Digital health systems to support pandemic response in Pakistan

Mapping digital health tools and matching deployment opportunities in response to COVID-19

June 2021

Introduction

Pakistan's National Health Vision: 2016–2025 provides the country's vision statement: "to improve the life of all Pakistanis, particularly women and children, through universal access to affordable quality essential health services, delivered through a resilient and responsive health system, ready to attain the Sustainable Development Goals, and fulfill its other global health responsibilities." Pakistan named health information systems as one of the thematic pillars to achieve this vision whereby it seeks to incorporate innovative technologies to provide speedy and reliant information to support evidence-based decision-making, build coherence across digital systems, and develop a robust early warning system. The COVID-19 pandemic brought a new level of urgency to this vision. Leveraging digital health tools is a rapid, cost-effective strategy to accelerate Pakistan's COVID-19 response while at the same time reinforcing the health system at large.

Background

Digital Square conducted a landscape analysis of Pakistan's digital systems in the ten-year period from 2010–2020 with information validated by tool implementers and designers, digital health experts, and government stakeholders as part of the USAID-funded Map and Match project. The purpose was to identify the existing digital tools utilized in Pakistan, map the tools already deployed for COVID-19 response to relevant uses cases, and highlight opportunities where existing tools can quickly be adapted and deployed to support COVID-19 response.

39 digital tools identified

14 tools scaled nationally

24 tools deployed for COVID-19

9 tools potentially adapted for COVID-19

Analysis overview

Map and Match's analysis found that Pakistan's health system uses 39 digital health tools, with at least 24 already deployed for COVID-19 response. This brief identifies opportunities for existing digital tools to be adapted to pandemic use cases to respond to needs for the COVID-19 response and potential future epidemics. Mapping of the existing tools to the use cases revealed where there are strengths and opportunities in Pakistan's digital health systems' response to COVID-19. For example, the analysis identified only one tool that currently supports points of entry and routine surveillance, with additional tools ready for adaptation to further address these use cases. Strategic adaptation of existing digital health tools will accelerate the COVID-19 response, offering greater efficiency and more robust support to the government, health workers, clients, and other stakeholders.

Figure 1. Current number of digital health tool deployments mapped to pandemic use cases in Pakistan.
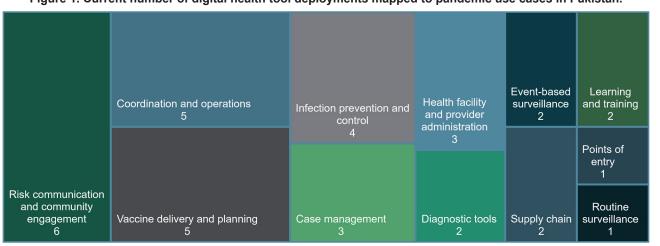

Figure 1 illustrates that many use cases are addressed using several tools in Pakistan's COVID-19 response while other use cases are filled by a sole tool.

Key definitions

Pandemic use case refers to the specific type of information collected, stored, tracked, analyzed, or visualized as it relates to the functional response to an epidemiological event, specifically COVID-19.

Digital health tool refers to a website, application, or other computer or mobile technology that supports data collection, storage, tracking, analysis, or visualization. The tool must have an electronic interface. One digital tool can address multiple use cases.

Application refers to components of digital tools that are primarily designed for use by clients of the health system or by health workers. Applications can be reused to address more than one use case, or applications can be uniquely used for only one use case.

Adaptation refers to making improvements to existing digital tools to improve their applicability and impact in the context of COVID-19.

Table 1. Mapping and matching digital health tools to strengthen Pakistan's COVID-19 response.
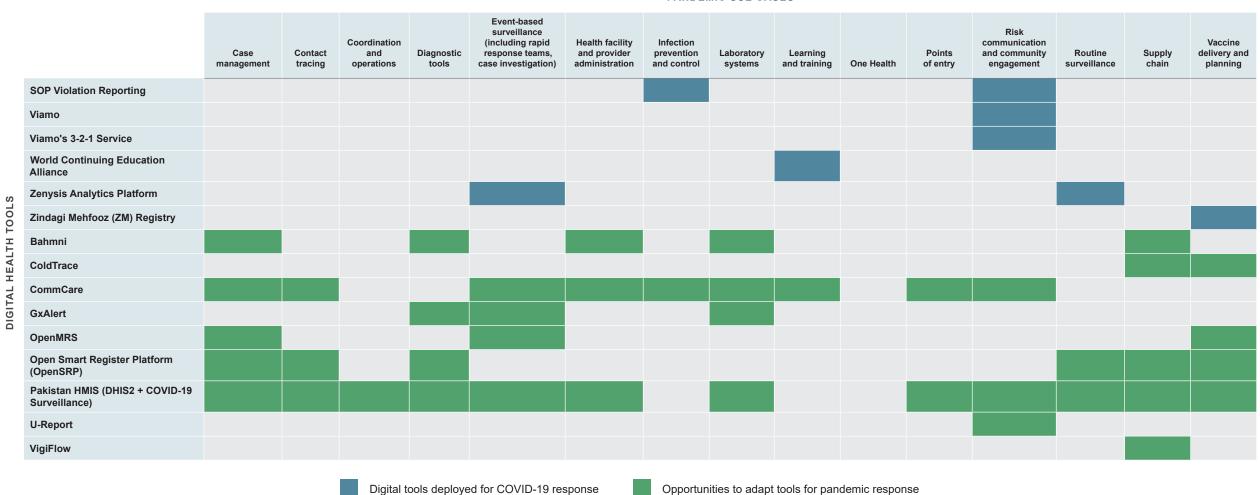
Digital Square mapped the current state of tools' functionality across the pandemic use cases in **blue** to illustrate how the digital health systems are supporting Pakistan's COVID-19 response. Digital Square matched opportunities for tool adaptation across the pandemic use cases in **green** to reveal places where Pakistan can reuse parts of its existing digital health systems to strengthen its COVID-19 response.

PANDEMIC USE CASES

DIGITAL HEALTH TOOLS	Case management	Contact tracing	Coordination and operations	Diagnostic tools	Event-based surveillance (including rapid response teams, case investigation)	Health facility and provider administration	Infection prevention and control	Laboratory systems	Learning and training	One Health	Points of entry	Risk communication and community engagement	Routine surveillance	Supply chain	Vaccine delivery and planning
CAD4COVID and CAD4TB	■			■											
CoronaCheck				■											
COVID-19 Gov App							■					■			
COVID-19 Vaccine Inventory Management System (COVIM)															■
doctHERs	■						■								
Emergency Response App												■			
Hayat															■
HealthAlert					■										
Integrated Disease Information Management System (IDIMS)			■												
National Emergency Operating Center (NEOC)			■												
Opensource Real-time Immunization System (ORTIS)						■								■	■
Pak Neghayban						■									
Pass Track					■ (green)						■				
Resource/Disaster Management System			■			■								■	■
Safe Delivery App									■						
Sehat Kahani	■														
Sindh Sehat Analytics Platform			■												
Smart Lockdown App			■				■								

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

Table 1. Mapping and matching digital health tools to strengthen Pakistan's COVID-19 response, continued.

PANDEMIC USE CASES

Legend: **D** = Digital tools deployed for COVID-19 response (blue); **O** = Opportunities to adapt tools for pandemic response (green)

DIGITAL HEALTH TOOLS	Case management	Contact tracing	Coordination and operations	Diagnostic tools	Event-based surveillance (including rapid response teams, case investigation)	Health facility and provider administration	Infection prevention and control	Laboratory systems	Learning and training	One Health	Points of entry	Risk communication and community engagement	Routine surveillance	Supply chain	Vaccine delivery and planning
SOP Violation Reporting							D					D			
Viamo												D			
Viamo's 3-2-1 Service												D			
World Continuing Education Alliance									D						
Zenysis Analytics Platform					D								D		
Zindagi Mehfooz (ZM) Registry															D
Bahmni	O			O		O		O						O	
ColdTrace														O	O
CommCare	O	O			O	O	O	O	O		O	O			
GxAlert				O	O			O							
OpenMRS	O				O										O
Open Smart Register Platform (OpenSRP)	O	O		O								O		O	O
Pakistan HMIS (DHIS2 + COVID-19 Surveillance)	O	O	O	O	O	O		O				O	O	O	O
U-Report												O			
VigiFlow														O	

The shift in data sharing across the country is very positive. The provinces previously thought there would be breaches for their citizens, but we've given them a view of the system that makes them very comfortable to provide their data and to expect a higher level of data in return so that the provinces can make decisions with a bigger picture lens. The provinces feel much more confident now.

—Shabahat Ali Shah, Pakistan's Ministry of National Health Services Regulation and Coordination

Matching digital health tools ready for adaptation to fill the pandemic use case gaps

Map and Match's analysis identified existing digital tools that can be adapted to support COVID-19 response for several use case gaps below. Use case gaps are defined as use cases that have fewer than two tools addressing them. The analysis found existing digital tools ready for adaptation to fulfill four use case gaps, namely contact tracing, laboratory systems, points of entry, and routine surveillance. However, it did not discover existing tools or adaptations to address the One Health use case.

To learn more about the tools in the matrix below, please see Table 2 for more details to facilitate adaptations. To find out more about all the Digital Square approved global goods mapped across these pandemic use cases, please see this Map and Match resource, which can provide decision-makers with targeted information to deploy and adapt global goods to fulfill gaps in the COVID-19 response.

Contact tracing

CommCare	OpenSRP
Pakistan HMIS (DHIS2 + COVID-19 Surveillance)	

Laboratory systems

Bahmni	CommCare
GxAlert	Pakistan HMIS (DHIS2 + COVID-19 Surveillance)

One Health

No tools or adaptations identified

Points of entry

Pass Track	CommCare
Pakistan HMIS (DHIS2 + COVID-19 Surveillance)	

Routine surveillance

Zenysis Analytics Platform	OpenSRP
Pakistan HMIS (DHIS2 + COVID-19 Surveillance)	

Examples of global goods ready for adaptation for COVID-19 response in Pakistan

OpenMRS

OpenMRS is a software platform and a reference application that enables design of a customized medical records system. OpenMRS has adapted its software to make it easier for 5,500 existing implementations to screen, test, and manage patients (diagnostic tools) and to report data out efficiently to District Health Information Software (DHIS2) for public health surveillance. While OpenMRS is not deployed for COVID-19 in Pakistan yet, OpenMRS has deployed an active COVID-19 Response Squad that is working to identify existing work within the OpenMRS community that can be rapidly adapted by implementers and packaged as a suite of COVID-19 public health response tools.
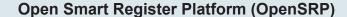
There are many other countries using OpenMRS as a tool in their pandemic response. For example, Kenya is using OpenMRS for patient care and reporting on COVID-19. Nepal is using OpenMRS to screen patients for COVID-19. OpenMRS is also adapted for COVID-19 response in Chile, Colombia, Guatemala, Haiti, Mexico, and Peru.

3 PANDEMIC USE CASES

0 USE CASES UTILIZED

3 ADAPTATION OPPORTUNITIES IDENTIFIED

- Case management
- Event-based surveillance
- Vaccine delivery and planning

Open Smart Register Platform (OpenSRP)

OpenSRP is an offline-capable open source mobile health platform built to enable data-driven decision-making at all levels of the health system. OpenSRP supports the health worker to prioritize point-of-care tasks, track service delivery, and simplify reporting. OpenSRP has been used to build localized applications for reproductive, maternal, newborn, child, and adolescent health; immunization; early childhood development; malaria rapid diagnosis and management; and tuberculosis treatment management.

OpenSRP is currently supporting COVID-19 response in other countries. For example, OpenSRP is working with the Indonesia and Malawi governments to support the COVID-19 response through the adaptation of the COVID Testing and Screening App. OpenSRP works with other digital tools like Reveal to facilitate contact tracing and with Akuko, a data storytelling platform, to provide a data visualization platform for information sharing.

6 PANDEMIC USE CASES

0 USE CASES UTILIZED

6 ADAPTATION OPPORTUNITIES IDENTIFIED

- Case management
- Contact tracing
- Diagnostic tools
- Routine surveillance
- Supply chain
- Vaccine delivery and planning

Table 2. An in-depth look at digital health tools to support the COVID-19 response.

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
CAD4COVID and CAD4TB	The CAD4TB software is designed to help non-experts detect and diagnose TB more accurately and cost-effectively by combining the speed and low costs of digital X-rays with machine learning and big data. Digital X-rays combined with machine learning and remote expertise make CAD4TB a valuable asset in the fight against TB. Delft's OneStopTB clinics reach remote, and frequently underserviced, areas with ease. Delft supplies two X-ray modalities for existing (mobile) clinics. CAD4COVID is a free solution that uses artificial intelligence on chest X-rays to triage COVID-19 suspects to support triaging in resource-constrained settings and high-prevalence areas.	**Case management, diagnostic tools**		Delft Imaging	Freemium	
CoronaCheck	This new mobile app enables Pakistanis to easily and safely evaluate symptoms with an in-home screening tool. The app uses an interactive chatbot, driven by AI, which allows users to understand their symptoms, recognize whether they may have contracted COVID-19, and seek help in a timely manner. It also aims to identify potential coronavirus carriers and limit their risk of transmission. Added features include access to WHO content and other videos in the Urdu language and a handy list of government and major hospital helplines.	**Diagnostic tools, risk communication and community engagement**	Aga Khan University	Aga Khan University		
COVID-19 Gov App	The COVID-19 Gov App is available for citizens to access chatbots, training manuals, tutorials, and videos about hygiene practices and to increase knowledge about the pandemic and ways to control the spread of COVID-19. The app provides citizens with information about the total number of affected persons by displaying dashboards for each province. Features include self-assessment, radius alert, and pop-up notifications of important personal hygiene reminders. This application also provides citizens with ChatBot and other awareness videos regarding the epidemic and ways to control spread. The Pak Neghayban feature is available in the COVID-Gov-Pk app, which is used in 1,100 hospitals across Pakistan to inform citizens of COVID-19 hospitals, ventilators, beds, and testing laboratories near them.	**Infection prevention and control, risk communication and community engagement**		Ministry of IT and Telecom, National Command and Operations Centre, National Information Technology Board		National
COVID-19 Vaccine Inventory Management System (COVIM)	COVIM is an adaptation of a proven off-the-shelf system that manages vaccine storage and distribution from the national to health facility levels.	**Vaccine delivery and planning**		Federal EPI, Pace Technologies, WHO		
doctHERs	doctHERs uses a digital platform to match the underutilized capacity of female health providers. doctHERs' unique business model provides access to affordable, quality health care in Pakistan to a subset of the "missing middle" population that includes women and children, which are not served by conventional health providers. Through its digital platform, patients get 24/7 access to leading specialists and consultants through a smartphone. Guddi Bajis ("Good Elder Sister" in Urdu/Punjabi) are last-mile retailers across 4,580 villages in Pakistan who own and operate rural village health wellness stores and are trained by doctHERs and equipped with tablets and 4G Wi-Fi connectivity. These retailers can connect village beneficiaries to 2,000+ licensed female health providers (e.g., doctors, therapists, pharmacists, dentists, and nutritionists).	**Case management, infection prevention and control**	FCDO, GCC, GSMA	doctHERs, FCDO, Unilever	Proprietary	National
Emergency Response App	The Emergency Response App guides people with severe COVID-19 symptoms to the nearest available hospital bed based on geographical location.	**Risk communication and community engagement**				
Hayat	Hayat is a mobile Android application and web portal used by health providers and administrators to track immunization and MNCH service delivery. Hayat is comprehensive, capturing data across all points of contact with the health system and can be accessed by different cadres of health workers. The platform is expanding its ability to track inventory. As COVID-19 vaccines and therapeutics are developed, established systems like Hayat will be crucial to monitor deployment and immunization at decentralized levels.	**Vaccine delivery and planning**	GCC	AKDN, MOH		Subnational

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

Table 2. An in-depth look at digital health tools to support the COVID-19 response, continued.

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
HealthAlert	HealthAlert is a smartphone application that provides a digital platform for disease surveillance and response. It is primarily designed for frontline health workers for generating alerts and relaying information on suspected patients and contacts to health authorities in real time. Community members can also register and use this app. During the COVID-19 emergency, Pakistan used the app in the government and the national and provincial levels to strengthen surveillance capacity. The app framework has the following three components: (1) the React component assists when a patient comes to a health facility by providing health workers with access to national guidelines on case definition and clinical management of priority notifiable diseases; (2) the Report component enables health workers to generate real-time alerts on priority notifiable diseases, including COVID-19, with essential patient information for health authorities; (3) the Respond component consolidates the information shared by health workers in a web-based dashboard for health authorities to make informed decisions and initiate appropriate responses.	**Event-based surveillance**	USAID	Contech International, JSI, IHS	Open source	National
Integrated Disease Information Management System (IDIMS)	IDIMS forms the national repository for all COVID-19-related data. IDIMS is integrated with all provincial systems for near real-time data exchange. IDIMS forms the basis for advanced data analytics for disease projections and identification of smart lockdowns. Pakistan began using IDIMS in 2015 to support its polio eradication program. The IDIMS database is used to store pre-, intra- and post-campaign data relating to multiple areas, including vaccination, disease surveillance, human resources planning, logistics planning, and mobile data collection. Data inputted into IDIMS is directly available for viewing and analysis at the provincial, national, and regional levels. It can be cross-referenced with other polio eradication databases.	**Coordination and operations**		NEOC		National
National Emergency Operations Centre (NEOC)	NEOC was built to track polio and later converted to an emergency operations center to track all tests all over Pakistan. There are 150,000 NEOC polio workers who were trained to bring potential COVID-19 patients to labs and hospitals to get tested. NEOC tracks the movement and traffic of all of these workers on a national dashboard (covid.gov.pk, made in .NET, SQL Server).	**Coordination and operations**				
Opensource Real-time Immunization System (ORTIS)	The ORTIS is an integrated product that can respond to all aspects of the Expanded Programme on Immunization. Its functionality includes inventory and warehouse management, order management, surveillance, supplementary immunization activities, human resource management, cold chain equipment, asset management, reaching every district/reaching every child microplanning, vaccine demand and forecasting, and EIR. The system is capable of responding to the needs of the immunization managers such as calculating coverage and identifying dropouts and fully immunized children. The ORTIS acts in real time to collect data from the lowest level of service delivery to the logistics data at all supply chain levels.	**Health facility and provider administration, supply chain, vaccine delivery and planning**	FCDO	Pace Technologies	Open source	Subnational
Pak Neghayban	Pak Neghayban is a government mobile application aiming to limit damage during emergency situations. It collects details about COVID-19 patients. Citizens can easily view the availability of hospital beds and ventilators in hospitals and laboratories with COVID-19 services all over Pakistan. Health inspectors can access the app and support COVID-19 patients.	**Health facility and provider administration**		NCOC, NITB		
Pass Track	Pass Track captures symptoms once a patient tests positive at all points of entry. This app is available on Android/iOS and is mandatory for patients/passengers to use when entering the country. The app has a portal where national data are posted for travelers coming in and out of Pakistan, communicating the number of COVID-19 positive and negative cases. Pass Track is currently not used in hospitals, but it could be adapted for hospital use, event-based surveillance, and aggregate data tracking.	**Event-based surveillance, points of entry**		Ministry of IT and Telecom, NITB		National
Resource/Disaster Management System	This national health resource mapping system rolled out in May 2020 and currently spans about 4,000 hospitals. The system tracks vaccine supply and distribution, as well as available hospitals and their bed numbers. It energizes the public utility app, Pak Negheban, which provides its users with location-based guidance to the nearest hospitals treating COVID-19. The system includes a dashboard for coordination of supplies.	**Coordination and operations, health facility and provider administration, supply chain, vaccine delivery and planning**		NCOC		National

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

Table 2. An in-depth look at digital health tools to support the COVID-19 response, continued.

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
Safe Delivery App	The Safe Delivery App supports skilled birth attendants to quickly diagnose issues in pregnancy and with newborns, offering step-by-step guidelines to perform a treatment. It is free to download and can be preinstalled so that providers can watch the animated instruction videos and read the action cards and drug lists whether or not they have Wi-Fi. The Safe Delivery App includes the adaptation of a COVID-19 content module that provides skilled birth attendants (e.g., midwives) with key information, animated video instructions, and checklists to support them to limit the spread of COVID-19 in the health facilities, including information on infection prevention, breastfeeding, and vertical transmission.	Learning and training	Gates Foundation, Maternity Foundation, Merck for Mothers, UNFPA	ICM, Laerdal Global Health, Maternity Foundation, Merck for Mothers, UNFPA, University of Copenhagen, University of Southern Denmark	Open source	
Sehat Kahani	Sehat Kahani is a 24/7 telemedicine application allowing health workers to evaluate, diagnose, and treat patients by connecting with patients via chat, audio, or video. It allows patients to create their personal eHealth record, comprising previous medical history, which is visible to the connecting doctors. Health workers are connected to a referral system if a suspected COVID-19 case turns up, which is then forwarded to the relevant authorities, tracking the number of COVID-19 patients in the country. To date, Sehat Kahani has more than 50,000 downloads and more than 18,000 consultations for general medical complaints and/or COVID-19 concerns.	Case management	FCDO, GSMA, USAID, World Bank	10 Pearls Pakistan, Adamjee Insurance, MOH, Sehat Kahani, Zetsol Technologies	Proprietary	National
Sindh Sehat Analytics Platform	Zenysis is working with a provincial government to establish a virtual control room and analytics platform for COVID-19 response. This platform integrates individual and aggregate COVID-19 case data, logistics data on testing kits and personal protective equipment, ventilator availability data, and lab data from more than 40 separate sources. These data are used to produce COVID-19 surveillance reports, inform decisions to impose micro-lockdowns in hotspots, make public announcements, and accelerate operational decision-making.	Coordination and operations		Zenysis	Proprietary	Subnational
Smart Lockdown App	The Smart Lockdown App accumulates real-time clusters of COVID-19 spread and enables the government to monitor containment activities. The app provides a real-time map to law enforcement and health workers to clamp down hotspot areas and shut down the streets.	Coordination and operations, infection prevention and control	SurveyAuto		Proprietary	
SOP Violation Reporting	Citizens use WhatsApp to take snapshots of incidences of COVID-19-related violations made by the public. Citizens upload those snapshots to the SOP Violation Reporting platform, which results in a warning or penalization to the place or people involved with the violation.	Infection prevention and control, risk communication and community engagement		NCOC		
Viamo	Viamo leverages existing mobile infrastructure and local partnerships to provide mobile solutions that can be scaled nationally within weeks to effectively respond to rapidly evolving health emergencies such as COVID-19. Viamo exists to share critical information on prevention and treatment, curb panic, and correct rapidly spreading misinformation regarding the outbreak. Existing technology integrations in-country can be used to reach any mobile subscriber on any network to disseminate crucial information in targeted regions and to vulnerable populations. Viamo includes many COVID-19 services, including national and regional awareness campaigns, mobile surveys, social media chatbots, a COVID-19 case reporting hotline, a COVID-19 support call center, outbreak mapping and data visualizations, and remote training for health workers. Viamo partnered with several organizations to run three different targeted mass messaging campaigns in Pakistan with the goal of reaching specific populations with COVID-19 awareness outreach.	Risk communication and community engagement	IRC, Mercy Corps, UNDP, UNICEF, UN Women, Viamo	IRC, Mercy Corps, UN Women, UNDP, UNICEF, Verso Consulting, Viamo	Proprietary	National

🟦 Digital tools deployed for COVID-19 response   🟩 Opportunities to adapt tools for pandemic response

Table 2. An in-depth look at digital health tools to support the COVID-19 response, continued.

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
Viamo's 3-2-1 Service	Viamo's flagship product, the 3-2-1 Service, is a free information service available in 18 countries globally. Users can access prerecorded audio messages in local languages for free. Users can also play interactive audio games, which are engaging, pathway-based games that allow people to think through decisions on relevant topics. Existing technology integrations in-country can be used to reach any mobile subscriber on any network to disseminate crucial information throughout the targeted regions and to vulnerable populations. COVID-19 services/solutions via Viamo include national and regional awareness campaigns, mobile surveys, social media chatbots, COVID-19 case reporting hotline, COVID-19 support call center, outbreak mapping and data visualizations, and remote training for health workers. Viamo has reached more than 10 million users through targeted calls and SMS messages related to COVID-19, with considerable targeted mass messaging impact in Pakistan.	**Risk communication and community engagement**		Viamo	Proprietary	National
World Continuing Education Alliance	This learning management system is a multifield eLearning and mHealth system that supports virtual and blended learning linked to certifications for professional development and lifelong learning. Examples of content includes modules about nursing and midwifery and COVID-19 (both clinical and nonclinical). The platform generates reports on study habits and data of users (i.e., age, gender, location, qualification, role, employment status).	**Learning and training**		Midwifery Association, WCEA	Proprietary	National
Zenysis Analytics Platform	The Zenysis Analytics Platform is a commercial off-the-shelf data integration and advanced analytics platform used by national and state public health entities in ten countries to enable data-driven emergency response activities, as well as routine program and resource management. Zenysis is working with a provincial government to establish a Virtual Control Room and analytics platform for COVID-19 response. This platform integrates individual and aggregate COVID-19 case data, logistics data on testing kits and personal protective equipment, and ventilator availability data and lab data from more than 40 separate sources and is used to produce COVID-19 surveillance reports, decisions to impose micro-lockdowns in hotspots, public announcements, and to accelerate operational decision-making.	**Event-based surveillance, routine surveillance**	Gavi	Zenysis	Proprietary	National
Zindagi Mehfooz (ZM) Registry	ZM (Safe Life) is a program that operates an Android phone-based online immunization registry in Karachi, Pakistan. Leveraging cutting-edge mHealth technology, ZM includes features such as identification through quick response barcodes, interactive SMS reminders, decision support systems for routine/catch-up immunizations, real-time workforce tracking, predictive analytics for identifying high-risk children, and customized report generation for monitoring. ZM uses radio frequency identification tags placed on EPI (immunization) cards linked to a lottery prize for parents to bring young children in for timely and complete vaccinations. The platform enables vaccinators to digitally enroll and track the immunization status of people in their catchment area. The vaccinators record vaccinations using the phone interface.	**Vaccine delivery and planning**		Interactive Research and Development		
Bahmni	Bahmni is an open source EMR and hospital information system that is currently deployed in more than 50 countries. Bahmni is a distribution of the OpenMRS medical record platform that is designed to help health workers improve the efficiency and quality of patient care, reduce the margin of error in clinical diagnosis, and advocate for policies related to public health in rural areas. It manages patient information in a flexible fashion throughout the care cycle, including registration, various points of care, investigations, laboratory orders and results management, picture archiving and communication systems, and billing. Bahmni released a COVID-19 kit that uses an OpenMRS module initializer to install forms that capture travel history and contract tracing, enable patient screening, and track information on home quarantining.	**Case management, diagnostic tools, health facility and provider administration, laboratory systems, supply chain**		endTB consortium (IHS, MSF, PIH)	Open source	

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
ColdTrace	ColdTrace is a wireless remote temperature monitoring solution designed for vaccine refrigerators in rural clinics and health facilities. The impact of COVID-19 on lifesaving immunization services has highlighted the need for a resilient cold chain system that can serve both routine and emergency vaccination going forward. This is possible by having end-to-end visibility into the country's vaccine cold chain network and ensuring data on fridge performance, power, and connectivity are available to the MOH in real time through ColdTrace. ColdTrace has partnerships with seven national governments and is active in 17 countries. NexLeaf Analytics has connected cold chain equipment from more than 16,822 health facilities and trained more than 1,400 health workers to respond to cold chain failures.	Supply chain, vaccine delivery and planning	GCC	Nexlead Analytics	Proprietary	
CommCare	CommCare is an offline-capable mobile data collection and service delivery platform used in more than 80 countries. CommCare is popular for its offline case management capabilities proven to be effective at scale. It is designed for everything from simple surveys to comprehensive longitudinal data tracking. It allows for easy digitization of surveys, has forms that are intuitive for end users, utilizes simple device deployment, and includes translation features. While not deployed for COVID in Pakistan yet, in other countries, CommCare is utilized across many use cases for COVID-19 response. CommCare can quickly identify people infected by COVID-19 with customized screening and triage protocols on its mobile app. CommCare can track COVID-19 patients via robust mobile case management features contract tracing. CommCare can equip health workers with decision support and job aid tools. CommCare can track the status of COVID-19 tests and enables field-based responders to manage logistics for critical medical supplies on their mobile phone.	Case management, contact tracing, event-based surveillance, health facility and provider administration, infection prevention and control, laboratory systems, learning and training, points of entry, risk communication and community engagement			Open source	
GxAlert	GxAlert is a digital platform that facilitates country-level surveillance of viral load laboratory tests by allowing data to flow across the health system. GxAlert can connect to other electronic tuberculosis (eTB) managers or M&E systems. GxAlert can also send targeted SMS alerts to facility managers, health officers, and suppliers. GxAlert enabled a solution to address the following gaps: (1) device management, monitoring, and reporting; (2) calibration, maintenance, and procurement planning; (3) lab technologists' capacity, availability, and training; (4) real-time results notifications to respective stakeholders including rapid case notifications for all positive results to all relevant health care officers; and 5) inventory management and notifications to reduce stockouts and expires.	Diagnostic tools, event-based surveillance, laboratory systems	ChallengeTB	SystemOne	Proprietary	National
OpenMRS	OpenMRS is a software platform and a reference application that enables design of a customized medical records system. OpenMRS has adapted its software to make it easier for 5,500 existing implementations to screen, test, and manage patients (diagnostic tools) and to report data out efficiently to DHIS2 for public health surveillance. While OpenMRS is not deployed for COVID-19 in Pakistan yet, OpenMRS has deployed an active COVID-19 Response Squad that is working to identify existing work within the OpenMRS community that can be rapidly adapted by implementers and packaged as a suite of COVID-19 public health response tools.	Case management, event-based surveillance, vaccine delivery and planning		IHS Informatics	Open source	
Open Smart Register Platform (OpenSRP)	OpenSRP is an offline-capable open source mobile health platform built to enable data-driven decision-making at all levels of the health system. OpenSRP supports the health worker to prioritize point-of-care tasks, track service delivery, and simplify reporting. OpenSRP has been used to build localized applications for reproductive, maternal, newborn, child, and adolescent health; immunization; early childhood development; malaria rapid diagnosis and management; and tuberculosis treatment management.	Case management, contact tracing, diagnostic tools, routine surveillance, supply chain, vaccine delivery and planning		Ona	Open source	

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

"Fifteen to 20 percent of hospitals across Pakistan have some kind of patient management system, but 80 percent perform this process manually in a physical book. There's a lot of work that needs to be done here."

—Shabahat Ali Shah, Pakistan's Ministry of National Health Services Regulation and Coordination

Digital health tool	Purpose	Use case(s)	Funder(s)	Implementer(s)	Licensing	Scale
Pakistan HMIS (DHIS2 + COVID-19 Surveillance)	District Health Information Software 2 (DHIS2) is an open source, web-based platform, typically used in national health information systems for data management and analysis purposes, for health program monitoring and evaluation, as facility registries and service availability mapping, for logistics management, and for mobile tracking of pregnant mothers in rural communities. DHIS2 supports the collection, analysis, visualization, and sharing of both aggregate and individual-level data, including mobile and offline data collection using the DHIS2 Android app. DHIS2 has developed toolkits to support COVID-19 surveillance and national vaccine delivery plans. Installable metadata packages facilitate uptake of global data standards and best design practices in national health management information systems (HMIS), while enabling flexibility for localization and customization for country workflows. Accompanying technical guidance, implementation guides, demo databases, and training materials provide all the resources a country needs to hit the ground running and implement fit-for-purpose solutions to curb the pandemic. The DHIS2 digital data package for COVID-19 is designed to accelerate case detection, situation reporting, active surveillance, and response in countries. The COVID-19 digital data package includes standard metadata aligned with the WHO's technical guidance on COVID-19 surveillance and has been adapted to local country context and language in this implementation. While DHIS2 is not yet deployed for COVID-19 response in Pakistan, this adaptation is in progress.	Case management, contact tracing, coordination and operations, diagnostic tools, event-based surveillance, health facility and provider administration, laboratory systems, points of entry, risk communication and community engagement, routine surveillance, supply chain, vaccine delivery and planning	Gavi, The Global Fund, Norad	DHIS2, MOH	Open source	National
U-Report	U-Report is a messaging tool that empowers young people around the world to engage with and speak out on issues that matter to them. It works by gathering opinions and information from young people on topics they care about, ranging from employment to discrimination and child marriage. U-Reporters respond to polls, report issues, and support child rights. The data and insights are shared back with communities and connected to policymakers who make decisions that affect young people. While not used in Pakistan for COVID-19 yet, U-Report can be used to survey the youth about their willingness to volunteer during the COVID-19 pandemic.	Risk communication and community engagement	UNICEF	UNICEF	Open source	National
VigiFlow	VigiFlow is a management system for recording, processing, and sharing reports of adverse effects for medical products. VigiFlow enables maximum local control and provides an effective means for management review and analysis of national data.	Supply chain	WHO	UMC	Open source	Subnational

■ Digital tools deployed for COVID-19 response   ■ Opportunities to adapt tools for pandemic response

"We have developed a considerable budget to create a central center for disease control. Now that the provinces are looking up to the federal government, we feel compelled to create a center for disease control, not only to address a pandemic like this, but for all diseases, like dengue and other diseases we've seen in the past, starting with infectious disease but with others to be incorporated later."

—Shabahat Ali Shah, Pakistan's Ministry of National Health Services Regulation and Coordination

At a glance

Figures 2 shows that Pakistan's digital health tools rely on different software licensing types for sustainability, with open source being the most common. Figure 3 demonstrates that Pakistan has 14 digital health tools deployed on a national scale while 9 operate on a subnational scale. A limitation of the Map and Match analysis was the inability to find complete information about licensing type and scale of these tools in Pakistan. These figures are not specific to COVID-19 response, but they provide an overall picture of Pakistan's digital health infrastructure.

Figure 2. Software licensing types of Pakistan's digital health tools.

Figure 3. Number of digital tools deployed at scale in Pakistan.

Conclusion

Digital Square mapped 39 existing, adaptable digital health tools in Pakistan and matched them to help target investments to accelerate the country's COVID-19 response and simultaneously strengthen its health system. This brief underpins how critical it is to align funding to Pakistan's existing digital health infrastructure to bolster its capacity to mitigate the effects of the current pandemic and prepare the country to respond to future outbreaks.

Take action

☑ **Coordinate with all digital systems stakeholders** to create a unified, robust digital health system that can strategically and rapidly be part of the ongoing COVID-19 response. It is paramount to support the government's lead and support its national digital health strategies and the tools it approves. Visit the Digital Health Atlas to see a complete, regularly updated snapshot of Pakistan's digital health system. If you know of a digital system that is not identified in this brief, please add it to the Digital Health Atlas.

☑ **Reuse existing tools when possible.** Do not invest in new systems if there are existing systems the government endorses that can effectively approach each of the pandemic use cases.

☑ **Learn more about Pakistan's digital health systems** and their role in the COVID-19 response by reviewing Pakistan's full Map and Match dataset.

☑ **Apply GIZ's Assessment Tool for Digital Pandemic Preparedness** to better understand the strengths and gaps in the country's COVID-19 response and to be well prepared for future disease outbreaks.

☑ **Connect with additional relevant resources, including:**

Digital Square continues to update its wiki with adaptations of Digital Square Global Goods and has a COVID-19 resource page that features hosted webinars that provide demos of tool adaptations.

The recently released Global Goods Guidebook (version 2.0) includes additional information about global goods deployment for COVID-19.

Map and Match's project landing page has many resources, including the Digital Applications and Tools Across an Epidemiological Curve, Global Goods Adaptations Across Use Cases, and other country briefs.

Digital Solutions for COVID-19 Response, published by Johns Hopkins University, features digital platforms that have been adapted for COVID-19 case management and contact tracing needs. The assessment includes a review of nine tools that were selected based on their existing deployment, flexibility, and adaptability for COVID-19 use cases; their ability to support multiple languages; and stakeholder interest in how these applications can be leveraged in response to COVID-19.

Annex 1. Abbreviations

Acronym	Definition
AI	artificial intelligence
AKDN	Aga Khan Development Network
DHIS2	District Health Information Software 2
EIR	electronic immunization registry
EMR	electronic medical records
EPI	Expanded Programme on Immunization
FCDO	UK Foreign, Commonwealth & Development Office
Gavi	Gavi, the Vaccine Alliance
GCC	Grand Challenges Canada
GSMA	Global System for Mobile Communications Association
HMIS	health management information system
ICM	International Confederation of Midwives
IHS	Integrated Health Services
IRC	International Rescue Committee
IT	information technology
JSI	John Snow, Inc.
M&E	monitoring and evaluation
MNCH	maternal, newborn and child health
MOH	Ministry of Health
MSF	Médecins Sans Frontières
NCOC	National Command and Operation Centre
NEOC	National Emergency Operations Centre
NITB	National Information Technology Board
Norad	Norwegian Agency for Development Cooperation
OpenSRP	Open Smart Register Platform
PIH	Partners in Health
RAAB	rapid assessment of avoidable blindness

Acronym	Definition
SMS	short message service
TB	tuberculosis
UC	union councils
UMC	Uppsala Monitoring Centre
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WCEA	World Continuing Education Alliance
WHO	World Health Organization

Annex 2. Use case definitions

Category	Objective	Functional description
Case management	Systematic processing of suspected infected persons	Systems for documenting patient details and clinical interactions
Contact tracing	Reduction of epidemic reproduction rate	Identification and follow-up with people who have had high-risk interactions with infected persons
Coordination and operations (including emergency operations centers)	Preparedness and response plans, support for multisectoral responses	Systems to support cross-coordination for multisectoral response, emergency operations centers, and executing response plans
Data analytics, visualizations, and use	Efficient and effective response to validated outbreaks	Systems for enabling data-driven decision-making and communications to field teams
Diagnostic tools	Improve efficiency in clinical diagnosis and collection of data from diagnostic tools	Diagnostic tools with digital connectivity to support monitoring, documentation, and reporting of diagnoses
Event-based surveillance (including rapid response teams, case investigations)	Early detection of outbreaks and epidemics, case detection and investigation, national and subnational emergency operations to ensure rapid management of infectious disease	Systems with functionality or ability to monitor patterns indicative of infectious disease epidemic outbreak; systems to detect and document cases of emerging disease threats, investigate those threats, identify cases, and manage the response
Health facility and provider administration	Robust organizational underpinning for response	Systems for managing facility accounting and HR
Infection prevention and control	Prevent infection among patients and health workers	Systems that support triage, isolation, WASH, waste management to prevent transmission to staff, other patients, and the community
Interoperability	Improve effectiveness of tools	Provision of standardized interfaces to other software modules
Laboratory systems	Validation of infectious disease incidence	Systems with functionality to order lab tests, follow progress of patient sample, receive test results (confirm suspected case)
Learning and training	Support health worker readiness, including improve patient data collection and sample testing	Localized E-learning solutions for health workers and others
One Health	Prevent zoonotic disease outbreaks	Monitoring of potential vectors to humans by tracking infectious diseases in local wildlife and livestock
Points of entry	Detect and manage international spread of disease by identifying suspected infected persons at border entry points	Systems to strengthen border health security, screen, and follow-up with suspected infected persons at ports of entry and other border entry points
Risk communication and community engagement	Improved public awareness of facts and best practices for disease prevention	Systems for channeling messaging and communication to public to promote public awareness, counter misinformation, encourage treatment seeking behaviors, and encourage citizens to take appropriate actions to promote health
Routine surveillance	Routine health data monitoring to identify trends	Systems to manage health data and track trends on an ongoing basis, regardless of whether there is an outbreak or epidemic; systems usually include aggregate data
Supply chain	Support allocation of resources to aid in response	Systems for monitoring facility readiness and stock levels
Vaccine delivery and planning	Systematic monitoring of vaccinations in the population	Systems for documenting vaccinations for patients

Annex 3. Digital tools supporting vaccine deployment

Digital technologies can act as accelerators for the introduction, deployment, and scale-up of vaccines in countries to assist health workers, communities, and other stakeholders. The use of digital tools and the data they enable facilitate rapid, iterative, and scalable approaches to ensure vaccines are safely delivered to health facilities, that health workers are equipped to administer them, and that communities are informed and confident in their efficacy.

Through the Map and Match project, Digital Square mapped the existing functionality of approved global goods to COVID-19 use cases, including those supporting planning, delivery, administration, and monitoring of COVID-19 vaccines. These adaptations and supporting resources are listed on Digital Square's wiki.

Table 3 illustrates how digital tools can support activities aligned to five use cases focused on vaccines. Digital Square has information about its approved global goods and how they align to these use cases currently as well as potential adaptations on its website. This list does not include all digital public goods in the digital health ecosystem. Other tools like RapidPro and WelTel, which are not supported through Digital Square, can be included in these use cases.

Table 3. Global goods tools to support vaccine deployment use cases.

Description of vaccine deployment use cases	Digital Square approved global goods use cases
Plan for vaccine introduction in country Digital tools can be used for planning and "microplanning" to inform how many vaccines are needed, where vaccines can be stored and monitored, who the most vulnerable populations are and where they are located, and other information essential to planning. Assessing the tools and data available throughout the health system, including patient data and health worker data, will inform this planning. As part of a vaccine introduction, governments need to build awareness of the vaccine and its benefits, and combat misinformation. Digital tools can be used for planning purposes to send messages to both health workers and communities about the vaccine. Training health workers is essential before introducing a new vaccine. Governments need to provide information to health workers on vaccine administration, possible side effects, and how to treat patients showing adverse reactions. Digital tools can be leveraged to rapidly share this information and offer virtual training.	Messaging Microplanning Training
Support vaccine introduction Digital tools can enhance the launching of a vaccination campaign. Communication tools like SMS and social media can support rapid information sharing with communities as the vaccine is made available. Pharmacies, hospitals, clinics, and other facilities use robust digital systems to ensure vaccines are stocked at facilities by tracking inventory and shelf life and ordering additional supplies when needed. Digital tools can manage the transactional movements of vaccines within multilevel supply chains. Supply chain systems can also ensure that syringes, diluents, and other materials needed for vaccine delivery are stocked. Digital tools can support temperature monitoring during transport and where vaccines are stored. Remote temperature monitoring can improve cold chain performance, giving health workers assurance that vaccines are safe and effective. Digital tools can track when clients receive vaccines as well as other data fields (e.g., vaccine type, immediate negative reactions, and longer-term potential adverse events). Countries can adapt existing electronic immunization registries (EIRs) for vaccine monitoring and follow-up.	Patient monitoring Supply chain Vaccine management

Digital Square approved global goods use cases

Electronic immunization registries
DHIS2 Tracker, OpenSRP, OpenMRS, Tamanu

Messaging
CommCare, Community Health Toolkit, mHero, OpenSRP

Microplanning
Healthsites, OpenSRP, Reveal

Patient monitoring
CommCare, DHIS2 Tracker, OpenSRP, SORMAS

Supply chain
DHIS2, OpenLMIS, Logistimo, OpenBoxes, Product Catalogue Management Tool

Training
CommCare, Community Health Toolkit, mHero, OpenSRP, SORMAS

Vaccine management
CommCare, Community Health Toolkit, DHIS2, DHIS2 Tracker, Logistimo, OpenBoxes, OpenLMIS, OpenSRP, Tamanu

Table 3. Global goods tools to support vaccine deployment use cases, continued.

Description of vaccine deployment use cases	Digital Square approved global goods use cases
Enhance roll-out of vaccine, support ongoing vaccine monitoring In this phase, scaling to vaccinate large portions of the population is a priority. Vaccine roll-outs can be enhanced by adapting digital tools to add workflows and functionality as vaccine coverage expands. Governments need to consider additional information communications technology (ICT) needs like larger cloud-hosting services and use of tools that are operational offline for areas that have limited mobile network coverage. Supply chain is critical as vaccines are transported to more sites across the country. Digital supply chain tools, especially when paired with vaccine delivery data (e.g., from electronic medical records/EIRs), can help forecast supply needs and include decision support to prompt vaccine orders when supply falls below a defined threshold. EIRs and other tools can help prevent overcrowding in clinics by scheduling specific clinic times for vaccines. This ensures more equitable distribution of health services.	**EIRs** **Supply chain** **Patient monitoring** **Vaccine management**
Enhance communication to sustain vaccine demand Many COVID-19 vaccines are multi-dose shots. To ensure clients receive boosters, now and in the future, enhancing communication to sustain demand for the vaccine is important. Digital tools can be used to send messages to both health workers and communities about the vaccine. Communication tools can be linked with patient monitoring tools to automatically trigger direct communication to clients. Digital tools can continue to be used to increase vaccine demand and address misinformation, dispelling rumors and misinformation that cause vaccine hesitancy. Many EIRs include contact information and messaging features for patients' caregivers, allowing for direct communication to caregivers. These messaging features have historically been used to notify caregivers about upcoming immunization sessions or overdue vaccines. As the global community develops a greater understanding of COVID-19—including its transmission patterns, full range of symptoms, and treatment options—health workers also have the ability to share health promotion messages with patients.	**EIRs** **Messaging** **Patient monitoring**
Use data to inform vaccine-related decisions Patient monitoring and tracking tools as well as EIRs can help generate meaningful insights for future vaccination efforts and encourage data-driven decisions when countries are able to plan for catch-up campaigns. For example, some EIRs can quantify the number of missed vaccines and determine which areas have been under-vaccinated. This individual-level data will enable decision-makers to target immunization services and allocate funding to those areas most in need. For more information, this publication explains how Gavi and UNICEF are working to scale up use of digital tools for vaccination campaign performance monitoring. Interoperability is critical. As governments review the portfolio of tools and systems that are in place to support vaccine management, it is crucial that there is strong consideration given to the movement of data between systems to ensure a harmonized set of records for the population. This ensures that no individual is missed or counted twice.	**EIRs** **Patient monitoring** **Supply chain** **Vaccine management**

Digital Health Center of Excellence (DICE) to support the COVID-19 pandemic response

As countries operationalize their COVID-19 vaccine rollout plans, there is an opportunity to identify areas where digital health interventions can amplify these efforts, while improving service delivery and strengthening health systems more broadly.

The success of digital health solutions often correlates with the strength of the enabling environment for these technologies, such as ICT infrastructure readiness, workforce capacity, data standards, interoperability, and the policy and regulatory environment. Poorly designed or inappropriate digital interventions, as well as vertical approaches geared only toward COVID-19, risk undermining and ultimately weakening national systems.

To more effectively organize support to countries for COVID-19 response, a multiagency COVID-19 DICE, with a UNICEF-WHO cohosted secretariat, will launch in April 2021. The DICE will provide coordinated technical assistance to low- and middle-income countries to support sustainable and scalable deployment of carefully chosen digital health solutions that support COVID-19 pandemic response plans.

Areas the COVID-19 DICE covers include:

- Support countries to conduct a structural readiness assessment of their enabling environment, define business requirements, conduct platform analysis, and map partnerships, existing tools, and gaps. Along with support to countries, this will require standardizing approaches and tools across development partners.
- Coordinate surge support to countries to assist in their development of a rapid strategic approach to meet the imminent needs of the vaccine delivery and transition to a sustainable strengthened and digitally enabled health system.
- Foster capacity and partnership with regional and national digital health experts toward the development of capacity that can provide long-term technical support to the region.
- Strategically support developers and product owners to modify and optimize software products relevant for pandemic response and vaccine delivery toward interoperability, standardization, and vaccine-specific functionalities.
- Complement and operationalize WHO and UNICEF guidelines developed in the context of the Access to COVID-19 Tools Accelerator (ACT-A) to further clarify and identify mature options open to countries building health infrastructure.
- Support the transition, alignment, and integration of COVID-19-related digital health investments through a systems strengthening lens.
- Pilot and assess transformative approaches to digital health deployments, monitor global developments and opportunities for standardized approaches, increase south-south knowledge transfer, and compile lessons learned.