




Revolutionizing healthcare in Somalia: the role of digital innovations in enhancing access and quality

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Abstract

Somalia's healthcare system faces significant challenges, including limited infrastructure, a shortage of healthcare professionals (2.5 physicians per 10,000 people), and geographic disparities in access to care, leading to only 35% of the population having access to basic health services. Despite these, Somalia is embracing digital health technologies to address these challenges and to improve healthcare delivery. Telehealth platforms such as Baano and SomDoctor provide remote consultations and specialized care to overcome geographical barriers. mHealth solutions, including Hello! Caafi, leverages Somalia's expanding telecommunications network to deliver healthcare information and services. The development of an electronic immunization registry demonstrated the role of digital health records in streamlining health services and improving data accuracy. Despite the potential benefits, challenges persist, including limited and unreliable Internet access (27.6% penetration rate), and the need to ensure data privacy and security. Capacity building and digital literacy enhancement among healthcare providers and populations are crucial. Learning from successful digital health initiatives in African countries that have effectively used digital health technologies for medical supply delivery and for improved healthcare access is essential. The roadmap for Somalia emphasizes government leadership, public-private partnerships, context-specific solutions, and investment in digital infrastructure, capacity building, and data privacy measures. This perspective explores current digital health innovations in Somalia and their potential impact on healthcare access and quality, outlining a roadmap for establishing a sustainable digital health ecosystem.

Keywords

Digital health, telemedicine, Somalia, healthcare innovation, mHealth

Introduction

The global healthcare landscape is undergoing a transformative shift through the integration of digital health technologies, which address longstanding challenges in healthcare delivery [1]. The global digital



health market size was estimated at USD 240.9 billion in 2023 and is projected to grow at a compound annual growth rate (CAGR) of 21.9% from 2024 to 2030 [2]. Digital health innovations, including telemedicine, mobile health (mHealth), and electronic health records (EHR), have improved patient outcomes, especially in underserved regions. Telemedicine, one of the core digital health technologies, has gained popularity since the COVID-19 pandemic. Research has shown that 86.6% of articles published between January and June 2020 on telemedicine were from high-income countries [3]. This trend is likely due to better infrastructure, higher healthcare spending, and greater acceptance of digital health technologies in these countries [3]. In contrast, developing regions, while experiencing growth in telemedicine use, face more significant barriers to implementation. For instance, Africa, which accounts for 24% of the global disease burden, but only 3% of the global health workforce and less than 1% of global healthcare spending, has historically struggled to implement telemedicine [3]. Despite these challenges, the African digital health market is projected to reach USD 4.86 billion by 2024 and is expected to grow at a CAGR of 9.33% from 2024 to 2029, leading to a projected market volume of USD 7.59 billion by 2029 [4]. The average revenue per user (ARPU) is estimated to be USD 47.17, with the largest market segment being “Digital Fitness & Well-Being”, which is projected to generate USD 2.37 billion in 2024 [4]. In Africa, digital health technologies are revolutionizing healthcare systems, overcoming barriers such as resource limitations and geographic isolation, and enabling personalized care through data-driven approaches [5]. Despite its political instability, limited healthcare infrastructure, and reliance on foreign aid, Somalia is gradually embracing digital health technologies to bridge gaps in access and quality of care [6]. Geographic disparities in healthcare access further compounded these challenges, leaving rural and marginalized populations underserved [7]. Currently, only 35% of Somalia’s population has access to basic health services [8]. The country also experiences high neonatal and child mortality rates, with 35 neonatal deaths per 1,000 live births and 106 deaths per 1,000 children under five [9]. Additionally, the maternal mortality rate is estimated to be 692 per 100,000 live births [10]. Compounding these challenges, Somalia suffers from a severe shortage of healthcare professionals, with just 2.5 physicians and 4.5 nurses and midwives per 10,000 people, far below the World Health Organization (WHO) recommended threshold of 22.8 health workers per 10,000 [11, 12]. However, recent government initiatives and collaborations with international organizations have provided a pathway for integrating digital health solutions into Somalia’s healthcare system. These technologies offer a unique opportunity to overcome systemic barriers and improve healthcare outcomes in Somalia [13]. By leveraging innovations such as telehealth, mHealth platforms, and digital health records, countries can enhance healthcare delivery, particularly in remote areas. Furthermore, the inclusion of digital health strategies in Somalia’s National Development Plan (NDP) for 2020–2024 reflects the government’s commitment to improving health outcomes through technological innovation. These efforts underscore the critical role of digital health in transforming healthcare in resource-limited settings. This perspective explores current digital health innovations in Somalia, their potential impact on healthcare delivery, and a roadmap for establishing a sustainable digital health ecosystem in the country. By assessing the challenges and opportunities presented by digital technologies, we aim to provide insights into how Somalia can harness these tools to overcome healthcare disparities and build a more resilient health system.

Digital health innovations

Somalia’s unique sociopolitical context presents distinct challenges and opportunities for digital health implementation compared to other countries. Ongoing political instability and limited healthcare infrastructure necessitate innovative approaches tailored to local needs [6]. Telehealth platforms have revolutionized access to healthcare, particularly for women and rural populations [14]. By providing remote consultations and health services, these platforms mitigate geographical and logistical barriers specific to Somalia’s context, offering a lifeline for those who would otherwise lack access to essential healthcare services [15]. Unlike in other regions, the integration of digital health in Somalia should consider the nomadic lifestyle of many citizens, requiring mobile solutions that are adaptable to constant movement [13]. Multiple pioneering platforms are transforming healthcare deliveries across the country. Baano has

emerged as a comprehensive telehealth solution that provides access to medical experts through voice and video consultations [16]. The platform offers specialized care across multiple disciplines. Another digital health initiative is SomDoctor, which provides remote medical consultations to patients from the comfort of their homes [17]. eHealth Somalia, another digital health initiative in Somalia offers a platform designed to transform healthcare delivery and accessibility [18]. Their integrated system involves four essential components: telemedicine services, EHR, health monitoring tools, and patient engagement platforms that facilitate active participation in healthcare decisions [18]. OGOW Health is another digital health initiative in Somalia that focuses on digitizing medical records and promoting public health interventions such as maternal and infant health [19]. The platform provides easy-to-access and timely care information to providers and caregivers to aid in informed decision-making. OGOW Health is designed to work offline and in low-connectivity areas, making it well-suited for use in low-resource communities [19].

The proliferation of mHealth solutions has also capitalized on Somalia's expanding telecommunications network, offering innovative ways to deliver healthcare information and services directly to individuals' mobile devices. These solutions have the potential to transform health education, disease management, and patient-provider communication, especially in remote and underserved communities [20]. One notable example is Hello! Caafi, Somalia's first telehealth service provider, offers remote medical consultations through a toll-free 3-digit phone number system [21]. The platform provides medical and mental health consultations, health screenings, prescriptions, and referral services, making healthcare particularly accessible for women and rural communities across Somalia. The development of an electronic immunization registry, in collaboration with the WHO Somalia and the United States Agency for International Development, marks a significant advancement in data management and immunization coverage. This initiative demonstrates the critical role of EHR in streamlining health services, improving data accuracy, and facilitating better health outcomes through efficient immunization strategies [22]. The advancement of digital health in Somalia has been marked by supportive government policies and international collaborations. Through initiatives such as the Somalia Recurrent Cost and Reform Financing (RCRF) Project, the Federal Government of Somalia is advancing the integration of technology into health system development and management [23]. The Technical Coordination Committee (TCC) plays a crucial role in coordinating digital health systems and enhancing local capacity, thereby contributing to the overarching goals of initiatives such as Health Alliance for Digital Development and Action (HADDA) [14]. The NDP outlines strategies for leveraging digital technologies to improve healthcare service delivery, strengthen health information systems, and enhance disease surveillance and response capabilities.

Capacity building and enhancing digital literacy

Capacity-building initiatives and efforts to enhance digital literacy are essential for the successful adoption and sustainability of digital health technologies in Somalia. Initiatives such as the 'Treat and Teach' telemedicine package highlight the importance of tailoring digital health programs to meet specific needs and ensure sustainability through continuous support and training [24]. By focusing on building the capacities of healthcare providers and the health system, these initiatives lay the groundwork for a more resilient and effective healthcare ecosystem. There is a pressing need to enhance digital literacy among healthcare providers and the general population. The successful adoption of digital health tools depends on users' ability to effectively engage with these technologies. Training and education are essential to equip both healthcare workers and patients with the skills necessary to navigate digital platforms, ensuring that these tools are used for their full potential [25].

Challenges and barriers

Despite its potential benefits, the advancement of digital health in Somalia is challenging. The country's healthcare system struggles with limited resources, inequitable access to healthcare services, and a heavy reliance on foreign aid. Political and socioeconomic instability further complicates the delivery of healthcare, making it difficult to ensure economic support and stability of the healthcare workforce [26]. Somalia also faces challenges in terms of establishing a comprehensive digital health system. The most

pressing challenge is the need for a strong digital infrastructure that can facilitate the implementation and expansion of digital health technologies. Internet access in the country is inconsistent and undependable, especially in distant rural areas, where there is a critical need for healthcare services. As of January 2024, Somalia's Internet penetration rate is only 27.6%, with only 5.08 million internet users out of the total population, highlighting the significant technological barriers to implementing widespread digital health solutions [27]. This digital divide severely limits the reach and impact of telehealth services and other online health interventions [28].

From a technical perspective, the implementation of digital health technologies requires a strong infrastructure that is capable of supporting multiple layers of security and functionality. The implementation architecture should incorporate secure data encryption protocols with industry-standard 128-bit AES encryption, which is essential for protecting sensitive health information [29]. Additionally, systems need to be designed with offline-first functionality to accommodate Somalia's intermittent Internet connectivity, particularly in rural areas with low internet connections [30]. These technical solutions should be sufficiently lightweight to operate on basic smartphones, which are the primary means of digital access for many people in Somalia. With the advent of advanced AI technologies in healthcare, such as "Hypernetwork-Based Physics-Driven Personalized Federated Learning for CT Imaging" and "Dynamic Corrected Split Federated Learning With Homomorphic Encryption for U-Shaped Medical Image Networks", there is an increased need to address privacy and security concerns [31, 32].

These technologies offer promising solutions for personalized care but also introduce risks related to data privacy and security. Patient privacy concerns are particularly complex in settings where traditional healthcare practices intersect with digital innovation [33]. To mitigate these risks, it is crucial to implement strong security measures, such as blockchain technology, to maintain immutable audit trails and zero-knowledge proof systems for privacy-preserving data sharing [34]. Additionally, adopting role-based access control systems can effectively manage healthcare workers' access to patient information, especially in remote settings where supervision may be limited [35]. Strong data protection policies and secure systems are required to prevent unauthorized access and breaches, which could undermine the credibility and effectiveness of digital health initiatives in the country.

Case studies: lessons from Africa

Africa's digital health landscape has emerged as a testament to innovative healthcare solutions, with several countries leading transformative initiatives that offer valuable lessons for Somalia's healthcare development. The continent's diverse experiences in implementing digital health technologies demonstrate how strategic adoption of these tools can overcome traditional healthcare barriers and improve service delivery. Rwanda is recognized for its successful integration of digital health technologies to improve healthcare access and delivery. One notable example is the adoption of drones to deliver essential medical supplies to remote areas with limited infrastructure such as blood and vaccines [36]. Since October 2016, the Rwandan Ministry of Health partnered with Zipline, which has enabled the delivery of blood products to 21 district hospitals, reaching nearly 12 million citizens [37]. This drone delivery system ensures that hospitals receive blood within 30 minutes of placing an online order, significantly reducing delivery times. Furthermore, the implementation of the RapidSMS system empowered 58,298 community health workers (CHWs) in Rwanda to transmit critical health information about vulnerable community members to a central database [37]. This mobile-based platform allows real-time monitoring and facilitates prompt intervention by medical professionals when necessary. Kenya is considered a frontrunner in leveraging mHealth to improve healthcare access and delivery, especially in maternal health, given its high maternal mortality rate, ranking 19th globally [38]. Kenya achieved a remarkable mobile phone penetration rate of approximately 100% due to the widespread practice of multiple SIM card ownership [38]. This high connectivity has fostered the growth of mHealth programs, leading to the implementation of 13 maternal mHealth interventions that primarily focus on education and behavioral change [39]. Tanzania is experiencing rapid evolution in its digital landscape, with a growing mobile phone penetration rate,

reaching 80% of the population by June 2018, a significant increase from just 25% in 2007 [40]. This has fueled the expansion of digital health initiatives, particularly those that leverage mHealth. Recognizing this potential, Tanzania's National Digital Health Strategy (2019–2024) seeks to integrate mHealth and social media to enhance community-based health services and promote healthy behaviors through improved access to health information and education [41]. Furthermore, Tanzania has implemented over 160 digital health systems, showcasing its commitment to leveraging technology for healthcare advancement [41]. Uganda presents another compelling case of digital health advancement in East Africa. Despite facing significant challenges in healthcare delivery due to a shortage of skilled healthcare workers, internet penetration in Uganda is steadily growing, with current estimates at 31% [42]. Among the Sub-Saharan African countries that have integrated mHealth platforms into their healthcare systems, Uganda has the highest number of mHealth initiatives [43]. Ethiopia has also been actively integrating mHealth into its healthcare system, particularly within the framework of its health extension program [44]. This program, which aims to extend healthcare services to rural communities, has incorporated mHealth technologies to support the work of health extension workers (HEWs), who serve as a vital link between the health system and community [45]. These African case studies collectively underscore several key lessons in Somalia. First, they highlighted the importance of government leadership and commitment to driving digital health initiatives. Second, they demonstrated the value of partnerships between the public and private sectors in developing and scaling digital health solutions. Third, they emphasize the need for context-specific solutions that address local challenges and leverage existing resources. Finally, these examples illustrate the potential of digital health to significantly improve healthcare access and outcomes even in resource-limited settings.

Roadmap to a sustainable digital health ecosystem in Somalia

The path forward for digital health in Somalia requires unwavering commitment and collective efforts from all stakeholders. Understanding and addressing individual patient-level barriers is crucial for successful implementation. Specific barriers in Somalia include cultural hesitancy, economic constraints, and limited digital literacy [13]. To overcome these challenges, targeted strategies must be developed. Research suggests that positive community experiences play a critical role in fostering the adoption of digital health services [46, 47]. Therefore, initiatives promoting these services should prioritize strategies that cultivate such experiences by addressing community-specific needs and integrating digital tools within existing healthcare structures. Economic barriers can be mitigated by partnering with mobile network operators to offer subsidized data packages specifically for health applications. This would reduce the cost burden on the patients and encourage their use [48]. Furthermore, developing multilingual interfaces for digital health platforms can help overcome language barriers and ensure accessibility to all users. Policy recommendations include incentivizing healthcare providers to adopt digital solutions through tax breaks or funding support as well as establishing a regulatory framework that ensures data privacy and security to build public trust in digital health systems [49]. Addressing the challenges of digital infrastructure, Internet connectivity, digital literacy, and data privacy is essential for the successful adoption of digital health technologies. Learning from successful digital health initiatives by neighboring countries and leveraging the support of international partners will be crucial in overcoming these challenges. Fostering strong partnerships among government entities, private sector companies, international organizations, and civil society organizations is key to scaling digital health initiatives and achieving transformative change. Continued investment in digital infrastructure, capacity building, and policy development is essential for creating a sustainable environment for digital health in Somalia and other global southern countries. The need for strong monitoring and evaluation mechanisms to assess the impact and effectiveness of digital health interventions is equally important. By collecting and analyzing data on the implementation and outcomes of these initiatives, policymakers and stakeholders can make informed decisions, identify areas for improvement, and ensure that resources are allocated efficiently.

Conclusion

Digital health technologies present a transformative opportunity for Somalia's healthcare system, as demonstrated by successful initiatives such as the Baano, SomDoctor, and Hello! Caafi projects. These platforms have effectively extended healthcare access to underserved populations through remote consultations and dissemination of health information. The implementation of EHR, particularly in immunization tracking, has made significant progress toward modernizing healthcare delivery. Critical challenges remain in terms of infrastructure development, data privacy, and digital literacy. Infrastructure improvements are needed to enhance Internet accessibility in rural areas, and robust data security frameworks must be established to protect patient information. Simultaneously, investment in digital literacy programs for both healthcare providers and communities is essential for widespread adoption. Drawing from successful models in Rwanda, Kenya, and Tanzania, Somalia's path forward requires strategic public-private partnerships, locally adapted digital solutions, and sustained investment in digital infrastructure. By addressing these key elements, Somalia can build a resilient digital health ecosystem that enhances healthcare access, improves service quality, and delivers better health outcomes to its population.

Abbreviations

CAGR: compound annual growth rate

EHR: electronic health records

mHealth: mobile health

NDP: National Development Plan

WHO: World Health Organization

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