Digital health systems to support pandemic response in **Kenya**

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

April 2021

Introduction

Kenya's Ministry of Health (MOH) published the Kenya National eHealth Policy: 2016–2030 outlining its vision "to create an enabling environment for the sustainable adoption, implementation and efficient use of eHealth products and services at all levels of healthcare delivery in Kenya." 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 Kenya's COVID-19 response while at the same time contributing to the MOH's longer-term vision for eHealth.

Background

Digital Square conducted a landscape analysis of Kenya's digital systems in the ten-year period from 2010–2020 with information validated by tool implementers and designers, digital health experts, and MOH stakeholders as part of the USAID-funded Map and Match project. The purpose was to identify the existing digital tools utilized in Kenya, 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.

154 digital tools identified

51 tools scaled nationally

63 tools deployed for COVID-19

26 tools potentially adapted for COVID-19

Analysis overview

Digital Square's analysis found that Kenya's health system uses 154 digital health tools, with at least 63 already deployed for COVID-19 response. This brief identifies opportunities for existing digital tools to be adapted to pandemic use case needs for the COVID-19 response and potential future epidemics. Mapping tools to the use cases revealed where there are strengths and opportunities in Kenya's digital health systems' response to COVID-19. For example, the analysis identified only two tools that currently support laboratory systems, with additional tools ready for adaptation to fulfill this use case.

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 Kenya.

Risk communication and community engagement **27**
Case management **21**
Learning and training **14**
Event-based surveillance **9**
Routine surveillance **7**
Contact tracing **6**
Coordination and operations **6**
Health facility and provider administration **6**
Vaccine delivery and planning **6**
Infection prevention and control
Points of entry **4**
Supply chain **4**
Diagnostic tools **3**
Lab systems **2**

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

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 Kenya'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 system is supporting Kenya's COVID-19 response. Digital Square matched opportunities for tool adaptation across the pandemic use cases in **green** to reveal places where Kenya 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
Ada Health App				green								blue			
AfyaRekod	blue											blue			
askNivi					blue							blue			
Bahmni	blue			green	blue	green		green			blue				green
Basic Internet / The Non-discriminating access for Digital Inclusion (DigI) project / Yeboo.com									blue			blue			
Basic Laboratory Information System (BLIS 3.0)								blue							
Cadasta platform			blue												
Cash Advance						blue									
ColdTrace														blue	blue
Collegium Telemedicus	blue											blue			
CommCare	blue	blue				blue			blue		blue				
Community Health Toolkit	blue	blue			blue						green	blue	blue		blue
COVID-19 Blog									blue						blue
COVID-19 Point of Contact Rapid Test Kits				blue											
COVID-19 Response WhatsApp Remote Learning for Health Providers									blue						
COVID-19 Service Delivery Tracker / Nurse Mentorship platform	blue														

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

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

PANDEMIC USE CASES

	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
COVID-19 SMS Data Collaboration Initiative					■							■			
COVID-19 Triage Tool	■			■											
CovidConnect	■				■										
COVID-Dx Dashboard								■						■	
DELTA									■						
Digital Community Scorecard App												■			■
e-Campus/Jibu app									■						
Emergency Alert and Response System (EARS)			■		■								■		
END CORONAVIRUS Kenya												■			
Fionet	■		■												
iCow												■			
iHRIS						■			▣			■			▣
Innovative Community-Led Caregiver Reward System															■
Jitenge	■				■							■			
Keheala												■			
KenyaEMR	■												■		
Kenya's HMIS	■	▣			▣								▣		
KoviTrace		■													
KUTRRH HMIS	■					■									
Leap									■						
LearnON									■						

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

PANDEMIC USE CASES

DIGITAL HEALTH TOOLS

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
Longitudinal surveys conducted via Interactive Voice Response (IVR) for resilience impact assessment												●			
Love Matters Africa												●			
Lwala Community Alliance Health Information System	●														
Malaria Commodities Dashboard (DHIS2)			●											●	
Mapbox					●								●		
mDakari	●														
Medixus									●						
mHero			●			●	●		●			●			
MomCare												●			
Msafari		●													
M-TIBA	●														
NCD Navigator Tool			●										●		
OpenMRS	●														
OpenSRP	●			●									●		
Pigia Penda	●											●			
PROMPTS												●			
RapidPro												●			
Safaricom									●			●			
Safe Delivery App									●						
Safe Water and AIDS Project (SWAP)							●								

DIGITAL HEALTH TOOLS

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
SafeCare / SafeCare4Covid						■	■							■	
Safiri Smart							■					■			
Simprints	■	■													
SORMAS					■								■		
U Afya												■			
U-Report												■			
Ushahidi												■			
Viamo									■			■			
WelTel	■	■										■			
World Continuing Education Alliance									■						
Afya Moja	●		●	●	●				●	●	●	●			●
AfyaEHMS	●					●									
Amplio Talking Book												●			
Baby Monitor				●								●			
CAD4TB				●											
CHAIN														●	
Chanjo														●	
cStock														●	
GxAlert				●	●			●							
Hoji Mobile Data Collection and Analysis Platform													●		
Journey Solution															●

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
Kasha														■	
Magpi (previously EpiSurveyor)	■												■		
ODK	■				■										
Ona	■														
OpenELIS				■				■			■				
Quantimed														■	
Reveal		■	■		■									■	■
Secure Data Kit (SDK)														■	
Ushauri	■											■			
Uzima for Health Providers	■	■													
Vantage			■												

"There is an influx of standalone systems that are not interoperable in Kenya, which bring a variety of problems.

We want to be able to better provide home-based care and support people to manage their own care from home."

—Onenus Kamau, Kenya MOH

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

The analysis identified an existing digital tool that can be adapted to support COVID-19 response for the One Health use case below. Use case gaps are defined as use cases that have fewer than two tools addressing them. This tool also provides opportunities to streamline the COVID-19 response across a range of use cases, namely case management, coordination and operations, diagnostic tools, event-based surveillance, laboratory systems, learning and training, One Health, points of entry, risk communication and community engagement, and vaccine delivery and planning.

To learn more about the tool 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.

One Health

Afya Moja

"Supply chain management is mostly manual, and there are currently no large-scale solutions in Kenya."

—Onenus Kamau, Kenya MOH

Examples of global goods are deployed and ready for adaption for COVID-19 response in Kenya

Reveal (OpenSRP)

Reveal is an open source platform that uses smart maps and technology appropriate for resource-constrained settings to monitor coverage of interventions in real time. It is designed to optimize available resources.

Reveal adapted for COVID-19 response to support coordination and operations by mapping high-risk gathering points (e.g., markets, banks); identifying the marginalized and elderly to target resources; and directing food, sanitation, and economic aid for quarantined persons. Reveal also adapted to support contact tracing through deploying WHO's FFX (the first few X cases and contexts) protocol with digital map and navigation support.

There are many opportunities to adapt and scale Reveal in Kenya, including supporting vaccine delivery and planning. For example, Reveal can be used for microplanning to accelerate efficiencies in vaccine distribution and coverage.

5 PANDEMIC USE CASES
0 USE CASES UTILIZED
5 ADAPTATION OPPORTUNITIES IDENTIFIED

- Contact tracing
- Coordinations and operations
- Event-based surveillance
- Supply chain
- Vaccine delivery and planning
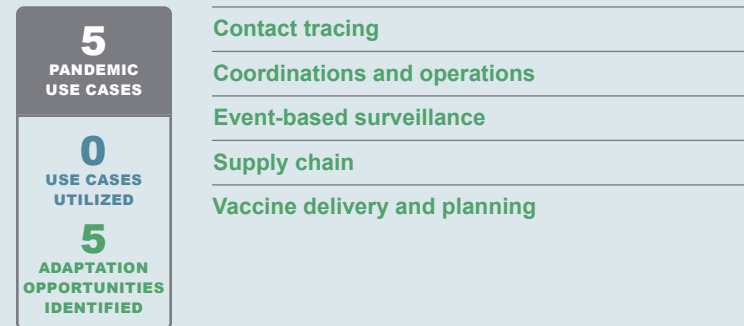
OpenELIS

The Open Enterprise Laboratory Information System (OpenELIS) is a global open source software. It serves as a laboratory information system tailored for public health laboratories in resource-constrained settings to support best laboratory practices and accreditation. OpenELIS can work offline and is available in English and French.

OpenELIS Global added COVID-19 metadata to support laboratory systems. It focuses on interoperability by including Logical Observation Identifiers Names and Codes (LOINC) codes. Users can immediately use the adaptations in the software to add tests for SARS-CoV-2 to their laboratory test catalog to facilitate tracking of laboratory tests and results.
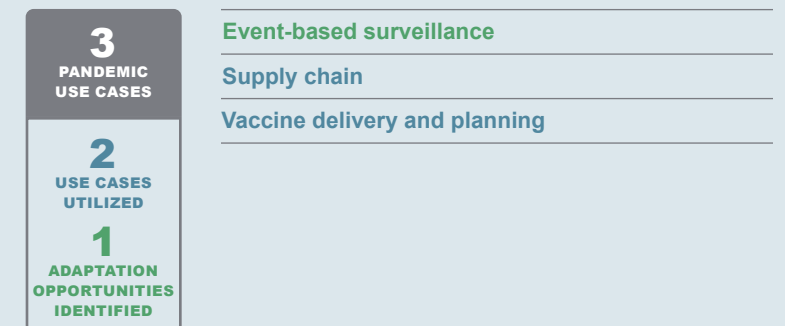
3 PANDEMIC USE CASES
2 USE CASES UTILIZED
1 ADAPTATION OPPORTUNITIES IDENTIFIED

- Event-based 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
Ada Health App	The Ada Help App guides users to answer simple questions about their own or others' health and symptoms. Ada's AI assesses answers against its medical dictionary of thousands of disorders and conditions. Users receive a personalized assessment report that tells them what could be wrong and what to do next. This app is available in Swahili.	**Diagnostic tools, risk communication and community engagement**	Foundation Botnar	Ada Health Global Health Initiative	Proprietary	National
AfyaRekod	AfyaRekod is a digital health data platform that focuses on the patient and allows health facilities to capture, store, and access patients' health data in real time. Developed as a patient-driven platform, patients maintain the sovereign right of ownership to their health data. Using AI and various blockchain modules, AfyaRekod allows health institutions, partners, and patients to make insightful data-driven decisions that allow health workers to provide better care for patients.	**Case management, risk communication and community engagement**	Ada Lab	AfyaRekod, Telkom	Proprietary	
askNivi	askNivi is a free sexual and reproductive digital health platform that makes use of AI, behavioral science, and the cloud to put health in the hands of every consumer globally. The core product is a digital contraceptive screening and referral service through a digital platform. Users can access information and referral information over Facebook, Instagram, WhatsApp, and SMS. For COVID-19, askNivi enhanced its chatbot capabilities to elicit early intelligence on COVID-19 information needs, create targeted messaging as a response to those needs, combat misinformation, and identify potential hotspots in Kenya and India.	**Event-based surveillance, risk communication and community engagement,**	Grand Challenges Canada, Merck for Mothers	Jhpiego, Marie Stopes Kenya, MyDawa, Nivi Inc., Pathfinder Kenya, ZanaAfrica	Proprietary	National
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 care providers to 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. The system 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.	**Case management, diagnostic tools, event-based surveillance, health facility and provider administration, laboratory systems, points of entry, supply chain**			Open source	
Basic Internet/The Non-discriminating access for Digital Inclusion (DigI) project/Yeboo.com	This Basic Internet Foundation sets up affordable equipment in rural sub-Saharan areas with low connectivity to take weak mobile signals and transfer them to a Wi-Fi with two options for users. Supported by the DigI project, users are enabled to go online (if the SIM card used for the signal has credits) or access a local server, tailored for the target audience. Users can access a digital health education platform on Yeboo.com in Swahili that has been adapted with COVID-19 content.	**Learning and training, risk communication and community engagement**	Ministry of Foreign Affairs, Norad, The Norwegian Research Council, University of Oslo	Basic Internet Foundation, MOH, University of Oslo	Freemium	Subnational
Cadasta platform	Cadasta provides a common global platform and set of technology and training tools that allow local organizations, government entities, and communities to document and map land and occupants in a quick, efficient, and affordable way. For COVID-19, Cadasta maps handwashing points in the informal settlements in Nairobi and Kisumu to provide access to up-to-date information about where the points are, and whether water is running at the time.	**Coordination and operations**		Cadasta, Friends of Lake Turkana, Namati, Pamoja Trust	Proprietary	Subnational
Cash Advance	Cash Advance is a short-term loan product for health workers that uses digital patient revenues as a means of security. This innovation allowed Medical Credit Fund to deploy a low-cost and low-risk financing solution to achieve its ultimate goal of benefiting smaller health facilities that often have difficulty accessing capital.	**Health facility and provider administration**	AFD, CDC Group, Dutch Ministry of Foreign Affairs, EIB, IFC	MCF	Proprietary	National

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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
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 other countries. NextLeaf Analytics has connected cold chain equipment from over 16,822 health facilities and trained more than 1,400 health workers to respond to cold chain failures.	**Supply chain, vaccine delivery and planning**	Grand Challenges Canada	NextLeaf Analytics	Proprietary	
Collegium Telemedicus	This is an Android-based asynchronous telemedicine software program to drive quality improvement in rural health settings and create equal access to digital health innovations for frontline health workers in Kenya. Local providers are given free access to a telemedicine platform and a global network of volunteer physicians who assist in the care of patients remotely and in less than 12 hours. The Addis Clinic staff in Kenya coordinate quality improvement through remote physician support, technology training and technical assistance, and continuing medical education. A COVID-19 specialist triage group of physicians are automatically alerted when a suspected COVID-19 case is referred via telemedicine. Public health alerts and clinical guidance are communicated through the tool.	**Case management, risk communication and community engagement**	Addax and Oryx Foundation	The Addis Clinic	Proprietary	Subnational
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.	**Case management, contact tracing, health facility and provider administration, learning and training, points of entry**		Lwala Community Allianca	Open source	
Community Health Toolkit (CHT)	CHT is an open source technology designed to support community health systems and frontline health teams delivering care in the hardest-to-reach communities. For COVID-19, CHT adapted to include a COVID-19 tracking app to conduct contact tracing and follow-up.	**Case management, contact tracing, event-based surveillance, learning and training, points of entry, risk communication and community engagement, routine surveillance, vaccine delivery and planning**	CDC, MOH	Amref Health Africa, CDC, county governments, KEMRI, Living Goods, MOH, Palladium	Open source	Subnational
COVID-19 Blog	UNAIDS collaborated with WeDoctor, a Chinese medical service platform, to organize virtual sessions for building skills and expertise for COVID-19 care and management. These sessions connected more than 250 African doctors from Kenya, South Sudan, and Uganda with leading Chinese frontline medical experts, sharing China's experience with the COVID-19 response.	**Learning and training**			Public domain	
COVID-19 Point of Contact Rapid Test kits	The Kenya Medical Research Institute repurposed existing diagnostic machinery and knowledge developed during the HIV/AIDS, tuberculosis, and Avian flu epidemics to address gaps in mass testing for COVID-19.	**Diagnostic tools**				
COVID-19 Response WhatsApp Remote Learning for Health Providers	The WhatsApp-based remote learning solution launched in August 2020 by sending out a clickable link to private clinics and pharmacy staff affiliated with PSI Kenya through WhatsApp groups urging them to join the COVID-19 Response WhatsApp Remote Learning for Health Providers. By November 2020, ~2,500 private-sector providers had accessed the platform to embark on training, with more than 1,000 providers completing the full COVID-19 curriculum. Providers who complete the COVID-19 curriculum receive a certificate, and the MOH recognizes this by contribution toward their Continuing Professional Development learning hours. Many providers continue to undertake the training.	**Learning and training**	FCDO, Unilever	PSI	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
COVID-19 Service Delivery Tracker/Nurse Mentorship platform	The COVID-19 Service Delivery Tracker collates information from mothers about their experiences in facilities and from providers about their challenges and performance. The tool includes a simple dashboard that is shared with county and facility managers to make more-informed decisions. To support the COVID-19 response, a Service Delivery Challenges Tracker has been added so that providers can update challenges in real time to alert health system administrators.	**Case management**	COVID-19	Jacaranda Health	Open source	Subnational
COVID-19 SMS Data Collaboration Initiative	COVID-19 is having huge social and economic effects on Kenya's poor with ground-level data needed to inform data-driven solutions. This initiative collects this data by directly engaging 1 million low-income Kenyans via interactive SMS.	**Event-based surveillance, risk communication and community engagement**	COVID-19	Echo Mobile, Population Council	Proprietary	National
COVID-19 Triage Tool	Wellvis COVID-19 Triage Tool is an application that allows users to self-assess their COVID-19 risk category based on their symptoms and exposure history. It is free to users. The application also allows digital health care appointments that can be paid online.	**Case management, diagnostic tools**		Wellvis	Proprietary	
CovidConnect	CovidConnect (Luscii) is a pre-triage support application and patient flow management system that allows digital COVID-19 symptoms tracking at a distance. Users can track COVID-19 symptoms via a simple application. A Care Coordination Center managed by medical professionals, often housed at a hospital, reaches out to those patients who request a call back and/or who have symptoms indicating COVID-19 to ensure they seek the right care at the right time. The system is pre-triage as it aims to relieve the health care system from being overrun and it can monitor those with no/mild symptoms. CovidConnect supports management of hospital capacity, symptoms tracking, and warning systems.	**Case management, event-based surveillance**	Achmea Foundation, FMO Development Bank, PharmAccess Foundation	CarePay, Luscii, Maseno University, PharmAccess, PharmAccess Foundation	Proprietary	Subnational
COVID-Dx Dashboard (CommCare)	COVID-Dx Dashboard uses a mobile phone or tablet built on a CommCare database to digitally fill in the official Kenyan COVID Case Identification Tool at any (i.e., public/private) health facility where a patient reports. The tool subsequently follows all steps required for COVID-19 testing by both PCR and antigen-RDTs, keeping digital track of sample collection, transport to lab, testing results, and back-reporting to MOH and to facilities and clients. The dashboard, created in Power BI, provides a semi–real time overview of numbers of tests and positivity rate (i.e., total and per facility), numbers of staff trained, geographic location of COVID-19-tested clients on Google Maps, comorbidities, symptoms, age distribution, sample handling efficiency, and professions of tested clients. Individual patient trajectories can be followed visually. The tool is available for key policymakers and health managers in Kisumu, as well as participating public and private facilities.	**Laboratory systems, supply chain**	Achmea Foundation, Dimagi, Pfizer Foundation, Netherlands Ministry of Foreign Affairs	KEMRI, PharmAccess Group	Proprietary	Subnational
DELTA	DELTA is a digital EmONC learning trainer and assistant, which allows providers to learn at their own pace in an interactive way via Telegram . This is a part of the Nurse Mentorship Program.	**Learning and training**	Grand Challenges Canada	Jacaranda Health	Open source	Subnational
Digital Community Scorecard App	Community scorecards are widely used to build a trusted and constructive relationship between communities and health facility staff. The Digital Community Scorecard App helps staff or volunteers running community scorecards to digitize and analyze the data generated from this process. The app includes three related tools: a simplified data entry app that is designed to work offline, a program management app that includes real-time analysis tools, and a data hub to aggregate and visualize data.	**Risk communication and community engagement, vaccine delivery and planning**	VSO	Kwantu, VSO	Open source	Subnational
e-Campus/Jibu app	The e-Campus platform offers tailor-made courses through eLearning and mLearning. It provides interactive, virtual end-to-end learning, mentorship/coaching, and learner and faculty support.	**Learning and training**	Elsevier Foundation	Amref Health Africa, Living Goods, Medic Mobile, MOH	Open source	

■ 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
Emergency Alert and Response System (EARS)	The Emergency Operation Centre at the MOH has been digitized through EARS to receive and respond to 40+ infectious diseases. The system is used to capture, report, and view emerging epidemics across the country. The system provides crucial data for decision-making and epidemic control measures at the national and county levels. An additional module called Jitenge System has been developed as a quarantine management platform, which is used nationally and subnationally in response to COVID-19.	**Coordination and operations, event-based surveillance, routine surveillance**		mHealth Kenya	Proprietary	National
END CORONAVIRUS Kenya	This is a mobile-friendly, low-data website in Kiswahili that provides critical handwashing guidance, accredited information on the COVID-19 disease from WHO, local helplines, and daily statistics. END CORONAVIRUS Kenya also offers users a series of interactive features to improve knowledge, attitudes, and behaviors.	**Risk communication and community engagement**		Every1mobile	Public domain	National
Fionet	Fionet is a first-of-its-kind mobile testing platform developed to manage and track community-based infectious diseases, including COVID-19.	**Case management, coordination and operations**	Fio Corporation	Fio Corporation, Relay Medical Corp	Proprietary	Subnational
iCow	iCow provides smallholder farmers information on sustainable agricultural practices as well as nutrition and health with a focus on zoonotic diseases. The application is available on both USSD and Android.	**Risk communication and community engagement**	CABI, Gates Foundation, Green Dreams TECH Ltd, Safaricom PLC, USAID	Green Dreams TECH Ltd, Safaricom PLC	Proprietary	National
iHRIS	iHRIS is a free, open source software package that helps countries around the world track and manage their health workforce data to improve access to services. Countries use it to capture and maintain high-quality information for health workforce planning, management, regulation, and training. Kenya also deploys the iHRIS Train instance to support preservice and in-service training.	**Health facility and provider administration, risk communication and community engagement, vaccine delivery and planning**	USAID, IntraHealth International	IntraHealth International	Open source	National
Innovative Community-Led Caregiver Reward System	This is a royalty rewards program that strengthens community-owned immunization advocacy processes, resulting in a transformative approach to immunization and vaccine adherence. The organization benefits infants—aged 0–12 months—and their caregivers by addressing the unique barriers to immunization uptake due to lack of accessible, trusted health information in Kiambu and Nairobi, especially during the COVID-19 pandemic.	**Vaccine delivery and planning**	ICRI	STAMP CLEANTECH		
Jitenge	Jitenge is an app developed during COVID-19 to register users, either through self-registration or by MOH officials, to receive daily reminders and prompts to report their health status. The Jitenge system manages and monitors home-based care management, self-quarantine for contacts, post-isolation follow-up, and the monitoring of long-distance truck drivers.	**Case management, event-based surveillance, risk communication and community engagement**		mHealth Kenya	Proprietary	
Keheala	Keheala is a digital health platform that delivers behavioral interventions across basic feature phones and smartphones to improve health care access and treatment outcomes for patients in low-resource settings. Keheala addresses the nonmedical drivers of disease (e.g., stigma and a lack of information, motivation, and support) with demonstrated behavioral strategies from the social sciences (i.e., behavioral economics and psychology). More than 17,000 TB patients in Kenya rely on Keheala's support & care intervention.	**Risk communication and community engagement**	Grand Challenges Canada, USAID	Keheala	Proprietary	
KenyaEMR (OpenMRS)	KenyaEMR is a digital platform built on OpenMRS that is used by the MOH to collect care and treatment data, mostly for HIV clients. KenyaEMR is continuously updated with new and improved features. KenyaEMR for COVID-19 is an adaptation that supports the national HIV program.	**Case management, routine surveillance**	CDC, I-TECH, IntelliSOFT Consulting, MOH, Palladium	I-TECH, MOH, NASCOP, Palladium, University of Nairobi	Open source	Subnational

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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
Kenya HMIS	Kenya HMIS is the MOH's implementation of DHIS2. DHIS2 is an open source, web-based platform, typically used as a national health information system for data management and analysis purposes, for health program monitoring and evaluation, facility registries and service availability mapping, logistics management, and 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 is deployed in more than 70 countries.	Case management, contact tracing, event-based surveillance, points of entry, routine surveillance	CDC, DHIS2, Gavi, GOK, Norad, MOH, PEPFAR, The Global Fund, University of Oslo, USAID, UNICEF, WHO	DHIS2, HISP Kenya/ Tanzania, JKUAT, MOH, University of Nairobi	Open source	National
KoviTrace	KoviTrace is an application that supports contact tracing COVID-19 patients that uses geosensing technology to track a patient's location over a 14-day period from the precise moment they tested positive. The app can be installed on Android and iOS phones or accessed on a basic feature phone. Health officials key in the patient's phone number and command it to trace all the persons that the patient came into contact with within the stipulated time period. This command prompts those who came into contact with the patient to receive an SMS notification with WHO recommendations on how to handle the situation, including instructions on how to self-quarantine and how to contact a COVID-19 response team.	Contact tracing				
Kenyatta University Teaching, Referrla, and Research Hopsital (KUTRRH) HMIS	KUTRRH HMIS digitally transformed the provision of patient-center and evidence-based health care, training, research, and innovation. The system features many mobile apps. The Doctors app allows doctors to monitor and treat patients from a remote location. The Management app allows key decision-makers to view HMIS reports and data to make sound choices. The Patients app allows patients to look up a consultant, locate facilities, call to ask questions, or schedule appointments. The Nurse app allows the nurse to enter vitals and nursing assessment details for outpatients instantly before sending the patient to the doctor chamber for consultation. There is also a Referral Doctor app, Feedback app, and Support Ticketing app.	Case management, health facility and provider administration			Proprietary	Subnational
Leap	Leap is a health-related mobile platform that enables health departments to train community health care volunteers. Volunteers have access to a variety of content ranging from diagnosis trees to chat forums that share best practices and advice among the volunteers using Leap. Leap allows health departments to monitor and support their volunteer workforce and generates report data needed to ensure improved efficiency and positive health outcomes for communities who are reliant on these volunteers. Leap provides training to health workers on COVID-19 response and preparedness.	Learning and training	Accenture Foundation, m-Pesa Foundation	Accenture, Amref Health Africa, Mezzanine, Safaricom	Proprietary	Subnational
Longitudinal surveys conducted via IVR for resilience impact assessment	Viamo deployed longitudinal surveys to monitor the impact of programs, COVID-19, and lockdowns on beneficiaries of MasterCard Foundation's grantees. These surveys use IVR technology, which allows anyone, regardless of literacy level, to access the information. IVR involves the use of a human voice recording to ask survey questions. Respondents receive a phone call and are asked which language they would like to take the survey in, starting with the primary language of the country they are located in.	Risk communication and community engagement	Mastercard Foundation	Viamo	Proprietary	National
Love Matters Africa	This is an online platform to provide sex-friendly information to youth that has adapted by sharing information related to the intersection of relationship, sex, and COVID-19. Its website reaches 150,000 visitors per month with social media pages reaching 1.3 million followers.	Risk communication and community engagement	RNW Media	Love Matters Africa	Public domain	

■ 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
Lwala Community Alliance Health Information System	Lwala's Community Alliance Health Information System implemented OpenFn to build a real-time decision support tool for its community health workers. OpenFn powers Lwala's connected health information system, integrating its CommCare case management CHW app with a central Salesforce-based patient database. This automated a secure, two-way information exchange for real-time monitoring and CHW decision support. Every time a patient case record is updated by a health worker, OpenFn forwards real-time case updates between CommCare and the centralized HIS built on Salesforce to keep the systems in sync. OpenFn automatically transforms the case data to match each system's required format and to prepare it for analysis. OpenFn sends CHWs regular updates on their progress for key indicators. Lwala Community Alliance integrated new COVID-19 CHW workflows and data collection tools into its existing connected health system.	**Case management**		Lwala Community Alliance	Proprietary	Subnational
Malaria Commodities Dashboard (DHIS2)	The Malaria Commodities Dashboard is built into DHIS2 and pulls malaria commodities data from the community, health facilities, and supply chain agencies. This data is aggregated, and the dashboard produces easy-to-use outputs to identify gaps and inform decision-making at all levels of the system. The dashboard is fully owned by the MOH and is currently being expanded to cover other health commodities.	**Coordination and operations, supply chain**	USAID PMI	MOH HIS Department	Open source	National
Mapbox	Mapbox is a mapping platform for custom designed maps. Mapbox's APIs and software development kits are building blocks to integrate location into any mobile or web application.	**Event-based surveillance, routine surveillance**	Mapbox	Map Kibera, MOH	Proprietary	
mDakari	mDaktari provides virtual access to primary care via teleconsulting. Patients can access virtual care either through the app or web account, choose an available physician from a directory, and/or consult an expert using online video or voice calling.	**Case management**		Access Afya, Addis Clinic	Open source	
Medixus	Medixus is a collaboration platform for African doctors to find mentors and discuss challenging patient cases together via a secure online app.	**Learning and training**	Samurai Incubate	Medixus Health	Proprietary	
mHero	mHero is a two-way, mobile phone–based communication system that connects ministries of health and health workers. mHero brings together existing health information systems with locally popular communication platforms to facilitate important health-sector communication. First created in 2014 to support health-sector communication during the Ebola outbreak in West Africa, mHero has since been adapted for general health-sector communication, disease surveillance, and COVID-19 response.	**Coordination and operations, health facility and provider administration, infection prevention and control, learning and training, risk communication and community engagement**	USAID	IntraHealth International, MOH	Open source	National
MomCare	MomCare is a digital three-way agreement (i.e., smart contract) among mothers, contracted health facilities, and health service funders at preset terms and conditions to deliver quality maternal and newborn health services (i.e., care bundles). The platform efficiently and transparently links patients, providers, and payers to improve the financing and delivery of maternity care. MomCare includes a telehealth/triage app via SMS to support patients during COVID-19.	**Risk communication and community engagement**	Childrens Investment Fund Foundation, Grand Challenges Canada, Merck for Mothers, Nationale Postcode Loterij, Stichting Sint Antionius Foundation	Jacaranda Health, MomCare, MSD for Mothers, PharmAccess, PharmAccess Foundation	Proprietary	Subnational
Msafari	Kenya launched the Msafari application for contact tracing in 2020. Public service vehicle operators and passengers are required to provide information that helps trace the movements of people who have contracted COVID-19. All public drivers or operators are required to enroll using their vehicle registration numbers and to collect details about every passenger.	**Contact tracing**		FabLab	Proprietary	
M-TIBA	M-TIBA is a Kenyan startup that focuses on connecting patients to health care affordably without them having to leave home by using the M-TIBA mobile app. M-TIBA offers a variety of medical care services, including COVID-19 tests, medical consultation, and sample collection, all within the comfort of a patient's home.	**Case management**	Shyneflor Enterprises		Proprietary	

■ 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
NCD Navigator Tool	The NCD Navigator Tool collects program-level NCD data from implementing partners. This is overlaid with routine service delivery data from DHIS2 to inform mismatch of NCD burden and implementer support for NCDs. The tool's dashboards include visualizations that help inform national and county-level managers and policy advisors where to best direct resources for impact and equitable access to NCD care.	**Coordination and operations, routine surveillance**	IFPMA, MOH	MOH, PATH	Open source	National
Learn ON	Learn ON is a program to transition Huawei's ICT academics from face-to-face learning to online learning. The Learn ON program includes a webinar to discuss global best practices for mitigating the impact of COVID-19 on education.	**Learning and training**		Huawei ICT Academy Kenya, UNESCO		
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.	**Case management**			Open source	
OpenSRP	OpenSRP is an mHealth platform built to enable data-driven decision-making at all levels of the health system that can work offline. Kenya and Indonesia have an OpenSRP-based Rapid Diagnostic Reader project, where an RDT reader for malaria screening and rapid diagnostic testing were integrated. This project adapted after the onset of the COVID-19 pandemic to move away from an RDT focus on malaria to a COVID-19 focus with an RDT reader app being built for COVID-19.	**Case management, diagnostic tools, event-based surveillance, routine surveillance**	Gates Foundation	KEMRI, Ona, SID	Open source	Subnational
PROMPTS	PROMPTS is a free, two-way digital health text messaging platform that provides pregnant women and new mothers in public health systems with a carefully designed sequence of behavioral nudge messages to help them seek care at the right time and place. PROMPTS also has an AI-supported helpdesk service that triages responses and questions to flag for clinical urgency.	**Risk communication and community engagement**	Grand Challenges Canada, Johnson and Johnson	County governments, Jacaranda Health, MOH	Open source	National
RapidPro	RapidPro is an open source platform that allows anyone to build interactive messaging systems using an easy visual interface. RapidPro works on basic feature phones and smartphones.	**Risk communication and community engagement**	Gavi, MOH, UNICEF	Living Goods, Medic Mobile, Praekelt	Open source	National
Safaricom	Safaricom is being used to educate the community on COVID-19 by sending free text messages and to train health workers by providing free courses on COVID-19 accessible via smartphones or computers. COVID-19 health care data is being reported using the DHIS2 tool.	**Learning and training, risk communication and community engagement**	Safaricom	Safaricom	Proprietary	National
Safe Delivery App	The Safe Delivery App is a free, evidence-based mobile application that uses simple, intuitive animated instruction videos, drug lists, and quizzes to guide health workers about how to handle the most common childbirth emergencies. The Safe Delivery App has been adapted with a module to help equip midwives in low-resource settings with up-to-date information to protect themselves, mothers, and newborns from COVID-19 and to ensure that women continue to receive quality services during pregnancy and childbirth.	**Learning and training**	Gates Foundation, Merck for Mothers, UNFPA	Amref Health Africa, Liverpool School of Tropical Medicine, Maternity Foundation	Proprietary	
Safe Water and AIDS Project (SWAP)	SWAP operates in western Kenya with public health programs, research, and emergency response. SWAP's mission is to provide innovative solutions for improved health and economic status of communities. SWAP joined the MOH COVID-19 rapid response teams to help prevent the spread and mitigate the impact of the disease. SWAP is supporting remote public health facilities with handwashing stations, soap, masks, and hygiene promotion.	**Infection prevention and control**		MOH, SWAP		Subnational
SafeCare/SafeCare4Covid	SafeCare is a unique standards-based and International Society for Quality in Health Care–accredited incremental approach for measuring and improving the quality of health care services in low-resource settings. With the free, globally accessible SafeCare4Covid mobile app, facility staff can perform a self-assessment using their own mobile phones; report on the availability of equipment, staff, and supplies; and check on their own processes and knowledge to treat patients for COVID-19 while staying safe. Data derived from the SafeCare4Covid app can be used through dashboards by stakeholders for data-driven resource allocation and patient allocation.	**Health facility and provider administration, infection prevention and control, supply chain**	Achmea Foundation, Grand Challenges Canada, Merck for Mothers, PharmAccess Foundation	Achmea Foundation, MSD for Mothers, PharmAccess	Proprietary	Subnational

■ 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
Safiri Smart	Safiri Smart is a mobile-based solution for the dissemination of information regarding notifiable infectious diseases (i.e., COVID-19, Ebola, cholera, plague). The solution provides information on how to prevent such diseases as well as signs and symptoms of infectious diseases. The platform includes a link with guidance on what to do if you experience these signs and symptoms based on your country of travel. Safiri Smart leverages Safaricom's roaming system to warn subscribers who travel of notifiable infectious disease in their destinations.	Infection prevention and control, risk communication and community engagement,		Korea Telecom, MOH, Safaricom	Open source	National
Basic Laboratory Information System (BLIS 3.0)	BLIS 3.0 is an open source mobile and web-based system that can be installed in a local, district, or national laboratory. It standardizes data collection, tracks the specimen/tests workflow, and improves the ability to generate useful reports. BLIS 3.0 provides a realistic picture of laboratory services and assists with staff and budget planning. BLIS.30 has incrementally improved based on the user feedback.	Laboratory systems	PEPFAR	@iLabAfrica at Strathmore University, APHL, ASLM, UMB	Open source	Subnational
Simprints	Simprints deployed biometric identification documents on health and humanitarian projects to increase health care visits and quality while preventing fraud. The Simprints scanner scans fingerprints and hooks up to a mobile phone. Simprints´ biometric solution is a desirable technology in the context of contact tracing and case management for COVID-19. Accurate identification supports effective response by ensuring that patients are correctly linked with their records, and that their records can be linked longitudinally.	Case management, contact tracing	Gates Foundation, FCDO	Cohesu, Simprints	Proprietary	Subnational
SORMAS (Surveillance Outbreak Response Management and Analysis System)	SORMAS is an open source software that processes disease control and outbreak management procedures. SORMAS also provides real-time digital surveillance of peripheral health care facilities and laboratories, which facilitates early detection of outbreaks.	Event-based surveillance, routine surveillance		SORMAS	Open source	Subnational
Pigia Penda	Penda Health operates a citywide network of medical centers that deliver affordable, high quality healthcare that patients can trust. All centers are located in low-income, densely populated areas that are expected to be hardest hit by COVID-19. Penda also operates a "Pigia Penda" telemedicine hotline that enables medical providers to give free consultations to patients over the phone.	Case management, risk communication and community engagement		Penda Health		
U Afya	U Afya is an online community of mothers that applies behavior change methods in innovative ways to deliver deep, ongoing, customized engagement to deliver real-world change in low-income communities. U Afya combines supply and demand-side solutions and SBCC to improve health and nutrition outcomes. U Afya is remotely empowering moths to become change agents who encourage their communities to practice positive health and hygiene behaviors (e.g., handwashing with soap, social distancing) to combat COVID-19.	Risk communication and community engagement	FCDO	Every1Mobile	Public domain	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 policy makers who make decisions that affect young people.	Risk communication and community engagement			Open source	Subnational
Ushahidi	Ushahidi, which translates to "testimony" in Swahili, was developed to map reports of violence in Kenya after the post-election violence in 2008. Since then, many have used Ushahidi's crowdsourcing tools to raise their voice. Ushahidi has been adapted and deployed to crowdsource information to help support business and community in Kenya during the COVID-19 pandemic.	Risk communication and community engagement		Ushahidi	Open source	National

■ 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
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.	**Learning and training, risk communication and community engagement**		Viamo	Proprietary	Subnational
WelTel	WelTel integrates virtual care and patient engagement, connecting remote outpatients with the health system via their mobile phones. Public health agencies are using it to monitor and support COVID-19 cases and contacts in home quarantine.	**Case management, contact tracing, event-based surveillance, risk communication and community engagement**	CDC, CIHR, Grand Challenges Canada, IRAP, National Institutes of Health, PEPFAR	BC Children's and Women's Hospital, government, University of British Columbia, University College London, Weltel Inc.	Proprietary	Subnational
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 include 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**			Proprietary	National
Afya Moja	Afya Moja is a mobile-based digital health passport that receives and securely stores patient information from a participating health provider. It grants patients ownership and access to a copy of their own health information with the ability to share it with trusted health providers on the Afya Moja platform.	**Case management, coordination and operations, diagnostic tools, event-based surveillance, laboratory systems, learning and training, One Health, points of entry, risk communication and community engagement, vaccine delivery and planning,**	IntelliSOFT Consulting, Safaricom, Savannah Informatics	Ask-a-Doc, CarePay, GSMA, IntelliSOFT Consulting, Savannah Informatics	Proprietary	Subnational
AfyaEHMS (Afya Electronic Health Management System) (OpenMRS)	AfyaEHMS, built on the OpenMRS software platform, is a reference application that enables design of a customized EMR system.	**Case management, health facility and provider administration**	FCDO, USAID	FCDO, MOH, USAID, WHO	Open source	Subnational
Amplio Talking Book	The Amplio Talking Book is a rugged, battery-powered audio device for low-literate adults and youth. Governments and development organizations use Amplio Talking Book to amplify their reach and share knowledge in rural remote communities. Talking Book overcomes barriers such as lack of infrastructure, illiteracy, and traditional gender norms and biases that often limit access to information.	**Risk communication and community engagement**	CBCC, UNICEF, USAID	CBCC	Proprietary	Subnational
Baby Monitor	Baby Monitor is an open source mobile phone application that offers free mobile screenings to pregnant women and new mothers through IVR technology to detect complications and take action. Call data is stored in an EMR system in the cloud.	**Diagnostic tools, risk communication and community engagement**	Gates Foundation, Grand Challenges Canada, Norad, Saving Lives at Birth Grand Challenge, World Bank, USAID	InSTEDD, Jacaranda Health, Moi University, Population Council	Open source	Subnational

■ 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
CAD4TB	Computer-Aided Detection for Tuberculosis (CAD4TB) is software designed to help nonexperts detect and diagnose tuberculosis more accurately and cost-effectively using digital X-rays, machine learning, and remote expertise. This solution has been adapted in other countries to triage COVID-19 suspected cases and is able to use artificial intelligence on chest X-rays. The CAD4COVID is a free solution that supports triaging in resource-constrained settings and high-prevalence areas.	**Diagnostic tools**		Delft Imaging	Proprietary	National
CHAIN	Connected Health AI Network (CHAIN) uses AI to support the supply chain. CHAIN is enterprise software that learns and builds the predictive supply chain for health from the ground up. CHAIN makes it possible for existing resources to serve more people in need, unlocking capacity and increasing access to care.	**Supply chain**	Gates Foundation	Macro-eyes	Proprietary	
Chanjo	Chanjo is a web-based platform that is used to collect data on cold chain equipment, vaccine stock, and other health commodities, while also providing remote temperature monitoring (via NextLeaf Analytics). Performance monitoring, integrated into the DHIS, is supported by a dashboard and periodic reports and analytics. Chanjo provides stock information at each level, while regional stores also submit orders through it.	**Supply chain**		CHAI	Open source	National
cStock (DHIS2)	cStock is a simple mobile-based resupply and reporting tool for community health workers (i.e., CHVs, CHAs) that provides last-mile visibility of supply chain data at the community level. It combines mobile technology for easier capture and reporting of logistics data and timely resupply of commodities by supervisors. It also includes user-friendly dashboards to help decision-makers review the data and identify supply chain problems. Users can interact with the system using whatever technology is available to them—feature phones, smartphones, tablets, or computers. cStock is built upon DHIS2, which is key to enabling its scalability and sustainability across multiple programs as more than 200 countries use DHIS2 as their national health information systems. cStock supports a CHV and CHA to perform a myriad of tasks and allows supply chain managers to make evidence-based supply chain decisions at all levels of the supply chain.	**Supply chain**	DHIS2, Gates Foundation, Grand Challenges Canada, Saving Lives at Birth	Amref Health Africa, inSupply, John Snow, Inc.	Proprietary	Subnational
Magpi (previously EpiSurveyor)	Magpi is a web-enabled mobile phone application used by volunteers to conduct house visits with a uniform approach and package of messages. Volunteers document the house visits in Magpi so that information is relayed to all campaign management levels.	**Case management, routine surveillance**		Kenya Red Cross	Open source	
Hoji mobile data collection and analysis platform	Hoji is an easy-to-use mobile data collection and analysis platform for surveys, M &E, and quality assurance. Hoji enables health workers to easily develop and deploy digital data collection and analysis solutions at scale.	**Routine surveillance**		Hoji Ltd	Proprietary	
Journey Solution	Journey Solution is a digital tool that provides continuity of care for mobile populations in cross-border environments between Kenya and Uganda. Journey relies on Near Field Communication cards to enable patients to carry their own data and access care across national borders without risking personal information sharing. It provides mobile electronic immunization records for migrant populations stored on smart cards that can be read using a mobile device reader at Journey-enabled facilities. Data stored on the card provides personal health records with potential for diagnostics record storage. Mothers in cross-border regions can carry their child's immunization records, avoiding loss of paper-based registers or the difficulty health workers experience trying to retrieve records via paper register books.	**Vaccine delivery and planning**	Broadreach, USAID	BroadReach, Jembi	Open source	Subnational
Kasha	Kasha is an e-commerce solution that focuses on pharmaceuticals and other health products. Kasha sells menstrual care products, contraceptives, pharmaceuticals, and a range of beauty products via its own platform, accessible through basic phones and a website. Kasha delivers to customers confidentially and aims to be a trusted source of information, especially around stigmatized products. Kasha operates in close cooperation with selected health partners.	**Supply chain**	Finnfund	Kasha	Proprietary	

🟦 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
mUzima for Health Providers	mUzima is a mobile extension to the widely deployed OpenMRS electronic record system, and it improves the reach of clinical care beyond tethered and connected settings. mUzima innovatively utilizes mobile technology to improve the health of the underserved across all care domains. mUzima handles multiple use cases (e.g., HIV, HTS , outreach, CDM), adds forms without repackaging, allows users to view historical data as well as capture data, handles record deduplication, and enforces security.	Case management, contact tracing	USAID	MOH	Open source	National
ODK	Open Data Kit (ODK) is free and open source software that helps millions of people collect data quickly, accurately, offline, and at scale. ODK has two tool suites (ODK, ODK-X) and created a strong community of users, implementers, and developers. ODK's lead developer, Nafundi, is offering support to COVID-19 response efforts, specifically to address contact tracing, decision support, community education, strategic mapping, and case management.	Case management, contact tracing, event-based surveillance, routine surveillance			Open source	National
Ona	Ona develops fingerprint records and digital health cards to help solve the global identity records crisis.	Case management			Open source	
OpenELIS (Open Enterprise Laboratory Information System)	OpenELIS is a global open source software system. It serves as a laboratory information system tailored for public health laboratories in resource-constrained settings to support best laboratory practices (e.g., help with lab workflows and processes) and accreditation. OpenELIS can work offline and plugs into larger national HIS systems.	Diagnostic tools, laboratory systems, points of entry		AMPATH	Open source	Subnational
Quantimed	Quantimed is a tool that quantifies essential medicines and supplies. Quantimed is designed to improve the accuracy of order planning and budgeting by providing a systematic approach to organizing and analyzing data. Quantimed facilitates the calculation of commodity needs using either a single method or a combination of any of the three primary quantification methods: past consumption, morbidity patterns, and proxy consumption. Depending on the availability of data, Quantimed can be applied at the local level with one facility, the regional level with several facilities, or at the country level for a national control program.	Supply chain		MSH, USAID	Open source	
Reveal (OpenSRP)	Reveal is an open source platform that uses smart maps and technology appropriate for resource-constrained settings to monitor coverage of interventions in real time. It is designed to optimize available resources. Reveal supports decision-makers by guiding and tracking delivery of field activities with precision and holding field teams accountable for action. Reveal has a mobile application that spatially guides field teams to planned areas and households for service delivery. This mobile application allows offline data collection and captures indicators to inform critical field decisions. Reveal also includes web user interface real-time dashboards to provide program managers with impactful coverage data to inform current activities and program progress.	Contact tracing, coordination and operations, event-based surveillance, supply chain, vaccine delivery and planning	Gates Foundation	Akros, Amref Health Africa, EndFund	Open source	Subnational
Secure Data Kit (SDK)	The Kenya Medical Supplies Authority (KEMSA) uses SDK to track medicines from national warehouses to sub-county warehouses all the way to the students who received them. SDK created an SMS feature first used for a deworming campaign in Kenya with almost 1,500 teachers. Medicines were tracked from the warehouse to teachers across the country. Once the teachers treated the children in schools, they sent a text message with the batch number that correlates to the shipment as well as the number of tablets used, which allowed tracking of the location of surplus medicine.	Supply chain		KEMSA, Merck for Mothers, MOH	Open source	National
Ushauri	A Kiswahili word meaning "advice," this is an SMS-based patient reminder system developed to enhance client retention in care and improve health care outcomes. Ushauri includes a tracing module to ensure patients are seen and followed with up in the shortest time possible.	Case management, risk communication and community engagement		mHealth Kenya	Proprietary	National
Vantage	Vantage is an AI-enabled cloud platform that empowers health workers to make decisions. The cloud-based platform is able to instantaneously analyze data and communicate findings and direct meaningful actions through automatically generated dashboards and targeted push notifications.	Coordination and operations	USAID	BroadReach	Proprietary	National

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At a glance

Figures 2 shows that Kenya's digital health tools rely on different software licensing types for sustainability with open source and proprietary being used for the majority of tools. Figure 3 demonstrates that Kenya has 51 digital health tools deployed on a national scale while 62 operate on a subnational scale. These figures are not specific to COVID-19 response, but they provide an overall picture of Kenya's digital health infrastructure.

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

- Public domain 3%
- Freemium 1%
- Unspecified 17%
- Open source 40%
- Proprietary 39%
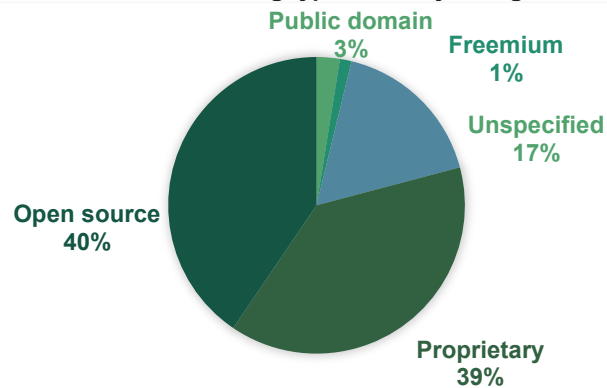
Figure 3. Number of digital tools deployed at scale in Kenya

National	Subnational	Unspecified
51	62	45
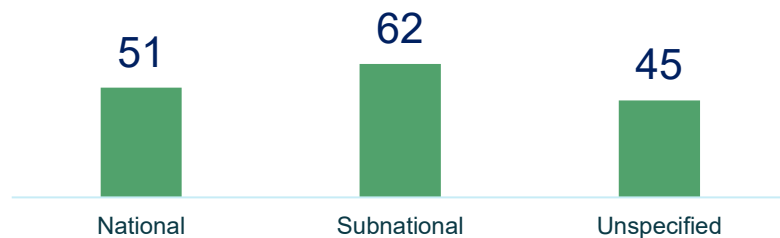
Conclusion

Digital Square mapped 154 existing, adaptable digital health tools in Kenya 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 Kenya'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 Kenya'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 Kenya's digital health systems** and their role in the COVID-19 response by reviewing Kenya'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 includes additional information about global goods deployment for COVID-19.

Map and Match has many resources on its project landing page 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. Abbrieviations

Acronym	Definition
AFD	Agence Française de Dévelopement/French Development Agency
AI	artificial intelligence
AMPATH	Academic Model Providing Access to Healthcare
APHL	Association of Public Health Laboratories
API	application programming interface
ASLM	African Society for Laboratory Medicine
CABI	Centre for Agriculture and Bioscience International
CBCC	Centre for Behaviour Change and Communication
CHA	community health assistant
CHV	community health volunteer
CHW	community health worker
CIHR	Canadian Institutes of Health Research
DHIS2	District Health Information Software 2
EIB	European Investment Bank
EIR	electronic immunization record
EmONC	emergency obstetric and newborn care
EMR	electronic medical record
FCDO	UK Foreign, Commonwealth and Development Office
FMO Development Bank N.V.	Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden
GSMA	Global System for Mobile Communications
HIS	health information system
HIS Department	Health Information Systems Department
HISP	Health Information Service Provider
HNQIS	Health Network Quality Improvement System
ICRI	International Child Resource Insitute
IFC	International Finance Corporation
IRAP	Industrial Research Assistance Program
IVR	interactive voice response
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KEMRI	Kenya Medical Research Institute
KEMSA	Kenya Medical Supplies Authority
MCF	Medical Credit Fund
MOH	Ministry of Health
MSH	Management Sciences for Health
NASCOP	National AIDS and STI Control Programme
NCD	noncommunicable disease
Norad	Norwegian Agency for Development Cooperation
OpenSRP	Open Smart Register Platform
PCR	polymerase chain reaction
PEPFAR	US President's Emergency Plan for AIDS Relief
PMI	President's Malaria Initiative
PSI	Population Services International
RDT	rapid diagnostic test
SID	Society for International Development
SMS	short message service
SORMAS	Surveillance Outbreak Response Management and Analysis System
SWAP	Safe Water and AIDS Project
UMB	University of Maryland, Baltimore
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USSD	unstructured supplementary service data
VSO	Voluntary Service Overseas
WASH	water, sanitation, and hygiene
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.	Messaging
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.	Microplanning
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.	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.	Patient monitoring
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.	Supply chain
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.	Vaccine management
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.	

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.