

GENDER AND THE PRIMARY HEALTH CARE SYSTEM: THE ROLE OF DIGITAL TOOLS

WITH CASE STUDIES IN INDIA, INDONESIA & NIGERIA

UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS,
RESEARCH & TRAINING (START) CENTER

REPORT TO THE BILL & MELINDA GATES FOUNDATION

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Executive Summary

Digital transformation – or the adoption of digital technologies to create new and efficient modes of doing business, delivering healthcare, and administering goods and services – is playing a major role in alleviating poverty in low- and middle-income countries (LMICs). This transition, nonetheless, is accompanied by challenges in the creation of enabling environments, information, and communication technology (ICT) infrastructure and shifting user needs and expectations. This shift is also not experienced equally across all groups and demographics around the world. The digital divide – or the gap in those who benefit from the digital age, and those who do notⁱ – is threatening the efficient and widescale adoption of digital tools and technologies. This divide exists both between countries, and within groups in individual country contexts. Too often, women and girls are disproportionately burdened with this divide more than their male peers. To understand how this divide is shaping women’s access to digital primary health care (PHC) services, this report examines the major catalysts and constraints that shape these dynamics.

The Strategic Analysis Research and Training Center (START) was commissioned by the Bill & Melinda Gates Foundation (BMGF) to research the existing landscape of digital tools and technologies in health care and how a women’s sociocultural and economic position affects her ability to engage meaningfully with such tools. The report uses published literature and key informant interviews to extract learning from the health sector, as well as three other sectors – digital financial services, education, and e-government – to understand how these services work within country-specific contexts to equitably deliver services to women. In addition, this report presents the existing ecosystem and key enablers of digital tools within three countries of interest: India, Indonesia, and Nigeria. Below we present a brief overview of the key findings and recommendations that accompany this research.

KEY LESSONS & RECOMMENDATIONS

DESIGN

1. THE GENDER DIGITAL LITERACY GAP

The gender digital literacy gap among mobile phone users in LMICs is a key barrier that affects the uptake of these digital tools. Designing digital health interventions that are gender-sensitive and keep in mind the socio-cultural context, literacy, and accessibility challenges for women and girls is critical for effective use of such tools.

2. USER-CENTERED DESIGN

Actively engaging women and girls in shaping strategies for digital health care program design can be highly beneficial while keeping in mind the prevailing social norms in the community. Co-creating digital tools alongside the key stakeholders also helps to accommodate issues of digital literacy, lack of access, or language barriers, and ensures acceptability and trust of the users.

3. LOGISTICS REQUIREMENTS FOR DIGITAL ACCESS

Users prefer not to download new apps, even if their phones are capable of doing so. However, they can be more likely to try new services when they are compatible within

programs that the users are already familiar with. User preferences should be analyzed and considered for designing digital tools for them.

IMPLEMENTATION

1. INTEROPERABILITY OF DIGITAL TOOLS

Given the plethora of digital tools in the health domain, there is a need to develop end-to-end solutions and create interoperability across applications. For instance, digital tools used for procurement should be able to communicate with data relating to broader supply chain and at the health facility level.

2. LEVERAGE EXISTING SYSTEMS/STRUCTURES TO BUILD TRUST

To expand digital access, it is important to leverage existing trusted touch points and work with community partners to build trust for digital tools. Further, the application of digital tools should be considered complementary to existing public health systems and not as a replacement, a point underscored by most of our key informants.

3. CAPACITY BUILDING NEEDS

Initial capacity building and/or continued technical support offered to healthcare workers and target users by members from within the communities also drives the acceptance and uptake of digital health tools. This is particularly critical for uptake of such tools by women and girls given the gender digital gap.

POLICY

1. ROBUST INFRASTRUCTURE AND GOVERNANCE

There is a central role of effective governance and leadership in scaling digital health technologies in LMICs. National and state governments should create an enabling environment, robust regulatory and financial mechanisms, and strong partnerships to foster cost-effective, scalable, and replicable digital health tools that are adaptable to local contexts.

2. DATA SECURITY AND PROTECTION

As we think about enhancing access of women and girls to use digital tools for healthcare, it is critical to design and implement robust data security and privacy laws to ensure confidentiality of patient records. Any inadvertent disclosure of patient records, particularly for women, can compromise their privacy and autonomy given the existing gender power relations in their households.

3. PUBLIC-PRIVATE PARTNERSHIPS

Private-public partnerships between private companies, such as local technology companies, telecom sector, financing institutions, and government for designing and implementing digital health tools can have a significant impact on [what?]. The coordination of efforts between the public health sector and private sector organizations can reduce fragmentation and redundancies, else technology can risk inadvertently undermining and weakening the existing local health system

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I. Introduction

A. Project Overview

This report is the product of research conducted by the University of Washington’s Global Health Strategic Analysis and Research Training Program (START) team from September to December 2021 in response to BMGF’s work order for “Gender and the Primary Health Care System.” First, it summarizes the current landscape of and lessons learned from the digital divide that exists universally across various sectors of LMICs. Second, it examines the gendered digital divide within the health care system digital tools in LMICs and presents existing examples of innovations currently being implemented to close this gap. Last, it seeks to provide a situational assessment of the ecosystem of digital tools and services within the primary health care system in three key countries of interest to the BMGF – India, Indonesia, and Nigeria – and how access is unequally shared across gender lines.

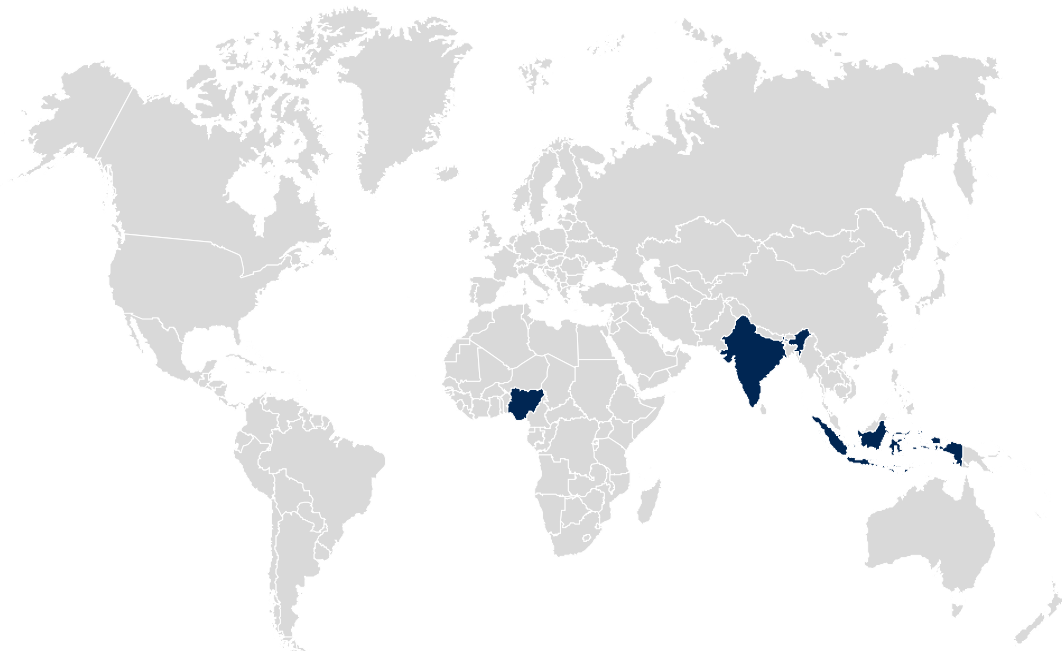


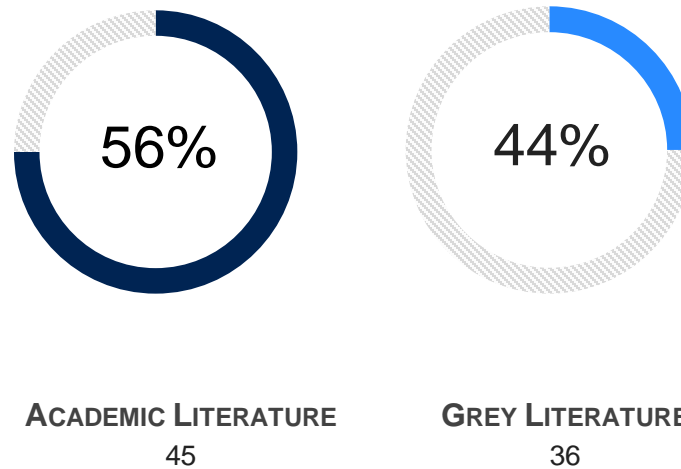
Figure 1: Countries of specific interest to this research

B. Methodology

LITERATURE REVIEW

This report seeks to draw from existing research and evidence that examines the gendered digital divide in LMICs. Research was conducted using multiple data collection methods, including literature reviews and key informant interviews. The team conducted a rapid literature review, which included

45 and 36 documents from published and grey literature sources, respectively. Sequentially, the team conducted ten key informant interviews with experts, ranging from ICT researchers to local technology entrepreneurs, working to advance digital access tools for primary health care in LMICs—specifically for women and girls.



Literature review was conducted in two stages. First, the team surveyed scholarly and grey literature on the non-health sectors known to be using digital tools for service delivery provision around the world. Next, the team mapped common themes and insights to demonstrate the widespread existence of gender-restricted access to digital services in healthcare. We used this mapping to delve deeper into the published literature that was used to ultimately inform our key findings and recommendations.

KEY INFORMANT INTERVIEWS

Ten key informants from a broad range of interdisciplinary fields were interviewed as part of this research project. The informants hold widespread knowledge and practical experience in researching and implementing programs meant to advance the equitable use of digital technologies around the world. The team selected key informants through existing relationships between the START Center and the BMGF. Using a snowball sampling approach, additional key informants were contacted through recommendations and connections from experts being interviewed. A general interview guide was provided to all interviewees prior to starting the interview. The interviews were conducted online via Zoom and lasted between 30-60 minutes.

Responses from the highly qualified and diverse key informants added nuance and evidence from their experience to this research. While most key informants have broad global experience, many had expertise in the three countries of interest within this report. These key informants were intentionally chosen to understand the unique challenges that individual countries face and augment the research to have demonstrable evidence from these settings.

LIST OF KEY INFORMANTS

EXPERT	ROLE	AFFILIATION	COUNTRY OF INTEREST
Chris Coward	Director & Senior Principal Research Scientist	Technology & Social Change Group, University of Washington Information School	Nonspecific
Araba Sey	Principal Researcher	Research ICT Africa	Nonspecific
Maria Garrido	Principal Research Scientist	Technology & Social Change Group, University of Washington Information School	Nonspecific
Farhad Ali	Project Director	Digital Green	India
Wale Adeoson	Founder, CEO	Wellvis	Nigeria
Claudia Marques de Abreu Lopes	Research Associate	Gender Health Hub, United Nations University	Nonspecific
Andrew Buhayar	Program Officer	Bill & Melinda Gates Foundation – Digital Square Project	Nonspecific
Jessica Watterson	Senior Lecturer	Monash University, Malaysia	Indonesia
Elizabeth Rowley	Senior Global Advisor	PATH	Nonspecific
Zahra Lutfeali	Acting Executive Director	PATH – Digital Square	Nonspecific

Using the above evidence and research, the sections below will provide an assessment of the disparities marginalized populations face in accessing digital technologies and tools. In addition, it will demonstrate evidence and lessons that have both hindered and strengthened such capabilities for three non-health sectors: financial services, education, and e-government.

II. Framing the Digital Divide in LMICs

A. Background

Digital tools and technologies are now ubiquitous in every country and society. They also hold the power to lift millions of people out of poverty by integrating innovative solutions that address problems for those existing on the margins of society. These tools and technologies can disrupt the traditional mechanisms by which we communicate, do business, educate populations, and deliver health care services. However, digital technologies can either reinforce or accelerate inequalities due to the critical infrastructure and digital literacy skills necessary for human interaction with such tools. Often referred to as the “digital divide,” this concept speaks to the stark inequities that exist between groups with access to computing and information resources such as the internet and the opportunities derived from such access.ⁱⁱ The digital divide exists across varying contexts. While broadly encompassing the availability of internet and data services between high income countries (HICs) vs LMICs, the term also represents the disparities seen among marginalized groups, and

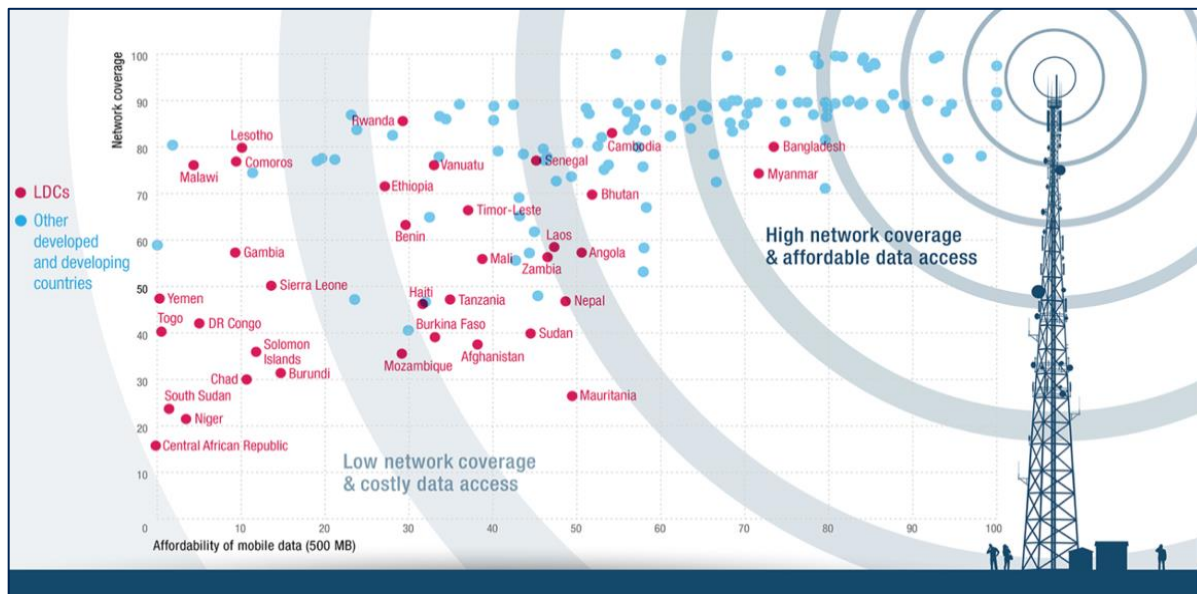


Figure 2: The above shows the distribution of the digital divide across least developed countries against other developed and developing countries. Access to high network coverage and the affordability of data access are key facets of digital inclusion. Source: UNCTAD.

women in particular within each country. According to data from the UN Conference on Trade and Development (UNCTAD), women are still roughly 20% less likely than men to use mobile internet in LMICs.ⁱⁱⁱ Though this trend is pervasive across many regions of the world, the underlying constraints that prohibit women from accessing digital technologies are not the same between countries and cultures. Differing cultural and societal norms that are hyper-localized within each country level often dictate how women can engage with digital technology. Gendered social norms – or the prescribed roles and expectations to men and women in households, communities, markets, and public life – often play an outsized role in shaping the way women engage with digital technologies.^{iv} Consequentially, the global community’s response for digital health may be more effective if it can design solutions that are sensitive to individualized country norms. Such programs exist both within the health sector and beyond.

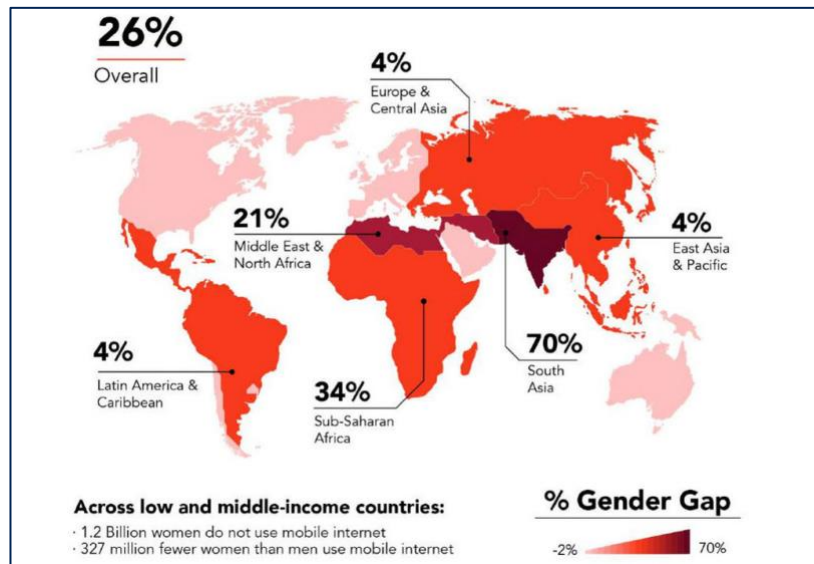


Figure 3 demonstrates the gender gap in mobile internet usage across worldwide regions. Source: GSMA Mobile Gender Gap Report 2018.

In the next section, we describe lessons learned and insights extracted from non-health sectors in bridging the digital divide.

B. Lessons From Non-Health Sectors

DIGITAL FINANCIAL SERVICES

The explosion of digital financial services (DFS) has overcome strong barriers in recent years within the digital divide that have historically plagued women’s access to digital technologies. Mobile money, or mobile-based payment systems, permits users to utilize their smart and non-smart phones to transfer money, receive government payments, pay individual household bills, save money, obtain loans, and manage small and medium enterprise (SME) finances. This new way of transacting and using accounts has improved the lives of millions of previously unbanked individuals across LMIC settings. According to a landmark 2016 study by Suri et.al., mobile money access in Kenya – through the system M-PESA – increased per capita consumption levels and lifted 194,000 (2%) Kenyan households out of poverty. These impacts were even more pronounced for female-headed households.^v

The literature documenting the positive economic effects from mobile money is extensive. Here, we document the key themes and efforts that improve equity and inclusivity of access to DFS for women, who make up the majority of the world’s unbanked population.

- I. **Device inclusion – SMS features phones vs smartphones:** Financial barriers and low access to physical devices constrict a woman’s ability to access digital tools. Feature phones – or phones without smartphone capabilities such as apps and music – are still more common in LMICs and smartphones people have may be underpowered, out of storage, or otherwise not fully functional. With this in mind, many successful programs are accessible to both smartphones and feature phones and cater to a ‘metered mentality’ where top-up data is bought infrequently in small bundles rather than through a prepaid plan.^{vi} This provides flexibility for people to save their money by only paying for a portion of phone services when they need them, rather than being locked into a long term, expensive contract. This is also true in 2G internet-only areas that tend to be rural, where SMS services are more reliable than roaming. This behavior is specifically important for women, as according to Araba Sey, an expert interviewed as part of this research and a researcher for ICT Africa, women tend to purchase data with money that they consider to be personally disposable income and is therefore less frequent.^{vii} Lessons from the flourishing financial inclusion sector lie in their efforts to reach unbanked individuals with the end users, their behaviors, and lifestyles in mind.

- II. **Trust is a fundamental component to user-driven digital tools:** Institutional trust is a fundamental prerequisite for people to use digital tools to handle their finances. In settings where financial capital is already scarce, populations in developing countries are hesitant to take risks with their money. Engendering trust for using digital financial services can be reinforced by mobile money service providers that are well known household names. The institutionalization of mobile service provider Vodafone and Safaricom in Kenya provided the legitimacy for Kenyans to readily adopt M-Pesa, which was founded by the mobile provider in 2007. Given Kenyans existing exposure to the brands, Safaricom and Vodafone, they were more accepting of these same institutions handling their finances. However, trust is also embedded within the social system governing usage of these technologies. As explained by Araba Sey, *“trust in institutions is only as strong as the social network in which a woman operates. For example, while women may theoretically be able to establish a bankable presence through a mobile money provider, their familial status may prevent them from achieving it. Her husband, and often her mother-in-law, must first trust the woman to be able to use a cell phone.”*

- III. **A physical, non-urban presence is important:** For financial services, mobile money kiosks in rural regions provide the human-to-human contact necessary to establish and build trust. According to Araba Sey, people want a “physical touch” when engaging with digital tools and technologies. These physical intermediaries, especially in rural settings, are highly valued by residents who prefer to have a tangible relationship with people handling their finances.

EDUCATION

The literacy rates within LICs and LMICs have grown considerably, from roughly 47% for people ages 15 and up being literate in 1975 to 77% in 2020.^{viii} However, a gender divide exists in the education sector too; in 2020, the literacy rate for women was 69% vs. 86% for men. This gender literacy gap is closing for every region in the world,^{ix} but not at a fast enough rate to allow women to effectively compete in the labor market. Reasons for lower female from school vary across contexts

and settings and education stakeholders in these settings have taken great strides in recent decades to counter these challenges. Especially catalyzed by the COVID-19 pandemic, digital learning has exploded as an additional tool for improving educational outcomes and literacy for women in LMIC settings. According to a recent report by the World Bank on remote learning during the COVID-19 pandemic, country governments adopted a myriad of techniques to ensure their students did not face massive disruptions in their learning. A few of these methods resembled partnering with the private sector, adjusting curricula to accommodate reduction in school days, offering self-paced programs, and designing e-learning materials in minority languages.^x Through these innovations, we have learned much about how to make digital tools more successful and impactful for women and girls.

- I. **Digital literacy is important in theory but nuanced in practice:** The gendered literacy gap parallels that of digital literacy. Particularly, in a LMIC, obstacles to using digital technologies includes low educational background, lack of ability, lack of facilities, lack of ICT training for women, and a patriarchal cultural influence.^{xi,xii} A young girl will not be able to engage meaningfully with a digital-based e-learning tool if she does not first have the capabilities to use the physical infrastructure that hosts it. However, digital illiteracy should not in itself excuse women’s impaired use of technology. Siddhartha Swarup, the India lead for Social Impact, Education and Communities at Facebook India says, *“attempted rationalization against women’s use of technology such as digital illiteracy and internet predators is inherently infantilizing to women and ignores the reality that men are exposed to these same barriers and are assumed to learn quicker and better withstand cyber scams though that is not necessarily true.”*^{xiii}

Here, we document the key challenges to digital literacy, particularly for women and girls –

- I. **Challenges with a one-size-fits-all e-learning approach:** Most digital e-learning tools are imported from HICs and are expected to work just as effectively in a new setting. The ICT availability for LMICs is significantly different from HICs, which may cause these tools to fail. Countries will be more successful during the pandemic and beyond to keep women and girls in school if they adopt suitable technologies by accounting for the access and utilization of different learning modalities.^{xiv} Women and girls generally have less access to ICT infrastructure. They are more isolated than their male peers, and experience barriers in their family in being trusted to use technology independently. A one-size-fits-all approach, imported from HICs, may risk further marginalizing young female students.
- II. **Education requires human interaction:** Much like many digital interventions, human-to-human interaction is critical for remote learning. Especially for young girls who may face resistance from a patriarchal figure or more digital illiterate than her male peers, a physical teacher presence in supporting her learning is important for pedagogical settings.^{xv}

E-GOVERNMENT

Governments around the world are pioneering digital tools to improve public service delivery, make data-driven decisions, and implement accountability and transparency mechanisms to improve

public trust.^{xvi} Such tools range in their composition and purpose. In India, the Unique Identification Authority is creating a nationwide program that assigns ID numbers to its population to facilitate an easier distribution of public goods.^{xvii} Rwanda became the first African country to pioneer an electronic procurement system meant to improve transparency and reduce corruption.^{xviii} In Togo, using geospatial data, phone surveys and machine-learning algorithms, the central government was able to deliver immediate mobile cash transfers for 572,000 extremely poor individuals working in the informal sector during the COVID-19 pandemic.^{xix} While innovative, this sector struggles to reach those most digitally marginalized. Research in this domain has demonstrated how to develop e-government tools that allow women to engage meaningfully with them.

- I. **Gaps in demographic data:** Many of these services rely on traditional data collection methods: census, household surveys, civil registration, and vital statistics. These methods oftentimes do not capture demographic statistics representing marginalized groups.^{xx} These data are being used as the inputs and foundations for building distributable digital e-government services. If female demographic data is not being captured, their perspectives, preferences, and behaviors will not be reflected in the tools being designed to facilitate the mechanisms by which women engage with their governments.
- II. **User-centered design approaches:** Co-creating and ensuring citizens are part of the design phase can help designers and developers understand the expectation of the users. Correctly and equitably balancing technology-human elements in service delivery design can augment this. According to the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) report on the effects of e-government on women in Asia Pacific, the digitization of service delivery may not automatically lead to gender-based inclusion. They argue that "*design challenges in e-services delivery therefore is to find a middle path to maximize technological and human elements, reaping the advantages of both universal, standardized procedures and localized, unique needs.*" The report advocates for not only women playing an active role in implementing such technologies, but also in the design and co-production of services.

C. Cross-Cutting Sector Findings

Disparities in access and equity in healthcare are often perpetuated by social and economic determinants resulting from different non-health sectors. This research recognizes that a siloed perspective into individual non-health sector does not fully capture the overall impacts that digital transformation has on healthcare, particularly associated with gender inequalities. The proliferation of digitalization has spread across all three aforementioned sectors and when woven together, their intersectional impacts have the potential to improve female livelihoods.

- I. **Digital Financial Services and Health:** DFS have been shown to help users grow economic resilience when faced with health care shocks.^{xxi} These have wide ranging effects for women, who are often the health care seekers for themselves and their families. In addition, studies have shown that DFS users who are rural, female, and less educated are more likely than non-DFS users to save money for health-related emergencies.^{xxii}

- II. Digital Financial Services and Education:** Female DFS users are more likely to have saved money to continue supporting other family-related expenses when faced with economic shocks.^{xxiii} A recent report by the United States Agency for International Development highlights the role of DFS in accelerating educational achievement and literacy.^{xxiv} In regions where female enrollment in school is low due to the lack of familial funds for school fees, DFS can increase a girl's likelihood of going to and staying in school. The report also argues that DFS can improve teacher effectiveness, school management, and student access through increased ability to meet education costs and pay-as-you-go e-learning mechanisms.^{xxv} The effects of increased literacy and education on health outcomes is well documented in published research and the relationship is strongly pronounced for women and girls. Higher levels of education are known to help women attain reproductive health services, improve maternal mortality, reduce women's likelihood of contracting HIV or AIDS, and increase child survival rates.^{xxvi}
- III. E-Government and Health:** E-government plays an essential role in both bridging the digital divide between groups within individual country settings and helping all citizens access basic social services. In settings where governments are the major providers of health care – such as in India, Indonesia and Nigeria – increased access to assistance through digital health platforms can help women obtain previously inaccessible health services. Additionally, strengthening the overall governance and accountability mechanisms of a government through digitization can impact the Sustainable Development Goals (SDGs) more broadly. One study demonstrated how improved regulatory quality has a significant and positive impact on the under-five mortality rate and overall health outcomes.^{xxvii}

Drawing on key barriers and opportunities for growth from each of these sectors, the next section of the report will assess the status of the gendered digital divide within the health care system.

III. Addressing the Gendered Digital Divide in Health Care

A. Background

Improving the way countries provide accessible, affordable, and quality health care is the very core of primary health care provision.^{xxviii} Digital tools in health care represent an emerging suite of services that include technologies to improve the overall provision and allocation of these health services. These ICT tools allow people to manage their personal health more effectively, quickly diagnose disease, and improve the efficiency of a country’s health care system.ⁱⁱⁱ According to the World Health Organization (WHO), digital tools can be classified into four categories based on the targeted user (Figure 4).

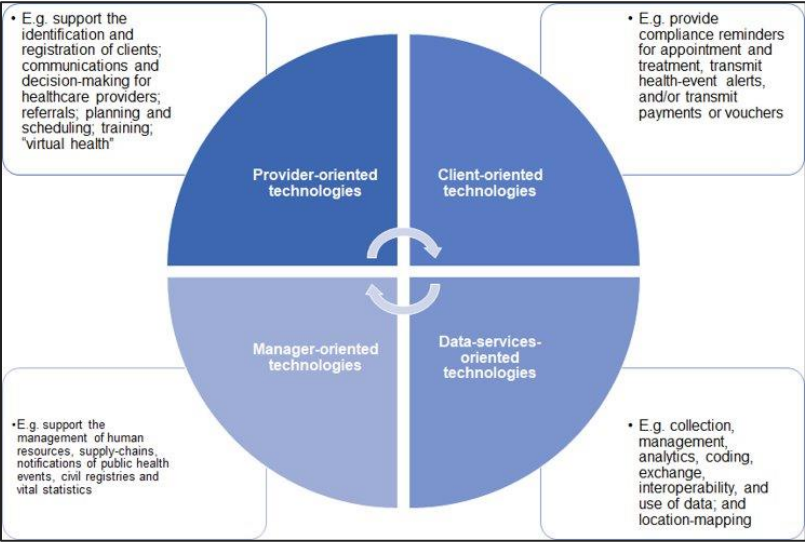


Figure 4: WHO classification of digital tools. Source: WHO

These tools can have a wide application in healthcare in low-resource settings and some examples of application of digital tools is highlighted below:

- Targeted communication via text, voice message, or combination to convey information and messages for **social and behavior change (SBC)** on different health outcomes such as maternal health, pregnancy knowledge, newborn health, sexual and reproductive health.
- **Digital tools for people to manage their health** more effectively. These range from diagnosis to monitoring of individual health.
- Application of **digital tools to support primary care** and essential public health functions such as workforce management, case management and surveillance.

Below we explore three country case studies – India, Indonesia and Nigeria – to demonstrate how gender equity in accessing digital tools and technology is a complicated phenomenon embedded within the larger social, economic, and political ecosystems of each setting. Yet, each country reveals positive and compelling examples of how local actors and governments are using equity-focused technology to overcome such barriers for women.

B. Country Profile Case Studies

INDIA

DIGITAL TOOLS ECOSYSTEM – BACKGROUND

India is becoming one of the fastest growing countries in digital accessibility. With over 40% of the population being internet subscribers and 1.2 billion mobile phone users in 2018, these figures are predicted to only increase in the coming years.^{xxix} The Indian government is a huge proponent of digitalization, leading the world's largest digital identity program, Aadhaar.^{xxx} A biometrics-based national identification system, Aadhaar, has covered over 1.2 billion people in 2018, making service deliveries efficient and cost-effective for many Indian citizens.^{xxix} Similarly, both public and private sectors in the country are embracing initiatives to broaden digital access and narrow the digital divide.

Amongst other sectors, India is attempting to bring revolutionary change in healthcare through digitization. While the Ayushman Bharat Programme (ABP) towards Universal Health Coverage (UHC) has already promised a huge investment to ensure comprehensive healthcare in primary, secondary, and tertiary levels, the recent launch of the National Digital Health Mission (NDHM) in August 2020 has leapfrogged the government's efforts to strengthen its healthcare system.^{xxxi} The NDHM provides a unique digital health identity for every citizen, and it is laid on the foundation of the existing National Health Policy (NHP) and the national digital health blueprint (NDHB), which ensures an integrated health information system that uses digital technologies throughout the care pathway.^{xxxi}

Many digital services have been adopted and implemented while simultaneously catering to the diverse health system building blocks such as service delivery, health workforce, essential medicines, health information and governance.^{xxxii} Digital health in India has been evolving rapidly: preliminary digitization such as creating analog of medical records has been achieved in some areas; however, enhancement into a robust digital workflows across health systems are next stages to progress towards digitizing health (Figure 5). Notable growth in the Indian digital healthcare sector is centered on the development of electronic medical records (EMR) standards, application of mHealth technologies such as telemedicine, point-

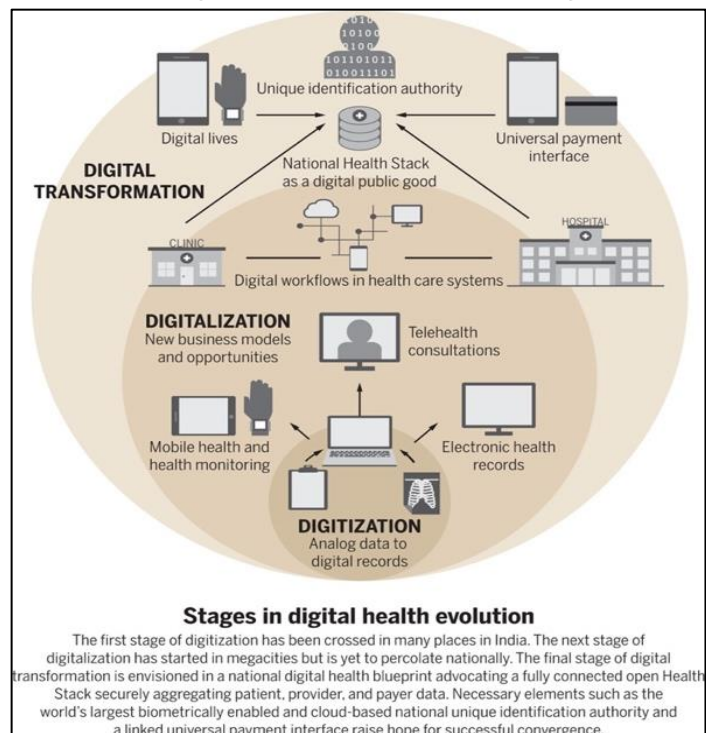


Figure 5: Stages in digital health evolution in India. Source: MELISSA THOMAS BAUM/SCIENCE

of-contact devices, GPS systems and clinical decision-making systems, and the recent establishment of the NDHM.^{xxxiii} Yet, there is a growing need to integrate these tools into the national healthcare system. Figure 6 shows ABP's framework to adapt suitable digital health technologies at primary, secondary, and tertiary healthcare levels.^{xxxiii}

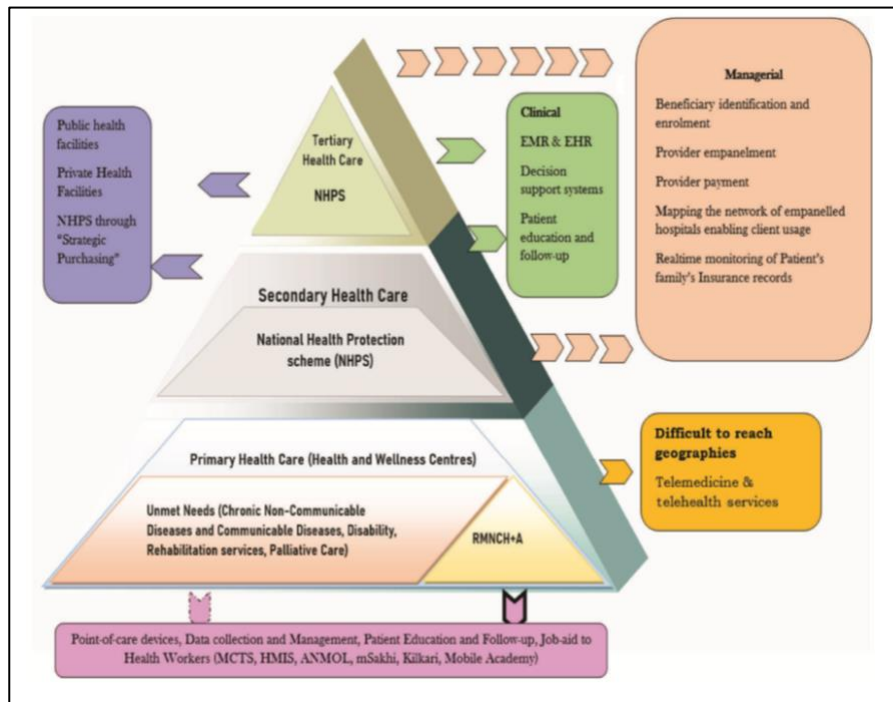


Figure 6: Framework for the development of digital health technologies in the context of Ayushman Bharat Programme Source: Kodali and Das 2021

Various types of digital tools exist in both consumer and workforce level that target a range of health issues. For instance, patient-facing mhealth apps such as doctor consultation apps are very popular. Eight of them: Practo, mfine, DocsApp, 1mg, Netmeds, Lybrate, MediBuddy, and Medlifeare are the most-used apps with over a million downloads.^{xxxiv} Other initiatives include digital health services for mental health prevention and treatment,^{xxxv} mhealth voice messages services for infant care practices and maternal health knowledge,^{xxxvi} smartphone-based intelligence for vaccine stock regulation and supply logistics,^{xxxvii} and mhealth interventions for chronic diseases.^{xxxviii,xxxix}

The effectiveness and uptake of digital health tools also depends on the structure and capacity of India's state-wide health systems. Some of the low-income states such as Uttar Pradesh, Jharkhand, Madhya Pradesh, and Bihar have consistently performed poor on various health indexes.^{xl} However, these states are also showing progress and are among the fastest growing with internet accessibility decreasing this digital gap. This growth provides an opportunity to assess the feasibility and adoption of various digital health tools to improve healthcare access and delivery.

Listed below are examples of digital health services from two of the poorest states in India: Uttar Pradesh and Bihar. Many of these examples mainly focus on the patient-facing tools for maternal, child and neonatal health since these states have been recorded to have high deprivation levels for the maternal health and child health deprivation index based on a 2012-13 health survey.^{xl}

TOOLS FOR DIGITAL HEALTH – UTTAR PRADESH

Uttar Pradesh is one of the most highly populated states in India and is home to one fifth of the national population. It is also amongst the poorest performing states in maternal, infant, and neonatal healthcare services uptake. According to India's 2012-13 census, 300 maternal deaths per 100,000 live births were observed in Uttar Pradesh. Additionally, some of the districts that ranked the most poor for the child health deprivation index were in Uttar Pradesh.^{xii} Some of the digital health interventions introduced in Uttar Pradesh are as follows:

REMiND PROGRAM

Led by the Catholic Relief Services, ReMiND (Reducing Maternal and Newborn Deaths) program is a mobile phone-based program implemented in rural communities of Uttar Pradesh to provide continuum of care for maternal and child health issues.^{xiii} The Accredited Social Health Activists (ASHAs) are the voluntary community health workers who are pivotal in delivering routine health care services such as behavior change counseling, check-ups, early diagnosis, treatment, and referrals to pregnant and new mothers through scheduled home visits. ReMiND helps these ASHAs to enhance their healthcare delivery using audio-visual aids in their mobile phones. The in-built applications offer guidance to ASHAs through questionnaires, checklists, and counseling aids to register new mothers, record their data, and follow-up on the clients' details for appropriate care. These applications mainly focus on improving the coverage of ASHA in these remote communities to increase the uptake of maternal and child health care, nutritional knowledge and behavioral practices during pregnancy and post-natal period. A midline evaluation done in 2014 showed that the low coverage of ASHAs decreased to less than 20% and were significantly able to cover 72% of the counseling visits to pregnant women and mothers in the community.^{xliii}

E-MITRA CLINIC

Jiyyo e-mitra clinic is a virtual consultation service that connects patients visiting the local practitioners and health workers with the skilled doctors through video conferencing tools as well as offers referrals and prescriptions. This e-clinic is based on a social business model and has been expanded from two to 20 centers in Uttar Pradesh, particularly bringing access to hard-to-reach communities in the rural areas. Some specific health concerns addressed included chronic diseases, respiratory issues, skin diseases, and mouth ulcers. Patients who used the service were predominantly men around 60 years old. A recent study showed that the acceptability and feasibility of the service looked promising, however, the program still needs to undergo evaluations on quality care, health outcomes and ethical concerns.^{xliv}

TOOLS FOR DIGITAL HEALTH – BIHAR

Bihar is another highly populated state in India with 40% of people living below the poverty line.^{xlv} The state consists of the poorest districts in the country and have meagre figures for maternal and child health rates. The Indian government has been committing to improve the health and economic sector of the state. These high rates of poverty translate to digital technology usage. According to the National Family Health Survey from 2019-2020, only 20.6% women in Bihar have used the internet, compared to 43.6% men.^{xlvi} In regard to digital health tools, the technologies that have been

piloted or scaled up in Bihar focusses mainly on improving the maternal and child health services through frontline healthcare workers.

MOBILE KUNJI AND KILKARI

Both Mobile Kunji and Kilkari are designed by the BBC Media Action as a part of the Ananya program led by the BMGF and the Government of Bihar to improve large-scale maternal, child and neonatal health.

Mobile Kunji is an audiovisual job aid designed to help the FLWs deliver key health messages timely and effectively to pregnant women and new mothers. The tool consists of colored cue cards with illustrations and a mobile short code directed to an Interactive Voice Response (IVR) service for audio messages.^{xlv}

Kilkari is a mobile-based stage-appropriate audio messages about pregnancy, childbirth, and childcare sent to families with women in the second trimester of pregnancy until the child is one-year-old. Kilkari aims to improve health behaviors and increase knowledge around various sexual and reproductive health, nutrition, infectious diseases, and maternal and neonatal health. It is the first mobile maternal messaging service in India with more than 3.1 million calls made in Bihar in 2016.^{xlvii}

GUPSUP POTLI

An mHealth service for frontline workers to effectively engage with and deliver health messages to families each month during the Village Health Sanitation and Nutrition Day (VHSND). It involved cue cards, audio messages and print materials to evoke social discussions and changes in behaviors. Unfortunately, the program has been stopped due to scale up issues.^{xlviii}

HOME ISOLATION TRACKING (HIT) COVID APP

HIT Covid App is a mobile app developed by the Bihar government to help health workers routinely monitor and track COVID-19 patients staying in home isolation.^{xlix}

CASE STUDY: DIGITAL GREEN

Digital Green is a global development organization committed to harnessing the collective power of technology and grassroots-level partnerships to help people lift themselves out of poverty. They help implement locally led projects by working with communities to innovate solutions from a systems perspective. In practice, this perspective allows them to understand the real needs of end-users, and work with the community to frame and implement solutions to pressing agricultural and health problems. Digital Green understands how the precarious nature of innovations and manufactured technological solutions to complex problems can cause ineffectiveness in the context of poverty alleviation. They also seek to understand how women and men interact with technology differently and aim to improve the equitable advancement of digital tools within small and poor communities in India. To date, 75% of their beneficiaries are women.

Farhad Ali, Director of Institutionalization & Partnerships for Digital Green, says, “*Digital Green’s approach is implemented by assessing and diagnosing the networks, systems, and organizations in a community, integrating technology where appropriate, and then analyzing and evaluating data generated as part of their process. Evidence gathered at the community level is shared back to participants in various formats*”.

Digital Green works alongside the Indian Government by partnering with local frontline workers to address the healthcare needs of hard-to-reach women. Project Samvad is one of their health projects that uses **trusted networks and systems** and **locally held technologies** to reach marginalized groups deprived of standardized health care. It is a digital community engagement that involves ICT and video-making approaches to address Family Planning, Maternal Child Health and Nutrition. This project aims on raising awareness and sharing information using videos on various local health topics in community groups, led by community-level workers. The FLWs instigates dialogue between community members to address issues, refer specific problem to higher primary healthcare level, and report on adopted behavioral changes based on the learnings from the videos. Short videos are shared via social media applications such as WhatsApp and Integrated Voice Response (IVR) along with the human mediated video dissemination to disburse information on health and nutrition targeting both men and women of reproductive age, as well as recent mothers.

Inclusivity is core in this project and while being aware that only 40-50% of rural women in India have a cell phone, they try to reach this population through other trusted community resources. For women not being able to join in-person or without mobile-phone access, community radio broadcasting is used.¹ In cases where there is little to no cell phone usage, Digital Green engages with the community by going door-to-door.

LESSONS LEARNED

Digital Green closely monitors their projects through intensive surveying, and their findings are below:

1. For those whose **first time using a cell phone is part of a Digital Green project – feelings of empowerment were strong**, especially for women.
2. Carefully understanding **who and what mediums the community trusts to deliver messaging** is crucial. Authenticity is awarded through trusted, local networks.
3. Having the opportunity to **interface with frontline workers alongside the technological innovation** builds legitimacy and acceptability of digital tools by local communities.
4. For women who have the least access to digital mediums due to cultural and social norms, **engaging meaningfully with her familial network and family members** helps build trust in the technology and project.

OPPORTUNITIES FOR GROWTH

Some of the areas for growth mentioned by Farhad Ali as part of this research include:

1. In recent years, the Government of India (Gol) has invested heavily in the health care infrastructure to improve outcomes for women and girls. Strengthened local capacity can be harnessed by **working with and alongside Gol and their investment in human capacity**. Investing in mechanisms to build trust in the health care system can bolster better health outcomes.

2. **Addressing poor data practices and ecosystems must be a priority** if any technological investment is to exist within a community. Technology thrives when data is **triangulated and shared across sectors** to address gaps in health care for women.
3. If not implemented carefully, **technology can undermine and weaken the local health care system**. Technology should be used as a tool to **augment what is already happening on the ground** as a means of integration, rather than replacement.

ANALYSIS AND RECOMMENDATION

Some key recommendations to improve uptake and scale up of digital health tools in India are described below:

1. **Need for robust Infrastructure and governance:** India's steering towards NDHM is a challenging task for such a diverse and highly populated country. Some national level concerns for adoption and scale-up include lack of robust data governance and management system with a scarcity of competent human workforce and standardized procedures for operability, data protection and privacy issues, and poor co-creation of digital health tools to incorporate end-users' perspectives. ^{xxxi,xxxiii}
2. **Sustainability and scale-up issues:** Digital health tools are initially piloted for hyper localized small population and designed to be user-centric and context-specific. However, the aim for sustainability and scaling-up can compromise the design and usability of the tool in order to make them operationally and economically feasible for larger contexts. For example, an evaluation of the Kilkari project highlighted that government adaption of the tool for scale up had to reconsider a cost-efficient way of reaching women compromising the number of calls, time of the day when women could receive the calls, and context-specific language requirementsⁱⁱ. Furthermore, the program also underscored that lesser the logistics and training required, better the willingness for adoption and scale up. Hence, keeping in mind the restrictions imposed by sustainability and scaling up in the design phase will be pre-emptively useful.
3. **Digital literacy and digital gender gap:** The gender gap among the mobile phone users and digital literacy is another barrier that affects the uptake of these mhealth tools. Smartphones are mostly owned by men and accessibility to mobile phones are limited among women particularly in the rural areas. In India, 20% of women are less likely to own mobile phones and 50% are less likely to use mobile internet compared to menⁱⁱⁱ. Similar trends were seen among adolescent boys and girls in Bihar and married girls were the least connected digitally.ⁱⁱⁱⁱ A COVID-19 study in Bihar and Uttar Pradesh found that women in general had poor knowledge about the symptoms and prevention of the disease than their male counterparts due to their pre-disposition to some economic and cultural factors such as level of education, socio-economic status, and location. Women were less likely to go outdoors, have limited exposure to media, and access to mobile phones making them more vulnerable and part of harder to reach populations. Therefore, promoting and implementing digital health interventions that are gender-sensitive and targets both men and women is crucial as their benefits can only be reaped when they can be effectively used in the communities where they are needed the most. Particularly, the NDHM initiatives should leverage

initiatives reaching women who might be marginalized due to the normative constraints associated with their socio-cultural context, literacy, and accessibility challenges.

4. **Community acceptance and usability:** Another issue particularly identified with using mobile health tools is ensuring acceptability and trust of the beneficiaries. Co-creating digital tools with the communities helps accommodate issues of digital illiteracy, lack of access, or language barriers. Some of the examples mentioned above uses technologies such as IVRs or video messaging to reach groups that have poor literacy. Government should focus on being contextual while moving forward with digitization and leveraging existing institutions as intermediaries, for example, the community health care workers or local groups who are already part of the community in order to build trust with the beneficiaries.
5. **Reinforcement of public-private collaboration:** As per our informant, Farhad Ali of Digital Green, leveraging existing systems and fostering partnerships with the private sector becomes important for the country to nurture digital growth. The Indian private sector has a huge digital health market – above 80% of the outpatient care is provided by the private medical care and clinics.^{liv} Supporting private and local innovations and incentives that target context-specific issues such as the digital gender gap, infrastructure and poor manpower, cultural acceptability, and economic viability can help catalyze a national-level uptake of health sector digitization.

INDONESIA

DIGITAL TOOLS ECOSYSTEM – BACKGROUND

The digital landscape in Indonesia is well established and growing rapidly. Citizens have high rates of digital technology adoption, and public and private industry are undertaking initiatives to match the demand to reach those that may be physically isolated. Indonesia has the unique landscape of being an island archipelago composed of thousands of islands. An understanding of this unique physical environment is what drives the push to digitize and provide access to those who live in the more rural and isolated islands.

With a population of roughly 267 million people, Indonesia is the world's fourth most populous country. Within Indonesia, 55% live in urban areas. 64% of the population were internet users in 2020 and 59% used social media. 98% of internet users use mobile internet, 96% with a smartphone, and 5% with feature phones though the rate of smartphone use continues to increase. Internet use is quickly growing and will increase by 17% from 2019 to 2020.^{iv} Similar to most LMICs, there is a gender gap in smartphone ownership

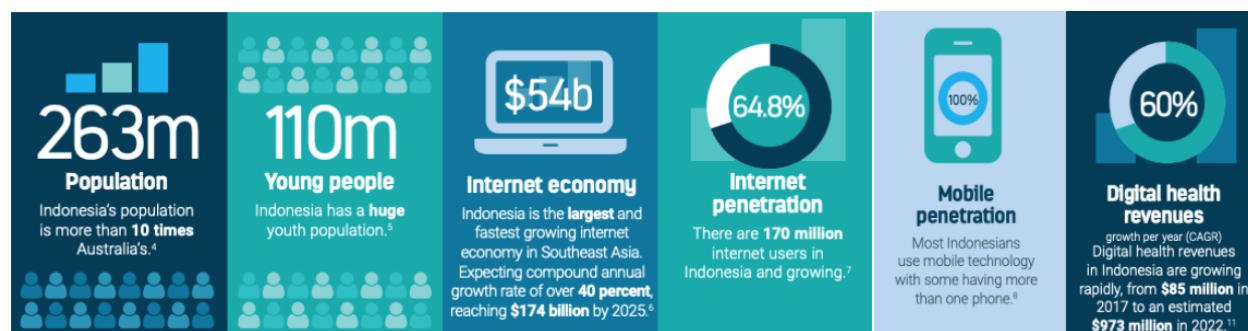


Figure 7 shows the general distribution of the general digital landscape in Indonesia. Source: Asialink Business/MTP Connect

Across sectors and geographies, the progression of digital health from urban to rural seems to be consistent. Digital health is still very new and generally starts in urban areas where it is adopted by mostly middle-class men before being expanded to rural areas and groups that are underrepresented in tech. According to interviews with digital health professionals, digital programs are adopted with less outreach in urban areas whereas in rural areas more community influence and even door to door outreach and education is often needed. Indonesia is unique in that the support seen for digital health from the government has been initiated with the goal of including the rural population in mind. Indonesia has many underlying factors that have helped facilitate the adoption of digital programs, including a 95% literacy rate and an increasing cultural understanding of the benefits of technology.^{lvi} In fact, the Indonesian government provides substantial support and has spearheaded initiatives to expand digital access. For example, their Palapa Ring Project brings broadband internet to rural populations using 36,000km of fiber-optic cable and a Multifunction Satellite Project to increase internet access.^{lvii}

The Indonesian government has been influential in their push to expand the digital financial services environment specifically to reach the entirety of the country's population. To grow their digital cash transfer program environment, they created the "Program Keluarga Harapan" (PKH) – or the Family

Hope Program – which became a massive initiative by the Ministry of Social Affairs to open digital bank accounts for 10 million people, many of whom were women. This experiment successfully exposed many women to the possibilities of digital banking and provided insights for providers as to what influences the success of similar digital programs. A program evaluation by Women’s World Banking found that 91% of accounts were only using cash withdrawal features. Reasons for such limited use of features beyond cash withdrawals were that the women had no active choice to open the accounts meaning many did not see the significance in having that new account, trust the process, or understand all of its capabilities.^{lviii} An analysis of these financial programs suggests exploring opportunities for growth in leveraging existing infrastructure to provide frequent well known touch points such as community-based shops and workers including well respected influencers that are physically close to the community to serve as leaders. Best practices have also included consistent reminder messages, celebrating accomplishments, reinforcing goals, and maintaining interest.

In Indonesia, the expansion of the digital environment is largely driven by a desire to include people in rural areas that are frequently left out. Migrant workers represent another marginalized community who are being targeted for digitization efforts are migrant workers who travel within the country and from abroad for economic opportunity. Indonesia has the second biggest migrant population in Asia where it hosts 4.2 million international and 4.5 million domestic migrants. About 70% of the migrant workers are women, working mostly in factories or domestic jobs such as nannies and maids.^{xxv} Many migrant workers come from more poor and rural parts of the country which puts them at a further disadvantage as they generally have low digital literacy and rely on their employer’s advice for financial and health services. Especially in the case of migrants, trust plays a key role in the uptake of services across sectors as migrants are more likely to use services that have been prescribed to them by other trusted individuals or are already established by employers.^{lix} Migrants are an important population to consider in regards to digital services because they face common barriers such as gender, digital illiteracy, and lack of access to technology, with individual autonomy and immigration status as additional dimensions of their engagement.

TOOLS FOR DIGITAL HEALTH

Indonesia began the transition to a fully public health care system in 2014 with efforts to provide universal primary health care. Primary care is delivered through a network of 10,000 community-based clinics and hospitals.^{xlix} It is still popular for wealthy Indonesians to travel to Singapore and other nearby places for more advanced and specialized healthcare because of lack of trust and skilled doctors available locally.^{lxi} Though digital health use is growing, in a study of clinician perception of telemedicine services in Makassar Indonesia, poor internet connectivity was consistently described as the main barrier that inhibited widespread use.^{lxii} With this in mind, Indonesia’s digital health push should address not only the vast physical barriers to patient connection, but also limited health infrastructure and a lack of sufficiently trained medical professionals.

The digital health sector in Indonesia is garnering attention from the government and many international investors looking towards the growing economic opportunity. It recently reported a growth rate of 60% and an expected revenue of over \$9 billion by 2023.^{xlix} In February 2021 there were 298 digital health apps available in Indonesia ranging from provider facing tools, E-pharmacy and consultations, to health tracking apps for specific illnesses like asthma. Some of the most

commonly used apps include Halodoc, Alodokter, KlikDokter, Good Doctor, and YesDok (Statista, Tracxn).^{lxiii} More of these tools are detailed below.

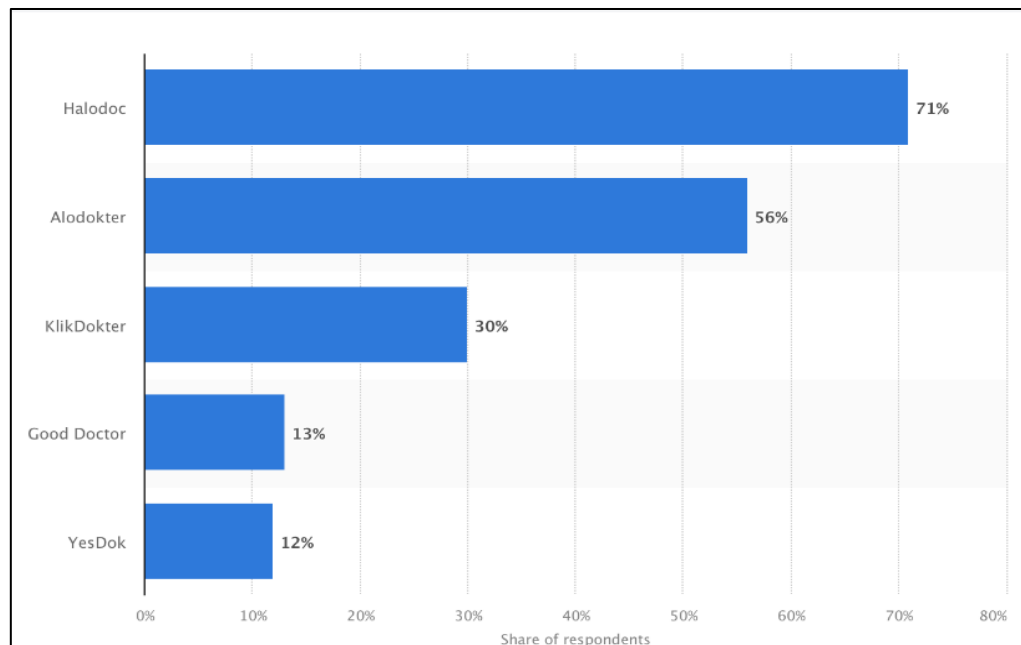


Figure 7 demonstrates the distribution of leading digital health apps in Indonesia as of February 2021. Source: Statista.

CASE STUDY: SEHATI AND THEIR TELECTG TECHNOLOGY

Sehati or 'Healthy' Indonesia is a healthcare startup that has been successful in its adoption and widespread support in Indonesia. It is specifically for women and their TeleCTG technology is available in 6 of 34 Indonesia's total provinces that are mostly rural, hard to reach areas, and are generally purchased by district governments.^{lxiv} Their website describes an integrated solution that combines innovation, technology, and community empowerment with the main goals of improving birth outcomes, reducing maternal mortality, and expanding access to quality healthcare in rural areas of Indonesia specifically.

Sehati's program has 4 main parts:

1. **Ibu Sehati:** Providing information and weekly pregnancy tips. This part of the application collects information on doctor and lab scheduling in addition to the mother's diagnostics, health journey, and even counts contractions during pregnancy. This part of the service is used by patients.
2. **TeleCTG:** An innovative portable CTG device that works within Sehati apps for real time monitoring of fetal heartbeat, contractions, and movement. This is meant to be used by midwives and clinicians in hard to reach and understaffed areas and sends data to doctors in other areas for analysis.
3. **Dashboard:** Where data is processed and visualized for quick analysis. This data can be accessed by providers and regional governments.

4. **Consultation center:** An on-call service to interpret TeleCTG results and provide recommendations for prompt referrals. This referral system is partnered with the Task Force (Satgas) managed by the regional government.

Part of what makes Sehati a successful company is that they have prioritized multi-level partnerships with practitioners, healthcare facilities, and government agencies. This app combines private sector innovation with government and practitioner supported integration. This is one of the only applications widely used in Indonesia that specifically addresses equity concerns and the needs of female patients though there is not published data on evaluations or use of this program by Indonesian patients.

ADDITIONAL EXAMPLES

RAPIDPRO

The Indonesian Ministry of Health (MOH) used a digital health platform designed using UNICEF's open-source software RapidPro during the second phase of Indonesia's Measles and Rubella vaccination campaign for in time surveillance and data analysis. Health care workers distributing vaccines would submit data daily for analysis and vaccination coverage results would be sent to stakeholders including MOH and government officials, district health officers, and facility managers to enable early responses to coverage gaps.^{lxv}

PT GLOBAL URBAN ESSENTIAL (GUE)

PT GUE translates to 'my company'. It is an application that has expanded into five other digital health apps connecting patients to certified providers and medical information.^{lxvi,xlix} One of the other apps is Teman Bumil "Pregnant Mother's Friend," a neonatal education app and Indonesia's most popular pregnancy app. Another is Teman Diabetes "Diabetes friend."

DOCQUITY

This is a provider facing application that connects nationally validated medical professionals to access medical information and share consulting advice with one another.^{xlix}

ANALYSIS AND RECOMMENDATION

Access to digital technology does not equate to use and as such, digital tools and technologies in Indonesia must address not only the primary goal of expanding physical access to digital technology but also the factors that determine use of technology once access has been established. Review of existing digital programs suggests that those that are the most successful are opt in, accessible by both feature phones and smart phones, and provide some kind of educational aspect to teach users how to optimally use the program. There is not much existing data as to the gender inclusion of common digital health apps, however some of the most well-established apps are maternal and neonatal specific. It is unclear if or how women who are not mothers are being considered in the digital health realm. The biggest equity initiative in digital health in Indonesia in recent years has

been to expand access to rural areas, and while there is still work to be done in technical expansion, that work should be gender inclusive as well.

- 1. Government regulation and partnership:** A widely recognized next step for the digital health landscape in Indonesia is government regulation. Many people are hesitant to truly accept digital health without government regulation and are concerned about security risks associated with their personal data. The Secretary General of Communications and Informatics, Mira Tayyiba, recognized the push Covid-19 pandemic had on providers to adopt more telemedicine services, but reiterated the importance of government regulation to avoid corruption and exacerbating existing inequalities. She states, “With no regulation, the absence of the state in protecting consumers and service actors will also be massively questioned by the public. Investors also aren’t intrigued to enter the digital health business if the regulations themselves aren’t clear or non-existent. In fact, this service has the potential to erode the inequity of access from the uneven distribution of health facilities and personnel.”^{liii} The Indonesian government has shown a commitment to expanding the digital health environment in general, but they have not committed to equity or gender inclusion through this process. The government should encourage digital health equity through policy and programs specifically aimed at female inclusion. Furthermore, the Indonesian government is demonstrating an ongoing commitment to expanding digital healthcare. Any programming done without partnership with the existing Indonesian institutions risks undermining their own progress, capacity, self-determination, and long-term sustainability.
- 2. End-to-end coordination:** The need to improve supply chains is emphasized by the drive to develop an end-to-end platform for procurement to supply, standardizing modes of communication and collaboration between hospitals, and creating interoperability across applications. According to key informants, evidence in many settings suggests that users much prefer using existing tools and platforms rather than downloading something new. The market is currently oversaturated and people are reticent to download new apps even if their phones are capable. Successful programs like Sehaty are useful for long periods of time, a woman’s entire pregnancy for example, and allow women to schedule appointments, monitor data, and gain education all in one place. Sehaty collaborates with stakeholders at multiple levels and incorporates benefits for patients and providers.^{lxvii} People are more likely to try new services when they are compatible with programs, which users are already familiar with. Quality and safety monitoring and transparency should also be at the forefront of digital health programming.
- 3. Continue expanding physical access:** In order to truly reach the most remote Indonesian islands, providers should continue efforts to expand access to digital technology and mobile phones across the archipelago. Increasing physical access will give women an opportunity to engage with technology that they may not have had before. Expanding access through better internet coverage should be complemented with additional physical presence in cities outside of the ‘tech hub’ in Jakarta as some cities like Surabaya are incentivizing start-ups to move to their cities.^{xlx} The Indonesian market is seen as a growing business opportunity for many foreign companies, and the healthcare system is already internationalized through the reliance on foreign health systems like Singapore. Therefore, in order to strengthen Indonesian self-sufficiency, new partnerships should incorporate existing companies and Indonesian led start-ups.^{xlx} Additionally, according to key informants, partnering with

companies that are already household names increases the adoption by citizens. Marginalized populations in Indonesia, specifically women living in rural areas, migrants, and those who may be warier of technology in general rely heavily on social capital and trust. Therefore, to expand digital access, providers should leverage existing trusted touch and work with community partners and leaders who may be influential in shaping opinion and culture.

NIGERIA

DIGITAL TOOLS ECOSYSTEM– BACKGROUND

Nigeria is Africa’s largest economy and most populous nation on the continent. According to the World Health Organization (WHO), Nigeria is ranked 197 out of 200 countries on health indicators, with some of the highest maternal and child mortality rates in the world. Targeted efforts are required to improve health outcomes and make progress towards Universal Health Coverage (UHC) in Nigeria. Recently, use of digital technology has been identified as a key tool for increasing access, improving quality of care, and also reducing costs of healthcare service delivery.

Given the UHC goal, Nigeria has established a National Health Information and Communication Technology (ICT) vision, which is highlighted in the figure below along with their short- and long-term goals.^{lxviii} With an initial focus on primary healthcare, key innovations to strengthen the public health system include use of digital technologies to improve access, coverage, and service delivery.

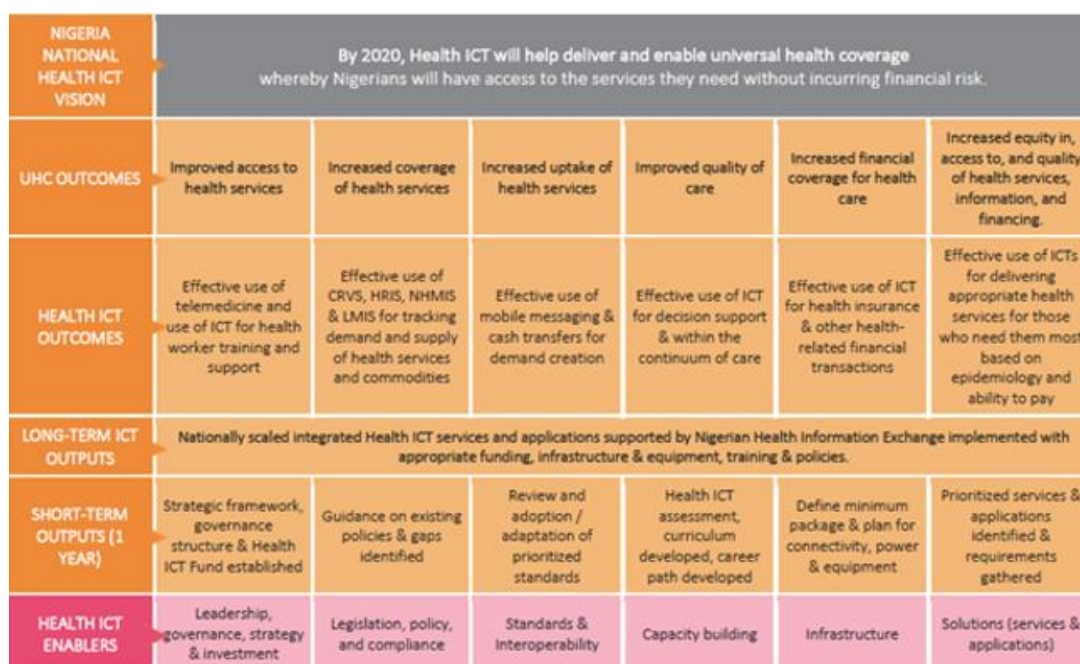


Figure 8: Nigeria Health ICT Strategic Framework 2015-2020. Source: Nigeria Ministry of Health

HEALTH ICT LANDSCAPE AND POLICY REVIEW IN NIGERIA

In 2015, the United Nations (UN) Foundation in partnership with the Saving One Million Lives (SOML) project launched a landscape and policy review on Nigeria’s Health ICT environment.^{lxix lxx} The goal of this review was to develop a strategic plan to scale up potential digital tools to strengthen the healthcare delivery in Nigeria. This review also included field assessments in selected Nigerian states, including Lagos.

This landscape review found that the Nigerian government is already investing in the building blocks required to scale ICT interventions across the country. In total, 84 ICT interventions were identified of which 24 had nation-wide coverage and 28 in pilot stage. The most common national programs were call centers with majority of the interventions focused on MNCH. Across states, many ICT intervention projects have been rolled out with majority of them using SMS technology. Across projects, Health Information Systems (HIS) and patient education programs were most common, and health financing and disease surveillance programs were least common. A key limitation of these ICT interventions is that most of them are operating in siloes and lack coordination across similar services and applications, and miss alignment with national policy objectives.

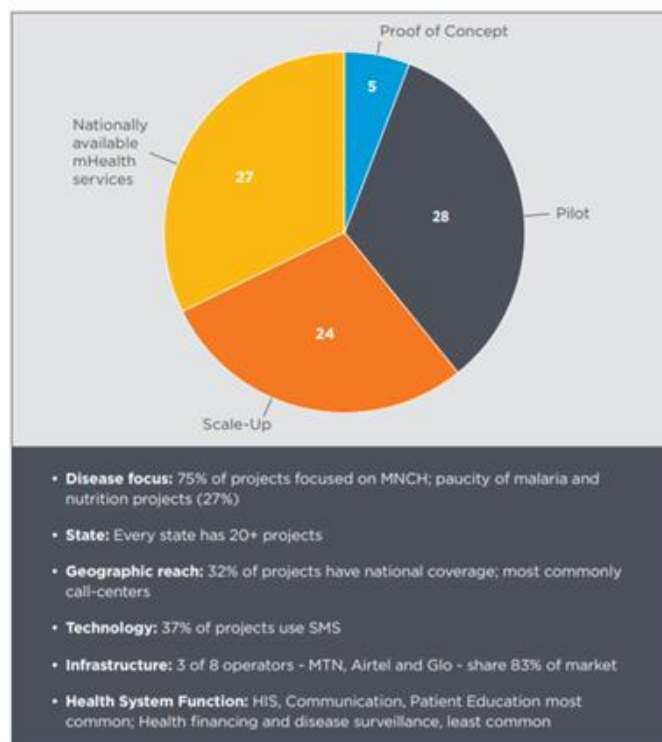


Figure 9: Landscape review of existing ICT interventions in Nigeria. Source: Nigeria Federal Ministry of Health.

LANDSCAPE REVIEW: LAGOS

Lagos state is considered as the economic capital of Nigeria and has witnessed exponential growth in successful tech start-ups, including those focused on digital health solutions. Given the strategic importance of Lagos as a tech hub with multiple digital health solutions, a field assessment was conducted by UN Foundation and SOML to understand the ICT infrastructure at state, Local Government Area (LGA) and health facility level, and understand gaps against national health priorities. Key findings from the field assessment in Lagos are highlighted below.

1. **Infrastructure:** At the state-level, there is basic ICT infrastructure to support and scale health ICT interventions including equipment maintenance at the state and LGA level. About one-third of the health facilities have access to IT support if needed.
2. **Services and Applications:** DHIS2, a health information system for reporting, analysis and dissemination of data for all health programs, is operational in 43% of health facilities. This is useful for health systems strengthening as facilities and LGAs can monitor their performance across health indicators which can be easily presented in the DHIS2 dashboard. Another ICT application reported at the health facility level is Smart Doctor and GENE. These are health information system applications used to collect patient data and help with patient billing, lab tests and diagnosis, etc.
3. **Workforce:** About 20% of the M&E officers at the state and LGA level are trained to use DHIS2. This highlights the gap to conduct capacity building workshops for the staff on use of

the software including interpretation of key statistics to manage health programs within the state.

4. **Strategy and Investment:** A limited budget is available at the state level for health ICT-related equipment. This includes access to internet, power supply and backup, IT repairs, etc. The funding situation at the LGAs and health facilities is similar with most of the LGAs dependent on external funding to support their ICT infrastructure for healthcare service delivery.

Given the availability of basic ICT infrastructure at the state, LGA and health facility level, Lagos is prioritizing scale up of three key platforms:

- **HMIS/DHIS2:** The first priority for scale up is the national HMIS/DHIS2 system to support program planning and decision making. It has also been identified as the key tool to inform health service delivery management. Data is used by health managers to identify geographies with inequities in health outcomes and/or disadvantaged groups and communities due to poor access to healthcare services.
- **mSCM:** The second platform of focus is the supply chain management system at the state, LGA and health facility level to reduce stock-outs of essential health commodities and improve supply availability.
- **Demand generation:** About 1/4th of the health facilities in the state send mobile health messages and reminders to patients to ensure continuity of care and this digital intervention is being prioritized for scale-up.

TOOLS FOR DIGITAL HEALTH

Apart from the key platforms identified for scale-up in Lagos, some other notable examples of digital tools in Nigeria are provided below.

CLINIPAK

InStrat Global Health Solutions has introduced a tablet-based solution using a satellite technology operated program called Clinical Patient Administration Kit (CliniPAK). It allows health workers to record their patient's medical history and treatment options. The data is collated centrally and can therefore help inform better decision-making by health authorities.

LIFEBANK

LifeBank is a medical distribution company in Lagos which connects blood banks to hospitals using an app and a web-based platform.^{lxxi} LifeBank also launched SmartBag last year, using blockchain technology. It allows patients or health professionals to see the safety records of their blood products.

DRUGSTOC

DrugStoc is a Nigeria-based startup focused on the medical supply chain.^{lxxii} The company created a digital platform that helps healthcare providers access pharmaceutical and healthcare products.

PEERNAIJA

PEERNaija is a gamified Android-based mHealth application to support adherence to antiretroviral therapy (ART) for adolescents and young adults living with HIV (AYA-HIV).^{lxxiii} This app provides access to peer social support through a chat group and allows patients to reach out to providers via app. Gamification attributes in the app includes points for progress, leaderboard with levels, badges, avatars and targeted behavior change messages.

4YBY

4 Youth By Youth (4YBY) mHealth Photo Verification App for HIV Self-testing includes tutorials to help users perform their tests successfully including timers and reminders to check for results exactly after 20minutes.^{lxxiv} Users have the option to upload their photos on the app and connect with healthcare workers through toll-free calls for counseling after the self-test.

CASE STUDY: WELLVIS

In 2018, Wellvis was launched as a comprehensive telehealth solutions platform in Nigeria with the goal to provide health information and service platform for users. The app provides both online and offline features including a Question-and-Answer platform to improve access to quality health information. This feature encourages active engagement by users through a crowd-sourced information model. Users can ask questions on the platform either openly or anonymously at no cost. Healthcare providers give answers to these questions and their certification is verified to avoid spread of misinformation. The app also offers a paid option of a direct one-on-one online consultation with verified health workers, appointment bookings and reminders for physical consultation with specialists and for lab investigations.

Since the outbreak of COVID-19, Wellvis added a layer on their existing platform referred as a triage tool.^{lxxv} This triage platform is a simple digital assessment tool that allows anyone to assess if they are at risk of contracting the COVID-19 virus, what they need to do if they are at low, medium or high risk and when they need to seek medical help. The aim of this triage tool is to limit unnecessary contact with medical facilities as they are overwhelmed especially with inquiries that do not require urgent or emergency response. Through the triage tool, users who are at high risk of infection are connected to Nigeria Centre of Disease Control (NCDC) for further case management.

Dr. Wale Adeosun, CEO of Lagos-based health startup Wellvis, recognizes the challenge with digital tools and notes that “*communities without enough data and cellphone service can continue to be left out from accessing essential digital services.*” One solution that he proposes is to build kiosks around neighborhood in a popular market and connect this kiosk to some call center. According to him, as Nigeria is a vast country with limited public health system, it is essential to leverage digital technology to address the healthcare issues faced by the communities.

Specifically referencing digital tools for women and girls, he notes that this demographic is not catered to enough and has many unmet needs for healthcare services. As digital health expands over physical space, it also permeates social geographies and evolves to be more accessible to

under-represented groups. As noted by Wale, Wellvis did not start out with a gendered lens, but over time adolescent girls needing information about puberty and sexual health services and young mothers seeking parenting advice have become their main clientele. While Wellvis was not initially designed with an equity and inclusion focus for women, it demonstrates a strong opportunity for digital health tools use their existing hard wear and resrouces to tailor services towards this population.

ANALYSIS AND RECOMMENDATION

The rapid development in access to technologies and internet has enhanced the need for digital health in Nigeria. Digital tools can play a fundamental role in improving the public health care system in Nigeria and there are already a variety of patient-and provider-focused digital tools in the country to target a range of healthcare issues. However, despite the recognized benefits of digital tools to achieve the UHC goal, implementation and scale-up of digital tools remains a challenge in Nigeria. Some of these challenges and key considerations to improve uptake and scale up of digital health tools in the Nigerian context are described below.

1. **Contextual Enablers of Technology Adoption:** A supportive policy environment is key to scale up of digital interventions in the Nigerian context. The focus of the national and state governments to leverage technology solutions to improve health care delivery for UHC highlights strong support for scaling up digital solutions and also prioritizing their use for vulnerable groups.^{lxxvi} A key example is the ICT for SOML initiative that is aimed to broaden access to essential PHC services for vulnerable communities with mothers and infants.

In a recent digital health capacity development workshop conducted in Nigeria, three areas were recognized for further strengthening the basic infrastructure for implementing digital health solutions in the country.^{lxxiii} These include digital health governance, internal capacity building of stakeholders and health officials, and technical requirement gathering for systems strengthening. Particular emphasis was made on the central role of effective governance and leadership in scaling digital health technologies in Nigeria with commitment from state governments to create an enabling environment, robust regulatory and financial mechanisms, and strong partnerships to foster cost-effective, scalable, and replicable digital health tools that are adaptable to local contexts.

2. **Public-Private Partnerships:** Related to the above, another consideration is private-public partnerships between local technology companies and Nigerian government for designing and implementing digital health initiatives. As an example, InStrat Global Health Solutions supported the Ondo state government in developing an Ebola-related learning application for healthcare workers. The successful launch of this eLearning App led to adoption of virtual training apps and data digitization in several other states in Nigeria. It is critical to consider the significant impact on coordination of efforts between the public health sector and private sector organizations like telcos, technology companies, and financing groups to harness the full benefits of digital technologies for strengthening health systems. Otherwise, there is a potential risk of fragmentation and redundancies along with the key issues of non-interoperability among various applications.

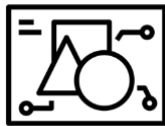
3. **Drivers of Technology Acceptance:** The key factors of consideration for technology acceptance among healthcare workers and target users/patients at the community level are perceived ease of use of digital tools and platforms and initial capacity building and/or continued technical support to use such tools. Since there is variation in users' awareness and skills to use technology, it is important to keep in mind required capacity building efforts to ensure technology acceptance and regular uptake. A study conducted by Balogun et.al in Lagos highlighted uptake of digital tools by health care workers and its association with maternal and child health services.^{lxxvii} The study findings suggest that when healthcare workers are knowledgeable about digital health tools, they are more likely to use such tools which in turn improves maternal and child health care service delivery.

Engaging local communities and governments to identify such capacity needs is essential to implementing digital health solutions and supporting communities especially the hard-to-reach populations to access quality and equitable healthcare services. This is especially important to consider for women and girls who face structural and social barriers that prevent them from participate equally in the digital health space. Actively engaging women and girls in shaping program design and delivery strategies digital health interventions can be highly beneficial while keeping in mind the prevailing social norms in the community.

4. **Data Security and Protection:** Finally, data security, protection and confidentiality are areas that require much attention in Nigeria. Confidentiality of patient records is critical as these digital health tools are considered for scale-up as inadvertent disclosures can compromise individual privacy, particularly for women. Given the existing gender power relations of women and girls with their parents, in-laws, and spouses, it is critical to ensure that their health information is safe and not disclosed to others without consent as it could compromise their autonomy.

IV. Key Lessons and Recommendations

Many LMICs are quickly advancing towards achieving the scale of ICT necessary for digital tools to succeed. This has accelerated the creation and adoption of many mobile and app-based technologies that aim to improve human health. However, for digital tools for primary health care to be universally successful, they must consider the unique positioning of women existing in this space with the technologies that support their positive health outcomes. Based on our review, we have identified the following considerations that can influence access and uptake of digital tools, particularly by women in our focus geographies. A detailed description of these key factors across design and implementation stages for digital tools and accompanied policy implications is provided below.

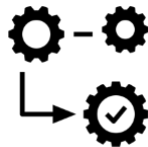


Design

Digital literacy and digital gender gap

User-centered design

Logistics requirements for digital access



Implementation

Interoperability of digital tools

Capacity building needs

Leverage existing systems/structures to build trust



Policy

Robust infrastructure and governance

Data security and protection

Public-private partnerships

DESIGN

1. GENDER DIGITAL LITERACY GAP

The gender digital literacy gap among the mobile phone users is a key barrier that affects the uptake of these digital tools. As noted previously, mostly men own smartphones and women have limited access to mobile phones. Phones owned by women generally have low features, are not smartphones, and usage is dependent on their spouse to add top-up to their phones. Designing digital health interventions that are gender-sensitive and keep in mind the socio-cultural context, literacy, and accessibility challenges for women and girls is critical for effective use of such tools.

2. USER-CENTERED DESIGN

Women and girls face many structural and social barriers that prevent them from participating equally in digital health. Actively engaging women and girls in shaping program design and delivery strategies for digital health interventions can be highly beneficial while keeping in mind the prevailing social norms in the community. As noted by our key informants and research from UNU, “*there is algorithmic bias and gender blind spots in data from digital tools with a primarily male user base*”. They suggest involving men in design of such tools since male gatekeeping poses a huge challenge to women in accessing digital technology. Co-creating digital tools with the key stakeholders also helps to accommodate issues of digital literacy, lack of access, or language barriers, and ensures acceptability and trust of the users. For instance, one popular way to overcome barriers in literacy for women is to use IVRs or video messaging that can be shared through WhatsApp or played at community centers as piloted by Digital Green. Interviews with the PATH Digital Square team also offer insights on how to employ user-centered design in digital health interventions. Zahra Lutfeali, acting executive director of the program, describes their Collaborative Requirements Development Methodology (CRDM) workshops that contextualize digital health tools for individual countries as being essential to their design process. These workshops reveal the deeper nuances and needs of users that are typically not captured in a survey or questionnaire, which is crucial for software developers to understand when designing platforms and tools.

3. LOGISTICS REQUIREMENTS FOR DIGITAL ACCESS

Related to the previous issues, it is important to consider the logistics requirements from the users’ perspective to ensure digital access. As noted previously, users don’t want to download new apps, even if their phones are capable. However, they can be more likely to try new services when they are compatible with programs that the users are already familiar with (for instance multiple features with the Sehaty app in Indonesia offering solutions to women throughout their pregnancy and beyond). User preferences should be analyzed and considered for designing digital tools for them.

IMPLEMENTATION

1. INTEROPERABILITY OF DIGITAL TOOLS

Given the plethora of digital tools in the health domain, there is a need to develop end-to-end solutions and create interoperability across applications. For instance, digital tools used for procurement should be able to communicate with data relating to broader supply chain and at the health facility level. Ensuring interoperability of digital tools can ensure efficient functioning of health systems which would in turn increase access and coverage of healthcare services to all populations.

2. LEVERAGE EXISTING SYSTEMS/STRUCTURES TO BUILD TRUST

To expand digital access, it is important to leverage existing trusted touch points and work with community partners to build trust in digital tools. This proposal replicates what has been done in the financial sector in providing top-up kiosks or selling vouchers at street shops. Further, the application of digital tools should be considered complementary to existing public health system and not as a replacement as underscored by most of our key informants. For instance, leveraging existing institutions as intermediaries, such as the community health care workers, local groups, local kiosks and libraries in the community, who are already part of the community can build trust with the beneficiaries and increase uptake of digital health tools.

3. CAPACITY BUILDING NEEDS

Another factor driving the acceptance and uptake of digital health tools is the initial capacity building and/or continued technical support offered to healthcare workers and target users within the communities. This is particularly critical for uptake of such tools by women and girls given the gender digital gap. As these digital tools are rolled out, successful implementation along with interventions to address the capacity building needs of the users can ensure technology acceptance and regular uptake.

POLICY

1. ROBUST INFRASTRUCTURE AND GOVERNANCE

There is a central role of effective governance and leadership in scaling digital health technologies in LMICs. National and state governments should create an enabling environment, robust regulatory and financial mechanisms, and strong partnerships to foster cost-effective, scalable, and replicable digital health tools that are adaptable to local contexts.

2. DATA SECURITY AND PROTECTION

In LMIC contexts, data security, protection and confidentiality are issues that are sometimes overlooked. However, as we think about enhancing access of women and girls to use digital tools for healthcare, it is critical to design and implement robust data security and privacy laws to ensure confidentiality of patient records. Any inadvertent disclosure of patient records, particularly for women, can compromise their privacy and autonomy given the existing gender power relations in their households.

3. PUBLIC-PRIVATE PARTNERSHIPS

Private-public partnerships between private companies, such as local technology companies, telecom sector, financing institutions, and government for designing and implementing digital health tools can have significant impact. For Wellvis, this meant partnering with networks of doctors and insurance companies. For others like Digital Green, this meant partnering with Health and Social Livelihood Ministries, grassroots organizations, and farmers themselves. Governments should focus their efforts on fostering such partnerships and support private/ local innovations that target issues such as the digital gender gap, infrastructure and human resources, and economic viability. The coordination of efforts between the public health sector and private sector organizations can reduce fragmentation and redundancies, else technology can risk inadvertently undermining and weakening the existing local health system.

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