

Guidance on the use of digital solutions to support the COVID-19 national deployment and vaccination plans

Prepared by the COVAX Innovation to Scale Working Group

November 2021



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Acknowledgements

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Acronyms

ACT	Access to COVID-19 Tools
AEFI	Adverse Events Following Immunization
BMGF	Bill & Melinda Gates Foundation
C19RM	COVID-19 Response Mechanism
CDC	US Centers for Disease Control and Prevention
CDS	COVID-19 Vaccines Delivery Support
CEPI	Coalition for Epidemic Preparedness Innovations
CHAI	Clinton Health Access Initiative
DHIS2	District Health Information Software 2
DICE	Digital Health Centre of Excellence
DIIG	Digital Implementation Investment Guide
DPPA	Digital Pandemic Preparedness Assessment
EDIT	Early Stage Digital Health Investment Tool
EIR	Electronic Immunization Record
eHealth	Electronic Health
eLMIS	electronic Logistics Management Information System
EPI	Expanded Programme on Immunization
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GS1	Global Standards 1
HRH	Human Resources for Health
ICT	Information and Communications Technology
IHRIS	Human Resources Information System
NDVP	national deployment and vaccination plan
ODK	Open Data Kit
RCCE	Risk Communication & Community Engagement
RTM	Real Time Monitoring
SAGE	Strategic Advisory Group of Experts on Immunization
SCANIT	Supply Chain Analysis and Intelligence Tool
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
WHO	World Health Organization



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Introduction

COVAX is the vaccine pillar of the Access to COVID-19 Tools (ACT) Accelerator, co-led by the Coalition for Epidemic Preparedness Innovations (CEPI), Gavi, the Vaccine Alliance (hereafter Gavi), UNICEF and WHO. Its goal is to facilitate equitable access to and distribution of vaccines to protect people in all countries, using the values framework endorsed by the WHO Strategic Advisory Group of Experts on Immunization (SAGE). As countries are currently working with their Interagency Coordinating Committees and National Logistics Working Groups to prepare their [national deployment and vaccination plans](#) (NDVPs) for COVID-19 vaccines, as well as their funding proposals to Gavi, the Global Fund, the World Bank and other donors, there is an opportunity to identify areas where digital solutions and innovations can amplify efforts, while producing actionable data.

The [Gavi COVID-19 Vaccines Delivery Support \(CDS\) guidelines](#)¹ (p. 6) encourage countries to include innovative activities that support COVID-19 vaccine delivery in their CDS needs-based funding requests where possible. For the purpose of these requests, Gavi defines innovation broadly, as the use of practices, products or services new to COVID-19 vaccine delivery in a country. This guide provides an overview of the most promising evidence-based digital innovations and procedures that can be deployed at different times during vaccine planning, distribution and scaling up in low- and middle-income settings, using the [NDVP framework](#). The proposed actions presented complement broader guidance and make strategic references to the [WHO Digital Implementation Investment Guide \(DIIG\)](#), and the [UNICEF digital health guidance for COVID-19 response](#).

Key considerations for introducing a new vaccine and leveraging digital solutions to support its deployment

Introducing any new vaccine – especially with new target populations – using new delivery strategies is challenging. Ensuring acceptance and uptake of COVID-19 vaccination at country level is key to the successful reduction of transmission and containment of the pandemic, but presents a unique set of difficulties. To ensure acceptance and uptake of COVID-19 vaccination, countries will need to adopt an integrated approach that:

- Starts with listening to and understanding target populations, to generate behavioural and social data on the drivers of uptake and to design targeted response strategies.
- Builds a supportive and transparent information environment and addresses misinformation through social listening and assessments that inform digital engagement initiatives.
- Builds trust and acceptance of the vaccines through engagement of communities by civil society organizations, particularly for vulnerable target populations.
- Provides health workers with the requisite knowledge of COVID-19 vaccines as first adopters, trusted influencers, and vaccinators, giving them the skills to communicate effectively and persuasively with target populations and communities.
- Prepares countries to respond to any reports of adverse events following immunization (AEFI) and have planning in place to mitigate any resulting crises of confidence.
- Strives for equity in vaccine access as a guiding principle for all countries to adequately protect groups experiencing greater burden from COVID-19.
- Ensures that the planning team is representative of the respective government’s eHealth and digital transformation structures, rather than sitting within disease verticals. This often requires the inclusion of stakeholders from multiple areas: the Expanded Programme on Immunization (EPI); Community Health; Monitoring and Evaluation; Planning; Information and Communications Technology (ICT); as well as other key stakeholders within the Ministry of Health and, sometimes, externally (Ministry of ICT, ICT Authority, Communications Commission, etc.).

Once a planning team has been formed, it should meet, together with any important additional stakeholders, to articulate a common understanding of the main goals of the health programme and how they align with the country’s national digital health strategy (if one is in place). The team should also review core programme documents, data and assessment reports that describe the programme’s goals and objectives, including how it has performed to date (see [DIIG²](#) p. 22). Specifically, the team should:

- Review the country’s health sector development plan, NDVP, eHealth strategy, etc.
- Ensure that national coordination structures (eHealth technical working groups, donor coordination working groups, etc) are all engaged and consulted.
- Pinpoint specific health programme processes and articulate the bottlenecks that it seeks to improve, which will set the stage for selecting appropriate digital health interventions ([DIIG²](#) p. 29).
- Map workflows, at which point challenges – or bottlenecks – should emerge. These

are areas where failures in service delivery occur, where health workers experience frustrations or even where patients may be lost to follow-up. Bottlenecks are the specific gaps that prevent people from reaching their goals and achieving positive health outcomes. Subsequently, the team should conduct a root cause analysis, which may reveal situations where a digital health intervention may not be warranted or ideal.

- Focus on describing the highest priority bottlenecks using a common vocabulary, so they can be linked to possible interventions. WHO developed a classification for health system challenges ([WHO Guideline: Recommendations on digital interventions for health system strengthening](#)³ pp. xv–xxii) that standardizes the categories of common bottlenecks experienced at various levels of the health system. This classification provides a consistent method for grouping the diverse methods that the various participants – from patients to health workers to decision-makers – use for expressing very granular, programme-specific bottlenecks and their root causes ([DIIG²](#) pp. 36–38).

The next step involves identifying and selecting digital health interventions that address the prioritized health systems challenge(s). At this stage, the following actions should be taken:

- If digital health interventions are appropriate, select one or more that have [demonstrated effectiveness](#) and determine how these interventions can address the prioritized challenge(s).
- Define what key functionalities and features the digital health interventions should have based on end-user needs and stakeholder expectations.
- Determine if existing digital health applications can be leveraged to support the prioritized health system challenges. This will show how the proposed implementation can integrate with or use the functionality of existing digital health applications and shared services ([DIIG²](#) p. 46).

- Explore whether existing systems can meet the defined needs, or can be augmented or expanded to meet those needs. If not, consider introducing a new system or platform ([DIIG²](#) pp. 56–59).
- The [Map & Match project](#), [DPPA](#) and [Digital Health Atlas](#) are all good tools that can be used to assess existing systems in each country.
- The Digital Square summary of [digital tools supporting vaccine deployment](#) or the Digital Public Goods Alliance report on [Health DPGs for Immunization Delivery Management](#) can be used as references to identify digital, open-source, public-good solutions specifically designed for vaccine deployment.
- The [Inter-American Development Bank](#), [Digital Impact Alliance](#), and the [US Centers of Disease Control and Prevention \(CDC\)](#) have also developed useful guidance and product catalogues for COVID-19 surveillance, diagnosis, prevention and treatment.

Next, determine whether the enabling environment can support the selected digital health interventions. This includes understanding the ecosystem and absorptive capacity of the environment in which the interventions will be implemented to ensure their feasibility.

- Digital health interventions are delivered through digital health applications, which ideally are linked to a supportive digital health platform comprising shared services and enabling components (in cases where there are multiple applications). These applications and platform, together with the people, processes and policies that support and use them to deliver health services to clients, make up the digital health enterprise. Successful deployment of digital health applications requires a thorough knowledge of the ecosystem where the interventions will be deployed and whether they can be supported in that environment. Understanding this context can help determine the feasibility of implementing the digital health enterprise and demonstrate where system integrations will be required.

- Use globally recognized and standardized assessment tools like [Digital Health Index](#), the [EDIT](#), and/or the [Digital Pandemic Preparedness Assessment tool \(DPPA\)](#) to help prioritize and cost the way forward.
 - Resources will be vital to the effort to deploy and use COVID-19 vaccine monitoring solutions. It is therefore important that these costs are estimated considering available general government and Ministry of Health resources (domestic and external resources).
 - As economic repercussions of COVID-19 impact government budgets, it is important that a digitally enabled COVID-19 vaccine strategy is an integral part of the general government response and reflected in budgets. The same condition applies to essential health services including the routine immunization budget.

It is important to understand the national policies and regulations that may apply and explore relevant global best practices when national policies are lacking. These could include regulations for hosting data and using personally identifiable information, processes for informed consent, relevant standards, and linkages with other systems. A successful digital health implementation plan will assess the current policy environment, adapt the design to that environment and ensure that policies are sufficiently implemented.

Country Technical Support via the Digital Health Centre of Excellence (DICE)

The Digital Health Centre of Excellence (DICE) is a mechanism for delivering coordinated, standardized support to governments, enabling them to prepare and deploy mature digital technologies to support health service delivery in the context of the COVID-19 pandemic. DICE can support countries to use digital solutions, many of which are mature and already integrated into national systems, and help expand these solutions to substantially reinforce the COVID-19 pandemic response using a health system strengthening lens. Actions include planning distribution of commodities and vaccines; tracking supplies; surveillance and case detection; monitoring coverage of services; and communicating to generate demand and reduce misinformation. Currently DICE is working with countries on digital solutions to support COVID-19 vaccine deployment, specifically related to:

- service delivery planning and microplanning
- logistics and inventory management
- vaccination registration and adverse event reporting
- vaccination status and digital certificates
- coverage monitoring
- counterfeit detection and traceability
- remote health worker learning
- community mobilization
- health service delivery and integration with routine immunization and primary healthcare.

DICE aligns with donor agencies and supports governments to identify and apply for funding for deployments using costed investment cases. Specifically, DICE:

- coordinates between donors and development partners at the regional and global level
- reviews concept notes, terms of reference, business requirements and proposals
- provides guidance and supports implementation of assessment tools
- advises on existing Digital Global Goods, including existing evidence and plans to scale/institutionalize
- provides recommendations and support in contracting technical experts and partners
- supports capacity building, training and knowledge exchange.

To request technical assistance, contact the DICE secretariat: contact@digitalhealthcoe.org. Support requests should be from or endorsed by the government and be using existing technical/donor coordinating mechanisms. Technical assistance should be aligned with NDVPs and leverage existing Global Fund (C19RM), Gavi and other assistance mechanisms. Support will be provided through existing regional and country structures, including government, United Nations, and DICE consortium partners. The DICE is a consortium of partners, including the Bill & Melinda Gates Foundation (BMGF), GIZ, CDC, the European Commission, the Global Fund, the UK Foreign, Commonwealth and Development Office, Gavi, the United States Agency for International Development (USAID), Digital Square and the World Bank. It is co-hosted by a UNICEF-WHO virtual secretariat that manages day-to-day activities and coordination with consortium members and other technical partners like the Clinton Health Access Initiative (CHAI). DICE is currently funded by donations from the BMGF, the German Development Ministry (BMZ), Gavi and GIZ.

Table 1. Summary of prioritized activities by NDVP programmatic area and examples of relevant digital processes and interventions

NDVP programmatic area	Prioritized activities	Relevant digital interventions
Regulatory preparedness	<ul style="list-style-type: none"> Developing or updating tools and regulatory procedures for registration of new vaccines and expedited import approvals. Supporting National Regulatory Authorities to effectively communicate with communities on the safety of vaccines. This may include building confidence in the registration processes of new vaccines, vaccine safety profiles and AEFI reporting channels. 	<ul style="list-style-type: none"> Consider developing or updating tools and regulatory procedures for vaccine registration and certification. Review existing digital health opportunities/tools to facilitate communication between national regulatory authorities and beneficiary communities on vaccine areas including safety and access. Support the assessment of country readiness using established maturity model tools to facilitate a discussion between government staff and national stakeholders around the building blocks that will inform the selection, design and investments needed for sustainable scaling of digital health solutions for vaccine roll-out. Areas to assess include: <ul style="list-style-type: none"> human capacity standards and interoperability governance and policy data capture and use investments and funding infrastructure.
Planning and coordination	<ul style="list-style-type: none"> Planning and coordination meetings for COVID-19 vaccine deployment at national and sub-national levels ensuring representation from civil society organizations, including community and faith-based organizations, women's groups and other marginalized high-risk groups. Identifying optimal vaccine delivery models based on community perspectives using human-centred design. Enhancing programme management and coordination capacities at all levels. Updating microplans as needed. Mapping opportunities for reaching target groups in marginalized/missed communities with integrated interventions including routine immunization and COVID-19 vaccination. Mapping opportunities and defining pathways for integrating COVID-19 vaccination with routine immunization and other health interventions such as primary health care across the life course. 	<ul style="list-style-type: none"> Review and assess the ecosystem to identify digital health opportunities including initiatives that strengthen near real-time data collection and monitoring for coordination of vaccine deployment at national and sub-national levels. Review and assess the ecosystem in line with the geospatial update of microplans, including availability and governance of core datasets (health facilities, human settlements, health areas), existing technical capacity and governance (eventually link with geospatial regulatory agencies such as National Statistical Offices and National Spatial Data Infrastructure committees). Identify and scale digital solutions that support optimal vaccine distribution models based on community perspectives and human-centred design. Map geographic coverage of existing service delivery infrastructure at national level, combined with target population estimates to assess gaps in supply and human resources versus target population.
Costing and funding: ensuring funds reach the point of delivery	<ul style="list-style-type: none"> Updating budgets and costing of COVID-19 vaccine delivery as needed. Resource mapping for COVID-19 vaccine delivery. 	<ul style="list-style-type: none"> Explore the use of digital payment platforms and services. Update budgets and costing for COVID-19 vaccine delivery to include digital platforms and services, using a Total Cost of Ownership tool. Based on country readiness assessments, develop costed investment cases that can be included in presentations to donors and partners in the context of resource mobilization efforts.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
Identification of target populations	<ul style="list-style-type: none"> Defining and identifying priority target groups in missed communities and the appropriate vaccine delivery strategies, as well as opportunities for integration with routine immunization and other essential services. 	<ul style="list-style-type: none"> Strengthen existing electronic patient/beneficiary registries to identify priority target populations and develop strategies for outreach, specifically by creating lists of frontline health and social workers, elderly people, and other risk groups such as those with pre-existing conditions. Establish or update national Human Resources for Health (HRH) registries and advocate for inclusion of all frontline health workers across the health system, including community health workers, and register their age, gender, contacts, catchment area, tasks, capacity, etc. Leverage digital solutions for frontline health workers to register and map eligible people during community mobilization activities, to allow the creation of priority lists. Update national lists of human settlement locations, potentially making use of satellite-derived information products on population households and settlements, as well as demographic data, to strengthen such lists and improve spatial information on the distribution of target populations.
Vaccination delivery strategies	<ul style="list-style-type: none"> Establishing and operating vaccination sites (depending on local context, these may be fixed, mobile or outreach services) while ensuring the security of the health workforce. Implementing integrated strategies for under-vaccinated or underserved priority populations. Developing and implementing plans for COVID-19 vaccination quality assurance and improvement. Integrating vaccine delivery into primary health care services that are used and trusted by the communities and marginalized groups such as those attending clinics for non-communicable diseases, TB and HIV. Updating national vaccination policies and guidelines to include adult vaccination. 	<ul style="list-style-type: none"> Monitor information channels, such as social and traditional media, to analyse misinformation circulating in the community. Use this analysis to create and share information that is accurate, clear, and easy to find on the websites, social media, chatbots and other platforms that the target audience uses to find health information. Develop and use social listening tools (which access online and offline data streams); establish two-way 'channels' for targeted community and public information sharing such as hotlines (text and talk), responsive social media, and radio shows. Support governments to adopt open-source messaging solutions like chatbots and translate these into local languages. Update national digital health strategies to adopt national vaccination information policies and strategies. Strengthen existing data collection and monitoring systems (e.g., for routine immunization and primary health care) to accommodate the COVID-19 vaccine modules. Strengthen data visualization dashboards for analysis, reporting and use of data for action and decision-making. Use Real Time Monitoring (RTM) approaches and digital solutions for immunization planning, readiness assessments and implementation, by leveraging systems and platforms currently in place whenever possible. <ul style="list-style-type: none"> RTM approaches may be deployed to refine immunization strategies and plans, ensure immunization resources are distributed and used optimally, reduce vaccine hesitancy via timely action taken to address misconceptions, improve service delivery and ensure the appropriate use of funds and resources and the timely distribution of incentives.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p>Vaccination delivery strategies (continued)</p>		<ul style="list-style-type: none"> ○ RTM approaches may also support elements of supply and logistics, including cold chains, stocks, wastage rates, etc. ○ Real-time digital data collection tools with protocols make data available more frequently (e.g., daily) and are used with real-time analysis of data to help detect and remediate issues as they occur, e.g., for redistribution of vials, mobilization of community members or identification and follow-up of AEFIs. ● Review the mapping or readiness assessment results to identify digital solutions with potential to support supply chain management, specifically, by forecasting when facilities will need supplies and by submitting, tracking and ensuring orders are safely delivered. ● Develop, test and scale up innovative service delivery models, including differentiated vaccine delivery strategies to effectively reach population groups with low coverage. ● Strengthen Master Facility Lists/Registries and HRH Registries, and provide these as services within national Health Information Systems. ● Integrate spatial data on the location of populations and health resources to strengthen the microplanning process: informing planning teams of delivery strategies (i.e., fixed, outreach, mobile, mass campaigns), cognizant of populations' physical access to vaccination points; optimizing the location of vaccination delivery points to maximize coverage; and supporting logistics of community-based outreach activities. Consider re-using and adapting spatial microplans from other programmes (polio campaigns, malaria long-lasting insecticidal nets/insecticide-treated nets campaigns).
<p>Preparation of supply chain and management of health care waste</p>	<ul style="list-style-type: none"> ● Supporting use of existing systems or introducing new systems (Target Software Standards qualified electronic Logistics Management Information System (eLMIS)) and tools to improve availability of precise and accurate data on vaccine stocks, wastage, temperature excursions, available cold chain equipment capacity and functionality at all levels of the supply chain. ● Supporting deployment of systems and tools for vaccine forecasting, triangulation of stock/coverage data, and use of data for action at all levels of the supply chain. ● Supporting robust supply and logistics planning and implementation in relation to optimal storage, temperature monitoring and control, distribution and redistribution planning, and waste management. ● Supporting establishment/integration of vaccine accountability and reporting systems into the COVID-19 response. ● Supporting identification of waste management needs for COVID-19 vaccine products and develop mitigation plans. 	<ul style="list-style-type: none"> ● Conduct a cold chain assessment using digital data collection tools, for example using smart phone/tablet-based data collection tools or SMS (specifically for low bandwidth settings). ● Assess the public supply chain to understand its operational and strategic capabilities and the availability of resources to inform the way forward across all areas of the immunization and COVID-19 vaccine supply chains, utilizing the UNICEF Maturity Model. ● Stress test the immunization supply chain to understand if it is fit for purpose and create different logistical scenarios that would inform the deployment of COVID-19 vaccines in the shortest possible time using the Supply Chain Analysis and Intelligence Tool (SCANIT). ● Consider establishing digital systems for vaccine management information, such as for remote temperature monitoring, fridge functionality and electricity. ● Strengthen immunization supply chain management using digital solutions and eLMIS that are compliant with the Target Software Standards:

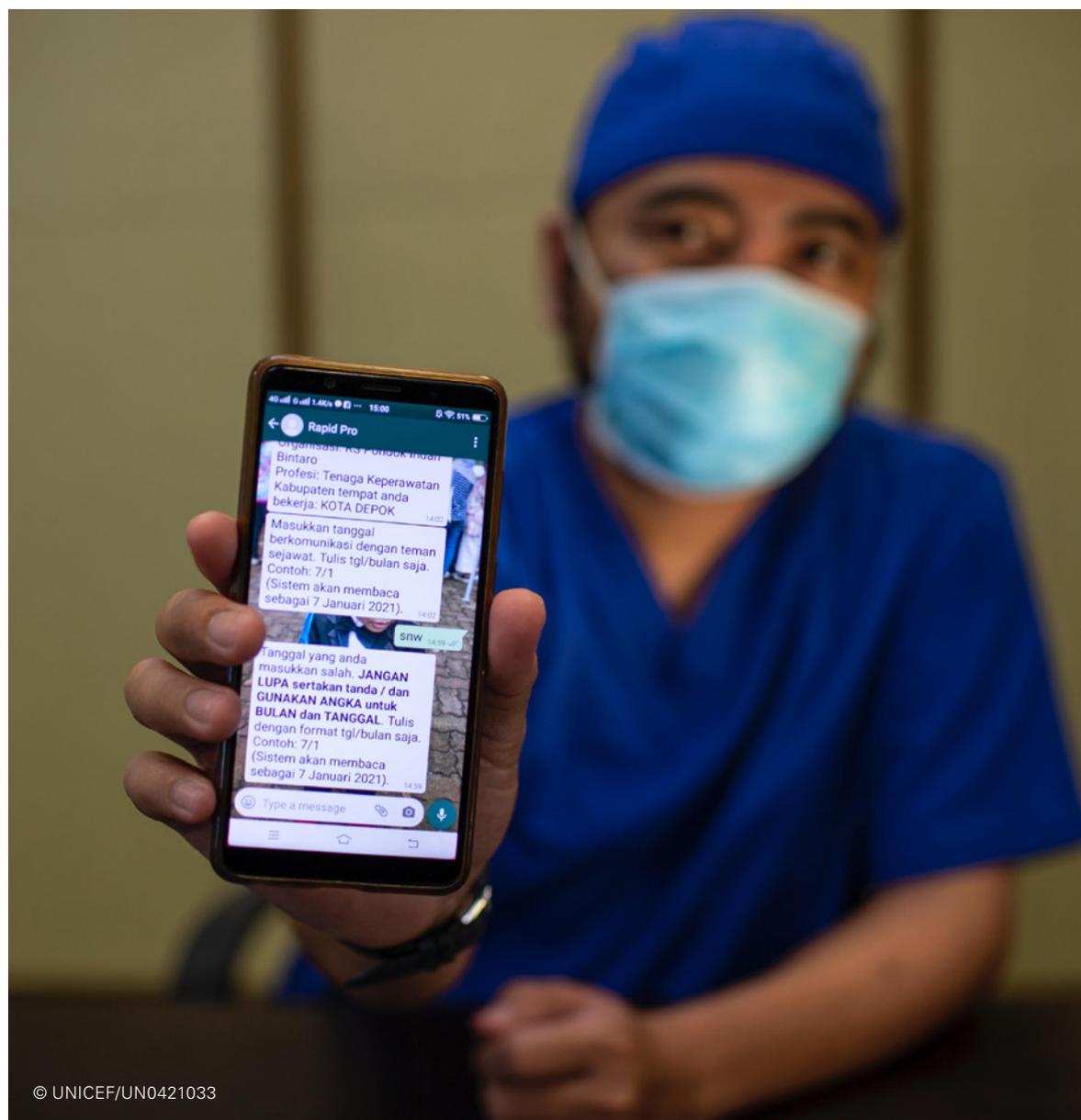
NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p>Preparation of supply chain and management of health care waste (continued)</p>	<ul style="list-style-type: none"> Supporting regular review of supply chain and logistics performance, at national and subnational levels, as well as triangulation with service delivery data (considering data use barriers and mitigating them) and iterative course correction. Taking established systems for forecasting, stock management and vaccine accountability to scale across all EPI vaccines (routine and campaign). 	<ul style="list-style-type: none"> Strengthen existing or introduce new eLMIS to accommodate COVID-19 vaccines and related commodities/equipment, including dashboards to visualize and map stock availability. Explore fuller integration of serialized routine immunization and COVID-19 vaccines into LMIS/eLMIS for fuller 'track and trace' capability. Explore remote temperature monitoring devices to manage the performance of the cold chain. Support the scaling up of Global Standards 1 (GS1) enabled COVID-19 vaccine verification to reduce the risk of falsified products in legitimate supply chains and eventually achieve end-to-end traceability for all vaccines, medicines and health products. Link this verification system with the newly established Global Trust Repository to store traceability data for use by national regulatory authorities. Support waste management system optimization, including the use of innovative waste management techniques/equipment. Conduct End User Monitoring to assess and measure availability, quality, utilization and distribution of COVID-19 vaccines at service delivery points. Identify areas for improvement in supply chain models to ensure sustainable access to vaccines using tablet-based data collection tools or computers.
<p>Human resource management and training</p>	<ul style="list-style-type: none"> Developing and implementing surge capacity to deliver high volumes of COVID-19 vaccines while maintaining routine immunization. This can include recruitment, remuneration, training and supervision of temporary staff at all levels. Supporting expenses associated with vaccine delivery including staff allowances/per diems and fuel for outreach and vaccine transportation. Conducting training, mentorship and supportive supervision. 	<ul style="list-style-type: none"> Establish or update national HRH registries using e.g., Human Resources Information Systems (iHRIS), and advocate the inclusion of all frontline health workers across the health system. Adopt and conduct innovative learning and supervision approaches such as digital knowledge sharing, training and performance management. Adopt and deploy available and digitally formatted health worker training content by localizing and validating it for the appropriate country context, and disseminating it using digital communications platforms. Identify opportunities to digitize supportive supervisory visits during vaccine monitoring using electronic supervision checklists and other performance management tools. Invest in 'digital dexterity', i.e., the training and capacity needed to build the competencies required among government staff to effectively adopt and sustain digital public goods for vaccine management. Strengthen Master Facility Lists/Registries and HRH Registries, and provide these as services within national Health Information Systems. Consider adopting digital tools with geotagging capabilities, such as Open Data Kit (ODK), for monitoring and targeting of human resource supervision visits.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p><i>Vaccine acceptance and uptake (demand)</i></p>	<ul style="list-style-type: none"> • Systematically collecting, analysing, understanding and acting on the drivers and barriers of vaccine acceptance and uptake at population level, including health and frontline workers. • Developing systematic approaches for social listening for immunization and broader health to help identify and mitigate risks and rumours related to COVID-19 vaccines. • Designing behaviourally informed interventions or complementary Risk Communication & Community Engagement (RCCE) and social listening approaches, with strong linkages between them. • Conducting community mobilization and developing communication materials to combat vaccine hesitancy and build confidence in COVID-19 vaccines and in the health workers delivering them, as well as to counter hesitancy about routine immunization, wherever prevalent. • Developing community engagement approaches in partnership with civil society organizations to reach marginalized and vulnerable groups, especially in underserved areas, and use it as an opportunity to improve uptake of routine immunization. • Implementing holistic and human-centred communication interventions, harnessing the power of available mediums and platforms. • Conducting quick learning assessments to ensure quality, reach and cost effectiveness of demand interventions. • Tackling gender barriers to COVID-19 vaccine deployment. • Working with religious leaders' networks to counter and address misinformation around vaccines. • Scaling up behavioural interventions that promote vaccine confidence among health care workers, leading to them getting vaccinated and advising communities to do the same. 	<ul style="list-style-type: none"> • Strengthen existing data and monitoring systems (immunization and public health) to accommodate the COVID-19 vaccines, as well as data collection, analysis and reporting, and use of data for action and decision-making. Also strengthen the understanding of the information ecosystem among different priority groups to inform demand strategies. • Consider systematic approaches for gathering qualitative insights, in addition to more formal survey data, from communities through digital ethnography. • Consider establishing a social listening and engagement strategy that consolidates digital (media, social media, 'U-Report' etc.) and offline data feeds into a single system, enabling analysts to provide regular actionable insights to RCCE teams. • Consider adopting the Digital Documentation of COVID-19 Certificates shared architecture to verify vaccination status of individuals, using both digital (e.g., smart phones) and analog (e.g., paper yellow cards, ID cards) to support continuity of care, opening of businesses and cross-border travel. • Use generated insights to develop digital content to promote demand, use or adapt and scale up digital solutions and approaches: <ul style="list-style-type: none"> ◦ Invest in national data science capacity, including using Geographic Information System (GIS) mapping to triangulate and help identify target populations and map missed and vulnerable communities. ◦ Identify digital solutions that utilize SMS, Integrated Voice Response and mainstream social media for information sharing to increase knowledge and demand for vaccines and to identify gaps in information/detect misinformation. These may also include two-way messaging platforms (chatbots) that, using artificial intelligence and natural language processing, conduct social monitoring on the prevalence of and reasons for vaccine hesitancy.
<p><i>Vaccine safety monitoring, management of AEFI and injection safety</i></p>	<ul style="list-style-type: none"> • Enhancing AEFI surveillance including the reporting system, health care workers' awareness of AEFI reporting, and AEFI data management. • Understanding and addressing vaccine safety and pharmacovigilance challenges. 	<ul style="list-style-type: none"> • Explore the ability of existing health management information systems to perform digital tracking and tracing of AEFI reporting. • Consider using community-level digital communication tools for safety monitoring. • Digitalize the Case Based Surveillance AEFI management system to strengthen active AEFI monitoring. • Consider linking AEFI reporting to global pharmacovigilance processes, e.g., linking to the Uppsala Monitoring Centre using VigiFlow. • Consider adopting digital tools with geotagging capabilities, such as ODK or District Health Information Software 2 (DHIS2) mobile capture, for linking AEFI identification to GIS for visualization and monitoring.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p>Immunization monitoring systems</p>	<ul style="list-style-type: none"> • Strengthening data collection, validation, reporting and monitoring of COVID-19 programme implementation progress and equitable access. This could include the collection, validation, reporting and use of national and subnational data, disaggregated by priority factors, such as gender, population group, age, occupation and co-morbidities. • Strengthening reporting of data to the regional level (such as regional dashboards) and the global level (such as through the WHO-UNICEF COVID-19 monthly Joint Reporting Form module). • Establishing or strengthening community-based monitoring systems to measure data on availability, accessibility, acceptability, equity and quality of COVID-19 vaccination services received. • Integrating COVID-19 into existing health management information or vaccination-related data systems. 	<ul style="list-style-type: none"> • Use, adapt and scale up digital solutions to enable real-time analytics to track vaccine delivery, track rates of missed appointments and loss-to-follow-up, and ensure critical segments are vaccinated first: <ul style="list-style-type: none"> ○ Real/near real-time data on vaccination coverage <ul style="list-style-type: none"> ▪ Strengthen the Health Management Information System to provide disaggregated data at country level and aggregated data at regional level (such as regional dashboards) and global level (such as through the WHO-UNICEF COVID-19 monthly Joint Reporting Form module). ▪ Explore opportunities to update surveillance information flows within any existing laboratory information systems. ▪ Invest in expanding existing DHIS2 capacity, where already deployed, to support vaccination coverage monitoring. ▪ Invest in national data science capacity, including using GIS mapping to triangulate and help identify target populations and map missed and vulnerable communities. ○ RTM for planning, implementation (including supply, logistics, etc.) and reporting <ul style="list-style-type: none"> ▪ Leverage digital data collection tools and systems with protocols to make more detailed disaggregated data available more frequently (e.g., daily instead of weekly/monthly). ▪ Conduct real-time analysis of data to help detect and remediate issues as they occur, e.g., for planning, preparedness, redistribution of resources and supplies, or mobilization of community members. ○ Registration of individuals or vaccination events <ul style="list-style-type: none"> ▪ If this step is considered a priority, explore the use of a web portal or mobile phone-based self-registration functions with eligibility checks and scheduling of vaccine or test appointments.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p>Immunization monitoring systems (continued)</p>		<ul style="list-style-type: none"> ▪ Explore feasibility, sustainability and readiness for deployment of Electronic Immunization Records (EIRs) that facilitate the monitoring of individual immunization schedules and the storage of individual immunization histories. EIRs can facilitate understanding of coverage gaps, track multi-dose vaccine dropouts, and direct communications (e.g., text messages) for recalls or reminders to clients. EIRs can also be useful for COVID-19 immunization activities to provide real-time coverage feedback. ▪ Using EIRs or individual vaccination data, generate dashboards to monitor performance by provider, and embed immunization decision support to help health care workers ensure that families return at the right time for their next immunization. ▪ Digital registries like EIRs can also be developed for pregnant women (antenatal care/postnatal care visits) and subsequently linked with newborn infants for healthy child visits and routine immunization. ▪ Consider adopting the Digital Documentation of COVID-19 Certificates shared architecture to verify vaccination status of individuals using both digital (e.g., smart phones) and analog (e.g., paper yellow cards) to support continuity of care, opening of businesses and cross-border travel. <ul style="list-style-type: none"> • Leverage the agreed-to standards for data exchange, authentication and security, and invest in interconnectivity between different data monitoring systems to allow insights in subnational- or district- level dashboards across areas of response, e.g., COVID-19 vaccine coverage mapping, facility stock data and COVID-19 case surveillance data. • Strengthen Master Facility Lists/Registries and HRH, and provide these as services within national Health Management Information Systems.
<p>COVID-19 surveillance</p>	<ul style="list-style-type: none"> • Integrating COVID-19 surveillance into existing surveillance systems for vaccine preventable diseases. • Supporting COVID-19 disease surveillance. 	<ul style="list-style-type: none"> • Leverage digital solutions to conduct monitoring and response for frontline health workers to register COVID-19 cases. • Leverage the agreed-to standards for data exchange, authentication and security; create an Application Programming Interface for distributed vaccine registers; and invest in interconnectivity between different data monitoring systems to allow insights in subnational- or district-level dashboards across areas of response, e.g., COVID-19 vaccine coverage mapping, facility stock data and COVID-19 case surveillance data. • Integrate COVID-19 surveillance into integrated electronic surveillance systems for vaccine preventable diseases.

NDVP programmatic area	Prioritized activities	Relevant digital interventions
<p>Evaluation of COVID-19 vaccine introduction</p>	<ul style="list-style-type: none"> Conducting programmatic evaluation and learning activities, such as COVID-19 post-introduction evaluations, Intra-Action Reviews, case studies, operations research, syntheses, and other efforts. 	<ul style="list-style-type: none"> Explore and review design requirements for digital health initiatives to include programmatic evaluation and learning activities, such as COVID-19 post-introduction evaluations, Intra-Action Reviews, case studies, operations research, syntheses, and other efforts. Conduct implementation research to evaluate the implementation and scale-up of digital innovations.



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Annex: Guidance for each National Deployment and Vaccination Plan (NDVP) pillar

NDVP pillar 1 – Regulatory preparedness

Digital health processes and interventions related to regulatory preparedness

- Consider developing or updating tools and regulatory procedures for vaccine registration and certification.
- Review existing digital health opportunities/tools to facilitate communication between national regulatory authorities and beneficiary communities on vaccine areas including safety and access.
- Support the assessment of country readiness using established maturity model tools to facilitate a discussion between government staff and national stakeholders around the building blocks that will inform the selection, design and investments needed for sustainable scaling digital health solutions for vaccine roll-out. Areas to assess include:
 - human capacity
 - standards and interoperability
 - governance and policy
 - data capture and use
 - investments and funding
 - infrastructure.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Digital Pandemic Preparedness Tool](#) to provide a systematic methodology to identify needs for digital tools that integrate with countries' existing digital ecosystem, while modernizing their overall pandemic preparedness, response and vaccination roll-out planning and execution.
- [Map and Match Tool](#) to understand the landscape of existing, adaptable software tools used at scale in countries, and subsequently match those tools with potential use cases for COVID-19.
- [UNICEF Country Mapping tool](#) of relevant Digital Health tools and technologies that can be leveraged to support countries' health initiatives and other sectors, for their response to COVID-19.

Other resources

- [Early Stage Digital Health Investment Tool](#)
- [Digital Health Atlas](#)
- [Digital Implementation Investment Guideline \(DIIG\)](#) – Chapter 4

NDVP pillar 2 – Planning and coordination

Digital health processes and interventions related to planning and coordination

- Review and assess the ecosystem to identify digital health opportunities including initiatives that strengthen near real-time data collection and monitoring for coordination of vaccine deployment at national and sub-national levels.
- Review and assess the ecosystem in line with the geospatial update of microplans, including availability and governance of core datasets (health facilities, human settlements, health areas), existing technical capacity and governance (eventually link with geospatial regulatory agencies such as National Statistical Offices and National Spatial Data Infrastructure committees).
- Identify and scale digital solutions that support optimal vaccine distribution models based on community perspectives and human-centred design.
- Map geographic coverage of existing service delivery infrastructure at national level, combined with target population estimates to assess gaps in supply and human resources versus target population.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- Use cases/Understanding the benefit of geospatial technologies: [Improving Immunisation Coverage and Equity through the Effective Use of Geospatial Technologies and Data](#)
- Assessing the geo-enabling environment: [Guidance on the Use of Geospatial Data and Technologies in Immunization Programs](#)
- Planning and budgeting for implementation: [Leveraging Geospatial Technologies and Data to Strengthen Immunisation Programmes](#)
- GIS technical support: [Using geospatial data and digital technologies, including geographic information systems \(GIS\), to support the planning and monitoring of service delivery at the local level of health facility and health district](#)

Other resources

- [Planning for an Information Systems Project – A toolkit for public health managers](#)
- [Digital Implementation Investment Guideline \(DIIG\) – Chapter 5](#)
- [Global Goods Maturity Model for evaluating solutions](#)
- [The Global Healthsites Mapping Project](#)
- [Mapping geographic access to health care tools and use cases](#)

NDVP pillar 3 – Costing and funding: ensuring funds reach the point of delivery

Digital health processes and interventions related to costing and funding

- Explore the use of digital payment platforms and services.
- Update budgets and costing for COVID-19 vaccine delivery to include digital platforms and services, using a Total Cost of Ownership tool.
- Based on country readiness assessments, develop costed investment cases that can be included in presentations to donors and partners in the context of resource mobilization efforts.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Digital Implementation Investment Guideline \(DIIG\) – Chapter 7](#)
- [Dimagi Total Cost of Ownership model](#)

Other resources

- [Country COVID-19 funding mapping](#)

NDVP pillar 4 – Identification of target populations

Digital health processes and interventions related to identification of target populations

- Strengthen existing electronic patient/beneficiary registries to identify priority target populations and develop strategies for outreach, specifically by creating lists of frontline health and social workers, elderly people, and other risk groups such as those with pre-existing conditions.
- Establish or update national HRH registries and advocate for inclusion of all frontline health workers across the health system, including community health workers, and register their age, gender, contacts, catchment area, tasks, capacity, etc.
- Leverage digital solutions for frontline health workers to register and map eligible people during community mobilization activities, to allow the creation of priority lists.
- Update national lists of human settlement locations, potentially making use of satellite-derived information products on population households and settlements, as well as demographic data, to strengthen such lists and improve spatial information on the distribution of target populations.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [WHO & UNICEF GIS Working Group for equitable COVID-19 vaccine deployment](#)
- [Digital Global Goods developed to support vaccine deployment](#)
- Use cases/Understanding the benefit of geospatial technologies for population mapping: [Improving Immunisation Coverage and Equity through the Effective Use of Geospatial Technologies and Data](#)
- Planning and Budgeting for population mapping: [Leveraging Geospatial Technologies and Data to Strengthen Immunisation Programmes](#)

Other resources

- [EIR – Practical considerations for planning, development and evaluation](#)
- [iHRIS Implementation Toolkit](#)
- [Introduction to the Health workforce registry](#)
- [Open spatial demographic data \(Global\)](#)
- [Geographic, population and demographic data \(Africa\)](#)

NDVP pillar 5 – Vaccination delivery strategies

Digital health processes and interventions related to vaccination delivery strategies

- Monitor information channels, such as social and traditional media, to analyse misinformation circulating in the community. Use this analysis to create and share information that is accurate, clear, and easy to find on the websites, social media, chatbots and other platforms that the target audience uses to find health information.
- Develop and use social listening tools (which access online and offline data streams); establish two-way 'channels' for targeted community and public information sharing such as hotlines (text and talk), responsive social media, and radio shows.
- Support governments to adopt open-source messaging solutions like chatbots and translate these into local languages.
- Update national digital health strategies to adopt national vaccination information policies and strategies.
- Strengthen existing data collection and monitoring systems (e.g., for routine immunization and primary health care) to accommodate the COVID-19 vaccine modules. Strengthen data visualization dashboards for analysis, reporting and use of data for action and decision-making.
- Use RTM approaches and digital solutions for immunization planning, readiness assessments and implementation, by leveraging systems and platforms currently in place whenever possible.
 - RTM approaches may be deployed to refine immunization strategies and plans, ensure immunization resources are distributed and used optimally, reduce vaccine hesitancy via timely action taken to address misconceptions, improve service delivery and ensure the appropriate use of funds and resources and the timely distribution of incentives.
 - RTM approaches may also support elements of supply and logistics, including cold chains, stocks, wastage rates, etc.
 - Real-time digital data collection tools with protocols make data available more frequently (e.g., daily) and are used with real-time analysis of data to help detect and remediate issues as they occur, e.g., for redistribution of vials, mobilization of community members or identification and follow-up of AEFIs.
- Review the mapping or readiness assessment results to identify digital solutions with potential to support supply chain management, specifically, by forecasting when facilities will need supplies and by submitting, tracking and ensuring orders are safely delivered.
- Develop, test and scale up innovative service delivery models, including differentiated vaccine delivery strategies to effectively reach population groups with low coverage.
- Strengthen Master Facility Lists/Registries and HRH Registries, and provide these as services within national Health Information Systems.
- Integrate spatial data on the location of populations and health resources to strengthen the microplanning process: informing planning teams of delivery strategies (i.e., fixed, outreach, mobile, mass campaigns), cognizant of populations' physical access to vaccination points; optimizing the location of vaccination delivery points to maximize coverage; and supporting logistics of community-based outreach activities. Consider re-using and adapting spatial microplans from other programmes (polio campaigns, malaria long-lasting insecticidal nets/insecticide-treated nets campaigns).

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [UNICEF Rapid Guidance on Digital Health and digital engagement for COVID-19 preparedness and response](#)
- [Digital Global Goods developed to support vaccine deployment](#)
- [Informing RCCE with equitable social listening](#)
- [Using digital technologies for real-time monitoring of supplementary immunisation activities](#)
- [Leveraging Geospatial Technologies and Data to Strengthen Immunisation Programmes](#)
- [Improving ITN campaign efficiency through use of digital tools](#)
- [Vaccine Misinformation Management Guide](#) for addressing a global infodemic and fostering demand for immunization
- [Guidance for national and district planners and managers](#) on the analysis and use of health facility data
- [Master Facility List Resource Package](#): Guidance for countries wanting to strengthen their Master Facility Lists
- [Portfolio of geospatial technical offerings to support COVID-19 vaccine delivery](#)
- Use case: [From paper cups to digital maps: enhancing routine immunisation microplanning in Northern Nigeria](#)

NDVP pillar 6 – Preparation of supply chain and management of health care waste

Digital health processes and interventions related to supply chain and management of health care waste

- Conduct a cold chain assessment using digital data collection tools, for example using smart phone/tablet based data collection tools or SMS (specifically for low bandwidth settings).
- Assess the public supply chain to understand its operational and strategic capabilities and the availability of resources to inform the way forward across all areas of the immunization and COVID-19 vaccine supply chains, utilizing the [UNICEF Maturity Model](#).
- Stress test the immunization supply chain to understand if it is fit for purpose and create different logistical scenarios that would inform the deployment of COVID-19 vaccines in the shortest possible time using the [Supply Chain Analysis and Intelligence Tool \(SCANIT\)](#).
- Consider establishing digital systems for vaccine management information, such as for remote temperature monitoring, fridge functionality and electricity.
- Strengthen immunization supply chain management using digital solutions and eLMIS that are compliant with the Target Software Standards:
 - Strengthen existing or introduce new eLMIS to accommodate COVID-19 vaccines and related commodities/equipment, including dashboards to visualize and map stock availability.
 - Explore fuller integration of serialized routine immunization and COVID-19 vaccines into LMIS/eLMIS for fuller 'track and trace' capability.
- Explore remote temperature monitoring devices to manage the performance of the cold chain.
- Support the scaling up of GS1 enabled COVID-19 vaccine verification to reduce the risk of falsified products in legitimate supply chains and eventually achieve end-to-end traceability for all vaccines, medicines and health products. Link this verification system with the newly established Global Trust Repository to store traceability data for use by national regulatory authorities.
- Support waste management system optimization, including the use of innovative waste management techniques/equipment.
- Conduct End User Monitoring to assess and measure availability, quality, utilization and distribution of COVID-19 vaccines at service delivery points. Identify areas for improvement in supply chain models to ensure sustainable access to vaccines using tablet-based data collection tools or computers.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [UNICEF Maturity Model](#) to identify strengths/gaps across all areas of the supply chain.
- [Supply Chain Analysis and Intelligence Tool \(SCANIT\)](#) to develop scenarios and identify if the supply chain is fit for purpose in terms of reaching all intended beneficiaries.
- The [System digitalization planning and investment portal](#), an interactive tool for partners and countries to track ongoing health digitalization initiatives and inform future investments. It is useful for understanding which eLMIS to scale up/modify to address identified COVID-19 needs.
- [Preventing in-country stock-risky situations through prescriptive analytics](#), a methodology that allows in-country supply chain managers to identify and prevent stock-outs and over-stock.
- [UNICEF Supply Chain Maturity Model online training course](#) – learn how the UNICEF Supply Chain Maturity Model can be used as part of a national supply chain strengthening journey.
- [Strengthening national data systems](#), an approach to review and strengthen national information systems of public supply chains.
- [Guidance for Countries Selecting a Logistics Management Information System](#) – sourcing and management of health products.
- [Concept note: the Global Trust Repository and the COVID-19 vaccine verification solution](#).
- [TechNet-21: eLMIS](#).
- [Digital Health Centre of Excellence \(DICE\) YouTube Channel on eLMIS vendors](#).

Other resources

- End User Monitoring (tool to be launched as soon as the pilot stage is complete)

NDVP pillar 7 – Human resource management and training

Digital health processes and interventions related to human resource management and training

- Establish or update national HRH registries using e.g., [iHRIS](#), and advocate the inclusion of all frontline health workers across the health system.
- Adopt and conduct innovative learning and supervision approaches such as digital knowledge sharing, training and performance management.
 - Adopt and deploy [available and digitally formatted health worker training content](#) by localizing and validating it for the appropriate country context, and disseminating it using digital communications platforms.
 - Identify opportunities to digitize supportive supervisory visits during vaccine monitoring using electronic supervision checklists and other performance management tools.
- Invest in 'digital dexterity', i.e., the training and capacity needed to build the competencies required among government staff to effectively adopt and sustain digital public goods for vaccine management.
- Strengthen Master Facility Lists/Registries and HRH Registries, and provide these as services within national Health Information Systems.
- Consider adopting digital tools with geotagging capabilities, such as ODK, for monitoring and targeting of human resource supervision visits.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Digital Learning Solutions to Support Community Health Workers in the COVID-19 Response](#) (including in the vaccine roll-out)
- [Overview of topics, courses and content ready for deployment on digital communication platforms](#)
- [COVID-19 Digital Classroom Course Series](#)
- [COVID-19 Vaccine Courses](#) from Open WHO

Other resources

- [Using Facebook messenger for digital communication: use cases](#)
- [iHRIS Implementation Toolkit](#)
- [Introduction to the Health Worker registry](#)

NDVP pillar 8 – Vaccine acceptance and uptake (demand)

Digital health processes and interventions related to vaccine acceptance and uptake (demand)

- Strengthen existing data and monitoring systems (immunization and public health) to accommodate the COVID-19 vaccines, as well as data collection, analysis and reporting, and the use of data for action and decision-making. Also strengthen the understanding of the information ecosystem among different priority groups to inform demand strategies.
- Consider systematic approaches for gathering qualitative insights, in addition to more formal survey data, from communities through digital ethnography.
- Consider establishing social listening and engagement strategy which consolidates digital (media, social media, 'U-report' etc.) and offline data feeds into single system, enabling analysts to provide regular actionable insights to RCCE teams.
- Consider adopting the Digital Documentation of COVID-19 Certificates shared architecture to verify vaccination status of individuals using both digital (e.g., smart phones) and analog (e.g., paper yellow cards, ID cards) to support continuity of care, opening of businesses and cross-border travel.
- Use generated insights to develop digital content to promote demand, use or adapt and scale up digital solutions and approaches:
 - Invest in national data science capacity, including using GIS mapping to triangulate and help identify target populations and map missed and vulnerable communities.
 - Identify digital solutions that utilize SMS, Integrated Voice Response and mainstream social media for information sharing to increase knowledge and demand for vaccines and to identify gaps in information/detect misinformation. These may also include two-way messaging platforms (chatbots) that, using artificial intelligence and natural language processing, conduct social monitoring on the prevalence of and reasons for vaccine hesitancy.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Vaccine misinformation management field guide](#)
- [Understanding the infodemic and misinformation in the fight against COVID-19](#)
- [Vaccination demand hub - Digital Information Environment](#)
- [Digital documentation of COVID-19 certificates: vaccination status: technical specifications and implementation guidance, 27 August 2021 \(who.int\)](#)
- [COVID-19 and Risk Communication resources](#)

NDVP pillar 9 – Vaccine safety monitoring, management of adverse events following immunization (AEFI) and injection safety

Digital health processes and interventions related to vaccine safety monitoring, management of AEFI and injection safety

- Explore the ability of existing health management information systems to perform digital tracking and tracing of AEFI reporting.
- Consider using community-level digital communication tools for safety monitoring.
- Digitalize the Case Based Surveillance AEFI management system to strengthen active AEFI monitoring.
- Consider linking AEFI reporting to global pharmacovigilance processes, e.g., linking to the Uppsala Monitoring Centre using VigiFlow.
- Consider adopting of digital tools with geotagging capabilities, such as ODK or DHIS2 mobile capture, for linking AEFI identification to GIS for visualization and monitoring.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Module: Responding to adverse events following COVID-19 immunization \(AEFIs\)](#)
- [AEFI Training Material for DHIS2](#)
- [VigiFlow management system](#) for recording, processing and sharing reports of adverse effects
- [After Vaccination Health Checker](#) by CDC

Other resources

- [Establishing surveillance systems in countries using COVID-19 vaccines](#)
- [Webinar recording: The use of DHIS2 for real-time planning, implementing and monitoring of vaccination campaigns](#)

NDVP pillar 10 – Immunization monitoring systems

Digital health processes and interventions related to immunization monitoring systems

- Use, adapt and scale up digital solutions to enable real-time analytics to track vaccine delivery, track rates of missed appointments and loss-to-follow-up, and ensure critical segments are vaccinated first:
 - Real/near real-time data on vaccination coverage
 - Strengthen the health management information system to provide disaggregated data at country level and aggregated data at regional level (such as regional dashboards) and global level (such as through the WHO-UNICEF COVID-19 monthly Joint Reporting Form module).
 - Explore opportunities to update surveillance information flows within any existing laboratory information systems.
 - Invest in expanding existing DHIS2 capacity, where already deployed, to support vaccination coverage monitoring.
 - Invest in national data science capacity, including using GIS mapping to triangulate and help identify target populations and map missed and vulnerable communities.
 - RTM for planning, implementation (including supply, logistics, etc.) and reporting
 - Leverage digital data collection tools and systems with protocols to make more detailed disaggregated data available more frequently (e.g. daily instead of weekly/monthly).
 - Conduct real-time analysis of data to help detect and remediate issues as they occur, e.g. for planning, preparedness, redistribution of resources and supplies, or mobilization of community members.
 - Registration of individuals or vaccination events
 - If this step is considered a priority, explore the use of a web portal or mobile phone-based self-registration functions with eligibility checks and scheduling of vaccine or test appointments.
 - Explore feasibility, sustainability and readiness for deployment EIRs that facilitate the monitoring of individual immunization schedules and the storage of individual immunization histories. EIRs can facilitate understanding of coverage gaps, track multi-dose vaccine dropouts, and direct communications (e.g. text messages) for recalls or reminders to clients. EIRs can also be useful for COVID-19 immunization activities to provide real-time coverage feedback.
 - Using EIRs or individual vaccination data, generate dashboards to monitor performance by provider, and embed immunization decision support to help health care workers ensure that families return at the right time for their next immunization.
 - Digital registries like EIRs can also be developed for pregnant women (antenatal consultation/ postnatal consultation visits) and subsequently linked with new born infants for healthy child visits and routine immunization.
 - Consider adopting the Digital Documentation of COVID-19 Certificates shared architecture to verify vaccination status of individuals using both digital (e.g. smart phones) and analog (e.g. paper yellow cards) to support continuity of care, opening of businesses and cross-border travel.

Digital health processes and interventions related to immunization monitoring systems

- Leverage the agreed-to standards for data exchange, authentication and security, and invest in interconnectivity between different data monitoring systems to allow insights in subnational- or district- level dashboards across areas of response, e.g., COVID-19 vaccine coverage mapping, facility stock data and COVID-19 case surveillance data.
- Strengthen Master Facility Lists/Registries and HRH Registries, and provide these as services within national Health Management Information Systems.

Knowledge Management Resources / Global Goods / Use cases

Key resources

DHIS2 resources:

- [Improving National Immunization Program Impact with DHIS2](#)
- [DHIS2 COVID-19 Vaccine Delivery Toolkit](#)
- [Metadata Package Downloads - DHIS2](#)
- [Digital documentation of COVID-19 certificates: vaccination status: technical specifications and implementation guidance, 27 August 2021 \(who.int\) \(including annexes\)](#)
- [Using digital technologies for real-time monitoring of supplementary immunization activities](#)
- [Adapting FHIR Immunisation Resources for Interoperability & Information Exchange](#)

Other resources

- [Improving the quality and use of immunization and surveillance data: Summary report of the Working Group of the Strategic Advisory Group of Experts on Immunization](#)
- [A Realist Review of What Works to Improve Data Use for Immunization: Evidence from low- and middle-income countries](#)

NDVP pillar 11 – COVID-19 surveillance

Digital health processes and interventions related to COVID-19 surveillance

- Leverage digital solutions to conduct monitoring and response for frontline health workers to register COVID-19 cases.
- Leverage the agreed-to standards for data exchange, authentication and security; create an Application Programming Interface for distributed vaccine registers; and invest in interconnectivity between different data monitoring systems to allow insights in subnational- or district-level dashboards across areas of response, e.g., COVID-19 vaccine coverage mapping, facility stock data and COVID-19 case surveillance data.
- Integrate COVID-19 surveillance into integrated electronic surveillance systems for vaccine preventable diseases.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Digital Solutions for COVID-19 Response – An assessment of digital tools for rapid scale-up for case management and contact tracing](#)
- [Adapting FHIR Immunisation Resources for Interoperability & Information Exchange](#)

Other resources

- [Leveraging Digital Solutions to Fight COVID-19: Lessons from ASEAN Countries](#)
- [Digital technologies for exposure notification in times of pandemic \(Spanish\)](#)

NDVP pillar 12 - Evaluation of COVID-19 vaccine introduction

Digital health processes and interventions related to evaluation of COVID-19 vaccine introduction

- Explore and review design requirements for digital health initiatives to include programmatic evaluation and learning activities, such as COVID-19 post-introduction evaluations, Intra-Action Reviews, case studies, operations research, syntheses, and other efforts.
- Conduct implementation research to evaluate the implementation and scale-up of digital innovations.

Knowledge Management Resources / Global Goods / Use cases

Key resources

- [Monitoring and evaluating digital health interventions: A practical guide to conducting research and assessment](#)
- [Implementation Research for Digital Technologies and TB \(IR4DTB\)](#)
- [COVID-19 vaccine post-introduction evaluation \(cPIE\)](#)
- [Guidance for conducting a country COVID-19 intra-action review \(IAR\): Addendum 1](#)

Other resources

- [Boost Community](#)
- [The Geneva Learning Foundation](#)
- [TechNet-21](#)

References

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2. World Health Organization, *Digital Implementation Investment Guide: Integrating digital interventions into health programmes*, Geneva, 2020, <https://apps.who.int/iris/bitstream/handle/10665/334306/9789240010567-eng.pdf>.
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