31 CASE STUDY: DIGITAL TRANSFORMATION OF PUBLIC HEALTH SYSTEMS

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ABSTRACT

Countries use data and digital technologies to make healthcare more financially sustainable and better prepared for future challenges while providing efficient, high quality and people-centred services. The COVID-19 pandemic catalysed the digital transformation of health systems, but the health sector lags in harnessing the potential of data and transforming services for the 21st Century. Expanding the digital transformation of the health sector in developing countries will require national strategies that are inclusive of all stakeholders as well as more co-ordination and support from development co-operation partners.

Key messages

▪ The COVID-19 pandemic highlighted the benefits, risks and limitations of digital technologies for healthcare, highlighting the need for countries to transform their data and information systems, and implement digital health strategies and health data governance frameworks.

▪ As this transformation spreads, policymakers in health, digitalisation and development can join forces to support systems for cross-border data sharing and surveillance that consider developing-country contexts and capacity challenges.

As countries work towards Sustainable Development Goal (SDG) 3.8: Universal Health Coverage, many look to data and digital technologies to make healthcare more financially sustainable and better prepared for future challenges while providing efficient, high quality and people-centred services. The COVID-19 pandemic catalysed the digital transformation of health systems. This ranges from innovating healthcare delivery (e.g., telehealth), to establishing health information systems (e.g., digitising patient records or providing vaccine passports), to setting up disease monitoring and management systems, to sharing data for research. However, the health sector lags significantly in harnessing the potential of data and transforming services for the 21st Century – particularly investments in human and technical capacity, given the increasing inequalities and digital divides within and between countries.

At the national level, often-intertwined challenges to digital transformation of health systems include interoperability, fragmentation, lack of end-user focus, and regulatory barriers or gaps. All economies face these challenges, as evidenced in OECD country reviews of health systems.[1] Despite the similarities, access to technology (and limited capacity to make use of it) often divides developed and developing countries, limiting the potential for joint solutions.

Data and digital technologies present opportunities and new policy challenges

The main reason health data cannot work together is a lack of interoperability when information systems are developed without common standards, preventing data from being exchanged or making it difficult to interpret or integrate with other data (OECD, 2021[1]). In addition, health information systems should be interoperable with other national data systems (such as for social protection), with strong data governance and regulatory frameworks that enable secure exchange (OECD, forthcoming[2]). Fragmented healthcare provision presents another challenge for national governments, increasing costs and co-ordination difficulties. The OECD's forthcoming report on the Netherlands' health system shows that efforts to overcome fragmented (project-by-project or locality-by-locality) approaches are critical for an information system that meets the needs of all stakeholders and maximises the use of data for direct care or secondary purposes. For developing countries, these systems must also be consistent with country capacity to operate and manage data if they are to improve financial and programmatic decision making, as exemplified by the oversupply of donor-driven health data initiatives in Papua New Guinea (Hetzel, 2020[3]).

Further, in countries where health systems are over-stretched and underfunded, health information systems must be efficient, with effective buy-in from users and other stakeholders. Health data can have many uses and users: from individuals monitoring and improving their own health; to providers delivering personalised care; to managers ensuring safety, quality and performance; to scientists developing and evaluating treatments; to IT developers creating new digital tools, devices and apps. Effective health systems need data that is widely

usable and takes country context into account.

Finally, lack of alignment and common interpretation of regulations also challenge the digital transformation of health systems. Overcoming these will require governance and regulatory systems that enable access to data for those who need them while keeping data secure and maintaining individuals' rights to privacy. In countries where poor digital and health infrastructure might prevent interoperability between data systems and the safe use of patient data, an appropriate governance framework can protect individuals and ensure that healthcare is tailored to the characteristics and values of the target communities (Wyber et al., 2015[4]). Advancing people-centred care also requires transparency about the data collected, and allows individuals to express preferences about data sharing and access their own health data.

At the international level, the case for health data as a global public good (through unrestricted sharing across borders) must be strengthened, highlighting the benefits of health data exchange to support response and preparedness. For example, it can enable multi-country medical and scientific research, foster industry innovations and allow healthcare organisations to adopt new technologies in line with global advances. In parallel, these efforts must protect health data from loss and misuse, and provide governance and oversight of the data to ensure safe use.

Despite efforts to accelerate data sharing between health systems globally in the wake of the COVID-19 crisis, most countries still struggle with a range of challenges. These include low data interoperability due to a lack of standardised data formats, siloed technology and data collection systems, and variations in national protocols to link records. These must be considered in addition to the overarching responsibility of ensuring that data can be safely accessed when and where authorised. The difficulty in agreeing a globally accepted COVID-19 vaccination passport underscores both the complexity of the

problem and the importance of identifying a solution for international mobility in the future.

Integrated health information systems deliver gains and protect against risks

Digital technologies already provide solutions to these challenges across developed, emerging and developing country contexts (Gunasekeran et al., 2021[5]; Scales, 2021[6]; OECD, 2020[7]).[2] If access to the Internet and other technologies can be resolved, an integrated health information system can strengthen healthcare delivery in many contexts so that health data can be accessed by a range of users, starting with patients and their healthcare providers.

Such systems should also enable secondary data use, including for:

- health system performance management on national, regional and network levels

- public health monitoring and management, including for the COVID-19 pandemic

- new digital services such as e-prescriptions and telehealth consultations, payments and reimbursements

- biomedical research and development

- innovation such as big-data analytics and artificial intelligence (AI) to enhance knowledge-based decisions for patient care and health system governance.

One national-level example of secondary use is France's Health Data Hub launched in 2019 to support research and innovation in healthcare. The hub provides a single entry point for secure and privacy-protected data services, and access to health microdata for research that contributes to the public interest while respecting patient rights and ensuring transparency for civil society. In addition to facilitating data exchange, the Health Data Hub also provides educational tools for citizens to understand the data and learn how to use it.

While at an early stage in many developing countries, big data and predictive analytics are helping prevent outbreaks of disease and save lives by enabling the pre-positioning

of emergency relief finance, supplies and personnel (Hernandez and Roberts, 2020[8]). For example, these technologies have been used to help address a cholera outbreak in Yemen with the support of the United Kingdom, UNICEF and partners (United Kingdom Department for International Development, 2018[9]). The health sector also had some success with the provision of digital public goods: 73 countries have adopted the District Health Information Software 2 (DHIS2) to collect and manage health data, which some used as the basis to issue vaccine certificates during COVID-19 (see Chapter 26). However, the quality of data sources and availability of digital devices in clinics and hospitals remain an issue, along with the absence of some of the most vulnerable groups from the data collection process.

As global interdependence in health security increases, co-operation between countries on knowledge sharing around digital health is accelerating (OECD, 2019[10]). In addition, international and regional organisations increasingly help countries leverage tools such as digital surveillance to exchange timely health system information (Kostkova et al., 2021[11]). The African Union's Centre for Disease Control and Prevention is helping six countries build capacity to leverage digital tools for tracking infectious diseases, including COVID-19, and use that information to target public health efforts (Africa CDC, n.d.[12]).

Furthermore, health systems can leverage data and digital technologies to become more efficient, reliable and financially sustainable. OECD countries use data to identify low-value services that could be discontinued because they are either unprofitable, not treating enough people, failing to achieve desired outcomes, or a combination of these (OECD, 2019[10]). Similarly, in developing countries, information feedback systems can move healthcare towards results-based practice and improve the use of resources (Wyber et al., 2015[4]).

Beyond efforts to strengthen health information systems, national governments and development co-operation providers use digital technologies to reinforce health policy objectives – for example mobile messaging and social media to promote vaccination in all age groups, including in low- and middle-income countries (COVID-19 Global Evaluation Coalition, 2020[13]).

Digital capacity determined preparedness to cope with COVID-19

Countries with greater digital capacity were better prepared to meet demands on their health information systems due to COVID-19 and broader challenges for global health security. Some had systems in place to integrate health data, a scientific community to translate data into knowledge, and IT infrastructure and communications channels to provide trusted information and digital tools to patients and the public. For example, tele-medicine and AI for health research and diagnosis were successfully deployed in many countries to address the shortage of medical personnel.

But there is a gap in uptake of these technologies between low- and high-income countries, and some found themselves totally unprepared to use health data and digital technology to manage the pandemic. The COVID-19 crisis accentuated weaknesses in health systems in both OECD countries and developing countries, which stem from a range of poor policy and technology choices. These include: failed electronic health-record system deployments; fragmented and unstandardised health data; legislation that prevented data development and sharing; policies and practices (such as biased AI algorithm deployments) that lost public trust (Oliveira Hashiguchi, Slawomirski and Oderkirk, 2021[14]); commodification and sale of personal data without consent (Murgia and Harlow, 2019[15]); and data breaches due to poor safeguards (European Union Agency for Cybersecurity, 2021[16]).

Similarly, there is a gap in uptake of digital payment and reimbursement systems. Nevertheless, success stories around the use of these systems in some developing

country contexts demonstrate benefits for global health security. For example, digitised payments to Ebola health workers were also implemented for COVID response (Better Than Cash Alliance, 2016[17]; Better Than Cash Alliance, 2020[18]; Better Than Cash Alliance, 2021[19]).

Next steps for development co-operation to expand digital health tools

Expanding the digital transformation of health to developing countries will require national strategies that are inclusive of all stakeholders while expanding work with development co-operation partners.[3] Three objectives were identified for national digital health strategies in all countries (OECD, 2019[20]):

1. Achieve a mature health information system with high-quality data across the continuum of care that can be linked with one another and with contextual and outcome data.
2. Develop a standardised, coherent and accessible Electronic Health Record (EHR) system that breaks down clinical data silos and can show health care trajectories and outcomes.
3. Create comprehensive health data governance, with legislation and policies that allow data to be linked and accessed for uses in the public interest, including cross-border collaboration.

The OECD Digital Health portal[4] is a useful starting point for information about best practices and lessons learned, including on health data development, new technologies and data governance. The OECD Recommendation on Health Data Governance provides a comprehensive framework for all countries looking to develop a national digital health strategy and roadmap (OECD, 2019[20]). It sets out principles to support health data development, use and sharing within and across borders, while protecting individuals' privacy and data security. These principles

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also provide a valuable framework for development co-operation, taking context as the starting point and ensuring consistency with national development objectives and development effectiveness. Information on adherence to the OECD recommendation and other resources is available at the OECD Legal Instruments portal.[5]

Meanwhile, development-specific efforts help low- and middle-income countries collect better public health data. During the COVID-19 pandemic, Bloomberg Philanthropies provided technical assistance to help 32 national governments improve their use of data and gain a better understanding of the disease's impact. (Bloomberg Philanthropies, 2021[21]). The MEASURE Evaluation project, funded by USAID, aims to enable countries to improve lives by strengthening their capacity to generate and use high-quality health information to make evidence-informed, strategic decisions at local, subregional and national levels in low-resource settings.[6] In addition to these efforts, development co-operation providers – including vertical funds such Gavi, UNAIDS, the Vaccines Alliance, and the Global Fund to Fight AIDS, Tuberculosis and Malaria – are joining forces to strengthen digital health information systems nationally and globally.

As this transformation expands, health and digital policy makers have a role in supporting developing-country governments while ensuring that the design of international systems for cross-border data sharing and surveillance take developing country contexts and capacity challenges into account.

REFERENCES

Africa CDC (n.d.), *Programmes - Digital Disease Surveillance (webpage)*, Africa Centres for Disease Control and Prevention (CDC), African Union Commission, Addis Ababa, https://africacdc.org/programme/surveillance-disease-intelligence/digital-disease-surveillance/ (accessed on 19 November 2021). [12]

Better Than Cash Alliance (2021), *Improving Humanitarian Payments Through Digital Innovation: Challenges and Opportunities*, Better Than Cash Alliance, New York, https://www.betterthancash.org/alliance-reports/improving-humanitarian-payments-through-digital-innovation-challenges-and-opportunities. [19]

Better Than Cash Alliance (2020), *Digital Payments in Ebola Response: Lessons for the COVID-19 crisis (webinar)*, https://www.betterthancash.org/videos/bKUrlwIN_wU. [18]

Better Than Cash Alliance (2016), *Saving Money, Saving Lives: A Case Study on the Benefits of Digitizing Payments to Ebola Response Workers in Sierra Leone*, https://www.betterthancash.org/alliance-reports/saving-money-saving-lives-a-case-study-on-the-benefits-of-digitizing-payments-to-ebola-response-workers-in-sierra-leone (accessed on 19 November 2021). [17]

Bloomberg Philanthropies (2021), *Data for Health (database)*, https://www.bloomberg.org/public-health/strengthening-health-data/data-for-health/ (accessed on 2 December 2021). [21]

COVID-19 Global Evaluation Coalition (2020), , https://www.covid19-evaluation-coalition.org/ (accessed on 7 December 2021). [13]

European Union Agency for Cybersecurity (2021), *ENISA Threat Landscape 2021*, https://www.enisa.europa.eu/publications/enisa-threat-landscape-2021. [16]

Gunasekeran, D. et al. (2021), "Applications of digital health for public health responses to COVID-19: A systematic scoping review of artificial intelligence, telehealth and related technologies", *npj Digital Medicine*, Vol. 4/1, pp. 1-6, http://dx.doi.org/10.1038/s41746-021-00412-9. [5]

Hernandez, K. and T. Roberts (2020), *Predictive Analytics in Humanitarian Action: A Preliminary Mapping and Analysis*, Institute of Development Studies, Brighton, UK, https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15455/EIR33_Humanitarian_Predictive_Analytics.pdf. [8]

Hetzel, M. (2020), "PNG's health data: Too much of a good thing – part two", *DevPolicy Blog*, https://devpolicy.org/pngs-health-data-too-much-of-a-good-thing-part-two-20200611/ (accessed on 19 November 2021). [3]

Kostkova, P. et al. (2021), "Data and digital solutions to support surveillance strategies in the context of the COVID-19 pandemic", *Frontiers in Digital Health*, Vol. 3, p. 707902, http://dx.doi.org/10.3389/FDGTH.2021.707902. [11]

Murgia, M. and M. Harlow (2019), *How top health websites are sharing sensitive data with advertisers*, https://www.ft.com/content/0fbf4d8e-022b-11ea-be59-e49b2a136b8d. [15]

OECD (2021), *Creditor Reporting System*, https://stats.oecd.org/Index.aspx?DataSetCode=crs1 (accessed on 19 November 2021). [22]

OECD (2021), "Laying the foundations for artificial intelligence in health", in *OECD Health Working Papers*, OECD Publishing, Paris, https://www.oecd-ilibrary.org/social-issues-migration-health/laying-the-foundations-for-artificial-intelligence-in-health_3f62817d-en (accessed on 19 November 2021). [1]

OECD (2020), *Trustworthy AI in Health*, OECD Publishing, Paris, https://www.oecd.org/health/trustworthy-artificial-intelligence-in-health.pdf (accessed on 25 November 2021). [7]

OECD (2019), *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://dx.doi.org/10.1787/e3b23f8e-en. [10]

OECD (2019), *Recommendation of the Council on Health Data Governance*, OECD/LEGAL/0433, https://www.oecd.org/health/health-systems/Recommendation-of-OECD-Council-on-Health-Data-Governance-Booklet.pdf (accessed on 25 November 2021). [20]

OECD (forthcoming), *Towards an Integrated Health Information System in the Netherlands*, OECD Publishing, Paris. [2]

Oliveira Hashiguchi, T., L. Slawomirski and J. Oderkirk (2021), "Laying the foundations for artificial intelligence in health"*, OECD Health Working Papers*, No. 128, OECD Publishing, Paris, https://doi.org/10.1787/3f62817d-en. [14]

Scales, I. (2021), "How COVID-19 accelerated digital healthcare", *MyITU*, https://www.itu.int/en/myitu/News/2021/04/07/07/25/COVID-accelerating-digital-healthcare (accessed on 19 November 2021).   [6]

United Kingdom Department for International Development (2018), "World first as UK aid brings together experts to predict where cholera will strike next", *ReliefWeb*, https://www.gov.uk/government/news/world-first-as-uk-aid-brings-together-experts-to-predict-where-cholera-will-strike-next.   [9]

Wyber, R. et al. (2015), "Big data in global health: Improving health in low- and middle-income countries", *Bulletin of the World Health Organization*, Vol. 93/3, p. 203, http://dx.doi.org/10.2471/BLT.14.139022.   [4]

NOTES

1. See: https://www.oecd.org/els/health-systems/reviews-health-systems.htm
2. See: https://www.oecd.org/health/trustworthy-artificial-intelligence-in-health.pdf
3. Financing for digital health projects from development co-operation providers increased at an estimated total of USD 786.8 million in the period 2015-2019, in line with an overall increase in health sector financing since 2017. Source: Authors' calculations based on OECD Creditor Reporting System (OECD, 2021[22]).
4. See: https://www.oecd.org/health/digital-health.htm.
5. See: https://www.oecd.org/legal/legal-instruments.htm.
6. See: https://www.measureevaluation.org.