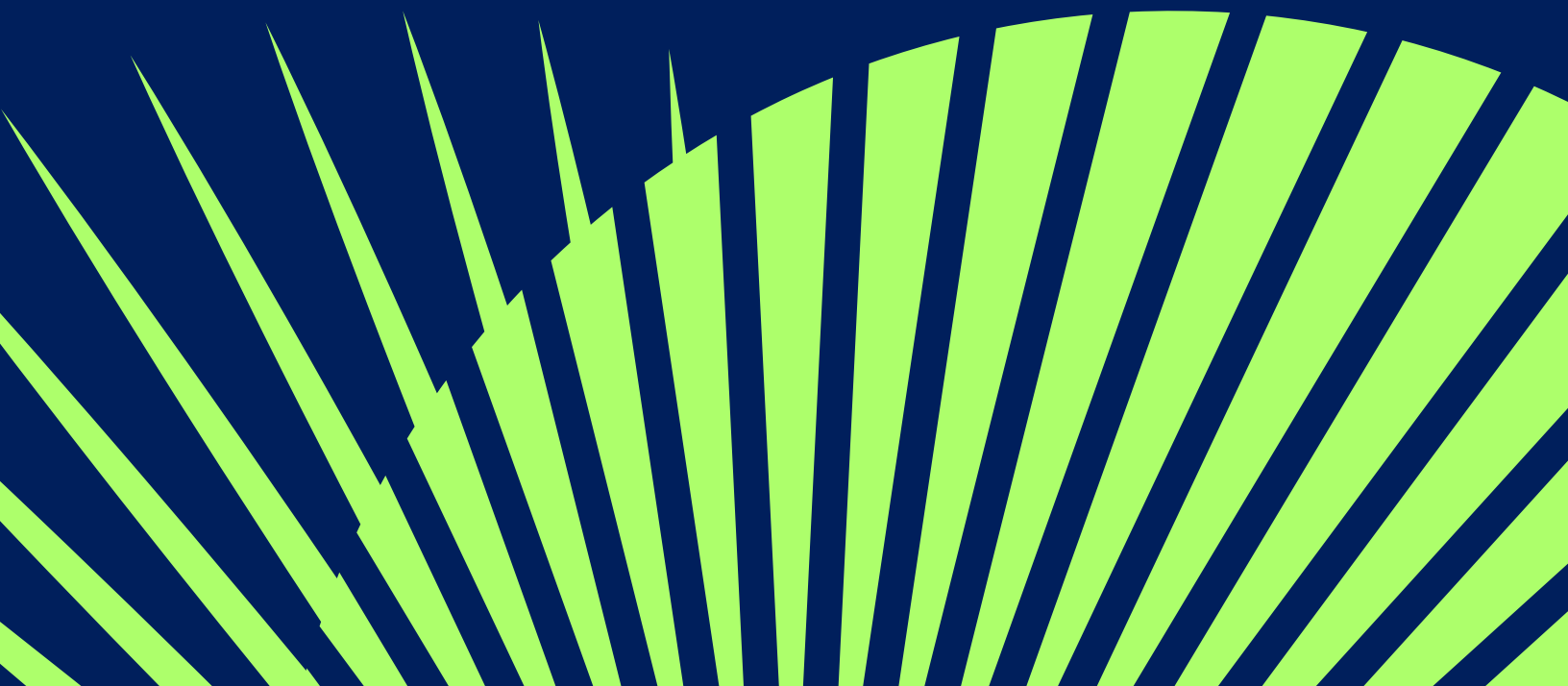
U.S. Chamber of Commerce

Partnership at the Digital Health Frontier:

Accelerating Access to Healthcare Through Public-Private Collaboration at the G20



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Acronyms

AI	Artificial Intelligence
G20 HWG	G20 Health Working Group
GIDH	G20 Global Initiative on Digital Health
GSDH	WHO Global Strategy on Digital Health
HIMSS	Healthcare Information and Management Systems Society
HL-7	Health Level Seven
IP	Intellectual Property
NDHB	National Digital Health Blueprint
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Acknowledgments

We would like to express our sincere gratitude to the organizations that contributed their resources, time, and expertise to the development of this report including representatives from: Pfizer, Medtronic, Roche, other health services companies, the Healthcare Information and Management Systems Society (HIMSS), Digital Square, IBM, the World Health Organization (WHO), and others.

Introduction

Digital health is rapidly permeating all areas of healthcare and has the potential to transform the way medical professionals and patients interact with health services. As this diffusion and uptake continue to evolve, policymakers are faced with a crucial decision: they can either opt for a coordinated, equitable, and systematic implementation of digital health solutions or risk a chaotic, fragmented, and inequitable rollout. By choosing the former, policymakers can ensure that digital health innovations are accessible to all, bridge gaps in healthcare access, and create a more resilient and efficient healthcare system. In contrast, the latter scenario may lead to increased disparities, uneven access to quality care, and, ultimately, missed opportunities to harness the full potential of digital health technologies for the betterment of global health.

Setting policy and regulation in a complex, technically diverse, and rapidly evolving area, such as digital health, presents unique challenges. Decision-makers must address a wide range of factors, such as patient safety, data privacy, and interoperability, all while minimizing the unintended consequences of poorly designed policy and regulation, like unintentionally stifling innovation and delaying access. By working in partnership with industry, patients, and other stakeholders, policymakers can develop comprehensive, adaptable, and supportive policies and regulations that foster innovation and promote equitable access to cutting-edge healthcare solutions.

What do we mean by ‘digital health’?

For the purposes of this white paper, we use the World Health Organization (WHO) definition of digital health as “the field of knowledge and practice associated with the development and use of digital technologies to improve health”. Digital technologies in this context include but are not limited to: mhealth, telemedicine, wearable smart devices, digitally enabled implantable devices, therapies and diagnostics, artificial intelligence (AI), and tools that enable data exchange and storage across the health ecosystem, including for research & development (R&D), manufacturing, safety monitoring, and supply chain optimization.

Digital health solutions have the potential to reduce healthcare costs[1], improve care quality[2,3] and outcomes[4], and, in so doing, accelerate access toward Universal Health Coverage. For example, AI, which is just one component of the digital health landscape, can support clinicians to identify high-risk individuals earlier in the disease process, thereby improving patient outcomes and simultaneously optimizing the allocation of limited healthcare resources. AI enables providers to rapidly identify babies at risk of pre-term birth using routine ultrasound scans[5], predict disease severity in children with malaria without complex laboratory equipment[6], and identify cases of breast cancer on x-rays that might otherwise be missed.[7]

Expanded access to digital health solutions can also have significant economic implications, including increased economic growth through improved productivity and a healthier workforce. Although the economic impacts of improved digital health adoption can be challenging to quantify due to their diverse applications and complexities, economic projections indicate that the widespread adoption of digital health innovations could generate a global health impact valued between US $250 billion and US $420 billion by 2030.[8]

In 2020, the WHO launched the Global Strategy on Digital Health (GSDH) to support countries to accelerate the development and adoption of digital health solutions under the technical stewardship of the newly created Department for Digital Health and Innovation.[9] The GSDH was launched in the context of increasing recognition of the importance of digital health. Many multilateral organizations are now supporting national governments and the private sector to scale digital health solutions, including United Nations agencies, such as UNICEF[10] and the United Nations Development Programme,[11] multilateral financing institutions, like the World Bank[12] and the Asian Development Bank,[13] and regional organizations like the African Union,[14] the Asia-Pacific Economic Cooperation[15], and the Organisation for Economic Cooperation and Development.[16] Further, a growing ecosystem of international organizations, including the Global Digital Health Partnership[17] and Digital Square,[18] are working collaboratively with country governments and industry to advance digital health initiatives, enhance coordination, and provide valuable technical support.

In 2023, the G20 Health Working Group (G20 HWG), under the leadership of the Indian Presidency, proposed the Global Initiative on Digital Health (GIDH) to support countries achieve objectives under the GSDH and to ensure that the benefits of digital health solutions are realized as broadly and equitably as possible.

Objectives and Approach

With the GIDH in its formative stages, the U.S. Chamber of Commerce ('the Chamber') commissioned Enlumen to work with industry leaders, standard-setting organizations, and multilateral agencies with experience in digital health to better understand their perspectives on how the private sector might best be engaged to support G20 member states in the delivery of the GIDH. Specifically, Enlumen set out to:

Identify opportunities for the private sector to support the development and operationalization of the GIDH.

Identify policy and regulatory enablers of, and barriers to, successful implementation of the GIDH.

Explore successful public-private partnership models in digital health that can inform the implementation of the GIDH.

Enlumen undertook a desk review of digital health strategies, policies, technical guidance, and case studies across G20 member states to support these objectives. Additionally, Enlumen conducted semi-structured key informant interviews (n=15) with representatives from industry, the public sector, and professional associations involved in digital health.

Where can public-private collaboration deliver impact in digital health?

On analysis, three key domains emerged that play a pivotal role in shaping digital health outcomes: Policy & Regulation; Finance, Infrastructure & Operations; and Innovation & Collaboration. In each domain, we highlight specific areas that warrant attention and collaborative action from policymakers and the private sector.

Domain 1.

Policy & Regulation

In the rapidly evolving digital health landscape, effective policy and regulation are crucial to ensure that innovative solutions are safe, effective, efficient, and universally accessible. By ensuring that regulations and policies are comprehensive, adaptable, and supportive, policymakers and regulators can help to foster innovation and promote equitable access to cutting-edge healthcare solutions. Specific areas of consideration in the domain of policy and regulation include:

Governance

A robust governance and policy framework is essential to implement and scale digital health initiatives effectively. Our respondents stressed the need for clear and consistent policies, strategic planning, and alignment between digital health goals and broader health system priorities. The private sector can contribute by sharing best practices, collaborating with public stakeholders to inform policy development, and highlighting existing standards, guidance, and policies that support convergence, innovation, and digital health growth. Governments and policymakers can support by appropriately resourcing and training teams involved in policymaking and regulation, implementing existing international best practices for digital health oversight, facilitating private sector consultations for policy harmonization, and promoting transparent benchmarking of digital health outcomes.

Regulatory Standards

Adopting established, internationally accepted, and industry-supported regulation and standards for digital health products and services is crucial because they ensure patient safety, foster innovation, and facilitate international interoperability, creating a globally consistent environment for their development and adoption. Policymakers should carefully calibrate their approach to standard-setting with industry and the private sector, ensuring that regulations are aligned to the internationally accepted best practice, are not overly rigid (which could unintentionally suppress innovation and delay the delivery of health solutions), and avoid technical barriers to trade. Key challenges identified by our respondents in this area include the need for clear, comprehensive, and flexible regulations that can adapt to the rapidly changing digital health landscape. Multilateral fora should rely on industry and sector-based standards organizations (including, for instance, through participation in standards-developing organizations like Health Level Seven International [HL7] and GS1) as the most effective way to promote the adoption of best practices that are technically sound to deliver on technology solutions and policy objectives. Governments and policymakers can aid regulators in achieving their goals by providing resources and training to enhance their capacity and expertise in reviewing digital health products and conducting post-market surveillance. Participating in regulatory sandboxes or pilots to test new products and services and creating multidisciplinary expert panels for regulatory oversight to ensure fair and balanced application of the rules may also be advantageous.

Example: In the United States, the Food and Drug Administration has established the Digital Health Center of Excellence to promote innovation and support the development of regulatory approaches for digital health technologies.[20] The Digital Health Center of Excellence actively engages with private sector stakeholders, including digital health companies, medical device manufacturers, and software developers, to track the evolving digital health landscape and develop appropriate regulatory guidelines and standards that protect patient safety and foster innovation.

Privacy & Cybersecurity

Handling sensitive personal health information carries significant risks and requires a commitment to protecting customers' and patients' right to privacy. Industry experts highlight the importance of transparent, risk-based, and harmonized privacy protections for securing sensitive data in a way that supports innovation, safety monitoring, and evidence-based decision-making. Key informants acknowledged the challenge policymakers and regulators face in maintaining stringent cybersecurity measures without hindering timely access to information for clinical care or decision-making. The private sector should continue investing in secure data storage and transmission technologies, including zero trust networking which leverages strong encryption, collaborating with public stakeholders to develop privacy-preserving solutions, and sharing best practices in cybersecurity.

Policymakers can support international cooperation and collaboration of privacy and cybersecurity efforts by ensuring that: (i) privacy and cybersecurity policies are risk-based and globally harmonized, (ii) privacy regimes are proportionate, balanced, and developed in partnership with industry, (iii) cybersecurity is strengthened by enabling cross border data flows and investing in cloud computing storage services vs. forced data localization, which would only undermine the security of health data, and (iv) GIDH guidance complements, supports and does not duplicate existing agreements developed by industry experts (for instance, the Cybersecurity Tech Accord[21]).

Domain 2.

Finance, Infrastructure & Operations

Countries worldwide face various cross-cutting challenges as they strive to build equitable and sustainable digital health ecosystems. Several respondents expressed concern about the digital divide, which underpins many other challenges in this domain. Ensuring adequate funding, capacity building, and infrastructure development are crucial to achieving health equity and reaching underserved populations. Potential areas of public-private collaboration within this domain include:

Funding & Investment

Equitable access to digital health solutions depends on the availability of robust digital health infrastructure, including widespread internet access. The International Telecommunications Union estimates that $428 billion in investment will be necessary by 2030 to provide internet access to currently unconnected populations worldwide.[22] Our key informants emphasized that attracting innovative sources of financing and fostering public-private partnerships are some of the most significant policy challenges in this area. Given the scale of funding required, policymakers will need to mobilize public and private investment. Additionally, policymakers can establish dedicated funding for digital health infrastructure, offer tax incentives for private sector investment in digital health assets, and foster international collaboration to mobilize resources for equitable access to digital health solutions.

Capacity Building

Building required capacity among the healthcare workforce and other stakeholders is essential for successfully implementing and adopting digital health technologies. Key informants highlighted several critical challenges in this area, including training healthcare professionals in digital tool use and fostering digital literacy among the general population. The private sector can contribute by providing training and education programs for healthcare providers, developing user-friendly and accessible digital health tools, and collaborating with governments and educational institutions to promote digital literacy. Governments can support private sector efforts by incorporating digital health education into healthcare curricula, establishing national digital health literacy campaigns, and creating targeted upskilling programs for healthcare workers.

Supply Chain

Supply chain digitization offers end-to-end tracking capabilities to safeguard health product safety and quality, improve logistics efficiency, and reduce delivery costs. Interviewees identified several challenges, including harmonizing data standards across diverse stakeholders, ensuring robust data security and privacy measures, and managing organizational change while building capacity for new technologies and processes. The private sector can contribute by sharing best practices and technical expertise on innovative digital supply chain management solutions and collaborating with public stakeholders to agree on and implement supply chain standards. Policymakers can foster advancement in this domain by investing in digital infrastructure to support supply chain digitization and establishing public sector procurement policies that emphasize compliance with digital supply chain standards. Additionally, policymakers can encourage public sector providers to adopt innovative supply chain management solutions through attractive incentives and comprehensive capacity-building programs.

Example: The Global Health Supply Chain Program-Procurement and Supply Management Project, funded by the United States Agency for International Development, involves partnerships with various private sector firms, including multiple pharmaceutical and logistics companies.[23] The program aims to strengthen and digitize supply chains for essential health commodities in low- and middle-income countries. The collaboration has resulted in improved procurement, increased visibility of supply chain data, and more efficient delivery of vital health products.

Domain 3.

Innovation & Collaboration

Innovation is crucial for expanding access to digital health solutions because it drives improvements in the outcomes and quality of care and increases efficiency, cost-effectiveness, and scalability. Specific opportunity areas for public-private collaboration within this domain include:

Research & Development

A robust global R&D ecosystem is crucial for equitable access to digital health solutions. Key informants underscored the need for increased investment in R&D, the importance of North-South knowledge exchange, and the critical function of intellectual property (IP) protection in incentivizing industry to commit to long-term investment to enable breakthroughs. The private sector can substantially contribute by investing in R&D, forming partnerships with diverse stakeholders such as academic institutions and government agencies, and engaging in collaborative research projects. Governments and policymakers can support these efforts by establishing a pro-innovation policy environment, increasing public funding for digital health R&D, incentivizing private sector investment through grants and tax breaks, and fostering international collaboration on research projects.

Data Sharing & Integration

Data sharing and integration are essential for creating a more connected and effective digital health ecosystem; these two actions facilitate better-informed decision-making, promote research and innovation, and enhance patient care. For example, seamless data sharing between electronic health records and telemedicine platforms can improve the accuracy of diagnoses and the efficiency of treatments. Similarly, facilitating secure cross-border data flows is paramount, as these support the delivery of global clinical trials, real-time disease and pandemic surveillance, and enhanced pharmacovigilance and safety monitoring. Interview respondents called attention to several challenges in this area, including ensuring data privacy, maintaining security, establishing standardized data formats, and addressing disparities in digital infrastructure. The private sector can support public sector efforts by investing in and implementing interoperable data systems, promoting global data standards adoption, and developing secure and user-friendly data-sharing platforms that adhere to privacy regulations. Governments and policymakers can advance data sharing and integration by enacting legislation that facilitates cross-border data exchange and safeguards privacy, endorsing the development and adoption of international data standards, and providing targeted funding or incentives to public providers for the implementation of interoperable data systems that adhere to stringent security and privacy regulations.

Example: The African Alliance of Digital Health Networks (African Alliance) is a regional network of digital health experts and organizations, including governments, private companies, and development partners.[24] The network aims to strengthen health systems in Africa by promoting the adoption of digital health solutions and fostering cross-border collaboration. One example of their work is the development of the Africa Health Data Collaborative, which aims to improve health data sharing and integration across the continent. Key private sector partners include companies like Philips, Merck, and Novartis.

Equitable Access

Achieving equitable access to digital health solutions is essential for addressing health inequalities, enhancing care for underserved populations, and fostering universal health coverage. For instance, telemedicine can provide healthcare services to remote communities that previously lacked access. The private sector can continue to support equitable access to life-saving digital health solutions by engaging in collaborative research efforts and continuing their long-standing engagement in public-private financing mechanisms that support equitable access. Governments and policymakers can promote equitable access by investing in digital infrastructure, fostering public-private partnerships, and supporting public providers in adopting innovative digital health solutions.

Example: GAVI, the Vaccine Alliance, is a public-private global health partnership committed to ensuring equitable access to vaccines for people in low- and middle-income countries. The private sector plays a significant leadership role within GAVI, holding board seats and contributing to decision-making processes. GAVI's innovative financing mechanisms and collaborative approach foster cooperation among pharmaceutical companies, governments, and non-profit organizations. By harmonizing various stakeholders' interests, GAVI enables sharing expertise while addressing equity concerns. Through the collective efforts of GAVI and its partners, vaccine development and distribution have been accelerated, promoting health equity and improving immunization coverage worldwide.

Digital Health Case Studies

Case Study 1:

Public-Private Collaboration for Strengthened and Streamlined Regulation

Indonesia is a lower-middle-income country in South-East Asia with a growing economy and the world's fourth-largest population.

The Government has taken an increasingly assertive role in healthcare planning and financing in recent years, including through the introduction of a national health insurance scheme that now covers over 80% of the population.[25] However, geographical barriers to healthcare remain, with 94.1% of the population living more than 5km from a healthcare facility.[26]

In the first months of the COVID-19 outbreak in Indonesia, the dynamics of demand for healthcare shifted dramatically.

Client demand for in-person consultations for routine health services fell substantially, with the utilization of pregnancy care services, for example, declining by up to 44% in some districts.[27] In parallel, the number of people admitted to healthcare facilities for COVID-19 treatment put increasing pressure on the healthcare system.[28]

Before the pandemic, telemedicine providers in Indonesia faced unclear regulations and guidance.

The prevailing rules lacked clarity on: (i) which healthcare workers were eligible to provide telemedicine services, (ii) which treatments and services could be administered remotely, and (iii) how patient data should be shared among telemedicine providers, patients, and the Ministry of Health. This ambiguity made it difficult for providers and operators to know if they complied with regulations and guidance. In so doing, the uncertainty increased operational risks and created an atmosphere of uncertainty that hindered providers from expanding their services effectively.

In response to the pandemic, the Ministry of Health worked with industry and professional bodies to test and implement clear guidelines and regulations for telemedicine providers.

Indonesia's telemedicine providers benefited from expanded market opportunities, accelerated innovation, and strengthened collaboration due to regulatory clarity and streamlining. As a result, patients experienced improved healthcare access, faster treatment, and more personalized care.

As a result of regulatory strengthening and streamlining, telemedicine providers in Indonesia were able to rapidly scale services to meet demand. The number of telemedicine users jumped from 4 million in 2019 to 15 million in 2020.[29]

Case Study 2:

Global Standards for Pharmaceutical Product Traceability

Healthcare supply chains have become increasingly complex, and pharmaceuticals and medical products pass through many hands as they move from the point of manufacture to the patient.

The complexity of health supply chains challenges manufacturers and national regulatory authorities to track and monitor the quality of medical products. As a result, substandard and falsified health commodities can enter the market: WHO reported a 10.5% failure rate among medicines sampled for quality testing.[30] This statistic highlights that patients are at risk of exposure to substandard or falsified medical products, especially in emerging market contexts. Governments and commercial pharmaceutical actors can leverage digital traceability technologies to address these vulnerabilities and optimize business outcomes.

GS1 is a not-for-profit and neutral organization that brings together private sector stakeholders to test, develop, and implement standards, including for the healthcare industry.

GS1 member organizations invest significant time and resources in the development of standards, including through participation in working groups and technical committees, sharing of best practices and case studies, and engagement in pilot projects to test new standards and technologies. Through their active participation in GS1, private sector stakeholders play an instrumental role in developing and implementing healthcare standards that improve patient safety, streamline supply chain management, and reduce costs.

By shaping and promoting the adoption of GS1 standards, private companies directly support public sector stakeholders to make better-informed decisions, increase patient safety and reduce waste.

For instance, the GS1 standards adoption can give regulators greater visibility and control over the supply chain, enabling them to monitor and enforce compliance with safety and quality standards more effectively. Similarly, by enabling more efficient tracking and management of medical products throughout the supply chain, GS1 standards can help reduce waste, minimize stockouts and overstocking, and lower the overall cost of healthcare delivery. Further, using standardized data exchange and traceability provided by GS1 standards can help prevent medication errors, reduce the risk of counterfeit or substandard medical products, and facilitate more accurate identification of patients and their medical records.

Global pharmaceutical traceability standards are becoming mainstream, and as of 2019, more than 45 countries had signed some form of traceability into law.[31]

To continue this momentum, the public and private sectors must continue working collaboratively to set standards, create reasonable implementation plans and timelines, and define policy and regulations to carry implementation forward.

Traceability standards supported the diverse public-private consortium that converged to develop and roll out vaccines against COVID-19. In Ireland, the Health Service Executive implemented a GS1 standards-based approach to efficiently and effectively track and report vaccinations across vaccination clinics using two software applications. In addition to the substantial health benefits associated with vaccination scale-up, traceability standards provided useful data on vial yields and stock expiry dates to assist in keeping wastage to a minimum: an estimated 75,000 doses were saved based on early detection of vial yield discrepancy and reduced staff needs.[32]

Recommendations for the G20 Health Working Group

In light of the significant potential for digital health solutions to transform global healthcare, and the essential role of public-private collaboration in unlocking this potential, the Chamber proposes the following recommendations for the G20 Health Working Group (G20-HWG):

Recommendation 1:

Create well-defined mechanisms and platforms for the private sector to contribute and collaborate within the GIDH framework.

The private sector brings invaluable expertise in technology development, financing, global standards, and market access, which are crucial for accelerating the adoption and scaling of digital health innovations. Effectively leveraging the strengths, resources, and innovative capabilities of the private sector will be critical to the success of the GIDH.

To facilitate ongoing dialogue and cooperation between the public and private sectors, the G20 Health Working Group should allocate seats for private sector representatives on the Steering Committee for the GIDH and ensure that there is a clear framework in place for private sector engagement in GIDH activities more broadly. Representation of the private sector on the Steering Committee would mirror the engagement in governance in other global initiatives like the World Bank's Pandemic Fund, the Global Fund, and GAVI.

Incorporating private sector representatives on the GIDH Steering Committee would enable sharing of insights, experiences, and best practices, fostering a more collaborative and innovative approach to digital health.

Recommendation 2:

Leverage private sector expertise across policy, regulation, standards, and other key areas to advance the benefits of digital health technology globally.

The G20 HWG should actively involve the private sector in shaping and adopting regulations and standards for digital health that are robust, agile, and that minimize the potential for unintended consequences. This collaboration should focus on promoting innovation, patient safety, and global interoperability, while avoiding overly rigid regulations that could hinder progress. Specifically, the G20 HWG should encourage the adoption of established healthcare standards which have been developed in partnership with industry, including, for instance, the GS1 Healthcare[33] and HL7 FHIR standards[34]. The GS1 Healthcare standard focuses on improving patient safety and supply chain efficiency through the use of globally unique identification numbers for products and assets, enabling seamless traceability and information sharing. The HL7 FHIR standard, on the other hand, enables the exchange of electronic health records and other healthcare data across different systems through the use of standardized data formats. Other areas of digital health practice where the G20 HWG could work to advance the adoption of common standards include, for instance, the DICOM standards for medical imaging data sharing[35], the ISO/IEEE 11073 standards for interoperability of medical devices[36], and the LOINC standards for standardized laboratory and clinical test results[37].

To accelerate the global adoption of these and other digital health standards the G20 HWG should work closely with international standard-setting organizations such as ISO, IEC, and IEEE in the formulation of standards-based regulations, develop targeted training and capacity-building programs to educate stakeholders on the benefits and adoption process of these standards, and establish incentives for private sector organizations that adopt and promote these within their operations. Additionally, the G20 HWG should facilitate knowledge sharing through the creation of centralized repositories for best practices, case studies, and lessons learned from successful implementations. Finally, the G20 HWG should provide clear regulatory guidance that encourages the use of these standards, by integrating them into national digital health strategies, setting measurable targets for their adoption, and streamlining the regulatory approval process for digital health solutions that comply with these standards.

Beyond supporting the adoption of digital health standards, the G20 should capitalizing on its unique convening power and influence to drive international collaboration, advocate for secure data flows, and direct investments toward global research initiatives that further digital health. Furthermore, the G20 HWG should prioritize bridging the digital divide and guaranteeing equitable access to digital health technologies for all populations. This achievement can be accomplished through infrastructure development support in underserved regions, digital literacy enhancement among various demographics, and exploring innovative financing models and public-private partnerships. These efforts can help address existing disparities in access to and utilization of digital health solutions, ensuring that the transformative potential of these technologies reaches everyone, regardless of their geographic location or socioeconomic status.

References

1. Eze ND, Mateus C, Cravo Oliveira Hashiguchi T. Telemedicine in the OECD: An umbrella review of clinical and cost-effectiveness, patient experience and implementation. Carter HE, ed. PLOS ONE. 2020;15(8):e0237585. doi:10.1371/journal.pone.0237585

2. Campanella P, Lovato E, Marone C, et al. The impact of electronic health records on healthcare quality: a systematic review and meta-analysis. Eur J Public Health. 2016;26(1):60-64. doi:10.1093/eurpub/ckv122

3. Zhang W, Cheng B, Zhu W, Huang X, Shen C. Effect of Telemedicine on Quality of Care in Patients with Coexisting Hypertension and Diabetes: A Systematic Review and Meta-Analysis. Telemed E-Health. 2021;27(6):603-614. doi:10.1089/tmj.2020.0122

4. Hoffer-Hawlik M, Moran A, Zerihun L, Usseglio J, Cohn J, Gupta R. Telemedicine interventions for hypertension management in low- and middle-income countries: A scoping review. Catalá-López F, ed. PLOS ONE. 2021;16(7):e0254222. doi:10.1371/journal.pone.0254222

5. Hoodbhoy Z, Noman M, Shafique A, Nasim A, Chowdhury D, Hasan B. Use of machine learning algorithms for prediction of fetal risk using cardiotocographic data. Int J Appl Basic Med Res. 2019;9(4):226. doi:10.4103/ijabmr.IJABMR_370_18

6. Johnston IG, Hoffmann T, Greenbury SF, et al. Precision identification of high-risk phenotypes and progression pathways in severe malaria without requiring longitudinal data. Npj Digit Med. 2019;2(1):63. doi:10.1038/s41746-019-0140-y

7. Nassif AB, Talib MA, Nasir Q, Afadar Y, Elgendy O. Breast cancer detection using artificial intelligence techniques: A systematic literature review. Artif Intell Med. 2022;127:102276. doi:10.1016/j.artmed.2022.102276

8. McKinsey Global Instittute. Discussion Paper: Connected World: An Evolution in Connectivity beyond the 5G Revolution.; 2020. https://www.mckinsey.com/~/media/mckinsey/industries/technology%20media%20and%20telecommunications/telecommunications/our%20insights/connected%20world%20an%20evolution%20in%20connectivity%20beyond%20the%205g%20revolution/mgi_connected-world_discussion-paper_february-2020.pdf

9. World Health Organization. Global Strategy on Digital Health 2020-2025. World Health Organization; 2021. Accessed March 16, 2023. https://www.who.int/docs/default-source/documents/gs4dhdaa2a9f352b0445bafbc79ca799dce4d.pdf

10. UNICEF. UNICEF's Approach to Digital Health. UNICEF; 2019. https://www.unicef.org/innovation/media/506/file/UNICEF%27s%20Approach%20to%20Digital%20Health%E2%80%8B%E2%80%8B.pdf

11. Dr Hammadoun Dia, United Nations Development Program. What role can digital play in Africa's health challenges? Published 2022. https://www.undp.org/blog/what-role-can-digital-play-africas-health-challenges

12. Gianluca Cafagna, World Bank. Digital health solutions in primary health care during COVID-19: Lessons from Latin America. Investing in Health. Published 2020. https://blogs.worldbank.org/health/digital-health-solutions-primary-health-care-during-covid-19-lessons-latin-america

13. Asian Development Bank. Guidance for Investing in Digital Health.; 2018. http://dx.doi.org/10.22617/WPS179150-2

14. African Center for Disease Control, African Union. Digital Transformation Strategy.; 2023. https://africacdc.org/download/digital-transformation-strategy/

15. APEC Health Working Group. Empowering Telehealth Solutions in APEC: Study on the Policy Landscape for Telehealth in the APEC Region. APEC; 2022. https://www.apec.org/publications/2022/01/empowering-telehealth-solutions-in-apec-study-on-the-policy-landscape-for-telehealth-in-the-apec-region

16. OECD. OECD-Digital Health.; 2023. https://www.oecd.org/health/digital-health.htm

17. Global Digital Health Partnership. About Us-Global Digital Health Partnership.; 2022. https://gdhp.nhp.gov.in/#

18. PATH. About-PATH Digital Square.; 2022. https://digitalsquare.org/about

19. Ministry of Health and Family Welfare. Final Report on National Digital Health Blueprint. Government of the Republic of India; 2019. https://main.mohfw.gov.in/sites/default/files/Final%20Report%20-%20Lite%20Version.pdf

20. Center for Devices and Radiological Health. About the Digital Health Center of Excelelnce (DHCoE). U.S. Food and Drug Administration; 2020. https://www.fda.gov/medical-devices/digital-health-center-excellence/about-digital-health-center-excellence

21. Cybersecurity Tech Accord. ABout-The Cybersecurity Tech Accord.; 2020. https://cybertechaccord.org/about/

22. International Telecommunications Union. Connecting Humanity.; 2021. https://www.itu.int/hub/publication/d-gen-invest-con-2020/

23. USAID Global Health Supply Chain Program. USAID Global Health Supply Chain Program-Procurement and Supply Management. United States Agency for International Development; 2022. https://www.ghsupplychain.org/PSM

24. About Us-African Alliance on Digital Health Networks.; 2023. https://www.africanalliance.digital/about-us

25. Maulana N, Soewondo P, Adani N, Limasalle P, Pattnaik A. How Jaminan Kesehatan Nasional (JKN) coverage influences out-of-pocket (OOP) payments by vulnerable populations in Indonesia. PLOS Glob Public Health. 2022;2(7):e0000203. doi:10.1371/journal.pgph.0000203

26. Wiweko B, Zesario A, Agung PG. Overview the development of tele health and mobile health application in Indonesia. In: 2016 International Conference on Advanced Computer Science and Information Systems (ICACSIS). IEEE; 2016:9-14. doi:10.1109/ICACSIS.2016.7872714

27. ThinkWell. Maintaining Essential Services during the COVID-19 Pandemic in Indonesia.; 2020. https://thinkwell.global/wp-content/uploads/2021/06/Indonesia-COVID-EHS-Brief_final.pdf

28. WHO. Indonesia Country Profile-COVID-19 Situation Report.; 2023. https://covid19.who.int/region/searo/country/id

29. Nawarini AT, Rabbani I, Novandari W. Telemedicine Adoption during Pandemic Covid19 in Indonesia. Int J Econ Bus Manag Res. 2022;06(10):161-171. doi:10.51505/IJEBMR.2022.61011

30. World Health Organization. A Study on the Public Health and Socioeconomic Impact of Substandard and Falsified Medical Products.; 2017. Accessed April 14, 2021. https://www.who.int/medicines/regulation/ssffc/publications/SE-Study_EN_web.pdf?ua=1

31. Pisa M, McCurdy D. Improving Global Health Supply Chains through Traceability. Center for Global Development; 2019.

32. GS1. Ireland: Traceability standards enabling a safer, more efficient rollout of the COVID-19 Vaccine Acrss Ireland. https://www.gs1.org/industries/healthcare/pandemic-case-studies-library

33. GS1. About GS1 Healthcare.; 2023. https://www.gs1.org/industries/healthcare/about

34. HL7 FHIR Foundation. HL7 FHIR Foundation Enabling Health Interoperability through FHIR.; 2023. https://fhir.org/

35. DICOM. DICOM Standard. DICOM; 2023. https://www.dicomstandard.org/

36. International Standards Organization. ISO/IEEE 11073-10101:2020 Health Informatics—Device Interoperability—Part 10101: Point-of-Care Medical Device Communication—Nomenclature.; 2023. https://www.iso.org/standard/77338.html

37. Regenstrief. LOINC.; 2023. https://loinc.org/