Optimising the use of digital technologies for healthy societies and economies
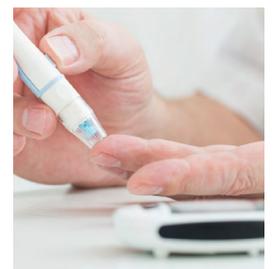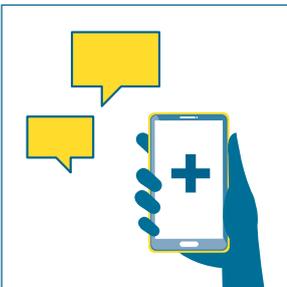
NCD Alliance

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1. Introduction

Noncommunicable diseases (NCDs), including heart disease and stroke, cancers, diabetes, chronic respiratory diseases, and mental and neurological conditions, are the cause of 74% of all deaths worldwide, or 41 million deaths per year.[1] More than 31 million of these NCD deaths occur in low-and-middle-income countries (LMICs), where health systems are often poorly equipped to deal with this burden.[2] Many NCDs are preventable, and share five main modifiable risk factors – tobacco and alcohol use, physical inactivity, unhealthy diets, and air pollution. Despite this, if no action is taken, deaths from NCDs are projected to exceed 52 million per year by 2030.[4]

Few health systems, if any, are adequately prepared to manage the increasing burden of NCDs. This was demonstrated during the COVID-19 pandemic, which shone a spotlight on the fragilities and failures of health systems everywhere. A survey by the World Health Organization (WHO) on the impact of service delivery for NCDs during the COVID-19 pandemic revealed that 53% of the countries surveyed reported partial or complete disruption of hypertension treatment, 49% reported disruption of treatment for diabetes and diabetes-related complications, 42% reported disruption of cancer treatment, and 31% reported disruption of cardiovascular emergencies. Evidence also showed that psychological distress and mental illness increased as a result of COVID-19, with some estimates indicating a worldwide increase of major depressive disorder up to 27.6% and anxiety up to 25.6%.[3] Not only did the pandemic disrupt essential NCD services, but subsequent research has shown without a doubt that people living with NCDs were more susceptible to COVID-19 and had an increased risk of a more severe course of the disease. 60-90% of deaths from COVID-19 were people living with NCDs[4].

The COVID-19 pandemic made even clearer the need to develop digital health services, forcing health systems to reorientate how they delivered services in a context of social distancing and enhanced infection control protocols that often limited physical access to health services.

In many countries, face-to-face appointments were switched to telephone or web-based appointments, and telemedicine services expanded rapidly, particularly for routine screening and monitoring. Over the last several years, the expansion of digital technology has been accelerating across multiple domains to support health promotion, diagnostics, treatment, and management of multiple health conditions.

Digital health has been a focus area for many civil society organisations as well as a priority within global health. In 2019, the NCD Alliance published a working paper entitled, "Realising the Promise of Digital Health for NCDs and UHC: What is the opportunity for Civil Society". It reflected the broad consensus that the advances made in digital technologies could transform the way healthcare is delivered, particularly for NCDs, and accelerate Universal Health Coverage (UHC). The working paper identified six building blocks to drive forward the digital health ecosystem, drawing upon WHO's eHealth Strategy Toolkit.

Later, in 2020, WHO adopted a global strategy on digital health at the 73rd session of the World Health Assembly. This five-year strategy recognizes that information and communication technologies present new opportunities and challenges for the achievement of the 17 Sustainable Development Goals (SDGs) and that digital health will be an enabler to achieve the Triple Billion targets.

Now, as countries continue working towards stronger, more resilient health systems, this brief aims to help take stock of the current digital health landscape. It also highlights key opportunities for digital health on the quest for UHC and explores avenues for digital health to expand and strengthen NCD prevention and control.

What is digital health?

Digital health is defined by WHO as "the field of knowledge and practice associated with the development and use of digital technologies to improve health".[5] It includes a broad range of categories such as mobile health (mHealth), health information technology, wearable devices, and telemedicine. It is ever evolving over time which is one of the challenges in trying to define what it is and what it does.

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1   World Health Organization (WHO). 2022. Noncommunicable Diseases Progress Monitor 2022. Available here

2   World Health Organization (WHO). 2022. Fact Sheet: Noncommunicable Diseases. September 2022. Available here

3   World Health Organization (WHO). 2022. Mental Health and COVID-19: Early evidence of the pandemic's impact. Scientific brief. 2 March 2022. Available here

4   The Defeat-NCD Partnership. Implications of non-communicable diseases care policies on COVID-19 disease management. 2021. Available here

5   World Health Organization (WHO). 2020. Global strategy on digital health 2020-2025. Available here

Digital health and Universal Health Coverage (UHC)

UHC is achieved when people and communities receive quality health services when they need them and without being exposed to financial hardship, covering the full continuum of essential health services, from health promotion and prevention to treatment, rehabilitation and palliative care. There are significant challenges to be overcome in relation to all of these defining factors before UHC can be achieved.[11]

The second UN High-Level Meeting (HLM) on UHC took place with Heads of State and Government on 21 September 2023, where progress was be measured against the targets set for 2030. SDG target 3.8 aims to achieve UHC, yet half of the world's population still cannot access essential health services, and almost 2 billion people are facing catastrophic or impoverishing health spending.[8] Many countries are also likely to miss SDG target 3.4, to reduce NCD mortality by one third. This will be intrinsic to achieving UHC, and vice-versa.[6] The NCD Alliance has set out key advocacy priorities for achieving UHC across four key areas: (1) Invest in prevention and control through adequate, predictable, and sustained resources for UHC; (2) accelerate UHC implementation by including NCD prevention and care services in UHC health benefit packages; (3) align development and global health priorities to achieve UHC; and (4) engage people living with NCDs to keep UHC people-centered. Digital health can play a role in achieving each one of these priorities and in addressing the barriers to UHC.

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6 NCD Alliance. 2023. NCD Alliance Advocacy Priorities for the 2023 UN High-Level Meeting on Universal Health Coverage. Available here

2. Challenges facing digital health

Digital health holds great promise to make our health systems more effective and accessible, but there are many challenges to developing it. We will look at a few of these challenges in more detail below.

2.1. The digital divide – ensuring inclusivity for all

While digital technologies for health can be a force for good, they also have the potential to increase disparities between those who have digital skills and access to digital tools and those who do not. According to the Organisation for Economic Cooperation and Development (OECD), the digital divide is the gap between individuals, households, businesses, and geographic areas at different socio-economic levels regarding both their opportunities to access information and communication technologies (ICTs) and their use of the internet for a wide variety of activities.[7]

The International Telecommunications Union (ITU) reports that 3.7 billion people worldwide are digitally excluded.[8] There are persistent digital divides between urban and rural areas, indigenous and non-indigenous populations, young and old, male and female, and people with and without disabilities. These disparities are not exclusive to the poorest nations, and usually continue even as national access to resources increases.[10] For example, in the United States, it has been estimated that 15-24% of Americans lack any sort of broadband connection to the Internet, with the majority falling into a lower income bracket.[9] In the United Kingdom, 10 million people lack the most basic digital skills to benefit from the digital world.[10] The gap in internet access and use between men and women has been growing in recent years, with around 1.7 billion women in LMICs not owning mobile phones.[11]

The WHO uses the concept of "digital determinants of health", which include literacy in ICT and access to equipment, broadband and the internet, as digital health becomes more prevalent.[7] Digital literacy and internet connectivity have been referred to as "super social determinants of health" because of their ability to address all other social determinants of health. For example, housing, food assistance applications, employment applications can often be exclusively online, each of which influences an individual's health and wellbeing.[11]

Therefore, realizing the potential positive effects of digital health requires acknowledging that digital inclusion is a social issue, and the design of digital interventions should not perpetuate existing digital inequality gaps but rather bridge the gaps with inclusive design and programming.

3.7 BILLION PEOPLE worldwide ARE DIGITALLY EXCLUDED

1.7 BILLION WOMEN in LMICs DO NOT OWN MOBILE PHONES

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7   OECD. 2002. Glossary of Statistical Terms: Digital Divide [online]. Available here

8   Good Things Foundation. 2022. The Digital Divide [online]. Available here

9   Sieck, C., Sheon, A., Ancker, J., et al. 2021. Digital inclusion as a social determinant of health. Digital Medicine. Available here

10 Lloyds Banking Group. 2021. UK Consumer Index and Essential Digital Skills Report. Available here

11 USAID. 2020. Digital Strategy 2020-2024. Available here

2.2. Digital health at scale – ensuring interoperability and integration with existing systems

To fully unlock the potential that digital health brings for NCDs across the continuum of care, interventions need to be able to operate on a large scale and integrate with existing platforms to avoid creating vertical information silos. While many digital health interventions have shown promise, small sample sizes often constrain evaluation of their effectiveness, often as a result of programmes being pilots in an early development phase.

All countries have already established reporting systems for health indicators at a national level – some of which are fully or partially digitalized, such as DHIS2. Digital health for NCDs should built on these and not create siloed health data that cannot be integrated, leading to fragmentation. The Broadband Commission Working Group on Digital Health identified the presence of a national ICT framework that promotes interoperability, sets common standards, and complements digital health policies and regulations as one of the key success factors that influence a country's ability to realise the full potential of digital health.

Digital health also needs to integrate across the continuum of care to be the most impactful. Apps that support prevention activities should link to electronic health records that record care within a health facility, which should be linked to disease management tools such as a remote blood pressure or glucose monitoring device so that the patient can receive care across the continuum of disease progression, giving both patient and provider greater levels of information upon which to make clinical decisions.

2.3. Ensuring quality and evaluating effectiveness of digital health interventions

Digital health faces the challenge of evaluating the effectiveness and quality of digital health interventions, and it has been noted that the lack of proper evaluation standards is inhibiting the uptake of digital health into clinical guidelines, as proven effectiveness is a key factor when considering uptake of any intervention.[12]

When it comes to evaluating the effectiveness of digital health interventions and being able to draw broad conclusions that can influence decision-making, digital health interventions face unique challenges.

First, both at a national policy level and at an individual study level, there is a lack of an evaluation framework that can be used. This can result in digital health interventions not being evaluated properly. Second, traditional methods of evaluating health care interventions, such as randomized controlled trials (RCT) may not be the best suited for evaluating digital health care interventions for several reasons. These reasons include the iterative development process and learning of digital health care interventions, the rapidly evolving digital landscape, and the length of time and cost of an RCT when most digital health interventions are piloted with small numbers.[13] Evaluating challenging digital health interventions, such as tools using AI where the algorithm used continually evolves and improves with more data, requires bespoke frameworks.[19]

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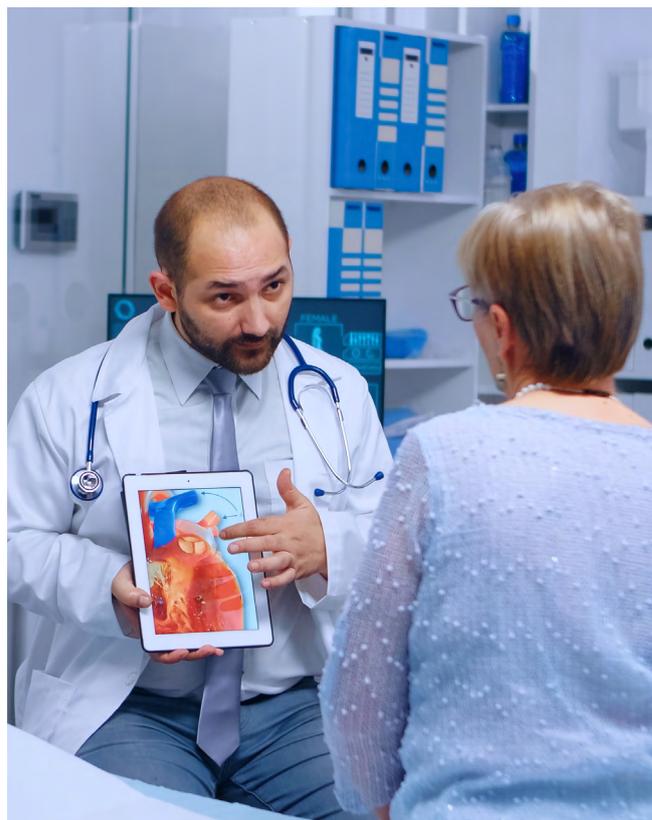
12   Tromp, J., Jindal, D., Redfern, J., et al. 222. World Heart Federation Roadmap for Digital Health in Cardiology. *Global Heart*. 17(1): 59. Available here.

13   Guo, C., Ashrafian, H., Ghafur, S., et al. 2020. Challenges for the evaluation of digital health solutions – a call for innovative evidence generation approaches. *NPJ Digital Medicine*. Available here

2.4. Developing standard terminology to strengthen the evidence base

Based on a thorough literature review, researchers found that the lack of agreed terminology and its use was a major challenge when trying to evaluate effects across multiple digital health and NCD studies. The accelerated use of digital health technology over the last three years has often led to the interchangeability of terms or the assignment of multiple definitions to a single concept. This hampers the design or interpretation of comparative effectiveness research, which is critical for generating evidence and funding future digital health interventions.

In 2019, WHO provided a framework for the classification of digital health interventions and health system challenges. The framework covers patients, health workers, health system managers and data services.[14] However it focused broadly on the uses of digital technology for health rather than the specific categories of technology used.

For instance, some applications provide smart workflows or prompts, such as reminders to drink water or take a break, while others can link you with health care providers. Therefore, labelling or categorising multiple interventions against a global classification would be helpful for comparison, and it will need to be an ongoing endeavour as digital health technology evolves.

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14   WHO. 2019. WHO guideline recommendations on digital interventions for health system strengthening. Available here

CASE STUDY

Creating a Glossary for Digital Health at the American Heart Association[15]

OBJECTIVE
To increase understanding of digital health terminology to ensure proper use.

PARTNERS
AHA stands with communities by advocating for laws and policies that help people access care, avoid tobacco and eat healthier. We partner with researchers to fuel scientific discoveries.

COUNTRIES
USA

DATE
2021- ongoing

The American Heart Association (AHA) values innovation, which supports its mission, and regards digital health as a catalyst for promoting health and well-being. The world has witnessed the capabilities of digital health to transform the delivery of healthcare over the decades, and the global pandemic spotlighted the need for developing a more patient-centric healthcare approach. In the context of the 2020 WHO global strategy on digital health at the 73rd session of the World Health Assembly and broadening the concept of eHealth to fields such as artificial intelligence (AI), big data, and genomics, the AHA developed a glossary for digital health to support the organization's understanding and collaboration in digital health efforts, prompted by these advances and the growing trend of people using technology for their health needs.

"Though we understood that measuring the effectiveness of this intervention would require a long-term and continuous evaluation process, we have already witnessed its ability to act as source of a common understanding when bringing together groups from across the AHA enterprise to discuss digital health topics from differing perspectives. A recent example is the ongoing discussion about the role of virtual cardiac rehab (CR) in a post-PHE environment. Before the lexicon, there was a great deal of confusion about the definition of virtual CR versus say home-based CR, or even hybrid CR. The benefits of an easily accessible tool to ensure that we are all speaking the same language, if you will, and therefore are making clear and informed decisions about complicated and rapidly evolving concepts, are obvious."
Brooke McSwain, Lead Author, 2023

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15   American Heart Association. 2022. Digital Health Lexicon and Program/Policy Evaluation Framework. Available here.

HIGHLIGHTS

According to WHO, digital health is a broad umbrella term that encompasses electronic health (eHealth) but also includes connected software solutions (Internet of Things [IOT]), as well as computational methods applied to big data, genomics, and AI.[16] The agreement on how to define related terms has been brewing for more than a decade.[17]

The AHA, through collaborative efforts between its Center for Health Technology and Innovation (CHTI) Science Division, and Policy Research Department, aims to develop and deliver evidence-based, scalable, digital health solutions across the health continuum through innovative health-tech relationships and evidence-based practice and policy. As such, the AHA has found the need for a common Digital Health Lexicon and Program/Policy Evaluation Framework necessary as they seek to provide the latest in scientific research to validate clinical findings that could support the public and patient community.

INSIGHTS

The CHTI has built relationships with innovative technology partners, a Health Tech Advisory Group (HTAG) and a network of subject matter experts since 2016 to support our commitment to accessible and affordable healthcare for patients and their families. Additionally, AHA advocacy staff has been working on certain, specific state and community digital health technology related issues (remote patient monitoring, self-measured blood pressure, hybrid/virtual cardiac rehabilitation, telehealth, etc.). This glossary and evaluation framework has served as a working document to inform these efforts and track developments in this area. Given the dynamic environment, we expect this framework to become more robust as more research is conducted on the impact of these digital health technologies to support cardiovascular health and myriad other health conditions.

As digital health technologies continue to evolve, the AHA will continue its efforts to educate its workforce on relevant terminology, the regulatory and legislative landscape, digital workflows and care plans, and training modules. Accordingly, the CHTI will build upon its work by acting as both a convener, bringing parties together to solve a problem, and a strategic collaborator, lending our expertise to develop products and/or solutions. The CHTI will also continue to grow its Innovators' Network, an industry cohort that serves to connect digital health entrepreneurs, providers, clinical researchers, and payers.

Technology Glossary:

Application Programming Interface: (API) allows two applications to communicate with one another to access data. Every action you take on your phone, like sending a direct message or checking the score of the baseball game, uses an API to access and deliver that information. (g2.com)

Artificial Intelligence (AI): A broad and general term encompassing many approaches and technologies focused on getting computers to do tasks that historically require human intelligence. The field encompasses not only computer science but also psychology, philosophy, linguistics, and other areas. (Deloitte)

Examples include:
- Deep learning
- Digital Coaching and Virtual Assistants
- Computer vision
- Machine learning
- Natural language processing
- Neural networks
- Voice recognition technologies

Defining each of these technologies clearly is complex and beyond the scope of this work.

Continuity of Care Document: An HL7 standard containing a core data set of the most relevant information necessary for continuity of care. It is used to share summary information about the patient within the broader context of the personal health record. Also referred to as CCD. (NQF)

Clinical decision support: A process for enhancing health-related decisions and actions with pertinent, organized clinical knowledge and patient information to improve health and healthcare delivery. The information delivered can include general clinical knowledge and guidance, intelligently processed patient data, or a mixture of both. Information delivery formats can include data and order entry facilitators, filtered data displays, reference information, alerts, and others. Also referred to as CDS. (NQF)

Digital Health Architecture: An overview or blueprint used to design and describe how different digital applications (software and ICT systems) and other core functionalities will interact with each other within a given context (25). (WHO)

Digital Health Application: The software, ICT systems, and communication channels used in the health sector, such as a software being used for health management information systems (HMIS) or an interactive messaging application ("app") (25). (WHO)

Digital Health Intervention: A discrete function of a digital technology to achieve health sector objectives. The WHO Classification of digital health interventions v1.0 provides an overview of the range of digital health interventions identified in the literature and implementation practices. (WHO)

Data Infrastructure: Technology, processes, tools, and standards needed to promote data sharing and consumption. (NQF)

International Organization of Standards: (ISO) ISO (International Organization for Standardization) is a worldwide federation of national standards bodies and nongovernmental organization that comprises standards bodies from more than 160 countries, with one standards body representing each member country. For example, the American National Standards Institute (ANSI) represents the United States.

Mobile cloud applications: A software program that is designed to be accessed over the Internet by many types of portable computing devices. Mobile cloud apps and mobile web apps are similar. They both run on servers external to the mobile device, they both store data externally, and they are both accessed over the Internet with a browser. However, it is often said that, while all cloud apps are web apps, not all web apps are cloud apps. Simply put, not all mobile web apps can run in a virtual environment without being reengineered. This is because a web app may have originally been written to run and store data on a dedicated physical server in a data center. A cloud app, on the other hand, will always be written to live on virtual servers in a distributed, multi-tenant architecture and store data in the cloud. (WHO)

Health Level Seven (HL7): HL7 refers to a both a set of international standards for transfer of clinical and administrative data between software applications used by various healthcare providers, and a not-for-profit, ANSI-accredited standards developing organization. HL7 standards focus on the application layer, which is "layer 7" in the OSI model. The HL7 standards are produced by the Health Level Seven International, an international standards organization, and are adopted by other standards issuing bodies such as American National Standards Institute and International Organization for Standardization. (NQF)

Fast Healthcare Interoperability Resources (FHIR): A draft standard describing data formats, elements, and an API for exchanging electronic health records. (WHO)

United States Core Data for Interoperability (USCDI): A standardized set of health data classes and constituent data elements for nationwide, interoperable health information exchange. (ONC)

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16   World Health Organization. 2019. WHO guideline: recommendations on digital health interventions for health system strengthening. Available here.

17   Boogerd EA, Arts T, Engelen LJ, van de Belt TH. "What Is eHealth": Time for An Update? JMIR Res Protoc. 2015 Mar 12;4(1):e29. Available here.

3. Opportunities for digital health to expand and strengthen NCD services

The use of digital health has the potential to improve healthcare delivery and sustainability, as well as treatment and management of NCDs, which can be challenging for many people due to factors like distance to health centres and cost of care. The sections below highlight just a few ways that digital health can help to make better NCD care more accessible to those who need it.

3.1. Digital health to prevent NCDs from an early age

Preventing NCDs requires promoting healthy literacy while building health-enabling environments and taking a multisectoral approach to addressing the social, environmental and commercial determinants of health, like the marketing of unhealthy foods, tobacco and alcohol use, and air pollution. In recent years, a wide range of interventions to reduce the exposure of children and adolescents to modifiable NCD risk factors have received increasing attention, including digital health solutions for health literacy. This kind of solutions is shown to be more successful when implemented together with population-wide regulatory measures on unhealthy products, such as marketing limitations, warning labels on unhealthy food products, and increased taxes on tobacco and alcohol.

CASE STUDY

Fit for the Future
Leveraging frontier technologies to build a noncommunicable disease programme for youth, with youth, in Vietnam

OBJECTIVE
To improve the wellbeing of and reduce risk of the major NCDs among Vietnamese youth and their teachers by leveraging frontier technologies.

PARTNERS
PATH is working with the Ministry of Education and Training (MOET), and the Provincial Department of Education and Training. This project is funded by the Fondation Botnar.

COUNTRIES
Vietnam

DATE
2020 - 2023

In LMICs such as Vietnam, the burden of NCDs is disproportionally increasing, with children and adolescents being exposed to major NCD risk factors from an early age. Unless the availability, affordability and marketing of unhealthy products is regulated and accompanied with healthy literacy efforts, such exposure often leads children and youth to adopt long-term habits that lead to negative health effects, even if they manifest later in life. There is evidence that 26% of secondary school students in Vietnam in 2018 were overweight or obese[18], and in 2014 about 15% of students aged 13-15 had started smoking.[19] PATH and the Vietnam Ministry of Education (MOET) decided to collaborate on a behaviour change programme to promote health literacy among youth and teachers in line with WHO's NCD 'best buys' and other recommended interventions[20] to ensure the sustainable health and wellbeing of future generations.

HIGHLIGHTS

The project provides a first-ever educational programme on NCD prevention for Vietnamese youth and their teachers over three years. The project was designed to combine class-based curriculum and digital self-learning (figure 1). After three years of the COVID-19 pandemic, teachers and students have become proficient with digital education and learning. Recently, the government of Vietnam has promulgated national policies to direct the application of digital innovations in the education sector.[21] Through the process of programme design, PATH and MOET partners at national and provincial levels recognized that digital information and communication technologies, which the younger generation enthusiastically embraces, will support education and health systems in promoting health literacy and behaviour change among young people.

The educational programme combines the application and curriculum as a blended intervention. The curriculum includes a teacher manual comprising 11 lessons that cover general knowledge about NCDs and risk factors, smoking harm and prevention, alcohol harm and prevention, unhealthy diet and NCDs, physical inactivity and NCDs as well as two lessons on common mental health disorders among youth and appropriate coping strategies.

18   Phan HD, Nguyen TNP, Bui PL, et al. Overweight and obesity among Vietnamese school-aged children: National prevalence estimates based on the World Health Organization and International Obesity Task Force definition. PLoS One. 2020;15(10):e0240459. doi:10.1371/journal.pone.0240459.

19   Anh le TK, Quyen BT, Minh HV, et al. Tobacco access and availability for Vietnamese school children (aged 13-15): results from the global youth tobacco use survey (GYTS) 2014 in Viet Nam. Asian Pac J Cancer Prev 2016;17(S1):25–29. doi:10.7314/apjcp.2016.17.s1.25.

20   World Health Organization. *Tackling NCDs: 'best buys' and other recommended interventions for the prevention and control of noncommunicable diseases* [internet]. Geneva: World Health Organization; 2017. Available here.

21   Vietnam Prime Minister (2022). Decision 131 on Approving scheme "strengthening application of information technology and digital transformation in education and training for the period of 2022-2025 with a vision towards 2030". Available here.
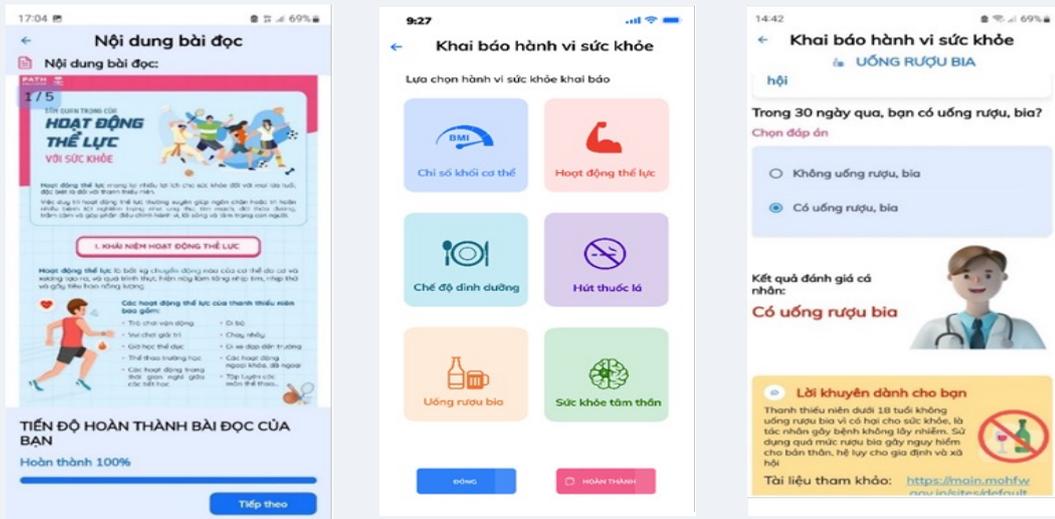
Figure 1: Screenshots of the application

After training the teacher on the teaching manual to guide in-class instruction, the schoolteachers deliver the 11 class-based lessons. At the same time, the students self-study using the mobile/web app that provides relevant youth-friendly content prior to each classroom lesson. During the classroom lesson, students discuss a topic of NCD prevention and practice new skills under their teacher's facilitation. Along with the curriculum, schools organize series of communication and sport events to promote healthy environments and informed choices that help prevent NCDs. The programme invites students, parents, community leaders and local health authorities to participate and deliver presentations that encourage youth to make informed choices to improve habits.

INSIGHTS

The app was developed in both mobile- and web-based formats. They embedded AI to provide tailored knowledge on NCDs and skills to make informed choices and improve habits suitable for teenagers to students, parents, teachers, and school managers.

After five months, more than 25,000 students have registered for the app. Almost 10,000 students have self-learned NCD knowledge, including mental health topics, from 20 e-lessons in the application and have monitored changes in behaviours. Thousands of teachers, parents, and family members use the app in their free time. Additionally, the app uses AI to provide users with about 100 questions, tracking habits, and producing an NCD-related behaviour report, along with notifications, tips, and indicators to encourage informed choices and support healthy behaviours.

Currently, three provinces have more than 10,000 students from secondary and primary schools learning the curriculum on NCD prevention at home and in classes. Students at 15 schools organize short performances or games to educate peers on NCDs and risk factors. Teachers, students, school guards, and parents organize several school sport events to promote physical activity and healthy diets and avoid NCD risk factors.

Next steps

The Fit for Future project will run through the end of 2023. In 2023, schools and provinces will organize several communication contests. The contests will encourage students to develop their own communication products on NCD prevention and share their own story on making informed choices and improving habits. PATH and MOET will work closely with provinces and schools to provide technical assistance. Along with the project progress, PATH will support MOET to develop a plan to finalize the educational programme and app from the experience of teachers and students, and evidence from baseline and endline evaluations. MOET leaders have proposed scaling up the model to a large student population and sustaining the education on NCDs for youth as a top priority after the project closes.

Figure 2: Students participating in a communication event

3.2. Increasing access to high quality care and treatment services

Increasing access to and availability of quality care and treatment services for people at risk of or living with NCDs is one of digital health's most compelling possibilities, particularly in low-resource settings. Socio-economic, cultural, racial, gender and other barriers all contribute to a person's ability to access NCD services. Availability of medicine, diagnostic equipment, trained and not overburdened healthcare workers, quality clinical records, timely access to specialized referral services, and adequate budget are just some of the factors that can improve the availability and quality of services provided.

CASE STUDY

Medtronic LABS Empower Health programme
Expanding access to high quality care and treatment services

OBJECTIVE

To improve access to comprehensive primary health care services for patients through digital health.

PARTNERS

Medtronic LABS with support from PATH, Novartis and Novo Nordisk is working with the Ministry of Health across seven counties in Kenya.

COUNTRY

Kenya

DATE

2017 - ongoing

The growing prevalence of NCDs has meant that health systems in countries like Kenya must deal with a double burden of disease – the continuing high burden of infectious diseases and the equally high burden of NCDS. In Kenya, NCDs account for 39% of deaths in the country, with the four major NCDS - cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases -comprising 57% of all NCD deaths. Most cases remain undiagnosed. While the documented diabetes prevalence is 3.3%, an estimated 3.58 million people living diabetes are still undiagnosed.[22] Hypertension prevalence estimates range from 12.6 – 36.9% of the population with only 22% of diagnosed individuals receiving treatment and the majority on treatment not meeting blood pressure control targets.[23]

HIGHLIGHTS

In 2017, Medtronic LABS launched "Empower Health" in Kenya, a groundbreaking approach to healthcare that enhances primary care accessibility for patients while enabling health systems to drive meaningful clinical improvements. The programme centers on patients, while also considering the broader health system, by tapping into existing healthcare system staff and resources. Community health workers are sustainably engaged to deliver highly localized screening, with seamless links to facilities for diagnosis and risk-stratification. Digitized risk-based algorithms enable data-driven follow-up care, while community-based longitudinal management of conditions is made possible.

Empower Health combines innovative software, point-of-care toolkits, and health systems strengthening to shift the model of care delivery from reactive and routine to proactive and predictive. At the core of the programme is the SPICE technology platform, which includes four modules that ensure community-driven activities are bi-directionally linked to facilities. These modules demonstrate how digital tools can take a systems approach to meaningfully improve clinical outcomes for managing NCDs and more.

22   IDF. 2021. IDF Diabetes Atlas 10th Edition [online]. Available here

23   Ministry of Health Kenya. 2015. *STEPwisesurvey for non-communicable diseases risk factors*. Available here

SPICE Core is the community-based platform that supports community health workers and facility-based clinicians using clinical algorithms to screen, refer and manage patients based on clinical risk.

SPICE Engage facilitates engagement between health care workers and patients. The platform risk-stratifies and prioritizes the highest-needs patients to enable health workers to use different forms of communication, from SMS to phone calls, to ensure that patients are adherent to and engaged in their care plans.

SPICE Insights powers the analytics platform providing actionable intelligence to health care workers and health systems on the performance of their NCD programme. Customizable dashboards and reports supported with training on data use and interpretation ensure that key decisions are driven by data.

SPICE Connect enables interoperability and integration with existing health system operating systems, electronic medical records and reporting systems such as DHIS2.

Medtronic LABS offers comprehensive services to support adoption, correct usage, and smooth operation of its platform. Local operations teams provide advisory services and support governments in developing future-ready digital health strategies, as well as creating policy frameworks and guidelines. In addition, healthcare workers are trained to use the platform and understand the data generated. This holistic approach ensures that the platform is fully utilized and delivers maximum benefits to patients and healthcare providers.

Figure 3: A community health worker checking blood pressure

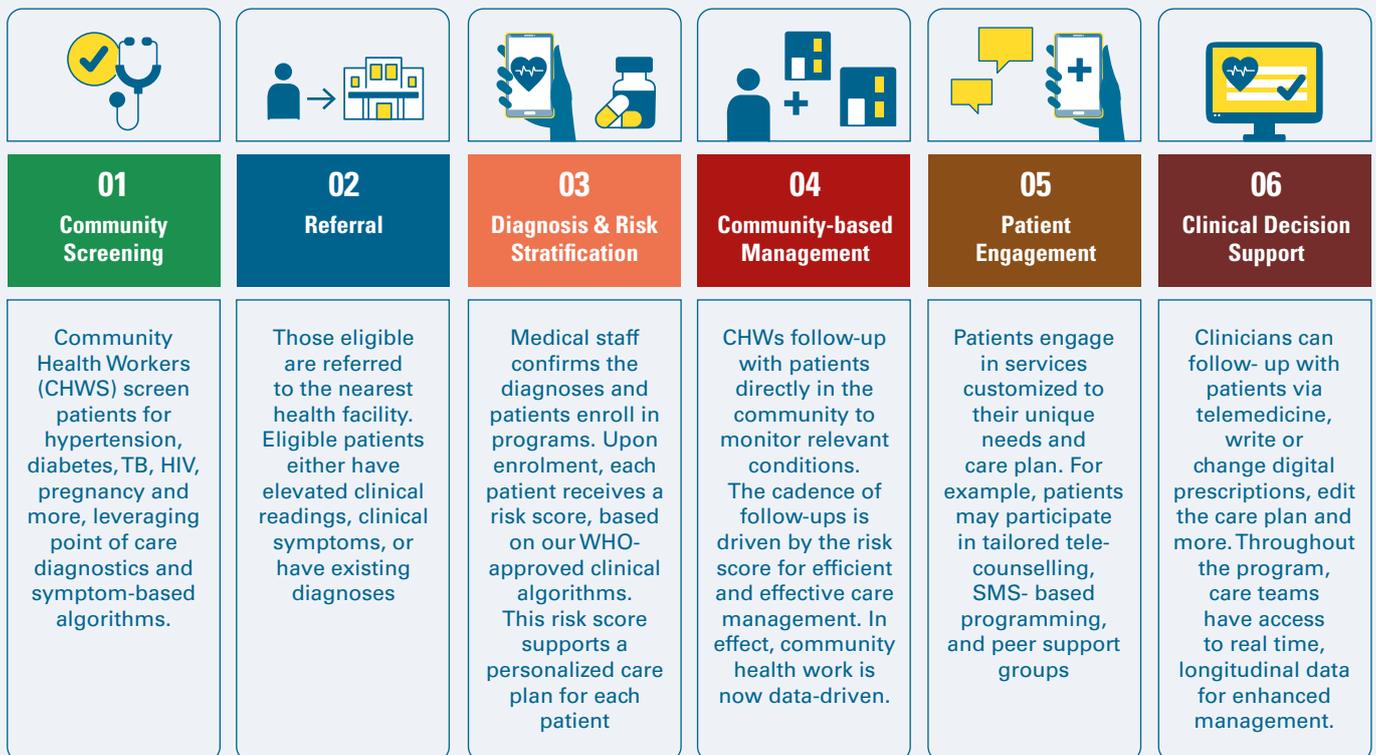| 01 Community Screening	02 Referral	03 Diagnosis & Risk Stratification	04 Community-based Management	05 Patient Engagement	06 Clinical Decision Support
Community Health Workers (CHWS) screen patients for hypertension, diabetes, TB, HIV, pregnancy and more, leveraging point of care diagnostics and symptom-based algorithms.	Those eligible are referred to the nearest health facility. Eligible patients either have elevated clinical readings, clinical symptoms, or have existing diagnoses	Medical staff confirms the diagnoses and patients enroll in programs. Upon enrolment, each patient receives a risk score, based on our WHO-approved clinical algorithms. This risk score supports a personalized care plan for each patient	CHWs follow-up with patients directly in the community to monitor relevant conditions. The cadence of follow-ups is driven by the risk score for efficient and effective care management. In effect, community health work is now data-driven.	Patients engage in services customized to their unique needs and care plan. For example, patients may participate in tailored tele-counselling, SMS- based programming, and peer support groups	Clinicians can follow- up with patients via telemedicine, write or change digital prescriptions, edit the care plan and more. Throughout the program, care teams have access to real time, longitudinal data for enhanced management.

Figure 4: Patient engagement pathway

INSIGHTS

Since 2017, Novartis, Novo Nordisk, and PATH have provided funding support for several deployments, which trained and equipped 165 health service delivery points across seven Kenyan counties to manage NCD patients using the platform. A total of 3,527 health workers have been trained and are actively screening and managing 71,344 enrolled patients in their communities. As of March 2023, of those who had a blood glucose or blood pressure reading in the preceding three months, 68% had their blood pressure come under control and 58% had their blood sugar come under control.

This approach to care has been backed by published clinical evidence. In 2020, the *Journal of Clinical Hypertension* published a study that examined 1,266 patients who were part of the Medtronic Labs programme for an average of 356 days.[24] The study found that there was a notable reduction in blood pressure for both the overall group – whose average systolic blood pressure was 145 mmHg at the start and decreased by 9.4mmHg (p<0.001) – and the subgroup with uncontrolled blood pressure, whose average systolic blood pressure was 159mmHG at the start and decreased by 17.6mmHg (p<0.001).[3]

This model of care has been successfully deployed across Sub-Saharan Africa to screen 333,000 people and enrol 181,880 patients in care. In Ghana, Sierra Leone, Tanzania, and Rwanda the programmes utilize SPICE under unique names customized to the local language and context. Based on the success of Kenya's Empower Health programme and continued government interest, in 2023 Medtronic LABS plans to scale the programme nationwide in Kenya with the support of World Diabetes Foundation to cover 35 of the 47 counties and reaching an estimated 1 million people annually. In addition, the platform's ability to effectively longitudinally manage patients and clinical outcomes over time will be leveraged to expand into other primary care conditions to ensure holistic care for people living with NCDs and other conditions.

> "I have been struggling with high blood pressure for a while. Since [Empower Health] launched in Nyeri County, I visit my local Health Center more regularly."
> Mary, 52yrs. Nyeri County.

212,724	32,653	71,344	41,382	36,481
Patients **screened**	Patients **referred**	Patients **enrolled**	Patients **active in care**	Patients **lives improved**

Figure 5: Programme results to date

24   Otieno, H., Miezah, C., Yonga, G., et al. 2020. Improved blood pressure control via a novel chronic disease management model of care in sub-Saharan Africa: Real-world program implementation results. *J Clin Hypertens*. Available here

3.3. Mobilizing financial and human resources for NCD prevention and care

Mobilizing financial and human resources is critical for NCD prevention and care. NCDs are the most underfunded global health issue relative to the billions of people impacted, despite their convincing investment case and destructive long-term impact on people and economies.[25]

To be able to provide the needed services, it is essential that there are sufficiently trained healthcare workers to meet the growing demand for NCD prevention and care. In 2019, the NCD Alliance commissioned a brief on 'Protecting Populations, Preserving Futures:

Optimising the health workforce to combat NCDS and achieve UHC' in which it notes the important role that digital health interventions can have on health work force capacity. Digital health interventions focused on training and capacity building of healthcare workers can expand access to resources both formally and informally across all levels of healthcare workers – from community health workers to clinical specialists. They can also support safe task-shifting of activities to less qualified staff and ensure that human resources are focused primarily on those tasks in which human contact cannot be replaced.

CASE STUDY

American College of Cardiology's NCD Academy
Expanding access to high quality training resources for healthcare workers globally

OBJECTIVE

To equip health care providers across the front lines of patient care with high quality education available whenever, wherever, and at no cost, on fundamental skills for the prevention and basic management of major NCDs.

PARTNERS

American College of Cardiology, with support from Viatris, and collaboration with World Heart Federation, American Society of Clinical Oncology, American Diabetes Association, World Psychiatric Association, and NCD Alliance.

COUNTRY

Global

DATE

2020 – Ongoing

The American College of Cardiology (ACC) is demonstrating that there's no need to wait for the devices of tomorrow to address the challenges facing providers and their patients today, while much of the enthusiasm for digital tools in health care focuses on the potential of emerging technologies. Though these are all crucial to extend the capacity of our strained health workforce without perpetuating the burnout of COVID-19, digital health applications are not limited to easier and better assessment, diagnostics, and patient monitoring.

Diagnosing, treating, and managing NCDs at the primary care level is imperative but ambitious. Over 40% of countries globally have fewer than 10 doctors per 10,000 residents with many primary care clinics led not by doctors

but by less qualified health care workers such as nurses or clinical officers.

One way to expand quality NCD services at the primary care level is by optimizing multi-disciplinary care teams through training more available healthcare workers, such as nurses or community health workers, to support identifying, treating, and managing NCDs with doctor oversight. It is critical to train healthcare workers to be able to respond to multimorbidity, which often occurs with NCDs, if NCDs are to be successfully prevented and treated.

However, there are many barriers to training healthcare workers at scale, including availability of trainers, cost of trainings, and logistic hurdles of attending face-to-face training to name a few.

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25   The NCD Alliance provides an in-depth analysis of the economic case for NCDs in a 2022 policy brief entitled Invest to Protect: 'NCD Financing as a foundation for healthy societies and economies' and a collection of case studies 'Mobilising private investments to address the NCD funding gap.'

HIGHLIGHTS

ACC launched the "NCD Academy" in 2020, which created a ground-breaking new style of medical education that expands access to free resources for healthcare workers at all levels. The program strategy for accessibility has been centred around the smart phone, coupled with what is known as e-learning instructional design to meet needs in rural and remote areas with training that is interactive, engaging, heavy in practice, and ultimately effective for skills development. In addition to accessibility, the digital approach with the NCD Academy overcomes another barrier often cited by healthcare workers to continuing medical education – convenience – by being entirely self-paced and on-demand.

There are seven modules that are currently available which cover topics on four of the five major NCDs and COVID-19, as well as a foundational module and a module on advocacy totalling over 25 hours of e-learning content. The courses are all designed to be interactive and intuitive and use different learning approaches such as gamifying education to support learning. The NCD Academy operates in six languages: Chinese, Italian, English, French, Portuguese, and Spanish, with more becoming available.

> Amazing learning platform. I love every part of the program. The contents are very comprehensive yet easy to understand. It definitely enhances my knowledge and confidence in my daily clinical practice."
>
> Physician, country unknown.

> "It's a fast and interactive course that every health professional should take."
>
> Physician, Nigeria.

INSIGHTS

So far, the courses have enrolled over 19,000 learners globally across 141 countries. Of those enrolled, 60% work in community health or family medicine.

The learners have highly appreciated the NCD Academy.

→ 77% of users strongly agree that the program addresses barriers to optimal performance.

→ 75% of users strongly agree the program addresses barriers to their most pressing questions.

→ 84% users agree the program equipped them with knowledge and strategies they can use in daily practice.

Estimates suggest that the training healthcare workers have received has indirectly benefitted 54 million patients.

Moving forward, the NCD Academy hopes to expand the platform by developing new topics that highlight diseases besides the main five NCDs, such as common communicable diseases that can be impacted by NCD multimorbidity; provide more localised content such as disease prevalence and guidelines for care at a regional and country level; and pursue integration with established healthcare workforce professional development programmes, particularly in rural and resource- constrained communities.
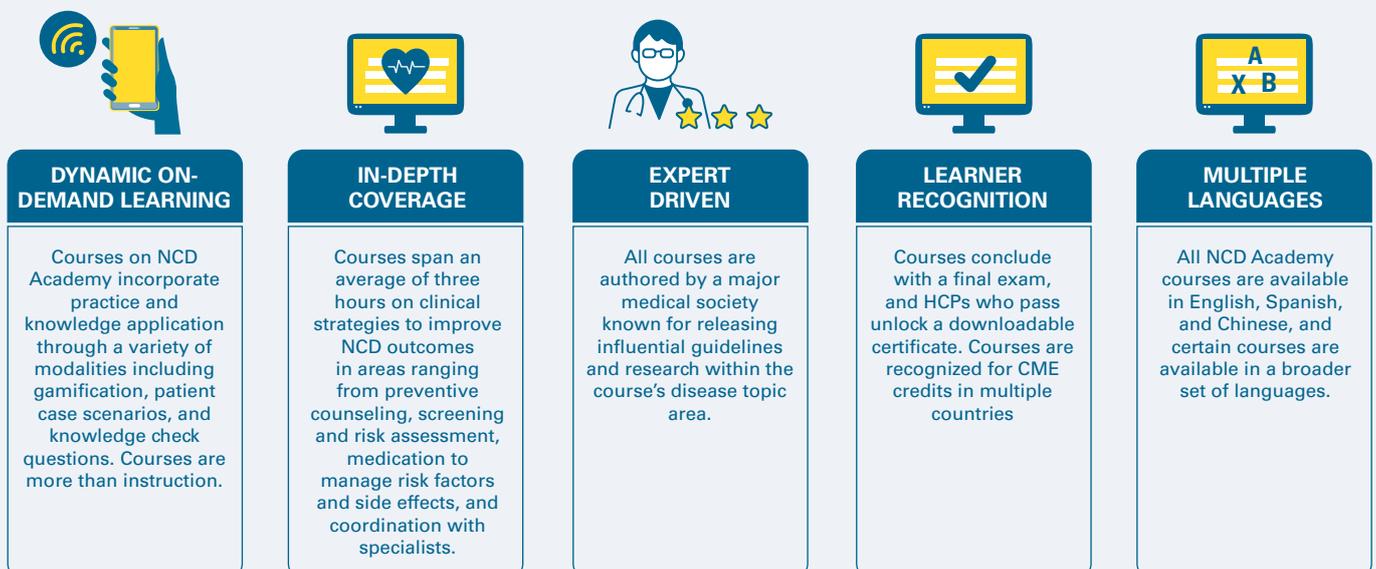

Figure 6: NCD smartphone application

DYNAMIC ON-DEMAND LEARNING	IN-DEPTH COVERAGE	EXPERT DRIVEN	LEARNER RECOGNITION	MULTIPLE LANGUAGES
Courses on NCD Academy incorporate practice and knowledge application through a variety of modalities including gamification, patient case scenarios, and knowledge check questions. Courses are more than instruction.	Courses span an average of three hours on clinical strategies to improve NCD outcomes in areas ranging from preventive counseling, screening and risk assessment, medication to manage risk factors and side effects, and coordination with specialists.	All courses are authored by a major medical society known for releasing influential guidelines and research within the course's disease topic area.	Courses conclude with a final exam, and HCPs who pass unlock a downloadable certificate. Courses are recognized for CME credits in multiple countries	All NCD Academy courses are available in English, Spanish, and Chinese, and certain courses are available in a broader set of languages.

Figure 7: NCD Academy approach

3.4. Strengthening the capacity, sustainability and engagement of NCD civil society and people living with NCDs

People living with NCDs include individuals who have or have had one or multiple NCDs, as well as their caregivers. They possess first-hand knowledge of the difficulties relating to NCD prevention, diagnosis, treatment, care, and palliation. People living with NCDs must play a direct role in determining their own health. They are rooted in the realities of their communities and can work to dispel stigma and prejudice while inspiring others, speaking to shared experiences, and representing people living with NCDs. Civil society for NCDs helps unite diverse lived experience groups across conditions and risk factors and supports them as change agents. To ensure digital solutions meet the needs of the people who will use them, it is critical to engage NCD civil society and people living with NCDs.

CASE STUDY

Diabetes Compass
A needs-based innovation approach for strengthening health systems for better patient outcomes in LMICs with the World Diabetes Foundation

OBJECTIVE
To improve the quality of diabetes care in primary care settings using digital health technology.

PARTNERS
WDF is working with Ministries of Health and local technology partners in each country.

COUNTRIES
Malawi, Sri Lanka, Tanzania

DATE
2021 - ongoing

Digital health has potential to improve health systems in low-resource settings, but many LMICs frequently deal with a digital health landscape characterized by individual products, services, and processes leading to singular disease programmes using diverse systems that are not interoperable. This can result in inefficiencies and compromised patient care. To complement existing initiatives to strengthen health systems through digital innovation, the World Diabetes Foundation (WDF) initiated the Diabetes Compass in April 2021. Its aim is to improve the quality of diabetes care in primary care settings by developing new or improving existing platforms and connecting digital solutions at the community and facility levels into an integrated ecosystem.

Pictures: Partners in Malawi, Sri Lanka, and Tanzania discussing the main challenges for which partners are designing digital solutions

HIGHLIGHTS

Currently in the development phase, the Diabetes Compass initiative in Malawi, Sri Lanka and Tanzania is working hand in hand with national authorities, local diabetes organizations, technology companies and academia. All solutions are expected to be released throughout 2023 and into early 2024.

The Diabetes Compass' approach to solution development uses a **needs-based innovation approach** to ensure the people being supported – and the conditions in which they live and work – are central to the design, development, and implementation of the solutions, and thereby contribute to their impact and sustainability.

Three core values are at the heart of the Diabetes Compass approach to solution design and development:

1. Develop a deep understanding of the problems to be addressed by technology solutions.

2. Design the solutions together with local partners in line with their values, needs, and wants.

3. Support local development of all solutions to ensure sustainability and scalability.

Understanding the problem

Bringing technology into healthcare is resource intensive. Prioritizing solutions over understanding the problems may not capture the contextual dependencies between stakeholders, end users, payers, and beneficiaries.[1] Needs-based innovation in healthcare starts with understanding clinical and personal needs. The Diabetes Compass uses this approach to address context-specific challenges in LMICs. Informed by the output of the research into vulnerabilities and needs, the Diabetes Compass partners aligned on three "opportunity spaces".

Health information

The lack of diabetes-specific health information, including the absence of a national diabetes registry, and lack of information sharing between facilities and hospitals, was reported to hinder the health systems' ability to: (1) undertake timely disease surveillance, (2) monitor and manage the quality of diabetes-specific health services, (3) allocate the appropriate resources based on reliable epidemiological information, and (4) support the facility-level provision of care.

Early detection

More than half of all people living with type 2 diabetes in LMICs are undiagnosed. Lack of early disease detection was reported to be a result of limitations in (1) awareness around risk factors, (2) capacity to routinely screen and diagnose, (3) engagement by people at-risk in available diabetes care services, and (4) ability to ensure continuity of care.

HCP learning and performance support

Many healthcare systems in LMICs are overburdened, with healthcare professionals (HCPs) self-reporting a lack of skills and resources to prevent, diagnose and treat diabetes. Reported challenges for continuous learning include (1) cultural and systematic barriers, (2) a frequent turnover of healthcare workers resulting in knowledge attrition, (3) insufficient support to translate knowledge into clinical practice, and (4) negative perceptions of chronic disease management which limits internal motivation to build necessary clinical skills.

Design solutions with local partners

WDF collaborated with local partners to envision digital solutions based on identified opportunities. This involved workshops, interviews, and observations with stakeholders like policymakers, practitioners, patients, and digital experts. Visions were translated into solution concepts for each opportunity space and technical platforms were tailored to the country context.

Health information solution

A suite of technologies to digitalize diabetes and hypertension care pathways, manage patient cases, improve referral mechanisms, and support clinical decision-making. Technical components include a diabetes and hypertension EMR module, a case-based data repository, an NCD data warehouse, and data visualisation and analytics software. The digital health solution touches on all stages of the data value chain and therefore comprises significant health information strengthening.

Early detection solution

The solution includes a community health platform and shared data repository. Connectivity barriers that often exist in community contexts in LMICs are addressed in the design of the Diabetes Compass solution components. For example, Open SRP, one of the selected community health platforms, has an "offline first" design and works with a cloud-based server, which allows users to sync data in different ways.

Learning and performance support solution

Offers three overarching learning components to strengthen the clinical capacity of healthcare professionals and community health workers in local settings through continuous learning: (1) An eLearning platform with a variety of courses and resources tailored to HCPs' individual preferences and needs, (2) a digitally supported mentorship programme, (3) a learning app that provides a comprehensive learning experience to improve the clinical management of diabetes and hypertension (available offline).

Support local development

Solutions are being developed in Sri Lanka, Tanzania, and Malawi with significant financial and technical support from WDF. Local partners are designing and developing all "products" in the solution architecture, with support from international experts when needed. For example, ONA is providing mentorship to local teams in Sri Lanka and Tanzania to build the community health platform, while HISP specialists from the University of Oslo are assisting local developers in Malawi to extend NCD services using DHIS tracker.

INSIGHTS

While the programme is ongoing, WDF has learned three key insights that could be applied to others seeking to work in digital health:

Understand the existing ecosystem

While digital solutions transform health systems in LMICs, they also contribute to significant fragmentation of health information systems. To avoid further fragmentation, spend the time doing extensive mapping of the existing health information systems landscape. This establishes the foundation for discussion with local stakeholders about the future solution architecture.

Use open standards, open data, open source and open innovation

The importance of applying open source health technologies is well-established. In contrast, the case for open standards is more challenging as working with open standards and integrating them into solution architectures can be complex and costly. The motivation to adopt this principle was to ensure the sustainability and scalability of digital health solutions.

Reuse and improve

Reusing and improving existing technologies improves sustainability and reduces costs. In many countries governments have invested significantly in digital solutions. Instead of introducing new products, bring user experience and interoperability experts to support improvements or extensions to existing technologies.

A project like the Diabetes Compass is very important to Tanzania, as it provides solutions to the rise in NCDs - including diabetes and hypertension. Tanzania has recently invested in primary healthcare in terms of infrastructure and human resources, and this project will continue to improve the primary healthcare response to NCDs."

Dr. Ntuli A Kapologwe, Director of Health Services at the President's Office of Regional and Local Government in Tanzania.

NCDAlliance

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