From strategy to implementation –
on the pathways of the youngest countries in Sub-Saharan Africa towards digital transformation of health systems

A report from

The Lancet and Financial Times Commission titled
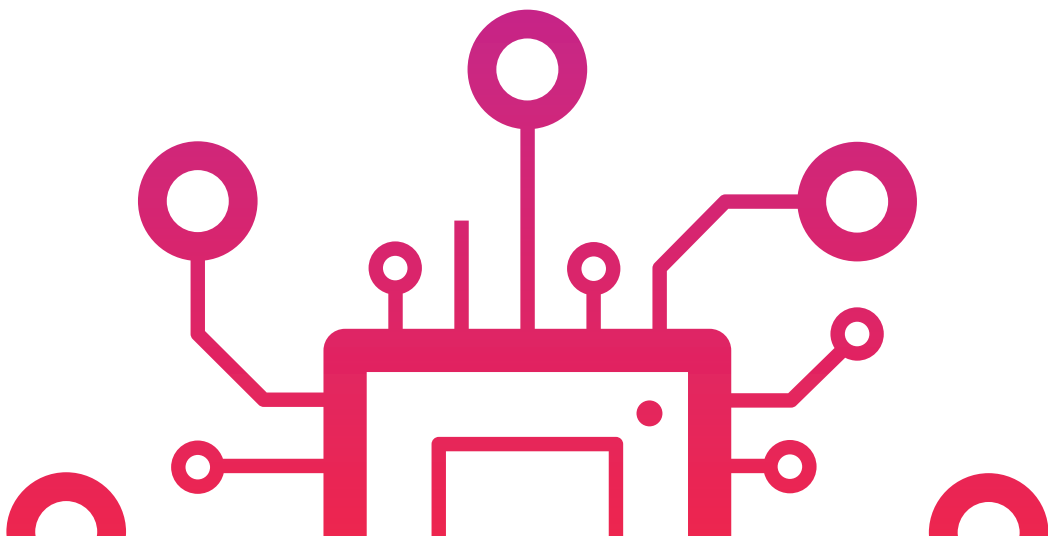*Governing health futures 2030 : Growing up in a digital world*

Growing up **2030**
in a digital world

GOVERNING HEALTH FUTURES
THE LANCET & FINANCIAL TIMES COMMISSION

ACKNOWLEDGEMENTS

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INTRODUCTION

The Lancet and Financial Times Commission on
Governing Health Futures 2030: Growing up in a digital world was
established in October 2019 to explore the convergence of digital health and
artificial intelligence with universal health coverage (UHC), with a focus on
improving and safeguarding the health and well-being of
children and young people.

As part of its broader research agenda, the Commission has gathered
information about approaches to digital transformation of health systems
taken in different parts of the world, particularly in countries where young
people under 25 make up a substantial proportion of the population. With
support from GIZ, the Commission's Secretariat conducted an exploratory
study on the approaches taken by ten African countries with young
populations. The objectives of this study were to better understand national
priorities and activities for strengthening digitally-enabled health systems,
barriers to implementation, and the extent to which the needs and views of
young people - who stand to inherit the health systems that are being
igitally-transformed today - have factored in these efforts.

This report provides a summary of the Secretariat's findings which will
inform the Commission's report being published towards the end of 2021.
The starting point for this study was an analysis of the countries' digital
health strategies which is summarised in Section 3. This section is preceded
by an overview of the status quo of the digital transformation as observed
from publicly available data (Section 2). A disconnect was identified
between the goals and plans outlined in these strategies and the situation
on the ground as presented through this data and literature on the topic.
A series of key informant interviews was conducted with experts from
governments, technical partners, civil society, and private sector in the ten
countries to uncover reasons why the aspirations outlined in countries'
digital health strategies have yet to be fully realised.
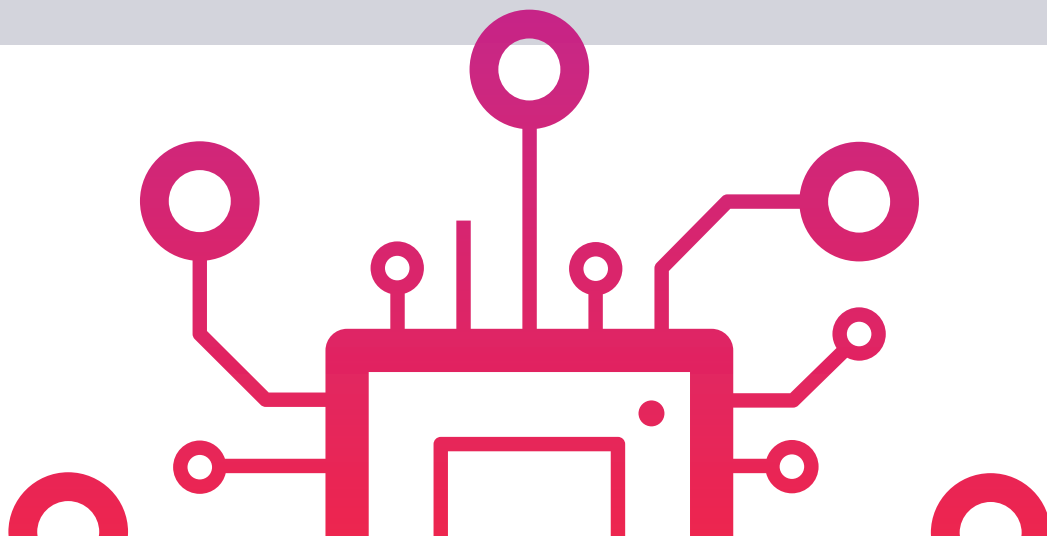
On the country selection

The Commission has taken a particular interest in Africa because it is estimated that, in 2030, almost one-third of children under 15 will live on this continent and it will be the only region of the world where the population of children under five is greater than the population of people over the age of 65. Africa will also be home to the countries with the highest proportions of young people aged 25 and under.

Digital health and data offer opportunities to accelerate the achievement of UHC and to improve the health and well-being of young people. However, African countries with the most youthful populations in the world are facing a double disadvantage of weak health systems, and low levels of connectivity and access to digital technologies (see Figure 7).

The Commission selected ten diverse countries with young populations for closer investigation: Cameroon, DRC, Ethiopia, Liberia, Malawi, Mali, Niger, Nigeria, Tanzania, and Uganda. In addition to their demographic profile, the countries were selected because of their significantly higher up-take of digital technologies among young people (39.6 percent of 15–24-year-olds were using the internet versus 28.6 percent in the overall population).[1]

Table 1: Population under 25 years by country

	As % of total	In Million
Niger	69,2	16,7
Uganda	67,0	30,6
Mali	66,9	13,5
DRC	65,0	58,2
Malawi	64,0	12,2
Tanzania	63,1	37,7
Nigeria	62,9	129,6
Cameroon	61,9	16,4
Ethiopia	61,4	70,6
Liberia	60,4	3,1

Source: UN DESA. (2019). World Population Prospects.
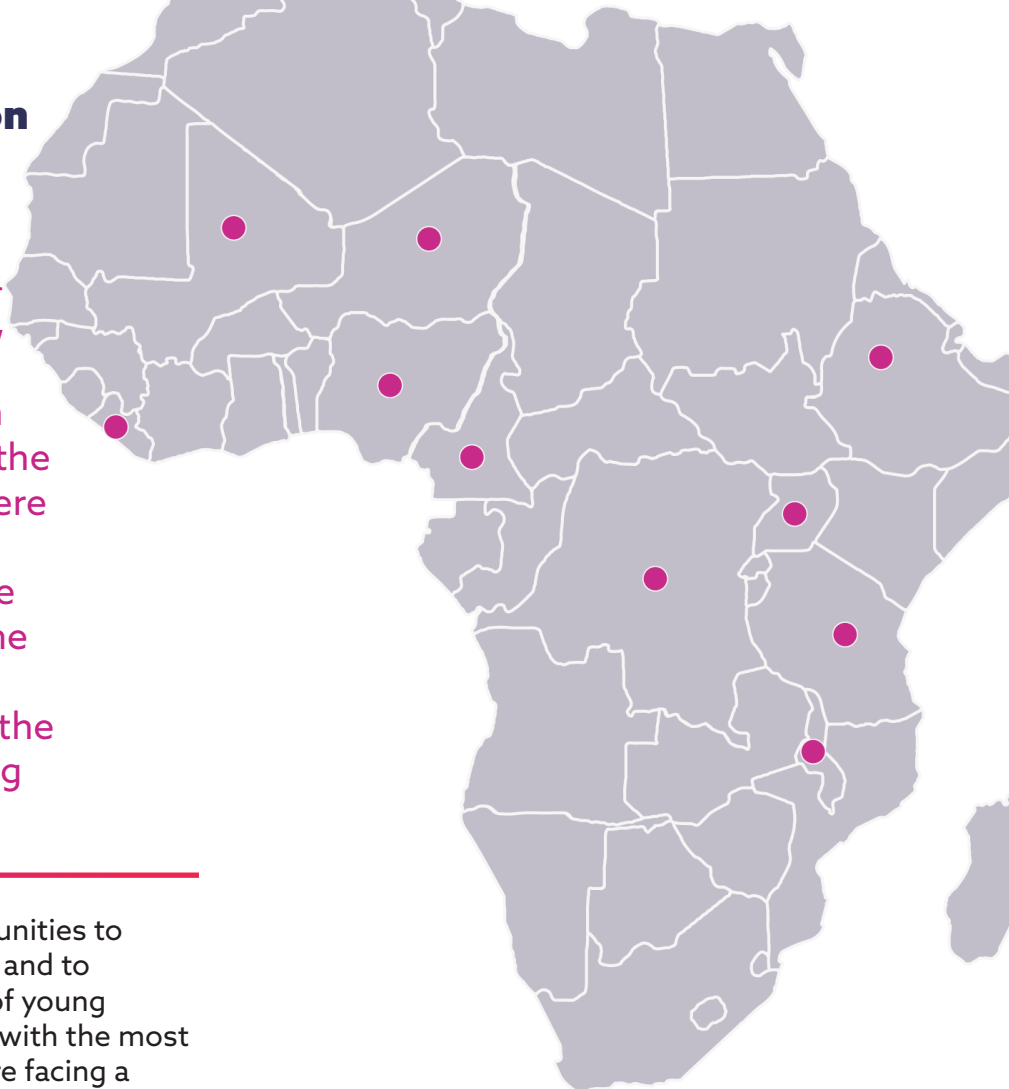
Figure 1: Selected countries for the study

Report structure

This report is structured in five sections: following the introduction, the second section provides a general overview of digital transformation in Africa and key data for the ten focus countries; the third section focuses on the content and objectives of current digital health strategies; and the fourth section summarises key themes that emerged from the key informant interviews. The concluding section brings these analyses together and synthesises findings across the focus countries, and then discusses governance and policy implications for countries wishing to accelerate digital transformations of health systems in ways that support the health and well-being of current and future generations of young people.

1. ITU (2021) Time series of ICT data for the world, by geographic regions, by urban/rural area and by level of development, (2005-2020). Last accessed: 01.03.2021. https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ITU_regional_global_Key_ICT_indicator_aggregates_Nov_2020.xlsx. See also: UNICEF and ITU (2020) "How many children and young people have internet access at home? Estimating digital connectivity during the COVID-19 pandemic." UNICEF, New York.

02 Digital transformation of health in Africa
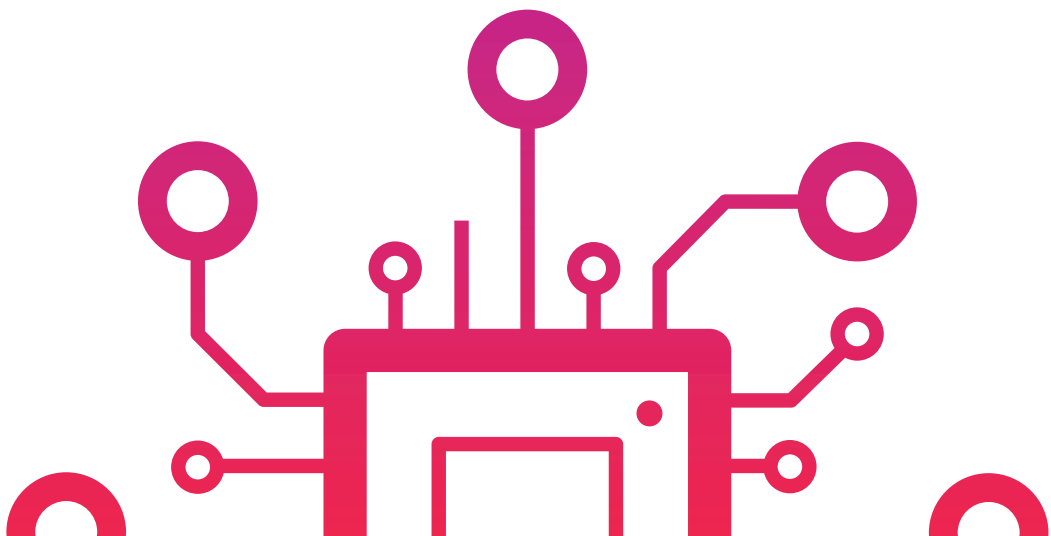
Digital transformation gets a lot of attention from policy makers and business investors

Before diving into health, it is useful to look at the numerous activities around digital innovation in Sub-Saharan African countries in general. In 2020, the African Union agreed on a "Digital Transformation Strategy for Africa (2020-2030)" which envisions an "integrated and inclusive digital society and economy in Africa".[2] As a complement to this strategy, the World Bank initiated the Digital Economy for Africa (DE4A) – a regional programme resting on five pillars: digital infrastructure, digital financial services, digital platforms, digital entrepreneurship, and digital skills.[3] In 2019, the "EU-AU Digital Economy Task Force" had published a report on how to accelerate the achievement of the SDGs through a digital economy partnership between the two regions. The report recommended among other things to ensure affordable broadband connectivity to all citizens, to equip citizens with the skills needed in a digital age, and to invest in e-Identification systems based on common standards.[4]

From outside the region, major international actors have brought forward reports on the opportunity of digital transformation: For example, the OECD (together with the African Union Commission) as well as the World Bank published reports on how the digital transformation could boost job creation.[6] The International Monetary Fund (IMF) dedicated an entire chapter of their flagship report "Regional Economic Outlook" for Sub-Saharan Africa on the region's digitalisation. [7] The report presents estimates that quantify the macroeconomic effect of higher internet penetration whereby "a one percentage point increase in the share of the population using the internet lead, on average, to a 0.37 percentage point increase in the growth of real per capita income."[7] Similarly, a report by the International Telecommunication Union (ITU) estimates that a 10 percent increase in mobile internet penetration increases GDP per capita by 2.5 percent in Africa.[8]

Lastly, the business sector is also reporting on a dynamically emerging digital economy in several countries in the region. According to the business consulting company Accenture, the digital economy of the African economy is to grow to a size of US$ 180 billion until 2025 and is forecasted to reach a size of US$ 712 billion by 2050.[9] A report by the venture capital fund Partech Partners in January 2020 took record of 250 deals with a total volume of US$ 2.02 bn in 2019 alone.[10]

Interestingly, the largest share of those funds was not raised by companies started in South Africa or Egypt, but rather Nigeria and Kenya.

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2. African Union (2020). Digital Transformation Strategy for Africa (2020-2030).

3. See the programme's website via: https://www.worldbank.org/en/programs/all-africa-digital-transformation.

4. African Union and European Commission (2019) New Africa-Europe Digital Economy Partnership: Accelerating the Achievement of the Sustainable Development Goals.

5. African Union and OECD (2021) Africa's Development Dynamics 2021: Digital Transformation for Quality Jobs, AUC, Addis Ababa/OECD Publishing, Paris. And: Choi, Jieun; Dutz, Mark; Usman, Zainab (2020) The Future of Work in Africa : Harnessing the Potential of Digital Technologies for All. Africa Development Forum. Washington, DC: World Bank.

6. IMF (2020) Regional economic outlook. 3. Digitalization in Sub-Saharan Africa. In: Sub-Saharan Africa: COVID-19: an unprecedented threat to development. Washington, DC: International Monetary Fund.

7. See also the annex of IMF (2020) for further details: https://www.imf.org/-/media/Files/Publications/REO/AFR/2020/April/English/onlineannexch3.ashx.

8. ITU (2019) "Economic Contribution of Broadband, Digitization, and ICT Regulation: Econometric Modelling for Africa". Research paper, ITU Publications, Geneva, 2019.

9. Cited in: IFC & Google (2020) E-Economy Africa 2020: Africa's $180 billion Internet Economy Future.

10. The report does only record VC-deals above a size of US$ 200,000 with regards to companies whose primary market is the African continent. Partech Partners (2020) Africa Tech Venture Capital Report 2019. Paris.

Digital transformation in health has been gaining traction

In the area of health, the enthusiasm about the digital transformation as well as the hope towards digital technologies as tools to 'leap frog' towards better health services have been high, too. Even though the sector of digital health is not among the key sectors for venture capital investment in Africa – which were fintech and energy, a bit more than 10 percent of the total funding went to health or insurance tech.

Similarly to the business innovation landscape, policy makers from across the African continent have been vocal about the opportunities of digital health, e-health, and mobile health to accelerate the achievement of UHC.[11]

> A 2020 Lancet article proposed that Sub-Saharan Africa is "the new breeding ground for global digital health".

A 2020 Lancet article proposed that Sub-Saharan Africa is "the new breeding ground for global digital health".[12] In the aforementioned Digital Transformation Strategy of the African Union, Digital health is featured as one of six "critical sectors to drive digital transformation". The Strategy proposes three policy recommendations and actions: First, to build the "prerequisite elements to realize the full potential of digital health" (e.g., national digital health strategies, strong leadership to establish collaboration between information and communication technology (ICT) and health, and monitoring and evaluation systems). Second, to put in place "regulations and policies needed to protect patient personal data and privacy" (e.g., also evaluations of digital health tools to improve services). Third, to "ensure interoperability to allow the integration and leveraging of different digital health solutions and data sources" (e.g., standards and interoperability task force). Inspired by the increasing number of innovation hubs in the region, the WHO Regional Office for Africa (WHO AFRO) held an Innovation Challenge in 2019 with submissions from 44 African countries.[13] And with the non-pharmaceutical measures due to COVID-19 in most countries in Sub-Saharan Africa, the push for more digital innovation in the health sector has received a strong boost.

The full impacts of the COVID-19 pandemic is yet to be evaluated but there are strong indications that the pandemic has accelerated the adoption of some digital health technologies across the continent. In response to physical distancing measures, healthcare providers have made greater use of telemedicine, online consultations and other digital tools to deliver health services to patients. Likewise, digital technologies have been widely leveraged to support the response to COVID-19, from disease surveillance to the introduction of digital vaccine passports.

11. The biggest investments were: mPharma (Ghana, US$ 9.7 mn), CarePay (Kenya, US$ 45 mn), and Zipline (Rwanda, US$ 120 mn) which is actually based in the US, but operating drone centres in Rwanda.
12. Holst C, Sukums F, Radovanovic D, Ngowi B, Noll J, Winkler AS. (2020) Sub-Saharan Africa—the new breeding ground for global digital health. Lancet Digit Heal 2(4):e160–2.
13. WHO Regional Office for Africa (2019) 'WHO Innovation Challenge to announce 30 finalists at the Africa Health Forum in Cabo Verde'.

The pandemic has shifted the mindset of healthcare providers and policymakers about the potential of digital health, enabling the development of favourable regulation to encourage further innovations and application of digital health tools. It has also highlighted governance challenges, particularly around security and privacy of personal data. Negative impacts on economic growth resulting from COVID-19 may also serve to encourage further exploration of the potential for digital technologies and data to reduce costs and increase the efficiency of health systems.

Research output on digital health-related topics in countries of Sub-Saharan Africa has been on the rise in a tremendous way, too. Even a cursory analysis of relevant publications indexed on the medical journal database PubMed shows that the topic has received significant attention: While topics around digital health were not high on the research agenda until 2010, the number of yearly articles in the past three years has consistently been well above 100 articles per year (see Figure 2). And this analysis is limited to articles in English language and does not include articles on South Africa. Thus, these numbers will only reflect a lower boundary of the true number of articles. Further analysis of the papers' topics reveals a strong focus on mobile health and telemedicine/telehealth (see Figure 3). Data intensive technologies such as artificial intelligence/machine learning only appear in three documents. What is surprising, is that words related to online/internet activities are equally absent (e.g., only three articles have 'internet' as a keyword).

Figure 2: Research on digital health & SSA*
Number of articles per year
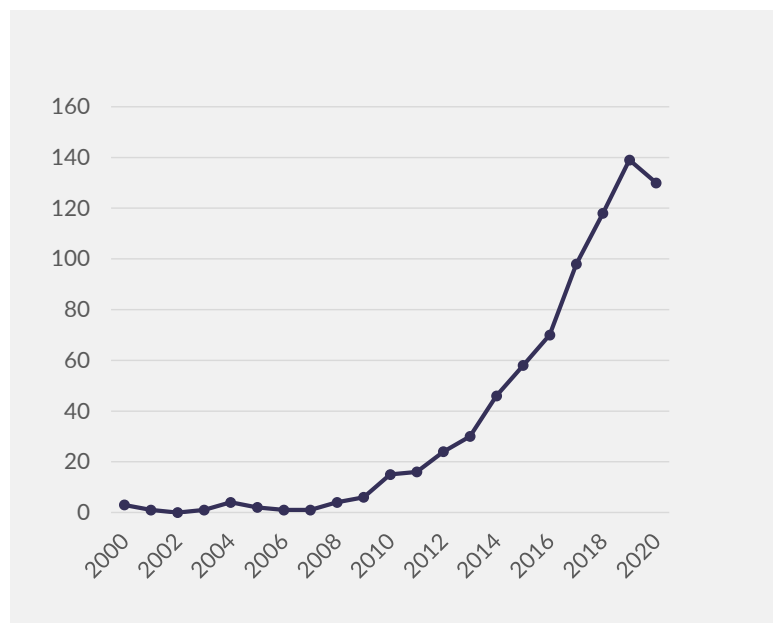
Figure 3: Key topics of journal articles, 2000-2020
Number of articles that have the topic as key word**
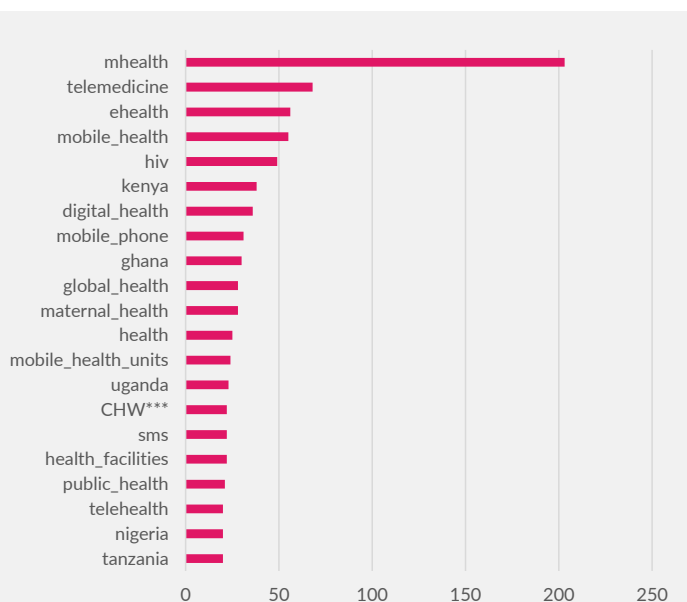
*** Community health workers

* Note: The analysis reflects articles that explicitly contain at least one key word related digital health and simultaneously at least one of the countries in Sub-Saharan Africa in the title or abstract. 'Digital health' was operationalized by the following terms: digital health, electronic health records, eHealth, e-health, mhealth, mobile health, m-health, tele-health, telehealth, telemedicine. All countries in Sub-Saharan Africa were included except for South Africa.
** Note: The analysis shows the key words that are self-reported by the researchers. Reading example: 203 articles on digital health and countries in Sub-Sahara Africa had "mhealth" as one of the keywords.
Source: PubMed, last retrieved 26 Feb 2021. Authors' analysis.

The digital ecosystem in some of the youngest countries on the planet

The short analysis of the research on digital health in countries in Sub-Saharan Africa points already to some of the realities about digital technologies in many of the region's countries: While mobile phone subscriptions are at a high level (80 per 100 inhabitants), the continent lags behind in active-mobile broadband (33 per 100 inhabitants) and fixed broadband subscriptions (15 per 100 inhabitants). [14] Similarly, several building blocks in the health system that are relevant for digital health applications to have a wide impact are only partially in place.[15]

According to a 2017 UNECA-report, Africa represented just two percent of total health expenditure globally despite representing 16 percent of the global population and 26 percent of the global disease burden.[16] This limited investments also surfaces in baseline infrastructure such as electricity supply in health care facilities. According to a systematic review of surveys among health facilities in eight Sub-Saharan African countries where data existed, only 28 percent of health care facilities, on average, had reliable electricity. [17] These facts notwithstanding, the digital ecosystem has developed in a tremendous pace in many countries in Sub-Saharan Africa. Among those developments, the rapidly increasing penetration of mobile phones, particularly smart phones, is among the most significant ones. Active mobile phone subscriptions rose from less than 2 per 100 people in the region in 2000 to over 82 per 100 people in 2018. Naturally, this average disguises the large variation across countries.

As Figure 4 shows, the mobile phone penetration among the ten selected countries differed quite substantially. Cameroon, Nigeria, Tanzania and Liberia had a development that was roughly in line with rest of the region. After 2010, Mali outperformed the other countries and the regional development and still has the highest penetration among the 10 countries analysed here. On the other hand, DRC, Ethiopia, Malawi, Niger, and Uganda have persistently lagged behind the region's overall development with regards to mobile phone penetration.

Figure 4: mobile phone subscriptions by country in comparison to the Regional average
Number of active subscriptions per 100 people. Blue line: Subscriptions in the respective country. Green line: Average across Sub-Saharan African countries. Red-shaded areas: development was below the regional average. Green-shaded areas: above-average development.

Source: International Telecommunications Union via World Development Indicator-database. Last available observation for SSA-average in 2018. Authors' analysis.
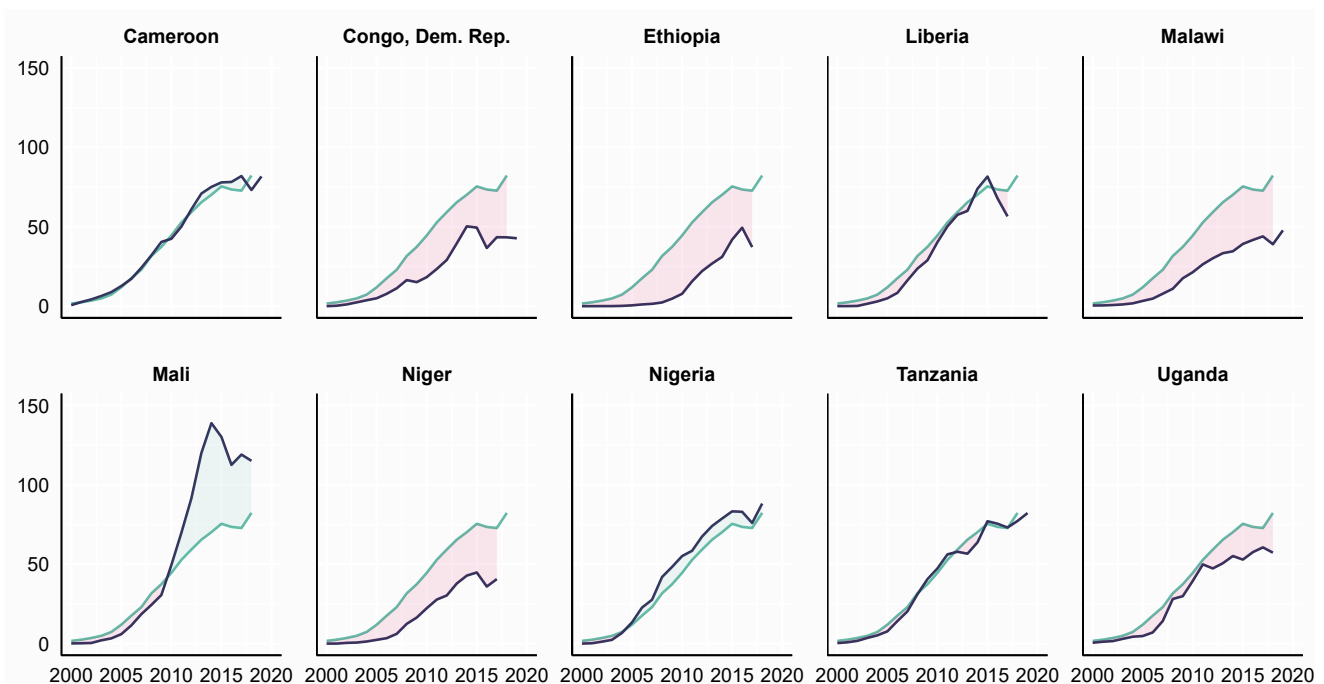
14. ITU (2020) Facts and Figures 2020.
15. Stroetmann, K. (2018) Digital Health Ecosystem for African countries. Federal Ministry for Economic Cooperation and Development (BMZ).
16. United Nations Economic Commission for Africa (2017) Healthcare and Economic Growth in Africa. Addis Ababa.
17. Adair-Rohani, Heather, et al (2013) "Limited electricity access in health facilities of sub-Saharan Africa: a systematic review of data on electricity access, sources, and reliability." Global Health: Science and Practice 1.2: 249-261.

Internet penetration has significantly increased, too. Less than 0.5% of the population was using the internet in Sub-Saharan Africa in 2000. By 2017, almost every fifth person was using the internet (18.7 percent). Cameroon and Uganda have been roughly in line with the region's average development over the past 20 years (Figure 5). Nigeria is the only country that has had a persistent above-average conjecture in getting more people to use the internet. In all other countries among the ten observed countries, the internet penetration in the population has lagged behind the average in Sub-Saharan Africa.

Figure 5: Share of population using the internet
In percent of the total population. Blue line: Share of internet users in the respective country. Green line: Average across Sub-Saharan African countries. Red-shaded areas: development was below the regional average. Green-shaded areas: above-average development.

Arguably, for some of the selected countries, these national averages are not representative of the full picture because of the large differences within countries, particularly between the rural and urban areas. According to recent data from the ITU, 41.2 percent of the urban population had internet access while only 6.9 percent of the rural population were connected to the internet – a gap of some 34 percentage points.

In Nigeria, the gap appears to be equally large with 39.5 percent of the population being connected in urban areas versus less than 5 percent of the rural population having access to the internet.[18] Across the African continent it is estimated that about 100 million people live in remote rural areas that are currently out of reach of even traditional cellular mobile networks.[19] The effort needed to close the connectivity gap is tremendous: In 2019, the Broadband Commission's working group on 'Broadband for All' estimated the needed investment to achieve 2030 the goal of universal access to affordable and good quality broadband at US$ 109 billion – nearly 90 percent of the investment required would have to go into countries in Sub-Saharan Africa.[20]

According to recent data from the ITU, 41.2 percent of the urban population had internet access while only 6.9 percent of the rural population were connected to the internet – a gap of some 34 percentage points.

18. Alliance for Affordable Internet (2020) A Rural Broadband Policy Framework providing guidance to address the 'Digital Divide'.
19. Broadband Commission (2019) Connecting Africa Through Broadband A strategy for doubling connectivity by 2021 and reaching universal access by 2030.
20. Ibid.

A key explanation for the comparatively slow development might be rooted in the high prices for mobile data. In the absence of a wide-spread fixed broadband network, mobile data is often the only way to use the internet. Yet, as of 2018, the prices for one gigabyte of mobile data was as high as 8 percent of average income on average in Africa (Americas: 2.7 percent, Asia: 1.5 percent).[21] Data for 2015-18 from the Alliance for Affordable Internet (a UN-supported public-private initiative) seems to suggest some validity of this affordability argument (Table 2): In those countries where the prices for 1 GB of mobile data has dropped below 10 percent of per capita GNI in recent years, a relatively strong growth in internet users can be observed (i.e. Uganda, Cameroon, Tanzania, Ethiopia, and Nigeria). Where prices have remained quite high such as DRC and Liberia, the uptick in usage has been less pronounced. Other affordability factors – such as the price of a handset – also play a role.[22]

A further crucial building block for digital transformations in health are digital identities. If people cannot be clearly identified, creating an enabling digital environment is much harder and needs to be based on imperfect work-arounds (e.g., mobile phone numbers). Similarly, electronic health records are only able to unfold their true usefulness if they provide a consistent account of the person's health status. A general indicator pointing towards a country's ability to provide this basic infrastructure is the completeness of the birth registries (Figure 6). Across Sub-Saharan Africa, the average completeness of birth registrations was at 46%. Among the ten focus countries, Cameroon, Malawi, Mali, Niger, and more recently, Nigeria have been able to achieve this level. DRC, Ethiopia, Liberia, Tanzania, and Uganda have remained far below the average value in the region. Recent research from Tanzania has shed some light on possible reasons of low registrations: Despite having made birth and death registrations mandatory by 2009, a centralised registration system implied cost and geographic barriers for families keeping them from conducting registration. A pilot programme to test a decentralised system showed a significant uptick in registrations.[24]

	2018	2017	2016	2015
D R Congo	34%	-	-	-
Malawi	18%	18%	20%	36%
Liberia	18%	-	-	-
Niger	12%	-	-	-
Mali	11%	21%	19%	19%
Uganda	8%	16%	15%	28%
Ethiopia	6%	10%	14%	20%
Tanzania	6%	6%	6%	9%
Cameroon	3%	6%	6%	12%
Nigeria	2%	2%	2%	7%

Table 2: Affordability of Mobile Internet Data
In percent of GNI per capita

Source: Alliance for Affordable Internet.[23]

Figure 6: Completeness of birth registration, available data points between 2000-2020
In percent – all available data-points per country are displayed here
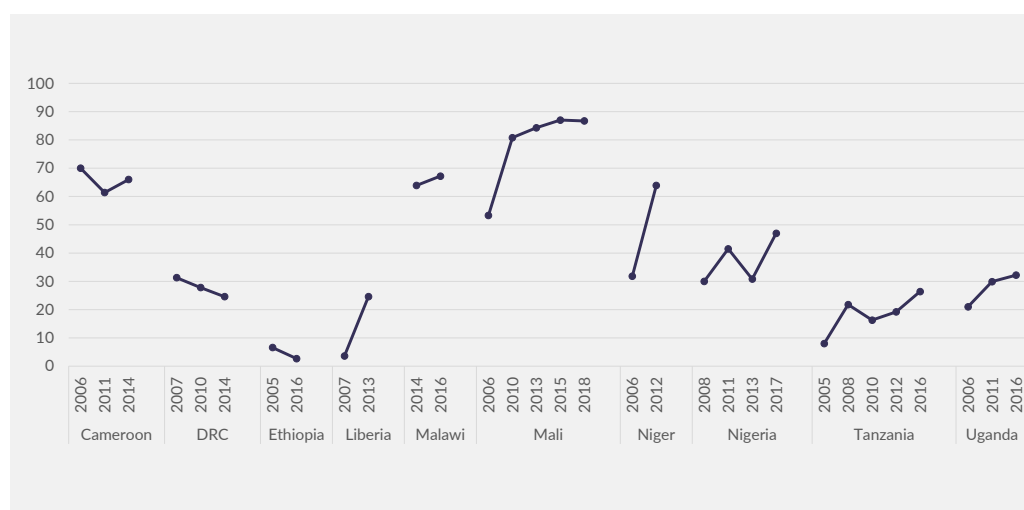
Source: World Development Indicators. Definition: Completeness of birth registration is the percentage of children under age 5 whose births were registered at the time of the survey. The numerator of completeness of birth registration includes children whose birth certificate was seen by the interviewer or whose mother or caretaker says the birth has been registered.

21. Quartz Africa (2019) How much is 1GB of mobile data in Africa? (qz.com)
22. GSMA (2020) The State of Mobile Internet Connectivity Report 2020
23. Alliance for Affordable Internet. A4AI Mobile Broadband Pricing - GNICM Q4 2018
24. Sanga, C., Kabadi, G., Karugendo, E., de Savigny, D., Cobos Muñoz, D., & Adair, T. (2020) Decentralization of birth registration to Local Government in Tanzania: the association with completeness of birth registration and certification. Global Health Action, 13(1), 1831795.

Given the multitude of factors contributing to the digital infrastructure, it is useful to locate the ten countries on a multidimensional indicator. For the purpose of this analysis, the GSMA Mobile Connectivity Index was adjusted to only include infrastructure components. This adapted index is comparing countries' performance on a range of dimensions, e.g., mobile network, affordability, and availability of applications and e-government services. [25] The index allows a global picture on where the digital infrastructure stands in the ten countries and is displayed on the horizontal axis in Figure 7: Nine out of the ten countries in our analysis range in the lowest quartile of the global distribution as indicated by the left-most vertical dashed line. Only Nigeria scores good enough to be located in the third quartile.

Figure 7 also allows us to simultaneously locate the countries along the health systems' ability to bring basic health services effectively to its populations. Building on the Global Burden of Disease Study by the IHME, the UHC Effective Coverage Index looks at 23 indicators aiming to represent a country's ability to improve health outcomes in accordance with the health needs and disease burden of its population. The horizontal dashed line indicates the average value scored across the overall sample. Only Malawi and Tanzania almost reach this average. All other countries rank much lower in on this index. In summary, the ten countries with some of the youngest populations on the planet are struggling with both providing the population with essential health services and the infrastructure required for connectivity.

Figure 7: Locating the selected countries in the global connectivity and health system landscape
Vertical axis: Country score on the UHC Effective Coverage Index (normalized, 100 = best). Horizontal axis: adapted GSMA Connectivity Index (normalized, 100 = best). Size of bubbles: Scaled population under 25 years in million.
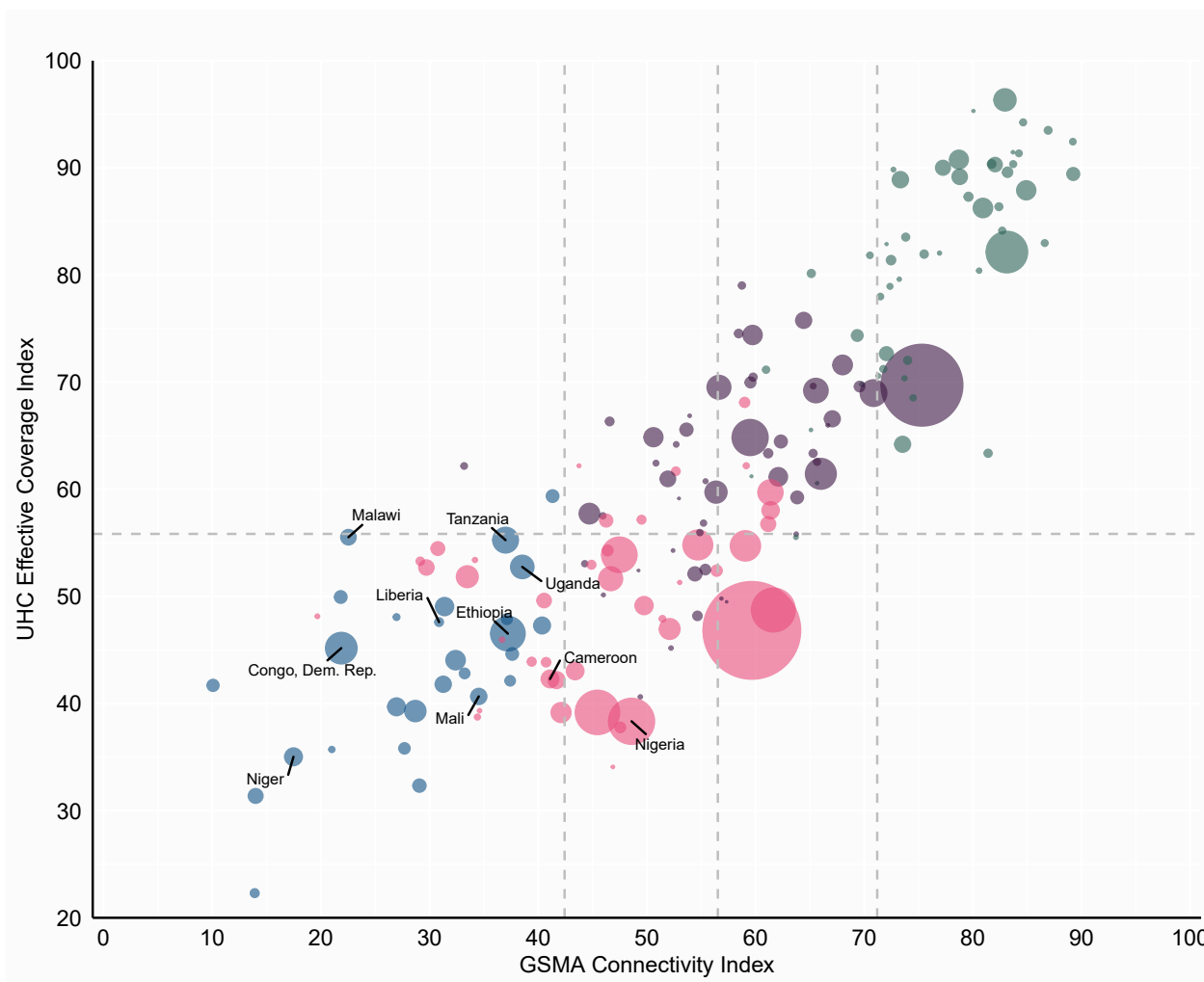
Source: IHME (2020) for UHC Effective Coverage Index. [26] GSMA (2020).
[27] Note: The GSMA Mobile Connectivity Index was adapted from the original index by excluding one of the four pillars of the indicator. The removed pillar "Consumer Readiness" is comprised of indicators that were not useful to this analysis (e.g., indicators on gender equality in a country and literacy). While important, these indicators would have conflated the technology infrastructure element in the index which is the primary focus here. Authors' analysis.

25. GSMA (2020). GSMA Mobile Connectivity Index – Methodology.
26. Lozano, Rafael, et al. (2020) "Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019." The Lancet, Vol. 396: 1250-1284.
27. GSMA. (2020). GSMA Mobile Connectivity Index. Data download (26.02.2020)

03 Analysis of digital health strategies
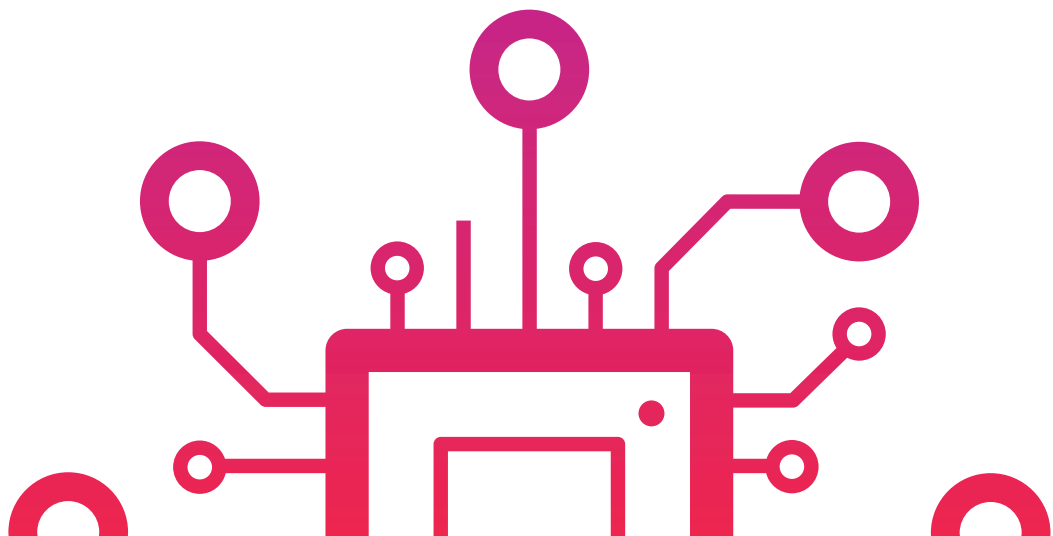
Comparable information on current national digital health policies is difficult to obtain. In the year 2015, WHO's Global Health Observatory conducted the most comprehensive survey of national policies to date and recorded them in an online Directory of eHealth Policies but this has not been updated since 2016. [28] Other initiatives to collate and analyse digital health strategies, such as those undertaken by Bertelsmann Stiftung [29] or the Global Digital Health Index [30] are more limited in their country coverage. WHO's Directory of eHealth Policies was the starting point for our research on digital health strategies for the ten focus countries with high youth populations. We then used internet searches to identify more current strategies. The WHO Regional Office for Africa and key informants interviewed for this study also provided copies of digital health strategies that were not available online.

Our analysis is focused on the content and substance of each strategy, rather than on the process to develop or implement the strategy. We recognise that each digital health strategy (plan, policy or roadmap) is unique and was developed within a particular context and through different processes. Given how dynamic the policy making landscape and field of digital health are, we also recognise that the situation on the ground is inevitably going to be different to that described in the strategy. Nevertheless, reviewing the content of a digital health strategy provides a helpful overview of a country's vision and priorities for digitally transforming their health system.

Our analysis focused on the following five questions:

01 What kind of strategy does the country have to guide the digital transformation of their health system?

02 What level of digital transformation is the strategy focused on?

03 Are children and youth considered in the strategy?

04 To what extent are the Commission's foundational entry points prioritised within the strategy?

05 What governance related goals are included in the strategy?

28. WHO. Directory of eHealth policies. WHO website. (Last accessed 28.02.2021)
29. Thiel, R., et al (2018) #SmartHealthSystems. International comparison of digital strategies. Bertelsmann Stiftung.
30. Health Enabled and Global Development Incubator (2019) The state of digital health: Global Digital Health Index 2019.

Status of digital health strategies

All ten countries have published a strategy to guide the digital transformation of their health system. An overview of the ten strategies can be found in Annex 1. In most cases, these strategies were developed to support the implementation of a national health strategy and as part of a broader digital transformation agenda. Nine out of the ten countries had current strategies at the time the research was conducted, meaning that the strategy covers the year 2020. Consultation processes were underway in 2020 in Malawi and Mali to develop a new digital health strategy, but these are yet to be finalised.

The titles of the strategies reflect changing terminology use. More recently published strategies, such as ones from Cameroon and Tanzania, are called digital health strategies. Mali, Niger and Uganda have eHealth strategies and the rest are health information/informatics or ICT strategies.

Table 3: Overview of digital health strategies

	Strategy	Period of validity	Lead Ministry/Agency
Cameroon	National Digital Health Strategic Plan	2020-2024	Ministry of Public Health
D R Congo	Plan National de Développement de l'Informatique de Santé	2020-2024	L'Agence Nationale de l'Ingénierie Clinique, de l'Information et de l'Informatique Sanitaire (ANICiiS), Ministère de la Santé Publique
Ethiopia	Information Revolution Roadmap II	2020-2029	Ministry of Health
Liberia	Health Information System and ICT Strategic Plan	2016-2021	Ministry of Health
Malawi	Monitoring, Evaluation and Health Information Systems Strategy	2017-2021	Ministry of Health and Population
Mali	Politique National Cybersanté	2013-	Agence Nationale de Télésanté et d'Informatique Médicale (ANTIM)
Niger	Stratégie Nationale E-Santé	2019-2023	Ministère de la Santé Publique
Nigeria	National Health ICT Strategic Framework	2015-2020	Federal Ministry of Health
Tanzania	National Digital Health Strategy	2019-2024	Ministry of Health, Community Development, Gender, Elderly and Children
Uganda	National eHealth Strategy	2017-2021	Ministry of Health

Strategy scope and aspirations

All ten strategies reflect their respective government's aspiration to use digital technologies and data to improve the performance of health systems and achieve better health outcomes for the population. The situation analysis within each strategy describes both significant health challenges and relatively low levels of digital maturity. All strategies therefore place strong emphasis on building the foundations for digital transformation. With the exception of Mali, all strategies draw heavily on the WHO-ITU's 2013 National eHealth Strategy Toolkit [31] and many strategies are structured according to the Toolkit's seven building blocks (see Figure 8).

The situation analysis within each strategy describes both significant health challenges and relatively low levels of digital maturity.
All strategies therefore place strong emphasis on building the foundations for digital transformation.

Figure 8: WHO-ITU National e-health strategy toolkit building blocks
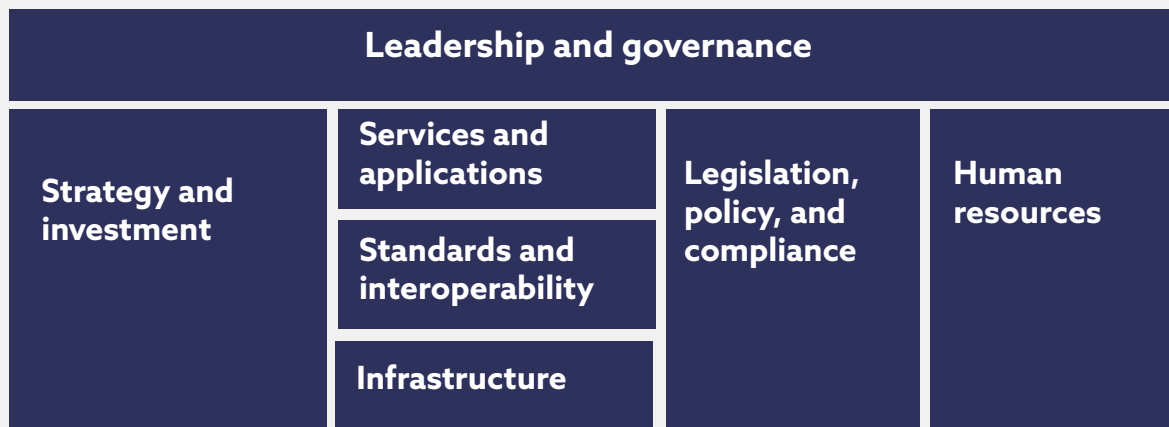
Leadership and governance				
Strategy and investment	Services and applications	Legislation, policy, and compliance	Human resources
	Standards and interoperability		
	Infrastructure		

Each strategy has a strong emphasis on strengthening integrated health information systems (HIS) to improve data collection and use for decision-making.

Each strategy has a strong emphasis on strengthening integrated health information systems (HIS) to improve data collection and use for decision-making. In the cases of Ethiopia, Liberia and Malawi, HIS is the primary focus of the strategy. In all countries, increasing the availability of high-quality data, and the capacity of the health workforce to use that data, are recognised as essential for optimising the efficiency and effectiveness of health services.

In addition to strengthening HIS, all strategies outline plans to use telemedicine, mHealth and/or eHealth tools to improve quality and increase service coverage, especially for underserved populations. Tanzania is unique in having a strategy that includes a reference and commitment to explore and research emerging technologies such as AI.

31. WHO and ITU (2012) National eHealth Strategy Toolkit.

	Strategy focus	Overarching goal and objectives
Cameroon	A national framework for the development of digital health services over five years to improve health promotion, disease prevention, case management, health system strengthening and governance, and strategic management of the health system. The strategy seeks to build digital maturity across all the eHealth building blocks.	**Vision:** By 2024, Digital Health will effectively contribute to UHC through informed decision-making at all levels of the health pyramid, and through reliable, robust, secure, and interoperable systems. **General objective:** By 2024, improve the performance of the health system through optimal use of effective digital technologies at all levels of the health pyramid.
D R Congo	The strategy is narrower in scope than previous versions and is limited to a selection of essential applications that can contribute substantially to the achievement of the national objectives of UHC. These are: standardisation and interoperability of IT solutions deployed in the health sector; strengthening health workforce capacities through remote learning and decision-support tools; building ICT infrastructure of health facilities; implementation of a national HIS; and improved governance of eHealth.	**Vision:** To create an integrated HIS, informed by first-line digital tools focused on the patient and health professionals, offering a complete source of information in a reliable, accessible and timely manner for steering health policy towards UHC. **Goal:** Implementation of the strategy contributes to the DRC's health and development objectives.
Ethiopia	As part of a broader 'Information Revolution' agenda, the focus of this roadmap is to guide a radical shift from traditional methods of data utilisation within the health sector to a systematic information management approach powered by a corresponding level of technology. The main strategies identified to achieve this are: enhance informed decision-making; improve data quality; enhance digital health information technology; improve HIS governance and leadership.	**Vision:** A strong HIS that produces high quality data and being the credible source of the health information. **Mission:** To advance and transform in data generation, analysis, synthesis and sharing quality data through nurturing digital information technology to promote data demand and informed decision-making at all levels of the health system.
Liberia	The strategic plan focuses on strengthening HIS to create a comprehensive and interoperable health information system that leads to improved health outcomes. Improving internet coverage, strengthening ICT infrastructure and increasing skilled staff are identified as necessary steps for delivering on the actions in the plan.	**Vision:** The Health System of Liberia is supported by a comprehensive and interoperable HIS, leading to improved health outcomes for individuals and communities in Liberia. **Goal:** By 2021, the National HIS of Liberia will produce quality data and information used in support of the health system functions at all levels, with a solid governance and management structure, using appropriate information and communication technology, including data confidentiality and security, at an affordable cost.
Malawi	The strategy's aim is to strengthen HIS and fully transition from paper-based to electronic systems at the point of care to leverage the power of ICT in the generation of real-time decision support data. An interoperability layer will be developed to allow data to be linked and shared across all parts of the health information management system.	**Vision:** A sustainable, integrated national HIS capable of generating and managing quality health information for supporting evidence-based decision making by all stakeholders at all levels of the health system. **Objectives:** To strengthen the health sector's capacity to use data for decision making; and to ensure that HSSP II is adequately monitored with high-quality data that are routinely reported, analysed, and disseminated.

	Strategy focus	Overarching goal and objectives
Mali	The strategy outlines how eHealth can support the objectives of the country's Ten-year Health and Social Development Plan (PDDSS). The creation of a national digital health network is a high priority to allow the interconnection of health facilities and facilitate the exchange of secure health data. Increasing connectivity of health facilities; modernising the HIS; strengthening human resources for health and ICT specialists; and developing guidelines on standards and interoperability are all planned activities to support the effective development and provision of eHealth services.	**Vision:** By 2030, ICT will be used at all levels of the health system to make reliable, secure and up-to-date health and medical information available, improve the quality of care and its accessibility, and make the management of health structures efficient. **Overall objective:** Contribute to the improvement of the health system through the inclusive use of information and communication technologies.
Niger	The strategy is structured around two pillars. Firstly, building an environment conducive to the development and use of eHealth services by increasing the connectivity of health structures; increasing the availability of skilled human resources; standardisation and interoperability; and strengthening eHealth governance. The second pillar is focused on expanding the provision of eHealth and telehealth services.	**Vision:** By 2030, ICTs will be used effectively in rural areas and particularly in remote and landlocked areas in order to improve the health of Nigerien populations. **Mission:** Use ICTs at all levels of the health system to make reliable health and medical information available, improve the quality of care and make efficient management of the resources of the country's health structures.
Nigeria	The strategy provides a vision and guide for the strategic application of ICT and alignment of current investments in technology within the health system towards a digitized health system that will help Nigeria achieve UHC. The strategy outlines steps to build maturity across all the ITU-WHO building blocks and has a strong emphasis on increasing financial coverage for healthcare through use of ICT for health insurance and other health-related financial transactions.	**Vision:** By 2020, health ICT will help enable and deliver universal health coverage in Nigeria. Intended outcomes of the strategy include improved access, coverage and quality of health services through effective use of ICTs, telemedicine, and HIS.
Tanzania	The strategy builds on earlier versions with a shift in focus from collecting and reporting from aggregate data to client-level data, as well as data use at all levels of the health system. This strategy looks at the application of different technologies for disease prevention and to promote healthy behaviours. It also considers the need to explore innovative approaches and emerging technologies and their potential to support UHC.	**Vision:** Better health outcomes through a digitally enabled health system. **Mission:** To accelerate the transformation of the Tanzanian health care system through innovative, data-driven, client-centric, efficient, effective, and integrated digital health solutions.
Uganda	The strategy aims to standardise ICT for health infrastructure and services to ensure that they are aligned to health service requirements, are interoperable, and enable more efficient use of healthcare resources. The strategy outlines an incremental approach from paper intensive processes to the development of electronic health records that will enable the flow of quality and relevant health information and decision-making across the healthcare network. Other pillars of the strategy seek to establish telehealth and mHealth services to deliver healthcare and empower communities; and increase awareness of eHealth through mass campaigns.	**Vision:** Effective use of ICT for better health outcomes of the Ugandan population. **Mission:** To transform the health of the people of Uganda by promoting effective utilisation of ICT. **Goal:** To harness and create an enabling environment for the development and utilisation of sustainable, ethically sound and harmonised ICT at all levels to promote health and improve health services delivery in Uganda.

Alignment of strategies to the Commission's priorities

The Governing Health Futures Commission was established to explore the convergence of digital health, artificial intelligence (AI), and other frontier technologies with UHC, with a special focus on improving the health and well-being of children and young people. Our analysis has therefore included an assessment of the extent to which digital strategies look to support the achievement of UHC and the flourishing of young people in a digital age.

Nine out of ten strategies are aligned to the Sustainable Development Goals (SDGs) and the realisation of UHC. The exception is Mali's strategy which predates the adoption of the SDGs and high-level political commitments to UHC.

Whilst the national health strategies of all ten countries prioritise newborn, child and adolescent health, none of the digital health strategies reviewed included any specific consideration of children and youth in the development and application of digital technologies or management of health data. The context sections of several strategies did reinforce that improved child and adolescent health are intended outcomes of digital health. Some also noted their country's young population and opportunities presented by so many young people entering the workforce to support the transformation agenda. None of the strategies referenced the involvement of children and youth in the development or monitoring of the strategy. Neither did any of the strategies elude to the potential risks to young people's health and well-being as a result of digital transformations.

Table 5: Strategy Alignment to UHC

	Alignment to UHC
Cameroon	Strategy's vision is that digital health will contribute to UHC.
D R Congo	Objective of the strategy is aligned to UHC. Recognises that the realisation of UHC will require eHealth.
Ethiopia	UHC is a guiding principle for the strategy. An objective of stronger HIS is to monitor progress towards UHC.
Liberia	Universal coverage is one of the national values guiding the strategic plan.
Malawi	Strategy supports monitoring of UHC and compliments broader national strategies to achieve UHC.
Mali	Predates global commitments to UHC but is in keeping with national health policy to improve coverage.
Niger	Strategy reinforces Niger's commitment to UHC.
Nigeria	Strategy seeks to align health ICT with the achievement of UHC.
Tanzania	Strategy proposes that digital health will fast-track the achievement of UHC.
Uganda	Strategy supports the Health Sector Development Plan which has UHC as its goal.

Table 6: Focus on children and youth

	High youth population noted in landscape analysis	Presence of young workforce / innovators identified as an opportunity	Use of digital health / data to improve child and adolescent health is a priority	Children and/or youth as a guiding principle for the strategy	Children and youth involved in development of the strategy
Cameroon	Present	Present	Absent	Absent	Absent
D R Congo	Absent	Present	Present	Absent	Absent
Ethiopia	Absent	Absent	Absent	Present	Absent
Liberia	Absent	Absent	Present	Absent	Absent
Malawi	Absent	Absent	Present	Absent	Absent
Mali	Present	Absent	Absent	Absent	Absent
Niger	Present	Absent	Present	Absent	Absent
Nigeria	Absent	Absent	Absent	Absent	Absent
Tanzania	Absent	Absent	Present	Absent	Absent
Uganda	Present	Present	Present	Absent	Absent

Present   Absent

In line with its focus on UHC and the health and well-being of young people, the Commission has been exploring approaches to digital health governance that are grounded in a set of core values and principles such as equity, human rights, democracy, and solidarity.
The Commission posits that such principles should be applied to all aspects of digital transformation and so, through this analysis, we sought to assess whether these values are reflected within digital health strategies.

Table 7 provides an overview of which values or principles are explicitly mentioned in a strategy (perhaps as a goal or guiding principle), or if there are more subtle references that indicate the strategy is aligned to that principle. Eight out of ten strategies explicitly reference equity as a core principle and the remaining two (Cameroon and DRC) indirectly support using digital health to reduce health inequities through their alignment with an equity-focused national health strategy.

Digital health poses a new set of ethical and human rights challenges. Five strategies explicitly talk about the need for an ethical approach to digital health; one references the need for users of HIS to be trained in ethics (Liberia); and the remaining four do not mention ethics. Only two strategies (Malawi and Uganda) outline a human-rights based approach. Two strategies (Mali and Niger) note that the Right to Health is enshrined in the country's constitution and one (Nigeria) references the Right to Privacy. Three strategies (Ethiopia, Liberia and Tanzania) do not use rights language but indirectly talk about the need to protect individual privacy and confidentiality.

In line with Principles for Digital Development,[32] approaches to digital health should be designed with the user. This means that intended users or beneficiaries should be partners in the design and application of digital health solutions. Going further, communities – including young people – should be enfranchised to contribute to digital health policy and to use digital health tools to support their own health. Six strategies make no reference to the inclusion of communities. Two (Ethiopia and Uganda) are explicit about the importance of involving communities in planning, implementation and monitoring. Niger commits to civil society involvement in creating a legal framework. Tanzania refers to the Principles for Digital Development but doesn't include activities to include communities. Four strategies (Ethiopia, Mali, Niger and Uganda) explicitly plan to use digital tools to enfranchise and empower ommunities. Two strategies (Nigeria and Tanzania) plan to use digital tools to empower health workers and the remaining four strategies make no reference to enfranchisement.

32. Principles for Digital Development. Available at https://digitalprinciples.org/.

The Commission has been exploring the merits of a solidarity-based approach to digital health and data which can enable policymakers to balance individual health and protection needs with the potential public health impacts. Whilst none of the strategies applied solidarity as a framework, Cameroon and Uganda's strategies both recognise the need for approaches to data governance that balance individual and public health needs.

Key messages:

01 Eight out of ten strategies explicitly reference equity as a core principle

02 Five strategies explicitly talk about the need for an ethical approach to digital health

03 Only two strategies (Malawi and Uganda) outline a human-rights based approach

04 Six strategies make no reference to the inclusion of communities

05 All ten strategies recognise the need for stronger governance of digital health and data

Table 7: References to Values and principles within digital health strategies

	Equity	Ethics	Human rights	Inclusion	Enfranchised communities	Solidarity
Cameroon	Indirect reference	Explicit reference	No reference	No reference	No reference	Indirect reference
D R Congo	Indirect reference	No reference	No reference	No reference	No reference	No reference
Ethiopia	Explicit reference	Explicit reference	Indirect reference	Explicit reference	Explicit reference	No reference
Liberia	Explicit reference	Explicit reference	Indirect reference	No reference	No reference	No reference
Malawi	Explicit reference	No reference	Explicit reference	No reference	No reference	No reference
Mali	Explicit reference	No reference	Indirect reference	No reference	Explicit reference	No reference
Niger	Explicit reference	Explicit reference	Indirect reference	Indirect reference	Explicit reference	No reference
Nigeria	Explicit reference	Explicit reference	Indirect reference	No reference	Empowered health workers	No reference
Tanzania	Explicit reference	No reference	Indirect reference	Indirect reference	Empowered health workers	No reference
Uganda	Explicit reference	Explicit reference	Explicit reference	Explicit reference	Explicit reference	Indirect reference

Legend: Explicit reference · Indirect reference · Empowered health workers · No reference

All ten strategies recognise the need for stronger governance of digital health and data.

All ten strategies recognise the need for stronger governance of digital health and data. The legal and regulatory environment for digital health is acknowledged to be weak in all countries, particularly in relation to protecting data security and confidentiality. Several strategies (Cameroon, Mali, Niger, Nigeria, and Uganda) note the existence of data protection laws but state that they are insufficient for governing health data (see Table 8). None of the strategies makes any reference to governing other aspects of digital transformations (such as the internet or digital health technologies) or the growing number of digital health actors that may have an impact on the achievement of health goals, particularly for children and youth.

Table 8: Gaps in legislation and regulation

	Legislation and regulation
Cameroon	No adequate law or regulation on digital health in Cameroon. But some legal instruments to regulate ICT. Draft instruments on telemedicine are being finalised.
D R Congo	Calls for legal and regulatory instruments governing the organisation and use of health data.
Ethiopia	Further legislation and regulation are required for HIS.
Liberia	Current laws aren't sufficient to ensure information security and confidentiality. Objective to develop and disseminate adequate legislation, policies, regulations and standards for HIS.
Malawi	National ICT policy aims to put in place appropriate institutional, regulatory, and legal frameworks to effectively support deployment and use of ICT.
Mali	Has laws on personal data protection but not specific to health. Plans to adopt legislative and regulatory measures specific to eHealth.
Niger	Has a law on protection of personal data but no specific laws on the use of medical data. Plans to create an inter-ministerial committee responsible for the legal framework around eHealth.
Nigeria	Existing privacy and security policies that are applicable to ICT. General right to privacy established in the Constitution. Data protection regulation adopted in 2019.
Tanzania	Objective to improve the legal and regulatory framework to ensure client safety, data security, confidentiality and privacy.
Uganda	Several laws and regulations which support but are not specific to digital health. Objective to establish and operationalise a legal and regulatory function for eHealth.

04

Barriers to implementing digital health strategies and other themes from key informant interviews
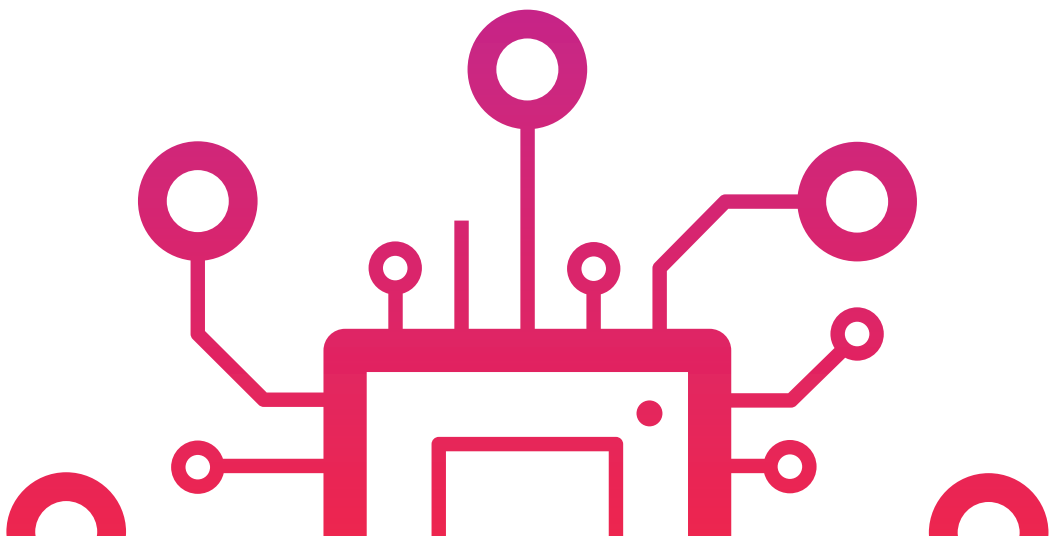
All ten countries in this study have a digital health strategy but the realisation of these strategies is not progressing at the anticipated pace. The following section presents an overview of the major barriers to implementation that could be identified from interviews from experts working in the ten countries, as well as complementary desk-based research.

Interview methodology
Between August and October 2020, 13 interviews or questionnaires were conducted with experts working in the ten focus countries. A semi-structured, open-ended questionnaire was shared with respondents in advance and used as an interview guide (see Annex 2). The same questions were offered as written questionnaire for respondents unable to attend an interview. While the researchers originally set out to interview at least three experts from each of the ten countries, locating suitable interviewees and conducting interviews during the COVID-19 pandemic proved challenging. As a result, a smaller sample was taken and researchers drew upon discussions with digital health experts, as well as desk-based research, conducted as part of the Commission's broader research agenda. Interviews were recorded and transcribed. Interview and questionnaire data was extracted and compiled in a database.
Data was manually coded using the rounded theory method. [33]

Respondents
Interview respondents represented different sectors: government; academia; civil society; international organisations; private sector; and donor agencies. Interviews were conducted under Chatham House rules so that respondents felt able to speak freely and in their personal capacities. Respondents' names or organisations are not recorded in this report to protect their anonymity.

Limitations
As noted above, identifying and interviewing digital health experts during the research period was extremely challenging. Despite regular outreach and follow-up by the researchers, it was not possible to secure interviews with the desired number and diversity group of experts from each of the ten countries. The majority of experts contacted did not have time to speak to the researchers or did not respond to their invitations to be interviewed. As a result, the findings from such a small sample size cannot claim to be representative of the ten countries.

33. Grounded theory means categorizing data into thematic categories which are identified by their repetitive emergence, arising naturally and in the exact language of interview respondents.

Barriers to implementation of digital health strategies

Major barriers to implementation described by interviewees fell into four broad categories: weak leadership and coordination; underinvestment in basic infrastructure; weak infostructure; and insufficient engagement of stakeholders.

4.2.1. Weak leadership and coordination

Not just in African countries, but everywhere around the world, realising a vision of digital health poses a challenge to leadership and governance systems. Digital health strategies cannot be implemented by a health ministry alone. Effective collaboration and working arrangements are required between the ministry of health and other ministries and government bodies, including those responsible for ICT and finance. Many regulatory questions related to digital health are cross-sectoral in nature, such as those related to data and privacy protection, and therefore demand coordination with ministries of justice and legislative bodies. Political leadership at the highest levels is therefore required to ensure that all of the relevant parts of government work together to support a country's vision for digital health. Interviewees suggested that further efforts were required in all countries to improve coordination between government departments, to allocate the necessary finances and human resources, and to create an enabling regulatory environment for digital health.

The problem is coordination and collaboration. Fragmentation is a big, big issue in the country. Of course, the problem is also because of money."
(DRC)

Health systems are inherently complex because beyond the executive branch of government, many other actors are involved. This represents a major challenge given a plethora of different IT-systems, data standards, and routine procedures that are used by hospitals, doctors, and payers. Given the strong reliance on data in one way or the other, such different systems often lead to issues of fragmentation that are

Gaps and obstacles in the implementation of national digital health policy frameworks can be ... the lack of an annual budget for ANTIM [National Agency of Telehealth and Medical Informatics] to cope with its programme of computerisation of health facilities across the country, despite ten years of existence as a structure created for digital health."
(Mali)

used by hospitals, doctors, and payers. Given the strong reliance on data in one way or the other, such different systems often lead to issues of fragmentation that are not easily overcome.

On top of these challenges, the influence of external donor organisations on the health systems in the ten countries analysed here can be substantial. While in Nigeria and Cameroon the external dependency of the health system financing is limited (~ 8 percent of current health expenditure), the share of external funds in the total health expenditure ranges from 17 percent in Niger to more than 30 percent in Tanzania, and over 50 percent in Malawi. But even when the financial reliance on external funds is not too large, external donors can have a significant influence on the innovation landscape by providing seed funding that pushes innovation into specific directions. Stronger government stewardship is required to bring diverse actors together and working in support of a national digital health strategy.

"There's that kind of disconnect between what the donor funded programmes want, and what is needed on a broader level.
They provide a solution that is not holistically integrated into the wider health plan or policy." (Nigeria)

34. World Development Indicators (2020) External health expenditure (% of current health expenditure) Last available data point: 2018.

4.2.2. Underinvestment in fundamental infrastructure

Digital transformation of health systems depends upon strong telecommunications infrastructure and electricity supply to connect health facilities, health workers and communities. Without these foundational investments – which are often considered to be outside the remit of a health ministry – in place all the way to the last mile, digital health tools and approaches can not be effectively applied. Interviewees constantly stressed how digital health interventions were often impeded by critical gaps in digital infrastructure such as irregular power supply and weak connectivity, particularly outside of urban areas. This was often attributed to investment gaps and a lack of clarity on who is responsible for what. Affordability of data and maintaining ICT hardware was also a recurrent theme in interviews. Some experts highlighted a trade-off health facilities and communities would face in which they have to balance the need to pay for data against other expenditures.

"

Electic power is still a big challenge. Many health facilites are without regular power. Even where solar or other energy sources are there, the skills and parts aren't there to keep them maintained. This undermines the whole network. Also, the way that health facilities are designed do not yet take into account of digital infrastructre - so they are still being built without thinking about cables and power sockets!" (Ethiopia)

Interviewees constantly stressed how digital health interventions were often impeded by critical gaps in digital infrastructure such as irregular power supply and weak connectivity, particularly outside of urban areas.

"

Even when you have access to a mobile phone, there is still a question of how fast you can connect to data, how much data you have, the cost of data. The subscriber base of mobile phones does not equate to the opportunity for using it to deliver care. At the end of the day, 8% of the population has smartphones, and a lot live in poor connectivity areas. So as long as the government keeps improving infrastructure, 5G and all that, there is a huge opportunity, but until we get to that structure, the bulk of the care will still be delivered direct provision. Rather than buying data, people prefer to send their kids to school and eat.
So there is a question about accessibility and affordability. But there is also a question about educating people about what the digital can do." (Nigeria)

Donor investments in digital health infrastructure were welcomed by interviewees but several expressed concerns about lack of coordination and alignment of donor funding with national digital health strategies. Interviewees appreciated growing interest in digital health from donors but often witnessed external resources going into digitalising vertical health programmes, rather than strengthening infrastructure that would benefit the whole health system. A number of interviewees noted the limitations of short term investments in, for example, computers or solar panels for facilities and digital devices for community health workers, that are not accompanied by longer-term support for maintenance and upgrades.

> "The problem is not money, there is always USAID, Global Fund, etc. But when they come, they invest in a disease. Their focus is malaria, TB, or pandemic response, but they forget infrastructure for all other diseases. … In the East of DRC there is better connection because it is run by the private sector. i.e. Vodaphone." (DRC)

The key reason that digital health interventions have 'blurry' boundaries of responsibility resulting in fundamental infrastructure gaps is often because of a misalignment of incentive structures amongst different stakeholders. These actors range from local, regional and national health governance and other relevant governance bodies depending on context; local, national and international NGOs; and a range of private sector companies. At the same time, some experts also highlighted positive developments wherever a multi-partner approach could be pursued. Uganda represents a major example that is closely followed by several of the experts for its coordination approach when it comes to digital health pilot programmes and external engagement.[35]

> When countries start to "move the needle" is when they can coordinate across multiple departments. For example, the national IT authority of Uganda received a 73 million loan from the World Bank to set up a national fibre network and one of the best data centers in Africa. International organisations worked with partner ministries to understand where would fibre go and how it would translate into the biggest impact for the country." (Uganda)

In addition to coordinating the incentives of donors, bringing together public and private sector goals is also an important mechanism to build the foundational infrastructure for digital health. Ethiopia is one example of a country where growing demand for connectivity has led to the opening of the telecom and data market, resulting in greater competition and reduced costs for consumers.

> The [Ethiopian] Government was able to negotiate an 80% cost reduction with Ethiotelecom to connect a VPN for health facilities (through cables and dongles) at federal and regional level (so not to the lowest level facilities yet). Now, around 40,000 locations are part of the VPN. This creates a foundation for digital tools." (Ethiopia)

4.2.3. Weak infrastructure

Optimising the potential of digital health at the population level requires a strong infostructures for data sharing and interoperability. Establishing interoperable health information systems is a strategic priority for all of the countries studied. When interviewees spoke about this topic, they expressed frustrations over persistent, siloed data and lack of standardisation. Whilst public health systems, donor-funded programmes and private sector actors are collectively generating growing volumes of data, they are inaccessible to other stakeholders leading to misconceptions that there is insufficient health data available for decision-making.

Establishing interoperable health information systems is a strategic priority for all of the countries studied.

35. See for example: Huang, F., Blaschke, S. & Lucas, H. (2017) Beyond pilotitis: taking digital health interventions to the national level in China and Uganda. Globalization and Health 13, 49.

> Data about Nigeria is hard to find, data about health care in Nigeria is more difficult to find. Less than 10% of health facilities in Nigeria are digitized. In terms of penetration it is still very low, the digital penetration in the health care system.' (Nigeria)

> Better standardisation and normalisation is needed to fix fragmentation. Health workers are still having to enter the same data multiples time into different information systems." (DRC)

Undertrained and underskilled health professionals were also mentioned as obstacles for effective use and management of interoperable health information systems. Low levels of digital health literacy and resistance to change are barriers to the uptake of new approaches and tools, particularly among older healthcare staff.

> Further sensitisation and ongoing training is required to change the culture around digital health and data, and to equip the health workforce with the necessary skills to collect and use health data.

A number of interviewees spoke with optimism about the next generation of young health professionals who are keener adopters of new technologies.

> Literacy is a barrier - community health workers tend to have only studied up to 10th grade. It takes a long time to train them to use new tools." (Ethiopia)

Finally, on the level of governance, interviewees stressed the importance of designing digital health infrastructures within paradigms of interoperability. This means striving

> Young health professionals are benefitting from an increased focus on training. Makerere University is supporting health worker training – both long term education programmes and short term training for community health workers – through a combination of trainings near to their location plus online learning." (Uganda)

to create comparable data, transferable data, and – similar to strategies to align donor incentives – thinking inter-ministerially to not duplicate infostructures that lead to siloed data; a concept some interviewees referred to as enterprise architecture, echoing the reccommendations of the recent WHO Digital Implementation Investment Guide.

> The role of the federal government is to i) coordinate their own existing data, and ii) provide avenues and practical means of engagement for non-public stakeholders to help feed into and contribute to the larger data infrastructure." (Nigeria)

> Enterprise architecture allows you to have a cohesive plan for how different actors can work together in the field. So you are not developing something just for yourself, you are developing a component that can fit within the larger system of components. What is ideal is coming to the model of the enterprise structure rather than coming to the drawing board and finding new ones. But, to build new systems where we don't have the technology, we need a center for coordination, a center for analyzing systems on what will be most useful." (Tanzania)

4.2.4. Insufficient stakeholder engagement

Lack of involvement of diverse stakeholder in the development of digital health strategies was perceived to contribute to slow implementation in many countries. Outside of a small group of stakeholders already working closely with governments on digital health, few people are aware that such strategies exist, let alone what their aspirations are. This leads to a lack of ownership among the wider digital health community and contributes to ongoing fragmentation. Private sector stakeholders, despite being major players in digital health, make very little contributions to the development of these strategies and have very little incentives for adoption. Tanzania was cited as an example of where concerted efforts are being made to popularise the national digital health strategy and to align stakeholders behind it's vision.

"

[There was] a lack of timely consultation of all stakeholders involved in the digital health process in Mali." (Mali)

"

I wasn't aware there was a digital health strategy until you contacted me. It looks good on paper but it hasn't been popularised and unlikely to have been developed through an inclusive process." (Cameroon)

"

As they started to create awareness of the national strategy, then there was some conversation of how actors can support the vision, and for the first time people were achieving and aiming for the same goal." (Tanzania)

Increased engagement of diverse stakeholders in the development and realisation of digital health strategies would increase demand on governments to accelerate progress and improve accountability. The inclusion of civil society and communities would also contribute to increasing individuals' knowledge of their rights and entitlements in relation to digital health and data.

"

Data is used for reporting up but isn't shared back with communities. Communities don't have access to the data and can't use it to understand the health challenges in their area and whether services are meeting their needs. Individuals need to have access to their own data and health information." (Ethiopia)

Should digital health strategies have a stronger focus on young people?

All interviewees were asked their perspectives on the lack of focus on young people within digital health strategies. None of the interviewees felt that this was an obvious gap in the strategies. Most noted that whilst young people are not specifically considered in digital health strategies, child and adolescent health are clearly articulated priorities within broader health strategies and policies.

> As long as programmess are geared towards youth they will benefit. That is the ancillary benefit." (Uganda)

> The improvement of the health system through new technologies has had a direct impact on the health of young people and adolescents." (Mali)

Several interviewees noted the demographic distribution in Africa to be a strong indicator for the future growth and adoption of digital health technologies. Young people, namely those in urban areas, were seen to more easily adopt digital technology and prioritise the need for broadband access, mobile phones, and the electricity required to power them. Young people are also helping to educate older family members about digital health. Some of the interviewees shared examples of their own work with young people who are training in digital health and involved in the development of digital health solutions.

> Young health professionals and community health workers are benefitting from an increased focus on training. We have seen a higher interest in learning about digital health from young people." (Uganda)

When asked whether future digital health strategies should include a specific focus on young people, interviewees fell into two camps. One group felt that strategies should maintain a whole population approach and that looking at different population groups may lead to unnecessary complexity and even further fragmentation.

> As far as digital health is concerned ... it is a sector that needs to be non-discriminatory. Much more specifically, for specific services, for example in adolescent health, the system would be very specific to consider how it is addressing adolescent health. We are now trying to take a holistic view and ensure whatever is being done [in digital health] will impact a wide range of stakeholders including adolescents, maternal, young girls, everybody." (Tanzania)

Other interviewees felt that future digital health strategies should pay greater attention to the specific needs of children and adolescents and involve them in the strategy development process. They noted that young people are both the main users of digital technologies and they have particular health and developmental needs that can be positively and negatively impacted by digital transformations. Some argued for example, that strategies should recognise the risks that young people are exposed to through digital means and their need for stronger protections in relation to their health data. One interviewee highlighted a gap in evidence about young people's behaviours in relation to digital health.

> [The] revised digital health strategy should have focus on different population groups and justify why. Children, adolescents and youth would be important to include. There are ways that digital technologies can incentivise positive behaviours and they are more attracted to digital technologies. They can also be negatively influenced. We have seen the benefits of tech in the COVID response. Certain issues that young people can talk about using digital tech; they would exchange more. Benefits for self-management of HIV. More confidential sources of information." (Uganda)

Understanding of and expectations towards digital health

'Digital health' has remained an umbrella topic as exemplified by the WHO's Digital Health Strategy from 2020: "Digital health expands the concept of eHealth to include digital consumers, with a wider range of smart and connected devices. It also encompasses other uses of digital technologies for health such as the Internet of Things, advanced computing, big data analytics, artificial intelligence including machine learning, and robotics." However, as could be seen from both the strategies of the ten countries and the analysis of research articles on digital health in countries in Sub-Saharan Africa (Figure 2), the interpretation of digital health in many of these countries follows a more narrow approach, reflecting their levels of digital maturity.

The focus of both the digital health strategies and the key informant interviews was primarily on health information systems and the expansion of eHealth and mHealth technologies for appointment bookings; managing electronic medical records; improved doctor-patient communication; health knowledge sharing; data mobility and accessibility; and coordinating laboratory testing. In particular, telemedicine was mentioned frequently – not a new technology but one that is still emerging in the clinical everyday life. The presence of digital technology was often talked about as a non-continuous process with innovations here and there, but also subject to trends or "fashions".

"

Optical fibre has made its appearance in health establishments (public/private hospitals).
The computerisation of health establishments has been fashionable for the past ten years, daily telemedicine is slowly being prepared in the country to become a daily act of health establishments." (Mali)

"

The whole consumer health care aspect is still at the fringes of the situation. People search YouTube or Google for symptoms. But anything more specialised is still niche. [...]
Digital health in Nigeria is essentially mobile health." (Nigeria)

Digital technologies were seen as tools that have to prove their viability within the context of the national health system but are linked to expectations regarding greater efficiency of services from the perspectives of health personnel, the patients, and private companies.

"

There are 80 million people in the DRC. To have one doctor per 7,000 people, that is the desirable rate. DRC does not have that. And that is why digital health is important: You have a nurse in the health facility and the nurse can access the doctor via digital health. You can do teleconsultation. It is the best way to provide good health care to people." (DRC)

"

How telehealth works [now]: direct to consumer telehealth companies have doctors who you can call and chat with. And health insurance companies also have a telehealth direct to consumer component within them because they are trying to reduce 'going to the doctor' because that is cheaper for them." (Nigeria)
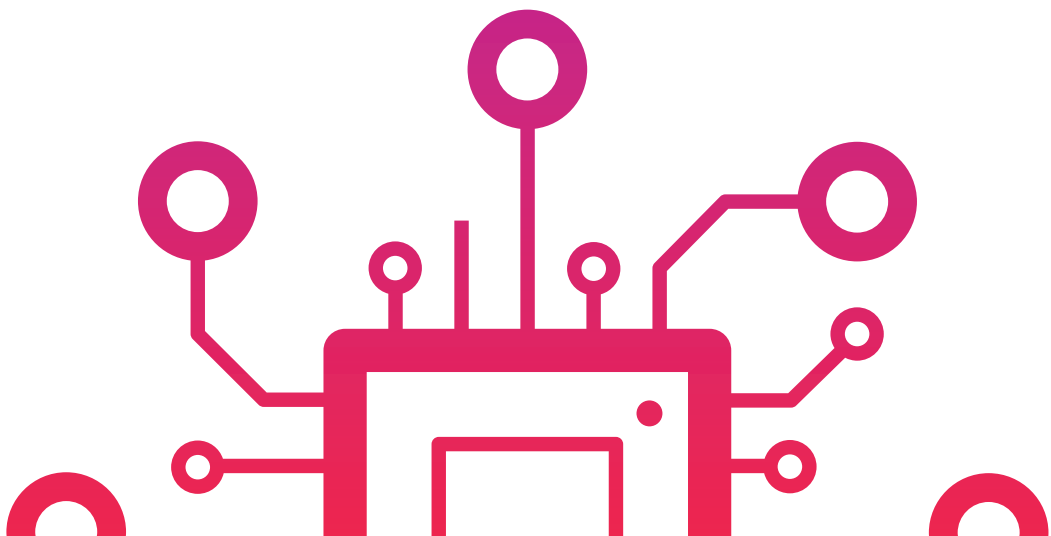
How useful are digital health strategies?

During some interviews, discussions about the utility of digital health strategies emerged. Expectations of what a digital health strategy could and should do varied among interviewees. Some felt that digital health strategies are important for setting the agenda and coordinating investment; others were more sceptical about their value within capacity strained governments. Standards and guidance that are not backed by sufficient political will and resources will not deliver the intended changes. To fully realise the potential of national digital health strategies, interviewees stressed the importance of strategies not being overly ambitious and linked to realistic budgets. More inclusive strategy development processes that involve all key implementation partners and beneficiary groups will reduce the chance of digital health strategies sitting on a shelf.

"

It's good to have standards and guidance but you also need support for guidance. It has to be made a live strategy, linked to budgets and actual resources. This is how I would judge the feasibility of the strategy is what are the resources and who are the stakeholders involved?" (Regional expert)

05 Policy implications and recommendations

This study finds that the implementation of digital health strategies in the ten countries lags behind because of several reasons:

01 Political leadership to coordinate actors in support of a common strategy and to mobilise the necessary resources is not strong enough in many of the countries

02 Underinvestment in the foundational infrastructure and infostructure for digital health is resulting in low levels of readiness and maturity

03 Insufficient involvement of diverse stakeholders in the development, popularisation and implementation of digital health strategies is leading to a lack of ownership and accountability, as well as strategies that do not reflect the needs and priorities of young people and other underrepresented groups.

These challenges are not unique to these ten countries but are experienced by many low and middle-income countries at emerging stages of digital maturity. In order for the full potential of digital health to be realised, particularly in those countries with the largest populations of young people, policymakers can take the following five recommendations under consideration when developing future digital health strategies.

Policy Recommendations

01 **Adopt an inclusive strategy formulation and design process:**

Public health agencies responsible for the development of national guidelines and strategies for digital health need to include all relevant stakeholders from across and outside of government to increase the ownership, coordination and investment required for successful implementation and accountability. Key groups to involve include other public agencies from the ICT, education, public infrastructure, and finance sectors; private sector actors involved in digital health and ICT; donors; civil society organisation; and representatives from diverse communities who will be directly or indirectly impacted by the strategy. Involving young people as equal partners in the development of digital health strategies will help to produce strategies that respond to the health needs of the young population today, as well as the health needs of future generations.

02 **Set realistic goals:**

Rather than setting overambitious and under budgeted digital health strategies that sit on a shelf, governments should develop goals and objectives that are feasible for the country's context, level of digital maturity and likely budget. Where fundamental infrastructure for digital health is weak, strategies should align with broader national ICT strategies and prioritise building the infrastructure required to connect all health facilities and households, upon which an effective digital health infrastructure can then be laid. Adopting an inclusive approach to strategy development will help with finding the right balance between ambition and achievability.

Policy Recommendations

03 Strengthen health data repository and access:

Approaches to digital health should continue to prioritise the effective collection and use of health data to support public health goals. Public health agencies can play a key role as data aggregators and repositories; encouraging data sharing and providing public access to health data – both internal and private-sector generated health data – whilst creating the governance mechanisms necessary to protect individual privacy. As digital maturity increases, health ministries should explore ways to leverage advances in machine learning and artificial intelligence to develop better insights from multiple sources of data.

04 Improve the digital health literacy and skills of health workers and communities:

Digital health literacy of the health workforce and wider population is a key component of digital readiness which eventually drives further digital health adoption. Building young people's digital literacy and skills is particularly vital for them to be able to critically and safely engage with digital technologies, effectively manage their health and health data, and become future digital health innovators. Updates to national education programmes and training curricula for health workers should therefore include components on building digital literacy and digital health literacy.

05 Apply a set of core values and principles to digital health transformations:

To ensure that no one is left behind in the digital transformation process, and that any risks related to digital health are mitigated, national approaches to digital health should be grounded in a set of core values and principles such as equity, human rights, inclusion, democracy, and solidarity. Future digital health strategies can more explicitly outline how such principles will be applied to all aspects of digital health and how the health-related impacts of digital transformations outside the health sector – including opportunities and risks to young people's health and well-being – will be monitored and acted upon.

Annex 1: Summary of digital health strategies

Cameroon

The Government of Cameroon's plan for Digital Cameroon by 2020 outlines the country's desire to digitally transform all sectors. The government has recognised that digital health interventions can strengthen health systems at different levels and contribute to UHC. Their vision is that by 2024, reliable, robust, secure and interoperable systems will support more informed decision-making.

Cameroon's first National Digital Health Strategic Plan (2020 – 2024) sets out a roadmap for the development of digital health services to improve health promotion, disease prevention, case management, health system strengthening and governance, and strategic management of the health system. Other national health policies such as the National Health Development Plan (2016-2020) and Health Sector Strategy (2016-2027) highlight the need to strengthen health management information systems to improve data for decision-making but do not include any references to digital health techn ologies.

The strategy aims to use digital technology and data to transform all pillars of the health system. The main digital health services that will be developed include birth and death notification; stock management; telemedicine; patient-targeted communication; health status tracking; health worker decision support; and mobile learning for health workers. Major activities planned over the strategy period include creation of a national digital health committee; establishment of the regulatory and legislative framework; a digital health investment fund; telemedicine for patients and the community; integrated electronic hospital management system; interconnection and provision of IT equipment for 3,000 health facilities; and definition of the interoperability framework and software accreditation process

The National Digital Health Strategic Plan notes Cameroon's young population and the opportunity presented by young ICT innovators. Other health policies place high priority on improving child and adolescent health with an emphasis on HIV and family planning.

DRC

In March 2019, the Ministry of Health launched the DRC's first digital health agency, the National Agency for Clinical Engineering, Information and Health Informatics (ANICiiS). The agency led the development of the new digital health strategy and will oversee and accelerate the use of new technologies, including telemedicine, connectivity for the health information system, and biomedical equipment.

The National Health Informatics Development Plan (PNDIS) (2020-2024) was developed to support the objectives of the National Health Development Plan (PNDS) which include achieving UHC and improving the health of women, children and adolescents. The PNDIS recognises that more reliable and timely information is essential for optimising both health care and decision-making in support of UHC, and the potential of digital health tools to promote the health of children and adolescents. The PNDIS is also aligned with the National Digital Plan: Horizon 2025 which sets out the country's ambition to take advantage of digital opportunities and its young population to support inclusive growth and sustainable development.

The PNDIS is a comprehensive plan for strengthening the national health information system and designing a new architecture for optimal management of health information. The plan's vision is to create an integrated health information system informed by first-line digital tools which are focused on patients and health professionals. The PNDIS recognises that limited progress has been made since the publication of the first PNDIS in 2014 and that significant challenges must be addressed to overcome the digital divide including addressing weaknesses in the infrastructure, network, energy required for the deployment of digital health. The plan also highlights the need for extensive training for health workers and the importance of communicating new approaches to health professionals and the public in order to overcome any resistance to change.

A key expected result of the PNDIS by 2024 is that all health facilities will have integrated and interoperable tools for information management, reporting and clinical support for health workers. Legal and regulatory instruments will be developed for digital health and management of patient data that respects privacy. Tools will be developed to support Health worker training, skills and capacity through extensive training and digital tools.

Ethiopia

The Federal Ministry of Health of Ethiopia introduced the second Health Sector Transformation Plan (HSTP2) in 2020 which focuses on achieving equitable and affordable access to health services. One of the transformation

Annex 1: Summary of digital health strategies

agendas in the HSTP2 is the Information Revolution highlighting the phenomenal advancement in the methods and practice of collecting, analysing, presenting, and disseminating information that can influence decisions in the process of transforming economic and social sectors. The Plan entails a radical shift from traditional methods of data utilisation to a systematic information management approach powered by a corresponding level of technology.

The Information Revolution Roadmap II (2020-29) and forthcoming Information Revolution Strategic Plan (2018-2025) elaborate the Government of Ethiopia's vision of a strong health information system that produces high quality data and becomes a credible source of health information. This will be achieved through changing the culture around data use; digitalising health information systems and improving interoperability; and strengthening governance and leadership. Objectives of the Roadmap include enhancing informed decision making; improving data quality; enhanced digital health information technology; and improved HIS governance and leadership. Underpinning these objectives are strategies to improve health IT infrastructure and to improve the HIS capacity of the health workforce.

Guiding principles for the Ethiopian health sector include equity, gender equality and a focus on youth. Within the Health Sector Transformation Plan, adolescent and youth health is discussed in the context of reproductive health and the need for targeted HIV prevention among youth.

Liberia

Following the Ebola epidemic in 2014-2015, Liberia embarked on a strategic planning process to develop its Health Information System & ICT Strategic Plan (2016-2021) which focuses on strengthening fragmented health information systems to have the "right information at the right time and in the right place". By 2021, the Government of Liberia aims to have health information systems that produce high quality data and information with a solid governance and management structure, using appropriate information and communication technology, including data confidentiality and security, at an affordable cost.

Planned activities include developing master facility registries, universal patient IDs, and establishing a mechanism to ensure information security and confidentiality. The strategic plan also aims to identify areas for the use of appropriate mHealth interventions building on the success of mHero, a mobile phone-based system used by community health workers. Improving internet coverage, strengthening ICT infrastructure and increasing skilled staff are identified as necessary steps for delivering on the actions in the plan. The current National Public Health Law also needs to be updated to cover aspects of vital registration, notifiable diseases, private sector data, confidentiality and fundamental principles of official statistics.

The Liberian National Health and Social Welfare Policy (2011-2021) includes commitments to strengthening ICT and health information systems but does not refer to other forms of digital technology. Two distinct packages of services serve as the cornerstones of the strategy to improve the health and social welfare of all people in Liberia: the gender-sensitive Essential Package of Health Services (EPHS) and a planned Essential Package of Social Services (EPSS). Both prioritise child and adolescent health. It is noted in the situation analysis that Liberia's growing population is young and increasingly urban. The policy refers to plans to develop a web-based health management information portal with interface software; these activities that are now well-advanced.

Malawi

Through the Digital Malawi Program, Malawi is building the digital foundations needed to modernise government operations, enable citizens to access information and public services online and provide youth with digital skills. In a similar vein, Malawi's previous National eHealth Strategy (2011-2016) sought to build ICT infrastructure and develop standards, connectivity services and health workforce capacity required to deliver national health goals.

Whilst the eHealth strategy has not yet been updated, a Monitoring, Evaluation and Health Information Systems Strategy (2017-2022) sets out Malawi's ambitions to strengthen health information systems to monitor implementation of the national health strategic plan and to boost the health sector's capacity to use data for decision-making. The Ministry of Health and Population aims to fully transition from paper-based to electronic systems at the point of care to leverage the power of ICT in the generation of real-time decision support data. An interoperability layer will be developed to allow data to be linked and shared across all parts of the health information management system. Human rights and privacy are key principles of the MEHIS strategy.

Child and adolescent health is a high priority for the Health Sector Strategic Plan II (2017–2022) which aims to

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move towards UHC. The strategic plan includes an objective on expanding the effective use of information technology to improve the quality, availability and continuity of healthcare. This will be achieved by developing ICT infrastructure; connecting facilities to broadband internet; training more staff in ICTs for health and establishing minimum ICT systems at all levels of the health system. Malawi's National Community Health Strategy (2017-2022) includes proposed activities to build a strong community health information system with increased numbers of community health workers using mHealth tools to support service delivery and data collection.

Mali

The Malian Ministry of Health set up the National Telehealth and Informatics Agency of Mali (ANTIM) in 2008 whose main mission is the promotion and development of telehealth and medical informatics in Mali. Since its establishment, progress has been made in various fields including telemedicine and training in rural areas. These applications have shown the need for further scaling up of telehealth.

ANTIM have plans to develop eHealth and mHealth strategies to build on the 2013 National eHealth Policy. This policy provides guidelines and priorities for implementing eHealth in Mali. It outlines the government's commitment to harness new technologies such as telemedicine and e-learning for health workers which will help to improve access and quality of care for patients, especially those who live long distances from facilities.

The main objectives of the policy are to establish national ICT infrastructure capable of supporting eHealth applications; modernise the National Health and Social Information System; and to use ICT as a decision-making tool. All activities are in support of broader national health plans such as the 10-Year Health and Social Development Plan. The most recent 10-year plan for 2014-2023 calls for eHealth to be scaled up to improve the quality of diagnosis and disease management, training, strengthen the health information system and research.

The priority interventions for this scaling-up are strengthening the institutional framework and ANTIM capacities for the coordination and support of the scaling up process of telehealth; strengthening technical capacities of health facilities at all levels in ICT; and development and implementation of strategies for the application of telehealth to the various components of the health system. Noting the very young population and high birth and fertility rates, the 10-year plan prioritises reproductive, maternal, newborn, child and adolescent health and family planning. In 2020, the Ministry of Health began working with partners on the development of a new eHealth strategy.

Niger

The President of Niger launched the President's Renaissance Programme in 2016 which includes flagship commitments such as connecting 15,000 villages with eHealth and other e-services. Commitments around energy infrastructure and electrification will support increased connectivity and use of digital technology for health. The National Agency for the Information Society (ANSI), created in 2017, is responsible for developing and implementing government projects in the field of ICT services.

The National eHealth Strategy 2019-2023 and accompanying strategic plan reflects the Ministry of Public Health's desire to use eHealth services to support implementation of the national health policy and Health Development Plan (PDS) 2017-2021. The vision outlined in the strategy is that by 2030, ICT will be used at all levels of the health system to make reliable, secure and up-to-date health and medical information available, improve the quality of care and its accessibility, and make the management of health structures efficient. The creation of a national digital health network is a high priority to allow the interconnection of health facilities and facilitate the exchange of secure health data.

Creating a foundation for the development and use of eHealth services is a core pillar of the strategy. Increasing connectivity, strengthening human resources for health and ICT specialists, and developing guidelines on standards and interoperability are all required for the effective development and provision of eHealth services particularly to improve maternal and child health and to increase coverage of health services to hard-to-reach populations such as nomads and remote communities.

Improved governance and leadership are also priorities for the strategy. Although a substantial proportion of Nigeriens are unconnected, several telemedicine and mobile health services are operated by non-governmental organisations across the country. Under the new strategy, the Ministry of Health seeks greater involvement and oversight of these initiatives. An inter-ministerial committee will be created with responsibility for legal and

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regulatory frameworks related to ICT and health. An administrative commission in charge of managing personal data will also be established to implement existing laws on the protection of personal data and electronic communications.

Nigeria

Nigeria's National Health ICT Strategic Framework 2015 – 2020 is a roadmap of actions for the strategic application of ICT to help achieve UHC and other health goals. The framework notes that there is already widespread application of ICT for healthcare across Nigeria but the ecosystem is uncoordinated. There are numerous digital health tools at varying degrees of maturity implemented throughout the country and there is a need to further integrate mHealth into national health programming, especially in underserved regions.

Guided by the building blocks of the ITU-WHO eHealth Strategy Toolkit, the framework sets out steps to improve access to health services by using telemedicine and other ICTs for health worker training and support. Mobile messaging and cash transfer incentives will be used to increase demand for health services, and effective use of civil registration and vital statistics (CRVS) and other information management systems will help to increase health equity by ensuring appropriate services are delivered to those who need them. ICT will be used to enhance health worker education and decision support, and to strengthen the national health insurance scheme.

To monitor implementation of the framework, the government of Nigeria will track a range of indicators including health facility connectivity; health worker training and use of ICT; citizen enrolment in national health insurance system; registration of births and pregnancies; and use of mobile health services (by pregnant mothers and mobile conditional cash transfer programmes). Children or young people are not explicitly considered in the framework.

Tanzania

The Government of Tanzania has demonstrated strong leadership and commitment to use digital technologies to transform the whole health system. The Tanzania National Digital Health Strategy 2019–2024 supports implementation of the Health Sector Strategic Plan 2015–2020 and its aims to expand provision of high-quality health care to all households and realise UHC in Tanzania. It is also aligned with the broader Tanzania Development Vision 2025. The vision of the National Digital Health Strategy is better health outcomes through a digitally enabled health system. The Strategy recognises digital health as an important enabler in transforming health care delivery by supporting health care processes and providing access to information, as well as facilitating management and decision making in the health sector.

Under Tanzania's previous digital health strategy (covering 2013-18), the country installed local area networks and national ICT backbone network in national, zonal, and regional hospitals. The eHealth governance and leadership at the national level was also established. Outstanding challenges to be addressed through the new strategy include inadequate ICT infrastructure; unreliable electric power supply; limited financial resources; inadequate skilled ICT personnel; limited eHealth skills amongst users and decision makers; and resistance to the adoption of eHealth solutions. Health information systems also remain fragmented and not fully interoperable.

Ambitious targets included in the strategy include developing legislation, regulations, and guidelines for ensuring client safety, health data security, confidentiality, and privacy by December 2021. By 2024 the Ministry of Health, Community Development, Gender, Elderly and Children aims for all health facilities with digitalised care services in place; Interactive digital platforms for information, education and communication (IEC) used by 75% of mobile phones and Internet subscribers; and 80% of all health workers trained on data use. Looking further to the future, the Ministry commits to invest in research, innovation, and development to explore how existing and emerging digital technologies such as AI can be harnessed to inform evidence-based and cost-effective application of digital health technologies.

Uganda

The Government of Uganda plays a central role in co-ordinating digital health initiatives in the country to overcome challenges associated with fragmented and unsustainable digital health pilots. eHealth is recognised as a priority in Uganda's National Development Plan II (2016-2020) and well elaborated in the Health Sector Strategic and Investment Plan II as an as a key enabler for supporting the health system to deliver good health to the population.

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The two guiding documents for digital health are the [Uganda National eHealth Strategy (2017-2021)](#) and 2016 [National eHealth Policy](#). The eHealth Strategy and Policy have 13 pillars: leadership and governance; eHealth Enterprise Architecture, Interoperability and Standards; eHealth Services, Information Sharing and Data Management; Infrastructure; eHealth Information Assurance; Ethics; Human Resources and Capacity Building; Mainstreaming Special Interest Groups; Research, Innovation and Development; eHealth Investment; Stakeholder Engagement, Collaborations, Advocacy and Smart Partnerships; Business Process Re-Engineering; and Legal and Regulatory Framework for eHealth.

Specific objectives under each pillar focus on improving patient care and empowering patients to manage their own health. The strategy emphasises improving access to underserved communities and vulnerable populations, but children and young people are not identified as a special interest group. Telehealth and mHealth services will enable electronic delivery of quality health care to individuals in remote areas and provide means for individuals to influence health systems. Mass campaigns will be designed to increase awareness and knowledge of eHealth. As outlined in the Health Sector Development Plan (2015/16-2019/20), a more comprehensive and harmonised knowledge management approach is still needed in the sector.

Annex 2: Interview guide

The following questions were shared with key informants in advance and were used to help structure the interview.

Request for key informant interviews

The Commission wishes to interview 20-30 experts from ten countries with large populations of young people under the age of 25 about national priorities, activities, and challenges in relation to digital health.
The objective of this series of interviews is to identify opportunities and challenges for strengthening and governing digitally-enabled health systems in sub-Saharan Africa that support the health and well-being of the region's young and increasingly connected population.
The interviews will complement desk-based research and analysis of national digital health strategies and other publicly available information and data. Interviewees will be invited to a virtual meeting later in the year to discuss the findings from the research and interviews. All information provided will help to inform the Commission's report and recommendations.

Interviewee profiles

Interviewees should have in-depth knowledge of the country's digital health policies, and current and future plans for digital transformation of the health sector. For example:
- Government officials involved in the development, monitoring, and implementation of digital health policies and programmes.
- Implementers of national digital health programmes.
- International organisations supporting the development, monitoring, and implementation of national digital health policies and programmes.

Questions

The questions are structured into four blocks: Digital infrastructure, digital health, growing up in a digital world, governance of data in health. The focus of the conversation lies on the implementation situation. That is: What is the situation in the countries observed by the interviewees.

1. Digital infrastructure (i.e. access to internet, mobile phone availability, data affordability...)
> **1.1** What opportunities have opened up in your country as a result of improved digital infrastructure?
> **1.2** How have improvements to digital infrastructure benefited the health system?
> **1.3** What are the outstanding gaps/problems when it comes to the digital infrastructure?
> **1.4** What steps has your country taken to improve the digital infrastructure in recent years?

2. Digital health (i.e. telemedicine, use of wearables, internet use for information seeking, artificial intelligence)
> **2.1** What are the most significant changes that you have observed in the area of digital health?
> **2.2** How have children and young people (below 25 yrs) benefited from these?
> **2.3** Where do you see the largest gaps and barriers in implementation of the national digital health strategy?
> **2.4** Are there further steps that you see your country taking to push for further digital transformation of the health system?

3. Growing up in a digital world
> **3.1** How are young people and children considered specifically in the digital (health) policies?
> **3.2** Are young people included in monitoring/implementation of digital health and policy development? If so, how
> **3.3** How do you think digital health approaches could better support young people's health and well-being in the future?

4. Governance of data in health
> **4.1** Does your country have data protection laws in place with specific regard of health data?
> **4.2** Are there special governance and protection rules for children and young people?
> **4.3** What are the barriers to effective implementation?

A report by

The Lancet and Financial Times Commission titled
Governing health futures 2030 : Growing up in a digital world