

# The Impact of Telemedicine on Maternal Health and Equity Outcomes in the Democratic Republic of Congo

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**Abstract:** *The World Health Organization (WHO) defines telehealth as the "delivery of healthcare services in which patients and providers are separated by distance." Telehealth is the use of technology to achieve remote care. Access to maternal healthcare facilities in Sub-Saharan Africa present significant challenges, despite the concerted efforts outlined in the ambitious sustainable development goals (SDGs) aimed at eradicating poverty and leaving no one behind. Recognizing that prioritising maternal, neonatal, and child health is crucial in eliminating poverty and disparities in low- and middle-income countries, telehealth emerges as a promising solution to enhance maternal health outcomes; By circumventing inefficiencies and inequities inherent in traditional healthcare systems, telehealth addresses barriers such as limited access to in-person medical consultations, a shortage of skilled birth attendants, and inadequate health promotion activities. However, it is essential to acknowledge the potential exclusionary nature of telehealth. In this study, we conducted an extensive literature review of technology-based maternal health programs in the Democratic Republic of Congo to illustrate the limited practices of telehealth programs. We specifically examine how wealth disparities, educational attainment, and geographic location (urban/rural) contribute to unequal access to maternal healthcare, rendering women particularly vulnerable. It is imperative to address these limitations and challenges in digital health to ensure equitable access to maternal healthcare for all women and girls, leaving no one behind.*

**Keywords:** Telehealth, Maternal health, Health inequity, DRC

## 1. Introduction

The origins of technology's utilisation in healthcare can be traced back to the 1860s, during the American Civil War, when telegraph messages were sent to seek medical assistance for treating wounded soldiers. This historical event, which took place approximately 155 years ago, marks one of the earliest instances of utilising technology for healthcare purposes. Despite the arduous journey, collective efforts have propelled us forward, leading to the emergence of telehealth today. (Scott & Mars 2015 p.2)

The World Health Organization (WHO) defines telehealth as the "delivery of healthcare services in which patients and providers are separated by distance." Telehealth has been widely implemented in numerous countries for several decades. The Covid-19 pandemic has been a pivotal period for the utilisation of telehealth services, which have experienced a significant increase in many countries, and now being regarded as an essential service for the general population. Although telehealth has the potential to provide equitable healthcare services, individuals with disabilities often encounter difficulties and challenges when accessing and utilising telehealth services. Some studies have indicated that telemedicine has helped save numerous lives in Lower- and Middle-Income Countries (LMICs) by addressing complications that would typically result in delayed treatment and potential fatalities.

Telehealth integration in Sub-Saharan African countries (SSA) has been hindered by ongoing challenges, a situation that has persisted even during the COVID-19 pandemic. Current evidence and research suggest that the implementation of telehealth in this region has been largely inadequate.

While there have been some initial efforts to introduce telehealth applications in SSA, these initiatives primarily exist as pilot projects, often reliant on foreign aid, private investments, or public-private partnerships. Regrettably, these programs lack long-term sustainability and fail to provide concrete solutions. Despite a significant mobile phone user base of over 650 million individuals in Africa, low subscription rates to health insurance remain a major obstacle in facilitating payment for telehealth services.

According to the authors, the crucial foundation for the successful implementation of telehealth services in Sub-Saharan African countries lies within the realm of government commitment and political will (Babalola et al., 2021, p. 1-2)

Linked to other indicators of economic growth in a country, maternal, neonatal, and child health play a crucial role in poverty eradication and the reduction of disparities in low- and middle-income countries. Telehealth has emerged as a promising solution to improve maternal health outcomes.

According to Bilal et al. (2022, p.1), telemedicine has demonstrated success in monitoring maternal and foetal health throughout pregnancy, delivery, and the postpartum period, particularly when patients are located far from hospital settings. Telemedicine has proven effective in addressing a range of conditions, from minor pregnancy complications such as vomiting, sweating, and mood swings to major emergencies such as rupture of membranes and preeclampsia. Notably, telemedicine interventions have been both highly effective and patient-friendly.

Diaka et al. (2021, p. 2) asserted that sub-Saharan Africa is the region facing the most significant medical and communications needs. Radio has been used in the healthcare sector for several years to enhance the healthcare system. However, there is an ongoing shift towards the use of mobile phones in areas where access is available. Consequently, it is essential to investigate the potential of telemedicine in improving access to high-quality healthcare in this region. Nevertheless, it is crucial to acknowledge the inherent limitations of communication technology and power supply in implementing such solutions.

The Democratic Republic of the Congo (DRC) is home to diverse indigenous peoples (IPs) who face numerous challenges, including forced displacement, discrimination, and limited access to basic services like healthcare and education. Congolese women specifically encounter barriers to economic opportunities and empowerment, such as high rates of gender-based violence and discrimination. The educational gender gap is evident, with only 16.8% of women completing secondary school compared to men. Early marriage and high fertility rates further compound the challenges faced by women without education. Despite a relatively high labour force participation rate of almost 62%, women in the DRC earn less than men and own fewer assets.

According to Diaka et al. (2021, p. 2b), the healthcare systems of the Democratic Republic of Congo (DRC) have been significantly affected by both its protracted internal conflict and ongoing complex humanitarian crises worldwide. These challenges have been further exacerbated by the COVID-19 pandemic and recurring outbreaks of diseases such as cholera, measles, and Ebola.

In March 2020, the country experienced negative consequences on healthcare service utilisation. This included a decrease in hospital visits, a reduction in the number of antenatal care visits, limited access to family planning and contraception, increased food insecurity, as well as a higher incidence of sexual and gender-based violence (SGBV).

Additionally, telemedicine plays a crucial role in enhancing maternal care by improving patient satisfaction through the provision of educational and supportive services with flexible meeting schedules. Maternity care involves urgent situations that require immediate interventions in the presence of healthcare providers (HCPs).

The Democratic Republic of the Congo (DRC) faces more obstacles to implementing telehealth compared to other Sub-Saharan African countries. These barriers are closely linked to pre-existing challenges that have hindered the healthcare sector even before the pandemic. Some of these challenges include the absence of healthcare implementation policies and political support, high costs associated with adopting telemedicine using live-video communication, lack of access to high-speed internet, disparities in educational attainment, and geographic location (urban/rural), all contributing to unequal access to maternal healthcare. As a result, women are particularly vulnerable in these circumstances.

Furthermore, Umuhiza & Ataguba, Ujewe, S. J., & van Staden, W. C. (2021 & 2019 p. 2) conducted a study on

socioeconomic inequalities, equity in healthcare, and health risk factors in the SADC region. However, their research overlooked the challenges associated with socioeconomic determinants of health, especially among disadvantaged households. By implementing a framework developed by Daniel Norman in sub-Saharan Africa without considering these challenges, they failed to acknowledge the significant impact of socioeconomic factors on various diseases and health conditions, including maternal and child health outcomes, healthcare utilisation, individuals' self-rated health, and instances of illness and disability.

For this reason, the aim of this article is to assess the impact of telemedicine on maternal health outcomes and equity in the Democratic Republic of Congo (DRC) and to provide recommendations for enhancing healthcare delivery in the country and generating relevant insights that contribute to the existing literature in this field.

## **2. Challenges**

Bringing any innovation to maturity is a significant challenge, and this holds particularly true for telemedicine, which has been in development for well over a century in various forms.

The global strategy on digital health outlined by the World Health Organization acknowledges that every country has the responsibility of formulating its own digital health action plan, aligning it with the strategy, and tailoring it to the national context. It is worth noting that countries vary significantly in terms of their levels of health and well-being. However, in general, economically developed nations with higher personal incomes tend to exhibit better health outcomes. According to Bilal et al. (2021, p.4), many African countries have limited or non-existent legal frameworks for telemedicine, which discourages private investors from getting involved. The high cost of infrastructure presents a significant barrier to the widespread implementation of telemedicine. A study conducted in Ghana's Amansie-West District to evaluate the cost-effectiveness of telemedicine for primary healthcare revealed that although it was cost-effective, the estimated annualised total costs for providing primary healthcare through telemedicine amounted to approximately \$227,000. African countries, on average, allocate only 5 to 6% of their Gross Domestic Product to healthcare.

According to Wijeratne and Weeks (2017, p.1), the maternal mortality ratio for sub-Saharan Africa as a whole experienced a decline of approximately 45 percent between 1990 and 2015. However, this decrease has not been evenly distributed throughout the region. Several countries have made little to no progress, and their maternal mortality rates remain among the highest in the world.

In countries such as Angola, Liberia, Sierra Leone, Chad, Somalia, and the Democratic Republic of Congo (DRC), the destruction of health infrastructure caused by prolonged regional and civil armed conflicts has posed a significant obstacle to progress. It has been estimated that sub-Saharan African countries that have recently experienced conflict

have maternal mortality rates at least 30% higher compared to conflict-free countries.

Since gaining independence in 1960, the DRC has been plagued by civil unrest and political instability, making it one of the poorest and most fragile countries globally. When asked to name long-running conflicts around the world, many individuals are likely to mention well-known hotspots like Afghanistan, Syria, or Ukraine. However, few would think of Kivu. In the Kivu regions, political instability and ongoing attacks have been a persistent issue, contributing to a protracted conflict spanning approximately 24 years. This conflict primarily revolves around the illicit exploitation of mineral resources. Starting from 2012, the international community seemingly overlooked or downplayed this conflict, despite the fact that natural resources did not directly cause the wars in the DRC. Instead, there was a gradual "economization" of the conflict, wherein violence increasingly became driven by profit. In contrast, the Kasai and Katanga provinces remained relatively calm until violence erupted in 2016 between local militants and national government forces. This conflict escalated into an intercommunal dispute that spread to neighbouring provinces. At its height, approximately 1.4 million internally displaced persons were affected, although the situation has since subsided. According to the United Nations, the violent conflict lasted for over two years and resulted in an estimated 5,000 deaths. The continuous violence, frequent mass displacement, Ebola outbreak and disruption of economic and agricultural activities have significantly impacted the basic needs and safety of vulnerable individuals, particularly women and children. Consequently, the national healthcare system has deteriorated due to the disruption of essential services (Guo, F et al., 2021, pp. 1-5).

The provision, planning, and implementation of healthcare delivery in conflict zones, such as the Democratic Republic of Congo (DRC), are pressing imperatives. Instability, violence, and pervasive insecurity have significant consequences for the daily operations of a healthcare system and the assessment of healthcare burden in affected areas. Hence, it is widely acknowledged that conflict poses exceptional challenges to the timely and routine provision of healthcare in these regions (Martineau et al., 2017, p. 2).

Furthermore, the authors emphasise the crucial role of timely and sufficient maternal health services, which encompass antenatal care (ANC), delivery care, and postnatal care (PNC), in safeguarding the well-being of both mothers and newborns. Many international health agencies have strongly advocated for maternal health services, encompassing maternal health education, health check-ups, immunizations, and early identification and treatment of complications.

However, in the Democratic Republic of Congo (DRC), the coverage of maternal health services falls significantly short of the desired standards. Statistics reveal that approximately 99% of preventable maternal deaths worldwide occur in low-income countries, where women lack access to essential childbirth services. Furthermore, the leading causes of maternal death in these countries are complications arising from unsafe abortions, obstetric haemorrhage, preeclampsia, and sepsis. Additionally, studies have demonstrated that

factors such as age, education, antenatal care, domestic violence, and gender discrimination are also associated with maternal mortality (Bilal et al., 2021, p.3).

Adding to the numerous challenges and conflicts, the Congolese healthcare system faces several major barriers that directly hinder its functioning. Firstly, limited access to technology such as smartphones, computers, and reliable internet connectivity is prevalent in many parts of the country, particularly in rural areas where these resources are scarce or non-existent. This lack of access contributes to low health literacy and digital literacy, particularly among marginalised communities and in rural areas, where individuals may have limited understanding of how to utilise digital platforms. Secondly, the linguistic diversity of the Democratic Republic of Congo (DRC), with over 242 spoken languages, impedes effective communication and comprehension between healthcare providers and patients.

The healthcare infrastructure in the DRC also presents other challenges such as the shortages of healthcare workers, the inadequate healthcare facilities, and the limited medical resources that further hinder the establishment of robust data privacy and security measures. It is crucial to prioritise the protection of patient data to prevent data breaches that can erode trust and impede the adoption of telemedicine services.

Financial constraints further exacerbate the situation, as only limited resources are allocated to healthcare. Telemedicine initiatives require investments in technology, training, and infrastructure, which may be challenging to secure due to financial limitations. Additionally, resistance from patients who prefer in-person healthcare interactions or have concerns about the quality of remotely provided care can pose obstacles to the implementation of telemedicine.

Therefore, it is essential to build trust and acceptance among both patients and healthcare providers to successfully implement telemedicine in maternal health. This necessitates community engagement, education, and awareness campaigns to foster trust and promote understanding.

### 3. Efforts and Recommendations

Telemedicine in obstetrics aimed to provide remote healthcare services, improve access to care, enhance prenatal monitoring, manage high-risk pregnancies, offer patient education and support, and facilitate emergency consultations.

Obstetrical causes significantly associated with maternal death, such as haemorrhage, uterine rupture, infection, and mechanical dystocia, have been extensively documented in the literature, particularly in the African region. In countries like the Democratic Republic of Congo and other low- and middle-income countries (LMICs), many pregnant women face grave complications that can lead to fatal outcomes. However, these complications can be easily prevented through early diagnosis and treatment. Therefore, the risk of maternal mortality increases when factors like postpartum haemorrhage, uterine rupture, infection, mechanical dystocia, and others are present. Postpartum haemorrhage, in particular, is a common and significant complication

contributing to maternal mortality. It can arise from various causes, including delays in blood loss management and limited availability of blood products for transfusion (Ramazani et al., 2022, pp. 8-12).

A study conducted by Escobar et al. (2022, pp. 4-7) in South America examined the impact of implementing telehealth in maternal healthcare wards in a lower-middle-income country (LMIC). The study aimed to compare the outcomes of patients treated before and after the introduction of telemedicine. The results revealed significant improvements in clinical indicators following the implementation of the telehealth model. Specifically, there was a noteworthy reduction in perinatal mortality by 29%. Additionally, the study observed a decrease in the need for blood product transfusion due to postpartum haemorrhage, as well as a decline in the rate of eclampsia.

In contrast, the study conducted by Galle et al. (2021, pp. 4-9) reported that telemedicine was used by 58% of health professionals, and two-fifths of them indicated not receiving guidelines on the provision of telemedicine. Key telemedicine practices included online birth preparedness classes, antenatal and postnatal care through video/phone consultations, a COVID-19 helpline, and online psychosocial counselling. Challenges identified by the study included a lack of infrastructure and technological literacy, limited monitoring capabilities, financial and language barriers, absence of nonverbal feedback and bonding, and patient distrust. While telemedicine was considered an important alternative to in-person consultations, health providers emphasised concerns about the lower quality of care and the risk of exacerbating existing inequalities in healthcare access.

Furthermore, a cluster survey conducted in the DRC stated that from 2010 to 2018, the overall weighted ANC coverage declined from 87.3% to 82.4%, while the overall weighted skilled birth attendance coverage increased from 74.2% to 85.2%. Adjusted ANC coverage and adjusted skilled birth attendant coverage both declined in Kasai Oriental, but increased in North Kivu and South Kivu. In Kasai Occidental, ANC coverage declined, but skilled birth coverage increased. In the Kasai region, the largest decline in adjusted coverage of ANC was found among the poorest women. However, in the Kivu region, both the adjusted coverage of ANC and skilled birth attendance increased among the poorest women.

Telemedicine has the potential to significantly impact maternal health and equity outcomes in the Democratic Republic of Congo, given the country's vast size, limited healthcare infrastructure, and challenges in accessing healthcare services, particularly in remote and rural areas. To harness this potential, several efforts can be implemented.

First, it is crucial to invest in the development of telemedicine infrastructure. This includes expanding and strengthening telecommunication networks and internet connectivity, particularly in underserved areas. Additionally, establishing telemedicine centers or hubs equipped with necessary technology and trained healthcare professionals is

essential. Ensuring reliable power supply is also important for uninterrupted telemedicine operations.

Education and awareness about maternal health should be a priority. Telemedicine-based programs can be developed and implemented to provide comprehensive maternal health education to expectant mothers and their families. Promoting awareness of the benefits and availability of telemedicine services through targeted campaigns, community outreach, and partnerships with local organisations can help reach a wider population.

To address the issue of maternal mortality, Rollet advocates for the provision of universally accessible, high-quality healthcare that is equipped with appropriate technical facilities and an adequate number of competent human resources. These components, combined with a well-organised health system, have the potential to enhance the quality of care and ultimately reduce preventable maternal mortality and morbidity. One approach to achieving this is by offering teleconsultations for prenatal check-ups, allowing pregnant women to remotely consult healthcare professionals. Furthermore, the implementation of remote monitoring devices for measuring vital signs can enable healthcare providers to remotely monitor pregnancies that are at high risk. In addition, virtual prenatal classes can be conducted to educate pregnant women on aspects such as nutrition, exercise, and self-care during pregnancy.

Ensuring remote access to skilled obstetric care is of paramount importance. Teleconsultation services can be established to provide pregnant women with remote access to qualified obstetricians and gynaecologists, facilitating timely consultations and expert guidance. Networks of healthcare providers and specialists should be created to collaborate virtually, offering consultations and second opinions for complex cases. Equally essential is the training and empowerment of local healthcare providers, such as midwives and community health workers, in effectively utilising telemedicine tools and providing basic obstetric care.

Emergency obstetric care can also be facilitated through telemedicine. Protocols and systems for remote triage and emergency obstetric consultations can be developed, allowing healthcare providers to assess and manage obstetric emergencies remotely. Real-time communication between healthcare providers in remote areas and referral hospitals can facilitate timely transfers of high-risk cases.

According to statistical data, the population of the Democratic Republic of Congo is estimated to be 107.5 million, encompassing the entire country. As of early 2023, there were a total of 48.15 million active cellular mobile connections, accounting for approximately 47.9 percent of the population.

In January 2023, the number of internet users reached 23.04 million. Conversely, it was observed that 77.57 million individuals lacked access to the internet at the beginning of the year, representing approximately 77.1 percent of the population. This substantial proportion of the population being offline at the start of the year often poses challenges to

data collection, analysis, and interpretation across various fields.

Therefore, it is crucial to prioritise the collection and analysis of data to monitor and evaluate the impact of telemedicine on maternal health outcomes and equity. To achieve this, robust data collection systems should be implemented, and the gathered data should be thoroughly analysed to identify existing gaps, challenges, and opportunities for improvement. Utilising this information, telemedicine strategies can be adjusted accordingly.

Establishing supportive policies and regulations is crucial. Policies should recognize and integrate telemedicine into the healthcare system, ensuring reimbursement, licensing, and liability frameworks are in place. Public-private partnerships can be fostered to drive telemedicine initiatives and leverage the expertise and resources of both sectors.

Equity considerations must be central to telemedicine programs. Barriers such as language diversity, digital literacy, cultural and religion sensitivities should be addressed to ensure equitable access to telemedicine services. Designing telemedicine programs that consider the needs of marginalised populations, including women in rural areas, ethnic minorities, and economically disadvantaged groups, is essential. Continuous monitoring and addressing of potential biases in telemedicine delivery should be prioritised to avoid exacerbating existing inequities.

Continuous evaluation and improvement are essential. Regular evaluations should be conducted to assess the effectiveness, efficiency, and user satisfaction of telemedicine services. Feedback from users, healthcare providers, and stakeholders should be sought to identify areas for improvement and incorporate their perspectives in refining telemedicine programs.

Therefore, implementing these efforts and recommendations, the Democratic Republic of Congo can effectively leverage telemedicine to improve maternal health outcomes, enhance access to care, and promote equity in healthcare delivery. However, it is important to acknowledge that telemedicine should complement, rather than replace, in-person healthcare services, especially for critical and emergency situations.

#### 4. Conclusion

In summary, the implementation of telemedicine in the Democratic Republic of Congo (DRC) is expected to have a profound impact on maternal health and equity outcomes. Telemedicine has the potential to revolutionise healthcare in the country by overcoming geographical barriers, improving accessibility to quality care, and enhancing maternal health outcomes. It will enable remote consultations, diagnosis, and monitoring, particularly benefiting underserved areas and bridging the gap between urban, rural, and conflict-ridden communities. The primary mission of telemedicine is to promote healthcare equity by addressing transportation and financial constraints, thereby ensuring that women from marginalised communities receive the same level of care as others. Moreover, it will facilitate capacity building among

healthcare professionals and strengthen the healthcare system as a whole.

However, certain challenges need to be addressed for sustainable and ethical telemedicine practices. These challenges include infrastructure limitations and the necessity for comprehensive policies and regulations. By tackling these hurdles, the full potential of telemedicine can be realised. Overall, telemedicine is expected to have a transformative impact on maternal health and equity in the DRC, but additional efforts are required to fully harness its benefits.

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