APEC

Asia-Pacific Economic Cooperation

Advancing Free Trade for Asia-Pacific **Prosperity**

Updated Summary Report of APEC Economies' Digital Policy Measures to Combat COVID-19

APEC Health Working Group

May 2023

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Abbreviations

APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
OECD	Organisation for Economic Co-operation and Development
HWG	Health Working Group
LSIF	Life Sciences Innovation Forum

Abbreviations for APEC economies

AUS	Australia
BD	Brunei Darussalam
CDA	Canada
CHL	Chile
PRC	People's Republic of China
HKC	Hong Kong, China
INA	Indonesia
JPN	Japan
ROK	Republic of Korea
MAS	Malaysia
MEX	Mexico
NZ	New Zealand
PNG	Papua New Guinea
PE	Peru
PH or PHL	The Republic of the Philippines
RUS	Russia
SGP	Singapore
CT	Chinese Taipei
THA	Thailand
US or USA	United States
VN	Viet Nam

Executive Summary

For the purpose of further developing APEC's agenda to promote digital health, Chinese Taipei composed this report, supported by the HWG Chair and members of the Digital Health Sub-Working Group. This report summarizes the digital policy measures HWG members have taken to combat the COVID-19 pandemic. It is anticipated to lay the necessary groundwork, as well as make it more convenient, for any attempt to further explore the implementation of digital health measures designed to combat COVID-19 and future pandemics.

This report summarizes the policy measures of individual economy in ten categories, namely, "Information Enquiry Platform," "Tracking Measures," "Telemedicine", "Mental Health", "Quarantine Measure", "Stockpile and Allocation of Essential Medical Resources", "Diagnosis", "Social Distancing", "Cross border solution" "Vaccination". It is discovered that all economies can establish policy measures in information enquiry platforms and tracking measures to tackle and monitor the outbreak of COVID-19. Further, in all COVID-19 digital prevention mechanisms, it seems that categories like stockpile and allocation of essential medical resources, diagnosis, and social distancing are the most under-appreciated ones. Lastly and foremost, based on the statistics and qualitative data analysis of the information compiled in this report, digital preparedness is correlated with the level of economic development.

The Purpose

APEC has been paying attention to the importance of digital health. In the 9th APEC High-Level Meeting on Health and the Economy in 2019, the Health Senior Officials reiterated the development of innovative technologies was conducive for improving all aspects of the healthcare sector as well as promoting economic growth in the region. Last year, APEC Putrajaya Vision 2040 noted 'Innovation and Digitalization' as a key element. To empower people and businesses to participate and grow in the global economy, APEC will foster an enabling environment that is market-driven and supported by digital economy and innovation. APEC will strengthen digital infrastructure, accelerate digital transformation, narrow the digital divide, as well as cooperate on facilitating the flow of data and strengthening consumer and business trust in digital transactions. And the Aotearoa Plan of Action endorsed by Leaders in November 2021 is designed to turn the Vision into reality. Although the development stage of each economy varies, we have witnessed more investment in the application and R&D of digital health in almost every member economy.

The global COVID-19 pandemic has demonstrated how a health issue can quickly have detrimental impacts on both the citizens and prospects of an economy. COVID-19 has exposed and exacerbated existing challenges faced by our health systems, including barriers to access to healthcare and health services. It has also raised social, economic as well as health inequalities, which have been magnified by the disproportionate impact of the crisis on the poor, women, children, indigenous peoples and so on.

Based on our experiences and research, we have recognized that digital technologies have rapidly developed in preventing the pandemic and promoting people's health in the period. The current crisis should be seen as an opportunity to bridge the digital divide among regions by increasing broadband access, however, in certain economies, it might increase the gap. It is a golden opportunity to create incentives to adopt digital technologies across all key governments, industries, and private sectors, and to promote a stronger digital culture across the population.

The impact of digital technologies is especially distinguishable as we are now confronting the COVID-19 worldwide. Policies like monitoring, stockpiling medical resources, diagnosing and telemedicine rely on technologies enormously. In our viewpoint, this also implies the development of digital health will be more in line with the "people-centric" principle as it impacts the health of every individual and local community. The goal of

APEC's digital health agenda is expected to attain "Digital Health Becomes a Lifestyle" as we accumulate experience and grow our capacity through the process of containing the pandemic. The following actions are needed for attaining our goal:

1. Combating the COVID-19 pandemic with digital tools. The power of digital technologies is witnessed as we combat the pandemic, however, more potentials are waiting to be explored. APEC is positioned to pioneer in this area before it can truly lead globally.

2. Promoting the application of digital health policies in APEC economies. With a wide-ranging diversity in the region, digital health policies are developed and employed in different economic and societal contexts in member economies. Comparison, experience exchange and capacity building will help identify the merits and shortfalls of each and benefit any improvement of these policies.

3. Exploring opportunities for regulatory cooperation to facilitate digital health practices. Regulations offer the necessary conditions for conducting digital health practices. And considerable scale economy can be generated if cross border regulatory cooperation is in position.

4. Establishing Public Private Partnership (PPP) for attaining the objectives listed above. The expertise, capacity and motivation of the business communities can inject extra momentum into our activities in the APEC region.

To this end, the Digital Health Sub-Working Group (DHSWG) of the APEC Health Working Group (HWG) composes this report to offer an initial stocktaking of the major policy measures utilized by APEC member economies to address the COVID-19 pandemic. This summary of policy facts will benefit policy makers, practitioners and researchers who are interested in understanding what has been done in the region by the individual economy. This report lays the necessary groundwork, as well as makes it more convenient, for any attempt to further explore the implementation and potentials of digital health measures designed to combat COVID-19 and the next pandemic to come.

This report presents the policy measures of individual economy mainly in nine categories, namely, "Information Enquiry Platform", "Tracking Measures", "Telemedicine", "Mental Health", "Quarantine Measure", "Stockpile and Allocation of Essential Medical Resources", "Diagnosis" and "Social Distancing" and "Vaccination". They are extracted from our experience during the pandemic. From immigration, quarantine to diagnosis and treatment, we have sorted out the process, collect existing international digital health and epidemic control policies. At the same time, available public sources from the other HWG member

economies have offered the main information contained in this report. We appreciate all the comments made by HWG member economies for improvement. However, any deficiency will be the responsibility of the authors.

Though it is a rough picture drawn by the report, we consider it a pioneer in the HWG, which will inspire more relevant efforts and cooperation to emerge. It also represents the enthusiasm of the DHSWG, established in early 2020, for developing the agenda of digital health in APEC. We anticipate further R&D and regional actions to emerge soon after this report is published.

Measures Taken in Individual Economy

Australia

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Coronavirus Australia App • COVID-19 WhatsApp channel • Vaccine Information and Location Service • National Coronavirus Helpline[1] • Older person's COVID-19 support line
• Tracking (including import management and CBS)	• COVIDSafe App • State and Territory Location Check-in Apps • Australian Immunization Register (AIR)
• Quarantine Measure	• Living with COVID-19 – COVID-19 ready kit
• Stockpile and allocation of essential medical resources	• COVID Vaccine Administrative System (CVAS)
• Mental Health	• Temporary changes were made to Better Access • Coronavirus Mental Wellbeing Support Service • National Coronavirus Helpline[2] • Support for Lifeline and Kids Helpline • Establishment of 26 Head to Health Pop Up mental health clinics • Increasing support to young people aged 12-25 through Headspace and eHeadspace
• Diagnosis	• COVID-19 Symptom and Antiviral Eligibility Checker • COVID-19 Vaccine Side Effects Symptom Checker
• Telemedicine[3]	• COVID-19 Temporary MBS Telehealth Services • Electronic prescriptions • My Health Record system • Home Medicines Service
• Social distancing	• Declared hotspots • COVID-19 Restriction Checker
• Cross border solution	• International COVID-19 Vaccination Certificate (ICVC)

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[1] https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-advice-for-the-health-and-disability-sector/providing-health-care-remotely-during-covid-19

[2] https://www.health.gov.au/contacts/national-coronavirus-helpline

[3] https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-advice-for-the-health-and-disability-sector/providing-health-care-remotely-during-covid-19

• Vaccination	• COVID-19 Vaccine Eligibility Checker • COVID-19 Vaccine Clinic Finder • Clinician Vaccine Integrated Platform (CVIP) • Commonwealth Booking Platform (CBP) • Residential aged care worker COVID-19 vaccination rates map • National Coronavirus Helpline, including priority lines for Culturally and Linguistically Diverse people, people with Disability, First Nations people, and aged care and disability workers • Easy Vaccine Access (EVA) SMS service

The government developed several information enquiry platforms in response to COVID-19. This included designing a publicly accessible official app, the Coronavirus Australia App, to share the latest information and advice regarding COVID-19. Through the app people are able to check their own symptoms and receive notification when urgent information and updates are published. Also, the National Coronavirus Helpline opened at the start of the pandemic and has since taken over 4,600,000 calls. It is complemented by the Public Enquires Support Ecosystem (PESE) that helps to ensure coordinated communications and responses to public inquiries about COVID-19 and vaccination. Healthdirect Australia has extended the use of its Knowledge Base across the ecosystem to provide a repository of content collated and published for use of call handlers in the PESE.

The government developed the COVIDSafe app as a tool to support contact tracing efforts early in the pandemic. Each Australian State and Territory has also launched regional apps to support contact tracing, utilizing location check-in.

The government has launched "Living with COVID-19 - COVID-19 ready kit".[4] This checklist can help people plan so if they, or their family member test positive for COVID-19 and needs to isolate are prepared.

The government has developed a specific National Mental Health and Wellbeing Pandemic Response Plan to respond to the mental health impacts of the COVID-19 pandemic. As part of this, the government has been providing extra digital supports to improve the mental health of Australians during the pandemic.[5] This has included additional funding to several

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[4] https://www.health.gov.au/resources/publications/living-with-covid-19-covid-19-ready-kit
[5] https://www.health.gov.au/sites/default/files/documents/2020/03/covid-19-national-health-plan-supporting-the-mental-health-of-australians-through-the-coronavirus-pandemic.pdf

existing phone and online mental health services (e.g., Lifeline, Kids Helpline), to boost their capacity to meet increased demand as a result of the pandemic. The government has also established 26 Head to Health Pop Up mental health clinics and mental health intake and assessment phone services in regions particularly affected by COVID-19 lockdowns and restrictions, as well as a dedicated National Coronavirus Mental Wellbeing Support Service which provides mental health support via telephone, and online channels. This was also supplemented through additional funding to support outreach and clinical capacity in physical settings, particularly for young people through Headspace.

From March 2020 the government added several temporary Medicare items to help health care practitioners deliver telehealth services via phones or video conferencing. Telehealth services help protect health care professionals, their staff, and patients from being exposed to unnecessary risks of infection. A range of health care providers can now offer telehealth services to patients, including general practitioners, specialists, allied health providers, mental health professionals and nurse practitioners. From 1st January 2022, patient access to telehealth services became permanently supported by ongoing MBS arrangements which built on the temporary telehealth items and continue to enable all Medicare eligible Australians to access telehealth (video and phone) services for a range of (out of hospital) consultations that can also be provided in person. On 16 January 2022, the Australian Government announced, in response to a surge in COVID-19 cases, it would invest an additional $24 million to introduce critical changes to the MBS to support a continued response to COVID-19, including:

- For specialists the Government temporarily reinstated until 30 June 2022 telehealth services to enable specialist medical practitioners to provide telehealth consultations to hospital in-patients when their doctor could not attend the hospital due to COVID-19 restrictions and further support access to specialist for people in the community who need care during COVID-19.
- For GPs and OMPs the Government temporarily expanded, until 30 June 2022, telehealth support by introducing MBS items to enable practitioners to deliver longer telephone consultations, lasting 20 minutes or more.

On 19th July 2022, in response to the Winter 2022 surge in COVID-19 cases, the Government introduced new temporary MBS services to enable patients with a positive COVID-19 diagnosis (verified by a PCR or RAT test) to access a telehealth phone appointment with any GP for longer than 20 minutes for the purpose of being assessed for treatment with COVID-19 oral anti-viral medication. These items are due to cease on 31st

December 2022.

In response to an outbreak, the state or territory governments or the central government can declare a hotspot to step up COVID-19 pandemic control. The COVID-19 Restriction Checker collates economy-wide information to help people easily find out what they can and cannot do in their location.

Australia's vaccination program is underpinned by user centered digital and non-digital channels (which themselves are supported by advanced digital solutions). The Australian Immunization Register (AIR) provides a single source of truth for vaccination status. Australia is one of few economies with this capability. Reporting of COVID-19 vaccinations is required by law. The AIR Immunization History Statement (IHS) displays all immunizations that an individual has had that are recorded on AIR. The IHS can be viewed and printed through Medicare Online via myGov or the Medicare Express Plus App. Health information including vaccinations recorded in the AIR, and increasingly, COVID-19 test results can be viewed through an individual's My Health Record, Australians' personally controlled e-health record. A COVID-19 vaccination digital certificate based on data in the AIR is available to consumers.

The government utilized geo-targeting features within social media applications to promote COVID-19 vaccines in vulnerable and remote communities including First Nations communities. Geo-targeted Facebook boosting has been used as needed with messages about COVID-19 preventative measures, vaccine pop up clinic information, and stay at home messaging for First Nations people. Information about COVID-19 tailored for First Nations audiences, is available on the Department of Health and Aged Care website. Information packs developed specifically for First Nations communities and including social media tiles, animation videos and digital radio broadcasts with community leaders.

The government's Vaccine Clinic Finder (VCF) is the primary economy-wide online channel for consumers to access COVID vaccines. As of 29th September 2022, the Vaccine Clinic Finder had over 52 million unique sessions. In the early days of the vaccine rollout, vulnerable populations were prioritized to support people who were at higher risk of serious illness from COVID-19. To support people to understand when they could get vaccinated, the Eligibility Checker helped people living in Australia to easily find out when they were vaccine eligible. If eligible, they were directed to the Vaccine Clinic Finder, to find a clinic administering COVID-19 vaccines near them and to book an appointment. The people who

were not initially eligible to access vaccines could register their interest to be notified (by SMS or email) when they could access a vaccine. When vaccines were available to all people in Australia, the government evolved the Eligibility Checker into one front page on the Vaccine Clinic Finder.

Further, a COVID-19 Vaccine Side Effects Checker was built when the vaccine rollout commenced to help those experiencing side-effects to determine their next steps. Delivering these solutions has required extensive engagement and cooperation across multiple governments, medical peak bodies and the private sector. The Commonwealth Booking Platform, based on an existing product by Australian company HealthEngine, was procured by the Government to enable COVID-19 vaccine providers, who do not already have an online booking solution, to quickly get up and running with a digital system to offer appointments. The Australian Digital Health Agency developed the Clinician Vaccine Integrated Platform (CVIP) to enable healthcare providers, who may not have conformant or integrated software, to upload details of vaccination encounters to the Australian Immunization Registry (AIR) to support healthcare providers to meet their mandatory reporting requirements and consumers view of their immunization status. The government launched an interactive map called "Residential aged care worker COVID-19 vaccination rates map"[6] , which shows COVID-19 vaccination rates of residential aged care workers by facility across Australia.

The government has introduced an International COVID-19 Vaccination Certificate (ICVC) for outbound travelers. The certificate meets the new global standard specified by the International Civil Aviation Organization (ICAO) and endorsed by the World Health Organization. The certificate uses Visible Digital Seal (VDS) technology in the form of a QR code that is secure as a passport chip and can be digitally authenticated in the same way as a passport. The QR code can be read by passport control systems at borders around the world and by COVID-19 travel apps such as the IATA Travel Pass that many airlines are using. The certificate also includes the holder's passport number as well as all the necessary vaccination details specified in the global standard, including the vaccine batch number. COVID-19 vaccination details are extracted from the Australian Immunization Register, an economy-wide register that can only be updated by authorized health professionals.

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[6] https://www.health.gov.au/resources/apps-and-tools/residential-aged-care-worker-covid-19-vaccination-rates-map

Brunei Darussalam

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• BruHealth • 148 Health Advice Line
• Tracking (including import management and CBS)	• BruHealth
• Quarantine Measure	• Digital Quarantine Order • Home Isolation Notices
• Stockpile and allocation of essential medical resources	• Vaccination dashboard, • Online Assets inventory and PPE stockpile, • Online Hospital and Isolation centre beds availablity
• Mental Health	• COVID-19 Health Advice Line:148 • Talian Harapan 141 (Mental Health Advice Line)
• Diagnosis	• Bruhealth Personal Assessment Code • Bruhealth Antigen Rapid Test result reporting platform • Bruhealth COVID-19 Recovery Certificate
• Telemedicine	• Bruhealth Video Consultation and Doctor Workstation
• Social distancing	• BruHealth
• Cross-border solution	• Digital Vaccine Certificates
• Vaccination	• Vaccination appointment Bookings • Adverse Effect Following Immunization Reporting

The government has developed the "BruHealth" app, a one-stop mobile application for anything related to COVID-19 in Brunei Darussalam, including COVID-19 information and epidemic updates, self-assessment tools, activity trace of the confirmed cases etc. Leveraging on existing data from our "One patient, one record" health information system, BruHIMS, which covers over 90% of the population, the COVID-19 platform was able to quickly extract relevant data and roll out the BruHealth App to indicate health status of an individual with the intention of identifying those at risk. BruHealth Health color codes were introduced to indicate an individual's daily health status where they would need to answer and submit screening questionnaires on the app to generate their daily health code status. At the same time, QR code scans were also put in place at all premises where any individual entering a premise would need to scan in and out for the purpose of contact tracing.

All this data were then in turn populated into a command center dashboard which helped MOH Brunei to achieve predictive capabilities resulting in better resource prioritization and optimization. In addition to this, real-time hospital beds and isolation centre information was made available through the command center dashboard as well as regularly updated vaccination stock and usage dashboard, PPE stockpile, and assets inventory.

There is also a video consultation feature on the Bruhealth App, where patients can book and gain access to video consultations. This service was started since 28 September 2020. Psychologists and dietitians are able to connect to these patients via the Doctor Workstation desktop app especially during the peak of the pandemic.

During the de-escalation process during the period in between the first and second wave of the pandemic in June 2020, the COVID-19 situation at the time was deemed safe enough to allow Muslims to resume Friday Prayers in the mosques, BruHealth app was used to provide Friday Prayer booking slots in all mosques in the economy. This was to ensure that mosques are not overcrowded and sufficient space between worshippers are kept. When the COVID-19 vaccines became available and the nationwide vaccination programme was started, BruHealth added functionality for vaccination appointment bookings and Adverse Effect Following Immunization (AEFI) reporting by the public using the app. Covid-19 digital vaccine certificates can also be generated by using the app and printed at home. During the 2nd and 3rd wave of the pandemic in August 2021 and February 2022, digital quarantine orders, home isolation notices, recovery certificate and reporting of ART results functionality were added to BruHealth to assist front-liners in managing the pandemic. Those undergoing isolation at home were also able to request medications and other essential supplies through the application.

Additionally, during the third wave, triaging COVID patients was also done using a feature in the Bruhealth App. This was extremely significant, as this assisted us in categorizing patients and transporting our sicker and symptomatic covid positive cases to our various isolation centres. Categorisation was utilized based on our own existing covid categories and data with risk stratified with added important co-morbidities like COPD, underlying renal problems, cardiovascular disease, and age. This helped the economy to manage and eventually curb the third wave significantly and optimize the use of our isolation centres, with remote triaging and monitoring and utilizing digital solutions to combat Covid-19.

As Brunei Darussalam entered the COVID-19 endemic phase, the government announced

that commencing 15th June 2022, scanning of Bruhealth QR codes is no longer mandatory to enter premises and the government has expanded the use of BruHealth as a health management app.

From 15th September 2022, Brunei Darussalam fully opened all its borders to allow travels via air, land, and sea. Predeparture and on arrival COVID-19 tests are no longer required. In addition, COVID-19 vaccinations requirement and quarantine measures have also been lifted for all travelers.

Canada

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• COVID-19 daily epidemiology update • Wastewater dashboard • My visit risk calculator
• Tracking (including import management and CBS)	• ArriveCAN
• Quarantine Measure	• ArriveCAN
• Stockpile and allocation of essential medical resources	• Inventory Management System
• Mental Health	• Wellness Together Canada
• Diagnosis	X
• Telemedicine	• Pan-Canadian Virtual Care Priorities in Response to COVID-19 • PrescribeIT®
• Social distancing	X
• Cross border solution	• N/A due to new COVID-19 Border measures effective October 1,2022[7]
• Vaccination	• Health infobase/COVID-19 vaccine coverage in Canada

The government has created a webpage of "COVID-19 daily epidemiology update" on its official website. The webpage summarizes COVID-19 cases across Canada, with detailed data about the spread of the virus over time and in different regions of the economy. The data provides an overview of hospitalizations and deaths, testing, variants of concern and exposures.[8] In addition, the Public Health Agency of Canada maintains a health infobase website that aggregates information from provinces and territories regarding vaccine coverage across Canada by province or territory, vaccination status, sex, age group, and vaccine series. The government also launched a "Wastewater dashboard" to provide trend data about the levels of COVID-19 in the wastewater (sewage) of different communities and settings across Canada. This can reflect whether the levels of COVID-19 in those communities are increasing, decreasing or stable.

The government created a website "My visit risk calculator" to help people of different ages

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[7] https://www.canada.ca/en/public-health/news/2022/09/government-of-canada-to-remove-covid-19-border-and-travel-measures-effective-october-1.html

[8] https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html

and states of health better understand the factors that affect the risk of getting COVID-19 when visiting others.

The Public Health Agency of Canada (PHAC) has initiated planning for a modernized warehouse management system. The National Emergency Strategic Stockpile (NESS) has developed a portal to allow for efficient management of Canada's critical medical supplies. This web-based application is designed to allow the NESS to have visibility of supplies, of which, provinces and territories can draw down should their own resources be exhausted. Overall, this allows the NESS to improve its approach to lifecycle management and accurately inform future needs of supply.[9]

Launched in April 2020 by the Government of Canada, Wellness Together Canada (WTC) is an online mental health and substance use support portal that provides free and credible information and supports available 24/7 to individuals across Canada in both official languages. It is led by a consortium of established leaders in mental health and substance use care that includes Stepped Care Solutions, Homewood Health and Kids Help Phone, and features content from other collaborators. Depending on their needs, individuals can access different levels of support, ranging from information, self-guided programming, and assessment tools, to connecting with peer support, social workers, psychologists and other professionals for confidential text sessions or phone calls.[10]

In response to the COVID-19 pandemic, the government is committed to working in partnership with provincial and territorial governments to put in place a range of digital supports to help Canadians get the information, resources and care they need throughout this unprecedented time. On May 3, 2020, the Prime Minister confirmed this commitment by announcing an investment of $240.5 million to accelerate the use of virtual tools and digital approaches to support Canadians. Part of this funding was dedicated to Wellness Together Canada, described above.[11]

Canada Health Infoway is working with Health Canada, the provinces and territories, and industry stakeholders to develop, operate and maintain the economy-wide e-prescribing service known as PrescribeIT®. PrescribeIT® will serve all Canadians, pharmacies and

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[9] https://www.canada.ca/en/public-health/services/emergency-preparedness-response/national-emergency-strategic-stockpile.html

[10] https://wellnesstogether.ca/en-CA#resources

[11] https://www.canada.ca/en/health-canada/corporate/transparency/health-agreements/bilateral-agreement-pan-canadian-virtual-care-priorities-covid-19.html

prescribers and provide safer and more effective medication management by enabling prescribers to transmit a prescription electronically between a prescriber's electronic medical record (EMR) and the pharmacy management system (PMS) of a patient's pharmacy of choice. PrescribeIT® will protect Canadians' personal health information from being sold or used for commercial activities.

The government recognizes that the safe reopening of economies and communities includes international travel. In response to a need to facilitate the restart international travel while recognizing the evolving epidemiological context, the government, in collaboration with the Canadian provinces and territories launched the Canadian COVID-19 proof of vaccination credential (PVC) for international travel in 2021. The Canadian COVID-19 PVC is a standardized and interoperable credential, based on SMART Health Card specifications. It provides a factual, digitally verifiable record of the holder's vaccination history that can be used by border officials to determine what public health measures may be applied to that individual. It is designed to be client-focused and protect user privacy.

Chile

Categories of Digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Chile Reports
• Tracking (including import management and CBS)	• **COVID Analytics platform**
• Quarantine Measure	• CoronApp (self-evaluation and access to level of risk)
• Stockpile and allocation of essential medical resources	X
• Mental Health	• Salud Responde
• Diagnosis	X
• Telemedicine	• "Your Health is Our Challenge"
• Social distancing	• **MeVacuno**
• Cross border solution	• **MeVacuno**
• Vaccination	X

The government shares detailed COVID-19 related information, such as confirmed cases, the percentage of positive PCR, hospitalization etc. in the "Chile Report" on the government's official website. The government has created the CoronApp to prevent Coronavirus infections. There are several functions of the app, which include[12]:

1. Carry out a self-assessment of the user's symptoms to generate a risk classification.
2. Receive notifications from the Ministry of Health.
3. Deliver informative content on the contingency and evolution of the pandemic.
4. Provide an instance to report and / or report high-risk behaviors or events.
5. Indicate where those infected will stay during their quarantine.

As a result of the pandemic, many firms had to adopt several digital technologies, such as video conferencing, document sharing, cloud solutions, information security, or online selling and buying, to keep their operations running. The government also collaborates with Chile's Institute of Complex Engineering Systems (ISCI for its Spanish acronym) and academics from the Universidad de Chile to develop **COVID Analytics platform**, to forecast numbers of critical patients in order to allocate them to hospitals and, in some cases, transfer them between cities.

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[12] https://www.minvu.gob.cl/coronapp/

To improve people's mental health, the government has established the "Salud Responde," a virtual and telephone platform that operates 24/7, where anyone can access to receive information, guidance, support, and education on COVID-19 issues or any other health-related topic.[13]

Chile has adopted telemedicine technology to reduce waiting lists. The objective of this alliance called "Your Health is Our Challenge", is to help decongest the non-surgical waiting lists in the region, especially for non-COVID pathologies that are lagging. The operations consist of telemedicine sessions that will allow specialists at the German Clinic of Santiago to attend to patients in the specialty of endocrinology, among others.[14]

The Pase de Movilidad allows greater freedoms to dine in restaurants indoors, and attend public events, theatres, gyms etc. Residents of Chile can request the Pase de Movilidad on the "MeVacuno" website once they have received their vaccination in Chile. This will generate a QR-code after entering the personal information. Visitors to Chile should visit the "MeVacuno" website to validate vaccinations received outside of Chile and receive a Pase de Movilidad, which is necessary to attend public events, restaurants, bars, theatres, gyms etc. 'MeVacuno' also provides information related to vaccinations.

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[13] https://saludresponde.minsal.cl/
[14] http://www.latinamerica.tech/2020/06/07/chile-adopted-telemedicine-technology-to-reduce-waiting-lists/

China

Categories of digital tools for COVID-19 prevention and control	Measures taken	
• Information Enquiry Platform and Connection Point	• Official Website	
• Tracking (including import management and CBS)	• Health QR Code • Epidemic Map	
• Quarantine Measure		X
• Stockpile and allocation of essential medical resources		X
• Mental Health		X
• Diagnosis		X
• Telemedicine	• Telemedicine platform	
• Social distancing	• Community drones are used to disperse public	
• cross border solution		X
• vaccination		X

The government has established an official website to gather and update information, including service availabilities, hours of operation and travel restrictions for all kinds of points-of interest. To track, health QR codes and digital travel records have been employed by the government as permits for making trips, going to school or work, entering certain public venues, and for other daily errands. The results shown on the codes and records can provide the basis for travel control and differentiate response measures, which have made risk identification and targeted control possible in different areas at different levels.[15] In addition, an "epidemic map" has been created to display the specific names and locations of the communities where cases have been reported and the number of confirmed infections. The map has made it easier for the public to guard against infection.[16]

The government has established a telemedicine platform that includes an online consultation clinic, where experts are available 24 hours a day. Experts can conduct preliminary screenings through remote consultation, which helps avoid the risk of cross infection in the hospitals and take the pressure off designated hospitals. Community residents and health providers have felt that it has created favorable support for early detection, diagnosis, and prevention.[17]

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[15] https://covid-19.chinadaily.com.cn/a/202006/08/WS5edd8bd6a3108348172515ec.html

[16] https://covid-19.chinadaily.com.cn/a/202006/08/WS5edd8bd6a3108348172515ec.html

[17] https://ccforum.biomedcentral.com/articles/10.1186/s13054-020-02884-9

Hong Kong, China

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Thematic websites • Interactive Map Dashboard • Social media platforms • WhatsApp Helpline • GovHK Notifications App
• Contact Tracing	• Geospatial Information Portal • Case Investigation and Management Portal
• Tracking (including import management and CBS)	• Electronic Health & Quarantine Information Declaration • LeaveHomeSafe App
• Quarantine Measure	• StayHomeSafe App & Bluetooth Low Energy wristbands
• Stockpile and allocation of essential medical resources	• Central Resource Allocation IT Module
• Mental Health	• Thematic webpage • Digital "Wellcation booklet"
• Diagnosis	X
• Telemedicine	• Hospital Authority (HA) Telehealth framework • 1D1P for inpatient telehealth services • HA Go for outpatient telehealth initiatives
• Social distancing	X
• Cross border solution	X
• Vaccination	• Vaccination Dashboard • Central Vaccination Database

In order to help the public grasp the latest and accurate information, the government launched the COVID-19 thematic website and the "Hong Kong Anti-epidemic Information Channel" in February 2020 in addition to the "Interactive Map Dashboard," which provides information including the confirmed cases, the buildings where the infected persons lived/visited, the collection points for sending test samples and the testing statistics, etc.[18]. The public can also gain access to information via the COVID-19 WhatsApp Helpline and the "GovHK Notifications App" which makes it convenient to receive messages or notifications and alerts via different means. The government has also employed diversified digital media including Facebook, Instagram, and YouTube as major communication platforms.

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[18] https://www.ceo.gov.hk/eng/pdf/article20210726.pdf

To support contact tracing, the robust application of the Geospatial Information Portal (GIP) enables visualization and analysis of vast amount of data and attributes of COVID-19 cases. This supports the government in making strategic and targeted decisions promptly and precisely, to cut the viral transmission chain and safeguard public health. The enhanced interactive map dashboard presents boundaries of area under compulsory testing notice, and catchment area for sewage tested positive in addition to details of confirmed cases. The link analysis function of the GIP not only shows the relationship between related confirmed cases, but also supports investigators to collate epidemiological relationship between index case and contacts, such as incubation period and communicable period, with georeferenced common meeting points through the linkages of their exposure or movement to study individual behavior and activities. The visualizing of geographical information of common contacts of confirmed cases of COVID-19 helps evaluate relationship of geolocations that would in turn help predict the spread of COVID-19.

The Case Investigation and Management Portal (CIMP) links up information systems of various relevant departments and agencies such as the HA for centrally and electronically collecting information needed for contact tracing, so as to streamline the procedures for information collection, input and sharing, which was once mainly conducted manually. Geocoding services based on geographic information system technology has been enhanced to improve the accuracy in inputting addresses and whereabouts of the confirmed cases. This helps improve the efficiency and effectiveness in tracing contacts of confirmed cases, conducting testing and arranging quarantine or medical surveillance of such contacts.

The government launched the "LeaveHomeSafe" mobile application in November 2020 to provide members of the public with a convenient digital tool to record their whereabouts, while protecting their personal privacy. Users will receive exposure notifications if they have visited the same venues with COVID-19 patients at about the same time. To make it easier for citizens to present their vaccination records upon entering specific places under the 'Vaccine Bubble' initiative, the version 2.0 of "LeaveHomeSafe" was launched in June 2021 to add the "electronic vaccination and testing records" function which allows users to store their vaccination records and related QR codes in the mobile app and display it when necessary. On the other hand, all inbound travelers entering Hong Kong are required to submit health declaration and quarantine information declaration, and travelers can submit the form online to facilitate and speed up the inbound health clearance procedure.

To support the territory-wide COVID-19 Vaccination Program, another new thematic website was launched in January 2021 as a one-stop information hub for the Program. The "Vaccination Dashboard" was launched in March 2021 to show the statistics on vaccination and safety monitoring. All vaccination records are seamlessly integrated with the existing Electronic Health Record Sharing System (eHRSS). A one-stop registration process of the eHRSS is introduced with the COVID-19 Vaccination Program and the vaccination record QR codes can be displayed through the eHealth App.

To support compulsory home quarantine measures, the government has deployed the use of the "StayHomeSafe" mobile application together with Bluetooth Low Energy wristbands since the onset of the pandemic. These technologies have been developed by the Logistics and Supply Chain MultiTech R&D Centre, the Hong Kong University of Science and Technology and a local technology start-up to monitor whether the quarantined persons stay in their designated dwelling places.

With the COVID-19 case reporting module at HA, healthcare professionals can conveniently report high-risk cases during clinical consultation. The data will be accessible in real-time by all public hospitals for isolation bed allocation and coordination across all hospitals for treatment purposes. A central resource allocation IT module is implemented within the treatment facilities to ensure appropriate resource allocation and suitable treatment for different patients, which has eased the demand for isolation beds in public hospitals.

On the mental health front, the government attaches great importance to addressing mental health issues arising from the COVID-19 pandemic. A thematic webpage is included in the mental health promotion and public education initiative "Shall We Talk" website to provide mental health resources in relation to COVID-19.

Lastly, the adoption of telehealth has accelerated during the pandemic as the HA has explored innovative service models to sustain service in the "new normal". Professional collaboration at the bedside has been made possible by clinical tablets supporting the HA videoconferencing platform. Tele-information services have been widely used. Telemedicine for outpatient appointments has been deployed for suitable patients and tele rehab adoption has increased greatly. HA Go, the HA's one-stop mobile app, is the key enabler and many of the telehealth services have also been integrated into CMS, giving clinicians and patients easy and convenient access. New telehealth services are under continual development.

Indonesia

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• SP4N-LAPOR! • Bersatu Lawan COVID-19 (BLC)-Official information platform/APP
• Tracking (including import management and CBS)	• Bersatu Lawan COVID-19 (BLC)-Official information platform/APP • PeduliLindungi • Inarisk
• Quarantine Measure	X
• Stockpile and allocation of essential medical resources	X
• Mental Health	X
• Diagnosis	X
• Telemedicine	• Bersatu Lawan COVID-19 (BLC)-Official information platform/APP
• Social distancing	• 10 Rumah Aman ("10 Safe Houses")
• Cross border solution	X
• Vaccination	X

In Indonesia, a platform called "SP4N-LAPOR!" has been established for Indonesian citizens to directly communicate with the government. Citizens can send vital information of COVID-19 and receive questions and ideas on how the Indonesian Government responds to the pandemic.[19]

Bersatu Lawan COVID-19 (BLC) is an application built by the Task Force for the Acceleration of Handling COVID-19 of Indonesian Government to overcome the COVID-19 pandemic. With this application, users can perform self-diagnosis to understand their own condition. Users will then receive recommendations based on the results of the diagnosis. BLC also increases users' alertness with its 'Hazardous Live Monitor' feature so the users can see whether certain areas are virus hotspots. In addition, users can also find out the latest updates about COVID-19 from the most valid data sources, and the users can receive information such as an update on positive case numbers, recovery rates, and death rates. Users can also find out the COVID-19 referrals to hospitals and consult a doctor online to

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[19] https://www.id.undp.org/content/indonesia/en/home/presscenter/articles/2020/e-citizen-platform-helps-indonesian-citizens.html

prevent possible exposure to COVID-19.[20]

For tracking purposes, the Ministry of Health of Indonesia has joined forces with the Bali Provincial Government and the Bali Provincial Health Office to launch a QR Code for the PeduliLindung application. PeduliLindungi is an application that allows the search for contact tracking and tracing, with an aim to strengthen efforts to reduce the spread of COVID-19. This application helps increase community participation in reporting locations and travel history during the pandemic.[21,22] In addition, the "Inarisk" app has released by the National Disaster Mitigation Agency, which counts on users to conduct self-assessments by answering 21 questions to determine everyone's risk level. Besides personal information, users must describe their family situations and living environment.[23]

To maintain social distancing for preventing the outbreaks, 10 Rumah Aman ("10 Safe Houses") has been designed to supplement "PeduliLindungi." This app is launched by the Presidential Staff Office (KSP), which utilizes artificial intelligence to generate maps that show the most recently logged body temperatures of people who are nearby, allowing users to check on anyone who may need help.[24]

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[20] https://play.google.com/store/apps/details?id=com.deepcovid19&hl=zh_TW&gl=US
[21] https://www.kemkes.go.id/article/view/21070200002/kemenkes-luncurkan-qr-code-untuk-aplikasi-pedulilindungi-perkuat-tracking-dan-contact-tracing-covid-.html
[22] https://www.geospatialworld.net/apps/covid-19/indonesia-launches-pedulilindungi-app-to-take-on-covid-19/
[23] https://kr-asia.com/indonesians-skeptical-of-the-states-covid-19-prevention-apps%EF%82%9F
[24] https://kr-asia.com/indonesians-skeptical-of-the-states-covid-19-prevention-apps

Japan

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• COVID-19 Information and Resources
• Tracking (including import management and CBS)	• COCOA
• Quarantine Measure	X
• Stockpile and allocation of essential medical resources	X
• Safety Net	・COVID-19 call center（Ministry of Health, Labour & Welfare）0120-565-653
• Diagnosis	X
• Remote Health Consultation Services	• Program for Remote Health Consultation Services launched by the Ministry of Economy, Trade and Industry and operated by Mediplat and LINE Healthcare
• Telemedicine	• The Ministry of Health, Labour and Welfare launched a list of 1,000 clinics that offer telemedicine
• Social distancing	X
• Cross border solution	・COVID-19 Vaccination Certificate Application
• Vaccination	・The Vaccination Record System (VRS)

The COVID-19 Information and Resources platform has been established by the government during the outbreak of the pandemic[25][26]. It organizes information ranging from prevention, hotlines for inquiry, quarantine restrictions, and daily case updates. Factual knowledge is crucial when it comes to combatting the pandemic, and such a platform has helped the government maximize its efforts. Along with promoting social distancing, contact tracing apps can also contribute to curbing the spread of COVID-19. An app named COCOA[27] uses Bluetooth technology to document users' trace and send out alerts when they encounter

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[25] https://corona.go.jp/
[26] https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000164708_00001.html
[27] https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/cocoa_00138.html

confirmed cases[28]. Each user will be given a random code, and the system will not reveal the exact place of contact to protect privacy.

Despite the pandemic, necessary medical services should still be offered. In response to such a situation, the government has collaborated with private sectors and developed effective telemedicine solutions. The Ministry of Economy, Trade and Industry released its Program for Remote Health Consultation Services that enabled people to consult with doctors remotely for free in 2020. The services were operated by LINE Healthcare and Mediplat Inc., with which people could receive health advice without having contact with anyone, therefore protecting both healthcare workers and people themselves.[29] The Ministry of Health, Labor and Welfare has also published a list of nearly 1,000 clinics that provide telehealth services.[30]

Japan established Digital Agency and launched in September 2021, contributes to reforming the culture of administration in a user-driven manner through digitalization. The Digital Agency created the Vaccination Record System (VRS). While administration related to inoculation is conducted at local governments, VRS allowed the central government to grasp real time data and effectively reflect the data in policy decision-making. Individuals who move across municipalities benefit from the interconnectivity of records.[31]

With regard to COVID-19 Vaccination Certificate Application, it is a smartphone app for obtaining digital certificate of COVID-19 vaccinations that Japanese government launched in Dec. 2021. Connecting with VRS, the app enables users to easily prove their vaccination history for getting discounts at restaurants, hotels, etc., as well as for immigration procedures. The app can be used both on iPhone and Android smartphones. By scanning an Individual Number Card and entering the card's pin code, users can obtain a certificate with the name, date of birth, dates of vaccination and type of vaccine.[32]

By scanning passport data, users can also obtain a certificate to use in other economies. Once imported to a smartphone, the certificates can be shown even without internet access.

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[28] https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/covid19_qa_kanrenkigyou_00009.html#Q1

[29] https://www.meti.go.jp/press/2020/05/20200501004/20200501004.html

[30] https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/iryou/rinsyo/index_00014.html

[31] https://www.meti.go.jp/press/2019/03/20200311004/20200311004.html

[32] https://www.nippon.com/en/news/yjj2021122000872/

Korea

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	X
• Tracking (including import management and CBS)	• KI-Pass • Self-Check Mobile App • COVID-19 Apps
• Quarantine Measure	• Self-Quarantine Safety Protection App
• Stockpile and allocation of essential medical resources	X
• Mental Health	X
• Diagnosis	• AI Diagnostic screening
• Telemedicine	• Data-Based Smart Monitoring System
• Social distancing	X
• Cross border solution	• digital COVID-19 certificate system
• Vaccination	• COOV App

In the wake of several sporadic mass infections in public facilities, the government has introduced KI-Pass, which contains QR codes to keep a customer or visitor entry log digitally at high-risk facilities and to implement rapid response measures. Users can receive a QR code from their smartphone service provider. Upon entry into a high-risk facility, the user will be asked to register the QR code through scanning. The scanned information is automatically transferred to Korea Social Security Information Service, a public institution.

The immigration and quarantine officers check the addresses of the places where inbound travelers will be staying and their phone numbers on their arrival and have them install the "Self-Check Mobile App" to continuously monitor signs of possible symptoms so that they can be quarantined and treated in a timely manner if necessary.

COVID-19 apps introduced in South Korea are different from other economies' tracing apps. The COVID-19 apps in South Korea help people identify the "places" where infectious individuals have been found within two weeks and warn users if they are within 100m from

those places. Such location information of movement log of infections people is collected by Korea Disease Control and Prevention Agency (Korea CDA) using smartphone GPS systems, CCTV and in-person interviews.[33]

The government has developed the Self-Quarantine Safety Protection App to effectively support the monitoring of those under self-quarantine. The App has two key functions: self-check and GPS-based location tracking. The self-check menu allows the users to monitor four main physical conditions ― fever, cough, sore throat, shortness of breath ― twice a day. The information is automatically reported to the assigned case officer. In case the person in quarantine does not submit the data or shows any possible symptoms, the assigned case officer will immediately receive a notice. The GPS-based location tracking also allows the officer to know if the user leaves their quarantine location. The app also provides the information on the quarantine guidelines and the contact information of the assigned case officer.

The government has adopted the "Data-Based Smart Monitoring System" to minimize medical staff's contact with patients with mild symptoms and to facilitate the monitoring of the condition of the patients in residential treatment centers. Patients with mild symptoms are placed in residential treatment centers across the economy can download an app that helps to monitor the patient's condition on their smartphone and allows them to enter their body temperature and blood pressure. Medical staff can then engage in real-time monitoring of their condition using the dashboard on their computer screen. If a patient's condition deteriorates, an automatic alert appears, allowing the medical staff to take immediate measures. This system minimizes the medical staff's direct contact with the patients and allows for the real-time monitoring of many patients with only a small number of medical staff.

South Korea launched the COOV app earlier in 2021, the app generates a unique QR code that will confirm vaccination status as well as how long it has been since receiving doses. COOV was created by Blockchain Labs, and the Korea Disease Control and Prevention Agency (KDCA) adopted the app for official use. The KDCA vaccine certificate and app are free of charge and the app stores all the user's information in the most secure way possible using blockchain technology.[34]

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[33] https://www.sciencedirect.com/science/article/pii/S0168851021001883
[34] https://www.covidpasscertificate.com/korea-to-issue-vaccine-passport/

On 1st July 2022, South Korea has joined the European Union's digital COVID-19 certificate system, which came into effect from 1st July. The connection to the system allows certificates of vaccination issued in South Korea to be valid in EU, and vice versa. Currently the EU digital COVID-19 certificate recognizes vaccines approved by the European Medicines Agency, including ones made by Pfizer, Moderna, AstraZeneca, Johnson & Johnson and Novavax -- all of which are ones primarily distributed in South Korea.

The validity of the certificate lasts for nine months since the receipt of the completion of a primary vaccine series. The validity period of doses administered additionally beyond the primary series is not yet determined.[35]

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[35] https://www.koreaherald.com/view.php?ud=20220701000611

Malaysia

Categories of digital tools for COVID-19 prevention and control	Measures taken
● Information Enquiry Platform and Connection Point	● Press TV and social media platforms. ● Dashboard (COVIDNOW) ● Data Repository (GitHub) ● SMS notifications from MKN regarding new SOP and updated policies
● Tracking (including import management and CBS)	● Check-ins ● MySJ Trace ● HIDE
● Quarantine Measure	● Home Surveillance Order (HSO)
● Vaccination	● National COVID-19 Immunisation Programme (PICK, PICK-Remaja, PICKids)
● Stockpile and allocation of essential medical resources	● X
● Mental Health	● Mental Wellbeing Assessment
● Diagnosis	● COVID-19 Risk stratification and assessment (Participatory Surveillance) ● Home Assessment Tool (HAT)
● Telemedicine3	● Robocall ● eCOVID VCAC
● Social distancing	● MySJ Trace ● Hotspot Tracker
● Cross-border solution	● Traveller Module

By leveraging the power of digital technology, MySejahtera's digital policy measures have been instrumental in helping Malaysia combat the spread of COVID-19.

Big Data, GitHub, and COVIDNOW

The big data collected enables the Health Control Centre to develop models and analyse the number of cases that are growing and impacting the public. This enables MySejahtera to identify trends, make data-driven decisions, and successfully mitigate the risks and impacts. As a result, this helps the ministry respond in a tactful and realistic manner to real-time information and manage the public's concerns. The data was kept secure by the government, and privacy was ensured for its users. Data is democratised and shared with the goal of increasing data transparency. The valuable data can be granularly published to public data repositories like GitHub and COVIDNOW.

Check-ins

As lockdowns were gradually relaxed and the public was allowed to check in to locations such as grocers and stores for their daily requirements. Business premises are required to print QR codes for users to tag and log their information for COVID response purposes. This helps the health officers to determine the time of access and individuals who may be in contact with an index case in a premise. Subsequently, the identified close contacts will be identified by the system and will be notified by the app to isolate and monitor their symptoms and report them to the MySejahtera app. Astonishingly, about 49,836,365 contacts were traced through MySejahtera throughout the pandemic, which is not possible to have been carried out using manual contact tracing methods.

Hotspot Identification for Dynamic Engagement

Hotspot Identification for Dynamic Engagement (HIDE) was developed, which identifies and displays large and small clusters. Hotspots, where cases were on the rise, would be communicated to users in the immediate vicinity to stay alert and avoid the situation and location, breaking the case transmission cycle among the general public. The HIDE function in the MySejahtera ecosystem has predicted 57,804 big clusters and 790,526 small clusters of COVID-19 in Malaysia, which enabled the relevant agencies to prevent the spread of the disease in advance.

MySJ Trace

The Ministry of Health Malaysia uses the MySj Trace method for contact tracing. This method uses a "community-driven" approach where mobile phone users will exchange

information when they are within a certain distance with the help of Bluetooth. This exchange of information allows the identification of MySJ Trace users who have been near individuals who have tested positive for COVID-19. At the peak of Omicron, this contact tracing mechanism had a 45% positivity rate.

Home Surveillance Order (HSO)

MySejahtera has end-to-end COVID-19 patient management that is done virtually, i.e., from disease reporting to the provision of a legally binding Home Surveillance Order and patient home assessment monitored virtually by health staff, which has benefited 95% of the total number of recorded cases in Malaysia. The implementation of a Home Surveillance Order (HSO) is to ensure that individuals who are positive for COVID-19 are isolated for a period of 7 days. Other than that, MySejahtera is also designed to help individuals who are under the HSO comply with the regulations and manage the quarantine period. The app allows users to access information about their quarantine period, self-monitor their health, and receive reminders to fill out the Home Assessment Tool (HAT).

National COVID-19 Immunization Programme

MySejahtera was used in the management of the COVID-19 vaccination program, transacting about 72,677,593 doses of the COVID-19 vaccine which made Malaysia one of the fastest-developing economies to vaccinate 98% of its adult population with the help of 12,424 registered PPV. The launch of the National COVID-19 Immunization Programme (PICK) was an initiative using the MySejahtera application to reflect the digital vaccine certificate. The application was used for the entire process of the vaccination program and the digital vaccination certificate produced is recognized internationally. The step was insightful in controlling the spread of COVID-19 in Malaysia, as reflected in the flattening of the curve of the number of reported cases of COVID-19.

Mental Wellbeing Assessment

The MySejahtera Mental Wellbeing Assessment consists of a questionnaire that assesses the mental health of an individual, and it can provide individuals with valuable information that can help them identify areas of concern and consider appropriate interventions.

Participatory Surveillance

The Participatory Surveillance system of MySejahtera, enables users to report their symptoms or warning signs via a self-health assessment tool. This is a powerful tool for

healthcare workers to identify potential cases of COVID-19. The tool will alert healthcare workers to those individuals who are at risk of contracting the virus, allowing for timely and effective interventions.

Home Assessment Tool

The Home Assessment Tool (HAT) was introduced in MySejahtera to assist in monitoring COVID-19 patients' symptoms at home while identifying those at risk for any signs of deterioration. This initiative provides comprehensive and effective monitoring of COVID-19 patients at home while also proving to ease the burden on ground staff by reducing the number of patients coming to the physical COVID-19 Assessment Centre (CAC).

Robocall

Aside from that, individuals who answer the HAT and show signs and symptoms of deterioration will receive a robocall instructing them to seek care at the nearest health facility.

eCOVID VCAC

eCOVID was developed for the purpose of assisting healthcare professionals in managing the information regarding patients that were obtained from MySejahtera. In April 2020, eCOVID-19 was developed to oversee the virtual CAC, patient line listings, and the generation of case IDs for use in reporting clustering. It was subsequently evolved to manage CAC patients when the Ministry of Health (MOH) was instructed by the emergency ordinances to establish the COVID-19 Assessment Centres (CAC) to review and assess patients before transferring them to the hospital or quarantine centre because not all infected patients are required to be admitted in March 2020.

Traveller

In relation to Malaysia's international border reopening, the Traveller Module was created to assist in monitoring all travelers who are returning to or visiting Malaysia. Every traveler will need to fill out a pre-departure form and include their vaccination status in MySejahtera. This is critical for assessing travelers' risk of COVID-19 based on their vaccination status.

Mexico

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Gobierno de Mexico-official government portal • COVID-19 MX
• Tracking (including import management and CBS)	• COVID-19MX -an official app that allows users to perform self-diagnosis, track the symptoms of several people, find hospitals, and check their capacity, and consult official information. Also includes advice and FAQs.
• Quarantine Measure	X
• Stockpile and allocation of essential medical resources	X
• Mental Health	• Línea de la Vida: 800 911 2000(Phone line)
• Safety Net	• Official Hotline: 5586338589 • Each state in the economy has a line for emergencies and guidance regarding COVID-19
• Diagnosis	• Detection of suspicious cases through the use of technological tools • COVID-19 MX
• Telemedicine	• Telehealth services in the State Secretaries of Health
• Social distancing	X
• Cross border solution	X
• Vaccination	X

In Mexico, a daily monitoring of all the variables and parameters that allow identifying the magnitude of the risk has been carried out weekly at the meetings on COVID-19[36]; in such a way that people can identify the level of epidemiological risk they are at and adjust the activities to engage in.

In terms of digital prevention, Santander Mexico and BBVA Mexico have provided the local government with an app for people to perform a covid-19 self-diagnosis, find their nearest hospital and receive official information easily and securely. The app connects to other public services, such as the SMS service launched by Mexico City to fight the pandemic. The app has been developed in two parts: Mobile application (covid-19 CDMX app) and

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[36] https://www.gob.mx/sre/en

command control. The app allows users to perform a self-diagnosis, track the symptoms of several people, find hospitals, and check their capacity, as well as obtain official information. It also includes advice and FAQs. As for Command control, the Mexico City Government manages the platform centrally with the command control. This brings together all the data generated by the app in real time, providing online control and tracking for a prompt response.[37]

As a consequence of the actions implemented by the authorities for the containment and mitigation of COVID-19 cases, symptoms and mental health problems began to appear reason why the Ministry of Health in Mexico implemented a telephone attention for the population through the **Línea de Vida (Lifeline) 800 911 2000** a 24/7 service, in order to provide counseling or emotional support. Fourteen Health Institutions have joined this service, also, educational, preventive teaching material and a questionnaire regarding detection of risks for mental health are provided through the official website of Coronavirus in Mexico.[38]

It was in October 2020 that The National Telementoring Program was established, it´s main goal was to feed the human capital of the health professionals belonging to the first and second level of attention, by providing advice and guidance regarding their clinical practice through mental health specialists, as a result the population may be able to receive an appropriate care in order to satisfy their needs.[39]

Telephone lines for emergencies and guidance on COVID-19 were established in each one of the 32 states of the economy, it´s main goal was to provide support and attention to the population in case of having symptoms of respiratory disease.[40]

The government, through its State Health Secretariats has implemented digital health services supported by technological tools, such as mobile applications, chatbots, web platforms, as well as telephone assistance systems for self-diagnosis, detection of suspected cases of COVID-19, as well as coordination and referral of patients between the different medical institutions in the economy.

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[37] https://www.santander.com/en/press-room/press-releases/2020/05/santander-mexico-and-bbva-mexico-provide-mexico-city-government-with-app-to-fight-covid-19

[38] Information on emotional support services and mental health care by telephone. Source: https://coronavirus.gob.mx/salud-mental/

[39] The National Telementoring Program. Source: https://www.telementosaludmental.org.mx

[40] Telephone lines for emergencies and guidance on COVID-19. Source: https://coronavirus.gob.mx/contacto/

The government has also worked in order to achieve strength and implementation of telehealth actions through the grant of remote triage, counseling services about cases regarding patients with COVID-19.   In addition, it is important to mention that as a strategy for the continuity of care services, the reinforcement of consultation, triage, advice, follow-up, monitoring, and remote visit services to non-COVID-19 patients took place. To close this idea, it is important to highlight that distance education actions were also carried out for health professionals and coordination of remote services between institutions; having as a result   a total of 5,741,033 telehealth actions during the year 2020[41] and for the first semester of 2021 a total of 7,981,482.[42]

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[41] Information provided by 20 of the 32 State Health Secretariats which entirely belong to the Mexican government. Source: https://cenetec-difusion.com/observatoriotelesalud/info-prog-tm/
[42] Information provided by 25 of the 32 State Health Secretariats which entirely belong to the Mexican government. Source: https://cenetec-difusion.com/observatoriotelesalud/info-prog-tm/

New Zealand

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Ministry of Health social media, news, and media updates. • Āwhina app for health workers to understand new and different outbreak information • Government 'Unite Against Covid-19 Website'. • Investment in Care Pathways tools for Primary Care to understand key developments in models of care.
• Tracking (including import management and CBS)	• NZ COVID Tracer application • National Contact Tracing Solution - managing and distributing contact tracing across multiple localities • Care in the Community integrated services delivery for community, social and health supports for those with COVID. •
• Quarantine Measure	• Online self-service isolation countdown timers
• Stockpile and allocation of essential medical resources	• Central/Economy-wide procurement and stock management of vaccinations and PPE
• Safety Net	• Online Services and toolkits • Online self-service for ordering RAT Tests • Central data pipelines for analysing all parts of the response • Central and regional risk scores for identifying those at risk of admission
• Diagnosis	• Economy-wide integrated testing and reporting • Wastewater testing and genomic sequencing of various variants • My Covid Record – self-reported RAT Tests, vaccination information, PCR Test results
• Telemedicine	• Various tools and investments aligned to the National Telehealth Resource Centre
• Social distancing	X
• Cross border solution	• Nau Mai Ra – traveler declaration used for managing travel bubbles with Australian and Pacific States

	• EU-DCC vaccination certificates
	• New Zealand Traveler Declaration
• Vaccination	• Covid Vaccination Solution – including booking, safety management, supply chain, register, vaccination certificates

Information Enquiry Platform and Connection Point

The New Zealand Government developed the Unite Against COVID-19 brand and communication channels to operate as a centralized information platform on the domestic COVID-19 response. This was led by the Department of Prime Minister and Cabinet (DPMC) and supported by the Ministry of Health and other response agencies. New Zealand's centralized approach was designed to ensure the public can access information that is credible, reliable, up to date, accessible and relevant to all sectors of the population, so that the public are well informed and know what to do to stay safe at the different stages of the COVID-19 response. Key information has been translated into 27 languages and provided in four alternative formats.

In addition, like other economies, the New Zealand Ministry of Health also provides the latest updates[43], information, and advice on COVID-19 in New Zealand including daily cases and testing rates.

New Zealanders can also access My Covid Record, a secure website that presents an individual's COVID-19 vaccination records. My Covid Record can be used to request an official record of an individual's COVID-19 vaccination status with a My Vaccine Pass[44] for use in Aotearoa New Zealand and a separate International Travel Vaccination Certificate for travelling overseas.

Tracking (including import management and CBS)

NZ COVID Tracer is the New Zealand Ministry of Health's official contact tracing mobile application. It is a private and easy way to keep track of where people have been, enabling faster contact tracing when a case of COVID-19 is detected. Generally, the NZ COVID Tracer app scans QR codes and creates a private digital diary of the places the users visit[45]. The app uses Bluetooth tracing to keep an anonymized record of the people they have been

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[43] https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-news-and-media-updates

[44] https://covid19.govt.nz/covid-19-vaccines/vaccine-passes-and-certificates/proof-of-your-vaccination-status/#my-vaccine-pass

[45] https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-resources-and-tools/nz-covid-tracer-app

in close contact with, registers their contact details so contact tracers can get in touch if they need to, and saves the National Health Index (NHI) number to speed up the process if a test is needed. Finally, it also locates the nearest testing center and offers other useful information.

Community health: digital wellbeing initiatives

The community health sector in New Zealand have also provided online health, wellbeing, and economic services for use during the pandemic, including:

- **GROOV**[46]: an APP providing mental wellbeing coaching
- **Melon**[47]: an online community where users can anonymously interact with others on a similar journey and connect with a team of support workers.
- **Just a thought**[48]: a free online course helps users learn how to cope with worry and stress when things get tough.
- **Getting through together**[49]: a mental wellbeing campaign to maintain users' mental wellbeing during the COVID-19 pandemic.
- **Sparklers at Home**[50]**:** an online toolkit for parents, provides activities that support the wellbeing of primary and intermediate students.

Diagnosis

People who test positive for COVID-19 in New Zealand should report the results of their rapid antigen test (RAT). They can do this online through My Covid Record[51] or by phone on 0800 222 478.

Telemedicine

During the pandemic, General Practitioner (GPs) are working differently to try and reduce the spread of COVID-19. This means undertaking non-urgent appointments by text, email, phone call, or video call. However, if patients need to see their GP in person, they can still do this safely and receive the expert medical advice they need. During the pandemic, local medical practices often request patients call prior to their in-person entry into the clinic. This is to ensure they can be appropriately screened for COVID-19 symptoms, thereby reducing the risk of transmission amongst patients and staff members.

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[46] https://www.groovnow.com/covid-19
[47] https://www.miq.govt.nz/being-in-managed-isolation/looking-after-your-wellbeing/
[48] https://www.justathought.co.nz/covid19
[49] https://www.allright.org.nz/campaigns/getting-through-together
[50] https://sparklers.org.nz/parenting/
[51] https://covid19.govt.nz/testing-and-tracing/covid-19-testing/report-your-rat-with-my-covid-record/

Concluding summary:

It is important to note that New Zealand is considering how it can leverage investment in COVID-19 digital policy measures by reusing underlying technology to support and/or solve other public health challenges.

Papua New Guinea

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• Official COVID-19 FACEBOOK - Joint Agency Task Force National Control Center for COVID-19 • Official COVID-19 Website
• **Tracking (including import management and CBS)**	• The State of Emergency Online Application Portal -The system will monitor and keep track of personal passes and vehicle passes thus improving security of the citizens and service providers.
• **Quarantine Measure**	• Online toolkit for health workers • Online training program
• **Stockpile and allocation of essential medical resources**	X
• **Safety Net**	• Official toll-free inquiry hotline:1800 200
• **Diagnosis**	X
• **Telemedicine**	X
• **Social distancing**	X
• **Cross border solution**	X
• **Vaccination**	X

The government of PNG provides daily updates on cases detected and total infections as well as Frequently Ask Questions (FAQ) on COVID-19 online, including FACEBOOK[52] and Official website[53].

PNG has also developed The State of Emergency Online Application Portal (SOE Pass Application Portal), an initiative of the Department of Communication Information Technology, The Police Ministry and Business Council PNG, to implement a digital solution to allocate personal and vehicle passes to essential service providers during the period of lockdown. The primary purpose of the passes is to manage the movement of citizens to avoid the spread of Covid-19. The system will monitor and track personal passes and vehicle passes, thus improving the security of the citizens and service providers.[54]

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[52] https://www.facebook.com/National-Control-Centre-for-Covid-19-106570254319336/?ref=page_internal
[53] https://www.health.gov.pg/subindex.php?news=2
[54] https://covid19.info.gov.pg/covid-19-awareness/

PNG governments provides multiple online toolkits for health workers, including documents[55] and an online training program[56]

Other than previous tools, PNG Flying Labs has built and run an afterschool education program named "Coding against COVID-19," focusing on youth's wellbeing. This program introduces young students to aerial drones, digital tools, and algorithms while raising the awareness of practices to reduce the transmission of COVID-19 and thus remain safe during the pandemic.

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[55] https://www.health.gov.pg/subindex.php?news=3
[56] https://www.health.gov.pg/subindex.php?news=6

Peru

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• Plataforma Digital Unica del Estado Peruano
• **Tracking (including import management and CBS)**	• SICOVID, Official COVID-19 software for suspect registration, antigen testing and patient monitoring • DECLARATION OF TRAVELERS • CONTACTCOVID
• **Quarantine Measure**	• ContactCovid, self-evaluation and report contacts.
• **Stockpile and allocation of essential medical resources**	• Sala Situacional • Excess mortality dashboard • KPI COVID-19 dashboard
• **Safety Net**	• digital bank account subsidy
• **Diagnosis**	X
• **Telemedicine**	• Teleatiendo • 113 Salud
• **Social distancing**	X
• **Cross border solution**	X
• **Vaccination**	• Vaccination: Acceder a tu carnet de vacunación contra la COVID-19 • National Universal Vaccination Register against COVID-19 • Dashboard of immunizations against COVID-19

Plataforma Digital Unica del Estado Peruano is a comprehensive platform providing reliable information regarding the pandemic such as prevention measures, common symptoms, patient care, vaccination, etc. The platform also contains daily updates of confirmed cases, sample tests and the number of deaths. Furthermore, the users can also share their location in order to protect others and themselves.

It is crucial to have sufficient personal protection equipment and   sufficient abilities to monitor the availability of medical resources. Sala Situacional was created to organize the stockpile of ICU beds, ventilation equipment and ensure they are appropriately distributed.

Such a platform also allows frontline workers to keep track of the resources and evaluate the readiness of the system. Though faced with the pandemic, necessary medical services for both chronic and emergent patient care should still be offered. To tackle this situation, several solutions have been provided by the government such as SISOL, Teletiendo, and 113 Salud, in collaboration with some innovators. These are the measures and platforms using telemedicine to tackle the pandemic.

SICOVID: A system that allows the longitudinal follow-up of the patient infected by SARs-COV-19. The SICOVID allows the registration of the following formats: F00: Triage format, F100.1: Antigen test performance record, F200: Epidemiological investigation form, F300: Clinical follow-up record format (SC), F300.1: Mental Health follow-up record format (SSM), F400: Pre-hospital care format, F500: Hospital care form and F600: Death Certificate.

DECLARATION OF TRAVELERS: The use of this tool is aimed at the prevention and control of COVID-19 of travelers entering and leaving the economy by air, land, and river in the context of the health emergency due to the COVID-19 pandemic.

CONTACTCOVID: Allows everyone who enters the border (international traveler) as well as the population living in Peruvian territory, to daily report their health status (Symptoms and warning signs) and that of their contacts (family circle) by a period of 10 days as part of the protocol established by the Ministry of Health.

VACCINATION

Registration of Undocumented for Vaccination against COVID 19: Allows the registration of people who go to a Vaccination Center for their vaccine against COVID-19 and do not have any Personal Identification document, in order to identify them later through the National Registry of Identification and Civil Status or National Superintendency of Migrations for Peruvians and foreigners

Application of Vaccinator: It allows the registration of the application of the vaccine; and the management of the incoming and outgoing stocks of vaccines received by the vaccinators, which allows the management of the Vaccination Centers by COVID 19 and allows the registration of the Vaccination Programming by the regional health directorate

Load Register for Vaccination COVID-19: It allows public and private entities to upload to the register the list of people who should be vaccinated according to the prioritized load group for COVID-19 vaccination, such as: Health Personnel, Oncological Patients, Pregnant Women, HIV Patients with HIV, validating the data to be registered with the National Registry of Identification and Civil Status (identification of people), economy-wide death registry (deceased), health information system (Persons vaccinated), and validation of other necessary data according to the prioritized load group.

Vaccination Card and Vaccination Certificate COVID-19: It allows the visualization of the Vaccination Card and the obtaining of the Vaccination Certificate for COVID 19 issued by the Ministry of Health, it also allows to register the request for Regularization and / or Correction of Personal Data and / Vaccination Data for the Vaccination Certificate for COVID 19 issued by Ministry of Health.

Acceder a tu carnet de vacunación contra la COVID-19: An official website which provides virtual vaccination certification. It is available at the following link:
https://carnetvacunacion.minsa.gob.pe/#/auth

National Universal Vaccination Register against COVID-19. It is a database of all Peruvians, which together with the database of vaccinated people, allows the programming of the date, place, and dose of vaccination in order to avoid crowds; In addition, it can help to identify if people were previously vaccinated, avoiding duplications.

Dashboard of immunizations against COVID-19. It is a public information panel that shows the doses of vaccine applied according to the number of doses, age group, manufacturer and district, province, and department of the economy. It is available at the following link:
https://www.minsa.gob.pe/reunis/data/vacunas-covid19.asp

KPI COVID-19 dashboard. It is an internal information board aimed at officials of the Ministry of Health to guide decisions on the distribution of human, logistical and financial resources in the different regions of the economy. It is available at the following link:
https://dph.minsa.gob.pe/covidkpi2/menu/   (It needs user and password)

Excess mortality dashboard. It is a public information board that shows the excess mortality by epidemiological weeks and by district, province, and department of the

economy. During the first wave of the pandemic, it was the indicator preferably used for the implementation of control measures and the distribution of resources to contain the pandemic. It is available at the following link:
https://www.minsa.gob.pe/reunis/data/exceso_mortalidad.asp

SAFETY NET[57]

Peru government provides up to S/700（180 USD）to the most vulnerable family. The subsidy can be transferred to a digital bank account.

TELEMEDICINE

The Ministry of Health in Peru provides services of telemedicine and electronic prescribing. Patients who are not in an emergency health situation can reserve Telemedicine services. It is available at the following link:
https://teleatiendo.minsa.gob.pe/?fbclid=IwAR3chFBS9_FopeXt583pytWYgM0W-ziEOKX4gKo3ziPkYCeFwCpIQ3kA26Q

The Ministry of Health also promoted provisions for the surveillance, prevention, and control of healthcare workers at risk of exposure to SARS-CoV-2. In addition, it developed and published the protocol for the administration of the third, fourth and booster doses of the Covid-19 - 2023 vaccine.

113 Salud [58] is a one stop health information service hotline, people can access comprehensive health information e.g., Nutrition, Obstetrics, mental health, COVID-19 by dialing 113.

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[57] https://www.gob.pe/14565-consultar-si-recibes-el-apoyo-economico-yanapay
[58] https://www.gob.pe/555-recibir-informacion-y-orientacion-en-salud

The Philippines

Digital tools for COVID-19 prevention, management, and control	Measures taken by The Philippines
• Information Enquiry Platform and Connection Point	• COVID-19 Tracker • Tanod Kontra COVID
• Tracking (including import management and CBS)	• StaySafe.PH & other local contact tracing applications • FASSSTER
• Quarantine Measure	• StaySafe.PH & other local contact tracing applications
• Stockpile and allocation of essential medical resources	• COVID-19 Supply Management Tracking System • DOH Data Collect Application
• Safety Net	• COVID-19 Hotline • One Hospital Command System • KIRA KontraCOVID PH • Tanod Kontra COVID
• Diagnosis	• COVID-KAYA • COVID-19 Document Repository System (CDRS)
• Telemedicine	• Engagement of 3rd-party Telemedicine Providers • Partnership with LGUs, including public and private health facilities on the implementation and use of telemedicine
• Social Distancing	• StaySafe.PH & other local contact tracing applications
• Cross border solution	• Digital Vaccination Certificate (VaxCertPH)
• Vaccination	• Vaccine Information Management System (VIMS) • COVID-19 Electronic Immunization Registry (CEIR)

In strengthening health system response and resilience, and easing the transition to new normal from the coronavirus disease 2019 (COVID-19) health situation, the Philippine Government has rationalized, mainstreamed, and maximized the adoption and use of innovative information and communications technologies (ICTs) for health, also known as digital health/eHealth, to bridge the access gap for the delivery of continuous, coordinated, and integrated health services and information even to the remotest areas and most vulnerable populations in the economy. At the helm of the implementation of various digital health/eHealth innovations for COVID-19 response is the National Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF-EID) as the overall governance and decision-making body, and as assisted by a Sub-Technical Working Group on ICT

Solutions (STWG-ICT) that provides policy, technical, and operational recommendations on matters relating to COVID-19 ICT solutions.

Among these digital health/eHealth innovations for COVID-19 response are:

1. **Digital contact tracing,** which allows early detection of cases from those who may have been exposed to known cases and thus reduces viral transmission. The economy's official contact tracing application is StaySafe.PH. Still, the Philippine Government continues to encourage and collaborate with innovators to develop applications that support this digital health intervention, and likewise, ensures that interoperability of various contact tracing applications is achieved for seamless and integrated data processing for decision-making.

2. **Telemedicine**, which has enabled patients and individuals to receive health services even while staying at home through increasing access to doctors who can provide COVID-19 and non-COVID-19 primary care consultations. By diverting access to primary care services to telemedicine consultations, health facilities are decongested of non-emergency, non-life threatening, non-COVID-19 face-to-face primary care consultations; thus, allowing these health facilities to focus more on the management of moderate to severe COVID-19 cases, among others.

   The Philippine Government through its Department of Health (DOH) launched a National Telemedicine Service Program in March 2020, where the Department vets and engages 3rd party telemedicine service providers, and partners with selected local government units (LGUs) that have expressed their intent to collaborate for implementing telemedicine services within their respective localities. To date, the DOH has engaged a total of nine (9) 3rd party telemedicine service providers, and seven (7) LGUs. In support to the concurrent implementation of the Philippine Universal Health Care (UHC) Act, the DOH has mandated to its regional offices, Centers for Health Development (CHDs) to activate and expand the implementation of telemedicine services in all public and private health facilities.

3. **One Hospital Command System,** which enables coordination between health facilities and health care provider networks (HCPNs) and streamline the referral and transfer of COVID-19 cases. Specifically, the OHCS facilitates medical transport and patient pick-up arrangements, provides health system capacity data analytics and risk communications, and optimizes the use of medical care services at the economy-

wide level.

4. **COVID-19 Hotline**, a full scale DOH health information and medical consultation service using various communication channels (i.e., phone call, chat, SMS, and email). It operates at a 100% service availability, 24/7 with toll-free capability and at least 90% handled calls.

5. **COVID-19 Information Systems,** which have eased the collection, processing, and submission of COVID-19 and other health-related data from various points of services, and generation of critical health reports by Philippine public health authorities for policy development and program planning.

   The following are the major Philippine COVID-19 information systems:
   a. *COVID-KAYA*: for case management
   b. *COVID-19 Document Repository System (CDRS)*: for laboratory results submission
   c. *Feasibility Analysis of Syndromic Surveillance using Spatio-Temporal Epidemiological Modeler (FASSSTER)*: for data analytics and decision-making
   d. *Tanod Kontra COVID*: for symptom reporting and chat services
   e. *COVID-19 Supply Management Tracking System*: for central logistics and warehousing, supply distribution and allocation, and distribution logistics
   f. *COVID-19 Tracker*: for case statistics
   g. *DOH Data Collect*: for health service statistics

6. **COVID-19 Vaccination Digital Solutions**, which enabled accurate, timely, and efficient distribution and administration of COVID-19 vaccines to eligible population groups in the economy.

   The following are the major Philippine COVID-19 vaccination digital solutions:
   a. *COVID-19 Vaccine Information Management System (VIMS)*, the official key process automation, data management system, and data repository of the Philippine COVID-19 Vaccination Program that is being used for: immunization registration and administration; supply chain management of the COVID-19 vaccines, including healthcare waste management and reverse logistics; monitoring of vaccine and immunization safety and effectiveness; and measuring real-time and equitable vaccine uptake and coverage over time by geography and

eligible population groups.

The COVID-19 VIMS has the following minimum platforms:

i. VIMS-Immunization Registry (VIMS-IR) – master listing, registration, screening, and verification of eligible population groups;

ii. VIMS-Vaccination Administration System (VIMS-VAS) – scheduling, communication and grievance management, and vaccine administration, including issuance of the vaccine card;

iii. COVID-19 Bakuna Center Registry (CBCR) – registration and verification of designated vaccination sites;

iv. COVID-19 Supply Chain Management Tracking System (CSCMTS) – central logistics and warehousing, vaccine distribution and allocation, and distribution logistics;

v. VIMS-Inventory Management (VIMS-IM) – vaccine post-inventory management, healthcare waste management, and reverse logistics;

vi. VigiFlow – recording, processing, and sharing reports of adverse events following immunization (AEFI);

vii. VIMS-Data Warehousing – data consolidation, integration, processing, and repository; and

viii. COVID-19 Vaccination Quick Count & Reporting Dashboards – analytics, dashboard, and report generation.

At the start of the implementation of the Philippine COVID-19 Vaccination Program in the last quarter of 2020, the DOH developed the COVID-19 Electronic Immunization Registry (CEIR), a COVID-19 vaccination digital solution intended for masterlisting, registration, screening, and verification of eligible population groups, scheduling, and vaccine administration. To date, the solution remains operational, but its adoption and use is only limited to selected health facilities and institutions.

b. **Digital Vaccination Certificate (VaxCertPH)**, which is the official key process automation, data management system, and data repository of the Philippine Government relative to the application, processing, issuance, and management of digital vaccination certificates (VaxCertPH).

To streamline the development and implementation of various COVID-19 digital

health/eHealth solutions, the Philippine DOH has implemented an assessment and evaluation mechanism of 3rd party proposals on COVID-19 ICT solutions, following established criteria and other qualifying requirements to ensure user protection and safety, guarantee privacy and data protection, and prevent redundancies and duplication of efforts, among others. Likewise, the Philippine Department of Information and Communications Technology (DICT) has also implemented a department vetting and evaluation mechanism for all ICT services, products, and applications for Philippine Government use in addressing the COVID-19 situation. Formalized through DICT Department Circular 009 dated 29 May 2020, this mechanism requires that all donations of ICT services, products, and applications for government use in COVID-19 response must undergo departmental vetting and evaluation using a defined framework of ICT best practices and standards on ICT service management; project management; enterprise architecture; cybersecurity; and data privacy. Donations are initiated by submitting a Letter of Intent indicating the details, terms, and conditions of donation duly supported by a favorable indorsement of the end-user agency.

At the lawmaking level, an eHealth/digital health-related Bill is undergoing legislative approval in the Philippine Congress. The Bill aims to direct and regulate the use, practice, and implementation of eHealth in the economy with its key provisions taking after the policy and strategic challenges and lessons learned during the ongoing COVID-19 pandemic.

Russia

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• General COVID-19 information website
• **Tracking (including import management and CBS)**	• Pass Entry System-QR code that people download on their phones. They need to fill out personal health information if they want to travel. • Automated face recognition system- a system first used to control citizen prescribed to self-isolate after coming back from China
• **Quarantine Measure**	• Social Monitoring-tracks users via GPS and sends them notifications at random times demanding a selfie to prove they're home
• **Stockpile and allocation of essential medical resources**	X
• **Safety Net**	X
• **Diagnosis**	X
• **Telemedicine**	• Telemedicine center in Moscow-Doctors treat patients with mild COVID-19 symptoms via video call
• **Social distancing**	X
• **Cross border solution**	X
• **Vaccination**	X

Russia has recently adopted the Digital Economy Program, National Data Management System Concept, and the Artificial Intelligence Strategy, which demonstrated Russia's aspiration to be a digital leader. A clear, agile, and comprehensive data policy is key to achieving this goal. The growing focus on digital transformation in Russia is prioritized. In

the past decade, Russia had focused on developing broadband internet access and built a strong digital infrastructure characterized by a competitive telecommunications market, high rates of mobile penetration, affordable broadband, and a high level of cybersecurity. This infrastructure has enabled the growth of strong domestic and localized digital platforms and can now be used to launch 5G mobile networks to create a more efficiently distributed network of data centers, develop local companies in the data analytics space, and accelerate the use of emerging technologies such as the Internet of Things (IoT), AI, robotics, and blockchain.

COVID-19 has highlighted the importance of digital health to the critical role of medicines across the patient-care pathway in the future. The main legal trend which can be found in the field of digital healthcare in Russia is the development of the legal environment to support automatic systems used in the healthcare sphere. This support is connected to personal data protection and developments regarding the form and order of obtaining personal data processing consent from a patient. In order to make personal data processing in digital healthcare more effective and safer, it is necessary to improve legal regulations governing the exchange of information in the healthcare sector, e.g., the Regulations on the Unified State Information System in Health Care approved by the Government of the Russian Federation.[59]

Article 36.2 of the Federal Law № 323-FZ dated 21st November 2011 "On protecting the health of citizens in the Russian Federation" regulates the specifics of medical care provided using telemedicine technologies. The Order of the Ministry of Health of the Russian Federation № 965n dated 30th November 2017 approved the Procedure for organizing and providing medical care using telemedicine technologies.
The specified acts have:
- validated the term "telemedicine technologies";
- established the procedure for remote doctor-to doctor and doctor-to-patient/ doctor-to-patients' legal representatives' interaction;
- formulated requirements for remote monitoring of the patient's health;
- determined the conditions for the correction of previously prescribed treatment using telemedicine technologies;
- approved requirements for the identification and authentication of a doctor and a patient, as well as requirements for documenting information on the provision of medical care to a

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[59] https://practiceguides.chambers.com/practice-guides/digital-healthcare-2021/russia/trends-and-developments

patient using telemedicine technologies, including entering information into a patient's medical records, using an enhanced qualified electronic signature of a medical worker.

By order of the Ministry of Health of Russia № 198n, dated 19th March , 2020 "On the temporary procedure for organizing the work of medical organizations in order to implement measures to prevent and reduce the risks of the spread of a novel coronavirus infection COVID-19", federal remote advisory centers were put into operation for consultations and council of doctors on diagnostic issues and treatment of COVID-19, It also has determined the procedure for organizing and providing medical care using telemedicine technologies to citizens treated at home with a confirmed diagnosis of COVID-19 and / or pneumonia, acute respiratory viral infections, influenza.

Singapore

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• Built a task force across multiple government agencies to coordinate interventions and messaging during any future pandemics • COVID-19 Situation Report on the Ministry of Health's website
• **Tracking (including import management and CBS)**	• Economy-wide level WhatsApp group for one-way messaging (Gov.sg WhatsApp) • TraceTogether application/token • SafeEntry Location check-in/check-out solution • Covid-19 Contact Tracing Solution • Conveyance assignment and tracking for patients
• **Quarantine Measure**	• Quarantine facilities setup • Quarantine Tracking Solution for high risk contacts • TraceSafe Wristband Quarantine Solution • Stay-Home Notice Tracking Solution
• **Safety Net**	• FluGoWhere
• **Diagnosis**	• Pilot programme for virtually supervised COVID-19 Antigen Rapid tests
• **Telemedicine**	• Telemedicine consultation and tele-antigen rapid testing[60]
• **Social distancing**	• TraceTogether application/token Safe Management Measures (SMM)
• **Cross border solution**	• HealthCerts certificates[61]
• **Vaccination**	National COVID-19 Vaccination Programme Portal (vaccine.gov.sg)[62]/ GoWhere (gowhere.gov.sg)

During the pandemic, the TraceTogether programme was developed to support existing economy-wide efforts to combat COVID-19 by enabling community-driven contact tracing. Comprising of the TraceTogether Application and Token, it allows the identification of

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[60] https://www.moh.gov.sg/covid-19/telemedicine-tele-art TELEMEDICINE (TM) CONSULTATION AND TELE-ART

[61] https://www.developer.tech.gov.sg/products/categories/digital-solutions-to-address-covid-19/healthcerts/overview.html HealthCerts - Digital Standards and Schema

[61] https://www.gowhere.gov.sg/vaccine Vaccine

people who were in close proximity to an infected person more efficiently using Bluetooth handshakes. This enabled Singapore to reduce the time taken for contact tracing from 2-3 days to less than a day for most cases. In tandem with TraceTogether, Singapore has also adopted an economy-wide digital visitor registration system that logs the details and contact information of individuals visiting hotspots, workplaces of permitted enterprises as well as selected public venues to prevent and control the transmission of COVID-19. From 17 May 2021, Check-ins must be performed using the TraceTogether Application or Token through the scanning of a QR code or via a Gateway device. Permitted enterprises are advised to adapt entry arrangements at their premises to new methods if they want to be confident in meeting statutory requirements. From 26 April 2022, Singapore has stepped-down the use of TraceTogether.

"FluGoWhere" is a website for residents to search through a list of Public Health Preparedness Clinics (PHPCs) providing special subsidies conveniently and easily for those diagnosed with respiratory illnesses.

Low risk individuals with mild flu-like symptoms are encouraged to seek medical help via teleconsultation and use telemedicine. This may reduce the queue and crowding at clinics. If patients are feeling ill, they may seek care via teleconsultation or tele- antigen-rapid-tests with a doctor through the telemedicine (TM) providers on this list. TM providers and private Pediatric Centres will charge for the services including consultation charges, antigen rapid test services, medication, and logistics. Patients need to check the preferred clinic or provider to confirm the charges, availability and arrangement of appointments, medication delivery, and swab services where required.

HealthCerts is a set of digital open standards and schema for issuing digital COVID-19 test results/ vaccination certificates, in line with international standards and the Singapore Government's requirements to facilitate the safe resumption of travel. The digitally authenticated and endorsed certificates are designed to be easily shared and provide added assurance to the traveler as well as authorities. HealthCerts was developed by the Government Technology Agency (GovTech) in collaboration with the Ministry of Health (MOH), the use of HealthCerts to enable an interoperable, verifiable, and tamper-proof solution which will smoothen and expedite check-in processing and customs clearance at foreign and local immigration checkpoints.

"VaccineGoWhereVaccine.gov.sg" is Singapore's governmental COVID-19 vaccination programme website for residents to look for up-to-date information on the COVID-19 Vaccination Programme and find the nearest updated list of locations administering COVID-19 vaccines. Additionally, residents could use an alternative government product, GoWhere, to search for nearby locations for vaccinations based on postal code as reference.

Chinese Taipei

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• Central Epidemic Command Center (CECC) • CDC official APP
• **Tracking (including import management and CBS)**	• Integrate patients past 14-day travel history with their NHI identification card data • import QR Code • Mobile positioning data (CBS)
• **Quarantine Measure**	• Digital Fence
• **Stockpile and allocation of essential medical resources**	• Name-based rationing system for at-home COVID-19 test kits[63]
• **Mental Health**	• 1925 mental health consultation service • Mood thermometer guidebook
• **Diagnosis**	• My Health Bank APP
• **Telemedicine**	• More than 130,000 domestic medical institutions offer telemedicine for people in isolation as part of the economy's COVID-19 response measures
• **Social distancing**	• Social Distancing App
• **Cross border solution**	• Issue digital COVID-19 certificate and join the EU Digital COVID Certificate system
• **Vaccination**	• COVID-19 vaccination registration and reservation system

Chinese Taipei has mobilized tailored policies for combating COVID-19. The Central Epidemic Command Center (CECC) has been established to conduct cross-sectoral coordination in government for sharing and reporting daily updated COVID-19 epidemic information through holding a regular press conference every day. It not only allows the public to receive first-hand information, but also establishes a channel for the authorities concerned to quickly respond to the media's questions. Chinese Taipei has also employed multiple media channels to timely announce information, such as the official Line and Facebook accounts to strengthen the mutual trust between the public and private sector, as well as consolidate the public-private partnership during the pandemic.

Regarding tracking and quarantine measures, Chinese Taipei has used numerous innovative technologies to assist border control. For example, all travelers are required to scan a QR

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[63] https://www.cdc.gov.tw/En/Bulletin/Detail/rGeS26Buh0cqn8HqwyX_QQ?typeid=158

Code to access the "Quarantine System for Entry" website and before taking off or after landing and should fill out a health declaration online form. All travelers are required to undertake 14-day home quarantine or home isolation measures. Through the "Digital Fencing", the location of people under home isolation and home quarantine can be monitored by detecting electromagnetic signals of their mobile phone to determine if they break quarantine rules.

To properly allocate at-home COVID-19 test kits among citizens, information on where to buy test kits is available on the websites such as NHIA, Food and Drug Administration…etc. Everyone can purchase at-home COVID-19 test kits by showing their personal health insurance card to the authorized shops.

With regard to mental health–relates service amid COVID-19 pandemic, Chinese Taipei has set up 1925 mental health consultation service to provide 24 hours free consultation services to those affected by mental issues. Chinese Taipei also published mood thermometer guidebook for people to be able to briefly measure their mental conditions.

In order to effectively avoid the flow of high-risk people and the risk of infection in medical institutions, the testing result will be shown on My Health Bank APP. "COVID-19 Vaccination/Testing Result" and "COVID-19 Rapid Antigen Test purchase record" was established in My Health Bank, consolidating the results of COVID-19 vaccination records, COVID-19 Rapid Antigen Tests, SARS-CoV-2 Real-time RT PCR tests, and named-based COVID-19 Rapid Antigen Test purchase record.

Regarding the development of telemedicine during the pandemic, more than 130,000 medical institutions have offered telemedicine for people in isolation as part of Chinese Taipei's COVID-19 response measures. Chinese Taipei announced on May 11, 2018, the "Measures for Communication Diagnosis and Treatment", which stipulates that five types of patients with special circumstances can receive telemedicine treatment, not limited to remote areas in mountainous and remote islands, laying a legal foundation for telemedicine. On 29th, November 2019, the "Reference Principles for Approved Work of Psychologists Performing Communication Psychological Counseling Services" was promulgated, allowing psychologists to conduct psychological counseling with clients through long-distance communication in institutions that have applied for communication psychological counseling services.

In response to the pandemic, Chinese Taipei expanded the scope of original "Communication Diagnosis and Treatment Measures" in February 2020. The measures can be applied to those that are at home quarantine or who cooperate with home quarantine regulations, allowing doctors in the hospital to conduct diagnosis and treatment through computer, mobile phone or tablet video, and even prescribe medicine for those who are quarantined or isolated at home.

People who are isolated and quarantined at home, if they have no symptoms of respiratory infection or fever ($\geqq 38°C$), but need to receive medical services immediately, they can call the 1922 or community center pandemic prevention hotline first, and the dedicated line staff will assist in referral to the designated hospital to arrange communication diagnosis service. The designated hospital is not possible to directly accept applications for telemedicine medical examinations from people who are isolated and quarantined at home. If citizens still need to go to the hospital for medical treatment later, citizens must wear a mask to go to the designated hospital for medical treatment (no public transportation is allowed), or the health bureau's epidemic prevention line will assist in arranging an epidemic prevention taxi to escort the doctor.

Also, On December 8, 2021, the revised draft of the "Measures for the Production and Management of Electronic Medical Records in Medical Institutions" was announced. It relaxed the regulations that hospitals can find professional institutions to assist in setting up electronic medical record information systems, which can be uploaded to the cloud and can be exchanged or used across institutions with the aim to assist the development of telemedicine in Chinese Taipei.

In response to the demand for telemedicine owning to the pandemic, Chinese Taipei issued a notice on 10th and 19th Feb. stating that people in home quarantine who need medical treatment will be included in remote diagnosis and treatment and put out another notice for insured subjects who are under home isolation or quarantine due to the pandemic. It says the cost of video diagnosis and treatment is covered by the total health insurance budget, and the care targets are those who are cooperating with isolation and quarantine and have no fever, or any respiratory symptoms referred by the Health Bureau and those with urgent medical needs.

For the latter, it was jointly developed by the Centers for Disease Control and Prevention of the Ministry of Health and Welfare and the "Artificial Intelligence Laboratory". It allows

users in Chinese Taipei to receive COVID-19 exposure notifications and reminds users who receive exposure notifications to contact the local health bureau to reduce the risk of infection. The objectives are 1) Protect personal privacy: Social interactions are estimated using mobile phone Bluetooth, and data is stored anonymously on personal mobile devices to ensure personal privacy; 2) Reduce exposure risk by reducing the number of interactions: simulate the number of social interactions as a reference for people's decision-making on travel, commuting, and shopping; 3) Use on a voluntary basis: Apps can be installed or removed at will; 4) Reduce economic shocks: Not only do people reduce the number of interactions, but businesses also operate in a way that reduces social interaction, which can reduce the possibilities of the government issuing measures to force the suspension of economic activity; 5) Reduce the risk of contagion: People are encouraged to continue their daily lives and reduce unnecessary physical contact; 6) Save lives: A confirmed case can share contact information with those who have been in contact with him on the condition of anonymity. Save other lives with privacy in mind.

As for the digital COVID-19 certificate development, Chinese Taipei has issued the digital COVID-19 certificate referring to EU Digital COVID Certificate (DCC), WHO's Smart Vaccination Certificates (SVC), and the COVID-19 Vaccination Record Card of TCDC since December 28th, 2021.

Chinese Taipei adopted the JSON minimum dataset format and the internationally accepted Fast Healthcare Interoperability Resources (FHIR) format, allowing data to be transmitted and exchanged efficiently and globally. In addition, Chinese Taipei followed the General Data Protection Regulation (GDPR), which only collects and records the information required for the digital COVID-19 certificate to protect the personal information of individuals. Since December 22nd, 2021, EU has recognized the "Digital COVID-19 Certificate" as equivalent to EU Digital COVID Certificate. So far, 67 economies have joined the EU Digital COVID Certificate system, including 27 EU economies and 40 non-EU economies (and territories).[64] The command center pointed out that the data fields, digital signatures, anti-counterfeiting mechanisms, personal data protection, QR Code display and electronic verification of Chinese Taipei's "Digital Certification of Vaccination" or "Digital Certificate of Test Results" are all in accordance with EU standards, especially personal data. The protection of personal data is completely based on the principles of minimum use, self-portability, and forgetfulness of the EU General Data Protection

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[64] https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/eu-digital-covid-certificate_en

Regulations.

In July 2021, the Central Epidemic Command Center unveiled the online COVID-19 vaccination registration and reservation system and announced that a trial program was launched on three outlying islands yesterday morning. The system would be used for scheduling vaccinations for those aged under 65, so it would be launched when the ninth and 10th priority groups are eligible for vaccination.

The ninth priority group is people aged 18 to 64, who have a high-risk disease, a rare disease or catastrophic illness; while the 10th priority group is people aged 50 to 64.

The system requires four steps — "registration, receiving a text message informing a person to book an appointment, booking an appointment, and receiving a vaccine according to the scheduled appointment.[65]

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[65] https://www.taipeitimes.com/News/front/archives/2021/07/07/2003760419

Thailand

Categories of digital tools for COVID-19 prevention and control	Measures taken
• Information Enquiry Platform and Connection Point	• Thailand Department of Disease Control Covid-19 Interactive Dashboard
• Tracking (including import management and CBS)	• DDC-Care
• Quarantine Measure	• SydeKick
• Stockpile and allocation of essential medical resources	X
• Safety Net	• DDC Hotline #1422
• Diagnosis	X
• Telemedicine	• Spring Up
• Social distancing	X
• Cross border solution	X
• Vaccination	• MOPH Immunization Center • Moh Prompt Application
• Mental Health	• Mental Health Check-in • Telepsychiatry

COVID-19 dashboard of Thailand Department of Disease Control website provides the latest situation reports, including daily confirmed cases, daily death cases and vaccine doses administered.[66]

DDC-Care[67] has been developed under the collaboration among the National Electronics and Computer Technology Center (NECTEC), the National Science and Technology Development Agency (NSTDA), and Thailand's Department of Disease Control, Ministry of Public Health. The application is only for people who enter Thailand or currently stay in Thailand and are identified by health personnel that they have a high risk of getting COVID-19 and need to be under self-quarantine.

SydeKick is an app that enables the government to monitor the daily behavior of at-risk groups and assists in determining whether specific individuals are detaining themselves at home in accordance with the self-isolation period.

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[66] https://ddc.moph.go.th/covid19-dashboard/
[67] https://play.google.com/store/apps/details?id=th.or.nectec.ddc_care&hl=zh_TW&gl=US

The DDC hotline (1422) for COVID-19 is available in Thai, English, Khmer, Lao, and Burmese languages.

The telemedicine service via the Spring Up application will be piloted in Bangkok and its metropolitan area from 26th April 2022. However, only beneficiaries of the Universal Coverage Scheme, civil servants' and local administrative organizations' medical benefits can access the service. Members of the Social Security Scheme are not eligible for this service at the moment. Patients are required to register their name, mobile number, address, and symptoms and submit an image of a self-test kit that shows a positive result. The information will appear in the database system of Good Doctor Technology Thailand （GDTT）, then the company's staff will screen through the information and contact the patients for identity verification. They will then virtually meet doctors who will prescribe medicine. The prescriptions will be sent to a pharmacy partnered with the National Health Security Office. Over 400 pharmacies across Thailand have participated in this initiative. Grab's rider will deliver medicine to the patient's address. The doctor will monitor the patient's symptoms within 48 hours after the first consultation.[68]

MOPH Immunization Center is a central database for COVID-19 Vaccination that gathers vaccination records from all healthcare facilities, including public and private sectors, as well as mobile vaccination units. The individual vaccination history can be viewed via Mohpromt Application as a personal vaccination record. The application also provides vaccination certificate to proof for entering restricted area.

Mental health Check-in is an application that has the objective of encouraging people to get a screened for mental health problems and get some advice. It also provides a chance to individuals support, consultation, and treatment. Telepsychiatric is a digital system service system that focuses on mental health care for psychiatric patients to increase adherence to treatment and medication, even when they cannot go to a psychiatric hospital, especially during the pandemic.

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[68] https://eng.nhso.go.th/view/1/DescriptionNews/Telemedicine-service-provided-to-COVID-19-patients/437/EN-US

United States

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• CDC Cases, Data & Surveillance webpage
• **Tracking (including import management and CBS)**	• Statewide contact tracing apps e.g., COVIDWise in Virginia • COVID Data Tracker Weekly Review[69]
• **Quarantine Measure**	X
• **Stockpile and allocation of essential medical resources**	• COVID-19Surge
• **Safety Net**	• 1-800-CDC-INFO (1-800-232-4636)
• **Diagnosis**	X
• **Telemedicine**	• COVID-19 Telehealth Program
• **Social distancing**	X
• **Cross border solution**	• Automated Passport Control (APC)
• **Vaccination**	X

To effectively control the pandemic, the Centers for Disease Control and Prevention has taken the leading role in this battle. The government has created a specific region for COVID-19, providing information on the prevention, control, and its response to the pandemic. In addition, surveillance data as well as medical resources availability can also be accessed through the CDC Cases, Data & Surveillance webpage. This ensures that all people have a basic understanding of the pandemic. If there are still questions regarding COVID-19, people can always call CDC's hotline for consultation.

Though there is not a coordinated strategy for the tracking of COVID-19, public health authorities in a few states have developed their own contact tracing apps that send an alert notification when users are exposed to confirmed cases. For instance, the State of Utah and the State of Virginia have both launched apps using Bluetooth technology to detect exposure, namely UT Exposure Notifications and COVIDWise. COVID-19Surge is a spreadsheet-based tool that allows hospital administrators and public health specialists to estimate hospital resources and compare each hospital's capacity so that the staff can be aware of the impact of COVID-19 to better distribute their human resources and stockpile. Besides, CDC

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[69] https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html

offers a free email subscription service, which makes it easier for people to learn more about different topics including COVID-19, Flu, HIV, Zika and more. With an email subscription profile, people will receive updated information on items of interest to themselves.

Due to the pandemic, U.S. government also develops a need for telemedicine to keep necessary medical services running. The government has launched the COVID-19 Telehealth Program, providing healthcare providers with funds to help them deliver telehealth services.

Regarding cross border solution, Automated Passport Control (APC) has been launched by U.S. Customs and Border Protection (CBP) that streamlines the entry process for U.S. citizens, U.S. legal permanent residents, Canadian citizens, eligible Visa Waiver Program participants, and specific U.S. visa holder travelers, by providing an automated process through CBP's Primary Inspection area. Travelers use self-service kiosks to respond to CBP – inspection related questions and submit biographic information. APC is a free service which does not require pre-registration or membership and maintains the highest levels of protection when it comes to the handling of personal data or information. Travelers using APC experience shorter wait times, less congestion, and faster processing.

Viet Nam

Categories of digital tools for COVID-19 prevention and control	Measures taken
• **Information Enquiry Platform and Connection Point**	• Ministry of Health and Government Online Portal
• **Tracking (including import management and CBS)**[70]	• NCOVI • Bluezone • Hanoi SmartCity
• **Quarantine Measure**	• GPS Tracker bracelets
• **Stockpile and allocation of essential medical resources**	X
• **Safety Net**	X
• **Diagnosis**	X
• **Telemedicine**	• Viettel Telehealth
• **Social distancing**	X
• **Cross border solution**	X
• **Vaccination**	X

Ministry of Health and Government Online Portal[71] provides all the COVID-19 information and daily confirmed cases are presented as well.

NCOVI is a mobile app designed to encourage voluntary symptom logging, share health care providers' advice on whether to self-quarantine or go to the hospital, and help officials identify hotspots by reporting suspected infections in their communities. It also serves as the official channel for state agencies to distribute rapid updates and public health recommendations to everyone who uses it.

Bluezone leverages Bluetooth Low Energy to alert users if they were in close contact with someone who tested positive for COVID-19.

Hanoi SmartCity helps authorities track and monitor people who have been infected and quarantined, sending a notification to the heads of districts if the patient moves more than 98 feet (30 meters) from the designated quarantine area, and the Vietnam Health Declaration,

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[70] https://www.exemplars.health/emerging-topics/epidemic-preparedness-and-response/digital-health-tools/ncovi-and-bluezone-in-vietnam

[71] https://covid19.gov.vn/

a mandatory multilingual tracking and tracing app designed for domestic and international travelers entering Vietnam.

The Ministry of Information and Communications encourages health authorities to use GPS Tracker bracelets on those who are under quarantine. The bracelets will issue a warning when people isolated at home leave the house or remove the bracelets.

This device will not only be effective in managing quarantine cases but also protect the health authorities' staff from being infected since they won't need to visit the homes themselves. A transformation of medical services is needed especially during this desperate time, and thus Viettel Telehealth was released to provide patients with virtual care, ensuring they can still receive necessary treatments. Moreover, a platform called Viettel's Telehealth enables remote medical consultation, remote surgery consultation, remote training, and remote technology transfer, and it has been adopted by many hospitals in the economy.

The Findings

To sum up, this report compiles the status of the implementation among APEC economies regarding the digital health technologies in the prevention and control of the COVID-19 pandemic, resulting in the following major findings. Firstly, all economies have established information enquiry platforms and tracking measures so as to tackle and monitor the outbreak of COVID-19. Secondly, in all COVID-19 digital prevention mechanisms, stockpile and allocation of essential medical resources, diagnosis and social distancing are three of the most under-appreciated measures. Lastly and foremost, based on the statistics and qualitative data analysis of this research, digital preparedness is highly correlated with the level of economic development.

However, limitations do exist in this report. First, this report was constructed primarily through secondary data collection and therefore lacks immediacy in obtaining information on the progress of COVID-19 digital prevention in each economy. Additionally, the purpose of this report is to provide an overview of the APEC region's digital health initiatives or policies, and it is not intended to assess the effectiveness and impact of those measures. The findings should inspire further exploration in the field for more first-hand information that leads to in-depth understanding of what has been done in every economy, as well as the outcomes and impacts of them.