

Harnessing technology and data for urban healthcare in Malaysia





The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

We invite you to find out more at gsma.com
Follow us on Twitter [@GSMAM4d](https://twitter.com/GSMAM4d)

Authors:

Nigham Shahid (GSMA Mobile for Development)

Contributors:

Aaron Kual (Foreign, Commonwealth and Development Office)
Carol Koh (Foreign, Commonwealth and Development Office)
Charis Yeap (Foreign, Commonwealth and Development Office)
Daniele Tricarico (GSMA Mobile for Development)
Sone Osakwe (GSMA Mobile for Development)
Clara Aranda (GSMA Mobile for Development)
Mojca Cargo (GSMA AI for Impact)
George Bauer (GSMA Mobile for Development)
Hilary Kemp (GSMA)
Michele Palladino (IfM)
VGR Chandran Govindaraju (C&G Analytica)
Sarpaneswaran Subramaniam (C&G Analytica)

Acknowledgements:

This report has been supported by the British High Commission in Kuala Lumpur and by research conducted for the GSMA by IfM Engage (University of Cambridge) and C&G Analytica.

We would like to thank the many experts and stakeholders who shared their insights with us. Please see the list of contributors at the end of this report.

Published: November 2022

GSMA Central Insights Unit

The Central Insights Unit (CIU) sits at the core of GSMA Mobile for Development (M4D) and produces in-depth research on the role and impact of mobile and digital technologies in advancing sustainable and inclusive development. The CIU engages with public and private sector practitioners to generate unique insights and analysis on emerging innovations in technology for development. Through our insights, we support international donors to build expertise and capacity as they seek to implement digitisation initiatives in low-and middle-income countries through partnerships within the digital ecosystem.



This initiative has been funded by the UK Foreign, Commonwealth & Development Office (FCDO) and is supported by the GSMA and its members. The views expressed do not necessarily reflect the UK Government's official policies.

Contents

List of figures	4
List of boxes	4
Glossary of terms	6
Executive summary	8
Introduction	10
1. Urban healthcare in Malaysia	12
1.1 Urban healthcare challenges	12
1.2 Urban health policy and digital health	16
2. Addressing non-communicable diseases (NCDs) through digital health tools	20
3. Strengthening urban healthcare through digital health tools	26
4. Enablers of digital health adoption	34
Recommendations	39
Annex: Stakeholders consulted	42

List of figures

Figure 1: Cardiovascular risk factors in Malaysia, 2019	13
Figure 2: Prevalence of diabetes, hypertension and high cholesterol in adults, by household income	13
Figure 3: Outpatient healthcare use in Malaysia (in a two-week period before NHMS 2019 survey)	14
Figure 4: Expenditure on healthcare as a percentage of GDP in 2019, selected countries	15
Figure 5: Key public health policies in Malaysia, 1997–2021	17
Figure 6: Strategic goals of the Digitisation Strategic Plan of the Ministry of Health	18
Figure 7: Digital health tools for efficient public healthcare	27
Figure 8: Building blocks for digital health systems	35
Figure 9: Malaysia’s Global Digital Health Index Score	35
Figure 10: Technologies and sectors enabled by the Technology and Innovation Sandbox in 2020-2021	38

List of boxes

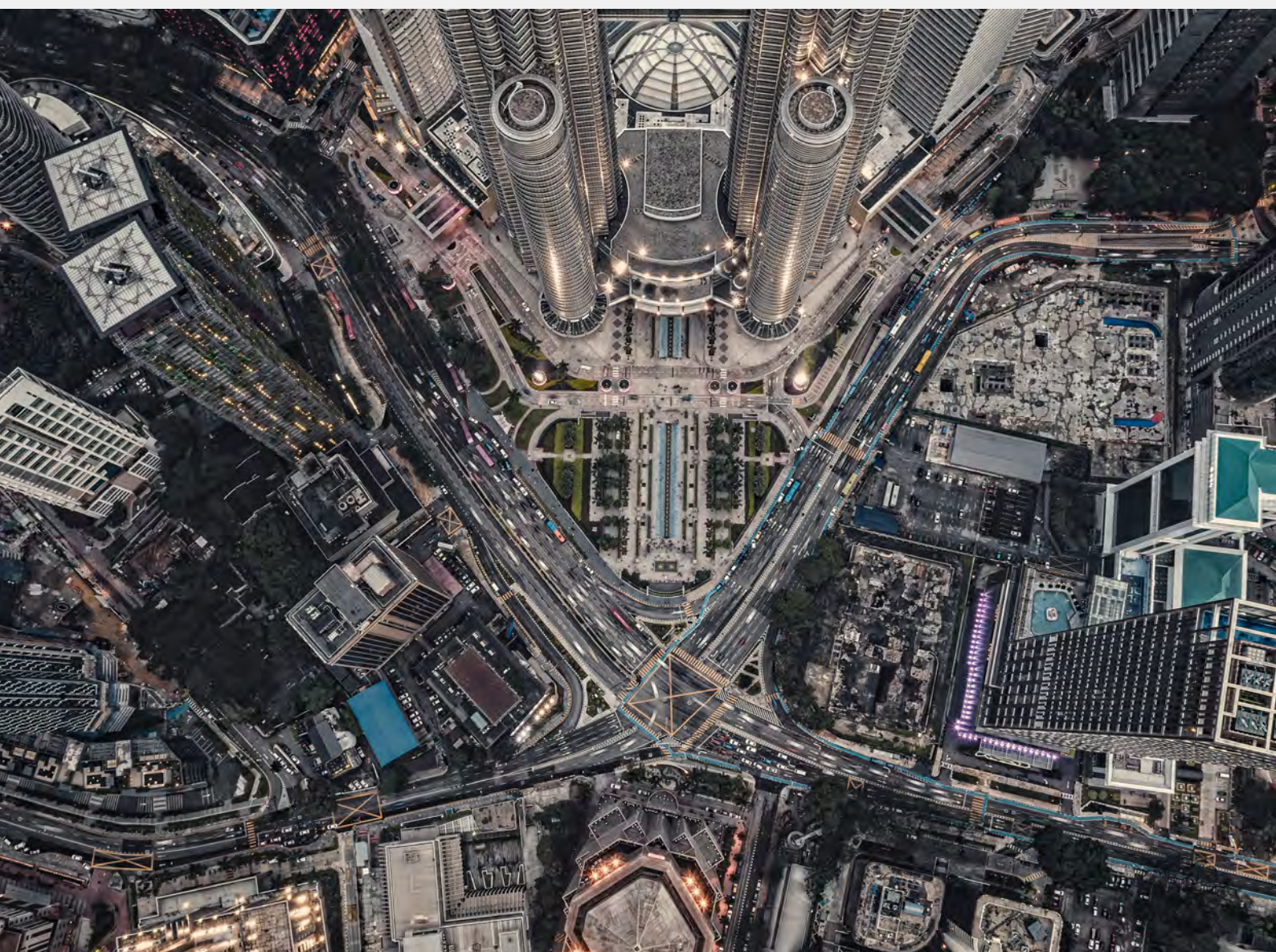
Box 1: Precision public health for NCDs: an emerging field	22
Box 2: CASALUD: a digital health screening tool for NCDs	22
Box 3: Digital LifeCare program for NCD screening for preventative care in India	23
Box 4: AxisMed and NCD management via digital healthcare in Brazil	24
Box 5: How blockchain technology is enabling patients’ control over their health data	25
Box 6: Smart ambulance trial in Malaysia	26
Box 7: Case study: NHS Digital, UK	30
Box 8: Case study: The Massachusetts Public Health Data Warehouse	31
Box 9: DHIS2 for NCD tracking; emerging use cases	32
Box 10: Using mobile big data to measure air pollution	33



Glossary of terms

Artificial intelligence	Artificial intelligence (AI) refers to the use of data to make decisions or perform certain tasks that are normally considered to require human knowledge, intelligence, learning and understanding. Such tasks include visual perception, speech recognition and decision-making.
Big data	Big data is a combination of structured, semi-structured and unstructured data collected by organisations that can be mined for information and used in machine learning projects, predictive modelling and other advanced analytics applications.
Blockchain	System for recording and sharing encrypted data across multiple data stores.
Cloud computing	Using a network of remote servers hosted on the internet to store, manage and process data.
Digital tools	Electronic tools, systems, devices and resources that generate, store or process data.
Digitalisation	Enabling or improving processes by leveraging digital technologies and digitized data.
Digital health	While there is no standard definition, the World Health Organization (WHO) defines digital health as: <ul style="list-style-type: none">• Electronic health (e-health): the use of information and communication technology (ICT) for health.• Mobile health (m-health): the provision of health services and information via mobile technologies, such as mobile phones, tablet computers and personal digital assistants (PDAs).
Electronic Medical Record	The electronic version of a patient's medical charts, generally restricted to one healthcare provider and not shareable across the health system.
Electronic Health Record	The electronic version of a patient's medical history that is shareable across the healthcare system with a range of healthcare providers so that all clinicians involved in a patient's care have access.
Frontier technology	Frontier technologies are defined as potentially disruptive technologies that can address large-scale challenges or opportunities. Frontier technologies include AI, big data, blockchain, the Internet of Things (IoT), augmented reality, virtual reality, drones and robotics.

Internet of Things (IoT)	The Internet of Things (IoT) refers to networks of physical objects (devices, vehicles, buildings, equipment, etc.) connected to the internet.
Open data	Open data is data that is openly accessible, exploitable, editable and shareable by anyone for any purpose.
Interoperability	Enables unrestricted sharing and use of data between different systems. In an interoperable system, two or more systems can share and exchange data so that it is understood by all systems involved.
Telehealth/telemedicine	Telehealth or telemedicine is the use of digital information and communication technologies to access healthcare services remotely and manage one's healthcare.



Executive summary

Malaysia has a high-quality universal healthcare system, but rapid urbanisation and a growing prevalence of NCDs is making it difficult for urban public healthcare to cope with demand.

According to the World Bank, at the end of 2021, 78 per cent of Malaysia's population lived in cities.¹ Malaysians suffer from a high incidence of non-communicable diseases (NCDs) including cardiovascular disease and diabetes,² and air pollution in cities is leading to an increased prevalence of respiratory diseases as well.³ While there is a quality private healthcare and a universal public healthcare system, the private system is expensive for low-income groups and the public system is increasingly overburdened.

Digital and frontier technologies can improve the management of NCDs in cities and make urban public healthcare systems more efficient.

Mobile, digital and frontier technologies are playing an increasingly significant role in the prevention and management of diseases, including NCDs, especially since the COVID-19 pandemic, which forced healthcare systems to adapt to delivering digital and remote care. These technologies, such as digital health screening and digital health literacy tools as well

as telehealth, are reducing the burden on urban health systems by making them more efficient. Digitised and shareable health records are enabling better patient care. Additionally, health data warehouses are serving to support the mapping, prediction and prevention of disease in urban populations through data-driven policymaking.

While Malaysia's healthcare system ranks well globally, citizens can be better served through wider and accelerated adoption of digital health.

Digital health tools need to be more widely deployed in Malaysia for health information literacy. Gamified fitness apps could enable behaviour change towards healthier lifestyles to reduce the incidence of NCDs. Digital health could also improve NCD screening, moving Malaysia towards preventative from curative care. Digital tools for remote consultations and digitised health data will reduce the strain on the public health system and make it more efficient. Using health data effectively for public health interventions will enable predictive analysis and better preparedness for infectious disease outbreaks as well as the reduction and management of NCDs.

1. World Bank Indicators. (2022). [Urban Population \(% of total population\): Malaysia](#).

2. Ministry of Health, Malaysia. (2019). [National Health and Morbidity Survey: Infographic Booklet](#).

3. According to World Health Rankings, lung disease is the fourth leading cause of death in Malaysia. Also see WHO. (2022). [Health and Environment scorecard: Malaysia](#).

To improve urban healthcare delivery, the Malaysian government and policymakers can undertake the actions identified below.

Digital health for NCDs	Digital health for efficient healthcare services	Data for health policymaking and predictive analysis
<p>Partner with private healthcare providers, healthtechs, corporates, and insurers to deliver health literacy and information on the prevention and management of NCDs in alignment via multiple digital channels.</p>	<p>Accelerate the development of electronic medical records (EMRs) and electronic health records (EHRs) through:</p> <ul style="list-style-type: none"> • Widespread training of health workers and healthcare providers in data recording and integration; • Ensuring private and public healthcare systems are interoperable and can share patient data securely; and clarifying consent procedures for the recording and sharing of patient data. 	<p>Expand the use of Malaysia's health data warehouse to improve healthcare planning by:</p> <ul style="list-style-type: none"> • Securing buy-in from all public sector stakeholders to share data on the system; • Appointing a chief digital officer to oversee this process in healthcare facilities; and • Expanding the sources of public health data that are integrated on the platform;
<p>Support and scale gamified apps that are creating behaviour change towards healthier and more active lifestyles with efficacy.</p>	<p>Provide remote consultations on a larger scale for medical and mental health. Ensure that regulations governing virtual consultations are up to date and enabling, to build confidence in healthcare professionals to adopt telehealth.</p>	<p>Proactively partner with private healthcare providers, insurers, and healthtechs to share deidentified and aggregated health data for policymaking, under fair terms.</p>
<p>Increase the use of remote consultations for NCD management where appropriate to reduce the burden on health services.</p>	<p>Ensure that the B40 group have connectivity and access for virtual health consultations.</p>	<p>Conduct a public education campaign and engagement exercise with people on the value of sharing and integrating deidentified and aggregated health data on the health data warehouse, while building confidence that personal data is protected and safe.</p>
<p>Prioritise the development of EMRs in both public and private healthcare systems for accurate and improved management of NCDs, reducing duplication of tests, unnecessary repeat assessments or risk of errors.</p>	<p>Investigate the impact of and support mental health and wellness apps that are having a positive impact. Enable access to these apps for the B40 group.</p>	
<p>Deploy a standardised national mobile/digital health screening tool developed in partnership with a leading technology provider, with the capability to digitally record patient data and conduct large-scale screening for NCDs in community settings. Ensure the digital tool is easy and efficient to use by health workers.</p>	<p>Draft an information sharing policy specifically for the sharing of EHRs and EMRs. This will provide clarity on how to ensure data privacy and protection while improving service delivery and patient care through data-sharing.</p>	
	<p>Revise and gazette a telemedicine act as a priority.</p>	

Introduction

Malaysia is a rapidly urbanising upper middle-income country poised to transition to a high-income country. While it has a quality urban healthcare system, the system is increasingly overburdened, partly due to a high rate of non-communicable diseases (NCDs).

Malaysia took pioneering steps towards adopting digital health by drafting a telemedicine act in 1997, but the roll-out of digital health services and initiatives since has been slow-paced. Malaysia has also made numerous attempts to scale electronic medical records so that patient data can be shared within a hospital or primary care facility, and electronic health records so that patient data can be shared securely across the health system to improve efficiency, but has faced several challenges in this regard linked to data platforms, standards, interoperability and digital skills in the healthcare sector, as well as cybersecurity concerns.

Meanwhile, two key developments in the global context have accelerated digital health adoption and use cases around the world. The first, the COVID-19 pandemic, necessitated the delivery of remote healthcare using digital tools due to lockdown conditions. The second, 5G connectivity, is expanding digital health use cases by enabling technologies such as smart ambulances that can deliver immediate emergency services and by enabling remote-assisted surgery and remote monitoring of patients.

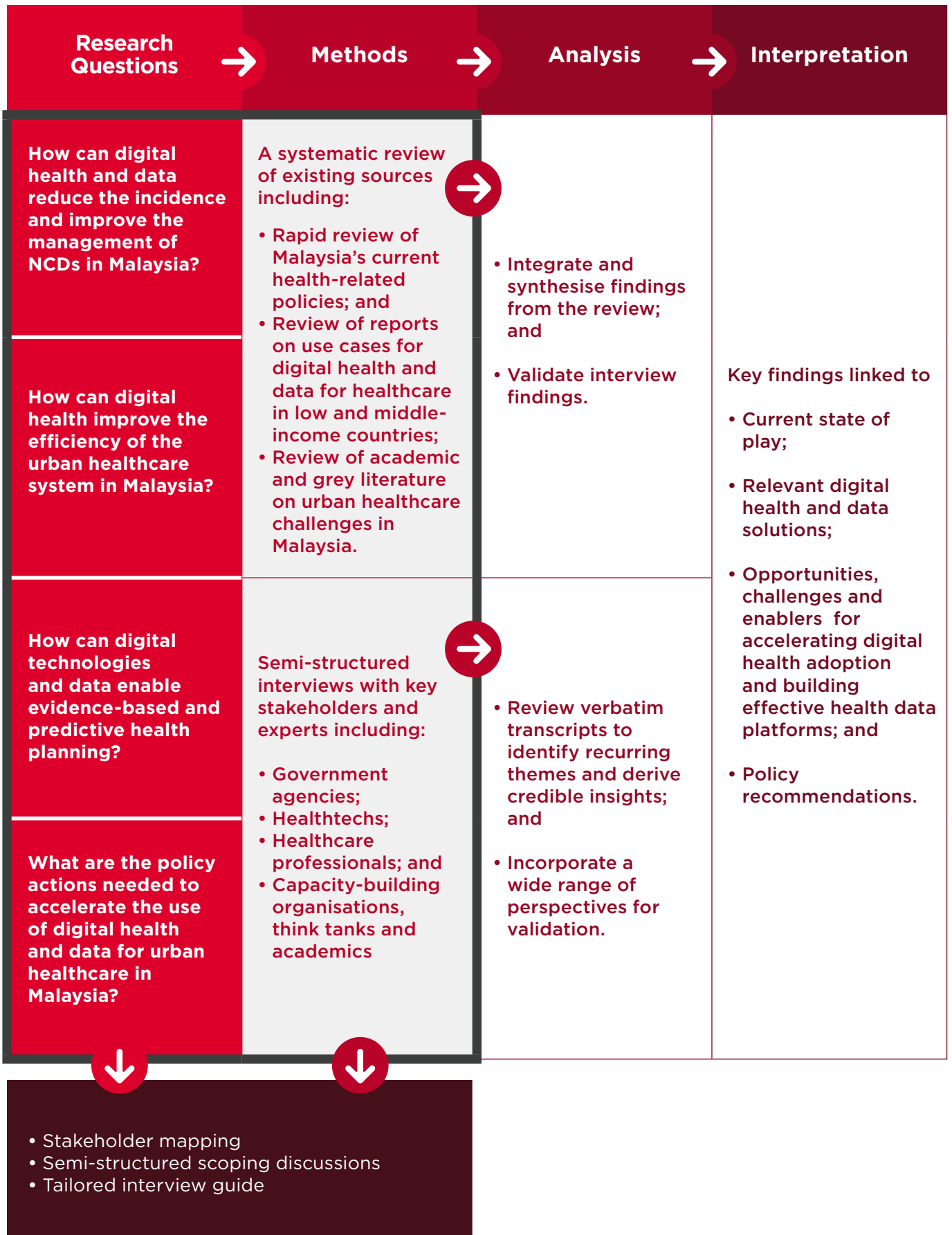
Malaysia can better manage NCDs and increase the efficiency of its high-quality but strained healthcare system by using data more effectively and adopting a suite of digital health solutions more widely, including:

- digital health screening tools;
- mobile health (MHealth) for health information, monitoring and behaviour change using gamified health and fitness apps;
- digital tools that enable self-diagnosis and remote healthcare consultations;
- electronic medical records; and
- health data platforms for the analysis of diseases and healthcare in cities.

Objectives and methodology

This report examines how digital health and data can reduce the burden of NCDs and improve the efficiency of the urban healthcare system in Malaysia, and the policy actions needed to accelerate the use of data and digital tools for healthcare in the country.

The research builds on previous reports from the GSMA Mobile for Development as well as peer-reviewed and grey literature. In addition, it incorporates insights from stakeholder consultations, including with government agencies, healthcare professionals and healthtechs, to identify the challenges and opportunities of digital health adoption and provide strategic recommendations to health policymakers and healthcare providers in Malaysia.



1. Urban healthcare in Malaysia



1.1 Urban healthcare challenges

Urbanisation generally causes negative health impacts for city dwellers due to rising pollution, lack of green spaces for active living and sub-optimal transport systems that discourage physical activity.⁴ Like many other middle-income countries with high urbanisation rates, Malaysia has a high incidence of non-communicable diseases (NCDs), such as cardiovascular disease and diabetes. According to Malaysia's National Health and Morbidity Survey 2019 (NHMS 2019), 1.7 million people in Malaysia suffer from diabetes as well as hypertension and cholesterol, and 3.4 million people suffer from two of the three conditions (Figure 1), which are major risk factors for

cardiovascular disease.⁵ It is estimated that more than 75 per cent of deaths in Malaysia are caused by NCDs. Malaysia also has the highest prevalence of obesity among adults in Southeast Asia, with the NHMS (2019) showing that more than half of the adult population is overweight and almost a fifth of adult Malaysians are obese.⁶

In addition to the impacts of pollution and lack of activity on health resulting from urbanisation, health behaviours such as poor eating habits, smoking, and alcohol consumption contribute to the high rate of NCDs in Malaysia.⁷ According to the NHMS (2019), over 35 per cent of the total population has low health literacy, compounding the problem.⁸

4. World Health Organisation. (2021). [Urban Health: Key Facts](#).

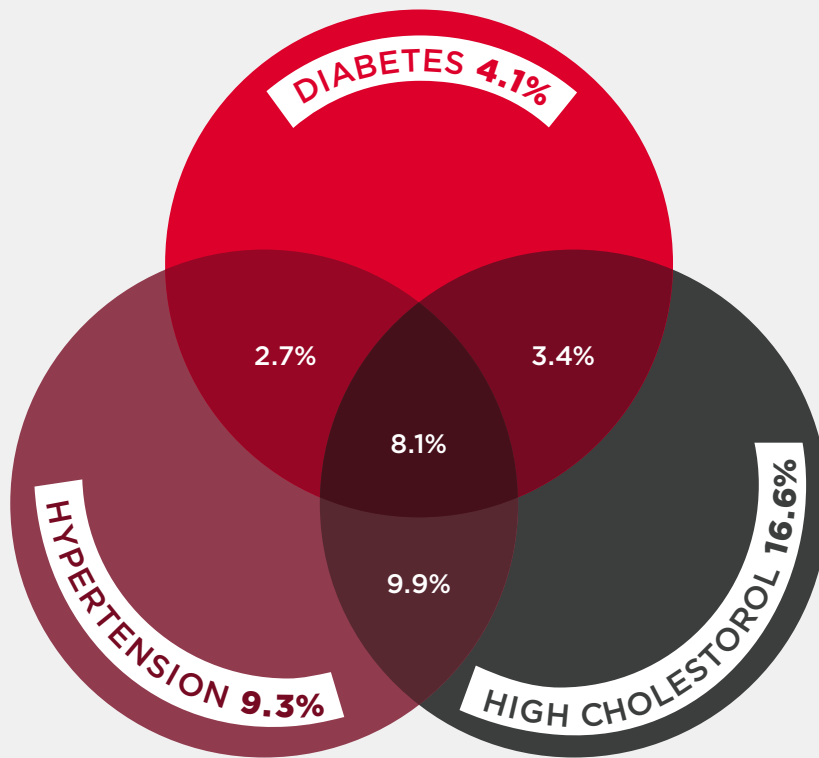
5. Malaysia's Ministry of Health. (2019). [National Health and Morbidity Survey](#).

6. Ibid.

7. According to the [NHMS \(2019\)](#), over 50 per cent of adult Malaysians were overweight or obese and almost 30 per cent of children aged 5-17 were overweight or obese. A fifth of children this age were stunted, and 30 per cent of women of reproductive age were anaemic. Over a fifth of Malaysians aged 15 and above were smokers in 2019. 11 per cent of the population consume alcohol of which somewhat less than half were identified as binge drinkers. A quarter of adults were categorised as physically inactive, and over 95 per cent identified as not consuming adequate fruit and vegetables.

8. Ibid.

Figure 1: Cardiovascular risk factors in Malaysia, 2019



Cardiovascular diseases (CVDs) are the leading cause of death in Malaysia

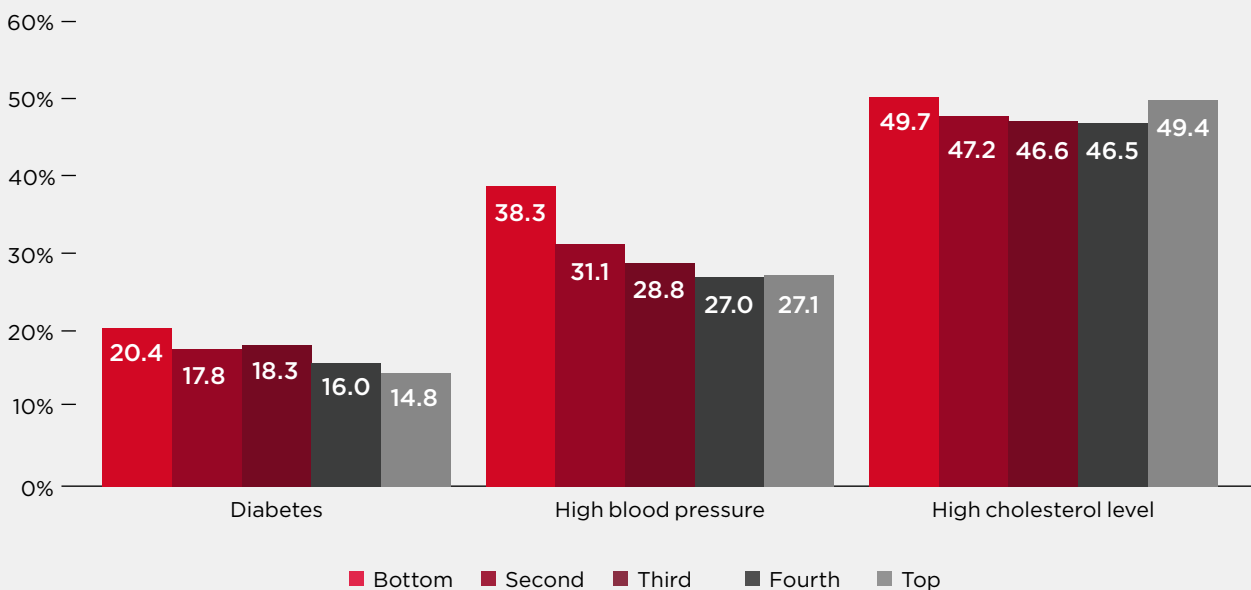
1.7 million people in Malaysia currently live with three major risk factors

3.4 million people in Malaysia currently live with two major risk factors

Source: NHMS (2019). Ministry of Health, Malaysia.

As shown in Figure 2, there is a correlation between the incidence of cardiovascular disease risk factors and income, with the highest incidence of diabetes, hypertension and high cholesterol levels in the lowest household income group.⁹

Figure 2: Prevalence of diabetes, high blood pressure and high cholesterol in adults, by household income



Source: KRI. [Social Inequalities and Health in Malaysia: The State of Households 2020 \(Part III\)](#).

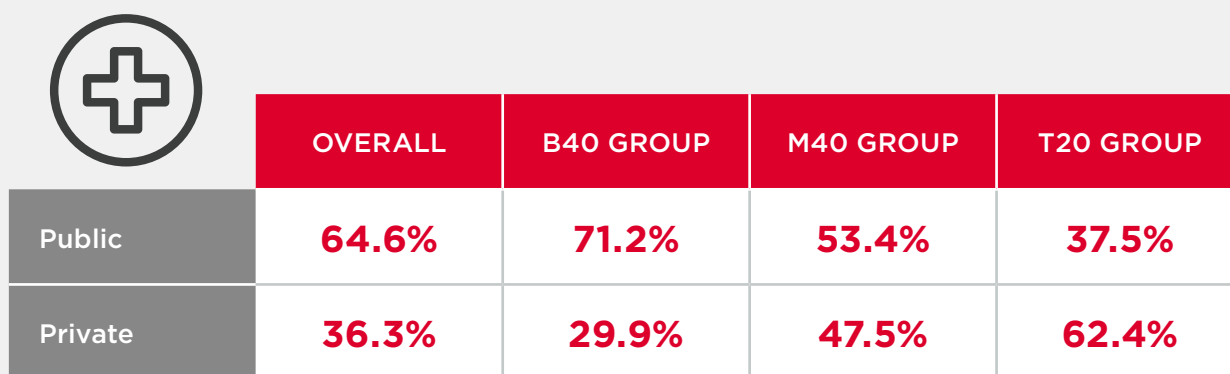
9. Ismail, N.W. and Sivasdas, S. (2020). "Urban health and the prevalence of non-communicable diseases in Malaysia". *Malaysian Journal of Medicine and Health Sciences*, 16(2), pp. 3-9.

Access to healthcare

Income inequality in Malaysia also has an impact on the accessibility of treatment. Malaysia has a two-tier health system of private and public healthcare. While good-quality universal healthcare is available through the public health system, which includes public, military and university hospitals and primary healthcare centres, wealthier citizens tend to access private

healthcare to avoid the long wait times in public healthcare facilities. More people from the middle 40 per cent (M40) and top 20 per cent (T20) income groups access private healthcare than the bottom 40 per cent (B40) income group (Figure 3). According to NHMS (2019), only 22 per cent of the population has private health insurance, with 43 per cent finding it unaffordable.

Figure 3: Outpatient healthcare use in Malaysia
(in a two-week period before NHMS 2019 survey)



	OVERALL	B40 GROUP	M40 GROUP	T20 GROUP
Public	64.6%	71.2%	53.4%	37.5%
Private	36.3%	29.9%	47.5%	62.4%

Source: NHMS (2019). Ministry of Health, Malaysia.

Health expenditure

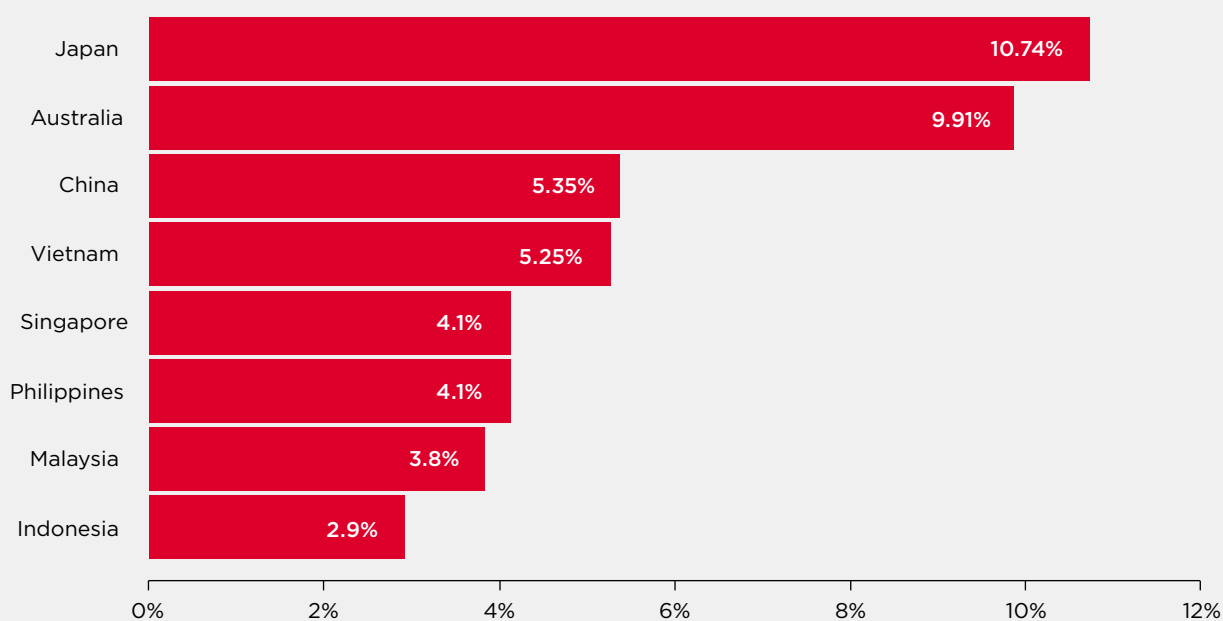
While Malaysia has increased per capita spending on healthcare as a percentage of GDP over time, the country spent just under 4 per cent in 2019 (Figure 4), slightly less than Vietnam, Singapore and the Philippines. There tends to be wide variation in the spending on healthcare in the Asia Pacific and globally; however, to contextualise, the average that

member countries of the Organisation of Economic Cooperation and Development (OECD) spent on healthcare as a percentage of GDP in 2019 was 8.8 per cent.¹⁰ Malaysia's healthcare expenditure as a percentage of GDP is also notably lower than the average of upper-middle-income countries at 5.9 per cent of GDP in 2019, though again, there is a wide variation on the spending between countries, ranging from over 2.5 per cent to 11.5 per cent.¹¹

10. OECD Indicators. (2021). [Health expenditure in relation to GDP](#).

11. World Bank Data. (2019). [Current Health Expenditure \(% of GDP\): Upper Middle Income](#). There are two outliers in the upper middle-income countries, Marshall Islands, which spend over 16 per cent and Tuvalu which spends over 24 per cent of GDP on healthcare.

Figure 4: Expenditure on healthcare as a percentage of GDP in 2019, selected countries



Source: World Health Organisation

The healthcare system is almost equally funded by the public and private sector, and the two healthcare systems operate fairly independent of each other. While the MoH primarily funds public sector healthcare, approximately three-fourths of the private system is funded by out-of-pocket payments,¹² the second biggest source of healthcare funding in 2020,¹³ which is why much less of the lower-income segment, or B40 group, of the population, utilise the private system.

Of the total expenditure on health in Malaysia in 2020, more than 64 per cent went into curative care, only 7.5 per cent in prevention and public health, and approximately 7 per cent in medical devices and capital formation each, while less than five per cent was invested in education and training.¹⁴

Malaysia needs to further extend its universal healthcare coverage and reduce out-of-pocket expenditures to make healthcare more equitable.¹⁵ Investments in universal healthcare have been evidenced to not only bring economic growth but significant returns on human capital in the form of reduced poverty, labour market mobility and well-being.¹⁶ In an innovative social protection scheme for the B40 income group, the state of Selangor introduced the Skim Peduli Sihat in 2017, to cover the cost of basic treatment for B40 income group at private clinics, up to 700 Malaysian ringgit (150 USD) per family.¹⁷ More public sector purchase of private healthcare solutions may be one strategy to extend universal healthcare and make the health system more equitable.¹⁸

12. Baharin M. F. A., Juni, M. H. and Abdul Manaf, R. (8 April 2022). "[Equity in Out-of-Pocket Payments for Healthcare Services: Evidence from Malaysia](#)". International Journal of Environmental Research and Public Health.

13. CodeBlue. (7 Dec. 2021). "[Malaysia's out-of-pocket health spending more than triples in 15 years.](#)"

14. Ibid.

15. Some suggested strategies to generate revenue for public healthcare include heavily taxing harmful substances such as tobacco and alcohol and removing fossil fuel subsidies. These revenue-generating strategies are proposed by the Lancet Commission's 2013 report, [Global health 2035: a world converging within a generation](#), and the World Bank's 2019 report, [High-Performance Health-Financing for Universal Health Coverage: Driving Sustainable, Inclusive Growth in the 21st Century](#). Malaysia is already taxing tobacco, alcohol and sugar.

16. World Bank. (27 June 2019). [UHC: All people have access to quality, affordable health services.](#)

17. Towse, Adrian. (2019). "[An efficient and sustainable healthcare system in Malaysia: challenges, lessons and the future.](#)" Monash Health Economics Forum.

18. Ibid.

1.2 Health governance, policy and digital health

Governance

Healthcare policy as well as funding in Malaysia is delivered primarily by the MoH, under a federally administered system with centralised control by the ministry. In the case of outbreaks of infectious diseases, in particular the COVID-19 pandemic, this has served as a strength as centralised governance has allowed Malaysia to take quick, decisive and consistent action across the thirteen states and 3 federally administered regions. The MoH is tasked with healthcare regulations, funding and delivering healthcare services and purchasing devices and services. However, it has been highlighted that government investment in private hospitals places the MoH in a conflict of interest as a regulator of the hospitals the federal government has a commercial stake in.¹⁹

There is a case to be made for more decentralised administration of healthcare, with states and

cities having more autonomy over the healthcare system. This could enable more tailored provision of services, capital investments and resource allocation based on local needs. Decentralisation could enable the shift to a more primary care-centred health system, which stresses prevention rather than cure. The MoH aims to table a health white paper this year, which is expected to prioritise a more community-based and preventative approach to healthcare, focussing on well-being rather than curative services in hospitals.²⁰

In addition, reportedly the MoH currently shares limited health data with states, making it difficult for state and city authorities to set evidence-based healthcare strategies.²¹

However, evidence from other countries that have decentralised their healthcare systems suggest that there is a threat of unequal funding based on the relative wealth of states, the concern over sufficient local capacity to deliver public healthcare and less control over how health outcomes are prioritised by state. Decentralisation, therefore, needs to be a carefully considered and managed process.²²



19. Wisdom Foundation. (2021). [Decentralising healthcare in post-Covid Malaysia: the scope, advantages, trade-offs and roadmap.](#)

20. MalaysiaKini. (April 2022). [MoH's White Paper: A vision to future-proof Malaysia's healthcare.](#)

21. Wisdom Foundation. (2021). [Decentralising healthcare in post-Covid Malaysia: the scope, advantages, trade-offs and roadmap.](#)

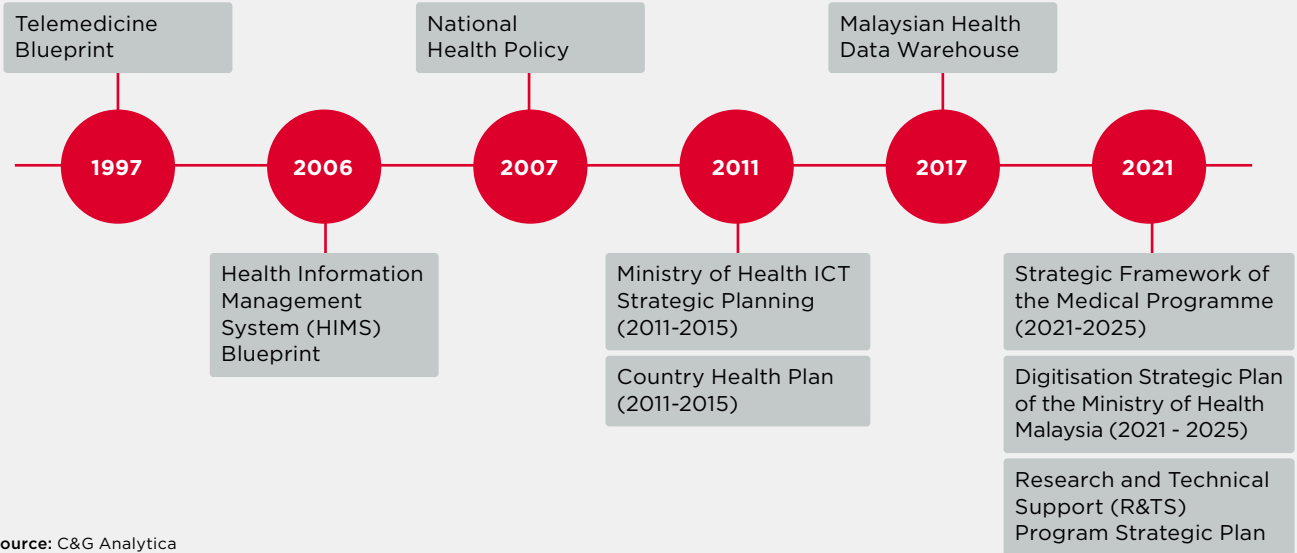
22. Ibid.

Health policy and digital health

Malaysia has been aiming to increase the adoption of technology for healthcare delivery since the telemedicine flagship project in 1997 (Figure 5).





Notable initiatives include the early adoption of telemedicine, the move from paper health records to electronic health records (EHRs) in hospitals since 1999 and the launch of MyHDW, an integrated health data warehouse, in 2017.

Figure 5: Key public health policies in Malaysia, 1997-2021



The Digitisation Strategic Plan of the Ministry of Health, Malaysia (2021–2025) has four strategic goals, as outlined in Figure 6.

Figure 6: Strategic goals of the Digitisation Strategic Plan of the Ministry of Health

		Key objectives to address the four strategic goals include:
Integrated and inclusive health services		<ul style="list-style-type: none"> • Strengthening the digital health delivery system; • Boosting analytics and data intelligence in policy planning and development; • Leverage emerging technologies to drive health service delivery; • Strengthening the management and coordination of health data;
Sustainable and secure digital services		<ul style="list-style-type: none"> • Strengthening digital infrastructure to support the adoption of new technologies; • Strengthening ICT security to ensure the privacy, confidentiality and availability of information;
Dynamic and agile digital governance		<ul style="list-style-type: none"> • Formulating and improving existing ICT policies so that they are always relevant to the health service environment; • Expanding strategic collaborations to mobilise public and private expertise to improve health services;
Empowerment, expansion and a culture of digitalisation		<ul style="list-style-type: none"> • Strengthening MoH staff who are knowledgeable, digitally skilled and recognised; • Optimising the potential level and utilisation of digital services; • Supporting a culture of digital services as a whole; • Recognising digital innovations that have won awards and recognition at every level; and • Increasing research ability, development and commercialisation of digital health.

Source: Ministry of Health, Malaysia.²³

23. Ministry of Health. [Digitisation Strategic Plan \(2021-2025\)](#) in Bahasa Melayu.

Digitalisation objectives linked to healthcare delivery are therefore wide-ranging and aim to improve overall service delivery. However, with the rising incidence of NCDs and the strain on urban healthcare services in Malaysia, tailored strategies that deploy digital tools to manage NCDs could have a significant impact on health and morbidity, reduce the load on urban

healthcare and make healthcare delivery more efficient. Based on data from 2017, the MoH and the WHO estimated that NCDs, especially cardiovascular disease, diabetes and cancer, cost the Malaysian economy close to RM 8.91 billion (USD 2 billion) a year.²⁴



24. WHO. (8 September 2020). "[Cardiovascular diseases, diabetes and cancer cost nearly RM 9 billion productivity losses annually to Malaysian economy](#)".

2. Addressing NCDs through digital health tools



Mobile, digital and frontier technologies for healthcare, also referred to as digital health, offer a range of opportunities to combat NCDs, including solutions for prevention, diagnosis and management. During COVID-19, the three most common digital health interventions to manage NCDs globally were telehealth, targeted online messaging to patients using social media channels, and personal health tracking.²⁵

NCD prevention

The most prominent digital tools for NCD prevention include gamified fitness apps to encourage physical activity and health messaging delivered via online channels to improve health literacy. Examples of these solutions to prevent and reduce the incidence of NCDs in Malaysia include healthtechs such as JomRun, an app that rewards activity, and PurelyB, which provides information and products linked to healthy food and lifestyle. In a recent partnership between the multinational pharmaceutical AstraZeneca, Malaysian

25. Murthy S, Kamath P, Godinho MA, et al. (2022). *Digital health innovations for non-communicable disease management during the COVID-19 pandemic: a rapid scoping review*. BMJ Innovations

healthtech DoctorOnCall, the National Heart Institute and insurance company Prudential Malaysia, a Protect Your Heart Now campaign has been launched to deliver heart health messages and advice via the Prudential app, Pulse.²⁶ The MoH has also partnered with the healthtech BookDoc to reward people for being active. BookDoc's app tracks users' physical activity, which is rewarded by discount offers and rewards at partner retail outlets. In addition, the Malaysia Diabetes Prevention Programme offers an app, MyDiPP to provide information on diabetes, dietary modification and physical exercise to people at risk of developing the disease.

Digital health tools can also play a role in NCD prevention at the community level and are most effective when they are co-created with community involvement. In 2021, for example, the Better Health Programme Malaysia (BHP MYS) tackled obesity at the community level in low-income neighbourhoods by implementing tailored community health promotion interventions to improve health literacy and encourage better diet and physical activity.²⁷ The interventions were delivered with the help of trained community health volunteers and complemented by digital e-learning using the MyBHP digital health app. Simple health messaging via the app increased participants' health literacy. Learning was reinforced by interactive missions and activities and a gamified community health reward model encouraged behaviour change at the community rather than individual level. A key learning from the program was the importance of utilising digital tools in addition to in-person engagement for effective community-level behaviour change.²⁸

With low levels of health literacy, and poor health behaviours such as high rates of smoking, low levels of physical activity as well as poor dietary habits among the urban population, more can be done to utilise digital health to tackle NCDs in urban Malaysia. The WHO European Office for the Prevention and Control of Noncommunicable Diseases (NCD Office) has several innovative initiatives to combat NCDs that may be replicable in Malaysia. For example, in the UK, the NCD office is working with academia to develop a data platform that will integrate data from meal delivery apps to understand the types, nutritional quality and geographical reach of meals being offered, to inform policies on food retail and consumption.²⁹ Since 2015, the WHO has also been developing a platform in the UK to monitor over 100,000 food and drink products retailed online at all major supermarkets in the country, providing granular data that can be utilised for big data analytics and evidence-based policymaking around food and nutrition. The WHO has also introduced an online interactive alcohol monitoring tool that can assess an individual's alcohol use, quantify risk and offer feedback. It has also created a digital health worker, Florence, that helps users – currently 14 million people – develop a personalised plan to quit smoking.³⁰

Since 2012, the WHO has been working with governments to tackle NCDs via mobile phones under the Be Healthy, Be Mobile (BHBM) program,³¹ which recognises that with over eight and a half billion mobile subscriptions in 2021 worldwide, a mobile phone is the most efficient way to reach populations with health interventions.

26. AstraZeneca. (7 September 2021). [Partnering to combat NCDs and accelerate healthcare digitalisation.](#)

27. PWC. (2022). [Better Health Programme South East Asia: Investing in action on non-communicable diseases.](#)

28. Ibid.

29. WHO Regional Office for Europe. (2021). [Tackling Noncommunicable Diseases with Digital Solutions: The work of WHO European Office for the Prevention and Control of Noncommunicable Diseases.](#)

30. Ibid.

BOX 1

Precision public health for NCDs: an emerging field

Precision public health is an emerging approach that aims to utilise big data analytics and AI for better health outcomes. By combining data on socio-economic indicators, public health sources, medical records and from newer digital health technologies, such as wearables and sensing technology, precision public health aims to provide preventative health interventions for at-risk populations using predictive analysis.³²

As an example, a scoping exercise of existing data sources that could enable predictive analysis for obesity in the population was recently conducted for Queensland in

Australia. The research team identified and assessed thirty-eight data sources, including publicly available survey data and administrative data, as well as electronic medical records, data from wearables, and health-related billing and claims data from Australia's universal healthcare system, as potentially enabling precision public health in obesity.³³ As use cases for precision public health for NCDs grow, digital infrastructure that can integrate, process and analyse NCD data in real-time will be needed. The challenges of data privacy and protection of medical records also remain an unresolved concern.³⁴

NCD screening and diagnosis

In 2013, the rising rate of NCDs in Malaysia led the government to introduce KOSPEN, an initiative that employs community health workers to screen, manage and educate people about combating NCDs in community settings. KOSPEN offers bookings for people in the community using the BookDoc app.

The KOSPEN initiative could be made more effective and efficient with the introduction of digital health screening tools, such as CASALUD in South America, a public-private partnership between the Carlos Slim Foundation and the Ministry of Health in Mexico (Box 2).

BOX 2

CASALUD: a digital health screening tool for NCDs

CASALUD is a suite of digital health services for managing NCDs at different stages, from prevention to management. It was first introduced at primary health centres in Mexico in 2009 to tackle the rising rate of NCDs and reduce the strain on the healthcare system. CASALUD introduced the MIDO cart and MIDO backpack, which screen for diabetes, hypertension and abdominal obesity. Equipped with a tablet, glucometer, blood pressure cuff and measuring tape, the portable backpack enables people to be screened at a variety of locations. Assessments were first conducted at primary healthcare centres and later in places with

high footfall, such as transport hubs. The MIDO cart is accompanied by software that records patient data and uses algorithms to assess risk and propose lifestyle changes.

CASALUD also offers a Chronic Disease Information System and Digital Portfolio for healthcare professionals. The information system is a hybrid (online/offline) database for physicians to record patient data, which improves the quality of care through constant monitoring. CASALUD also provides a stock management solution for medicines, apps for primary care staff to receive ongoing training on NCDs and tools for patient engagement.³⁵

31. WHO. [Be Healthy, Be Mobile program](#).

32. Front Public Health. (2022). [Precision Public Health for Non-communicable Diseases: An Emerging Strategic Roadmap and Multinational Use Cases](#).

33. Canfell, O.J., Davidson, K., Sullivan, C. et al. (2022). ["Data sources for precision public health of obesity: a scoping review, evidence map and use case in Queensland, Australia."](#) BMC Public Health.

34. Ibid.

35. GSMA. (2019). [CASALUD: A suite of digital services for the prevention and management of NCDs](#).

Basic health screening for NCDs is widely available in Malaysia, but test results can take time and results are mostly delivered in paper format. To provide more efficient screening, the healthtech BMZ Technologies Sdn. Bhd. has developed an app, the My Health Card, which enables users to receive and store digital copies of their NCD test results, which can then be easily used for further consultations with healthcare professionals.³⁶ The app has a dashboard that provides the user's risk profile. BMZ has also partnered with MW Digital Health in the UK to offer the MyDiabetesMyWay (MDMW) app, which is connected to primary care clinicians and helps give people with diabetes more control over their health by offering information as well as enabling access to their diabetes records. Because the development of electronic medical records in Malaysia is still under way, users' access to their NCD health records via such applications puts users in more control over their NCD management and treatment.

In addition, to manage contact tracing during COVID-19, Malaysia utilised a tracing application, MySejahtera. The app has since evolved to deliver other digital health services such as health screening, telehealth and digital health data records. The National Health Screening Initiative (NHSI) being conducted through MySejahtera has led to over a quarter of a million people being screened, being able to access their screening results on the app, and book for further consultations at primary health centres as needed. Private healthcare facilities are expected to be able to use the app, to offer health screenings as well. MySejahtera's evolution into a multi-purpose national digital health tool has been enabled by partnerships between the government, private sector and NGOs and low-income groups are either screened for free or provided subsidies under the PeKa B40 and Socso initiatives.³⁷

BOX 3

Digital LifeCare for NCD screening for preventative care in India

A particularly compelling case of utilising digital health for widespread preventative NCD screening is the Digital LifeCare program in India, which may hold some important lessons for Malaysia. Developed in partnership with the global company Dell, the government of India and a range of public and private sector partners, the program was initially piloted in one rural facility by two Dell employees and local volunteers. The government of India adopted the solution for NCD management in 2018.³⁸ One of the strengths of the system is the creation of an electronic health record for all screened users, that can be used across healthcare facilities. The success of this digital health program, which has now enrolled over 100 million people, is based on three factors:

- It offers a simple to use interface via multiple apps, designed with feedback

from end users, community health workers and volunteers and does not require extensive training or upskilling to be used by community health workers;

- The solution was rolled out across India through an existing network of community health workers and nurses, and therefore integrated into the existing public health system; and
- It has been advanced through several partners in the ecosystem, including federal, state and local governments, technical and implementation partners as well as academia.

Data collected is aggregated and analysed by Digital LifeCare for local, state and federal governments to understand health trends.³⁹

36. See [My Health Card](#).

37. Free Malaysia Today. (30 Sept. 2022). [Over 250,000 people screened for NCDs, says KJ](#).

38. Dell. [Digital LifeCare: The power of preventative screening to change millions of lives](#).

39. Ibid.

Self-Diagnosis

Another growing trend in digital health screening is self-diagnosis. As an example, PocDoc is a UK-based self-diagnostic assessment tool that can be used to check cholesterol levels at home. After downloading an app and filling out their healthcare information, users take a finger-prick lateral flow test, take a photo of the test on their phone, share it with the PocDoc app and receive results immediately. Such digital health diagnostics solutions can help reduce the burden on primary healthcare centres that generally carry out NCD screening and enable quicker, more efficient and more regular testing to flag the risk of cardiovascular disease, which is the leading cause of mortality in Malaysia.

NCD management and treatment

NCD management in Malaysia could be significantly improved with the accelerated use of electronic medical records (EMRs), which enable healthcare professionals within a healthcare facility to review a patient's complete medical history to prescribe a course of action. EMRs help to improve accuracy and reduce errors and duplication of tests, increasing the overall efficiency of disease management.

Patients' health records were first shared digitally in Malaysia more than two decades ago when the hospital information system (HIS) was introduced. A HIS enables the digitisation of a patient's medical record for sharing across departments in a healthcare facility to provide better care as well as facilitate administrative processes such as billing.⁴⁰ The government also introduced a teleprimary care system (TPC) in 2005 and an oral health clinical information system (OHCIS) in 2009, later referred to as TPC-OHCIS, to digitise patients' medical data from both primary care and dental centres.⁴¹

These initiatives had limited impact and despite a renewed commitment by the MoH to roll out the digitalisation of patients' records in 2018, by 2020 only 25 per cent of public hospitals and 9 per cent of public health clinics had developed EMRs for patients.⁴² The MoH has attributed the slow development of EMRs to budget constraints as well as rapid advancements in technology that have been challenging to keep pace with.⁴³

Brazil has faced a similar challenge of rising NCDs as Malaysia. In response, the company AxisMed developed an EMR system that integrates a patient's health data that healthcare professionals can utilise for improved patient care (Box 4).⁴⁴

BOX 4

AxisMed and NCD management via digital healthcare in Brazil

The rate of NCDs in Brazil has been rising steadily. AxisMed, a subsidiary of mobile operator Telefonica, offers a digital health platform for insurance providers and companies offering health insurance to their employees. The EMR system integrates a patient's health information from the databases of healthcare and health insurance providers and enables healthcare professionals to access a patient's medical history to provide personalised healthcare

guidance and support. AxisMed offers additional services, such as a central clinic, a 24-hour call centre with access to qualified health professionals, a hospital management service to prepare and inform clients before and after hospitalisation and tailored resources for more vulnerable insurance users. Together, these services have significantly reduced unnecessary hospital visits and improved health outcomes.

40. Mudaris, I.S.M. (2021). [Electronic Health Records: Planning the Foundation for Digital Healthcare in Malaysia](#). Khazanah Research Institute.

41. Ibid.

42. Ibid.

43. Ibid.

44. GSMA. (2019). [Telefonica's AxisMed: Optimising healthcare resources in Brazil](#).

Accelerating the pace of development of EMRs helps make public health services more efficient, but healthcare professionals who find such systems complex or time-consuming to use are slow to switch from paper-based legacy systems to EMRs.

The concern over data privacy and security of medical records has also been a challenge in developing EMRs globally. In Malaysia, several data breaches have led to concerns over the security of health data. In 2018, for example, it was reported that the personal information of 220,000 organ donors and their families had been leaked and available online for over a year.⁴⁵ In 2019, it was reported that the medical scans of 20,000 patients had been leaked.⁴⁶

Blockchain technology, a distributed ledger technology (DLT), is a database that enables data sharing while protecting its accuracy and

keeping it secure, and offers a promising path forward for digitising and sharing medical records.⁴⁷ A DLT database is held on a network of computers that all hold identical copies of the database; information added to the database cannot be amended or tampered with. Users' data on such a ledger enables them to store their data securely and have control over their records and over who accesses them.⁴⁸

Currently, healthtechs are driving the adoption of blockchain technology for medical health records rather than national health systems. In Malaysia, the healthtechs Doc2Us and Data8 are using blockchain technology to enable patients to store, access and share their health records from a variety of sources with their healthcare providers, giving them full and secure control over their health records and improving the efficiency and accuracy of their treatment (Box 5).⁴⁹

BOX 5

Blockchain technology is enabling patients' control over their health data

Doc2Us and Data8 are healthtechs in Malaysia that offer an app using blockchain technology to store a patient's health records, from wearables, home health tests and healthcare centres. Patients can access their records, share them with their doctors and book online consultations.

Data8 has been working with the Digital Health Research & Innovation Unit (DHRi) of the National Institute of Health (NIH) to develop a blockchain-based centralised database under the cHEART platform.⁵⁰ The health data is anonymised, standardised and integrated. The solution is being tested at the Kuala Lumpur Hospital and the Sungai Buloh Hospital in Selangor.

45. Reuters. (2018). [Personal details of over 200,000 Malaysian organ donors leaked online.](#)

46. CodeBlue. (10 Oct. 2019). [Malaysia patient data leak came from private entity, says MoH.](#)

47. Reform UK. (2018). [Blockchain in the NHS.](#)

48. Ibid.

49. See [cHEART website.](#)

50. Ibid.

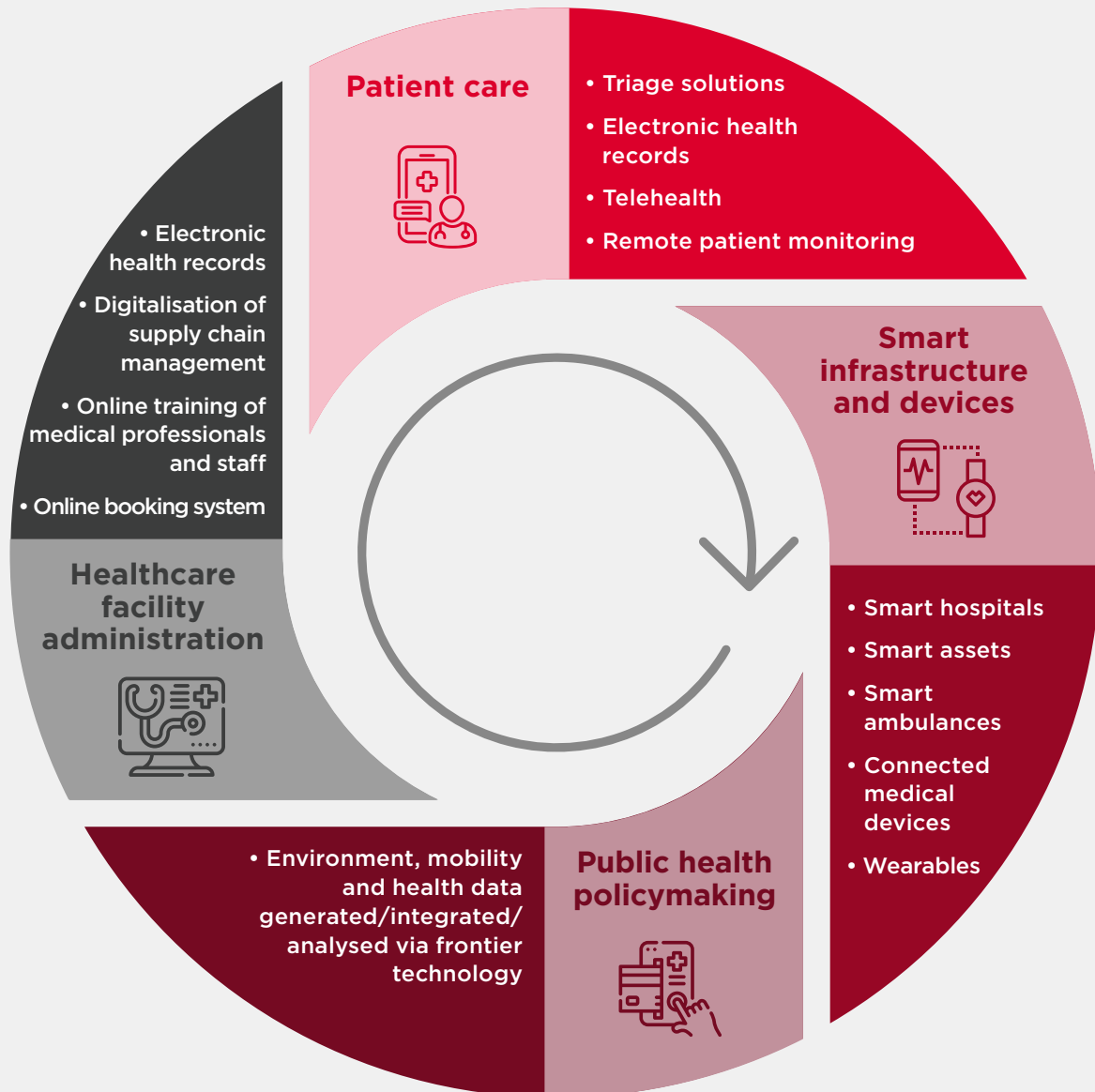
3. Strengthening urban healthcare through digital health tools



There are a range of applications for digital health solutions in low- and middle-income countries (LMICs) that can enhance the efficiency of the public healthcare system. These improve patient care, simplify

administration in healthcare facilities, provide cost and energy-saving infrastructure, enable remote monitoring and data-driven policymaking to tackle public health challenges (Figure 7).

Figure 7: Digital health tools for efficient public healthcare



Source: GSMA Mobile for Development

Two recent developments have given further impetus to rapid digital health adoption in public healthcare. The first has been the COVID-19 pandemic, which increased the need for contactless healthcare delivery and therefore accelerated the use of telehealth and telemedicine. The second, 5G, which offers

better connectivity, is enabling remote health monitoring on wearable consumer devices, remote assisted surgery and training, connected ambulances that can deliver immediate care and smart healthcare facilities that can operate more efficiently.⁵¹

51. Vodafone. (2020). [How 5G and IoT Can Transform Health and Social Care](#).

Smart ambulance trial in Malaysia

Delayed response in emergencies is a challenge in Malaysian cities. While the global average response time is eight or nine minutes, in Malaysia it may take 15 minutes or more for an ambulance to arrive. This delayed response can be fatal in the case of heart attacks, the leading cause of death in the country. In April 2022, the mobile operator Celcom Axiata partnered with First Ambulances to launch Malaysia's first smart ambulance using 5G technology. The roll-out of smart ambulances in cities, which can provide on-the-spot treatment, could have a significant impact on mortality rates.



For Malaysia, digital health can reduce the strain and improve the quality of urban public healthcare most effectively through more efficient triage, remote consultations, an electronic health system and a robust health data platform that enables predictive analysis for evidence-driven interventions.

Triage

With public healthcare systems overextended during the COVID-19 pandemic, digital solutions have been developed to prioritise patients for consultation and treatment based on need. In the UK, Doctorlink is the leading supplier of online triage and video consultation services to general practices across the country. It currently serves more than 1,000 general practice surgeries. Doctorlink takes a patient's information and uses an algorithm to determine the best course of action, as well as offer video consultations. It reduces the number of hours doctors spend in consultation and reduces costs.⁵²

The Care Quality Commission in the UK has recently set up a regulatory sandbox to explore the impact of digital triage on patient care, and how data and insights generated by digital triage can be used for better health outcomes.⁵³

Telehealth

Malaysia was an early adopter of telehealth with a flagship digital project in 1997. However, the country trails its neighbours in offering telemedicine solutions, which primarily enable remote online consultations with healthcare professionals. Private sector-led initiatives in telehealth are growing, with healthtechs such as DoctorOnCall, Speedoc, Doc2Us and CareCall offering remote consultations and online pharmacies.

However, these paid-for solutions are not affordable for many people in the B40 income segment. To reduce the load on healthcare facilities, reduce commute and wait times for patients and provide more regular and timely management of NCDs, telehealth needs to be more widely adopted by public healthcare providers, such as primary care clinics.

A survey of Malaysian medical doctors conducted in four private urban healthcare facilities in June and July 2020 found that only 22 per cent used telemedicine for consultations during the COVID-19 pandemic.⁵⁴ Almost 81 per cent reported legal and regulatory challenges as a barrier, while 67 per cent identified billing as a challenge, 63 per cent insurance reimbursement and 63 per cent technical difficulties as a barrier.

52. See [DoctorLink](#) website.

53. Care Quality Commission. (2022). [Digital Triage in health services](#).

54. Thong, H.K. et al. (July–August 2021). "[Perception of telemedicine among medical practitioners in Malaysia during COVID-19](#)". *Journal of Medicine and Life*, 14(4), pp. 468–480.

In another survey of 395 doctors conducted by Medical Protection in early 2021, 96 per cent of doctors agreed that telemedicine risks being non-inclusive, 94 per cent were concerned about missing a symptom or diagnosis in a remote consultation and 89 per cent felt that medico-legal risks of telemedicine are greater than in-person consultations. 86 per cent highlighted privacy and security issues as a concern.⁵⁵

Malaysia drafted a telemedicine act in 1997, but the act was never gazetted. Healthcare professionals interviewed for this research suggest that updating and gazetted a telemedicine act will help build confidence in telehealth consultations among healthcare providers in Malaysia. The Telemedicine Act stipulates that remote consultations can only be conducted for patients already known to the healthcare professional unless for continuity of care, and the use of online prescriptions is also limited by the Act, placing additional constraints.⁵⁶

Removing barriers to wider telehealth adoption is even more urgent due to the significant role remote consultations are playing in the delivery of mental healthcare globally. Mental health problems are believed to have been exacerbated due to the isolation and anxiety that some groups of people experienced during the COVID-19 pandemic. While the NHMS (2019) reported depression in 2.3 per cent of Malaysian adults, skewed towards higher depression rates in the B40 income group, as well as mental health problems in over 425,000 children,⁵⁷ it is estimated that mental health problems escalated rapidly in Malaysia during the pandemic.⁵⁸

Mental health services through telehealth are being offered by healthtechs such as Naluri and ThoughtFull in Malaysia, both of which are offering services as business-to-business services to insurers and employers offering their staff health benefits. ThoughtFull also offers a subscription model to individuals. The Help Talk is another smartphone-based digital therapy solution that offers limited online mental health services for a low cost to support lower-income groups access mental healthcare.

As part of expanding universal healthcare, Malaysia's public health system would

benefit from advancing online therapy and telepsychiatry. According to the health minister, at the end of 2021, Malaysia had only 479 registered psychiatrists and of a total of 9,580 certified counsellors, only 346 serve in MoH facilities,⁵⁹ indicating that lower income groups, who use public healthcare to a greater extent, are less likely to be able to access mental health services.

In this situation, telepsychiatry and remote therapy can be a cost-effective solution and provide critical and timely care in emergency mental health situations. In addition, smartphone-based mental health apps that offer well-known therapies such as cognitive behavioural therapy can enable sufferers with milder mental health conditions such as low levels of anxiety or depression self-manage and improve their symptoms. However, it is important to note that the B40 income group, who need these services more than other income groups, tend to have less access to internet connectivity and therefore to these digital health solutions, especially those that are paid for.

Electronic health records

Electronic health records are EMRs of patients that can be shared securely across the healthcare system rather than limited to a single healthcare facility. This makes the healthcare system more efficient by providing a patient's detailed health records to healthcare professionals working at different locations, enabling more patient-centred care and reducing the duplication of tests and errors. In 2008, the MoH launched the Malaysian Health Information Exchange (MyHiX) platform, to enable EMRs to be shared across the public healthcare system rather than within a healthcare facility.

As previously noted, the uptake of EMRs has been low and currently, only ten hospitals have implemented MyHiX, which lacks the agility to easily integrate data from other systems. Technical challenges, data standardisation and interoperability have been identified as some of the barriers to EHR development in Malaysia.

55. Medical Protection. (2021). [Doctors in Malaysia see benefits of telemedicine but majority feel some patients may be left behind.](#)

56. Sabrina, M.I. and Defi, I.R. (2020). "[Telemedicine guidelines in Southeast Asia – a scoping review](#)". *Frontiers in Neurology*.

57. MoH. (2019). National Health and Morbidity Survey.

58. Balakrishnan, V., NG, K. S. and Lee, Z.L. (2022). "[COVID-19 mental health prevalence and its risk factors in South East Asia](#)." *Current Psychology*.

59. CodeBlue. (23 December 2021). [Malaysia has 1.5 times less psychiatrists than 2025 target.](#)

The development of an EHR system that is interoperable, secure and easy to use across the healthcare system has been a challenge facing most public health systems globally.⁶⁰ This is partly due to the nature of clinical notes, which are difficult to accurately standardise even with defined data standards, as well as the extremely harmful consequences of medical data leaks as compared to other personal information.

The National Health Service (NHS) in the UK has been developing an EHR system, but progress has been slower than expected for similar reasons. Still, the NHS has been proactive in dealing with these challenges by articulating a clear vision for the EHR system and its objectives, earmarking investment to work with private partners and

providing guidance frameworks, standards and regulations to ensure the system is secure and data privacy is maintained while also enabling deidentified data to be used for public health improvements (Box 7).

BOX 7

Case study: NHS Digital, UK

Due to the rapid advancement of digital technology, the UK National Health Service has continued to revise their vision and formulate policies, offer guidelines and set standards for digital adoption in healthcare and the development of an EHR system. In 2018, the Department of Health and Social Care released the policy paper “The Future of Healthcare: Our Vision for Digital, Data and Technology in Health and Care” outlining clear guiding principles, including user needs, privacy and security, interoperability and openness and inclusion through an internet, mobile- and cloud-first approach. To operationalise this policy, the NHS published digital, data and technology standards and is devising an accompanying strategy. It has also published a list of accredited suppliers of EHRs that health trusts can choose from to enable interoperability and allow different data platforms to “speak” to each other.

Key lessons from the NHS include the importance of enabling local trusts to choose their systems and suppliers while ensuring interoperability, publishing clear guidelines that do not conflict with other regulations, building the capacity of all staff to be digital-first and working with vetted private technology suppliers.

The Acute Data Alignment Programme⁶¹

The Acute Data Alignment Programme (ADAPt) is a joint programme between NHS Digital and the Private Healthcare Information Network (PHIN) to adopt common standards for data collection and performance measures across the NHS and the private healthcare system. This will ensure that relevant information is consistently recorded and available to be more easily analysed and compared.

ADAPt aims to move towards a common set of standards for data collection, performance measurement methodologies and reporting systems in the NHS and the private healthcare system. The purpose is to protect patient safety through appropriate, secure and robust information sharing.

The programme is jointly led by PHIN and NHS Digital in partnership with the Department of Health and Social Care (DHSC), NHS Improvement (NHSI), NHS England (NHSE), the Care Quality Commission (CQC) and other bodies.

60. U.K. Department of Health and Social Care. (2021). [G7 open standards and interoperability](#).

61. See: [Acute Data Alignment Programme](#).

Malaysian Health Data Warehouse (MyHDW)

In 2017, the MoH launched the Malaysian Health Data Warehouse (MyHDW), a platform to collect and integrate anonymised data on the population's health from public and private health systems and other relevant sources.

A health data warehouse that combines data from a variety of sources (Table 4) can enable data-driven healthcare policy to tailor interventions to community needs. Meanwhile, big data analytics can help prepare health services for disease outbreaks and future emergencies. MyHDW allows healthcare providers and policymakers to make evidence-based decisions about patient treatment and public health, enables predictive analytics⁶² and can be integrated with a Geographical Information System to understand health outcomes at the community level.

MyHDW has not gained significant momentum, however. In part, this is due to the siloed nature of healthcare data collection in Malaysia and

a lack of buy-in or capacity of healthcare practitioners. As mentioned earlier, private hospital data systems are not interoperable and very few public hospitals have managed to integrate their hospital information system with MyHix. Capacity building in healthcare facilities to understand the importance of sharing data on MyHDW and to do so effectively will help accelerate progress.

An effective health data warehouse requires data-sharing partnerships between a wide variety of stakeholders, as well as technical capacity among the various partners. While a nationwide health data warehouse can be extremely useful, those at the state and local level can support more goal-driven data sharing, agile partnerships, granular data and effective use of that data. A good example is the Public Health Data Warehouse launched in 2017 in the US state of Massachusetts, which links data sets across the state to address public health priorities, especially to understand and combat the opioid crisis (Box 8).

BOX 8

The Massachusetts Public Health Data Warehouse

The Massachusetts Public Health Data warehouse is built on four pillars:

- **Governance:** ensures a sustainable interagency data warehouse by establishing guiding principles, an organisational structure for decision-making and stakeholder access and roles.⁶³
- **Legal:** establishes accountability for a secure data environment and a collaborative framework for data contributors and users.⁶⁴
- **Technical:** provides expertise in defining the technical architecture, linkage algorithms, data configuration and overall analytical principles and develops a roadmap for the future expansion of

the PHD to adapt to new computing environments.⁶⁵

- **Operations:** oversees the funding and implementation strategy for programme sustainability and provides ongoing support for the management of PHD daily functions.⁶⁶

The data warehouse currently contains more than two dozen datasets from hospital cases and discharges, payers' claims databases, birth certificates, substance addiction bureau, ambulance trip record information, cancer registry, prescription monitoring programme, death certificates and nutritional and substance abuse recovery programmes. This data is used by the public health department for evidence-based policymaking.

62. The MyHDW system, currently in Phase One, has already collected data from 2.5 million inpatients from all government and public hospitals, military hospitals and day care unit services. Phase Two aims to collect data from 70 million outpatient medical records from other healthcare facilities, such as health and specialist clinics. MyHDW was developed by the MoH in collaboration with MIMOS Bhd.

63. Verbatim from the [Massachusetts state government website](#).

64. Ibid.

65. Ibid.

66. Ibid.

Globally, the District Health Information Software (DHIS) is an open-source tool for health data collection and sharing that is used by 73 countries including Indonesia, Myanmar and Vietnam for health data collection and analysis.⁶⁷ Launched in South Africa, it is now a free, global open-source project coordinated by the HISP centre at the University of Oslo. DHIS2 enables health data collection for analysis from remote and even poorly connected settings via a range of devices including mobile phones, tablets and computers. Designed for ease of

use, it is enabling community health workers and community organisations to record and transmit health data without requiring extensive expertise. While initially used to track infectious diseases, there are emerging use cases for the tracking of NCDs via DHIS2 (Box 9).

BOX 9

DHIS2 for NCD tracking; emerging use cases

In Indonesia, DHIS2 was first piloted to understand and tackle childhood malnutrition in remote villages in 2017.⁶⁸ Recently, Indonesia is trialling DHIS2 to help clinicians improve disease registries, including for NCDs such as cancer. For disease registration, hospitals in Indonesia are currently primarily engaged in retrospective data collection, or reliant on secondary data from medical records. However, disease-specific data requires more than data from medical records such as descriptive analysis and a systematic data quality check. For disease registries, clinical outcomes such as survival analysis and treatment outcomes conducted periodically are the main indicators. DHIS2 is enabling continuous and targeted rather than retrospective and or/medical record reliant data collection, which can then be extracted and used for clinical data analysis.⁷⁹ However, one of the key challenges the pilot has faced is the need to synthesize legacy medical records onto the system, for which data managers have to make assessments on what data is relevant for synthesis versus extraneous.

DHIS2 has also been trialled for screening for hypertension and diabetes in Nigeria at the primary care level. The pilot took place in 2020 at 12 primary healthcare facilities in two states in Nigeria, with key stakeholders involving the Ministry of Health and the WHO and Health Management Information System (HMIS), Nigeria as capacity building and technical partners. The pilot commenced with a co-creation workshop with international development and government partners, healthcare professionals and community health workers to agree the indicators. A prototype was then developed and deployed in the health centres. The tool enabled patient registration, recording of prior medical history, data recall using a QR code and entering data from the current consultation. After a successful trial, capacity-building training was carried out with staff from the MoH and later cascaded to state healthcare facilities, and the aim is for Nigeria to completely transition to NCD management via DHIS2 on devices.⁷¹

67. See [DHIS2 website](#).

68. DHIS2 website. [Combating malnutrition in Indonesia with DHIS2](#).

69. DHIS2. [NCDs and DHIS2](#)

70. Ibid.

Measuring pollutants in the urban environment for better health outcomes

The incidence of NCDs in Malaysia is worsened by congestion and high levels of air pollution in cities, where the transport sector creates high GHG emissions. The WHO health and environment scorecard for 2022 showed that Malaysia has three times the recommended amount of particulate matter in the air, and that 14 per cent of deaths from stroke and ischaemic heart disease can be attributed to air pollution.⁷¹

Research suggests that Malaysian citizens would live on average 1.8 years longer if annual average fine particulate matter (PM2.5) concentrations were reduced to 10 ug/m³ — a 65% reduction from the current average levels of air pollution in the country.⁷² According to the State of Global Air report 2020, deaths attributed to PM2.5 in Malaysia have increased by nearly 30 per cent in the last 10 years, and in 2019, as many as 10,600 people in the country were estimated to have died as a result of air pollution.⁷³

BOX 10

Using mobile big data to measure air pollution

Mobile networks generate large amounts of data (MBD), which provides unique insights into population mobility patterns and socioeconomic indicators. Deidentified, aggregated and randomised MBD can be combined with data from air quality monitoring sensors to measure and predict air quality in urban areas and enable local authorities to take proactive action.

In partnership with the GSMA and the São Paulo Municipality in Brazil, mobile operator Telefonica has been analysing city air quality using open data from air quality sensors and mobility data from its networks to estimate vehicle numbers and locations. Correlating mobile device location data with other datasets yields accurate and valuable information for local administrators to improve traffic distribution and the level of air pollution in different parts of the city at different times.⁷⁴ This is particularly important for urban health given that long-term exposure to certain pollutants has been linked with natural and cardiovascular mortality,⁷⁵ as well as cardiovascular and respiratory hospital admissions.⁷⁶



71. WHO. (2022). [Health and Environment scorecard: Malaysia](#).

72. Greenpeace. (2022). [The health and economic impacts of ambient air quality in Malaysia](#).

73. See [State of Global Air report 2020](#).

74. GSMA. (2018). [Air Quality Monitoring using IoT and Big Data](#).

75. Ibid.

76. Zhang, Y. et al. (2019). "The short-term association between air pollution and childhood asthma hospital admissions in urban areas of Hefei City in China: a time-series study". *Environmental Research*, 169, pp. 510–516.

4. Enablers of digital health adoption



While the policies related to the digitalisation of healthcare indicate there is an ambition in Malaysia to adopt digital health more widely, consultations with experts in the healthcare sector suggest that some key enablers to scale these initiatives are lacking. Research by the International Telecommunication Union (ITU) and UNESCO have highlighted common

challenges that have led to the fragmented adoption of digital health solutions in many countries, which Malaysia also faces.⁷⁷ These include a lack of coordination between various healthcare service providers, a lack of systems and workforce capacity to manage data and digital technology; and inadequate financing to support digital health.

77. Broadband Commission for Sustainable Development. (2018). [The Promise of Digital Health: Addressing Non-communicable Diseases to Accelerate Universal Health Coverage in LMICs](#).

The ITU and UNESCO have proposed six building blocks for digital health systems (Figure 8):⁷⁸

Figure 8: Building blocks for digital health systems



The global digital health index is a digital health resource that uses the ITU/UNESCO e-health framework and evaluates digital health across countries on 7 metrics (Figure 9), which are further broken down into 19 indicators.⁷⁹

Figure 9: Malaysia’s Global Digital Health Index Score



Source: Global Digital Health Index (2018)

78. Ibid.

79. Global Digital Health Index. (2018). [Malaysia Scorecard](#).

While Malaysia is at phase four or five on most indicators, it is in phase two on “protocols for regulating or certifying devices and/or digital health services.”⁸⁰ In addition, Malaysia is in phase three on a number of the indicators linked to workforce readiness and development, such as whether digital health is integrated in pre-service training before health professionals are deployed, and whether digital health training is part of the curriculum for health and health-related professionals in training. The index also ranks Malaysia at phase three out of five for network readiness.⁸¹

An analysis of where Malaysia stands on the six building blocks identified by the ITU and UNESCO suggests that the following gaps need to be addressed to fast-track digital health adoption in Malaysia:

Regulations

While Malaysia has a Digitisation Strategic Plan of the Ministry of Health Malaysia (2021–2025), there are several challenges and gaps in the regulations governing digital healthcare that pose barriers to meeting policy objectives.

- Malaysia’s Telemedicine Act (1997) has never been gazetted. Updating and gazetting a telemedicine law will increase confidence in offering remote consultations. Similarly, digital healthcare in Malaysia remains undefined, creating uncertainty over what is and what is not permissible.⁸²
- Digital healthcare products and medical devices are governed by the Malaysian Medical Device Act, 2012. Products and devices are only broadly defined, and software and apps that provide diagnostics, consultancy and treatment capabilities fall under this regulation. The regulation needs updating for new technologies to be used for digital health services and the approval of new devices and software needs to be fast-tracked.
- The Personal Data Protection Act (PDPA) requires that the express consent of patients be taken to collect and store data for future patient care. However, for institutions using a hospital information system, this consent is taken as implicit. Medical practitioners

have also expressed concern over how to record consent when delivering remote care. Regulations linked to consent for digital health records need to be clarified and widely publicised among healthcare practitioners. In the event of a security breach or tampering of data, medical practitioners are liable under the PDPA, creating some anxiety in using remote consultations in light of reported data leaks.

Malaysia could draft information-sharing policies specifically for the health sector. In the UK, the NHS has an Information Sharing Policy specifically for NHS staff in exchanging data within the healthcare system and with external bodies. The government takes the approach that not sharing data can be as damaging as doing so, and that data-sharing for better services is essential but must uphold data privacy.⁸³

The MoH has launched an online healthcare services (OHS) regulatory lab in February 2022 in partnership with Futurise Sdn. Bhd, which leads Malaysia’s regulatory sandbox, to expedite regulatory reform in healthcare and support innovation.⁸⁴ The OHS regulatory lab will enable the MoH to understand digital technologies in healthcare, allow innovative healthtechs to operate in a controlled environment, and develop and adapt regulations and guidelines for online healthcare services accordingly.

Digital infrastructure

While Malaysia offers good connectivity and access to Wi-Fi, digital health solutions such as remote monitoring and telehealth require consistent reliable service and speed. According to Speedtest,⁸⁵ Malaysia ranked 67th in the world for mobile speeds and 41st for fixed broadband speeds in May 2022 and is targeting improvements in connectivity and speed as part of the digital agenda.

One concern about connectivity is that a significant proportion of the B40 income group in Malaysia do not have broadband connections and may not be able to use healthcare messaging apps, remote monitoring and telehealth facilities. Several programmes were recently introduced to reduce the cost of broadband for low-income groups, but data on

80. Global Digital Health Index. (2018). [Malaysia Scorecard](#).

81. Ibid.

82. Chambers and Partners. [Digital Healthcare 2021: Malaysia](#).

83. NHS. (2019). [Information Sharing Policy](#).

84. Futurise. (2022). [Online Healthcare Services Regulatory Lab](#).

85. See SpeedTest: [Malaysia's fixed and broadband internet speeds](#).

uptake is not available. Another issue reported by healthcare professionals is that the quality of online consultations due to poor connectivity is a deterrent to widespread adoption.

Interoperability

The health informatics centre (HIC) under the Ministry of Health is responsible for setting health data standards in Malaysia, and these standards have been under constant revision to keep pace with innovation and international developments in health data standards. Currently, adopted health data standards include the International Classification of Diseases (ICD), the ISO/TC 215, which enables standardisation of health data, Logical Observation Identifiers Names and Codes (LOINC) which sets universal standards for medical lab observations & SNOMED CT, which provides standardised codes for clinical data.⁸⁶

However, the low uptake of HIS and MyHix indicates the significant challenges that hospitals are facing in uploading and integrating data. In particular, private hospitals have their own systems that do not easily integrate with MyHix. To change systems or drive integration efforts requires significant investment that private hospitals may not be incentivised to undertake without a clear value proposition.

There is a lack of coordination not only between public and private sector healthcare providers, but also within the public healthcare system. Digital solutions are therefore primarily developed and offered by healthtech start-ups and have not been adopted at scale in the public healthcare system.

Public trust and cybersecurity

Malaysia faces the serious challenge of lack of public trust in data sharing. In news coverage in 2020, Malaysia's Deputy Communications and Multimedia Minister reported a 109 per cent increase in cybersecurity incidents.⁸⁷ Despite Malaysia's high ranking in cybersecurity, reports of such breaches undermine public trust in the government's ability to keep their data safe.

Several countries have enabled citizens to access their health data and see whom it is shared with. For example, in Iceland, an app was developed in collaboration with a private UK firm that allows patients to access and download their health records.⁸⁸ In Finland, My Kanta Pages provides patients with access to their public and private health records and enables them to upload health data from smartphone apps and wearables. The system also enables them to see who has viewed or accessed their data.⁹⁹

While ensuring that cybersecurity for health data is robust, the Malaysian Government would benefit from conducting a public education campaign to assure citizens their data is safe and communicate the benefits of an EHR system and sharing deidentified data on the health data platform.

Partnerships and Financing

Rather than building technology and developing data analytics capabilities in-house, doing so in partnership with technology partners will help to fast-track digital adoption in healthcare. Malaysia set up a Technology and Innovation Sandbox under the Ministry of Science, Technology and Innovation (MOSTI), which supported more start-ups in medical and healthcare in 2020-2021 (Figure 10) than any other sector.⁹⁰

In September 2022, the health minister announced the launch of health technology hubs to strengthen and complement the sandbox. Five hospitals are part of the hubs, including three urban hospitals, Putrajaya Hospital and National Cancer Institute, Tunku Hospital Azizah, and the Women and Children's Hospital in Kuala Lumpur.⁹¹ The aim of the sandbox is to bypass the barriers that outdated regulations impose on the adoption of digital health, and leverage 5G connectivity to test the potential impact of frontier technologies such as robotics and IoT devices on healthcare.⁹² The sandbox may enable more public-private partnerships with healthtechs in the future, driving more financing towards digital health.

86. Healthcare IT News. (23 September, 2019). "[The benefits of a standardised digital health agenda in Malaysia.](#)"

87. The Malaysian Insight. (5 August 2020). "[109% spike in cybersecurity incidents, says Deputy Minister.](#)"

88. McEachran, R. (16 December 2021). "[How to solve the healthcare data-sharing dilemma.](#)" Raconteur.

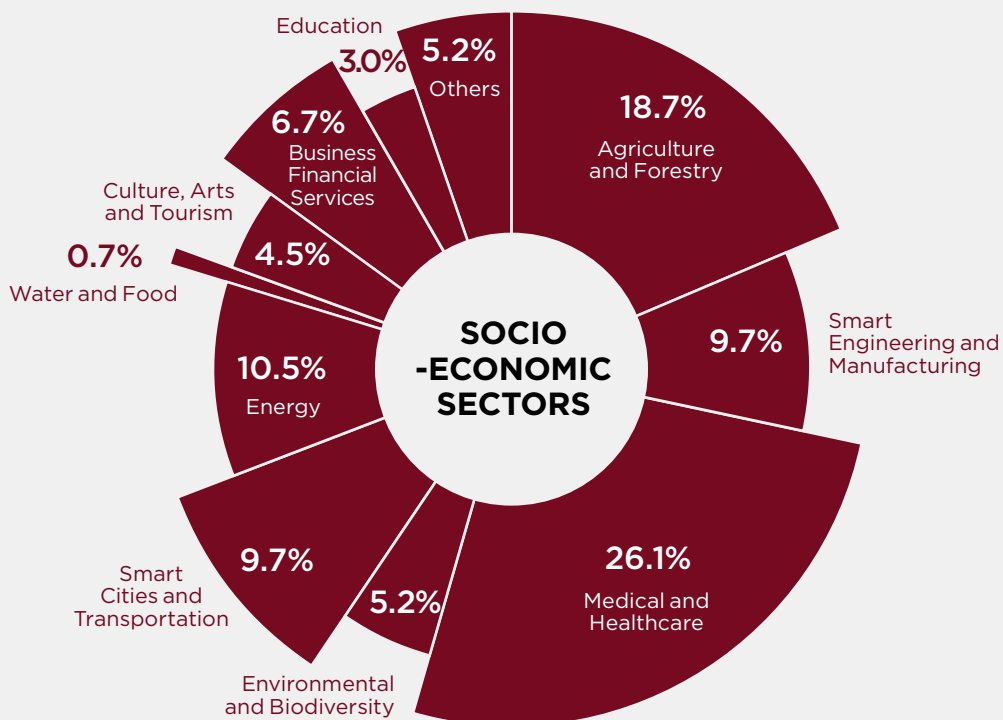
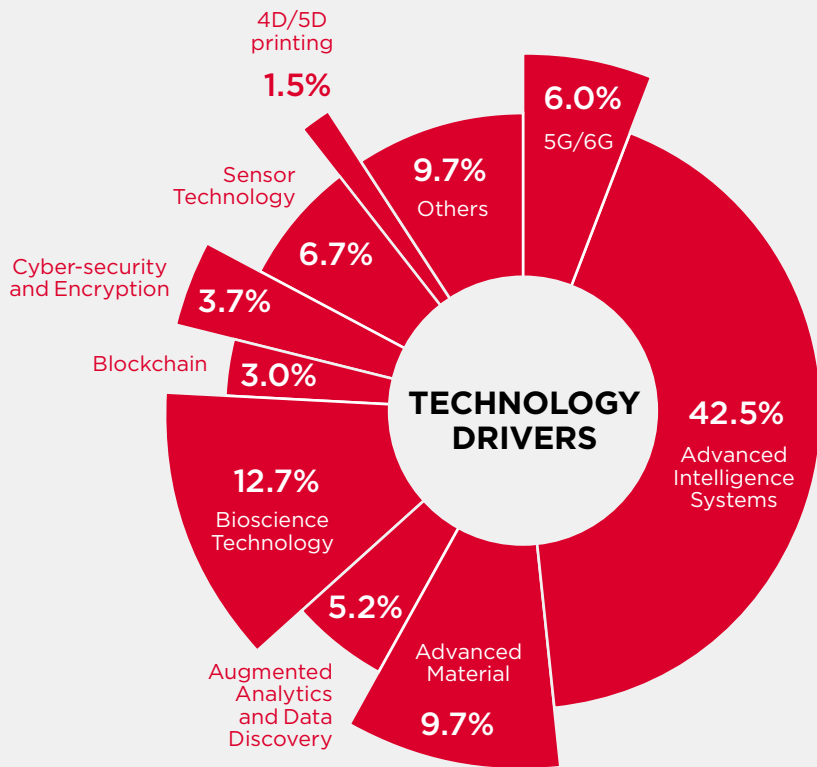
89. Ibid.

90. NTIS. (2022). [National Technology and Innovation Sandbox: Year 1 Report.](#)

91. Digital News Asia. (Sept 2022). [Launch of health technology hubs shows NTIS still close to Khairy Jamalludin's heart.](#)

92. Ibid.

Figure 10: Technology and sectors enabled by the Technology and Innovation Sandbox in 2020-2021



Source: [National Technology and Innovation Sandbox: Year 1 Report](#)

Recommendations

Malaysia's policies related to digital healthcare are wide-ranging. Although they will lead to overall system improvements in the long run, in the shorter term, targeted digital strategies and interventions based on a mapping of where technology is likely to have the greatest impact, enabled by clear policies, is likely to help accelerate digital health in the country.

Based on our analysis, digital health should be integrated more effectively into the healthcare system to prevent and better manage NCDs, improve the system's efficiency and make health policymaking more data-driven.

Digital health for NCDs	Digital health for efficient healthcare services	Data for health policymaking and predictive analysis
<p>Partner with private healthcare providers, healthtechs, corporates, and insurers to deliver health literacy and information on the prevention and management of NCDs in alignment via multiple digital channels.</p>	<p>Accelerate the development of electronic medical records (EMRs) and electronic health records (EHRs) through:</p> <ul style="list-style-type: none"> • Widespread training of health workers and healthcare providers in data recording and integration; • Ensuring private and public healthcare systems are interoperable and can share patient data securely; and clarifying consent procedures for the recording and sharing of patient data.* 	<p>Expand the use of Malaysia's health data warehouse to improve healthcare planning by:</p> <ul style="list-style-type: none"> • Securing buy-in from all public sector stakeholders to share data on the system; • Appointing a chief digital officer to oversee this process in healthcare facilities; and • Expanding the sources of public health data that are integrated on the platform;
<p>Support and scale gamified apps that are creating behaviour change towards healthier and more active lifestyles with efficacy.</p>	<p>Provide remote consultations on a larger scale for medical and mental health. Ensure that regulations governing virtual consultations are up to date and enabling, to build confidence in healthcare professionals to adopt telehealth.</p>	<p>Proactively partner with private healthcare providers, insurers, and healthtechs to share deidentified and aggregated health data for policymaking, under fair terms.</p>
<p>Increase the use of remote consultations for NCD management where appropriate to reduce the burden on health services.</p>	<p>Ensure that the B40 group have connectivity and access for virtual health consultations.</p>	<p>Conduct a public education campaign and engagement exercise with people on the value of sharing and integrating deidentified and aggregated health data on the health data warehouse, while building confidence that personal data is protected and safe.</p>
<p>Prioritise the development of EMRs in both public and private healthcare systems for accurate and improved management of NCDs, reducing duplication of tests, unnecessary repeat assessments or risk of errors.</p>	<p>Investigate the impact of and support mental health and wellness apps that are having a positive impact. Enable access to these apps for the B40 group.</p>	
<p>Deploy a standardised national mobile/digital health screening tool developed in partnership with a leading technology provider, with the capability to digitally record patient data and conduct large-scale screening for NCDs in community settings. Ensure the digital tool is easy and efficient to use by health workers.</p>	<p>Draft an information sharing policy specifically for the sharing of EHRs and EMRs. This will provide clarity on how to ensure data privacy and protection while improving service delivery and patient care through data-sharing.</p>	
	<p>Revise and gazette a telemedicine act as a priority.</p>	

* As recognised in the 12th Malaysia Plan, the health databases of public healthcare institutions are not well integrated. MyHDW aims to address this challenge, but it is still being developed and progress is slow.

Starting with the telemedicine initiative in 1997, Malaysia has taken a proactive approach to adopting digital health solutions. While its digital healthcare system ranks well on many metrics, if it can address gaps in the regulations and update outmoded ones and increase the buy-in and capacity of healthcare institutions in digitally recording and sharing data to

develop an effective EHR system and health data warehouse, it has the opportunity to build a leading global public healthcare system. In addition, more financing directed towards digital healthcare and digital infrastructure and collaboration with the private sector will help Malaysia accelerate the pace of digital health innovation in the country.



Annex

Stakeholders consulted

Malaysia Digital Economy Corporation (MDEC)

Ministry of Health

Technology University of Malaysia

Universiti Tenaga Nasional

Galen Research Centre

Alpha Sdn. Bhd.

Collaborative Research in Engineering, Science and Technology Centre (CREST)

DoctoUs Sdn. Bhd.

Naluri Sdn. Bhd.

We'd also like to thank the stakeholders that participated anonymously in this research.

GSMA Head Office

1 Angel Lane

London

EC4R 3AB

United Kingdom

Tel: +44 (0)20 7356 0600

Fax: +44 (0)20 7356 0601

