



Digital Health

A health system strengthening
tool for developing countries



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Contents

Executive summary	2
Research objectives	3
Healthcare challenges in developing countries	4
Components of health systems	4
Health systems and challenges	6
How COVID-19 is exacerbating existing challenges	11
Digital health: a health system strengthening tool for developing countries	12
Classification of key private sector business models	15
Digital health during a crisis: managing COVID-19 with digital technology	18
Country overviews	21
Benin	23
Nigeria	24
Rwanda	25
Somalia	26
Bangladesh	27
Myanmar	28
Pakistan	29
Reaching the underserved through digital health solutions	28
Scaling digital health to the bottom of the pyramid	28
Lessons from scaling digital health solutions	30
Strategic recommendations for digital health stakeholders	32

Executive summary

The coronavirus (COVID-19) pandemic has magnified existing weaknesses and gaps in health systems. Developing countries have been severely affected. From under resourced health facilities to poor data and information coordination, weak health systems pose serious challenges for developing country leaders and development partners working to mitigate the impact of COVID-19 and other health issues.

Consequently, there is a pressing need to strengthen health systems in developing countries. Reducing and mitigating the impact of these challenges will require a holistic approach that recognises health systems as complex and adaptive, functioning at multiple, interconnected levels with a range of stakeholders.¹

Digital health: a health system strengthening tool

Digital solutions have proven to be excellent tools to address systemic challenges, particularly by enabling communication within and between various parts of the healthcare value chain. Our research highlights tangible examples of digital health and digital solutions that are strengthening health systems across the developing world. We identified 13 key private sector business models as major applications of digital solutions. The report also highlights best practices for reaching the

underserved through digital health solutions. Country overviews were also prepared to provide some context for the health and digital health systems.

The report is shaped by interviews with health and digital health experts across seven developing countries. Their views about the key healthcare challenges indicated the relatively equal importance of seven key health system components. While there are some key short term actions to be taken, our interviewees provided us with their thoughts on some of the more strategic issues that stakeholders need to consider to strengthen digital health systems. This has enabled us to provide some strategic recommendations for key healthcare stakeholders, including development partners and NGOs, start-ups, mobile operators, investors, governments and Ministries of Health.

Digital solutions and COVID-19: the role of technology

In a crisis like COVID-19, responders and decision-makers need timely data about the spread of the disease, and communities need access to trusted information. Innovative use of digital solutions can enable faster and more diverse information exchange to support more informed decision making at all levels.

Tackling COVID-19 calls for strategic and holistic thinking at national, local government and community levels. Governments, development partners, innovators and other key stakeholders should collaborate across different systems and sectors. Below are actions that developing countries can take in the short term:

Assess and understand the current situation

- Understand the current state of the health system and digital health system in each country.
- Assess what the government is already doing to respond to the pandemic.
- Begin coordinating efforts and collecting and sharing information.

Take stock

- Understand the country's existing resources and understand what has already been accomplished.
- Analyse what has been done in previous disease outbreaks to improve the response.

Draw on best practices

- Use tried-and-tested digital technology and digital health tools to amplify local efforts.
- Refer to global best practices on the use of technology in health. Some examples include Principles of Donor Alignment for Digital Health, Digital Health Atlas (DHA), and Global Digital Health Index.

¹ Paina, L. and D. Peters (2012), Understanding pathways for scaling up health services through the lens of complex adaptive systems.



Research objectives

Objectives and scope

Our research aimed to reveal the transformative impact digital health can have in developing countries. This report unpacks the challenges facing health systems in developing countries and how they have been exacerbated by the COVID-19 pandemic. It examines digital health as a strengthening tool for health systems, featuring different private sector

business models, and highlights the role of digital health in managing COVID-19. Finally, we share strategies for reaching those at the bottom of the pyramid (BOP) and conclude with strategic recommendations for digital health stakeholders during and beyond the COVID-19 pandemic.

Summary of methodology

The information collected, analysed and presented in our research came from two sources:

- **36 key informant interviews (KIIs)** with governments/Ministries of Health (MoH), development partners and NGOs, investors, mobile operators and health technology start-ups from across seven developing countries: Benin, Nigeria, Rwanda, Somalia, Bangladesh, Pakistan and Myanmar. Key informants were asked several

questions about the state of healthcare and digital health in their respective countries. KIIs were conducted between 20 January and 16 March 2020, which means most took place before the WHO officially declared COVID-19 a pandemic on 13 March 2020.

- **Desk-based research** on healthcare and digital health challenges in developing countries, specifically the COVID-19 response.



Healthcare challenges in developing countries

At least half the world's population lacks access to essential health services and, unless ground-breaking advances are made, a third will still be underserved by 2030.² While developed countries grapple with public health challenges, these challenges are much more pronounced in developing countries where health systems tend to be weak and fragile.³

People in developing countries often have limited access to healthcare, which is also low quality, contributing to the steady growth, and burden of, non-communicable and communicable diseases. According to the World Bank, people in developing countries spend half a trillion US dollars annually (over \$80 per person) on out-of-pocket expenditures,⁴ and some 400 million people, primarily in Africa and South Asia, still lack access to essential health services.

Components of health systems

There is a pressing need to strengthen health systems to respond to, and address, challenges like COVID-19. To deeply understand the full range of healthcare challenges, it is important to understand how health systems work. According to the World Health Organisation (WHO), health systems have three primary goals: to improve the health of populations; to enhance responsiveness to the population's health needs and expectations; and to ensure the financial burden of paying for health systems is fairly distributed.⁷ These goals should be routinely monitored by all countries and should form the basis for assessments of health system performance.

Health systems are often complex, adaptive systems that function at multiple, interconnected levels with

Furthermore, over eight million people per year in low- and middle-income countries (LMICs) die from conditions that should be treatable by the health system,⁵ and the economic losses caused by these deaths were \$6 trillion in 2015 alone.⁶ Addressing these challenges, improving outcomes and achieving universal health coverage (UHC) requires a thorough and holistic understanding of health systems.

a range of stakeholders. Those that run efficiently provide healthcare where it is needed most. A good health system successfully delivers treatments, prevents disease and delivers cost-effective care to improve the health of a population.

One of the most robust frameworks for analysing and understanding this area is the Health System Dynamics Framework developed by Van Olmen and colleagues.⁸ It incorporates common elements of many frameworks, such as the WHO's Building Blocks handbook,⁹ but goes further to articulate the dynamic nature of health systems and how each of the components interact (Figure 1). The following are the key components of a health system and the roles each of these components play (Table 1).

2 World Health Organization (2017), [World Bank and WHO: Half the world lacks access to essential health services, 100 million still pushed into extreme poverty because of health expenses](#).

3 Health systems consist of all organisations, people and actions whose primary intent is to promote, restore or maintain health.

4 Direct payment for healthcare goods and services from a household's primary income or savings, where payment is made by the user at the time of the purchase of goods or the use of the services. See: [World Bank press release](#)

5 Kruk, M. et al. (2018), [High-quality health systems in the Sustainable Development Goals era: time for a revolution](#).

6 Ibid.

7 Murray, C. and J. Frenck. [A WHO Framework for Health System Performance Assessment](#).

8 Van Olmen, J. et al. (2012), [The Health System Dynamics Framework](#).

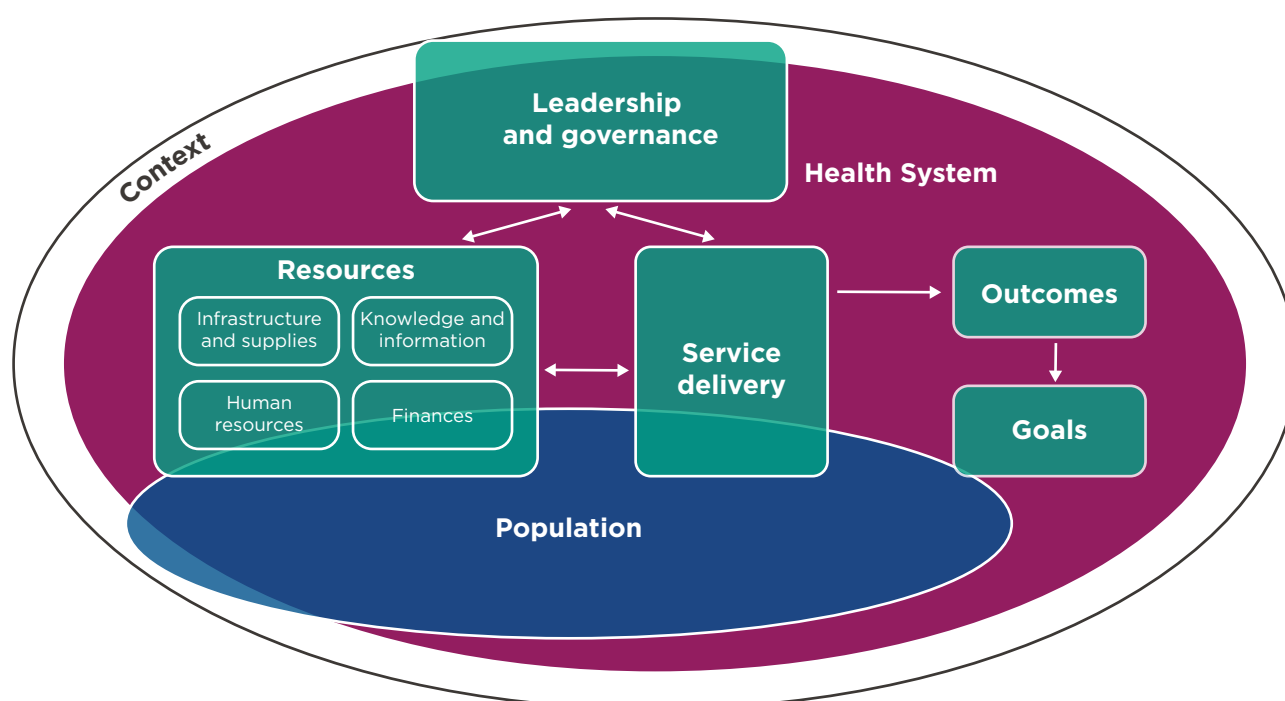
9 WHO (2010), [Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and Their Measurement Strategies](#).

Table 1

Key components of a health system and their roles

- **Leadership and governance** focus on the role of governments in health policy and their relationships with other healthcare stakeholders whose activities have an impact on the population's health.
- **Human resources** refer to individuals whose roles and actions are primarily to protect and improve health outcomes.
- **Finances** ensure that the population can receive health services when needed and are protected from catastrophic expenses and potential impoverishment from having to pay for these services themselves.¹⁰
- **Infrastructure and supplies** are the 'hardware' of the health system that make efficient healthcare delivery possible.¹¹ This includes public healthcare and technology infrastructure.
- **Principles and values** cover the ethical challenges associated with all the above components of the health system.
- **Knowledge and information** relate to individual patient-provider interactions at the health facility level and population-level decision making. It includes the health information systems that contribute to the production, analysis, dissemination and use of reliable and timely health information by decision makers and practitioners at different levels of the health system (including clinicians), both on a regular basis and in emergencies.¹²
- **Service delivery (healthcare delivery)** refers to the various packages of care and services delivered for the prevention, promotion and treatment of acute and chronic conditions.
- **Context and population** are contextual and demographic factors within the health system that call for responsiveness and adaptation to social, economic, technological, cultural, political, regulatory and environmental changes and transitions over time.

Figure 1

The health system dynamics framework

¹⁰ WHO (2010), *Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and Their Measurement Strategies*.

¹¹ Van Olmen, J. et al. (2010), *Analysing Health Systems To Make Them Stronger*.

¹² Health Metrics Network and WHO (2012), *Framework and Standards for Country Health Information Systems*. Second Edition.

Health systems and challenges

Participants in our KII were asked, “What are the major challenges facing the health system in your country?” Each identified between three and seven challenges in their respective country. We used the Health System Dynamics Framework¹³ to analyse qualitative findings from the interviews. Then, we analysed responses/entries, identified themes and regrouped them in the framework.

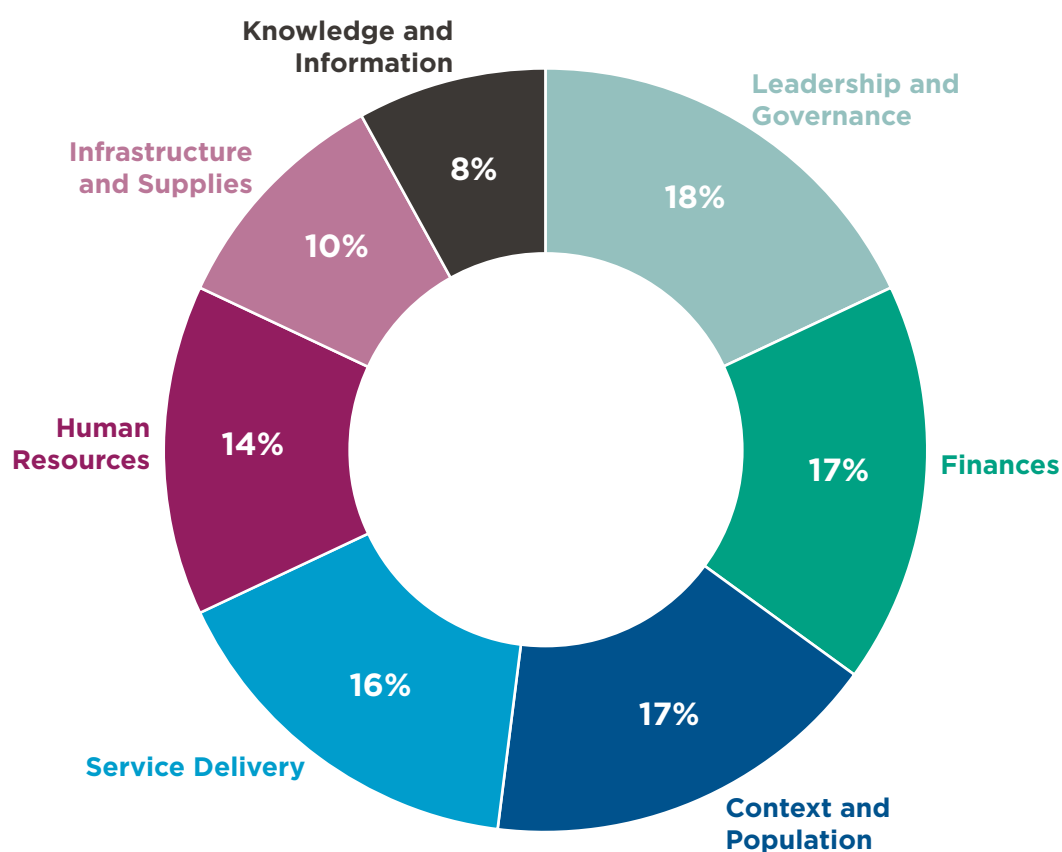
The leading health system challenges were as below in Figure 2.¹⁴ The top three health system challenges (leadership and governance, finances and context

and population) account for almost 52 per cent of the challenges in health systems in our focus countries. Addressing these top challenges may resolve most of the issues facing healthcare systems in developing countries.

The remarkably equal spread of responses across these components reinforces the importance of taking a holistic approach to strengthening health systems and greater need for systems-level interventions. However, our review of the responses to each component uncovered some additional insights.

Figure 2

Health system challenges in developing countries



¹³ WHO (2010), *Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and Their Measurement Strategies*.

¹⁴ X% of the total challenges as identified by experts



18%

Leadership and governance

Poor regulation and coordination

10%

Lack of clear policies

5%

Lack of government accountability

3%

Within this category, the most frequently reported issue was poor regulation and coordination. Respondents noted the poor coordination efforts of governments/MoHs in facilitating interactions between health system stakeholders. Some mentioned that governments/MoHs had not established mechanisms for setting priorities and balancing the different interests of stakeholders. In the context of COVID-19, strong systemic coordination is needed to mitigate the risks of the pandemic.

The lack of clear and consistent strategic health policies was the second most significant challenge. Respondents pointed out that private sector players are often not included in the policy design phase. Some mentioned that even when appropriate health policies are in place, they are often not known, enforced or implemented. They highlighted that governments could do more to coordinate and collaborate with health stakeholders in the private sector (start-ups, mobile operators and others).

Lack of government accountability characterised both central- and district-level authorities. This challenge was often linked to corruption and a lack of transparency and political will.



17%

Finances

Poor allocation of resources

12%

Little to no health insurance coverage

4%

High health system costs

1%

Health systems in developing countries are often characterised by a disaggregated mix of health financing: government budgetary allocation, health insurance (social and private), external funding and private out-of-pocket spending. In the Finance category, poor allocation of resources was the top challenge highlighted.

The second biggest challenge in Finances is little to no health insurance coverage. Respondents stated that out-of-pocket expenditures are driven by a lack of financial protection among low-income populations.



17%

Context and population

High disease burden

6%

Poor health awareness and health seeking behaviour

4%

Low literacy levels

3%

Lack of trust in the health system

2%

Poverty, high mortality and stigma

2%

The most frequently cited challenge within context and population was the high burden of disease. Notably, most of our KIIs were conducted in January and February 2020, in the very early phase of COVID-19. Our analysis showed that the challenge of high disease burden is closely tied to other parts of the health system. For instance, lack of strong leadership and governance, inefficient allocation of financial resources, weak human resources and poor healthcare delivery, have all exacerbated the challenge of COVID-19.

Low health awareness and poor health-seeking behaviour in the population was echoed in the KIIs. Some opined how this challenge leads people to make poor health decisions. In some countries, lack of knowledge about diseases and symptoms often leads people to be passive about their health, with some resorting to self-medication. Poor health-seeking behaviour is often intensified by other challenges like low literacy levels, lack of trust in the health system, poverty and stigma.



16%

Service delivery

Poor access to healthcare

10%

Poor quality of healthcare

4%

Poor continuity of care

2%

Several respondents mentioned that lack of access and poor access to healthcare services were major concerns. Some alluded to the connection between affordability, acceptability and geographical (rural/urban) accessibility. They described the close link between poor access to healthcare and low-quality healthcare. Some respondents revealed how unaffordable or inaccessible private healthcare leads those with low incomes to traditional healers or unqualified doctors. Poor continuity of care was also identified as a common challenge with service delivery.



14%

Human resources

Staff shortage



Poor staff education and training



Poor staff and patient communication



Respondents mentioned staff availability as the main challenge in this category. According to the aggregated response, the key drivers of staff shortage are migration abroad, poor incentives for workers and the exclusion of trained, qualified women healthcare workers due to socio-cultural reasons. Some described staff shortage as a country-wide challenge and pointed to geographical (urban/rural) challenges, citing a shortage of health workers in rural communities. Others described staff shortage as an imbalance between the public and private health sectors, explaining how the private sector provides better opportunities and incentives to healthcare workers.

Poor staff education and training was another challenge that was emphasised. Respondents questioned the quality of training provided to healthcare workers, specifically highlighting how community health workers and nurses are often poorly trained. Lack of staff-patient communication is another challenge closely linked to competency, education and training, and staff shortage.



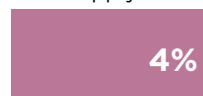
10%

Infrastructure and supplies

Poor infrastructure



Poor supply of drugs, medical supplies and technology



Several respondents described poor infrastructure as the biggest barrier in this category. Three main infrastructure issues were identified: public infrastructure (e.g. roads and electricity), healthcare infrastructure (e.g. hospitals, clinics and pharmacies) and ICT infrastructure (e.g. digital technologies and medical hardware solutions). Lack of infrastructure has had a detrimental impact on the delivery of medical products, vaccines and technologies.

Other respondents said that low availability of drugs, medical supplies and technology is another major challenge. With drugs specifically, they mentioned lack of financial access, low supply, inaccurate prescription and poor quality.



8%

Knowledge and information

Poor collection of healthcare data

3%

Little or no data sharing or interoperability

2%

Poor quality of healthcare data

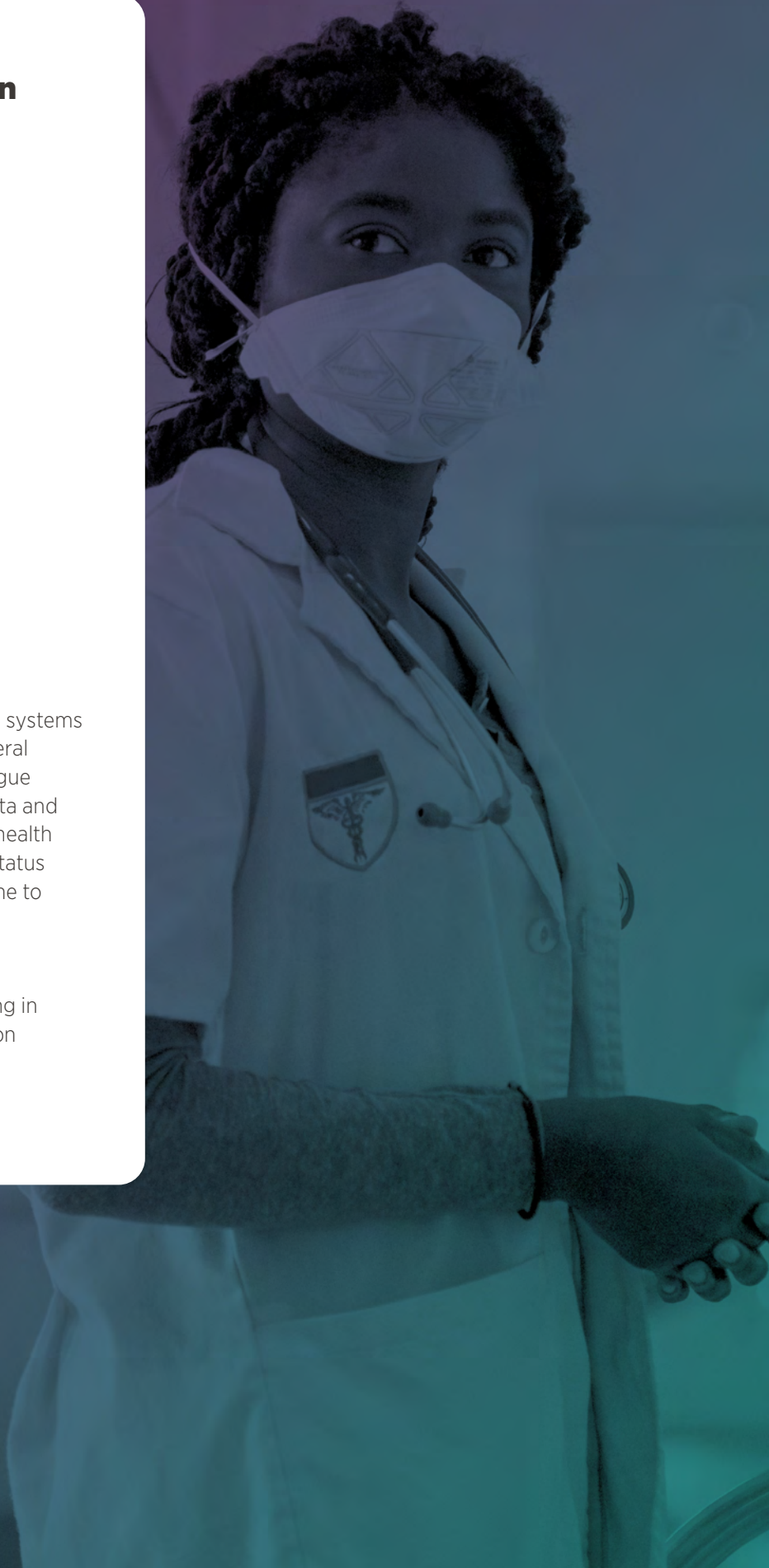
1%

Others

1%

Respondents mentioned poor collection of healthcare data and weak health information systems (HIS) as major barriers. They stated that several countries rely heavily on paper-based, analogue data and information collection methods. Data and information on patient-provider interaction, health records and status, and health facility-level status were often lacking, poorly collected and prone to error.

They highlighted that healthcare data and information are often not centralised, resulting in poor-quality information and poor information analysis.



How COVID-19 is exacerbating existing challenges

In late 2019, the first COVID-19 outbreak appeared in Wuhan, China. Since then, **COVID-19 has had severe health and economic consequences and exposed the fragility of global health systems.** As of 3 June 2020, 213 countries and territories around the world have been affected by the virus, including 6,464,534 reported COVID-19 cases, 382,727 deaths and 3,077,808 recoveries.¹⁵ No vaccine or effective treatment for the virus are available to date. Consequently, the ability to minimise the devastating effects of the pandemic on people's lives and livelihoods depends on implementing technologies and effective preventive non-pharmaceutical interventions (NPIs),¹⁶ such as case and contact management and social distancing measures.

The pandemic has magnified existing weaknesses and gaps in health systems. While a global challenge, it is quickly becoming clear that developing countries will be disproportionately hit by the far-reaching public health, social and economic ramifications. In developing countries, income losses are expected to exceed **USD 220 billion** and less than **10 per cent of households** can comply with all the requirements needed to protect themselves from COVID-19. Furthermore, weak healthcare systems pose a substantial challenge to curtail the impact of the pandemic in the developing world. The ratio of healthcare workers to the general population is often below WHO's recommended ratio. Developing countries often lack adequate health facilities, and are often ill-equipped with healthcare supplies, trained healthcare workers and technology to ensure the rapid testing and detection of infections. Unfortunately, the health systems in these countries are already struggling with a double burden of infectious diseases such as malaria, and the rising incidence of non-communicable diseases (NCDs) such as diabetes and hypertension. The additional burden of COVID-19 is overwhelming already fragile systems.

To successfully mitigate the health, social and economic implications of COVID-19, strong coordination and alignment among key health stakeholders are vital. Governments need to involve

development partners and facilitate communication between all public and private players.

The Ebola response provides a model for action.¹⁷ The 2014–2016 outbreak in West Africa magnified the shortcomings of health systems in affected countries. Weaknesses in health information systems, part of the foundation of health service delivery, made it difficult for governments to understand health needs, target health interventions, allocate resources and otherwise respond to the outbreak efficiently. Lack of timely, accurate and accessible data clouded situational awareness, impeded effective decision making and stymied the response.¹⁸

Although there was a proliferation of new digital tools and information collection systems, they were not being used in national health systems. Data systems and data (cases, patients, contacts, burials, workforce, supplies, logistics and health facilities) were often weak and disorganised. Data and information were often managed with paper systems that fuelled reporting delays, baseline data was often missing or unaligned, and there was a lack of robust and interconnected data management systems.

A key lesson from the Ebola crisis in Liberia was that **developing interoperable data systems and using existing systems improved real-time reporting of information.** Over time, existing systems like mHero¹⁹ were leveraged, and the information collected and documented was used by the incident management system (IMS). Strong engagements with the private health sector developed rapidly, with organised and engaged private health players improving information sharing and coordination. A key example was the private sector providing training to frontline workers. Across the Ebola response, organisations began deploying digital technologies to manage treatment centres, case information, contact tracing, burials and other key activities. As with the Ebola crisis, digital technology and digital health solutions have been fundamental to the global COVID-19 response. Some examples are documented in a later section, **Digital health during a crisis: managing COVID-19 with digital health technology.**

¹⁵ According to Worldometer: www.worldometers.info/coronavirus/

¹⁶ NPIs include multiple public health measures designed to reduce viral transmission rates in a population by reducing the reproduction number.

¹⁷ Fast, L. and A. Waugaman (2016), *Fighting Ebola with Information: Learning from Data and Information Flows in the West Africa Ebola Response*.

¹⁸ Ibid.

¹⁹ mHero is the Mobile Health Worker Electronic Response and Outreach system launched as a pilot in Liberia in November 2014 to meet the need for real-time data and information exchange between the Ministry of Health and frontline health workers.

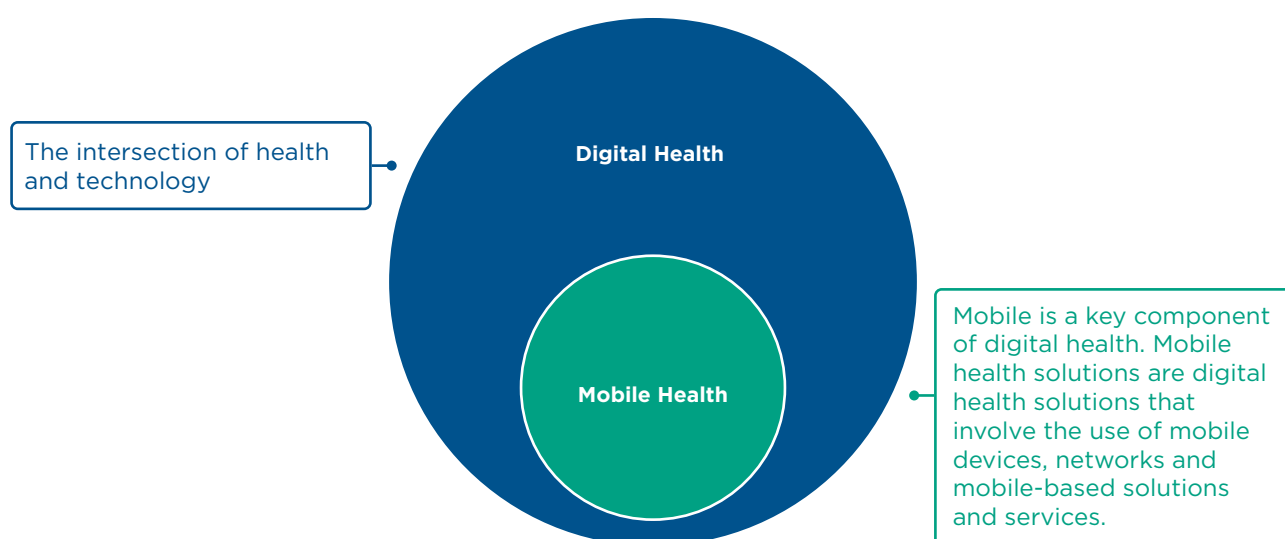
Digital health: a health system strengthening tool for developing countries

According to the WHO, digital health is “the field of knowledge and practice associated with the development and use of digital technologies to improve health”.²⁰ This definition encompasses eHealth and mHealth, which are defined as follows:

- **Electronic health (eHealth)** is the cost-effective and secure use of information and communication technologies for health and health-related fields.
- **Mobile health (mHealth)** is a component of eHealth, and involves the provision of health services and information via mobile technologies, such as mobile phones, tablet computers and personal digital assistants.

Figure 3

Digital and mobile health



²⁰ WHO, Draft global strategy on digital health 2020–2024.

Digital health makes the concept of remote healthcare a viable and scalable reality.

To overcome some of the major challenges in developing country health systems and achieve universal health coverage, key stakeholders in the healthcare system must embrace digital health on a large scale.

While digital health is not a universal remedy to healthcare challenges, it has a vital role to play in strengthening health systems, particularly in resource-constrained areas. Our research findings highlight that digital health is most effective in securing appropriate health system financing, optimising healthcare service delivery, enhancing the skills of healthcare workers, and supporting the infrastructure for reliable health information systems.

These applications are detailed below:

- **Health system financing**

A variety of digital solutions are being integrated in health financing arrangements in developing countries. Several start-ups and mobile operator-led initiatives are currently developing digital health solutions that offer insurance packages to low-income households. **Jamii**, a digital health microinsurance start-up in Tanzania, has partnered with Vodacom Tanzania and a private insurance provider to offer individuals or families different health coverage options. Jamii uses Vodacom's mobile money solution, M-Pesa, to collect premiums and pay out microinsurance claims to hospitals. **Tonic**, developed by Telenor Health in partnership with Grameenphone, allows people in Bangladesh to access a wide range of services, including health insurance, information and advice from selected providers. Tonic has served over five million registered users as of the first quarter of 2020.

- **Health service optimisation**

Digital technology can be used to mitigate challenges in healthcare service delivery, infrastructure and supplies. These technologies have the potential to shift health service delivery from facility-based providers, hospitals or clinics to community-based service providers.²¹ Digital solutions like telehealth and drones can root out inefficiencies while also making affordable and quality healthcare available in developing countries. **Swoop Aero** currently operates in Malawi

in partnership with UK aid, USAID Global Health Supply Chain and UNICEF, delivering medicines and medical supplies by drone from healthcare centres to remote villages. Outbound deliveries include vaccines for malaria and tuberculosis, penicillin, anti-malarial and anti-venom medications and HIV/AIDS testing kits. On the return trip, drones often carry tuberculosis tests and other blood samples. Swoop Aero has been supporting the government in Malawi to transport COVID-19 test kits to remote villages and fly the samples back for testing.

- **Human resource training**

In low-income settings, mobile apps have been used to provide on-demand training, enable communication between health workers, implement clinical decision support systems and provide work planning and scheduling tools.²² **MOTS** in Sierra Leone is a mobile service that provides community health workers (CHWs) with refresher training through feature phones. MOTS runs on Interactive Voice Response (IVR) technology and allows CHWs to train and retrain in their local language. The MOTS platform currently offers training capabilities on up-to-date COVID-19 information. Quizzes and tests quickly determine the health workers' level of understanding, which leads to rapid refinement of the training content and emphasises topics crucial for CHWs to understand and communicate to others.

- **Health information systems**

Data collection and reporting is another strong use case for digital health. Several private companies are also developing technology and infrastructure to address data gaps in health systems. **OGOW** runs an electronic medical record (EMR) and practical management system designed for hospitals in Somalia. The solution is designed with the primary goal of improving the delivery of healthcare through collaboration, innovation and efficiency. **Helium Health** also runs an EMR and hospital management system in West Africa. Its software enables healthcare facilities to deliver better care by simplifying and streamlining health records, processes and payments. The solution is used by over 5,000 doctors, with data from over 500,000 patients across West Africa. Helium Health has formed a **public-private partnership** with the Akwa Ibom State Government in Nigeria.

21 Meessen, B. (October 2018), *The Role of Digital Strategies in Financing Health Care for Universal Health Coverage in Low- and Middle-Income Countries*.
22 Labrique, A. et al. (2013), *mHealth Innovations as Health System Strengthening Tools: 12 Common Applications and a Visual Framework*.

Frontier technologies and healthcare

Frontier technologies are powerful tools with transformative potential to deliver healthcare in developing countries. These technologies, when combined with mobile, have the potential to bridge gaps in health systems and enhance health outcomes.

Artificial intelligence and big data enable complex healthcare data and information to be analysed and used to predict future care plans, as well as expedite and increase the accuracy of triage, diagnosis, screening and interventions. They can also aid the management of disease spread patterns and optimise the time of health workers.

Blockchain has the potential to secure healthcare data systems and enhance the management of EMRs. The nature of healthcare, which has distributed stakeholders, calls for a decentralised management system. Blockchain technology can help make data and patient records more secure, private and transparent, and enable traceability and authentication of medical and pharmaceutical products.

Internet of Things (IoT) and drones have the potential to increase the number of patients that can be treated. IoT-enabled remote diagnostic capabilities can maximise existing capacity and extend care to isolated areas where hospitals and doctors are scarce. One advanced IoT solution is the use of drones for transporting medical supplies. Drones have the capacity to transport vital medical necessities to underserved and rural areas, resolving access issues or easing the challenges associated with a lack of hospitals and pharmacies. Drones are expected to have a critical impact on the health systems of developing economies.

Survey findings on frontier technologies and healthcare

Most of the people we interviewed believed that frontier technologies have slim prospects in developing countries in the immediate and short term. Most explained that the dearth of readily available digital data on patients, providers and the broader health ecosystem will hinder the deployment of frontier technologies. They called for well-functioning health information systems to bolster the collection and availability of data and information.



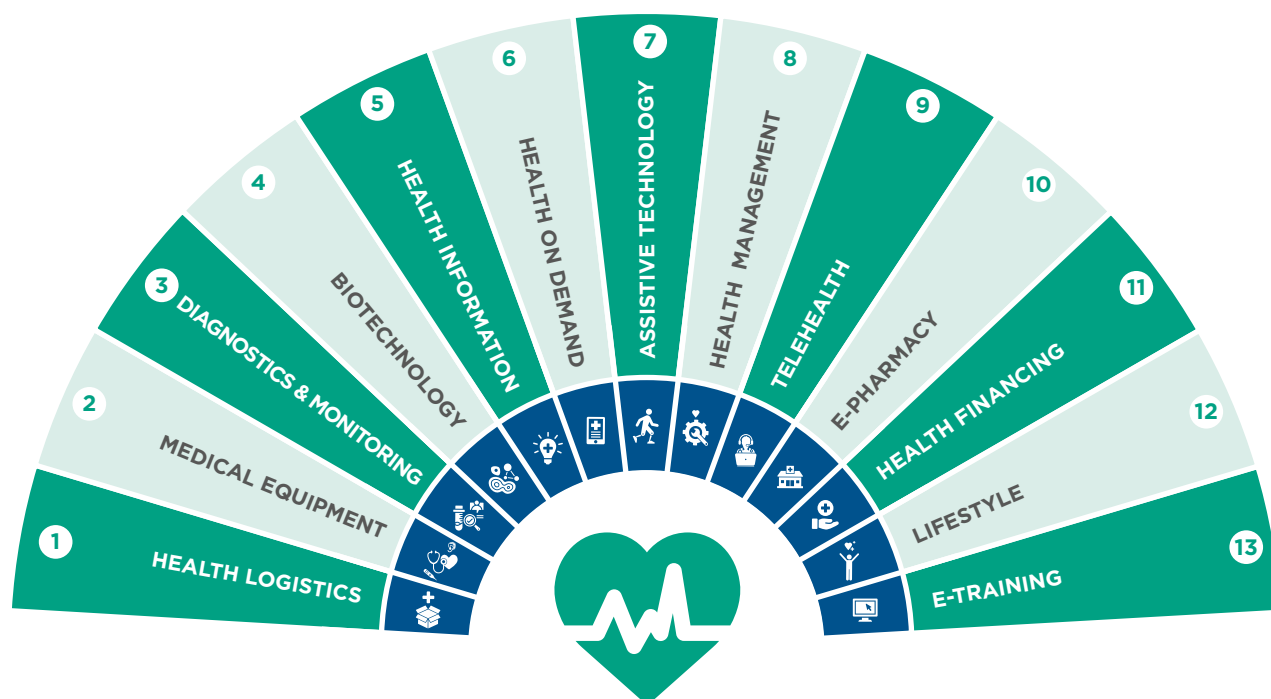
Classification of key private sector business models

The private sector is playing a major role in the digital health space in developing countries, with start-ups using mobile and frontier technologies to profoundly transform health systems. Our research identified

13 digital health models and classifications as major applications of mobile and frontier technologies in developing markets. Figure 4 and Table 2 summarise these applications.

Figure 4

Digital health solutions in developing markets



- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Logistical arrangements, delivery of medical supplies and emergency response services</p> <p>2 Hardware for medical purposes</p> <p>3 Identifying and monitoring medical conditions through technology</p> <p>4 Manipulation and production of medical products derived from living organisms</p> <p>5 Digital distribution of knowledge, awareness and education</p> <p>6 Connecting patients and doctors online for appointment bookings</p> <p>7 Devices or software that maintain or improve an individual's functioning and independence, thereby promoting their well-being. These solutions are particularly relevant to persons with disabilities (PWDs)</p> | <p>8 Platforms to manage patients' activities, scheduling, billing and digital records</p> <p>9 Connecting healthcare providers and patients digitally through online chat platforms, phone calls or video chats</p> <p>10 Pharmaceutical products and supplies for purchase and delivery online</p> <p>11 Health insurance plans and financial services</p> <p>12 Digital solutions for a healthy lifestyle, with a focus on fitness, nutrition and wellbeing</p> <p>13 Digital solutions that provide training to healthcare workers to improve clinical knowledge and performance</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Table 2

Digital health solutions in developing markets

Solutions	Definition	Start-up examples
Health logistics	Digital solutions that offer logistical arrangements, provision and delivery of medical supplies and products. It also includes emergency response services, including an on-demand fleet for transport of patients, organs and medical supplies (e.g. blood or equipment).	LifeBank (Nigeria and Ghana) facilitates the transmission of blood from labs across Nigeria to patients and doctors in hospitals. Zipline (Ghana and Rwanda) designs, builds and operates drone aircraft for the delivery of blood, platelets, frozen plasma and cryoprecipitate.
Medical equipment	Services related to the design, development and manufacture of medical hardware. Business-to-business (B2B) solutions include medical equipment used by hospitals or doctors to facilitate their work and provide services to patients. Business-to-consumer (B2C) solutions include IoT-enabled wearables, prosthetics and apparatuses for eye, ear or mouth.	TeleCTG (Indonesia) provides portable cardiotocography (CTG) solutions that can be used by midwives and doctors in rural and urban areas to provide quality maternal health services. Bionic Limbs (Egypt) provides PWDs with a wide variety of open-source solutions to boost their productivity.
Remote diagnostics and monitoring	Diagnostics refers to the identification of medical conditions, either visually or with invasive and non-invasive diagnostic tools. Monitoring includes solutions that allow healthcare professionals and individuals to control health status after the diagnostics phase.	CMED Health (Bangladesh) provides smart preventive care for regular health monitoring. mScan (Uganda) provides portable mobile ultrasound services to pregnant mothers.
Biotechnology	Biotechnology refers to the manipulation and production of products derived from living organisms, such as pharmaceuticals and medical supplies, genetics and cell studies and the development of vaccinations. Biotechnology can improve diagnostic services, disease prevention and medical treatments.	BiotechAfrica (South Africa) specialises in recombinant protein production and bioprocessing services. 54gene (Nigeria) offers a genetic testing platform to Africans.
Health information	Digital solutions that facilitate the distribution of knowledge, awareness and education to provide insights into topics such as diseases, maternal or reproductive health and medical procedures. The impact of COVID-19 led to increased traction in the use of health information services to spread awareness and promote good health practices across the developing world.	KEA Medicals (Benin) provides medical identity solutions to patients and hospitals. Hello Sayarwon (Myanmar) provides information services on health-related issues.
Health on demand	Digital platforms that connect patients to an array of healthcare solutions online, allowing them to get an instant overview of relevant service providers across several regions and specialties. The platforms facilitate efficient communication and bookings for physical appointments with a chosen doctor.	HomeCare24 (Indonesia) is a platform that allows users to search for registered nurses and caregivers. Dr Consulta (Brazil) is an online clinic offering high-quality, low-cost primary healthcare services.
Assistive technology	Digital solutions/software or devices that improve the well-being and functionality of PWDs and the elderly. Details on GSMA's Assistive Tech programme can be found here. The programme works to drive greater access and use of mobile technologies for PWDs in emerging markets and maximise opportunities for social and economic inclusion.	Dreet (Botswana) provides low-cost hearing loss detectors and treatment. Avaz (India) is a picture-based communication tool that offers speech therapy for autism.

Solutions	Definition	Start-up examples
Health management	Digital platforms and software help healthcare providers manage their day-to-day operations and patients' activities more efficiently. The suite of services offered includes electronic health records, scheduling, billing and digital communication with patients. On the B2C level, health management platforms help patients or individuals keep track of their health objectives.	Redwert (India) provides healthcare incident and risk management software. Afya Rekod (Kenya) is a medical data storage platform that allows patients to store their health records.
Telehealth	Digital solutions that connect healthcare providers and patients, enabling them to communicate directly through text, online chat platforms, phone calls or video chats. Due to the impact of COVID-19, telehealth services have seen significant traction in developing countries. Start-ups like oDoc, Maya and Sehat Kahani have partnered with the government in their respective countries to roll out their solutions to the masses.	oDoc (Sri Lanka) provides mobile-based telemedicine services for low-income populations. Sehat Kahani and DoctHers (Pakistan) delivers connected telehealth solutions to low-income populations. Maya (Bangladesh) provides a digital well-being assistant that connects users with real doctors and therapists.
E-Pharmacy	Digital platforms that offer pharmaceutical products and supplies for purchase and delivery. These platforms help healthcare professionals or medical facilities keep inventories of medical products, and enable individuals and families to order prescription and non-prescription medicine and other health-related products.	mPharma (Ghana and Kenya) offers a pharmaceutical inventory management subscription service. OshudhWala (Bangladesh) provides an online pharmacy for purchasing medicine and healthcare products. Kasha (Kenya and Rwanda) offers an e-Commerce solution with focus on pharmaceuticals and other health products.
Health fintech	Digital solutions that make it easier for individuals to access health insurance or to own a medical savings account.	Alignd (South Africa) provides financial solutions to improve the quality of life of palliative care patients. Maria Health (Philippines) allows users to shop and compare plans from several health providers. WellaHealth (Nigeria) provides a microhealth insurance solution for Malaria.
Lifestyle	Lifestyle solutions refer to platforms and mobile apps that promote and manage a healthy lifestyle, such as employee programmes, fitness and nutrition advice platforms, self-assessment and monitoring apps and sites that connect users to stakeholders offering physical health facilities.	Truppr (Nigeria) enables users to organise and find fitness events. Instadiet (Egypt) connects users to dietitians, nutritionists or health coaches.
E-training	Digital solutions that provide training to healthcare workers to improve clinical knowledge and performance. These solutions have proved useful in providing remote training to community health workers during the COVID-19 pandemic.	Otrac (Nigeria) provides an e-learning platform with tailored training/courses for the public and health practitioners. Amref Health (Kenya) provides an e-learning mobile solution that trains community-based health workers.

Digital health during a crisis: managing COVID-19 with digital technology

Digital health is uniquely positioned to strengthen fragile health systems in most developing countries, which often have unreliable stock of essential medicines, low density of health workers, poor access to health facilities and little to no electricity. Digital health improves the way infectious diseases like COVID-19 are detected and managed. Implementing digital technologies can be effective at different

stages of a disease outbreak, including data-driven disease surveillance, prevention and health promotion, diagnosis, treatment and social control. These digital technologies can also reduce the exposure of healthcare workers to highly contagious diseases like COVID-19. Table 3 features some prominent examples of mobile technology and frontier tech applications being used to fight the pandemic.

Table 3

Surveillance and early warnings

In Kenya, [Safiri Smart](#), a disease surveillance and awareness system leverages [USSD](#) solutions to alert Safaricom subscribers of infectious diseases via mobile phones. The system can provide messaging to roughly 33 million subscribers.

[Health Check](#) enables travellers to report their symptoms via automated calls with an IVR system. Health agencies can then periodically and

automatically monitor the symptoms and well-being of at-risk individuals.

Similarly, frontier technologies like AI are being used to spot infectious disease outbreaks. Start-up [BlueDot](#) predicted the COVID-19 outbreak at the end of 2019 and issued a warning to its clients on 31 December 2019, ahead of the WHO on 9 January 2020.

Prevention and health promotion

Mobile operator Robi Axiata in Bangladesh has rolled out a real-time SMS alert system. Residents in areas with a high number of confirmed cases of COVID-19 receive an SMS notifying them of a high risk of contraction. People who visit these areas will also receive an SMS notification of the risk, as well as directions to follow the standard health advice for COVID-19.

In Mozambique, the [Pensa](#) mHealth platform is available on all mobile operator networks via USSD and online. Pensa is a free digital solution for citizens designed to disseminate health information to local populations. On the USSD and web solution, users have access to information on the origin, causes and ways to prevent the transmission of COVID-19. Together with the Ministry of Health, Pensa uses bulk SMS and other dissemination channels to inform people about the virus.

In South Africa, WhatsApp-based helpline [HealthAlert](#) disseminates accurate and timely information about COVID-19 to the public. This digital solution, launched by the National Department of Health, includes a help desk with

an automated response, triage to answer users' queries and real-time data insights for national policy decisions. Also in South Africa, [Broadreach](#) has partnered with the Mpumalanga Department of Health to roll out a COVID-19 community screening mobile app via its Vantage platform. Thousands of community healthcare workers are being deployed throughout the province of 4.5 million to control the pandemic via mass screening.

Frontier technologies like AI are being used to track and predict how COVID-19 will spread over time. Algorithms trained to [predict the seasonal flu](#) are now being retrained on new data from COVID-19. In India, Jio has partnered with the Reliance Foundation on a tool that determines a user's risk of contracting COVID-19. The Reliance Jio tool asks users questions about their health and travel history to determine their risk. Based on their answers, the Jio tool uses a set of parameters to tell the user whether they are at low, moderate or high risk of being infected with COVID-19.

Diagnosis

[CommCare](#)'s Dimagi platform is an open-source mobile case management platform used by 700,000 frontline health workers in over 60 countries to track clients through a continuum of service delivery, commodity supply chains and patient messaging. Dimagi allows non-engineers to build and adapt mobile apps for contact tracing, data collection, decision support, client tracking, SMS interaction and map-based visualisations.

Bharti Airtel, in association with Apollo 24/7 (the digital wing of Apollo Hospitals), has launched the [Corona Virus Risk Scan](#) — a self-diagnostic tool to check for COVID-19 symptoms on its Airtel Thanks app. The tool is a risk scanner that asks the user several questions and guides them through an assessment of their infection risk. In South Africa, [Vodacom](#) has partnered with Discovery to deliver an online platform that includes a self-screening risk assessment tool and virtual healthcare consultations to facilitate testing procedures,

referrals and advice. The service is free for all members of the public and can be accessed on any web interface or mobile phone. Vodacom customers can get additional information and do a self-assessment via USSD by dialling *111#. Consultations with a doctor can be facilitated through video, audio calls or text.

Chinese technology giant Alibaba recently developed an AI system for diagnosing COVID-19. According to a report in Nikkei's [Asian Review](#), Alibaba claims its new system can detect coronavirus in computed tomography (CT) scans of patients' chests with 96 per cent accuracy against viral pneumonia cases. The system was trained on images and data from 5,000 confirmed coronavirus cases and has already been tested in hospitals throughout China. According to the Review's report, at least 100 healthcare facilities are currently employing Alibaba's AI.

Treatment

[Community Health Toolkit](#) is a global public good project that includes open-source technologies for CHWs and supervisors, open access resources and a community of practice to advance universal health coverage. The toolkit can support the COVID-19 response through community- and event-based SMS/USSD check-ins by those in self-quarantine, educational messaging about protective measures for CHWs and communities, referrals and treatment adherence and data harmonisation with other platforms.

[Flare](#) in Kenya convenes available private and public ambulances on a single network. Flare plays a key role in the referral system by transferring patients

to the right point of care. Patients are moved in ambulances to limit further COVID-19 exposure and, in more serious cases, moved to higher levels of care. Flare's technology also maps available resources at hospitals, including intensive care units (ICUs) and high dependency units (HDUs).

AI can also help accelerate processes for discovering new drugs and repurposing existing drugs. For example, Google's [DeepMind](#) has predicted the structure of the proteins of novel coronavirus — information that could be useful in developing new drugs. However, DeepMind has made it clear that its predictions have not been verified by experiment.

Social control

AI and Big Data solutions are being used to manage the COVID-19 pandemic by scanning public spaces for potentially infected persons and **enforcing** social distancing and lockdown measures.

Qlue in Indonesia, which enables Indonesians to report neighbourhood conditions to city authorities and businesses, has introduced a new feature in their app to enable citizens to report a confirmed COVID-19 case which is then populated to the government in an aggregated form to identify virus hot spots. This information enables the government to take necessary measures like smart lock-down and contact tracing accordingly.

Chinese company **Baidu** produces infrared cameras that use computer vision to scan crowds. It is **reported** that these cameras can scan 200 persons per minute and will recognise those whose body temperature exceeds 37.8 degrees Celsius.

Whereas using AI to predict and diagnose COVID-19 has been hampered by a lack of historical training data, AI tools like computer vision and robots have not. It is therefore more

likely in the short term that this type of AI will be used, including for social control.²³

Finally, as COVID-19 continues to spread rapidly in many parts of the world, some governments and other agencies are making requests for data or insights held by mobile network operators (MNOs) and other companies. The mobile industry recognises the urgency with which governments must act to slow the spread of COVID-19 and the desire of some governments to seek help regarding those efforts. At the same time, the mobile industry recognises that the use of mobile network operator data by governments or agencies raises serious privacy concerns. GSMA has provided **guidelines and recommendations** on how the mobile industry may maintain trust while responding to those governments and public health agencies that have sought assistance in the fight against COVID-19.

GSMA has also published **COVID-19: Digital Contact Tracing Applications**, a paper presenting current and pertinent information about digital contact tracing applications.

Digital technologies and digital health provide an opportunity to use real-time data to improve the prevention and control of rapidly changing infectious diseases like COVID-19. These technologies, combined with NPIs, should be used in public health emergencies. Governments and other healthcare stakeholders in developing countries should draw conclusions and learn from the roll-out of digital solutions in previous crises (such as SARS and Ebola)

as these findings have the potential to enhance COVID-19 responses.

To maximise the benefits of mobile and frontier technologies, leaders in developing countries need to critically and carefully assess the impact of these technologies at every stage, from disease surveillance and early warning systems to prevention and health promotion, diagnosis, treatment and social control.

23 Naudé, W. (April 2020), *Artificial Intelligence against COVID-19: An Early Review*.

Country overviews

Benin



Benin has one of the world's highest death rates for children under five, with malaria the main cause of death. The health system is quite weak in terms of the quality of services delivered, and only about half the population (44 per cent) use it fully due to high out-of-pocket expenses. The Government of Benin, along with key development partners such as [USAID](#), have put decentralisation and improving the quality of healthcare at the heart of the country's health strategy. There is a focus on making health services more accessible, developing human resources and strengthening links between financial mechanisms.

Digital health system

The Government of Benin has put digital health at the centre of its national health strategy. The Government has shown political willingness, with Sèmè City (which brings together high-level training institutions, research and development centres, and incubators of innovative solutions to help solve the challenges facing Benin and Africa).²⁴ All key staff in the country at the top level are being trained in proficient use of digital tools. Our survey revealed that the local digital health landscape is being shaped by efforts in three main areas: nurturing innovation, building the ecosystem and integrating the BOP. [UNFPA](#), [REMA](#), [Kea Medicals](#), a medical database management start-up, and [Lab Etrilabs](#), an organisation that helps African social entrepreneurs, NGOs, businesses and governments create or use innovative technology-based solutions, are major players in digital health. One of the country's priorities is strengthening the impact of digital health at a local level by integrating those at the BOP. Making smartphones more affordable and improving ICT infrastructure will lay the groundwork for such improvements.

Nigeria



Nigeria's federal system assigns different health system responsibilities to the three levels of government (federal, state and local), each of which is largely autonomous in terms of management and financing despite national policies that provide a certain measure of standardisation.²⁵ Besides tertiary healthcare provision, the federal government manages the implementation of disease-specific programmes at all levels. The private sector provides close to 60 per cent of health service delivery, despite owning an estimated 30 per cent of health facilities. The Health Partners Coordinating Committee (HPCC) is an umbrella coordination structure for engaging stakeholders in the health sector and developing and implementing health policies in the country. The coordination and effectiveness of aid from multiple partners and agencies at various levels remains a challenge.²⁶

The Government of Nigeria is developing and implementing policies and programmes to strengthen the national health system and achieve universal health coverage (UHC). The initial focus is on primary healthcare. All three tiers of government in Nigeria are involved to varying degrees in financing the primary

healthcare system, but despite the seemingly clear delineation of roles, in reality these functions have been poorly defined. Years of weak coordination of the various sources of funding, coupled with inadequate capacity in budget planning and execution at lower levels, have contributed to low performance of the primary healthcare system and limited the impact on health outcomes.

Digital health system

The overall picture painted by respondents is that digital health in Nigeria is in its infancy and investing in digital health is a challenge in such a new ecosystem. The Nigeria eHealth Strategy of 2016 stated that "Health ICT must be in alignment with the clear, actionable goals of the health system to help achieve UHC and improve service delivery."²⁷ Respondents commented that while this policy is essentially sound, it has not been implemented wholeheartedly. It was also suggested that many of the relevant supporting policies are in place, but they are not known or enforced. There was also a view that digital health is not a priority for the government or politicians, and that the accountability of local government needs to be reviewed. [Digital health stakeholders](#), such as USAID, Bill and Melinda Gates Foundation [UNICEF](#), [Global Fund](#), [DFID](#), etc. supporting digital health initiatives.

Organisations like [LifeBank](#), [Doctoora](#), [Talamus Health](#), [Medsaf](#), [CarePay](#), [Wellahealth](#), [MTN](#), [9Mobile](#), [EchoVC Partners](#), [Microtraction](#), [Ventures Platform](#), [CCHub](#), and [HSDF](#), among others, are also active in the digital health space.

²⁵ World Bank (2005), [Nigeria: Health, Nutrition, and Population, Country Status Report, Volume 2, Main Report](#).

²⁶ WHO (2018), [Country Cooperation Strategy: Nigeria](#).

²⁷ The Medical Concierge Group (2015), [Nigeria National Health ICT Strategic Framework 2015-2020](#).

Rwanda



Rwanda's health sector consists of three levels: central, intermediary and peripheral. The Ministry of Health focuses primarily on the development and enforcement of policy and regulations while its implementing agency, the Rwanda Biomedical Centre, designs national disease prevention and control programmes. Although funded on weak infrastructure and delivering poor health services, the healthcare system offers an equitable scheme that provides insurance coverage for 90 per cent of its population.

There are currently several health insurance programmes in Rwanda targeting specific groups of the population. However, the biggest in terms of membership is the mutuelles scheme, participation in which is organized on a per household basis, with an annual payment of 1000 Rwandan francs (US\$2) per family member. Establishing a reliable digital health system is one of the government's priorities, but any impact is likely to be felt in the medium to long term.

Overall, the government of Rwanda provides dynamic leadership in the health sector. Priorities change regularly and progress is fast. Digital health is a current priority of the Government.

Digital health system

With strong endorsement of the digital agenda from the government, and the articulation of the whole-of-government approach to creating a 'Smart Rwanda',²⁸ it is not surprising that progress is also being made in digital health. Respondents noted the critical role played by the Rwanda Biomedical Centre in endorsing digital health investments and facilitating support from development partners. Meeting the challenges of the underserved by developing affordable solutions, embracing innovation by fostering partnerships, promoting investment in digital health / digital infrastructure and developing strategies at scale, were all areas of improvement highlighted by our survey. The government has created a conducive climate for investment, and examples of Rwanda exporting successful solutions helps improve investor confidence (e.g. **Kasha** has expanded from Rwanda into Kenya, providing e-Commerce for women's health products). Organisations like Babyl for comprehensive digital health services, Zipline (medical product delivery) are active in the country. Respondents indicated that telemedicine was now playing an increasing role. Because the government is largely trusted, we were told, so experimenting and finding different ways to influence behaviour change has gone well too.

Many NGOs are working with the government and supporting its Health Management Information System. Development partners too, such as WHO, UNICEF, GAVI, CHAI, The Packard Foundation, Bill and Melinda Gates Foundation, and DfID (e.g. via Unilever Transform programme), Rockefeller Foundation and USAID are supporting digital health - but it is as a part of their broader programmes.

Somalia



The health system in Somalia is recovering from conflict, mass human displacement, recurring droughts and floods and extreme poverty. Ongoing insecurity makes it challenging to rebuild, staff and equip health facilities across the country. The Federal Government of Somalia and the Ministry of Health have taken steps to strategically utilise digitalisation in Somalia to improve public health. Healthcare is largely in the private sector and regulated by the Ministry of Health of the Federal Government of Somalia. In March 2013, the central authorities launched the Health Sector Strategic Plans (HSSPs), a new national health system that aims to provide universal basic healthcare to all. Both its human and material resources are in their formative stages and require substantial investments. Widespread insecurity limits accessibility to rural areas outside major cities and towns and severely impacts healthcare delivery to the most vulnerable groups. Budgetary constraints hamper Ministry of Health's ability to invest in rebuilding the healthcare infrastructure in a timely manner.

Digital health system

Digital health is at a nascent stage in Somalia. The health sector has been historically slow to adopt digital technologies, but there has been a shift as many practitioners are seeking digitalised health solutions. Following the 1991 civil war, Somalia's infrastructure, including its health systems totally collapsed, giving way to an entirely private ecosystem in which whatever healthcare services offered came mainly from private clinics or NGOs. The current health records and medical implementation system as it stands lacks connectivity and continuity of care. Caregivers are discouraged by the lack of reliable access to information and education. However, players like OGOW EMR and SPIDER are active. The current health records and medical implementation system as it stands lacks connectivity and continuity of care. Despite the severity of the healthcare challenges this country faces, clinicians are optimistic about the future of healthcare and digital health

Bangladesh



Bangladesh was among the first countries in the world, after Italy, to reach 2,000 cases of COVID-19, just 40 days after its first case on 8 March 2020. According to the National Preparedness and Response Plan for COVID-19, Bangladesh's overall spending on health is around three per cent of GDP. However, the government contribution under the current budget is only one per cent and over 70 per cent is out-of-pocket expenditure, the highest in South Asia. Although still very high, health indicators such as under-five child mortality and maternal mortality have been improving over the last decade. According to our survey, there is relatively poor access to quality health information — the result of low literacy levels and access to technology. Improving access to, and the quality of, healthcare services for the low-income population is one of the government's priorities, along with establishing a sustainable digital health system.

Digital health system

Implementing the vision of Digital Bangladesh has offered the country 'a tremendous opportunity to leapfrog and accelerate its journey to becoming a middle-income country' by 2021.²⁹ Our survey highlighted the importance of initiating a shift in mindset to having a national strategy in collaboration with development partners and start-ups actively seeking to integrate frontier tech in the health system; improving coordination and collaboration between key stakeholders for a better digital health strategy in the medium- to long-term; enhancing health policy through the development of flexible participatory governance mechanisms; engaging with the evolving ecosystem of health stakeholders; and exploring new digital health areas in addition to telemedicine and mobile health, which are already advancing quickly. Organisations like the WHO, Banglalink, Grameen Telecom Trust, Jeeon and Maya Apa are active in the digital health space.

29 Government of Bangladesh (2011). Strategic Priorities of Digital Bangladesh.

Myanmar



The Ministry of Health and Sports (MOHS) has ultimate responsibility for Myanmar's health system, but after years of isolation under a military regime, the country's new civilian leadership is opening the door to the international community and NGOs, and deepening ties with community groups and religious societies that have often filled gaps in healthcare provision. Within the MOHS, the Department of Public Health oversees the provision of basic healthcare and operates 1,132 hospitals nationwide. Its facilities range in size from 2,000-bed hospitals in cities like Yangon and Naypyidaw where they provide a variety of specialisations, to remote rural health clinics with 20 or fewer beds.³⁰

Digital health system

Myanmar has policies that allow 100 per cent foreign ownership and has benefited from dynamic markets that are highly sensitive to consumer pressures.³¹ A critical moment came in 2013 when the government liberalised the telecommunications sector, leading to a significant drop in SIM card prices, an explosion of smartphone use and a burgeoning start-up ecosystem.³² There are now four big MNOs operating in Myanmar providing good coverage (except in mountainous regions and hard-to-reach areas). There has been rapid growth of mobile technology and the use of Facebook, which are opening new options for digital health.³³ For example, mobile money is beginning to be used to provide incentives for healthy behaviours, and Facebook plays a key role in communicating with young people about them too. Organisations like PSI, Koe Koe Tech and Trust Oo are active in the digital health space.

³⁰ Oxford Business Group (2017), Myanmar's government makes health care investment key policy.

³¹ A4AI (2019), 2019 Affordability Report.

³² GSMA Ecosystem Accelerator programme (2019), Myanmar: A burgeoning start-up ecosystem.

³³ Sandberg, B.T. (2020), Five tech trends in Myanmar for 2020.

Pakistan



Pakistan has a mixed health system with government infrastructure, parastatal health system, private sector, civil society and philanthropic contributors. At 26.2 per cent, government health spending as a proportion of total health spending is low, and out-of-pocket spend is high (62.7 per cent of all health spending). The 2011 devolution of health to the provinces has created both challenges and opportunities for action. It is envisaged that the health benefits gained through federal support can lead to more equitable health system coverage. Pakistan's health system faces challenges of vertical service delivery structures and low accountability for government performance, creating efficiency and quality issues. Largely unregulated for quality care and pricing, there is also duplication of services by the private sector. Despite its potential, the private sector contributes the least towards preventive health services.

Digital health system

The National Health Vision of 2016 anticipates that innovative technologies will be incorporated to provide speedy and reliable information to support evidence-based decision making at the district level through the District Health Information System (DHIS). Provincial and national platforms for transforming evidence into policy advice will be encouraged, including dedicated units. A central hub for information repository, standardisation and quality control will be developed at the national level with the assistance of provinces.³⁴

Respondents suggested that while digital health solutions are high on the political agenda, they are still in early stages with progress has only begun to be made in the last three years. No innovations have scaled, but there are some “islands of excellence in a sea of mediocrity”. Although MNOs are spread out and provide good coverage, internet access and quality are poor. However, Pakistan's digital health market is exciting and growing as more affordable smartphones are increasing use and penetration in both urban and rural areas.

Organisations like [DFID](#), [GIZ](#), [Jazz Pakistan](#), [Oladoc](#), [Sehat Kahani](#) and [doctHERs](#) are active in the digital health space.



Reaching the underserved through digital health solutions

Most digital health solutions rolled out to date do not have a viable business or revenue model for serving those at the bottom of the pyramid. This consumer segment is often characterised by low purchasing power and low literacy levels, leaving digital health companies with relatively low-unit economics and frequent challenges in generating the customer volumes they need to sustain operations.

Scaling digital health to the bottom of the pyramid

In our KIs, participants offered four strategies for driving adoption and scaling digital health solutions to the BOP in developing countries.

1. Leveraging community health workers and other agent networks

Community health workers and other existing agent networks play a major role in digital health adoption in low-income settings. CHWs are a particularly vital link between health systems and the communities they serve by improving access to, and coverage of, health services. Consequently, digital health companies active in rural areas are equipping CHWs with digital technologies to overcome the trust barriers many digital health services face. Equipping and training CHWs to use digital technologies lessens the technical challenges of less tech-literate users during registration processes and throughout the product adoption phase. [Naijacare](#) in Nigeria is a notable example.

2. Combining brick-and-mortar with digital technology

With rural areas in developing countries facing shortages of primary care providers, brick-and-mortar health centres that are equipped with technology can bridge the service delivery gaps in underserved communities. Combining technology with brick-and-mortar has proven effective in delivering digital health to the BOP. In these centres, telehealth services and an appropriately trained CHW or local community nurse can be an intermediary between users and a doctor who appears on a laptop or mobile phone screen.

One example is [Sehat Kahani](#)'s flagship E-Health Clinics in Pakistan. These brick-and-mortar centres are staffed with a trained CHW or local community nurse who meets with patients in person while a network of 1,500 registered female doctors consult with patients using Sehat Kahani's online platform. This team of

doctors include specialists in gynaecology, psychology and psychiatry. E-Health Clinics also offer laboratory services for blood tests, as well as ultrasound and pharmacy services. An outpatient appointment at the clinics costs PKR 100 (about 63 cents).

3. Combining business model and bundling services

According to a 2017 study of 85 digital health start-ups, 34 per cent began with a B2C model, but 61 per cent have since pivoted to B2B or B2B2C models.³⁵ To overcome the sustainability challenge of serving those at the BOP, digital health companies are bundling digital health offerings, often a mix of telehealth, microinsurance and health information services, among others. Other companies are combining business models and developing solutions for different consumer segments with varying purchasing power. Some companies provide services across the B2C, B2B and B2G business models to mitigate the challenges that come with solely serving BOP customers, a segment that is often less profitable and harder to reach. Those in our KIIs mentioned that B2B and B2G business models provide safer and more secure revenue streams.

A number of start-ups using this approach have adopted innovative pricing models that allow them to reach those at the BOP. Examples include **LifeBank** and **Helium Health** in Africa and **Maya** in Bangladesh, all of which are running cross-subsidisation models that have differential pricing and use one segment to subsidise the other.

4. Developing multi-stakeholder partnerships

Stakeholders in the digital health sector often have vastly different business objectives, which makes it a challenge to establish a common set of KPIs.³⁶ However, our KIIs drew attention to the importance of partnerships when driving adoption of digital health. Some suggested that development partners and NGOs should partner with digital health companies to reduce the cost of reaching users in resource-poor

settings. Others pointed out that government support and endorsement are essential to building trust and improving the quality of digital health services. Various respondents identified the following as key functions of governments.

- **Policy and strategy:** Governments should develop health and digital health policies, secure agreement from stakeholders on these policies and be active promoters of digital health.
- **Legislation and technical standards:** Governments should develop laws and regulations on specific areas of digital health in collaboration with stakeholders. Telehealth, online prescribing, electronically collected microinsurance packages, data platforms, training and innovation are all areas requiring laws and regulations.
- **Behaviour change:** Governments should find out what people's health challenges are, and provide the platforms that enable stakeholders to come up with solutions. Governments should ensure digital health solutions are people-centred and help communities, especially hard-to-reach ones, to access equitable quality health services.
- **Investments and innovation:** Governments should collaborate with the private sector and actively promote digital health innovations and partnerships. They should be willing to work with innovators directly and not create bureaucracy, which delays decisions.

Some respondents proposed a consortium of government, development partners and private sector players (start-ups and MNOs). Other types of partnerships included those between start-ups and corporate partners, such as mobile operators or fast-moving consumer goods (FMCG) companies. Corporate partnerships can significantly reduce the cost of reaching the the BOP. Start-ups can provide health technology while corporate partners can facilitate access to it. **Babyl** in Rwanda is one example of a successful partnership between governments and corporate partners (Babylon Health and others) that launched a telehealth service in 2016 and has since reached two million users.

³⁵ Rock Health (2017), *The rumors about digital health business models are true*.

³⁶ GSMA mHealth (2018), *Creating mobile health solutions for behaviour change: A study of eight services in the mNutrition Initiative portfolio*.

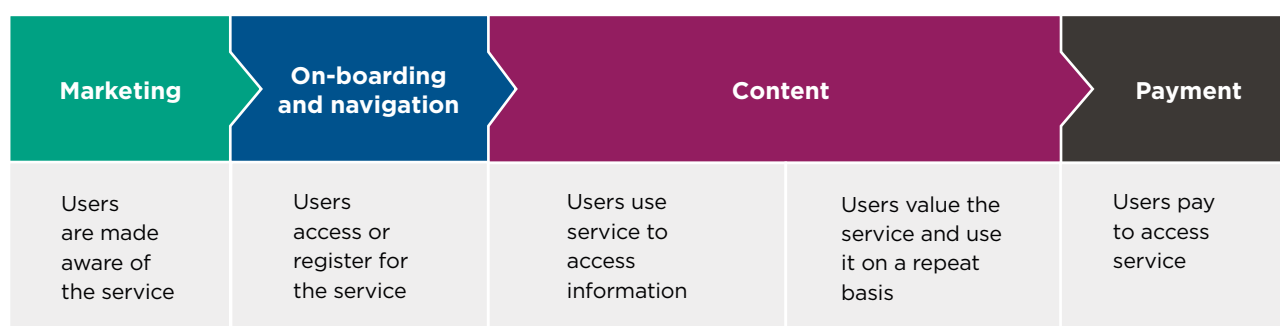
Lessons from scaling digital health solutions

The GSMA mHealth programme, under the mNutrition Initiative funded by UK aid, has worked with mobile operators and other mobile and health sector stakeholders to support the launch and scale of mobile health services. As of June 2018, these services have cumulatively delivered life-saving maternal and newborn child health (MNCH) and nutrition content to over two million women and their families across eight

markets in Sub-Saharan Africa: Ghana, Kenya, Malawi, Mozambique, Nigeria, Tanzania, Uganda and Zambia. Over a period of five years, the mHealth programme documented service design lessons from the customer journey in urban and rural areas (Figure 5). These lessons are vital, relevant and applicable to companies seeking to launch and scale digital health solutions to the BOP (Table 3).

Figure 5

Customer journey



Source: GSMA (2018), *Creating mobile health solutions for behaviour change*.

Table 4

Marketing	
<p>Agent-assisted registration for mHealth services can be an effective marketing route when an existing agent network is leveraged. Assisted registration via CHWs or other agents can overcome the trust barrier that many mHealth services face.</p> <p>Branded clothing and merchandise helps strengthen the role of agents in a community. Many people are hesitant to give their phone to a stranger for assisted registrations. Branded items such T-shirts, baseball hats and pins signal that agents are official representatives of the service, which instils trust.</p>	<p>Mass media campaigns raise awareness, but work best in combination with on-the-ground promotion. When combined with agent network support, channels such as radio can play a crucial role in raising awareness of mHealth services and give them legitimacy. For example, CHWs in Tanzania who helped register users for the mHealth service reported that it was easier to convince people to register if they had already heard the radio advertisements. Recalling an advertisement was not enough, however. They would often only complete the call to action and register when encouraged by a CHW.</p>

On-boarding and navigation

Traditional mobile-based marketing methods, such as end-of-call notifications and airtime top-up messages, have proven highly effective at driving uptake of services. These messages are delivered to customers when they are actively engaging with their phone, making it easy to respond and explore a service the moment the promotional message is read.

Shorter self-registration increases registration rates. Only essential information should be collected at this stage, with additional information gathered after users are on-boarded.

For services that require users to navigate through menus, it is vital to find the right balance between the number of menu options and menu depth. If users are faced with too many options throughout navigation, they often feel overwhelmed, and might give up if they have to make too many choices before receiving valuable content. To

ensure easy navigation and content discovery, menu titles should use simple language and clearly describe what content is available. This is especially important for on-demand services since users are usually seeking answers to specific questions.

To build long-term trust, users must feel they can control their relationship with the service. They should be able to easily unsubscribe and resubscribe to the service, as well as track their spending. Service providers should include administrative tips about the service (e.g. how to re-register to the service when getting a new SIM card). This also reminds users of the registration short code and process, should they wish to help other users to subscribe. Providing immediate feedback on transaction status, with further instructions where necessary, gives users essential feedback and guides them throughout their decision-making process.

Content

Use relevant terminology and language to reach target users. Even users who can read English often do not fully comprehend the meaning of a text message. Translation of messages from

English to a local language in Uganda resulted in a 13 percentage point increase in appropriately recalled nutrition knowledge among users.

Payment

Clearly articulating the value proposition is essential to explaining why a customer should spend their money on a service. As it can be difficult to see the immediate benefit of many mHealth services, people can feel hesitant to pay, especially before trying one. Freemium models allow users to experience the value of a service first.

Complex or unclear charging models are confusing and create uncertainty about cost, preventing users from fully embracing services. If charging for a service, payment must be as simple as possible.

‘Willingness to pay’ uncovered through traditional market research does not necessarily convert into actual paying users for a service if it is poorly designed or the value proposition is not clearly presented. In Kenya, consumer research by the GSMA and TNS revealed that 69 per cent of the female target audience were either likely or very likely to pay for an MNCH messaging service (the questionnaire did not specify a specific service on offer). Yet, only seven per cent of all users who showed interest (initiated registration) in the Totohealth service in Kenya went on to pay the low subscription fee. This was due to significant user experience barriers to registration, service trial and payment.

Read more about lessons learned from the GSMA's [Creating mobile health solutions for behaviour change](#) report.

Strategic recommendations for digital health stakeholders

We asked key information interview (KII) participants what they would recommend to health and digital healthcare stakeholders, including development partners and NGOs, start-ups, mobile operators, investors, governments and Ministries of Health. These strategic recommendations are captured below.

Development partners and NGOs

Align efforts and support the government to build capacity to deliver policy and strategy

- **Consider committing and adhering to collaborative donor actions** like the Principles of Donor Alignment for Digital Health.³⁷
- **Commit to having** a digital agenda as part of any development partner-backed intervention, giving digital health the same status as gender/social inclusion.
- **Provide a platform** for all health and digital health stakeholders to discuss and share requirements, best practices and solutions.
- **Work with governments** to enable them to track progress on their initiatives.
- **Create a strategic plan** with the government based on health systems rather than a programmatic approach, and design the digital health architecture, blueprint or roadmap needed to deliver it.
- **Support the government** to build the technical capacity it needs to develop and deliver the digital health agenda.

- **Support governments** to slow the spread of COVID-19 and provide social protection for vulnerable populations, promoting a whole-of-government and whole-of-society response to complement efforts in the health sector.
- **Share timely and accurate data** with data privacy in mind.
- **Collaborate with government** and other health stakeholders to assess the unique social and economic impacts of COVID-19 in a country, take urgent recovery measures to minimise the long-term impacts and help societies to recover.

Work collaboratively to enable sustainable solutions

- **Be clear** about what is to be delivered and show how it can become sustainable and scalable.
- **Be more agile** with decision making and willing to try new solutions.
- **Improve coordination** and share strategic documents and information to avoid siloed solutions.

³⁷ Digital Health Principles, The Principles of Donor Alignment for Digital Health.

Development partners and NGOs (continued)

- **Work collaboratively** with start-ups and mobile operators to solve problems together, rather than innovating separately.
- **Cooperate with innovators** who are working on sustainable solutions.
- Be open to matched funding models in which development partners provide a grant if the start-up also has an equity investment.

Help to extend the reach of digital health

- **Work with all stakeholders** to help extend the reach of digital health services to the BOP.
- **Take the first financing and planning steps** to extend the reach of service provision.

- **Provide the skills** and introductions for start-ups to make contracts with the government.
- **Help map out the benefits** of investing in digital health.
- **Support in the provision of tools** and resources for strengthen their health systems. This includes helping to procure much-needed medical supplies, leveraging digital technologies and ensuring health workers are paid.
- **Leverage existing and established digital health platforms** and digital technologies to avoid reinventing the wheel and link these to the national system. A proliferation of new tools, such as information collection systems, can complicate efforts to align information infrastructure and threaten sustainability.

Start-ups

Focus on problems that people care about

- **Create a proof of concept** based on local ideas, but build for broader (potentially global) ecosystems.
- **Be innovative in developing solutions** that are good for patients/staff and the bottom line.

Understand the processes involved in supporting innovations in digital health

- **Polish the proof of concept** and use incubation centres to test ideas and potentially attract funds.
- **Combine digital with analogue models** for health solutions. This is more likely to work than converting entirely to digital.
- **Build trust and engage** with the government to influence policy. Soft skills, perseverance and dedication is also needed.

Leverage partnerships

- **Identify mutual benefits** for start-ups and mobile operators, as collaboration can deliver customised digital health services.

- **Understand** mobile operators' cost structures.
- **Align services** with the corporate social responsibility (CSR) activities of development partners.
- **Have demonstrable products** and a roadmap to attract attention from the government.
- **Approach mobile operators** with a proven product. Acting as a consortium (e.g. development partners) can be more powerful.

Develop realistic business cases

- **Be focused** and do not attempt to run several businesses simultaneously.
- **Understand that investors and banks** are averse to risks in digital health, and be prepared to deal with an unsupportive policy environment.
- **Investigate the market** and how to grow – who is going to buy the service and how is it aligned to the country's needs. Be aware of national and international regulatory barriers.
- **Understand the implementation landscape** and realise that investors are more likely to focus on companies that use brick-and-mortar as part of their solutions.

Mobile operators

Pursue partnerships

- **Be open to partnering and collaborating** with start-ups. Working with them to extend the reach of digital health can be beneficial and profitable for both mobile operators and start-ups.
- **Partner with** digital health platforms to leverage existing ecosystems, infrastructure and personnel.
- **Continue to open APIs** and customer bases to innovators.
- **Gather feedback** on user growth and offer these insights to the start-ups.

Make a long-term, large-scale business case for digital health

- **Adopt best practices** from mobile operator-led/ supported digital health solutions (examples include **Tonic** in Bangladesh and **M-Tiba** in Kenya)
- **Explore providing** preferential rates and decreasing costs per call as volume increases.
- **Adopt a three- to five-year view.** There is huge potential to grow and reach millions as everyone needs healthcare.
- **Leverage relationships** with the government on behalf of other stakeholders.

Make digital health services more user friendly

- **Simplify payment** processes and ensure dependable connectivity
- **Nurture local ecosystems**, for example, by providing basic health education to customers when they come to distribution centres to recharge their phones.

Extend the reach of digital health services

- **Understand that digital health** is a channel for attracting new customers. Like identity, civil registration and rural connectivity, digital health is also a way to build a customer base.
- **Use CSR to extend reach**, for example, by providing more toll-free hotlines, and by showing the government how it will benefit from the CSR resources being committed.
- **Share non-confidential data** so that all stakeholders can find ways to partner and extend digital health to the BOP.
- **Recognise emerging opportunities** for collaboration with the government and development partners/NGOs in the areas of disease prevention and health promotion, provided coordination mechanisms with the government are in place.
- **Foster** well-performing, widespread network coverage to aid long-term recovery, disseminate information and support technology in healthcare infrastructure.

Investors

Understand the investment climate

- **Adopt a long-term view** and be willing to take more risks. The digital health sector takes at least three to five years to see returns, in terms of both finance and impact.
- **Understand the dynamics** and regulations of the digital health market.
- **Recognise** that digital health provides ample opportunity for social impact investors to support millions of people.
- **Coordinate investments** to avoid a proliferation of similar digital health tools.

Understand the local context

- **Understand the implications** of local start-ups having to take unconventional, innovative approaches to improve service delivery.

- **Refrain** from investing in digital health companies without understanding the local context. What works well in one country may not in another.
- **Remember** that what works well in an incubator environment may not scale if local conditions have not been fully considered.

Nurture the investment climate

- **Be clear** with all stakeholders about the conditions for investment, for example, that government must be clear about its policy priorities.
- **Capitalise** on positive feedback. When end users spread the word that an innovation is working well, find ways to accelerate the spread of that information to open up other monetisation channels and encourage return on investment.
- **Recognise** that certain countries are positioning themselves to be leaders in digital health.

Governments and Ministries of Health

Develop digital health policies and strategies

- **Develop** health and digital health policy and obtain approval from stakeholders, including the Ministry of ICT.
- **Create** an enabling environment for digital technologies through new workflows, new policies, and institutional changes and capacity.
- **Map out** where technology is likely to have the greatest benefit, and ensure there is a policy ecosystem in place to support it, such as legislation that requires patient records to be stored electronically.
- **Secure agreement** from all stakeholders, including mobile operators, on the digital health architecture, blueprint or roadmap needed to deliver the strategy.
- **Help development partners** identify where they are in the value chain. This will help start-ups and investors understand what to focus on, and how to contribute (such as opening up their APIs).

- **Appoint** a high-level digital health officer(s) who may have interim external funding to build capacity for digital health policy and strategy, to support the government and to ensure development partners and NGOs understand what they need to achieve.
- **Take** a strong technical leadership position and act as a central point for collecting, analysing and disseminating information for COVID-19 and future disease outbreak.

Laws and regulation

- **Draft laws** and regulations that address sector-wide information and data governance issues, and address specific sub-sectors of digital health, such as telehealth, online prescriptions and microinsurance (so that small, affordable premiums can be collected electronically). Data platforms, training and innovation are also areas where laws and regulations are needed.
- **Establish enforcement** mechanisms provided by digitally enabled services, such as inspection and regulation of the quality of care and information management.

Governments and Ministries of Health (continued)

Behaviour change

- **Identify** stakeholders' challenges and make arrangements to work with all stakeholders to devise solutions.
- **Collaborate** and adhere to governmental roles and responsibilities.
- **Be more open** to collaborating with the private sector and actively promoting digital health innovations and partnerships. Be willing to work with innovators directly and avoid creating bureaucratic processes that delay decisions.

Encouraging investment

- **Advise** development partners on how they can support and strengthen the government's management capacity.
- **Recognise the value** of existing data and improve assessment of the impact of digital health, including success stories, which will help to attract investors.
- **Encourage** more investment in the public health sector to bring them up to private sector levels (which only serve those at the top of the pyramid). Keep in mind that improvements to private sector quality can take 10 to 15 years.



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