

Global Scholarship Fellowship Program
Research Workgroup 1: Efficacy of Mobile Health in Uganda (mHealth)

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How can Mobile Health (mHealth) be used to Help Lower the Infant and Maternal Mortality Rate in Uganda?

1. Background

The fertility rate in Uganda remains sky-scraping at the same time positively associated with the infant and maternal mortality rate. Whereas Uganda as a developing country, tackling public health issues with limited resources is a complication to the government or any helping parties. Getting into the era of technology, mobile health is an idea to maximise the functions of available resources and attain the best efficiency in medical services. Targeting the women in Uganda, we aim to reveal how the implementation of mHealth can improve maternal health related issues, particularly in reducing the infant and maternal mortality rate through refining medical services, education, and filling the gaps of insufficient resources.

Following the motto of “Listen, Think, Act”, we listened to speakers and read literature in order to obtain a sector of focus for mHealth. Thinking was done by extensive research in order to get a full understanding of Uganda's health care when it comes to maternal health and infants. Acting is now the current step - action is being done by the writing of this research paper and a presentation to the fellows and leaders in order to get the research and ideas out into the world. This article starts off with our literature review, followed by ideas to combat maternal and infant mortality rate, and suggestions on how to implement mHealth into Uganda.

2. Literature review

2.1. Statistics on maternal and infant health in Uganda

The following information and statistics on maternal and infant healthcare in Uganda will come from the documentation of UNICEF (United Nations Children Fund). In 2015, 1.7 million babies were born in Uganda. Approximately 81 babies will die each day before reaching their first month of life and 96 stillbirths will occur each day. Uganda's neonatal mortality rate (NMR) is 19 deaths per 1,000 births. In rural locations the NMR is 30 deaths per 1,000 live births. Some of the largest causes for neonatal deaths are birth asphyxia, prematurity, sepsis, congenital anomalies, acute respiratory infections, injuries, and tetanus. The maternal mortality ratio is 343 deaths per 100,000 live births. The national estimate for family planning satisfied by modern methods is 40.5%. The

national estimate for antenatal care coverage at least four times is 47.6%. The national estimate of having a skilled attendant at delivery is 58%. The national estimate of institutional deliveries is 57.4%. The national estimate for postnatal care of mothers within two days of giving birth is 33%. It is also worth noting that there are staggering differences in care for infants in urban and rural regions of Uganda. In urban areas postnatal care of newborns within two days is 20.9% compared to rural regions at 9.1%. In urban areas newborns weighed at birth is 86.4%, compared to rural regions at 44.6%. In urban areas birth registration is marked at 38%, compared to rural regions at 28.7%. Also, women giving birth by the age of eighteen in urban areas is 23.7% compared to rural regions marked at 36.2%.

It is vital to include this information due to the statistics being dramatically low in care and dramatically high in health issues and mortality. It is also important to note the extreme difference in the urban and rural regions when it comes to maternal and infant health. These extreme differences in urban and rural regions can be due to many factors such as lack of transportation to medical facilities, lack of wealth to afford health care, lack of access to education, lack of medical facilities, and lack of medical staff. UNICEF also includes the importance of education, noting that educated women tend to fall into better statistics than uneducated women. Overall, these alarming statistics on maternal and infant health care lead us to focus on this topic and explore the possibility of mHealth changing these statistics.

2.2. mHealth and Maternal Health

To have a better understanding of how mHealth and maternal health in Uganda could be done, along with maternal health-related barriers seen in Uganda, Tumuhimbise et al. (2020) recognise areas that the maternal health sector need significant improvement and these improvements could be obtained with the use of mHealth. The paper discusses how expecting mothers have issues with receiving proper prenatal health-care due to lack of transportation, lack of resources, lack of income, and lack of proper medical care. At the end of the research study, women were asked what barriers they ran into trying to receive prenatal and maternal care - the barriers were endless. One barrier was lack of transportation to get to scheduled appointments. Another was lack of income in order to be able to pay for medical care such as ultrasounds, education, prescriptions, etc. Another big issue was the quality of medical staff. Women who were unable to arrive on time due to lack of transportation or other issues were treated rudely by medical staff at facilities. Most of the women involved in this study were illiterate women from rural areas, therefore the findings of how medical staff were treating these women were shocking. The attendance to appointments for prenatal care and education is critical as it has a huge impact on maternal and infant mortality rate (Tumuhimbise et al, 2020).

After the findings of endless barriers to access maternal and prenatal health care, Tumuhimbise et al (2020) concludes that the use of mHealth in rural areas could help combat the barriers women are facing to receive care. The integration and incorporation of mHealth has the potential to ensure universal access to maternal health care and related information.

2.3. Strengths of mHealth in Various Health Sectors

Although mHealth is not a brand new idea to the world, it is necessary to study the feasibility and suitability of the system targeting an issue in a specific country. Aranda-Jan, Mohutsiwa-Dibe & Loukanova (2014) conduct a systematic review on the strengths and weaknesses of the implementation of mHealth in Africa. Botswana indicates that specialists could assist health workers working in remote areas for better diagnoses by providing latest medical information (as cited in Aranda-Jan et al, 2014). With the use of mobile phones, reminders for appointment and immediate inquiries can be responded to, which reduces the operational and time costs while increasing the capacity of the treatment program. In terms of management, studies reveal SMS reminders have facilitated patient care and enhanced the quality of treatment with limited resources.

Research discloses positive impacts brought by mHealth on the mental health sector and maternal health sector. Berrouiguet, Baca-García, Brandt, Walter & Courtet (2016) review the use of mHealth in the mental health sector, obtaining a positive effect on clinical outcomes. Caring messages, reminders, and information are delivered through text messaging to the patients, which provides an opportunity for patients to access important health information (Berrouiguet et al, 2016). Since text messaging does not require patients to visit clinics or any medical centres, the natural environment also allows patients to give more precise and genuine reflection of their physical and mental status. A two-way communication between patients and caregivers builds promising support and reduces social isolation. Patient-physician connections can be built through mHealth without any constraints at the same time providing professional support.

For maternal health, Seebregts et al (2017) study a successful mobile maternal health messaging programme in South Africa. This prevailing programme is of high reference value to our research in terms of the method and procedures in carrying out the system. In South Africa, MomConnect is a program initiated by the South African National Department of Health (NDoH) that promotes health information and allows interactive feedback by sending free mobile phone text messages to registered pregnant

women. As of September 2017, almost 2 million of unique mobile phone numbers are registered on MomConnect (Seebregts et al, 2017).

2.4. Benefits Of mHealth on the Local Population

In countries with weak primary healthcare systems and where access to care is limited, utilizing community health workers in partnership with facility-based health systems is the best way to maximize benefits and reach the population with the greatest need (Progress Panel, 2010). According to existing research, mHealth, as part of the delivery of maternal health care aims to lessen the distance, whether it is financial, structural or political. Therefore, the lives of women and children can be saved each year by better addressing preventable health problems (Progress Panel, 2010).

Aranda-Jan et al (2014) believes that mHealth benefits the entire health system in the country as it would increase direct communication among health workers especially rural areas and mHealth would increase the support for patient management in the healthcare system. MHealth allows community health workers to prioritize where they are most needed because; mHealth interventions target populations who have the least access to health services (Aranda-Jan et al, 2014). Patients can be benefited from mHealth as it saves them money from paying for a regular doctor consultation, bridges the communication gap between them and the community health workers to utilize cell phones and therefore better access to information. As a result, “low-cost, ease of use and widespread availability were frequently cited as the main drivers for implementation” (Aranda-Jan et al, 2014).

The accessibility of mHealth helps to narrow the gap between access to services in urban versus rural areas attributed to the fact that health care providers are most likely to be located in densely populated cities where hospitals and clinics are more available. For this reason, mHealth not only compensates for poor or inconsistent access to health services in rural areas, it can also help in delivering faster and better quality care. This highlights how mHealth allows people to overcome geographical limitations in health care. mHealth also addresses the chronic shortage of healthcare workers as described by Agarwal, “this shortage will further exacerbate the inequity in distribution of healthcare providers in low-resource settings as evidenced by the fact that of the 57 countries facing a shortage, 36 countries are in Sub-Saharan Africa” (Agarwal et al, 2015).

3. Discussion

3.1. Ideas on how to implement mHealth for the local population - especially in rural regions

One of the biggest challenges with the idea of implementing mHealth into maternal and infant health care is how mHealth will be accessible for as many people as possible. Accessibility can be extremely hard to maintain when it comes to reaching rural regions that have little access to technology devices and the internet. The research team read many research articles that implemented different ways to make mHealth accessible, and while we do not have a complete idea on how to fully solve the issue of accessibility we have taken steps to come up with ideas on how to fix the issue.

One, the mHealth would need to be on a platform that did not require the internet for usage. This would mean electronic SMS messages would need to be sent out in order for women to be reminded of appointments and medical information, along with education on prenatal and postnatal care. The use of SMS messaging will allow for the challenge of access to the internet to be overcome. Also, a non-internet program could be made. The program would communicate with itself to send information out to devices that pregnant women have. But the implication of a program of this sort would require trained professionals to create. The program would need to be created in order for us to know if it is useful for the community and if it is able to do what needs to be done in the sector of mHealth.

Another issue with implementing mHealth is accessibility to power in all regions. The use of technology requires power for long term use due to recharging devices. The team has not been able to come up with a long term sustainable way to make sure all women have access to power, but we have come up with some smaller ideas to help the process along. One thing that could be implemented is the use of solar power charging devices, but the issue with this is how will women access these devices. One, health care facilities that are able to afford it could allow women to take these devices home during their pregnancy in order for them to be able to access the mHealth. Two, an NGO could step in and help to fund kiosks in rural communities that have solar panel charging, and these kiosks would be used for charging devices.

While the idea behind mHealth is a spectacular one, obviously the challenges can seem endless when it comes to implementing the actual usage. We truly believe that the use of mHealth could in fact help to lower infant and maternal mortality rate, but the challenges of implementing the actual use of mHealth is something that will require trial and error, along with case studies of what works best for the local population.

3.2. Using mHealth in Education and Promotion

Education works as a primary step to avoid preventable diseases from happening, especially to tackle infant and maternal mortality rate (MMR). Several Millennium

Development Goals (MDGs) were proposed by the United Nations in 2015, which aims to alleviate poverty and make developing countries more sustainable. Highlighting the fourth one - reduce child mortality, and the fifth one - improve maternal health, Uganda's government has made some effort in achieving these goals. The MMR dropped by half from 687 maternal deaths per 10 thousand live births in 1990 to 343 deaths per 10 thousand live births in 2015, and the infant death rate also dropped from 111 infant deaths per 1000 live births to 38 deaths per 1000 live births. Such significant improvement and progress can be linked to the free health care policy established by the government (Hodin et al, 2016). The active participation in the free health care policy implies people in Uganda are actually aware of health issues but lacking incentives and money to take action. Yet, the progress made in reducing MMR such as offering free health care policy is not sustainable enough to resolve the whole problem. A long-term solution should be proposed and to ease the problem at source. Hodin et al (2016) suggests the barriers for African countries from attaining sustainable development are the fewest resources and limited access to data. In the following section, getting to know the current situation in Uganda and the desperate needs of education to improve the maternal health sector, mHealth is an effective and efficient tool for education and delivering family planning services.

3.2.1. Current behaviours and practices in Uganda

In Uganda, due to the shortage of medical professionals, grandmothers perform as the doctors who help deliver a baby and educators about prenatal care (Gates, 2017). Hodin et al (2016) states that only 58% of births in Uganda are attended by skilled health personnel, which is 10% below the average in Africa. Births attended by unskilled health personnel may contribute to the high infant and maternal mortality rate, which flawed care and assistance would increase risk for diseases such as HIV. The alarming MMR statistics are associated with the tough social setting for girls and women, insufficient antenatal care and skilled birth attendance, and poor quality of care (Hodin et al, 2016). Women's roles in Uganda are largely domestic and women rights are usually being underrated due to the undesirable social atmosphere, which has lowered the awareness of maternal health. As a result, less resources are put into this aspect and actions are required to improve the situation. We assume tackling the problem at source by raising awareness through education could equip women with basic knowledge on handling maternity problems and the importance of professional medical treatments.

3.2.2. Family planning and contraception

Proper family planning and the use of contraception can help lower the abandonment rate of infants and deaths of infants due to negligent care. With a limited number of workers and resources in Uganda especially in rural areas, education on family planning has not met the desirable level. Hodin et al (2016) points out that approximately 36% of women in Uganda have an unmet need for contraception in terms of family planning. Available resources are in great shortage to meet the needs of Uganda's women. According to the UN's report (2015), only one third of young women and 37% of young men in sub-Saharan African countries had a thorough understanding of HIV in 2014. It is also reported that the adolescent fertility rate in sub-Saharan Africa is more than double that of the world's average, which alludes to the inadequate education on preventing pregnancy and contraception. As cited in Hodin et al (2016), Ahmed suggests that access to family planning services and safe abortion can improve maternal and neonatal health. We contend the low usage of contraception is associated not only with lacking access to contraceptives but also with the inadequate knowledge of HIV. Since people are not conscious of the severity and consequences brought by HIV, contraception seems to be a dispensable option. Hence, education on family planning and the significance of contraception is needed in order to lessen unexpected pregnancy and the risk of catching sexually transmitted diseases such as HIV and AIDS which are commonly found in Uganda's population.

Given a limited number of available resources, we shall come up with a solution that maximizes their function and attain efficiency. As we have mentioned the prevailing situation in Uganda and given the limited resources, mHealth can function as a tool to raise awareness and discussion in maternal health as well as offering family planning services and promotions on preventive measures such as contraception. While our ultimate goal is to lower maternal and infant mortality rates, minimising the probability of infecting HIV can be done by contraception.

A messaging system can be performed by mHealth, which trained and responsible workers can respond to users' queries remotely and instantly at the time the message is sent and received. It is particularly beneficial to women living in rural areas who have difficulties in accessing family planning services due to the distant location of centres. The instant messaging system reduces the labour force of the medical services provider and the effort that the local population needs to make in working out their family planning. Patients can be easily followed up by workers with messages or calls through

the mHealth system. Accessing the system is an effortless move which may encourage women to reach out more and eliminate their excuses of unreachable services.

By sending health promotion messages and introducing contraception through the media, relevant information is at hand as long as you have a digital device. In return, medical service providers can receive common questions or difficulties that women in Uganda face through their messages. Whereas messaging works as a platform to acknowledge their concerns, it also facilitates the primary research on knowing the actual needs of the community for a better development planning. Rather than replacing traditional face-to-face consultation and physical educational programmes with mHealth, mHealth should only be used as an assistant tool. Some services can only be done corporeally such as distributing condoms and contraceptives since some locals reflect that the access of condoms is deficient. Besides, for people who choose attending activities in the flesh over solely staring at the screen, workshops or talks are still effective in terms of having real time engagements with the serving targets.

3.3. Community Health Workers Training

The training of community health workers to use mHealth can last from a few hours to a week depending on the type of mHealth intervention being carried out. Such training includes an overview of the phone's function and overview of software being used. (Agarwal et al,2015) Regular training for mHealth clinical data collection application use is said to reduce the error rate for data entry from 54% to 8% within a one year span (Agarwal et al,2015). In addition to the benefits to direct healthcare provided by CHW, there are broader benefits to using mHealth with community health workers. To CHW the aspects of mHealth include reducing the need for travel, improving healthcare efficiency and planning, receiving feedback and information and improving communication with supervisors, patients and other CHW. They use their mobile devices in a variety of ways such as clinical data collection and reporting , decision support tools and training,emergency referrals and alerts and reminders (Agarwal et al, 2015).This removes the need for face-to-face communication with patients, other CHW and health facilities across the regional and national level. The health worker can transmit data from her/his phone into the health system's database and also utilize treatment guidelines for specific health problems straight from his/her phone (Agarwal et al, 2015). The CHW can organize emergency services to a patient based on the patient's health status that allows the data to be connected at the facility level during emergency referrals. Alerts and reminders assure CHW to conduct follow-up visits. (Agarwal et al, 2015)

3.4. mHealth helps to fill the gap between medical professionals and medical facilities

The magnitude of issues that are faced with the women when it comes to their health in maternal cases, is quite large compared to the amount of medical facilities and health care workers that are available to address these health problems in Uganda. According to Linda Waldman and Marion Stevens (2015), mHealth has the capability and the capacity in improving the access to proper health care services to women in poor communities where it is able to bridge the gap between patients and healthcare providers through mobile phones as well as through supporting front line health workers. mHealth can thus potentially render solutions for patients who face the struggles of not having the ease of access to healthcare facilities that are close in proximity with all the vital equipment and staff that is needed for healthy pregnancies and babies. The authors also pointed out that mobile phone-based information messaging shows great potential for the collaboration between health workers and pregnant and parenting women all in an effort for the improvement of and the delivery of maternal and child health care. Mobile phone messaging could be used to disseminate the vital information that is needed by expecting mothers and also to track their progression in their pregnancies in order to ensure the medical help that is needed and is provided.

Daniele Giansanti, (2021) has pointed out that mHealth will also assist in the speedy and consistent doctor/patient communication and treatments tailored to the patients anywhere that would not have been possible if it is that healthcare facilities and medical professionals were at a stable/fixed workstation, where the patients' only option would have been to make their way to travel to the healthcare station.

4. Limitations of implementing mHealth

Although the opportunity and strengths of mHealth are advancing due to the development of digital technology, limitations are still found in terms of carrying out mHealth to earth. The major limitation for the implementation of mHealth is the coverage and accessibility of technologies such as networking. Even though mobile phones are prevalent nowadays in Uganda, there are uncertainties towards technical or expert knowledge for maintenance and development of softwares. Other than technical issues, the emergence of mHealth requires trained and qualified health staff to administer the newly established program. It takes time for medical workers training and the locals to familiarise with the use of the system. In addition, privacy concerns of the mHealth system are uncertain and it may be challenging to get consensus from all stakeholders.

Yet, the design and implementation of the system can be adjusted to meet the availability of resources, thus easing some of the possible barriers. According to Seebregts et al (2018), anyone with a mobile phone could use the service under MomConnect. In other words, the provided services do not require a Wi-Fi network to operate, which eradicates the concern of

connectivity issues. The proposal for mHealth implementation should consider the limitations and how the available resources now in Uganda can satisfy the needs to prevent unnecessary spending.

Nonetheless, since mHealth is still under a development stage, there are lots of uncertainties that we have not reached at this point. Different communities may have different limitations in the implementation and the above is only what we observed and acquired from the articles. Further research and study are essential to study the feasibility of implementing mHealth into Uganda regarding the constraints and risks.

5. Conclusions

Even with an improving progress on maternal health in Uganda, more efforts are needed to educate and promote the importance of maternal health. Indeed, the implementation of mHealth will take up a vast investment and as a public health issue, all parties are inevitable from taking part in running the system. In particular, the government which holds most of the funding and has the control over budgeting should consider offering assistance to the accessibility of mHealth, resources for education in terms of family planning services and contraception, medical staff training, and the utilisation of mHealth in filling the existed gaps between medical staffs and facilities. More research on the implementation of mHealth is needed, especially the standards of a mHealth system, any privacy and security risks from the internet, and the popularity of the system among the target population.

5.1 Suggestions

The team suggests that the government of Uganda make maternal and infant health a priority in budgeting. If the government were to prioritize the budget on healthcare- especially in the sector of women and children the infant and maternal mortality rates would decrease drastically; infant and maternal care would increase drastically. The government taking initiative with healthcare budgeting would bring deep rooted systemic change to the healthcare of Ugandan citizens. On top of this, with the help from NGOs funding smaller healthcare projects Ugandan healthcare would change drastically. If the Ugandan government provides the base for healthcare change, then NGOs can take initiatives by focusing on certain communities that need extra help such as infrastructure, medical staff training, and education.

To continue, another suggestion the research team has is normalizing the discussion of family planning, contraception, and sex education. Education can be a major root in changing things. Also, education has been proven to help lower status of all kinds. With normalizing the discussion of family planning, households would be more prepared and educated on what kind of family they can afford to have and take care of.

Family planning also involves normalizing the use of contraception - condoms and birth control. The use of contraceptives can help decrease abortion rates and unwanted/unplanned pregnancies in Uganda. This can drastically change the lives of women and their families. Normalizing contraceptives is imperative to helping change the issues of maternal healthcare in Uganda. Due to conservative views on sex education and contraceptives in Uganda, this would be a big change - the research team recognizes that. But it is imperative that women know their rights to have contraceptives and that all people are educated on safe sex. Not only does this category include women (the target group) but the research team feels it's important for men to be educated on these topics as well, especially sex education. Having all people equally educated on the subject will not only help family planning, but also simultaneously combat the spread of sexually transmitted diseases - another big issue within Uganda.

Furthermore, providing specialised care/mentoring in rural areas will help to increase the level and quality of healthcare in rural regions. The rural regions of Uganda have significantly lower levels and quality of healthcare. As seen in section 2.1 of the literature review the statistical differences in maternal and infant health care between rural and urban areas are drastic. Offering specialised training in maternal and infant healthcare in rural areas would significantly improve the quality of care. It is also important to note that other specialised training should be offered in whatever medical sector that rural regions need in order to produce the best quality of care for all people in that specific rural region. These trainings should be funded by the government, in order to follow suggestions in prioritising maternal health in budgeting.

The last suggestion that the team has to offer is cooperation with local expertise or NGOs for more technical assistance in long-term planning when it comes to the implementation of mHealth. While there may not be many professionals with technical expertise, external volunteers from other countries can be recruited through NGOs to help with the long term goals of implementing mHealth in a way that best works for Ugandan citizens. It is essential that the implementation of mHealth is done properly and the system works easily for the local population. In order to make this happen there will need to be health and technology experts, along with local citizens who can assist with what will actually be productive and useful for Ugandan citizens.

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