The State of Digital Health 2023

Global Digital Health Monitor

Acknowledgments

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Executive Summary

WHO is working, across all its six regions and with member-states, to amplify the use of the Global Digital Health Monitor as an official WHO maturity instrument. Under the new Global Initiative on Digital Health we see the Monitor as an important tool to develop country plans and align limited resources towards building strong foundations. We're really excited about this partnership and what it can do to support digital health transformation.

- DR. ALAIN LABRIQUE, DIRECTOR, DEPARTMENT OF DIGITAL HEALTH & INNOVATION AT WHO

The State of Digital Health Report 2023 offers a comprehensive analysis of global digital health trends based on data from 67 countries across all WHO regions participating in the Global Digital Health Monitor (GDHM), complemented by secondary data from other sources. The GDHM, a multi-stakeholder, web-based platform, provides insights into the digital health maturity of countries across seven digital health enabling environment component areas. This report reflects progress since the State of Digital Health Report 2019, expanding on the GDHM's participation from 22 countries in 2018 to 67 in 2023. It also contextualizes the analyses within a broader context of complementary trends analyses and digital health initiatives. The year 2023 witnessed tremendous activity worldwide in the digital transformation of health systems, culminating in the launch of the World Health Organization's <u>Global Initiative on Digital Health</u>.

The GDHM undertook a review and redesign in 2022 and was relaunched in 2023 alongside the World Health Assembly in Geneva, Switzerland to align with WHO's global Digital Health Strategy and meet present realities post-COVID-19. The GDHM indicators were updated to ensure consideration for emerging technology and AI, equity, gender, Universal Health Coverage, person-centered health, and population health. The indicators are mapped to a 5 Phase Maturity Scale, captured through an annual survey, to enable countries to understand where they are now and, more importantly, to prioritize where they should invest. It then enables countries to monitor their investments year on year. In 2023, the GDHM was approved as a Digital Square Content Global Good. Participating countries use the GDHM to benchmark, compare themselves globally or regionally, and monitor progress. For non-participating countries, publicly available data is used to estimate digital health maturity, encouraging these countries to participate in a more accurate representation of national and global digital health maturity.

Of the 67 participating countries, most countries (40%) are at Phase 3 of digital health maturity, followed by 33% at Phase 2 and 22% at Phase 4. No country is at Phase 1, indicating growing advancements in digital health. Across the seven components of the digital health enabling environment as defined by the WHO/ ITU eHealth Strategy Toolkit, Leadership and Governance is the most mature, while Workforce is the least. The following is a high-level breakdown of the state of digital health across participating countries by component.

Leadership and Governance: A third of countries are either at Phase 4 or 5, making this component the highest performing component. Significant efforts are also ongoing and focused on promoting equity and gender balance in digital health programs. There is a notable rise in the adoption of emerging technologies like AI, blockchain, IoT, and VR in healthcare. However, 55% of countries show no progress in readiness for at least one of these technologies.

Strategy and Investment: Many countries have developed national digital health strategies, but only 47% are in Phase 3 or above in Strategy and Investment. Digital health funding remains insufficient in most countries, with 90% of them meeting only half of countries' national digital health needs. A supportive environment for private sector investment is also limited and focused largely in high-income countries.

Workforce: The workforce is the lowest performing component, with over 50% of countries yet to integrate digital health in pre-service or in-service training for health professionals. In addition, over 70% of participating countries do not have a defined public sector career path for digital health.

Legislation, Policy, and Compliance: Almost half of the countries indicate Phase 4 or 5 in the Legal Framework for data protection and for privacy, consent, and confidentiality. Over half do not have any mechanism for certifying AI in health applications.

Standards and Interoperability: While most countries have adopted standards, many do not have national architectures or health information exchanges to enable individuals' health information to move seamlessly through the health system.

Infrastructure: Infrastructure and network readiness have increased in maturity, particularly during the COVID-19 pandemic. However, it still needs to be at the highest levels of maturity required for full digital transformation of health.

Services and Applications: Most countries do not have digital health interventions that align with their national health priorities, but they do have the foundational building blocks to support them in the form of national registries. While many countries have digital health systems that help monitor population health, many do not have patient feedback

UNICEF advocates for an integrated, multi-sectoral approach to digitally transforming health systems. The GDHM provides a critical window into the digital readiness of countries, helping Governments and Partners to prioritize which enablers - from governance to standards, human resources to financing - need to be strengthened for their strategies to be successfully operationalized. As UNICEF, we are excited to see the recent uptake and momentum around the GDHM, which we believe will ultimately result in investments that will increase accessibility and quality of digitally enabled health interventions for children.

- SEAN BLASCHKE, SENIOR HEALTH SPECIALIST AT UNICEF

To plan, align resources, and provide technical assistance that is tailored to the country context, GDHM is helpful as a reference baseline. Building on AeHIN's partnership with HealthEnabled since the beginning of this effort, we are glad to share that some of the countries from the Asia Region have started using the data from GDHM surveys towards bridging the capacity and investment gaps in their national digital health programs.

- JAI GANESH UDAYASANKARAN, EXECUTIVE DIRECTOR, AEHIN

systems to engage individuals in reflecting on the quality of the services they are receiving.

Comparisons between the State of Digital Health 2019 and 2023 highlight the effects of COVID-19 with accelerated investment in Infrastructure as well as the adoption of Services and Applications within the health system in support of remote health service delivery, including telehealth, digital self-care, remote patient monitoring, and portable personal health records. It also increased the adoption of global standards, including those related to vaccination certification, resulting in an increase in maturity of the indicator related to cross-border data sharing and use.

The State of Digital Health 2023 highlights the advancements in digital health across various components of the enabling environment. It emphasizes the need for a more inclusive and intentional approach to digital health alongside strategies and policies to harness the benefits and mitigate risks of emerging technology, such as Generative AI. It also highlights a persistent gap in the Workforce needed to design, use, and deploy digital health interventions. Through systematic prioritization and monitoring of digital health investments, we can more effectively leverage digital health technologies to achieve Universal Health Coverage, improve health outcomes, and strengthen health systems.

THE GLOBAL INITIATIVE ON DIGITAL HEALTH (GIDH)

GIDH, or "*Guide*", was launched in August 2023, as a key outcome of this year's G20 health working group process. Given the rapidly growing demand from countries to move from a state of digital health experimentation to systematic digital health transformation, stronger alignment and cooperation across the ecosystem is needed. As noted in this report, investments in the enabling environment and foundations are lagging behind, and fragmentation in technical support and resource allocation continues to hinder effective progress across the globe. *Guide*, a WHO-managed network of networks, builds on experiences gained during the COVID-19 pandemic to strengthen mechanisms for country support, and develop the tools and quality-assured content and technologies that countries need to be in the driver's seat of their own digital health transformation. *Guide* plans to strengthen knowledge sharing across stakeholder groups, communities of practice and technical agencies. *Guide* will initially work in lighthouse countries to support public sector leadership and focus development partner efforts in achieving articulated digital transformation priorities. The Monitor will serve as an important instrument for the priority setting and monitoring progress.

Introduction

Welcome to the State of Digital Health 2023 Report, a comprehensive analysis of the trends in digital health based on 67 countries that participated in the Global Digital Health Monitor (GDHM) in 2023, representing over one-third of all countries across all regions of the world.

The GDHM is a multi-stakeholder interactive web-based open data platform and global public good that provides visibility into the status and historical progression of key standard digital health performance indicators at national, regional, and global levels. It empowers health ministries, policymakers, and industry to make intelligent and informed strategic decisions about how and where to allocate resources as they strive to improve health and well-being for all through digital transformation of national health systems.

Developed through an intensive participatory process involving governments from high, middle, and low-income countries, the GDHM benchmarks countries along a five-phase maturity model against 23 standardized digital health indicators. It serves as a keystone for the World Health Organization (WHO) Global Initiative on Digital Health and uses the WHO/ITU eHealth Strategy Toolkit as the underlying framework. It was originally launched at the World Health Assembly as the Global Digital Health Index and Maturity Model in 2018 alongside the WHO Digital Health Resolution and has since undergone a comprehensive review and redesign process to better contribute to the WHO Global Strategy on Digital Health 2020-2025 with updated indicators reflecting Universal Health Coverage, pandemic preparedness, person-centered health, population health, emerging technologies, and equity/ human rights – including gender.

Governments use the GDHM to inform the development of national digital health strategies and policies at national and sub-national levels. Along with WHO, the World Bank; Africa CDC; UNICEF; The Global Fund to Fight AIDS, Tuberculosis and Malaria; Gavi, the Vaccine Alliance; and other international organizations are using the GDHM to prioritize funding and investments and monitor performance. In 2023, The Global Fund supported country mobilization for 55 high-impact and core countries, the majority of which are in Africa and Asia. These and some additional countries were also mobilized to participate through global and regional networks such as the Asia eHealth Information Network (AeHIN), the

It is vital that we have a standard benchmarking approach and methodology to make decisions on where to invest. The Global Digital Health Monitor provides a great opportunity to do this.

- MARK LANDRY, SENIOR SPECIALIST, COUNTRY DIGITAL HEALTH INFORMATION SYSTEMS, THE GLOBAL FUND

THEORY OF CHANGE

If ▶ Then ▶ This

countries are able to measure and monitor their progress and maturity in digital health

they can identify key gaps to inform the development of policies, scale up and integration of systems and investment in human and financial capital

contributes to a supportive enabling environment and the availability, quality, and use of data to measure and track the strength of the health system and the ability for countries to achieve Universal Health Coverage and improved health outcomes

International Society for Telemedicine and eHealth (ISfTeH), and Red Centroamericana de Informática en Salud (RECAINSA), that use the GDHM to identify and prioritize joint learning opportunities that can benefit multiple countries. It facilitates learning and sharing of resources from and by countries that are further ahead in specific areas.

The GDHM serves as a vital digital resource with the aim to empower stakeholders, evaluate national digital health maturity, and motivate strategic action toward digitally transformed health systems and improved health outcomes.

The purpose of this report is to present a detailed analysis of the current state of digital health in 2023, utilizing the data and insights gathered mainly through the GDHM. This report reflects progress made since The State of Digital Health Report 2019 and the expansion of GDHM participation from 22 countries at inception in 2018 to 67 countries post-redesign in 2023. The report seeks to illuminate the advancements, trends, and challenges in scaling and sustaining digital health interventions and enablers, providing key stakeholders with insights to guide future initiatives both at the country and global levels.

Year in Digital Health 2023

The year 2023 witnessed unprecedented milestones in digital health, all geared towards attaining the strategic objectives set out for member states and other stakeholders in the WHO Digital Health Strategy 2020-2025. In August 2023, at the G20 Summit in India, the WHO launched the Global Initiative on Digital Health to accelerate the use of digital technologies in achieving Universal Health Coverage (UHC) and the Sustainable Development Goals (SDG) as important contributions to the achievement of the Digital Health Strategy. The GDHM's revised set of 23 indicators were updated to align with the strategic objectives of the WHO Strategy, paving the way for a standardized mechanism for implementation progress monitoring as a foundational resource within the Global Initiative on Digital Health. Other noteworthy milestones include the update of the WHO Classification of Digital Health Interventions, the WHO's landmark digital health partnership with the European Union (EU), and the joint partnership of the Pan-America Health Organization (PAHO) with the Inter-American Development Bank (IADB) to facilitate digital transformation in the Americas with greater focus on telehealth, artificial intelligence, digital literacy, digital public goods, governance, and adaptation of international guidelines and standards including the WHO SMART guidelines and Fast Healthcare Interoperability Resources (FHIR).

This year, there has been a paradigm shift to focus more on the capabilities of digital technology to facilitate improved access to and delivery of health services with a focus on equity, as captured in the World Bank's "Digital-in-Health: Unlocking the Value for Everyone" report. Digital health is known to both facilitate improved access to and delivery of health services, but the historical focus on its ability to generate data and information has been outsized. Evidence is showing that countries use less than 5% of health data in health-related decision-making, and that appropriate digital health investments can help governments save 15% of health costs when applied strategically in the service of health system outcomes and targeted health outcomes. Three essential areas were highlighted as governments invest in digital in health, namely 1) be service-driven, 2) start with intractable challenges, and 3) ensure equitability and scalability with enablers identified, supported, and monitored using the GDHM.

Advances in emerging technologies in health, particularly [Generative Artificial Intelligence (GenAI) for healthcare](#), has dominated the field in its known and unknown potential to increase equity in health and/or to exacerbate gender and racial biases already present in the technology sector and underlying data sources. The launch of ChatGPT re-energized the conversation about artificial intelligence (AI) and Large Language Models (LLM), their responsible use, regulations and has catalyzed unprecedented financial investments. The Broadband Commission for Sustainable Development [Working group on Digital and AI in Health](#) projects that global healthcare spending will reach $20 trillion by 2040. The report identified the following areas for AI in health maturity: People & Workforce, Data & Technology, Governance & Regulation, Design & Processes, Partnership & Stakeholders, and Business models. Many of these enablers are captured within the GDHM as they are necessary for both the technology and data needed to harness the benefits while mitigating the risk of GenAI.

An important challenge in the accelerated adoption and use of digital health and AI is the widening gender digital divide and the need to move beyond digital literacy among a predominantly female health workforce towards digital fluency and greater representation and participation. Gender-intentional digital health promotes an intersectional approach that includes race, age, disability, and other characteristics that may hinder active participation in a way that strives to ensure that technology and data reflect the needs, wants, and characteristics of the people it is intended to serve. This is reflected in new indicators focused on equity, human rights, and gender in the GDHM and supported by the [Gender-Intentional Digital Health Intervention & Enablers: Rapid Guide for Analysis, Planning, and Monitoring](#) toolkit, which provides a clear framework for analysis, design, and implementation of gender and broader inclusiveness in digital health.

2023 has been a pivotal year for digital transformation of health with more sub-national, country, regional, and global initiatives than ever. The GDHM powers and complements other initiatives to monitor and track digital health progress, including the forthcoming Africa Digital Health Index, which uses the GDHM data to set a baseline and monitor progress for the Africa CDC Regional Digital Health Strategy, and the [2023 Digital Health Barometer](#) covering 10 countries including the United Kingdom and the United States of America.

This State of Digital Health Report 2023 provides the most geographically diverse set of participating countries to garner insights and shed light on where we are now and where we ought to be going towards digital transformation to achieve the WHO definition of health, "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity," for all people everywhere.

GDHM Methodology

In early 2016, the GDHM Secretariat together with representatives from 20+ countries and 50+ international agencies and organizations, designed version 1.0 of the Global Digital Health Index (GDHI). In 2022, the resource underwent a year-long indicator and platform review and redesign process to align the indicators with the WHO Global Digital Health Strategy to complement the WHO Digital Health Atlas and to include a greater focus on AI, equity, gender, and Universal Health Coverage. In addition, the name was changed to the Global Digital Health Monitor (GDHM) to articulate the tool's value in providing a platform to monitor digital health progress at a country, regional, and global level. The updated GDHM includes year on year performance monitoring country visualizations, regional visualizations, and country-to-regional/country-to-global comparisons.

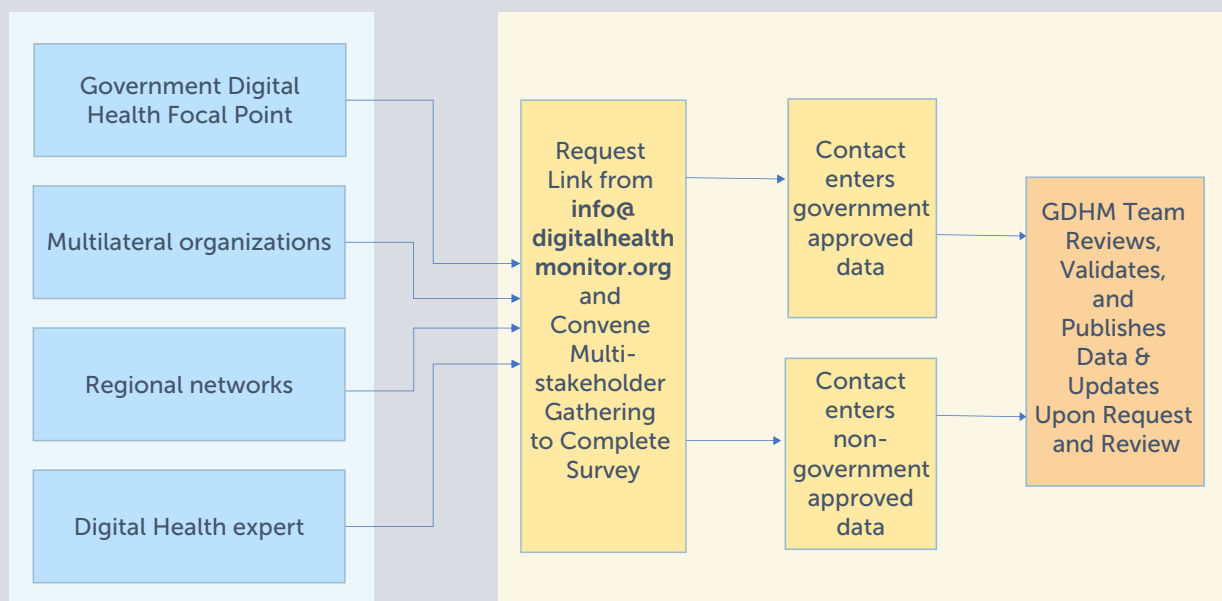Source: https://monitor.digitalhealthmonitor.org/
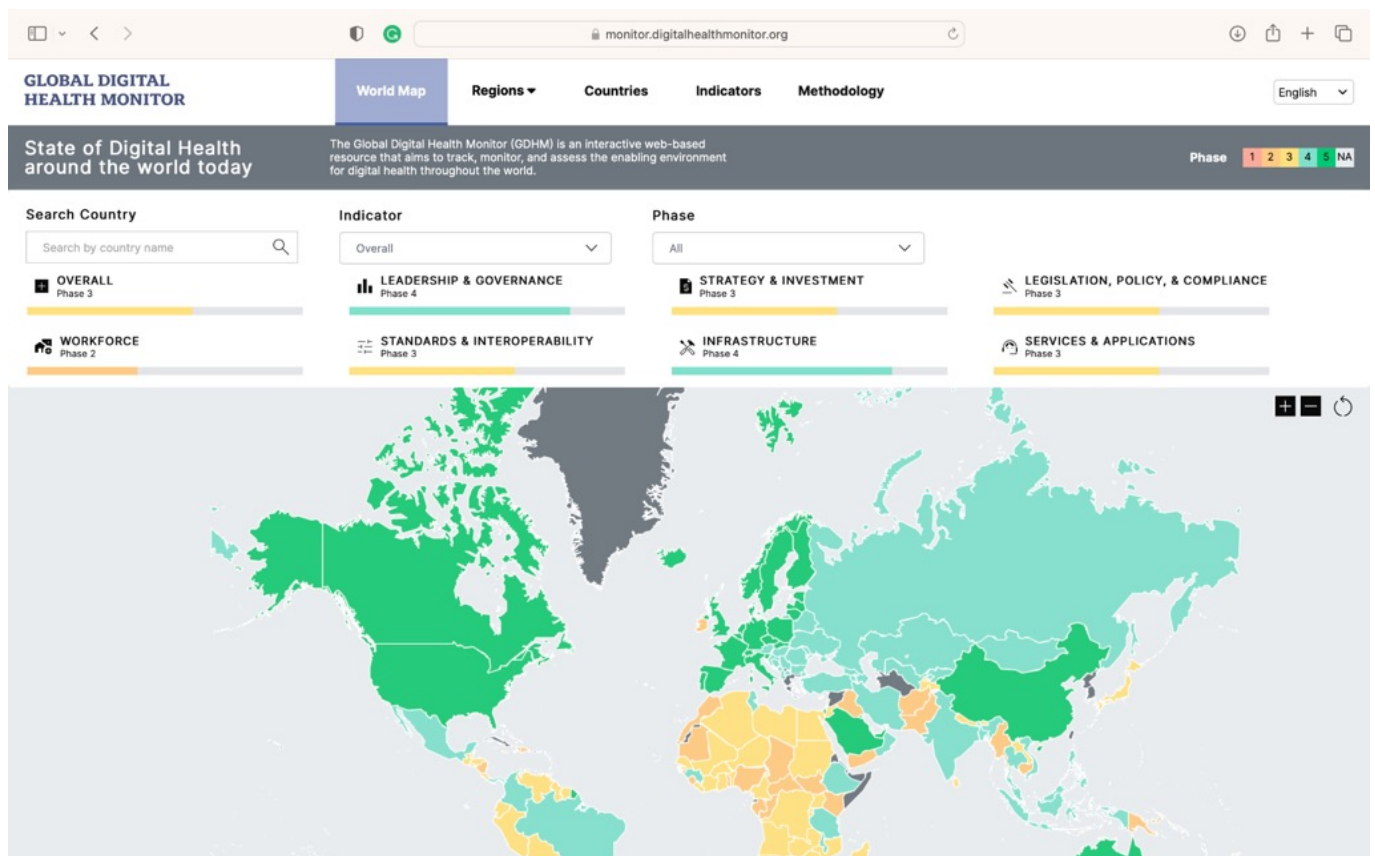
Under the guidance of a global Technical Committee and through consultations with early adopter countries, the GDHM team undertook the following process to develop the twenty-three (23) indicators.

- A systematic review of existing prioritization tools covering digital health, health information systems, digital development, AI, and mHealth.

- A landscape review of relevant publicly available data collected and made available by multilateral organizations.

- A review of existing frameworks and tools developed by experts to help practitioners and countries understand the strength and maturity of the enabling environment relevant to digital health.

- Virtual regional workshops with early and new countries to document their experiences and assess interests and needs in relation to both indicators and functionality.

- Countries strongly recommended removing some sub-indicators and minimizing the overall increase in indicators. This led to a final net increase of one indicator.

DATA COLLECTION AND VERIFICATION

The GDHM team works with Ministry of Health representatives and country partners who are leading digital health efforts in their respective countries to convene multi-stakeholder consultations to collect data for each country. These country partners submit their country's data through a unique country link to an annual GDHM survey and select the appropriate phase for each indicator as well as rationale and evidence

COUNTRY PARTICIPATION WORKFLOW

Government Digital Health Focal Point

Multilateral organizations

Regional networks

Digital Health expert

Request Link from **info@ digitalhealth monitor.org** and Convene Multi-stakeholder Gathering to Complete Survey

Contact enters government approved data

Contact enters non-government approved data

GDHM Team Reviews, Validates, and Publishes Data & Updates Upon Request and Review

to support these phases. Broader national population health indicators from the World Bank Development Indicators 2019 have been included to contextualize digital health maturity. Approval to publish results is provided by the national government's digital health focal people. Where there are no clearly recognized government focal points, other recognized digital health experts are contacted, who then work in a group of three or more persons (preferably including health and IT stakeholders). Information entered is then reviewed, approved, and published as "Pending Government Approval." Data from countries with completed surveys included in the GDHM (67 countries) have been analyzed and form the basis of this report.

CALCULATIONS AND BENCHMARKING

The GDHM uses the main indicator in each category to calculate the overall country average. While sub-indicators are included to add greater specificity to specific GDHM indicators, they are not used in calculating the Component Phase or the Country or Global Averages. The GDHM enables countries to benchmark themselves against the Global Average or a Regional Average.

PRE-POPULATED DATA FROM PUBLICLY AVAILABLE SOURCES

For countries that have not completed a survey in the Global Digital Health Monitor, data was extracted from publicly available information to pre-populate the indicators below to give a general sense of broader digital ecosystem maturity in alignment with relevant indicators. While this data serves as a proxy for these digital health indicators for countries, data completed by government officials provide a more accurate and robust picture of the digital health progress in each country. The Data sources in the GDHM included the GovTech Maturity Indicator (GTMI), the Network Readiness Index, and the GSMA Mobile Connectivity Index. Indicators populated include 2a, 4, 6a, 7, 8, 9, 17, and 18. This means that many high-income countries that did not participate have their data extracted from published sources to extrapolate Leadership and Governance, Policy and Legislation, and Infrastructure data components.

The State of Digital Health 2023

The following 67 countries across the WHO regions participated with complete surveys in 2023.

GDHM PARTICIPATING COUNTRIES BY WHO REGION AND MATURITY PHASE

WHO Region	Country	Digital Health Maturity Phase
Western Pacific Region	Cambodia	2
	Japan	3
	Lao People's Democratic Republic	3
	Malaysia	4
	New Zealand	3
	Papua New Guinea	2
	Philippines (The)	4
	Vietnam	4
South-East Asia Region	Bangladesh	4
	Indonesia	4
	Maldives	2
	Myanmar	2
	Nepal	3
	Sri Lanka	3
	Thailand	4
Europe Region	Austria	4
	Ireland	2
	Portugal	5
Eastern Mediterranean Region	Afghanistan	2
	Egypt	3
	Iraq	2
	Jordan	3
	Morocco	2
	Pakistan	2
	Saudi Arabia	5
	United Arab Emirates	5
Americas Region	Argentina	4
	Brazil	4
	Chile	4
	Colombia	4
	Costa Rica	3
	Dominican Republic	2
	Jamaica	2

| WHO Region	Country	Digital Health Maturity Phase
Africa Region	Benin	3
	Burundi	3
	Cabo Verde	3
	Cameroon	3
	Central African Republic	2
	Chad	2
	Comoros	2
	Cote d'Ivoire	3
	Democratic Republic of Congo	3
	Ethiopia	4
	Gabon	2
	Ghana	3
	Guinea	4
	Guinea-Bissau	2
	Kenya	2
	Liberia	3
	Madagascar	3
	Malawi	4
	Mali	3
	Mauritania	2
	Mozambique	3
	Namibia	3
	Niger	3
	Nigeria	2
	Rwanda	3
	São Tomé and Príncipe	2
	Senegal	3
	Sierra Leone	2
	South Africa	3
	Tanzania	4
	Togo	2
	Uganda	3
	Zambia	3
	Zimbabwe	3

Most countries (40%) are at Phase 3 in overall digital health maturity, followed by 33% at Phase 2 and 22% at Phase 4. Three participating countries (4%) are in Phase 5 (Portugal, Saudi Arabia, and the United Arab Emirates). No country is at Phase 1. This is promising, indicating that all participating countries are making some investments in digital health.

PARTICIPATING COUNTRY MATURITY BY PHASE
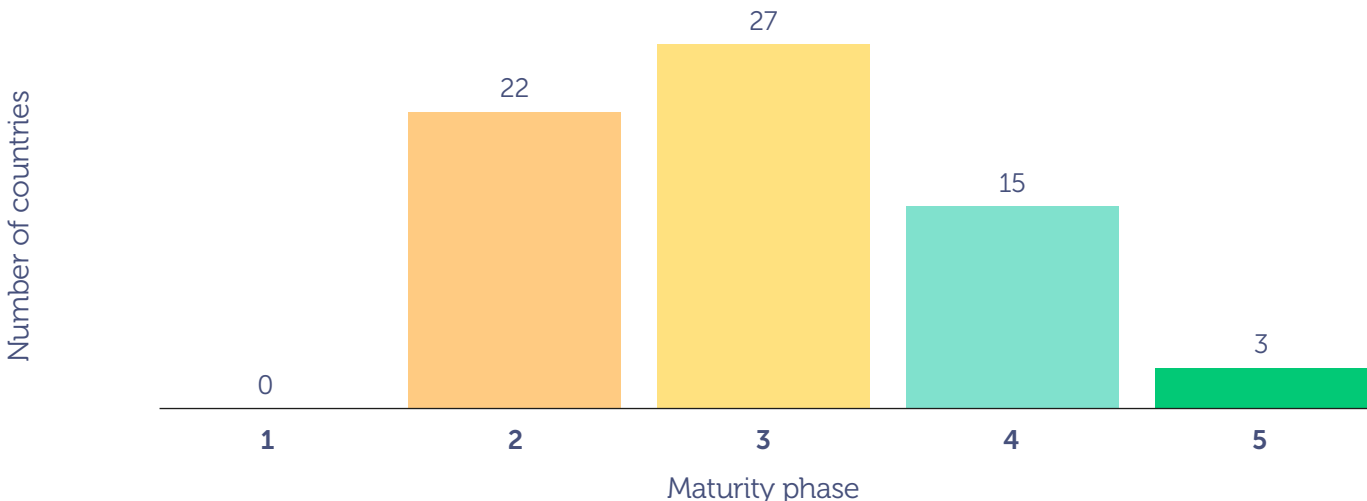
Globally, across the seven components of the WHO/ITU eHealth Strategy Framework, most components are in Phase 3, apart from Leadership and Governance, which is in Phase 4. With respect to Leadership and Governance, a third of the countries with complete data are at Phase 4 or Phase 5, and a high proportion of countries are at Phase 2 or Phase 3. No country with complete data in the GDHM was at Phase 1. All the other six component areas average to Phase 3. However, for the Workforce, most countries are in Phase 1 and Phase 2 with 14% of countries in Phases

GLOBAL DIGITAL HEALTH MATURITY PHASES BY COMPONENT
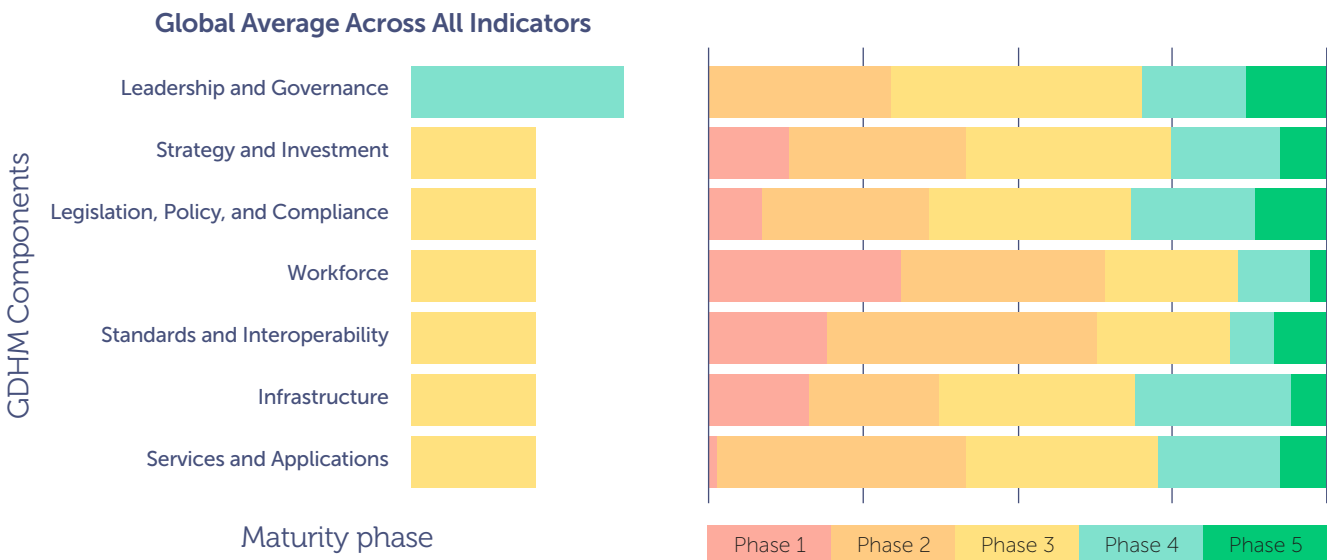
4 and 5. Standards and Interoperability is the second least performing component after Workforce, with 62% of countries still at either Phase 1 or Phase 2 with 16% in either Phase 4 or Phase 5. On Infrastructure, a third of countries (31%) are in Phases 4 or 5, while 37% of countries are in Phases 1 and 2. For full digital transformation in health, greater infrastructure investments are needed along with collaboration between Ministries of Health and those related to Science, Technology, and Telecommunications.

Each indicator within the broader categorization of the digital health components of the enabling environment provides greater insight and clarity into the maturity distribution and relative aspects of strength as well as those that need prioritized investment.
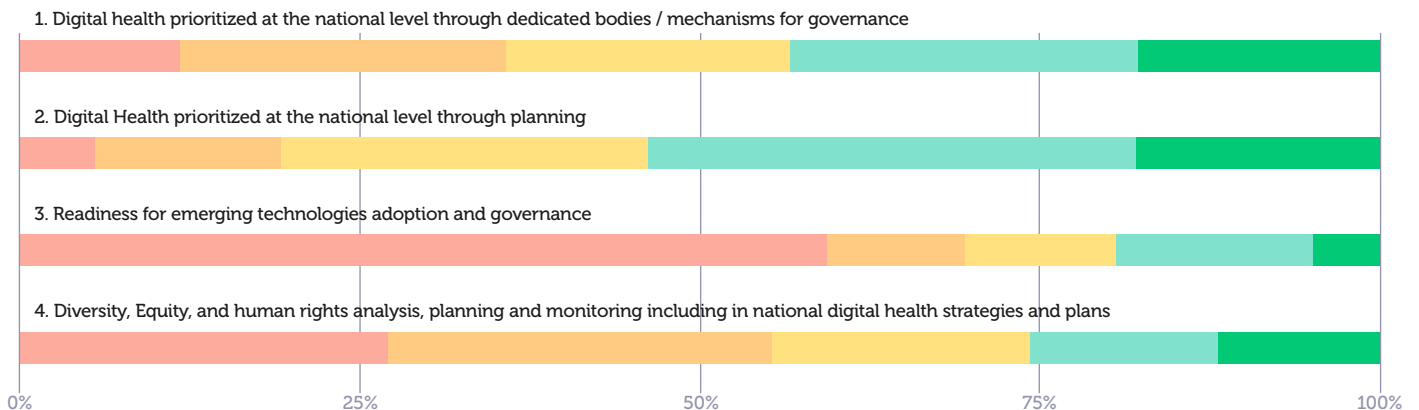
Leadership and Governance

The Leadership and Governance component involves the coordination of digital health at the national level to ensure alignment with national health goals and priorities.

Fifty-six percent of countries either do not have established digital health governance or have non-functional governance. Leadership and Governance remain the best performing of all the seven component areas on average at Phase 4. Yet, a look at the individual indicators shows that while digital health is prioritized through national planning and dedicated bodies, the bodies are mostly non-functional.
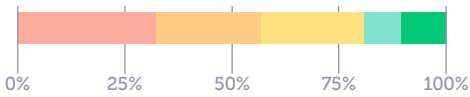
Emerging technologies in health (particularly AI) regulation is lagging behind innovation. Stakeholders are exploring the ethical and regulatory implications of emerging technology, especially GenAI in health, to ensure their responsible and effective integration into national health programs. Most participating countries (55%) reported having low readiness for emerging technologies, their adoption, and governance. Countries reporting having national plans for at least one emerging technology (eg. AI, Blockchain, IoT) that is funded to support public health work include

STATE OF DIGITAL HEALTH LEADERSHIP AND GOVERNANCE 2023

1. Digital health prioritized at the national level through dedicated bodies / mechanisms for governance

2. Digital Health prioritized at the national level through planning

3. Readiness for emerging technologies adoption and governance

4. Diversity, Equity, and human rights analysis, planning and monitoring including in national digital health strategies and plans
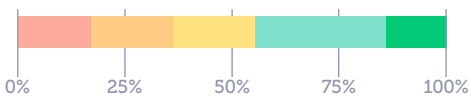
0%   25%   50%   75%   100%

Bangladesh, Brazil, Gabon, Guinea, Malawi, Malaysia, Mozambique, Portugal, Saudi Arabia, Thailand, United Arab Emirates, and Vietnam.

Equity and gender transformation in digital health is gaining traction. Digital health strategies increasingly include gender-intentional digital health investments, gender-disaggregated data collection, and the integration of gender perspectives in digital health policies and programs. Just less than half of the countries (48%) do not consider diversity, equity and human rights in their digital health strategy. The percentage of countries that either have digital health strategies without gender consideration or only consider gender on an ad-hoc basis is 57% (Phase 1 and 2). Conversely, 19% of countries represented by Argentina, Austria, Bangladesh, Brazil, Jordan, Niger, Saudi Arabia, Thailand, Togo, United Arab Emirates, and Vietnam systematically consider gender in their digital health strategy (Phase 4 and Phase 5).

Digital transformation strategies increasingly include health components. Digital transformation (or ICT) strategies and policies systematically include components of the health sector in 64% of countries.

4a. Gender considerations accounted for in digital health strategies and digital health governance

2a. Health is prioritized in national digital transformation and data governance policies

CASE STUDY
The Philippines

The Philippines completed the GDHM in 2018 and again in 2023. Over this five-year period, they recorded improvements in the areas of Legislation, Policy & Compliance; Infrastructure; and Services & Applications. They continued to score highly in Strategy & Investment; and noted a decrease in maturity in the areas of Leadership & Governance; and Standards & Interoperability. Key insights that came out of the process of completing the GDHM included a recognition of the major role that the private sector is playing in digital health within The Philippines. This provides an opportunity for the government to focus less on services and applications, and more on policies, standards and frameworks. In addition, they have noted a need (whether through the government or private sector) to increase attention towards patients, service providers, and health system managers, especially to use AI to improve efficiency in health service delivery and decision-making.

PHASE OVERVIEW

● Philippines
● Global average
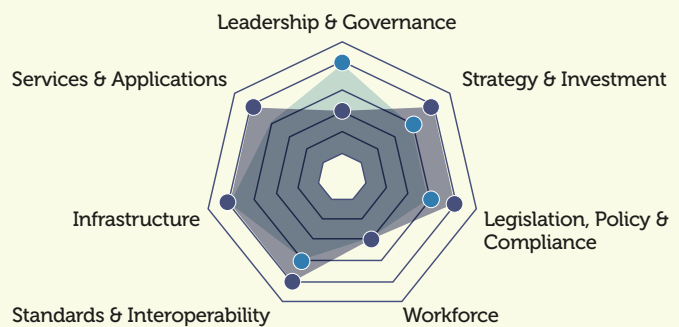
Strategy and Investment

The Strategy and Investment component ensures a responsive strategy and plan for systematically financing and implementing national digital health plans.

Seventy-five percent of countries either have started development or have approved national digital health strategies. Countries worldwide have recognized the importance of digital health and are developing or updating their national digital health strategies. These strategies encompass areas such as health information exchange, telemedicine, electronic health records, and digital health infrastructure development. Only 47% of countries are in Phase 3 and above regarding Strategy and Investment. About 25% of countries still do not have digital health strategies or ongoing plans to develop one, despite the number and cadence of WHO resolutions and global efforts in support of such strategies. The following countries are in Phases 4 or 5, indicating the country has a costed national digital health strategy that is partially or completely implemented: Benin, Burundi, Comoros, Cote d'Ivoire, Ethiopia, Ghana, Indonesia, Lao People's Democratic Republic, Malawi, Malaysia, Portugal, Rwanda, Saudi Arabia, Tanzania, Thailand, United Arab Emirates, Vietnam, and Zimbabwe.

Public funding for digital health is inadequate. Public sector funding for digital health is largely insufficient in participating countries; 90% of participating countries have funding that meets less than half of the country's national digital health needs.
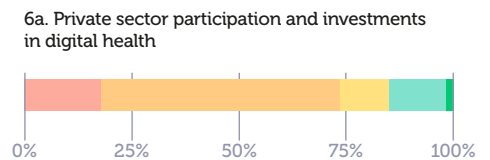
STATE OF STRATEGY AND INVESTMENT 2023

5. National eHealth / Digital Health Strategy or Framework

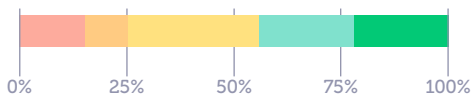6. Public funding for digital health
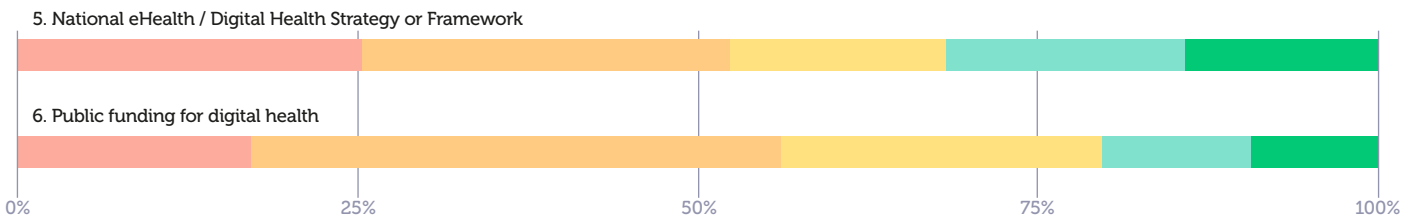
Seventy-three percent of countries either have no visible private sector participation in digital health or their participation is ad-hoc and limited.

The countries Benin, Central African Republic, Comoros, Gabon, Ghana, Guinea-Bissau, Mozambique, Myanmar, Pakistan, São Tomé and Príncipe, and Togo (18% of countries) reported no visible private sector participation of national digital health activity (Phase 1). Also, 56% of countries perceive private sector participation as ad-hoc and limited.

National digital health strategies increasingly use UHC core components, with 75% of countries making UHC, the cornerstone of their strategic vision.

6a. Private sector participation and investments in digital health

Sub-national use of the GDHM is on the rise.

In addition to national-level strategies, many countries, especially those with federated health systems, are developing sub-national digital health strategies. Notable examples include Canada, India, Indonesia, Nigeria, and the United States. Nigeria provides a good example of a country that has used the GDHM as part of their national digital health strategy prioritization and sub-nationally in the development of the Lagos State Digital Health Blueprint.

5a. National digital strategy alignment with Universal Health Coverage (UHC) Core Components

0%   25%   50%   75%   100%

LAGOS STATE GLOBAL DIGITAL HEALTH MONITOR BASELINE AND FORECAST
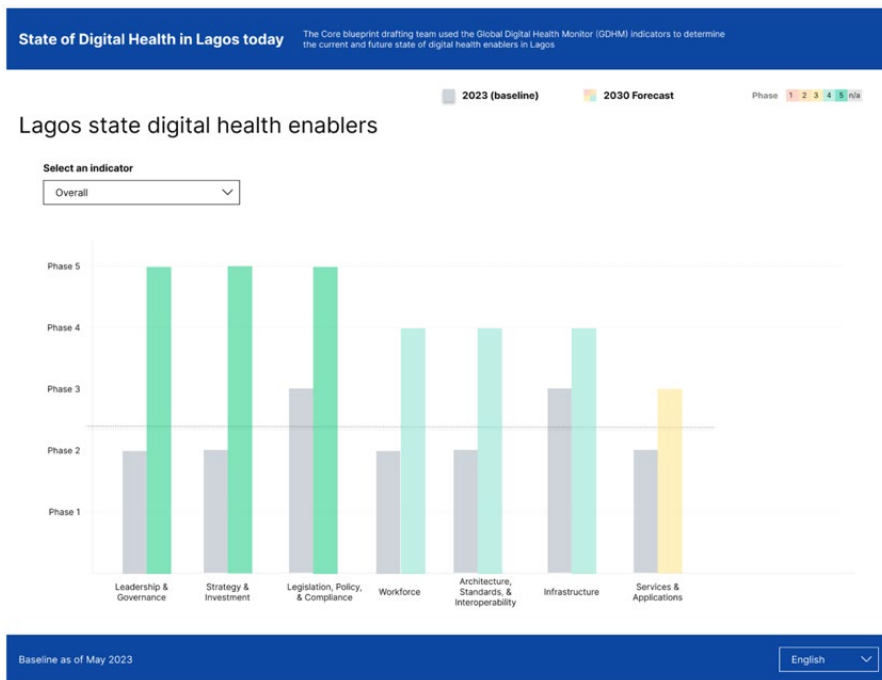
In addition to national and sub-national digital health strategies, there are growing regional collaborations and strategies emerging in the African Union through Africa CDC, the European Union through WHO, and in the Americas through PAHO and the Inter-American Development Bank. These strategies aim to articulate regional aspirations, address regional health challenges, promote cross-border collaboration, and facilitate the harmonization of digital health policies, standards, interoperability, and other regulations.

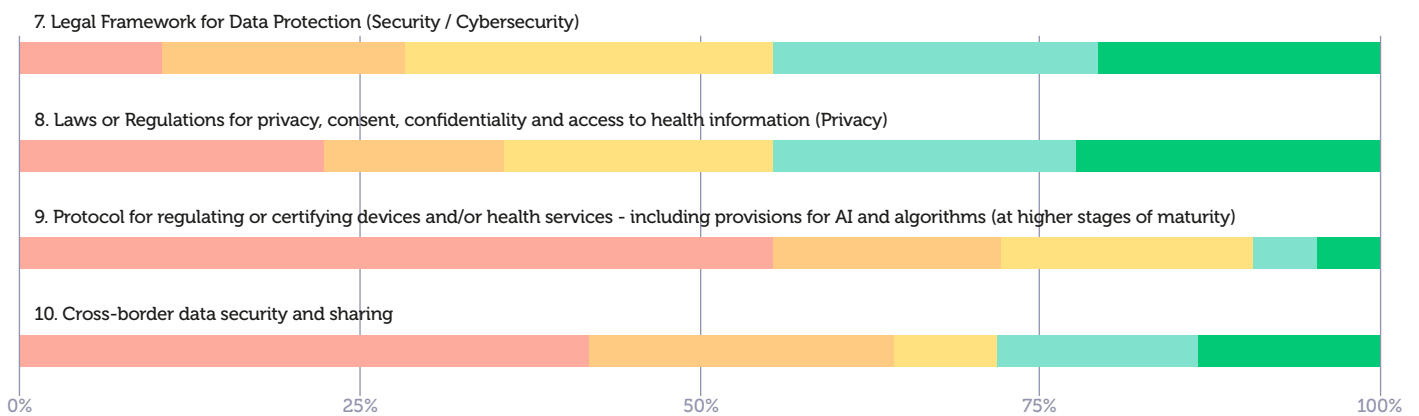**There is a wide regional disparity in investments in digital health.**
According to a 2022 CB Insights Report on Digital Health, regional variations in digital health investments exist, reflecting the diverse health landscapes and priorities of different regions. Investments in digital health have seen a significant increase in recent years. Funding for digital health globally has stabilized from $25.6 billion in 2018, after peaking at $59.7 billion in 2021 (likely due to COVID-19), and back to $25.9 billion in 2022. These investments aim to strengthen digital health infrastructure, promote innovation, and enhance the capacity of health systems to leverage digital technologies effectively. There is a wide disparity between regions in funding raised for digital health. US-based companies represented 74% of global funding in Quarter 4 of 2022, with Africa and Latin America and the Caribbean raising 1% and 2% of global funding, respectively.
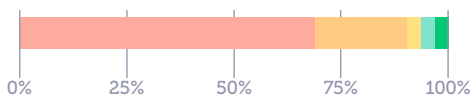
Legislation, Policy, and Compliance

The Legislation, Policy, and Compliance component helps countries create the legal and regulatory environments to establish trust and protection for users and consumers of digital health interventions through privacy, security and safety.

Over 71% of participating countries are at Phase 3 and above and are leveraging existing policies and regulatory frameworks for digital health. Countries have developed policies and frameworks to guide the responsible and ethical use of digital health technologies. A multi-sector legal framework for data protection for security and cybersecurity has been established in over 90% of countries, with an estimated half of the countries in Phase 4 and Phase 5. However, protocols for certifying and regulating digital health services and/or devices are largely unavailable in 72% of countries. Despite successes of information sharing across borders stimulated by the COVID-19 pandemic, about 45% of countries do not have a protocol for cross-border information sharing.

STATE OF DIGITAL HEALTH POLICY, LEGISLATION, AND COMPLIANCE 2023

7. Legal Framework for Data Protection (Security / Cybersecurity)

8. Laws or Regulations for privacy, consent, confidentiality and access to health information (Privacy)

9. Protocol for regulating or certifying devices and/or health services - including provisions for AI and algorithms (at higher stages of maturity)

10. Cross-border data security and sharing

0%   25%   50%   75%   100%

9a. Protocol for regulating and certifying AI within health services

0%   25%   50%   75%   100%

Artificial Intelligence in Healthcare is not regulated in 90% of countries. Sixty-nine percent of countries do not have protocols, policies, frameworks, or other accepted processes for governing AI's use in healthcare, with another 21% of countries having proposals under review. This indicates that only 10% of countries have any form of regulations (in Phase 3 and above), including Argentina, Guinea, Mozambique, Saudi Arabia, United Arab Emirates, and Vietnam.

Data privacy and security laws have become increasingly important in the digital health context. Seventy-two percent of countries have enacted legislation to safeguard individuals' health data, regulate data-sharing practices, and establish consent management frameworks. These laws aim to balance between facilitating data exchange for improved healthcare outcomes and protecting individuals' privacy rights. The table illustrates the privacy regulations in selected countries.

UK	UK, Data Protection Act 2018
China	Personal Information Protection Law ('PIPL')
EU	General Data Protection Regulation (GDPR)
Saudi Arabia	Saudi Arabia Personal Data Protection Law as amended (PDPL)
US	Health Insurance Portability and Accountability Act (HIPAA)
Russia	Personal Data Law of 2006 and the Data Localisation Law of 2014
Nigeria	Nigeria Data Protection Act of 2023 (NDPA)
Canada	Personal Information Protection and Electronic Documents Act (PIPEDA)
Israel	Protection of privacy law (PPL)

Kenya Adopts a National Digital Health Law 2023

The Kenyan Digital Health Law 2023 establishes the Digital Health Agency (DHA) and lays out a comprehensive framework for digital health services. The DHA provides a framework for digital health services, including establishing and maintaining a comprehensive integrated digital health information system. It covers health data governance, confidentiality, privacy, security of data, e-health service delivery, e-waste management, health tourism, and related provisions. Key provisions include establishing the DHA with the power to develop and maintain a comprehensive integrated management information system, establish health data registries, ensure health data portability, and facilitate data collection for policy and research. The law aims to safeguard people, empower providers and researchers, and strengthen the health system. The law prioritized the need for an enhanced informatics workforce, alignment with global digital health standards, and investment in relevant digital health infrastructure. It is expected that this law will contribute to global evidence of regulations for digital health.
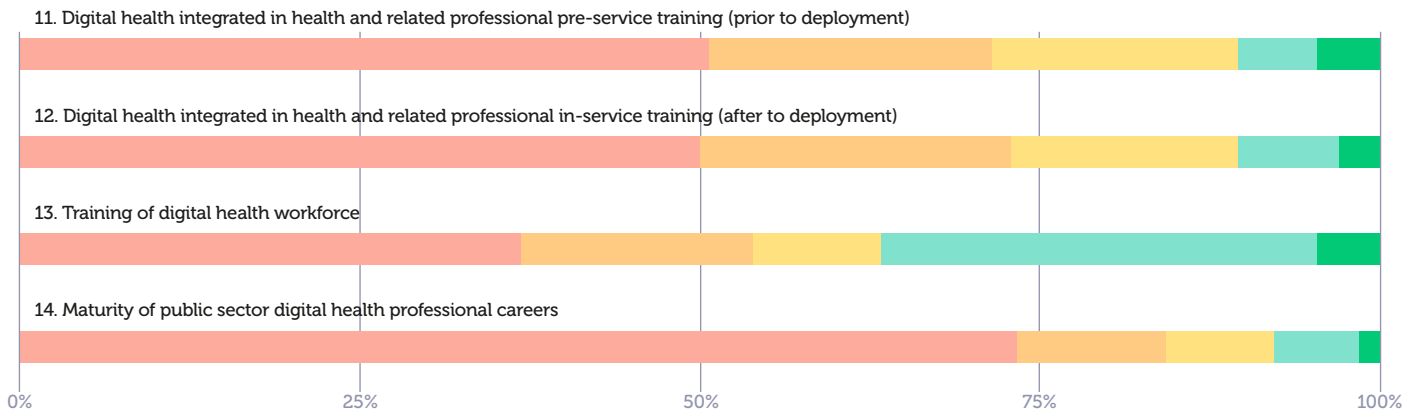
Workforce

The Workforce component covers the need for human resources with the skills to develop, support, and use digital health services and applications.

Pre-service digital health training for health professionals is not in place for half of the participating countries. Health professionals require digital health training to effectively use digital technologies in their practices. Over 50% of countries do not have digital health as part of the pre-service curriculum for health professionals in training and education. Even deployed health professionals receive in-service structured training in only about 50% of participating countries. Such training programs cover areas such as telemedicine, health information systems, data analytics, and the ethical use of digital health technologies. In about 75% of countries, there is no career path for the digital health workforce. Only 4% (3 countries: Ethiopia, Jordan, and Saudi Arabia) have embedded digital health in pre-service training of health professionals, such that over 75% of health professionals receive this training (Phase 5). However, Brazil, Columbia, Guinea, and Malawi all have integrated digital health curricula, covering less than 75% of health professionals (Phase 4). Also, only Saudi Arabia and Thailand have digital health training implemented as part of the in-service curriculum that applies to over 75% of the target population (Phase 5). Similarly, Bangladesh, Brazil, Ethiopia, Malaysia, and the United Arab Emirates have in-service training curriculum for less than 75% of the target population (Phase 4).

STATE OF DIGITAL HEALTH WORKFORCE 2023

11. Digital health integrated in health and related professional pre-service training (prior to deployment)

12. Digital health integrated in health and related professional in-service training (after to deployment)

13. Training of digital health workforce

14. Maturity of public sector digital health professional careers

Zambia

Zambia underwent the GDHM assessments in 2021 and 2023, revealing overall stability in digital health maturity across most categories. Notable improvements were seen in Infrastructure, while there was a slight dip in Leadership & Governance. The GDHM served as a pivotal benchmark, providing a systematic evaluation of their digital health maturity. This evaluation became the foundation for the development of their national digital health strategy spanning from 2022 to 2026. A key takeaway from the GDHM process emphasized the imperative of concentrating on health workforce development in the realm of digital health, encompassing frontline health workers, health systems managers, and IT professionals. Additionally, the assessment shed light on the necessity for robust, supportive policies and the integration of digital health into broader government initiatives.

PHASE OVERVIEW

● Zambia
● Global average
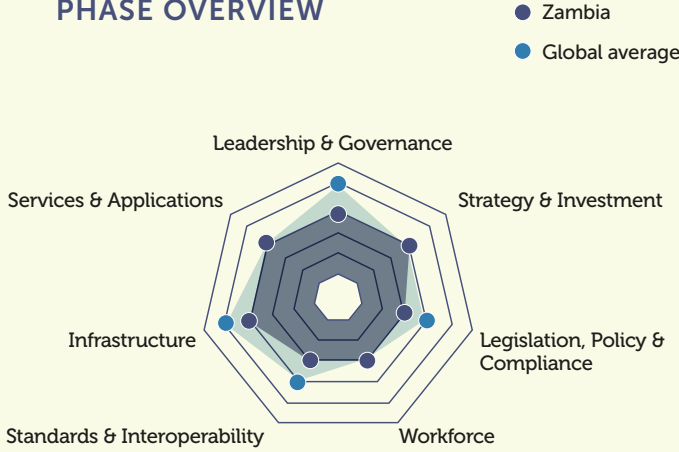
The WHO, regional networks, digital health training facilities, and academic institutions are emerging to develop competency frameworks and training curricula to help address these gaps in the Workforce.

Standards and Interoperability

Standards and Interoperability facilitate the ability for individuals and data to move through the continuum of care in a way that enables data to be seamlessly shared, stored, and used when, where, and how it is needed.

Architecture for standards and interoperability remains a challenge. Thirty percent of the countries do not have a high-level national digital health architecture framework. Another 42% have proposed a high-level architecture, but it has not been approved. Only 27% of countries have established a Health Information Exchange (HIE). Seven percent of countries ranked at Phase 5, indicating that the national HIE provides core functions related to data exchange and is periodically reviewed and data from the HIE is used for data exchange. These countries are Malawi, Portugal, Saudi Arabia, Tanzania, and the United Arab Emirates.

Nearly three-quarters of countries use some form of digital health standards. Seventy-two percent of countries use some form of data standard in digital health implementation. However, 27% report that they do not have standards for data exchange, transmission, messaging, security, privacy, and hardware. Countries at Phase 5 with data standards and enabling enterprise architecture that facilitates monitoring and evaluation, strategic planning, and budgeting include Austria, Benin, Brazil, Cabo Verde, Malawi, Portugal, Saudi Arabia, Tanzania, and the United Arab Emirates.

STATE OF DIGITAL HEALTH STANDARDS AND INTEROPERABILITY 2023

15. National digital health architecture and/or health information exchange

16. Health information standards
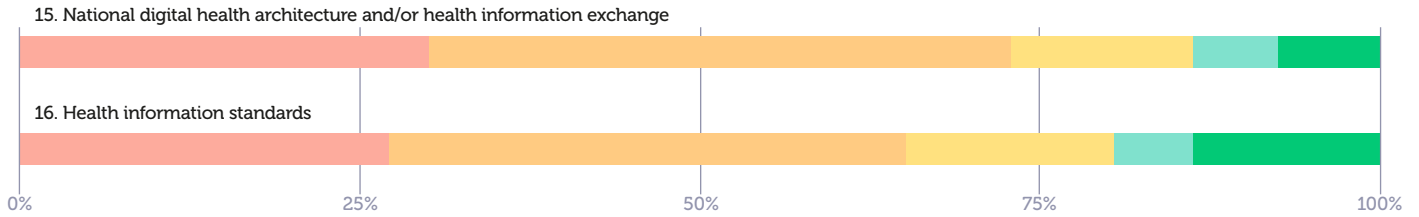
Infrastructure

The Infrastructure component includes computing equipment and connectivity as well as electricity required to run digital health services and applications.

Most countries have progressed significantly in network readiness over the past few years, but still need to grow in maturity. No country is in maturity Phase 1 when it comes to network readiness, and 92% of countries are either in Phase 3 or Phase 4. Of countries that participated in the 2023 survey, none were at Phase 5 maturity.
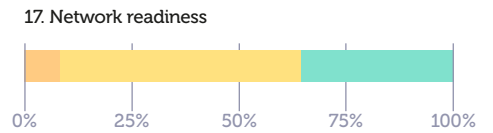
A third of countries do not have plans for maintaining digital health infrastructure. Planning and support for ongoing digital health infrastructure maintenance has not progressed, as only about 50% of countries are in Phases 3 or above. Nine percent of countries indicate having a plan and using it regularly to maintain digital health infrastructure in 75% of public healthcare sector services include: Bangladesh, Brazil, Ghana, Portugal, Saudi Arabia, and the United Arab Emirates (in Phase 5).
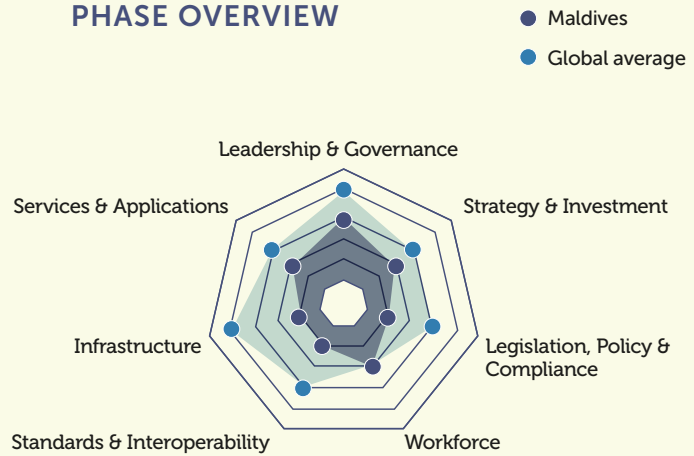
17. Network readiness

18. Planning and support for ongoing digital health infrastructure maintenance
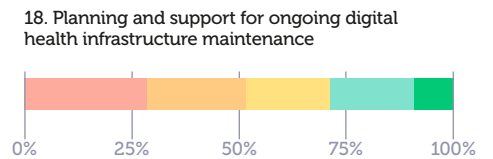
Maldives

Upon completing the GDHM in 2023, stakeholders from the Maldives Ministry of Health uncovered invaluable insights that have guided a strategic approach to advancing their digital health maturity. The assessment revealed notable areas for improvement, particularly in Legislation, Policy, and Compliance; Standards and Interoperability; as well as Infrastructure. Armed with this knowledge, they have adopted a more deliberate focus on foundational investments, recognizing the importance of a holistic perspective beyond digital health applications. Notably, the GDHM facilitated the identification of 'quick wins,' exemplified by the commitment to ensuring gender representation on digital health steering committees. This comprehensive approach positions The Maldives Ministry of Health to not only address immediate needs but also build a resilient and sustainable digital health ecosystem for the future.

PHASE OVERVIEW

- Maldives
- Global average

Radar chart axes: Leadership & Governance, Strategy & Investment, Legislation, Policy & Compliance, Workforce, Standards & Interoperability, Infrastructure, Services & Applications
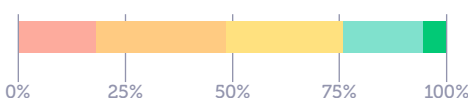
Services and Applications

The Services and Applications component reflects the digital health interventions deployed for service delivery and/or tracking health system performance.
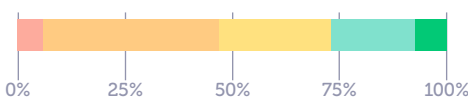
Few countries support all of their priority areas with nationally scaled digital health interventions. Only 7% of countries have all of their health priorities supported by nationally scaled digital health systems. This includes Bangladesh, Portugal, Saudi Arabia, Tanzania, and the United Arab Emirates.

One-quarter of participating countries have established a complete and geotagged shared registry of providers, administrators, and health facilities. Six percent of countries do not have any current plans for shared registries, while 41% are currently developing one, though they are not available for use. The 24% of countries that have established a complete registry of providers, administrators, and health facilities and are currently using them include Austria, Bangladesh, Brazil, Chile, Colombia, Guinea, Jordan, Lao People's Democratic Republic, Malawi, Malaysia, Niger, The Philippines, Saudi Arabia, Tanzania, Thailand, and the United Arab Emirates.

19. Nationally scaled digital health systems

0%   25%   50%   75%   100%

20. Digital identity management of service providers, administrators and facilities for digital health, including data for GIS mapping

0%   25%   50%   75%   100%

Few countries have a fully functioning system for unique individual patient identification. 18% of countries indicate being in Phase 5, signifying they have a functioning unique identifier registry that is used by over 75% of the relevant population. These countries include Austria, Brazil, Chile, Colombia, Costa Rica, Indonesia, New Zealand, The Philippines, Portugal, Saudi Arabia, Thailand, and the United Arab Emirates. On the other hand, 36% of countries do not have any system for unique individual patient identification.

Foundational individual identifier registries are either missing or not being used in most health systems. Over 52% of countries do not have a Master Patient Index (MPI) used for managing cross-institution patient identification. Additionally, 23% of countries have but irregularly use a partially maintained MPI.

Forty-seven percent of countries do not have or are still developing digital registers of unique birth registrations.

Also, 55% of countries do not have or are currently developing a digital registry of death registration.

Eighty percent of countries do not have a secure patient feedback system. The countries with no patient feedback system make up 54% of participating countries, while 28% of countries have incomplete or partially available or irregularly maintained patient feedback systems. The 20% of countries that are in Phase 4 and 5 indicate they have a patient feedback system that is available and accessible, including Bangladesh, Brazil, Chile, Guinea, Jordan, Portugal, Saudi Arabia, Thailand, and Vietnam.

Most countries are using digital health systems to monitor population health. Ninety-three percent of countries have digital systems at the district, community, or facility level that contribute to public health reporting and decision-making for population health management.
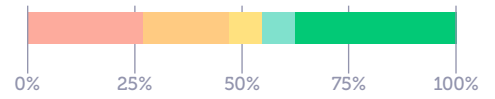
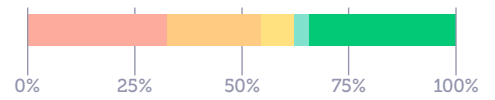21. Digital identity management of individuals for health
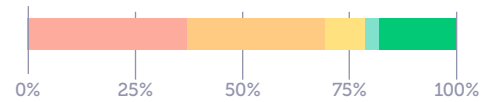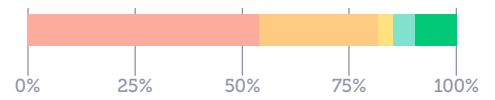

21a. Digital Master Patient Index (MPI)
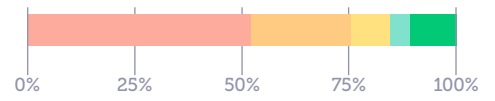
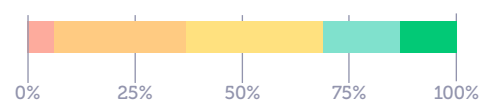21b. Digital identity for birth registration

21c. Digital identity for death registration

22. Secure Patient Feedback Systems

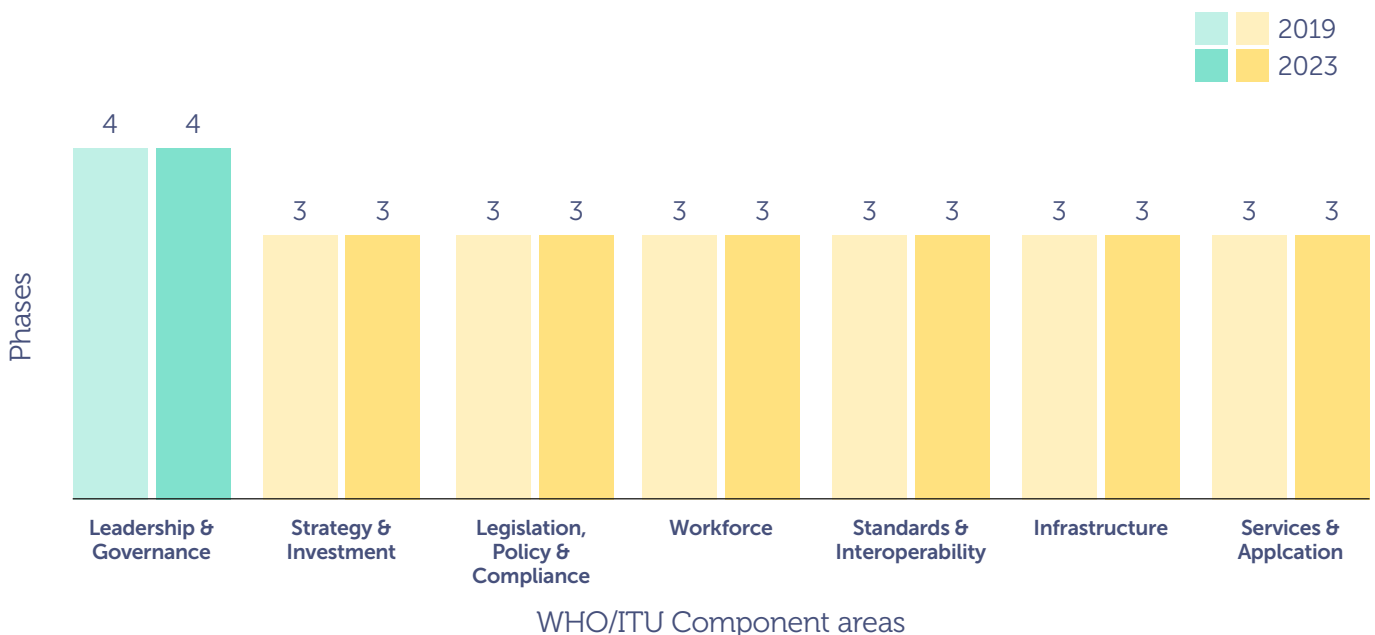23. Population health management contribution of digital health
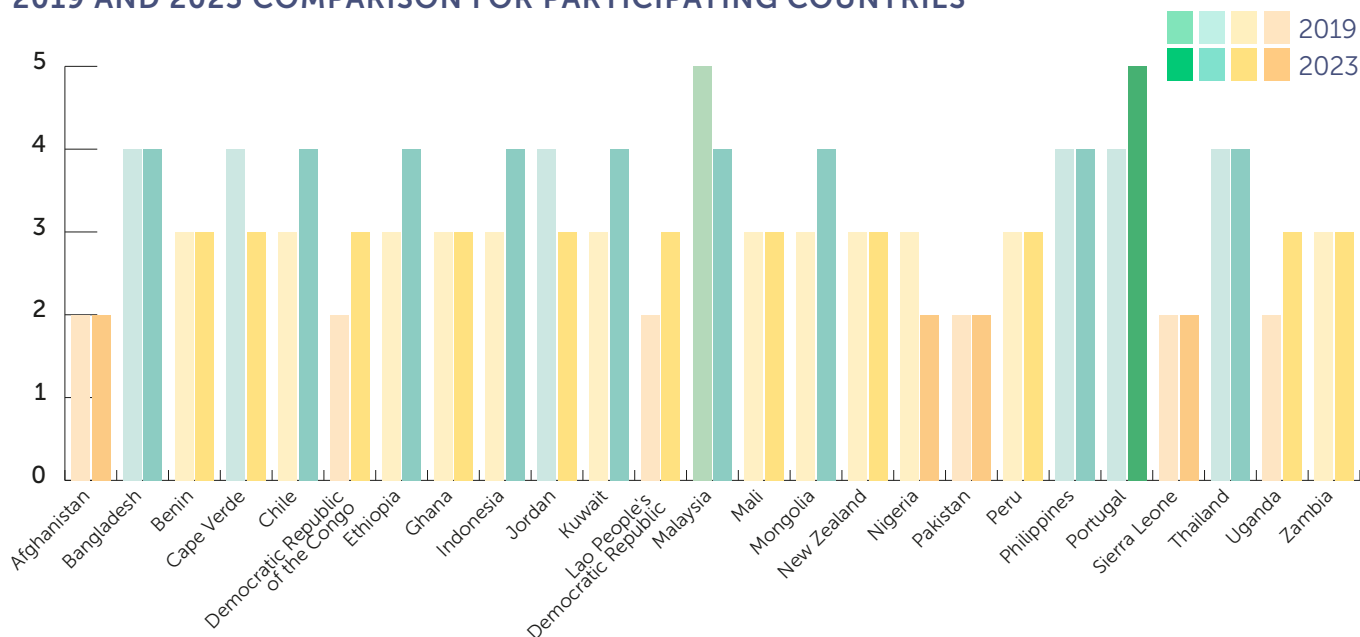
Global Progress 2019 to 2023

To understand the progress made in the digital health landscape, it is essential to compare the current trends with those identified in The State of Digital Health Report 2019. This comparison highlights the advancements and changes that have occurred over the past few years. As of 2019, 22 countries participated compared to 67 countries in 2023 having complete data for all indicators.

Overall, there was no change in Phase between component Phases from 2019 to 2023. Countries' digital health Leadership and Governance remain ahead of other component areas at Phase 4. All other components are at Phase 3 as was the case in 2019. Strategy and Investment planning did not significantly progress in many countries, though there was a measurable increase in Infrastructure maturity, particularly network readiness, largely stimulated by the COVID-19 pandemic lockdown push towards digital transformation across sectors such as education, health, and industry. Workforce maturity declined in most countries aligning with the broader effects of the pandemic on the health workforce in general.

GLOBAL DIGITAL HEALTH MATURITY 2019 AND 2023 COMPARISON

Legend: 2019, 2023

WHO/ITU Component areas	2019	2023
Leadership & Governance	4	4
Strategy & Investment	3	3
Legislation, Policy & Compliance	3	3
Workforce	3	3
Standards & Interoperability	3	3
Infrastructure	3	3
Services & Applcation	3	3

Phases

WHO/ITU Component areas

2019 AND 2023 COMPARISON FOR PARTICIPATING COUNTRIES

All 25 countries that participated in 2019 (v1) also participated in 2023. Nine of them made one step progress, and 11 of them did not make any progress. Four of the countries retrogressed in digital health maturity.

In a highly complementary process, the Digital Health Barometer 2023 data from 10 countries (Australia, Brazil, France, Germany, Japan, South Korea, Spain, the UK, and the United States) have been extrapolated for four of the seven component areas and their maturity in these countries. In addition, the network readiness of each of the 10 countries was extracted from the Portulans Network Readiness Index, to populate the infrastructure component. All but Mexico had established governance for digital health. Policy, Legislation, and Compliance in support of digital health is the most advanced of all component areas for all countries. All countries (among the 10) have established detailed standards, though only two have integrated care resulting from the established standards. Only Brazil and Japan participated in the GDHM and their data is somewhat consistent with the GDHM entry. Also, the data for Australia, France, Germany, Mexico, South Korea, Spain, United Kingdom, and United States are complementary to the GDHM sourced data.

DIGITAL HEALTH BAROMETER 2023 COUNTRY MATURITY

Country	Leadership and Governance	Strategy and Investment	Legislation, Policy, and Compliance	Standards and Interoperability	Infrastructure
Australia	1 of 1	4 of 4	4 of 4	3 of 5	4 of 5
Brazil	1 of 1	4 of 4	4 of 4	3 of 5	4 of 5
France	1 of 1	1 of 4	4 of 4	3 of 5	5 of 5
Germany	1 of 1	4 of 4	4 of 4	3 of 5	5 of 5
Japan	1 of 1	3 of 4	4 of 4	4 of 5	5 of 5
Mexico	0 of 1	0 of 4	4 of 4	3 of 5	4 of 5
South Korea	1 of 1	3 of 4	3 of 4	3 of 5	5 of 5
Spain	1 of 1	4 of 4	4 of 4	2 of 5	4 of 5
UK	1 of 1	2 of 4	4 of 4	4 of 5	4 of 5
US	1 of 1	2 of 4	4 of 4	3 of 5	5 of 5

Conclusion

The State of Digital Health 2023 reflects stability and sustained progress in key components of the digital health enabling environment through a systematic analysis of countries participating in the GDHM in 2023. These enablers form the foundation for the successful implementation and sustained use of digital health interventions leading to improved health outcomes and strengthened health systems worldwide. An important achievement is the scaled investment in digital health Services and Applications that align with national health priorities. Based on the findings and recommendations of the State of Digital Health Report 2023, we propose the following call to action:

1. **Equity and Inclusion:** Efforts should be made to ensure equitable engagement in the design processes and access to digital health interventions, particularly for marginalized and underserved populations. Strategies should be developed to overcome known biases such as gender and race and to address barriers such as language, cultural sensitivities, and low digital literacy, to ensure that no one is left behind in the digital transformation of health.

2. **Workforce:** Health professionals need to be equipped with the necessary digital skills and knowledge to effectively utilize digital health interventions. Pre-service and in-service training should be implemented to ensure health providers are prepared to leverage the benefits of digital health and other emerging technology innovations like GenAI.

3. **Standards and Interoperability:** Governments should prioritize the development and implementation of architectures and standards that promote interoperability between digital health interventions to support the continuum of care.

4. **Infrastructure:** Adequate investment in digital infrastructure, including broadband connectivity, telecommunication networks, and health information systems, is crucial to enable the widespread adoption and effective use of digital health interventions.

5. **Strategy and Investment:** While ambitions for digital transformation are high, the financing needed is not sufficient to meet the needs of most countries. Greater investment should be made by the public sector and the conditions established to promote private sector engagement.

Through prioritized investments and systematic monitoring, countries can accelerate the adoption and impact of digital health, ultimately leading to improved health outcomes, enhanced access to and delivery of health services, and more equitable and resilient health systems. This foundational contribution to the Global Initiative on Digital Health strives to inspire collective action towards greater maturity in digital health through sharing and learning between countries at higher maturity and those on the path towards higher maturity.

The GDHM invites countries who participated in 2023 to participate again in 2024 to measure their progress, and invites new countries to set a baseline in 2024 and use the platform to prioritize their digital health investments into the future. Year on year, it is our hope that we will see an overall movement towards Phase 5 in all components in all countries in a way that contributes to the achievement of UHC and leads to health and well-being of all people, everywhere, so that no one is left behind.