Moreover, e-health systems have become the most appropriate platform for service delivery during this pandemic as they provide access to safe, cheap and convenient routine treatments for those in high risk groups (the elderly, pregnant women and those with underlying health problems) who are not affected with the virus (Bokolo, 2020).

Although MEDCs such as the USA, UK and China have quickly embraced e-health innovations to compliment conventional health delivery platforms, the same cannot be said for health systems in SSA. While the region has recorded low numbers of COVID-19 cases as compared to other parts of the globe. Literature reviewed shows that most health systems in SSA are limited to mobile phone support to consult and monitor patients, trace suspected and confirmed cases, educate the public on the virus and offer mental support to medical staff (David & Adebisi, 2020; Kamulegeya et al., 2020; Ekong et al., 2020). Countries like Nigeria, South Africa and Uganda were identified to have made notable strides towards the adoption of e-health in response to the COVID19 pandemic. The success of e-health innovations undertaken in these countries is credited to partnerships between the government and private mobile network operators. This is a lesson that other African governments have to learn and emulate that political will is one of the most critical factors towards successful public projects and programmes (Zhou & Chilunjika, 2013).

Despite the adoption of e-health systems being presently possible in many African countries due to rapid advances in ICTs and widespread wireless internet access, a number of impediments to e-health adoption were brought forward and these include lack of technological skills among health workers and citizens, high costs of setting up ICT infrastructure, expensive internet charges, security and privacy concerns and unstable power supply. These challenges have stalled the widespread operationalisation of e-health technologies pre-COVID19 and are likely to hinder the adoption and use of these technologies during this ongoing pandemic in SSA (Mahmood et al., 2020). The task now is for African governments to come together and find ways that will enable them to fund, develop e-health applications, and put in place policies that facilitate their successful implementation as being witnessed in First World countries. Countries in the European region for example are working together and implementing similar policies and guidelines for the use of e-health solutions during this ongoing pandemic (Bokolo, 2020). This is enabling them to share softwares, expertise and other ICT infrastructure leading to reduced financial burden.

Furthermore, since the virus is yet to completely overwhelm the African health systems as it has in the European and Asian continents, health workers are likely to stick to traditional health delivery platforms while observing social distance, disinfecting and wearing PPE to minimize direct person-to-person transmission of the virus. As stated by Hollander and Carr (2020), no e-health system can be deployed overnight, medical staff and citizens in Africa can make use of already existing basic IT systems such as voice calls and messaging applications as a response to the COVID-19 pandemic. This will ensure that the already constrained national budgets are not over-stretched in developing new e-health platforms to curb the virus. Instead, resources may be channelled to other critical areas such as social welfare grants to cushion vulnerable groups in the society. Lockdown measures will likely disrupt economic activity in SSA and thus increase poverty levels which may result in other health and social problems such as malnutrition, poor health behaviour, and increased gender based violence. For instance, in Liberia during the Ebola crisis prices for basic commodities like rice increased by 30% which resulted in increased food insecurity (Nyoni & Okumu, 2020). Consequently, some humanitarian organisations are fearful that COVID-19 responses may reverse the gains made in the last decades to eradicate these problems in SSA (Nyoni & Okumu, 2020).

6. Recommendations

Below are some recommendations that health decision makers and public policy makers can adopt to facilitate the adoption and effective use of e-health applications in SSA during the COVID-19 pandemic:

1. Governments in SSA should partner with each other and implement similar e-health policies, applications and guidelines. This will enable them to share software and technical expertise which result in reduced costs.
2. Public policy makers in SSA should establish conducive environments in which e-health systems can flourish. This could be accomplished by putting in place policies and guidelines that govern the use of e-health technologies so as to curb data breaches and information theft.
3. Given the existing economic challenges in SSA, there is a need for governments to come up with sustainable funding strategies to raise funds for the full implementation and longstanding and uninterrupted support of the e-health projects and programmes. These funds will cater for setting up costs, training health practitioners and remodelling the current service delivery platforms to suit COVID-19 response measures.
4. Health decision makers should integrate e-health solutions into current health systems, so as to supplement and increase their operational efficiency. This will ensure that patients continue receiving health care at a time where in-person hospital visits are limited.
5. The adoption of e-health systems should not be done in a haphazard manner, policy makers should adopt effective change management strategies to prepare all the concerned stakeholders on the use, benefits and implications of using e-health technologies.
6. It is crucial that health decision makers engage in constant monitoring and evaluation of e-health systems in use. Monitoring and evaluation allows them to track progress, identify challenges and make adjustments if need arises.

7. Conclusion

The COVID-19 pandemic and measures adopted to curtail it have drastically changed how health services are delivered. Fortunately, the use of ICTs in the health sector can fortify and complement conventional health systems to ensure the continuity of health service delivery (Hollander & Carr, 2020). This study revealed that, at such a time e-health innovations are the most viable tools to offer safe, timely, cheap and convenient health services. The paper also explored the e-health technologies which are being used in SSA towards reducing the spread of the Coronavirus. While challenges exist that may hamper the widespread use of these technologies in Africa, this paper suggests that African governments should come together and implement similar e-health policies, share software, expertise and other critical ICT infrastructure as it results in reduced costs. The COVID-19 pandemic should thus be a wakeup call for many African governments to fund innovations in health and put in place policies that facilitate the successful implementation and use of e-health solutions as being witnessed in MEDCs as these solutions are beneficial for a viable health system.

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S.R.T. Chilunjika: Conceptualization, Original Draft Preparation, Writing – original draft, Validation. **A. Chilunjika:** Methodology, Supervision, Reviewing and Editing, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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