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Digital Interventions in the Health Sector

Country Cases and Policy Discussions

Lucy Xiaolu Wang and Carolina Bloch

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Digital Interventions in the Health Sector—Country Cases and Policy Discussions

Lucy Xiaolu Wang and Carolina Bloch

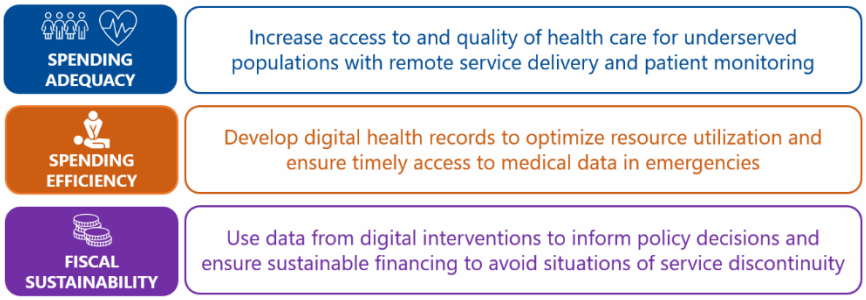
October 2023

This note discusses, through selected country case studies, how digital health records and telemedicine can improve delivery quality, access to underserved populations, and resource utilization in health care. In addition, it shows how digital disease surveillance tools can identify outbreaks and track the spread of diseases, while novel digital platforms can facilitate patent licensing and international pooled procurements for better drug access in developing countries. Ensuring the safe and well-regulated collection and use of health care data, as well as facilitating standardization and interoperability of digital infrastructure in different sectors, is critical for the success of these interventions.

Introduction

Increased digitalization and connectivity can positively affect access to and delivery of health services in a few ways. With the onset of the COVID-19 pandemic, remote delivery of health care gained significant traction given the severe disruption of in-person services. However, long before the pandemic, digital health interventions had been proving to be useful tools to (1) increase access to underserved populations (for example, remote diagnostics), (2) improve care quality (for example, timely and coordinated access to patient medical history), and (3) optimize resource utilization (for example, using remote patient monitoring to reduce health personnel workload). Well-designed digital health care interventions can both support the provision of quality medical care and make better use of resources. Moreover, the systematic use of digital records can produce data to inform health policy decisions and improve coordination among health care professionals, thus increasing the efficiency of service delivery. Figure 1 maps these examples to the concepts of spending adequacy, spending efficiency, and fiscal sustainability; the IMF uses these concepts to guide IMF staff's assessment of macrocriticality of health care and other social spending issues (IMF 2019).

Figure 1. Mapping Digital Health Care Interventions to IMF's Framework for Social Spending



Source: Authors' elaboration.

The concept of the "Internet of Health Care Things" can be a useful framework for thinking about policy interventions that rely on internet-connected devices that can collect individuals' health-related data. Although the broad idea of the internet of things has been applied widely in fintech and govtech, its implementation in the health care sector is particularly delicate given the heavy regulation, potential impact on health, and strict patient data privacy requirements. Kelly and others (2020) structured the concept of the "Internet of Health Care Things" around three layers: (1) perception—the use of devices that can perceive changes in an environment, such as radio frequency identification, infrared sensors, cameras, GPS, medical sensors, and smart device sensors; (2) network—data communication and storage (for example, 4G cellular networks, cloud servers); and (3) application—interpretation of health data and delivery to the user (for example, use of artificial intelligence [AI] to enhance diagnostic capability, treatment decisions, and disease management). The World Bank's recently developed *Framework for the Economic Evaluation of Digital Health Interventions* (Wilkinson and others 2023) also provides a standardized approach for determining and using evidence on the economic value of digital health interventions.

Empirical studies find promising evidence on health and nutrition improvements from digitalization in developing countries. In Indonesia, transitioning from a manual in-kind food assistance approach to an electronic voucher improved the quality of food received and reduced poverty significantly; the administrative costs are estimated at about 4.1 percent of the total benefits of switching to electronic vouchers (Banerjee and others 2023). In Niger, the beneficiaries of a mobile cash transfer program increased household and child diet diversity by 9 to 16 percent, and children ate a third more of a meal per day, thus improving their nutrition and health (Aker and others 2016). In Brazilian elections, the adoption of electronic voting technology improved voting among less educated citizens, which led to further shifts in government spending toward health care that particularly benefit the poor. Results show increased utilization of health services (prenatal visits) and improved newborn health from less educated mothers (Fujiwara 2015).

By focusing on the use of electronic health records (EHRs; based on the experiences of Estonia and Korea) and telemedicine (using Brazil and China as case studies), this note illustrates how digital interventions can help increase access to health care and help decrease within-country inequality of health outcomes. It also discusses the role that these measures can play in developing the health sector in sub-Saharan Africa as well as some of the main challenges for scaling up health interventions. It then addresses empirical evidence on two international organizations—the Medicines Patent Pool (MPP) and the Global Fund—that build novel digital platforms to facilitate patent licensing and international pooled procurements for better drug access in developing countries. This note further provides an overview of the global effort in building online repositories to share country experiences and resources in digital health adoption, intervention, and utilization. This note fits into IMF Fiscal Affairs

Department's broader agenda on public finance and govtech, which seeks to inform public policy and investments in digital interventions in different sectors, including health care (Amaglobeli and others 2023).

Using Electronic Health Records to Increase Accuracy and Timeliness of Health Policy Action

Increasing the adoption and utilization of EHRs is an important component of health care digitalization. Data collected from such records can inform diagnostics; monitor diseases and health security at local, national, and even global levels; and provide precious evidence on which to base policy decisions (including those on resource allocation). At a micro level, well-organized health information systems allow health care professionals to access patient data and medical history in a timely manner. Governments can provide support by (1) ensuring that the collection and use of health care data are safe and well regulated and (2) facilitating standardization and interoperability of digital infrastructure initiatives in different sectors.

The Estonian National Health Information System became operational as the main effort of health care digitalization in Estonia in 2008. Since then, all citizens have had EHRs, a considerable transition from the previous paper-based system, which had major drawbacks—for instance, access to paper-based patient records would be denied if doctors left their hospitals for new jobs at other facilities (Read 2016). Today, all patients have countrywide EHRs, which contain data from various systems and centralize data into a standard e-patient portal. Along with EHRs are e-ambulance and e-prescription programs that use the patient's identification (ID) card. An ambulance can use this ID to access information on a patient's blood type, allergies, recent treatments, ongoing medication, or pregnancy status, which can be essential during emergencies. In addition, 99 percent of prescriptions are digital, and patients do not need a full doctor visit to get represcribed; instead, they call the doctor for approval and pick up the new prescription with their ID, saving the doctor and patient time. The e-prescription database has software that monitors drug prescription interactions. Doctors are notified when they prescribe interacting drugs, and an estimated 15 to 17 percent of prescriptions get changed after these warnings are displayed. Having all these transactions and health actions digitized provides massive data to help with decision making and policymaking and allows patients access to their own health data.

More recently, during the COVID-19 pandemic, people have seen the positive impact of digitized health care systems. Public health officials can use data from social media, internet searches, and other digital sources to identify outbreaks and track the spread of diseases—allowing for quicker response times and better-targeted interventions. Some countries have developed digital disease surveillance tools, including the Integrated Disease Surveillance Project in India and the Electronic Disease Early Warning System in Yemen. Similar systems were introduced in Ghana (Integrated Disease Surveillance and Response system), Kenya (Health Information System; Gray-Lobe and others 2022), and Rwanda (Health Management Information System; Mamuye and others 2022).

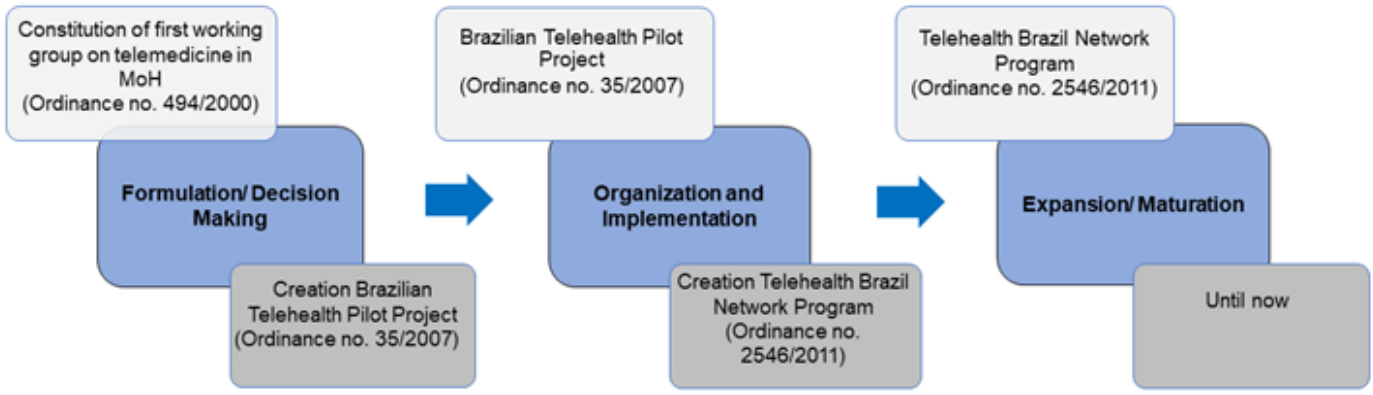
Korea's single-payer mandatory health insurance system, where all citizens are registered upon birth, was a key tool for COVID-19 contact tracing. The health insurance number is linked with Korea's national identity system and functions as a key identifier in medical, financial, and administrative records (Jung 2021). In addition, a special taskforce for digital health was formed as part of the 2017 "DNA" (Data, Network, and AI technology) strategy to boost economic growth, and new data protection laws make pseudonymized data available for scientific research without consent. The high data-utilization rate paired with a single registration system makes digital data integration feasible, and a legal amendment

during the pandemic allowed public health agencies to collect data from banks, telecom firms, and surveillance cameras for contact tracing. However, questions on how best to address concerns about security, privacy, and surveillance remain. In 2021, the government launched the My HealthWay app as a mobile-based public personal health record app service (Lee 2022). My HealthWay integrates medication and vaccination data, can be linked to Samsung Health and Apple HealthKit, and is interoperable with EHRs in hospitals that offer core primary health care functions (preventive care, family medicine, etc.).

Expanding Access to Health Care through Telemedicine

Telemedicine can help address the scarcity and uneven distribution of quality health care services. In 1988, Brazil's constitution declared health as a universal right and established the Unified Health System (SUS in Portuguese). Since then, life expectancy has risen from about 65 to 75 years in 2019 (UNDESA 2022). However, challenges persist in providing people in rural and remote areas with sufficient access. In particular, specialized care cannot keep up with demand, and long wait times/diagnoses are common (Silva and others 2020). To improve the situation, legislation related to telemedicine emerged in 2000 and was implemented in three phases (Figure 2). The ministry of health (MoH) has also developed e-SUS software to integrate systems within the Unified Health System. Although there is no systematic study on the impact of this government-led intervention on downstream health outcomes, digitalization adoption and utilization are clearly growing rapidly in Brazil, as made clear by the growing number of primary care units using digital records and the increasing use of laptops and tablets by health care professionals (Brazilian Network Information Center and others 2021).

Figure 2. Implementation of Brazil's Public Telemedicine Policy



Source: Silva and others 2020.

Given the scarcity and uneven distribution of high-quality health care services, many citizens in China find accessing quality health care difficult. In 2014, Ping An Healthcare and Technology was established as an umbrella health care provider, offering services from doctor consultations to life insurance, seeking to improve China's health care through technology. The company's chief executive officer observed that 40 to 50 percent of patients who went to doctors in person could have gotten treatment through online consultation, which led Ping An to develop the Good Doctor, a service that allows patients to connect virtually to doctors for consultation. By 2019, Ping An Good Doctor had 315 million total registered users. With so many users, the company has been using big data cloud services to provide knowledge support to nearly 50,000 clinics and 100,000 pharmacies, as well as thousands of other health providers. In addition, using data from more than 530 million online consultations, Ping An

created an AI doctor that can answer patient questions and suggest recommendations to doctors to increase efficiency. Ping An estimated a five- to tenfold rise in the platform's capacity thanks to the AI system (Chan Kim and others 2021). This private sector–led intervention was further strengthened in 2019 by the Chinese State Council's initiative to include internet health care in China's public health insurance reimbursement plan.

Using Digital Health Interventions to Develop Health Care Systems in Sub-Saharan Africa

As is the case in most low-income developing countries, many countries in sub-Saharan Africa face a shortage of health care professionals and infrastructure (both in quantity and quality), especially in hard-to-reach areas. Poor access to (quality) health care, as well as other health care system constraints, can be improved with digitalization interventions. As a first step in building digital infrastructure, policymakers across sub-Saharan Africa are increasingly investing in biometric identification systems to pave the way for data-heavy interventions (Parekh 2020). These IDs can help address administrative constraints and facilitate coordination and interoperability of existing systems (for example, those used for health, social protection, and education service delivery). In addition, the development of integrated health information systems would lead to increased data collection, which can then be used for decision making (Holly and others 2022).

Overall, sub-Saharan Africa is becoming increasingly digitized in health care, but there is still significant need for basic infrastructure investment and institutional development. In recent years, many countries in sub-Saharan Africa have instituted digital health strategies, which outline plans to use telemedicine, mobile health (mHealth, which relies on mobile devices), or electronic health (eHealth, which refers to the broader use of technology) tools to increase service coverage and improve the quality of care, especially for underserved populations. There is promising evidence on the progress on some initiatives to boost the utilization of digital health tools for public health. For example, the African Drone and Data Academy in Malawi has been educating students on drones and data. These drones also transport blood between clinics (Holst and others 2020).

Interviews with digital health experts from 10 countries in sub-Saharan Africa made clear that implementation of digital strategies faces a variety of barriers, including weak leadership and coordination, underinvestment in basic infrastructure, weak information systems to support data sharing and interoperability, and insufficient stakeholder engagement (Holly and others 2022). It is important that successful digital health interventions (and their challenges) be well documented; such evidence would help make the case for sustainable funding and facilitate scaling up these initiatives.

Using Digital Platforms to Facilitate Patent Licensing and Drug Procurements

The information on drug patents is often not transparent, and licensing patented medicine for supply in developing countries can be challenging. The MPP was established in 2010 in Geneva to improve patented drug access in developing countries. It used digitalization tools to build a transparent drug patent database and shared all available licenses online to reduce information friction in drug licensing. A systematic study of the HIV drug supply in 103 developing countries found the MPP increased generic drug supply by 7 percentage points. In addition, there have been positive spillover effects to upstream drug innovation in clinical trials and drug product approvals (Wang 2022). From 2010 to 2017, the total operating cost of the MPP ($33 million) was much smaller than the estimated consumer

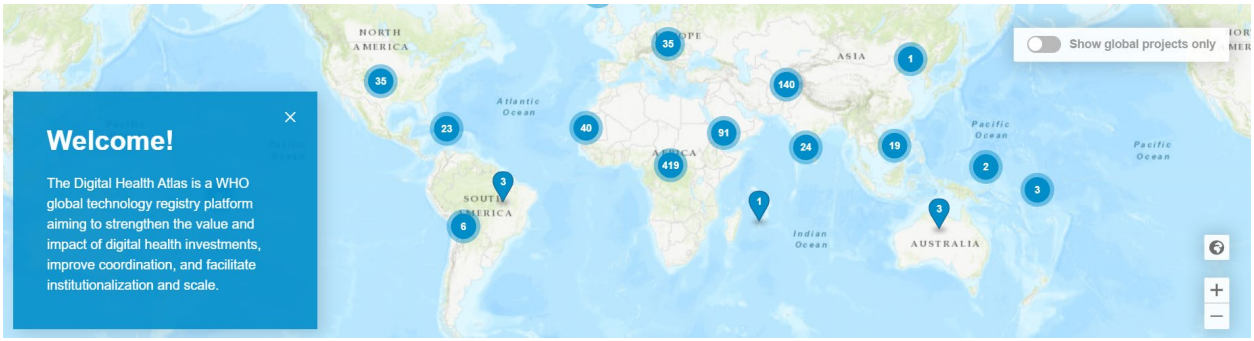
and producer surplus: $0.7 billion and up to $181 million, respectively (Wang 2023). Now, the MPP is a key partner of the COVID-19 Technology Access Pool and helps to construct technology transfer hubs.

Digital platforms also make the drug procurement process easier, facilitating pooled procurement across and within countries. Through international pooling, pooled procurement institutions can help lower prices for small countries and in more concentrated drug markets. However, global drug procurement is complicated and involves a large amount of coordination. The Global Fund Price and Quality Reporting database is an online procurement platform (wambo.org) that gives buyers access to various procurement channels, including the Global Fund's Pooled Procurement Mechanism (PPM). The PPM allows countries to pool drug orders into larger volumes for better discounts. The digital platform further allows buyers to track order status, enter data directly, and enhance the quality of reporting and monitoring. Research attested that the PPM also reduced delivery delays—but at the cost of longer procurement lead times needed for advanced planning (Wang and Zahur 2022). It can be challenging to disentangle the effects of digitalization from the impacts of pooling in these two cases, as digital platforms are integrated parts of the institutional design.

Building Up Global Digital Health Resource Repositories

International organizations have made many online platforms available to provide resources on digital health interventions. The World Health Organization (WHO) has established a comprehensive global technology registry platform, the Digital Health Atlas (DHA), to coordinate digital health efforts and strengthen the value and impact of digital health investments. The DHA provides a highly standardized format for stakeholders to access, report, and share information on digital health projects online. Digital health project implementers can research projects on DHA to design a health intervention without duplicating the effort, register a digital health project online in standardized formats, and enhance the coordination and governance of national digital health. As of February 2023, the DHA had 944 projects registered, reaching about 4.74 million health workers and more than 1.56 million facilities (Figure 3).

Figure 3. Global Distribution of Projects Registered in WHO's DHA



Source: WHO Digital Health Atlas: https://www.digitalhealthatlas.org/en/-/.
Note: DHA = Digital Health Atlas; WHO = World Health Organization.

In 2021, UNICEF established the Digital Health Centre of Excellence (DHCE) to support its Digital Health & Information System unit and WHO's Digital Health and Innovation Department. The DHCE gives technical assistance to countries on the development and scale-up of digital health solutions, including drug purchases and delivery, service delivery and management, epidemiological surveillance, and workforce training. The DHCE also hosts an online knowledge base where countries can share their digital health guidelines and toolkits and learn from each other. By January 2023, the DHCE had provided 38 technical assistance engagements of 11 types to 58 countries.

In addition, an evidence gap map, produced jointly by the World Bank and 3ie, delivers a summary of research on digital health interventions. This initiative categorizes studies into types of interventions and the associated health, economic, and behavior outcomes observed (World Bank and 3ie 2019). While showing that there is ample literature on interventions directed at health care clients (for example, communication and personal health tracking) and providers (for example, telemedicine, training, and decision support), the map identifies a considerable evidence gap on interventions related to health system management and data services.

Conclusion

The increasing public and private investment in digitalization has resulted in broader use of digital health interventions to improve data quality, public service delivery, and market efficiency. Literature review and country case studies (Table 1) revealed promising impacts of digital health interventions, but questions on how to maximize their impact while investing in foundational health and connectivity infrastructure, as well as managing privacy concerns, remain.

International efforts to develop, coordinate, and use digital health tools have grown. Institutions like the MPP and the PPM have used digital tools to improve the licensing, purchasing, and delivery of drugs to developing countries. Major health international organizations like the WHO and the United Nations have been refining their open access global repositories to enhance information sharing, standardization, coordination, education, and technical support. More comprehensive data and research are needed to untangle the effects from digitalization itself from the expanded access to existing healthcare services, and to understand the cost-effectiveness of different interventions.

The high-level policy insights on digitalization and health care discussed in this note could support IMF engagement with country authorities on macrocritical health-related issues. IMF country teams have become increasingly engaged on health spending issues in surveillance and program work—and more so during the COVID-19 pandemic (IMF 2019, 2023). This note explains how digital interventions might help address macrocritical health care issues related to spending adequacy (for example, increasing access to health services for underserved populations with remote service delivery), efficiency (for example, using digital health records to ensure timely access to medical data), and sustainability (for example, drawing evidence-based insights from digital interventions to ensure sustainable financing and service continuity).

Table 1. Summary of Country Cases

Challenge	Country cases	Digital solution
Access to remote and rural areas	Brazil and sub-Saharan Africa	Telemedicine, access to laptops and tablets, data, and drones
Transferability of records	Estonia	Centralized standard e-patient portal
Interconnectivity, geolocation, and tracing	Korea	Integrated centralized insurance system with other data, and mobile-based health records
Access to quality health care	China	Umbrella health care provider and AI doctor

Source: Authors' elaboration.

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