

How We Could Use Digital Health to Improve Action on Non-Communicable Diseases

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ABSTRACT

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Introduction

Non communicable diseases (NCDs) are the leading killer disease globally accounting for over 70 % of deaths globally [1] and significantly rising in sub-Saharan Africa [2]. In Kenya, non-communicable diseases currently account for 27% of all deaths [3] and 55% of all hospital admissions [4]. NCDs is a huge burden in Kenya but receives a small percentage in the average of just 7% of the annual budget being allocated to health [5]. One of the biggest challenges in the fight on non-communicable diseases in Kenya is the vast misinformation and lack of it, insufficient access to early diagnostic services [6,7] and poor compliance to medication.

Digital Data Collection Tools for Improved Outcomes for Patients

Digital data collection tools would be important in collecting relevant data that could inform interventions and influence positive health outcomes. This could be achieved by the following tools:

- **Mobile Phones**

The use of mobile phones is the easiest way to capture valuable data in Kenya as the penetration is high [8]. Mobile phones could be used to collect data and improve patient compliance through reminder SMS services [9,10] and use of interactive voice control [11] both which have worked with other conditions like malaria and HIV and could be adopted for non-communicable diseases as well. Self-reporting questionnaires have proven to be an ideal way to collect data especially amongst the youth [12].

- **Bio Sensors**

The most common biosensors already actively used in the country are the blood pressure monitor and the blood glucose monitors. Successful programmes like Tiba Yako have successfully combined the use of phones and bio sensors mentioned above to improve early diagnosis and monitoring of conditions as a result improve the health of millions in the country [12]. There are already existing projects aimed at using nano sensors in phones for cancer detection [13] in the country and the amplification of such projects could ensure early detection for such NCDs.

- **Geographic Data Capture**

To assess the distribution of various clinics and medical centers that offer care for, the use of geo location and GIS would be the most appropriate way to collect data on the same. This data could then be used by governments to put in place detailed plans aimed at improving access to services to those who need it the most. In 2020 for instance, GIS greatly improved Kenya's response to COVID-19 [14].

Impact of Policies and Legislation

- **Data Security**

Digital data collection tools like sensors and internet of things whilst they may collect the best data, patients may not want their data released without them giving their informed consent. As a

result, policies such as the Kenya Privacy and Data Protection act 2019 [15] sets standards for protecting the patient's data.

- **Data Sharing**

Policies and legislation should be put in place to allow cross data sharing in critical areas to ensure the greater good of all especially data in important areas like health. Rwanda is a good example that is beginning to set the pace on this in Africa through sharing special data and whilst they still have challenges, there have been some significant benefits as well [16].

- **Cyber Security**

With increased data collection, there is a constant need for regulations on data accessibility, data encryption and data deidentification. Having strong policies on cybersecurity and who can access data and how the data is treated is key in avoiding the wrong use of data. Strengthening the Kenya Privacy and Data Protection act 2019 (15) will ensure increased cyber security and protection of this data [17].

Benefits and Challenges in Using Digital Data Collection

Benefits:

- **Easy and a Cheaper Way to Collect Data**

Digital data collection makes data collection much easier as it avoids challenges on paper-based data collection. It reduces costs, streamline data collection processes and improve efficiency and this is very important especially in developing countries like Kenya where resources are scarce [18].

- **Massive Data Could Be Collected Faster**

With digital data collection, it's much easier to collect massive data from many patients and geographical collections. Since this data collected comes from a wider lot, a better picture of the real scenario can be identified and the right solutions implemented [19].

- **Data Could Quickly Be Analyzed**

With the massive digital data collection, the data can be easily analyzed with the right technology and algorithms [19]. Data that is easily accessed in digital formats reduce significantly the time required to analyze data, as a result the data always stays relevant.

- **Real Time Data and Reports**

Traditional methods of data collection do not show what's happening in real time as a result you would have to wait before the data is analyzed and interpreted [18]. The loss of time during this phase may equal to a lot of missed cases and even deaths resulting from the conditions. Real time data enables development of proactive interventions instead of reactive health interventions.

- **Precision Medicine**

With increased digital data collection for patients living with NCDs such as cancer, the data analysis from individuals would encourage the customization of their treatment and management based on their data as a result the individuals can become healthier faster and avoid unnecessary drugs and medication [20].

Challenges:

- **Digital Divide**

The biggest challenge in digital data collection in Kenya and in most LMICs is the great digital divide that still exists. There is still a big gap in internet accessibility and access to mobile phones that can support various forms of the digital data collection. Also, the divide in terms of the age groups is a contributing factor to the digital divide where the elderly cannot be able to access the internet and use it yet in our context, they are the most affected with non-communicable diseases [21].

- **Geographical Setting**

Most parts of Kenya are still rural areas where there is less access to internet which is also slower and has poor infrastructure making it difficult to collect accurate and inclusive data digitally [22]. The geographical setting increases health inequality especially since those with access to and utilize the internet will continuously show significantly better health outcomes compared to those who do not.

- **Inadequate Infrastructure**

In Kenya there is a big challenge in infrastructure development that can manage the digital data collection and analysis [23]. With insufficient cell towers, low internet penetration and use, and lack of appropriate technologies, digital data collection remains a secondary means of data collection at least in most parts of the region.

- **Analysis And Interpretation**

To successfully analyze and interpret digitally collected data, there is need for specialists and algorithms. Maintaining these across the divide is expensive. As a result, this contributes to inequality since some regions have the capacity to maintain analysis and interpretation and reap from its benefits and some others don't [24].

Role Big Data in Improving Outcomes Further

- **Electronic Health Records (EHRs) Analysis**

Electronic health records contain all the data about the patient with a folder that can easily be changed and adopted as the patient lives on [25]. This is the biggest application of big data which if well managed and implemented in the region then patient data

management can be seamless and there will be easy tracking and addressing of the patient's medical condition.

- **Real-Time Alerting**

With big data, health service providers can monitor patients living with non-communicable diseases through wearables or mobile phones to check on the compliance with medication for their various conditions and are able to improve their compliance via real time alerting them and reminding them on the same. Also, conditions like blood pressure and breathing that can be remotely monitored with wearables ensuring any dangers are quickly identified and managed [26].

- **Using Health Data for Informed Strategic Planning**

Using big data allows for strategic planning in the health care system as it provides better insights into people's motivations, and the gaps and trends in the healthcare system [26]. With this data strategic improvements could be prioritized to places that need them as a result ensuring the right challenges in the health care system are solved and that the little resources are utilized effectively.

- **Determine Disease Prevalence**

With big data analysis, we can identify what are the different levels of disease prevalence of non-communicable diseases. We are also able to determine where they occur and as a result able to make necessary interventions in a targeted approach to address such challenges [26]. This data can help governments budget for health care in areas that need them the most.

- **Smart Staffing & Personnel Management**

Wrong distribution of staff could mean that some departments are crowded while some are lacking the staff where they matter the most. With big data tools, it's possible to streamline your staff around the key areas of concern in the hospital and generally in the health care system [27]. Big data analysis can help in optimizing staffing and predicting where there will be the most demand for services thus improving patient care.

- **Enhanced Supply Chain Management**

Big data analysis can help in establishing relevant predictive data that can enhance decisions for negotiating for prices and variation in medical supplies. Such data would help in acquiring the right medication for instance to treat various NCDs [28]. In this way big data contributes significantly to improving the supply chain management.

- **Developing New Therapies & Innovations**

With increasing research in the field of non-communicable diseases, the human capacity is limited in analyzing all the data and finding the right connections and interrelations. However with big

data analysis, there are increased possibilities of identifying trends and connections between various research and as a result develop new drug combinations and new therapies that can help even cure some NCDs such as cancer [29].

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