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DPPA Report

Digital Pandemic Preparedness Assessment

Côte d'Ivoire

August 2022

Acknowledgements

This report on the assessment of Digital Pandemic Preparedness in Ivory Coast reflects the joint effort of the expert team, and national and international partners. We would like to thank all stakeholders for their availability and their multifaceted contributions to the success of this evaluation.

In particular our thanks go to the Ministry of Health, the Bilateral Health Programme of the KFW, the GIZ country office, the German Embassy and development partners for their guidance and input, as well as their support in conducting interview sessions and stakeholder consultation, the GIZ and KFW office and their respective development partners.

We would also like to thank all the interviewees; Pr Samba Mamadou and Dr Soro Gorgoh (Direction générale de la Santé), Franck Simon Bléhiri (Direction de la Santé Numérique), Dr Pongathie and Alain Kouakou Koffi (Direction de l'Informatique et de l'Information Sanitaire), Alimata Diakite Sow (UNICEF), Braud Bertrand (JHPIEGO), Rodrigue Sidibe (Save The Children), Clement Prince Tuyisabe (SAVICS), Pauline Robert, Craig Drown, Mamadou Ben Traore (MSUPPLY Fondation), Alexandre Allouin (ONUSIDA), Natalie Tibbels (JHU).

The Authors apologize to any individuals or organizations inadvertently omitted from this list.

TABLE OF CONTENTS

Figures and Tables

Acronyms

API	:	Application programming interface
BMZ	:	Federal Ministry for Economic Cooperation and Development
CHR	:	Centre Hospitalier Régional
CHU	:	Centre Hospitalier Universitaire
DHIS2	:	District health information system version 2
DPP	:	Digital Pandemic Preparedness
DPPA	:	Evaluation of digital pandemic preparedness
DSNISI	:	Direction du Système National d'Information Sanitaire et de l'Informatique
DIIS	:	Direction de l'informatique et de l'Information Sanitaire
EDIT	:	Early-Stage Digital Health Investment Tool
EIS	:	Health Information Exchange System
EPI	:	Equipements de protection individuelle
ETL	:	Extract-Transform-Load
FM	:	Global Fund to Fight AIDS, Malaria and Tuberculosis
GAVI	:	Vaccine Alliance
GFA	:	GFA Consulting Group
GIZ	:	German Agency for International Development Cooperation
HISP WCA	:	Health information system program for West and Central Africa
HMIS	:	National Health Information System
HR	:	Human resources
ICD-10	:	International Classification of Diseases and Related Problems version 10
ICT	:	Information and Communication Technology
iHRIS	:	Human resources information system
KFW	:	German Development Bank
MICS6	:	Multiple Indicator Cluster Survey 6th edition
MoH	:	Ministry of Health / Ministère de la Santé
MSHP-CMU	:	Ministère de la Santé et de l'hygiène Publique – Couverture Maladie Universelle
NISD	:	Directorate of National Health Information System and Informatics
ONU	:	Organisation des Nations Unies
OOAS	:	Organisation Ouest Africaine de la Santé
PAM	:	Programme Alimentaire Mondial
PSSNIS 21-25	:	Plan Stratégique de renforcement du système d'Information Sanitaire 2021-2025
PPE	:	Personal protective equipment
REDISSE	:	Regional Disease Surveillance Systems Enhancement
RH	:	Ressources humaines
RHS	:	Health human resources
SACIDS	:	South African Centre for Infectious Disease Surveillance
SNIS	:	National Health Information System
SDIT	:	Sous-Direction de l'Informatique et de la Télémédecine
TIC	:	Technologie de l'Information et de la Communication
UiO	:	University of Oslo
UN	:	United Nations
WAHO	:	West African Health Organization

How to read this report

This report aims to provide an overview of the digital landscape, a narrative and recommendations on the country's digital health preparedness in the event of an epidemic.

The Executive Summary provides an overview of the key findings and conclusions of the report.

The Methodology section explains the configuration of the prototype DPPA tool and the processes that key actors need to follow to generate the results.

The results of the evaluation are elaborated in the country-specific results sections, which are subdivided into five (5) sections:

- The section WP1 preliminary work gives an overview of the key actors involved in this evaluation and to whom the report might be of interest.
- The WP2 Digital Health Ecosystem section provides an overview of the digital health ecosystem in Togo.
- The WP3 opportunities section presents all potential digital tools, including digital global public goods, that could be relevant to prepare the country for a pandemic at national and sub-national level.
- The WP4 gaps section is the result of the mapping of DPP use cases. It provides an overview of the functionalities that could be implemented in the country, with a comment on the importance of these functionalities in the country context.
- The WP5 recommendation section is a set of preliminary recommendations regarding the digital health ecosystem, pandemic preparedness and selected global goods that could be considered a priority by some stakeholders.

The last section is the conclusion, which summarises the evaluation and gives a first overview of how the results have been adapted by the stakeholders.

Executive Summary

This assessment made it possible to identify thirty-six (36) software programs dedicated to digital preparation for the pandemic and was conducted from December 2021 to August 2022 in Ivory Coast.

Objective
The objective was to identify the need for digital tools that fit into Togo's existing digital health ecosystem that can modernise overall pandemic preparedness. More specifically, it was to i) assess the different functionalities of the digital health ecosystem in the country's health system; ii) identify gaps and opportunities by functionality and iii) make recommendations for action based on the analysis of each identified gap/opportunity.

Methodology
A literature review and stakeholder interviews based on the Digital Pandemic Preparedness Assessment Tool (DPPA) were conducted. The Map & Match database[1] was used as a starting point to identify a set of existing digital tools in the country. In addition, an important part of the DPPA was an analysis of the status and digital health ecosystem in the country. To complement this aspect of the DPPA, the Initial Stage Digital Health Investment Tool (EDIT) was integrated as an essential part of the process of assessing the country's digital health readiness (infrastructure, strategy).[2]

Results
Analysis of the Global Health digital ecosystem against several initial and essential parameters showed that Ivory Coast demonstrated an average score of 2.9/5 towards digital pandemic preparedness. However, the gaps and inadequacies identified must be addressed to ensure adequate preparation and response to a possible pandemic.

Recommendations
A number of recommendations were made to address the gaps and deficiencies identified. With these recommendations, the Ministry of Health will be able to prioritise the most urgent or important items for the country and engage its international partners to obtain technical or financial support.

Conclusion
The assessment of Ivory Coast’s digital pandemic preparedness provided findings in terms of gaps and opportunities for functionality and made relevant and realistic recommendations for the country to implement to ensure optimal digital pandemic preparedness.

[1] https://digitalsquare.org/covid19-map-match
[2] https://katicollective.com/what-were-thinking-1/edit-a-tool-for-the-greater-good

Recommendations

Improving the digital health ecosystem

R1.1. Setting up a database of health institutions

R1.2. Setting up a centralised management system for primary health records

R1.3. Establish a national digital health governance committee

R1.4. Develop a long-term national digital health strategy

R1.5. Financing plan for the national digital health strategy: Define a budgetary plan for financing the implementation of the National digital health strategy

R1.6. Develop a strategy that can promote real-time data collection

R1.7. Establish a budget plan to support the strengthening, renewal and maintenance of infrastructure and IT equipment

R1.8. Strengthen staff skills in ICT to ensure technical maintenance of ICT infrastructures

R1.9. Set a budget for additional digital tools

R.1.10. Consider issues of diversity, equity, and inclusion

R.1.11. Design administrative and human resources management tools at the national level

Digital pandemic preparedness

R2.1. Development of local digital tools to promote local, two-way communication or messaging with patients

R2.2. Consider the development of a digital data analysis solution for “Big Data” to improve data analytical capacity

R2.3. Support the implementation of the digital animal health management tool and environmental (One-health)

R2.4. Support the development of a tool for reporting side effects after vaccination

R2.5. Development of digital tools for self-declaration and anonymous proximity self-detection

R2.6. Online training for digital health stakeholders on open-source and global public goods for health at national level

R2.7. Create an online health training platform for different health stakeholders at the national and sub-national level

1 Background and objectives

Digital Pandemic Preparedness (DPP) is becoming crucial not only because paper-based methods have shown their limitations in the face of increasing numbers of cases, but also because epidemics require adequate national, regional and international control measures, strategies and optimal allocation of available resources. Digital tools allow the generation of granular data to identify and model trends in disease evolution and guide policy changes and response strategies. This is becoming increasingly important, especially since the advent of Covid-19, which has highlighted the usefulness of digital tools in public health and epidemiology.

However, there has been an atypical explosion in the digitalisation of the health sector in partner countries, leading to an uncoordinated multiplication of digital tools, sometimes on a very small scale. This phenomenon hinders the consistency of the data collected and reveals major gaps in the capacity to manage and guide informed decision-making in pandemic prevention. Good governance and a shared strategy are therefore needed to enable the alignment of multilateral partners and integrated digital tools. This in turn will support public health administration and effectively help partner countries to better manage the current COVID-19 pandemic, as well as potential future outbreaks.

It is in this context that the GIZ Global Health and Digitalisation Programme and other international stakeholders have sought to identify and map the gaps in the digital health ecosystem of partner countries. By mid 2020, the Programme had successfully defined a DPP context and a prototype digital tool for conducting local assessments. Meanwhile, USAID, in collaboration with Digital Square, has also succeeded in establishing the Map & Match database which provides a good illustration of the digital tools implemented by a large number of stakeholders in the field of public health.

The objective of the Digital Pandemic Preparedness Assessment (DPPA) is to assess the current digital health landscape for pandemic preparedness and response, identify opportunities to further develop this landscape and propose activities to explore these opportunities.

1.1 DPPA

The development of the prototype DPPA tool was commissioned by GIZ to the GFA Consulting Group (GFA). The concept was developed as a framework that provides a digital tool and a systematic methodology to identify gaps and opportunities in existing digital tools in a given country to enable the national health system to be prepared to respond to a pandemic.

The DPPA digital tool integrates and builds on the important work of other partners, including USAID's Map and Match (M&M) database, feedback from various stakeholders such as the Centers for Disease Control and Prevention (CDC), the World Bank, and the UNICEF/WHO-led Digital Center of Excellence (DICE) . In addition, the DPPA digital tool has integrated the Early Stage Digital Health Investment Tool (EDIT), a digital global asset developed by the Kati Collective.

The results of the DPPA digital tool are assessed and interpreted to formulate scenarios for integrating or enhancing interoperability within an existing digital health ecosystem. With the DPPA reports, partner countries and Multilateral Organisations have relevant insights on how to address these gaps or opportunities through digital applications and appropriate measures to modernise public health pandemic preparedness and decision-making.

The first version of the DPPA was finalised in October 2021. It is being piloted in five member countries of the Economic Community of West African States (ECOWAS) : Ivory Coast, Ghana, Nigeria, Togo and Sierra Leone.

1.2 Ivory Coast a pilot country

Ivory Coast is a coastal country in West Africa, which shares its borders with Liberia, Guinea Conakry, Mali, Burkina Faso and Ghana. It is home to more than 27 million inhabitants (World Bank, 2021) over an area of 322,462 km². It has become a member of ECOWAS since 1975[3] and of the West African Economic and Monetary Union (UEMOA) since 1994[4].

First a French protectorate in 1843 than a French colony on March 10, 1893, the country acquired its independence on August 7, 1960, under the leadership of Félix Houphouet-Boigny, first President of the Republic of Ivory Coast. In 2002, a military-political crisis broke out which left more than 3,000 dead. After several peace agreements which led to presidential elections in 2010, Alassane Ouattara holds the position of President of the Republic to this day.

The departments of Ivory Coast are an administrative division and a former territorial collectivist. The country is subdivided into 109 departments, grouped into 31 regions and two autonomous districts. The departments are in turn subdivided into 509 sub-prefectures.

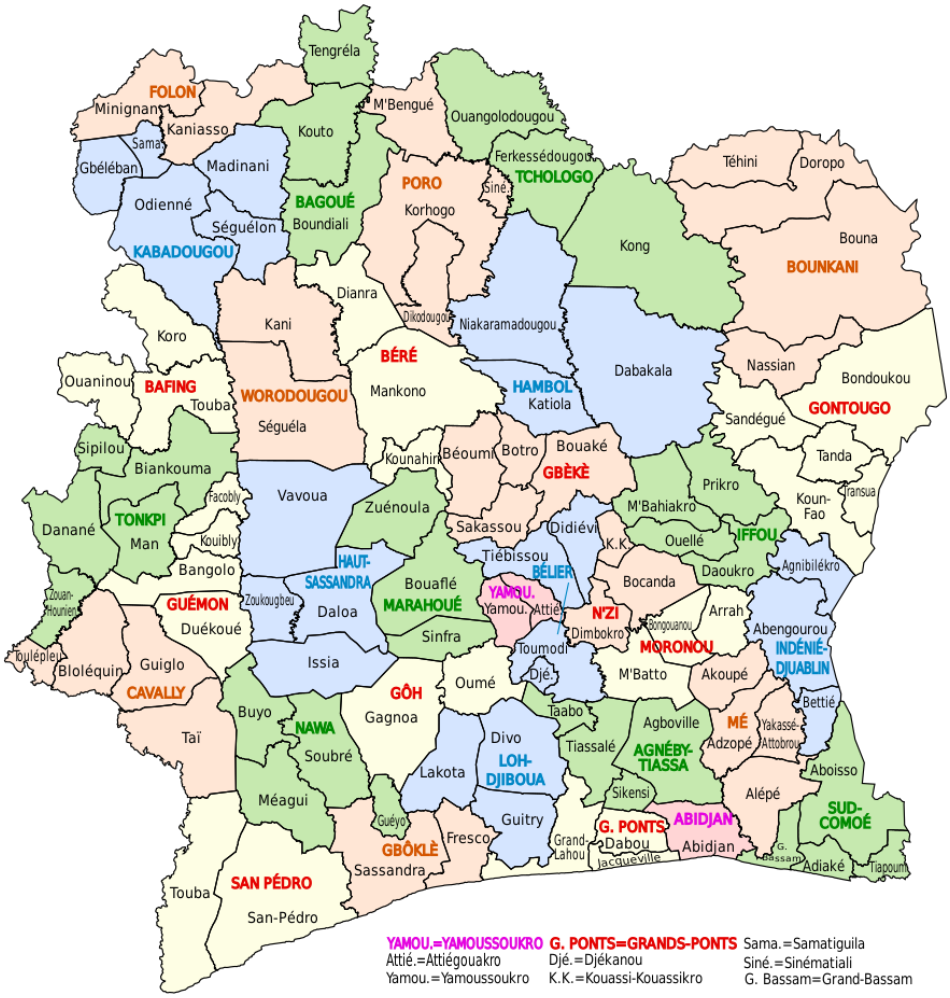

Figure 1: Map of departments, regions and autonomous districts of Ivory Coast [5]

[3] https://fr.wikipedia.org/wiki/Communaut%C3%A9_%C3%A9conomique_des_%C3%89tats_de_l%27Afrique_de_l%27Ouest

[4] https://www.jeuneafrique.com/114537/archives-thematique/l-uemoa-en-quelques-dates/

[5] Côte d'Ivoire – Wikipedia

Color backgrounds and names indicate autonomous regions and districts (red background, magenta name).

Ivory Coast's membership in the International Health Partnership and Related Initiatives (IHP+) dates to August 2011. A year after joining IHP+[6], the Ivorian Government signed on the sidelines of the 2012 World Health Assembly the international compact thus marking its commitment to the process of developing the national compact with a view to supporting the implementation of National Health Development Plans according to the principles of the Paris Declaration. In July 2017, the Ivorian government signed a National Compact with its technical and financial partners in the health sector for the implementation of the National Health Development Plan (PNDS) 2016-2020. The problem above all remains the weak coordination of the Ministry of Health to improve the alignment and harmonization of TFP interventions and better predictability of aid. According to the NGO Health Service, approximately 592[7] non-governmental organizations and associations participate formally in the development of health activities.

Since the declaration of the first case of Covid-19 on March 11, 2020 in Ivory Coast, we have witnessed an increasingly growing development in the number of digital tools. In such a context, the assessment of digital preparedness for the pandemic becomes an urgent necessity for the MSHP-CMU in partnership with the GIZ in order to guide decision-making on the development and deployment of digital tools based on recommendations relevant findings from said evaluation.

2 DPPA: tools and methods

The DPPA data collection process can be described in five (5) steps or work packages (WP). After preliminary work (1) and a qualitative assessment of the digital health ecosystem (2), using the Map and Match data as a starting point and validating it in the local context (3), the landscape of existing digital tools has to be mapped (4) and interpreted according to opportunities, gaps and recommendations (5).

2.1 WP1: Preliminary work and stakeholders

Before starting the DPPA process, it is crucial to obtain the support and approval of the country's Ministry of Health and key stakeholders in the health sector. To do this, a few meetings are necessary to present the DPPA concept, its objectives and, most importantly, the benefits that the results could bring to digital health strategies and donor-supported activities during the different phases of an epidemic.

For the stakeholder mapping, a simple coding has been defined. The aim is to represent key actors who can contribute to decision-making processes that are very important for the collection of information and the implementation of recommendations.

- Primary**:** key actor for information gathering or decision making;
  For example, some national governmental stakeholders could be primary actors to support the assessment process.
- **Secondary:** key actor for information dissemination.

[6] https://www.uhc2030.org/fr/nouvelles-et-evenements/nouvelles-csu2030/health-stakeholders-sign-country-compact-in-ivory-coast-406584/
[7] https://www.serviceong-sante.ci/annuaire.html

For example, multilateral stakeholders might be interested in funding some of the recommendations as part of their programme.

2.2 WP2: Digital Health Ecosystem Analysis and EDIT tool

An important part of the DPPA is to analyse the status of the digital health ecosystem in countries. This should identify key elements of the system that can be reused, exploited and built upon to improve a country's health system before, during and after a pandemic. The tool allows for the capture of basic epidemiological data, qualitative information on the country's digital health preparedness and data sources for potential aggregate data indicators collected and monitored centrally by the country's health authorities.

To complement this aspect of the DPPA, the EDIT tool has been integrated as an essential part of the process of assessing the country's readiness (infrastructure, strategy) for digital health. It is a digital public good developed by the Kati collective. It defines a set of 79 indicators that help describe the digital health landscape at the national level and identify areas that require specific improvements or digital tools. The EDIT indicators are divided into six (6) key blocks: human capacity, investment and financing, data capture and use, infrastructure, standards and interoperability, and governance and policy. EDIT has labelled each indicator as either informative, enabling or critical. In a further process, EDIT allows indicators to be scored according to the country context with a number between 1 (non-existent) and 5 (functional at the optimal level). A minimum score of three (3) as the final score in the overall EDIT assessment should be a good indicator of a country's digital health readiness to conduct activities at the national level.

2.3 WP3: Map and Match Data and existing digital tools

Map & Match is a USAID-funded project that provides a landscape of existing and adaptable digital tools used at the country level. These digital tools are then mapped to potential use cases for COVID-19 and broader pandemic management.

In this context, the Map & Match database is used as a starting point to obtain a set of existing digital tools in the country. Therefore, the first step is to validate the Map & Match data locally in the country context.

The second step, in cases where there is a national database or knowledge of other digital tools in the health sector, is to expand the list of available digital tools before starting the assessment.

With this list of tools, the DPPA digital tool automatically generates a table with all the functional DPP opportunities available in the country. The following information is the minimum information that must be validated locally in the country before starting the assessment.

Table 1: Important information on the digital tools evaluated

Name of Column in DPPA Tool	**Description**
Project/Tool	The software or project name under which the software was implemented.
Software Name (incl. package, module etc.)	The given name to the software. This is important as it will be used throughout the whole process to describe the solution.

Name of Column in DPPA Tool	Description
Primary purpose of tool	A short description of the tool and the status in the country is important to evaluate the existing opportunities. In case this information is not available, a simple text describing what effort has been done to get this information will suffice.
Funder	(Organization(s) involved in tool funding)
Implementer	(Organization(s) involved in tool implementation)
Government Contributions	(1) Yes (2) Yes, MOH is fully funding the project (3) Yes, there is a financial contribution through MOH budget (4) Yes, they are contributing in-kind people or time (5) No, they have not yet contributed (6) Unknown In case this status is unknown, a simple text describing what effort has been done to get this information will suffice.
Tool proprietary /Open source	(1) Freemium (2) Non protective free and open-source software (e.g., Apache) (3) Open source (4) Proprietary (5) Protective free and open-source software (6) Public domain (7) Unknown In case this status is unknown, a simple text describing what effort has been done to get this information will suffice.
Scale: National or Sub-National	(1) National (2) Sub-National (3) Unknown In case this status is unknown, a simple text describing what effort has been done to get this information will suffice.
Scale: Scope	(A description of the scale at which the tool is being used)
Link	(website, github) or Developer (Organization(s) involved in tool development)
Scale: Regions	(# of regions the tool is being used in)
GIZ DPP Categories	This refers to the 14 DPPs use cases. In case a tool is added to the list, the corresponding and validated DPPA uses cases if existing need to be listed. Monitoring Laboratory systems Case management Contact tracing Proximity tracing Coordination & operations Supply chain & health facility logistics Health facility administration Health worker training Risk communication & community engagement One health Interoperability Vaccine delivery Data analytics, visualization & use

2.4 WP4: DPP use cases and mapping process

The use cases and functionalities of the DPP were developed in coordination with USAID's Map & Match use cases, which were defined in a framework describing how digital tools can be adapted and used during different phases of an epidemic (Digital Applications and Tools Across an Epidemiological Curve). The DPP use cases were further broken down into 64 sub-features.

For the pilot phase of the DPPA, the mapping process consists of validating locally with national key stakeholders the use cases of the DPPA against the existing landscape. The process has been documented in an e-learning format to enable stakeholders to understand the process.

For the evaluation, a simple coding was defined:

- (1) Deployed: If a digital tool is deployed, the functionality is used in the country.
- (2) Existing functionality in the software package, but NOT deployed: If not used.
- ( ) Unknown / NA: Empty boxes indicate that the status is unknown or not available.

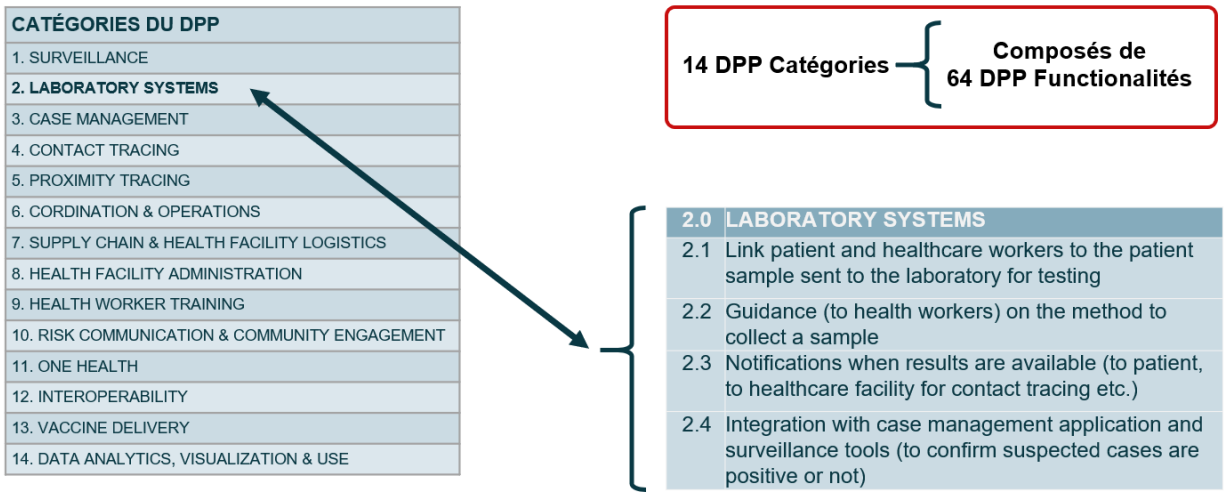

Figure 2: Functionalities of DPP systems to be assessed

2.5 WP5: Recommendations

The DPP assessment developed two types of recommendations:

2.5.1 Towards the digital health ecosystem

Based on the analysis of the Digital Health Ecosystem and the EDIT assessment, a set of recommendations should be formulated to support coordinated donor activities targeted at country-level Digital Health strategies and to improve basic Digital Health infrastructure and country-specific readiness.

2.5.2 Concerning pandemic preparedness

Based on the available DPP opportunities, which ideally display all existing digital tools in the country, and the validated table of DPP functionalities deployed or not deployed in the country context, an assessment can be made to provide an analysis-based recommendation for each gap based on use cases, opportunities, and the digital health ecosystem.

- Leverage existing software: Existing software is available as an opportunity identified in the context of the partner country's DPP. Based on the opportunities and the contextual viability analysis, we recommend exploring the use of specific software currently operated by government stakeholders to meet this functionality requirement.
- Recommendation for new software: if no existing software is available for an identified gap in the partner country DPP context. Based on the stakeholders and the analysis of the digital landscape, we recommend exploring options for new software to meet this functionality requirement.

3 DPPA Results for Togo

3.1 WP1: Preliminary work and stakeholders

At the start of this assessment, we had to organize preliminary work with the Ministry of Health and the stakeholders involved in this activity. Thus, we were able to obtain informed support and approval from the Ministry of Health and key stakeholders. This resulted in the identification and appointment of a focal point for the DPPA process by the Ministry of Health.

Furthermore, the training of the expert consultant on the DPPA concept was held on November 29, 2021. Subsequently, a meeting with UNICEF was organized on December 6, 2021. It made it possible to map the parties' stakeholders for the organization of the virtual information meeting which was held on March 24, 2022. This meeting saw the participation of the General Directorate of Health, the Directorate of Informatics and Health Information (DIIS), UNICEF, The German Development Bank (KFW), GIZ and GFA. It made it possible to present the DPPA process and the local consultant to obtain their commitment to support and facilitate the collection of data, a crucial step in the implementation of this evaluation.

The start of this phase was marked by the interview of key players conducted according to the DPPA concept and a qualitative assessment of the digital health ecosystem. As part of the DPPA, additional information was collected from key stakeholders via their emails.

At the end of the evaluation, a virtual meeting was organized with the Sub-Directorate of Informatics and Telemedicine (SDIT) to present the recommendations of the study and receive their feedback with a view to improving these recommendations. The PAM, GIZ, SDIT and GFA were present. The SDIT welcomed the fact that certain recommendations of the study align with the recommendations included in axis 3 of the 2022-2023 operational plan and therefore fully adhered, placing particular emphasis on the development of a national digital health strategy and the establishment of a national patient record management system.

The ANNEX 1 presents a list of all people consulted.

The **primary actors** identified and who responded to the requests are:

- **Direction de l'Informatique et de l'Information Sanitaire (Department of IT and Health Information - MoH):** This is the department responsible for data management and implementation of applications. It ensures the mobilization of financial resources and strategic direction;
- **Sub-Information and Communication Technology Division (Sub-Department of IT and Telemedicine - MoH)**: she is responsible for the development and maintenance of applications, in short, she could intervene in the use of the evaluation recommendations;
- **JHPIEGO (ONG)**: implemented the Electronic Platform for Monitoring Patients on ARVs (PESP), an application developed under CommCare and deployed nationally on 169 HIV care sites with 156,355 patients on ARVs monitored. It could contribute to a certain extent to the harmonization of the digital health system;
- **Public Health Emergency Surveillance and Response Division (MoH)**: is a key player in the implementation of applications related to disease surveillance and more specifically to the response to epidemics;
- **Johns Hopkins Center for Communication Programs (ONG)**: implemented the Rumor Management System application. It is a system based on DHIS2 which collects rumors and misinformation and then presents them to the national technical working group on risk communication to guide decision-making. This application is strategic in the context of managing a pandemic;

- **Save The Children international (ONG)** : implemented the Malaria Prevention application in collaboration with the National Malaria Control Program. This application intended for health workers makes it possible to monitor pregnant women and remind them of visit appointments by SMS to improve the CPN4 coverage rate and reduce the mortality rate among pregnant women and children caused by Malaria. It is implemented nationally. SCI is a key partner that can in some way contribute to strengthening the digital health system;
- **The mSupply Foundation (ONG)** : implemented mSupply which is a mobile application that can be used for inventory management, displaying aggregated data on dashboards, patient recording of vaccine distribution (including calculating vaccination rates and producing a list of people to send SMS reminders), monitoring cold chain equipment using Bluetooth sensors, adverse drug reaction recording, adverse drug reaction recording, etc...
- **ONUSIDA (UN)** : implemented in collaboration with the Department of Informatics and Health Information, Situation Room which is a platform that allows you to extract and harmonize data from different sources (DHIS2 being the main source) and to design tables of edges facilitating decision-making support. It could contribute to a certain extent to the harmonization of the digital health system.

Secondary actors come from both the Ministry of Health and multilateral organisations:

- **Direction Générale de la Santé (Ministry of Health – MoH)**: this is the department responsible for the implementation of health care policy and other actions to combat diseases such as HIV/AIDS, malaria, etc. It is important in developing the strategies of the Ministry of Health. It is important in the development of the Ministry of Health's strategies;
- **World Health Organization (WHO)**: plays a strategic role in the direction and adoption of digital tools;
- **World Bank**: is a financial partner that could support the country in implementing the recommendations of the evaluation;
- **Global Fund**: plays the same role as the World Bank with the difference that its support focuses on the three deadly diseases HIV/AIDS, malaria and tuberculosis.
- **GIZ**: is a technical partner and has discussion about the regional programme RPPP (Regional Programme Support to Pandemic Prevention) ECOWAS. Which aim is to support local organisations in setting up a transnational system for the prevention and control of pandemics.
- **UNICEF**: provides technical and financial support for the implementation of digital tools through expert consultations. However, it can to some extent be considered a primary stakeholder in the sense that UNICEF is also involved in the implementation of U-Report used as a targeted mHealth application, specifically providing real-time mobile advice and conducting coordinated surveys on HIV/AIDS among adolescents and young people.
- **KFW** : The German Development Bank already supports the government in several projects. It expressed great interest in financially supporting the Ministry of Health, Public Hygiene and Universal Health Coverage in the implementation of digital health projects.

3.2 WP2: Analysis of the digital health ecosystem and EDIT tool

The assessment of the country regarding digital preparedness and the state of the digital health system was carried out by considering all the indicators of the EDIT tool. Quantitative information only was evaluated, as it was not possible to obtain qualitative information from the MSHP-CMU, due to the time constraints. The narrative analysis is therefore based on the definition of the EDIT tool. This assessment considers several aspects such as:

- General preparation for the pandemic;
- Digital readiness and the state of the digital health system, including infrastructure, governance and regulation;
- The quality and use of data;
- Human resources as well as the adoption of technology;
- The national architectural framework for digital health and/or health information exchange (HIE) and;
- Existing health information standards.

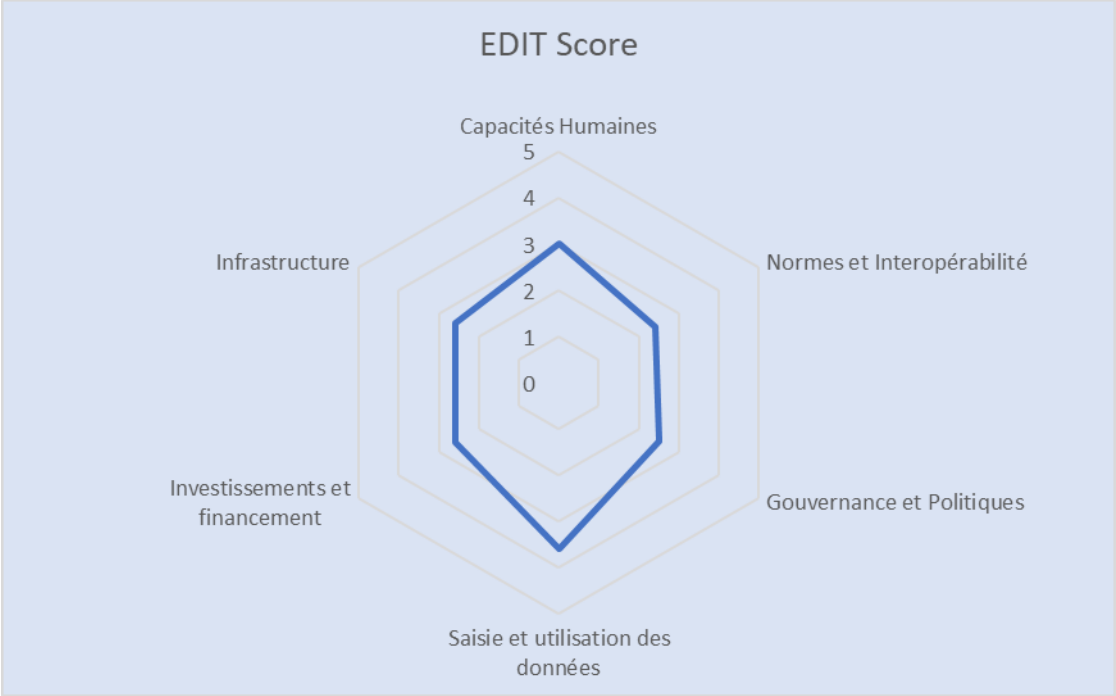

Figure 3: EDIT evaluation

With an overall average score of 2.9 out of 5 (score obtained by averaging the 20 indicators in Table 2) for all indicators of the EDIT tool, Ivory Coast positions itself as a country predisposed for the digital pandemic preparedness. Indeed, this is due to the adoption of technology in general at all levels of the health pyramid ranging from data collection to analysis for better decision-making.

As proof, data entry and use have the highest score (3.6/5). There is also a Strategic Plan for the **National Health Information System 2021-2025** which is structured **around 5 strategic axes** including the establishment of a digitalized information system[8] and an **operational plan for the health information system 2022-2023** which aim to improve the performance of the

[8] PSSNIS 2021-2025 partie 7.4 (page 53)

Ivorian health information system by 2025. However, the country does not yet have a national **digital health strategy**.

Table 2 shows a summary of the results and details of the evaluation.

Table 2: EDIT assessment of critical indicators for digital health

Subcategory	Indicator	Goal
Human capabilities	Human Capacities Human capacities in digital health	4
	Development opportunities for the ICT workforce	3
	What supervision does staff have	2
Standards and Interoperability	Standards and Interoperability Digital health standards are in force	2
	The established national digital health architecture opens opportunities for interoperability 3	3
	Digital identity management implemented	2
Governance and Policy	Governance and Policies Structuring digital health governance	2
	Digital health strategy implemented	2
	Processes put in place to encourage the engagement of key stakeholders	3
	Opportunity for the private sector to do business easily in the country	4
Data capture and use	Data capture and use Types of data captured and availability	4
	Data entry	4
	Use of data	5
	Processes for improving data quality	3
	Evaluation of digital health solutions and data	2
Investments and financing	Investments and financing Political interest and support for investment in ICT for improving services	2
	Existence of sufficient funding to support infrastructure strengthening 3	3
Infrastructure	Infrastructure Proportion of health facilities with good electricity supply and internet connection	4
	Equipment and software available and maintained	2
	Country capacities in terms of establishment, operation and maintenance	2
Overall average score :		**2,9**

Human capabilities

Digital literacy in the health sector is high in Ivory Coast and ICT is widely used by health personnel at all levels. The performance of Internet users' social progress score is above the expected average.

Health personnel are adept at using digital tools, which are an opportunity available to the ICT workforce in terms of development. Furthermore, there is no workforce strategy, policy or guide that recognizes digital health. The distribution of the digital health workforce is done ad hoc. The same goes for the supportive supervision schedule. Also, technicians are regularly available in some (but not all) locations, as employees or contractors.

There are multiple channels for sharing information[9] at all levels of the health system and information, but information is not shared in real time.

The adoption of information and communication technologies has been boosted using social networks[10].

The distribution of human resources shows that at all levels of the health pyramid, there should be computer scientists[11], but this is not always the case, especially at the decentralized level. But the majority of CHR, CHU, regional directorates and departmental directorates have computer engineers.

Standards and Interoperability

Since 2013, there have been texts and laws regulating data protection in Ivory Coast and the Telecommunications/ICT Regulatory Authority of Ivory Coast (ARTCI) was created to ensure the proper application and compliance with this law.

There is also a certain ability to unambiguously identify an individual within each system due to the existence of a customer matching algorithm which makes it possible to identify customers in 50 to 75% of cases.

The problem arises, however, when we want to make the systems communicate with each other because there is no unique identifier. This constitutes a real challenge for the interoperability of systems which must be based on very specific protocols, standards, or communication rules.

There is a lack of an interoperability framework or interoperability guidelines. Indeed, although there are policies in place, they are not fully implemented. There are no accepted protocols, frameworks, or processes in place to support data exchange.

Governance and Policy

Since 2016, the Ivorian government has created within the MSHP-CMU, the Directorate of Informatics and Health Information (DIIS)[12]. Below this directorate, there is a Sub-Directorate of Informatics and Telemedicine which is responsible for digital health and has a Strategic Plan for the National Health Information System 2021-2025 considering all health system strengthening initiatives relating to health information and an Operational Plan for the Health Information System 2022-2023. In this Operational Plan, the government's desire to strengthen the institutional, regulatory and governance framework of the national health information system is clearly highlighted[13]. **This will surely involve the development of a digital health strategy**.

A digital health governance/direction committee is available on paper but is not operationalized. However, leadership and political will exist at the highest levels of the Ministry of Health and other relevant government agencies.

Data capture and use

The average score for this category is 3.6. This is the highest score and is justified by the establishment of an institutional framework and the government's desire to use digital tools for the capture and analysis of health data.

[9] PSSNIS 2021-2025 partie 6.1.5 (page 50)
[10] https://datareportal.com/reports/digital-2021-cote-divoire?rq=C%C3%B4te%20d%27Ivoire
[11] PSSNIS 2021-2025 partie 5.2 (page 28)
[12] PSSNIS 2021-2025 partie 3.1.1 (page 17)
[13] Plan Opérationnel 2022-2023 - III (Page 10)

The Routine Health Information System (SISR)[14] of Ivory Coast includes 2 types of tools which are:

- Paper tools composed of primary tools (individual files or files, registers, scorecards, etc.) and secondary tools (activity reports which are monthly or quarterly).
- Electronic tools include all data management applications (SIGDEP 2, DHIS2, e-SIGL etc.).

Since 1995, the Ministry of Health for data management has opted for the establishment of the SIGDEP Platform for data entry and centralization. It was in 2010-2011 that DHIS2 was implemented in Ivory Coast. A process of updating digital collection tools was undertaken and the national transition of DHIS2 covering all health facilities was effective from 2018. It is free open-source software to which all digital tools additional parts had to be connected (interoperability).

Furthermore, Ivory Coast does not have a health data monitoring and evaluation plan and existing digital health solutions allow lessons to be learned but are not formally evaluated.

Investments and financing

Digital health is not included in the national health strategy and is not fully funded as the government contributes 5-10%.

It is implemented in an ad hoc manner in health programs. There is no long-term plan for costed funding to operate, maintain and support digital health systems. However, there is political interest and support for investment in ICT for improving services.

This is a national priority, as reflected in political decisions, although funding is not assured. No funding is planned to support the strengthening of infrastructure. A plan exists but does not consider a growth trajectory.

For the 2022-2023 financial year, several funding gaps for digital health activities have been identified by the government and listed in part IV.3 of the 2022-2023 Operational Plan[15].

Infrastructure

Recent data on internet accessibility indicates that the internet penetration rate is 36% in 2019 and has 145 telephone subscriptions per 100 inhabitants. Which means that 52.2% of Ivorians use mobile internet[16]. But these inhabitants are mainly concentrated in the city of Abidjan (the capital).

At the health level, the CHR, CHU, Regional and Departmental Directorates have computers and internet connection although this needs renewal. But at the level of health structures, only those who are in digital health projects implemented by the TFPs often benefit from computers, smartphones or tablets and an internet connection.

3.3 WP3: Opportunities

The tools evaluated mainly come from Map and Match data from Digital Square (29 tools), the DIIS database (5 tools) and the literature review (2 tools). This makes a total of thirty-six (36) tools listed and evaluated.

1. AfriDoctor
2. PESP (Plateforme Electronique de Suivi des Patients sous ARV)

[14] PSSNIS 2021-2025 partie 3.1.3 (page 18)
[15] page 21-23
[16] https://donnees.banquemondiale.org/indicateur/IT.NET.USER.ZS?locations=CI

3. DHIS2 CI
4. DataToCare
5. DVD-MT (District Vaccination Data Management Tool)
6. eSIGL-Système d'Information Electronique de Gestion Logistique (OpenLMIS)
7. Extract, Transform, Load (ETL) Application (DHIS2)
8. iHRIS
9. ISS: Integrated Supportive Supervision (ODK)
10. Magpi
11. mSupply
12. M-Vaccin
13. OpenELIS
14. OpenMRS
15. Plateforme WhatsApp USAID[17]
16. Quantimed
17. QuickRes (ORA software)
18. RECOVR (ODK)
19. Rumor Management System (DHIS2)
20. SAGE
21. Saved by Tech - drone local
22. SGS (Systeme de gestion des stocks)
23. SORMAS
24. Trace Tube
25. UGA (Unite de gestion des approvisionnements)
26. RapidPro
27. Vantage
28. VigiFlow
29. Wellvis COVID-19 Triage Tool
30. Malaria Prevention Côte d'Ivoire V1 (CommCare)
31. Dossier Patient Informatisé
32. Identifiant Unique du Patient
33. MTB VIH
34. OPENDCH
35. Situation Room
36. OPISMS

The Computerized Patient File, Unique Patient Identifier, MTB HIV, OPENDCH and Situation Room tools come from the DIIS database, the Malaria Prevention Côte d'Ivoire V1 (CommCare) tools come from research and therefore were not found in the Map and Match database and were completed in the list of digital tools used nationally in Ivory Coast. The WhatsApp USAID Platform tool was removed from the analysis because it did not have any information that could be used to evaluate it.

The starting digital health ecosystem based on the Map and Match data is summarised in the figure below. It shows the digital tools taking into account each of the 14 DPPA categories. Where there is functionality in the system, then there is an "opportunity".

This list was validated in terms of functionality and the fact that there was at least one pilot phase or local pilot team of the software at national level. Some of the digital tools were abandoned due to non-adoption or lack of funding.

Opportunities can also be interpreted as digital tools that can be adapted very quickly and more easily to the country context if needed.

[17] Nous n'avons pas pu avoir des information sur cette application. Elle a donc été retirée de l'évaluation

Table 3 shows a first overview of the opportunities in the digital health ecosystem in Ivory Coast. A more detailed view of the existing tool opportunities is in ANNEX 3.

Table 3: High-level assessment of existing opportunities before the validation process

Module Pays en mode gestion des épidémies ou préparation ? SÉLECTEUR DE CLASSEMENT :	S/N	Catégorie du DPP (1) Actuellement déployé dans la catégorie des fonctionnalités listées (réf. A1 **column Y:** Catégories d'utilisation)	AfriDoctor	PESP (Plateforme Electronique	DHIS2 CI	DataToCare	DVD-MT (District Vaccination D	eSIGL-Système d'information E	Extract, Transform, Load (ETL)	iHRIS	ISS: Integrated Supportive Sup	Magpi	mSupply	M-Vaccin	OpenELIS	OpenMRS	NA	Quantimed	QuickRes (ORA software)	RECOVR (ODK)	Rumor Management System (D	SAGE	Saved by Tech - drone local	SGS (Systeme de gestion des s	SORMAS	Trace Tube	UGA (Unite de gestion des appl	RapidPro	Vantage	VigiFlow	Welvis COVID-19 Triage Tool	Malaria Prevention Côte d'Ivoir	Dossier Patient Informatisé	Identifiant Unique du Patient	MTB VIH	OPENDCH	Situation Room	OPISMS
OUTBREAK			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Core	1	SURVEILLANCE			1	1						1									1				1	1												
Extended	2	LABORATORY SYSTEMS				1									1										1	1												
Core	3	CASE MANAGEMENT	1	1	1						1		1	1		1			1						1	1					1	1	1	1	1			1
Core	4	CONTACT TRACING		1	1								1								1				1													
General	5	PROXIMITY TRACING																																				
Extended	6	COORDINATION & OPERATIONS		1	1	1		1				1	1			1		1		1		1			1				1	1								
Core	7	SUPPLY CHAIN & HEALTH FACILITY LOGISTICS			1			1					1					1				1	1	1			1			1								
General	8	HEALTH FACILITY ADMINISTRATION	1							1																												
Extended	9	HEALTH WORKER TRAINING								1			1												1													
Extended	10	RISK COMMUNICATION & COMMUNITY ENGAGEMEN										1									1		1					1				1						
Extended	11	ONE HEALTH																			1																	
General	12	INTEROPERABILITY		1	1	1			1		1	1	1			1									1													
Core/Extended*	13	VACCINE DELIVERY					1				1		1	1																		1						1
Core	14	DATA ANALYTICS, VISUALIZATION & USE		1	1	1				1			1	1											1					1		1	1		1	1	1

At first sight, only one (1) category are not served. For all other categories, as shown in Figure 4 below, there is at least one opportunity that could be deployed nationally.

Figure 4: Opportunities in terms of the number of existing software products to meet DPP functionality

3.4 WP4: Gaps

This section presents the validation of opportunities against actual implementations of the digital tools found at national level. To do this, email responses and individual interviews with key informants and stakeholders were analysed according to the methodology for assessing the **14**

DPPA Cagoteries and 64 Functionalities described earlier in Chapter *2 DPPA Tool and Methods*.

Figure 4 above shows in detail the gaps identified in relation to the 64 DPP features examined. This shows that for 1 **category** there was no opportunity and for the **other categories some DPP features were** not as well served. In total, there were gaps in **10 functionalities across 5 DPP categories.**

It is also important to note that the gaps were justified by the somewhat difficult and inadequate context of Togo for the implementation of certain digital tools. This also justified the lack of opportunities for these gaps.

An overview of the gaps based on the opportunities of existing tools are in ANNEX 3.

Table 4: List of DPP features not served in Ivory Coast

S/N	DPP Functionalities by Category	Progiciels: DÉPLOYÉS	Progiciels: Existants mais NON DÉPLOYÉS
4.4	Communication with contact via phone call (through app)	0	2
4.6	Bidirectional communication with contact via messaging (e.g. SMS, social media, in-app, WhatsApp)	0	2
5.1	Automated mass contact tracing of anonymous contacts via smartphone (or bracelet) Bluetooth signals	0	0
5.2	(Optional) notification of positive infection diagnosis with high-risk contacts via user's smartphone app	0	0
5.3	Functionality adapted to generalised epidemic response (not strictly COVID-19)	0	0
6.7	Big Data analysis (e.g., mobility monitoring based on mobile phone data, rumour monitoring based on social media analysis)	0	0
11.1	Tracking of infectious disease outbreaks in domesticated animals (livestock etc)	0	1
11.2	Tracking of infectious disease outbreaks in wildlife	0	1
11.3	Ecological surveillance of environment for changes that could increase risk of zoonotic infection	0	1
13.4	Reporting on adverse events	0	4

3.5 WP5: Recommendations

The main objective of this assessment was to gain an overview of the digital public health ecosystem and to formulate recommendations and action plans that could contribute to modernising overall digital pandemic preparedness.

3.5.1 Improving the digital ecosystem

The qualitative analysis of the digital health ecosystem and the EDIT tool reveals several areas for improvement to which Ivory Coast should pay particular attention.

Ivory Coast will need to develop its **long-term plan for financing the digital health system** and **its strategic plan for digital health** (essential documents for mobilising resources from partners and the government). It will also be necessary to establish a coordinating body and a framework document that clearly defines roles and responsibilities for digital health functions and activities, as well as the training of female health personnel. These are issues that need to be addressed as Ivory Coast develops its digital health landscape (and improves its current overall score on critical indicators). Without this, there are risks of uncoordinated development and siloed digital tools. In addition, attention should be paid to the advantages and disadvantages of open-source digital tools versus proprietary digital tools. Low acquisition costs do not necessarily mean that these open-source digital tools have the lowest total acquisition cost.

R1.1. Create a database of health institutions

A list of public health establishments, NGOs and private establishments is available, but is not up to date. Thanks to a consultation framework between the Directorate of Health Establishments and the Health Profession (DEPS) and the Directorate of Computing and Health Information (DIIS), the updating of a master list of establishments could be carried out . This list could also be used to identify unauthorized health facilities.

R1.2. Create an individual data management system

Currently, individual data can only be linked in 50 to 75% of cases. However, the Ivorian government carried out biometric identification in 2020 of a segment of the population (16+) before the elections which gave them the right to a National Biometric Identity Card, and which could subsequently be used in the health care system.

It is imperative that the Ivorian Government adopts a national medical records management system to ensure patient identification, monitoring and documentation of the patient's journey for better care.

It should also be noted the presence of the Computerized Patient File and Unique Patient Identifier projects managed by the DIIS. These initiatives should be supported by the government and the TFPs to have an effective system for managing individual data.

R1.3. Establish a digital health governance committee

Leadership and political will exist at the highest levels of the Ministry of Health and other relevant government agencies. However, a coordinating body or governance structure for digital health would be needed to help coordinate the informatization of the health system.

R1.4. Develop a long-term digital health strategy

Build on the evidence of political will and leadership highlighted in the EDIT analysis to address some of the key weaknesses, particularly the lack of a digital health strategy, a costed long-term plan and improvement of data management and systems at district and health facility level. The costed long-term plan should include, where appropriate, a statement of the standards to be considered to help develop the use and interoperability of the systems.

R1.5. Financing plan for the national digital health strategy: Define a budgetary plan for financing the implementation of the National digital health strategy

A national strategy or framework is approved, but there is no costed plan. It is therefore necessary to develop a budget or financing plan for the national digital health strategy to facilitate advocacy for resource mobilization.

R1.6. Develop a strategy that can promote real-time data entry

Data entry is the first entry point for health information. To guarantee its quality and security, it is imperative that data entry in health establishments be done in real time via smartphones, tablets or computers and that large registers which are never properly completed by health care agents be abandoned. health. Several NGOs are implementing similar projects in collaboration with various programs of the Ministry of Health. But these actions must be centralized.

R1.7. Establish a budget plan to support the strengthening, renewal and maintenance of infrastructure and IT equipment

Advocate for the creation of a budget line for the purchase and maintenance of computers for healthcare establishments; Develop a budget plan to facilitate the participation of Technical and Financial Partners (PTF) in financing.

R1.8. Strengthen staff skills in ICT to ensure technical maintenance of ICT infrastructures

District-level capacity to maintain and troubleshoot hardware, servers and digital tools is insufficient. Recruit companies for technical assistance and equipment maintenance at all levels of the health system.

Furthermore, the staff or consultants have the capacity to respond to the most common maintenance problems. Develop a comprehensive plan to strengthen staff skills at the national level.

R1.9. Set a budget for additional digital tools

The cost of digital tools for pandemic preparedness should also be considered in the various plans (strategic, maintenance, depreciation, training, etc.) and reflect the orientations required for digital health tools in general.

R1.10. Consider issues of diversity, equity and inclusion

Ultimately, digital pandemic preparedness benefits everyone. This raises issues of diversity, equity, and inclusion in pandemic planning, and includes consideration of how issues of ethnicity, gender, etc. are processed. Although they are not a characteristic of the DPPA, Ivory Coast in the development of its digital health ecosystem should consider these sometimes-sensitive issues.

R1.11. Design administrative and human resources management tools at the national level

For better coordination at the health worker level, it is imperative to have management software for all health personnel. iHRIS is a health human resources management and health workforce mapping software. It can also be used to capture and maintain high quality information for health workforce planning, management, regulation and training.

This software is implemented by JSI and IntraHealth in Ivory Coast with funding from USAID, but on a small scale. iHRIS represents a great opportunity to be seized and implemented at the national level for the management of human resources in health.

3.5.2 Digital pandemic preparedness

R2.1. Development of local digital tools to promote local, two-way communication or messaging with patients

There seem to be local opportunities or rather attempts to implement digital tools to meet these functionalities. But these were abandoned very early on given the unfavourable realities of the country. The development of a digital tool should consider realities, the local context, and the following aspects:

- Internet use is very limited in the country outside of large cities. Price is a limiting factor, with a cost per MB equivalent to USD 8.78 beyond the accessibility threshold defined by the UN (source: Alliance for Affordable internet, 2018).
- This type of technology would require good connectivity network in all parts of the country or an equivalent alternative that could work in the local context.

R2.2. Consider the development of a digital data analysis tool using the example of "Big Data" to improve data analytical capacity

This computing technology enables advanced data collection functionality using web-scraping from public/private internet resources. The development of a digital tool to respond to such a DPP functionality is not sustainable in the context of the country. However, the following aspects should be considered for implementation:

- Cooperation with large national and international social media companies or search engine operators would be very important. In the case of detailed records of mobile phone communications, this may require an agreement between the government and the mobile network operator.
- Conceptualize a methodology for extracting large-scale data from frequently changing website structures.
- Consider that digital web scraping tools are not omnipotent, and websites can ban IP addresses.
- Consider that there are legal questions that may arise.

R2.3. Support the implementation of the digital animal and environmental health management tool

In order to ensure holistic management of increasingly frequent health crises which require concerted multi-sectoral actions involving human health, animal health and environmental health, an integrated and interoperable application with the national platform would constitute a natural complement to the existing digital health ecosystem.

Furthermore, given that most human diseases are transmittable between animals and human, the need to have mechanisms for the exchange and mutual sharing of information and to act in a concerted manner has been clearly expressed by the actors following recent health crises in the country and in West Africa such as the epidemics of avian flu, Ebola virus disease and Lassa fever.

The process of establishing a One Health platform is underway in the country. This is a recommendation from international organizations, notably the WHO and WAHO, to member countries.

In this specific framework, given that the country is already engaged in this process, the following aspects could be strengthened.

Implementation will require the mobilization of additional financial resources for capacity building of local developers and users as well as the acquisition of infrastructure.

- Mobilization of additional financial resources to strengthen the capacities of local developers;
- Content development and support for users of the One Health concept;
- Acquisition of additional infrastructure for users;
- Support the development of key elements to enable the monitoring of infectious disease outbreaks in domestic animals (one Health);
- Take into account the important aspects enabling the monitoring of outbreaks of infectious diseases in wildlife;
- Implement digital tools that will enable ecological monitoring of the environment for changes that could increase the risk of zoonotic infection.

R2.4. Support the development of a tool for reporting side effects after vaccination

Several digital platforms and tools for managing or monitoring the vaccination process exist in Ivory Coast. However, none of them allows the reporting of side effects after vaccination, which has become a very important feature since 2020 because several vaccines against Covid-19 have been administered to populations and certain side effects have been reported.

The African Fund for the Acquisition of Vaccines (AVAT) and the Ivorian government launched in March 2022 a compensation program for people who had adverse effects.

The African Fund for the Acquisition of Vaccines (AVAT) and the Ivorian government launched a compensation program in March 2022 for people who had side effects after vaccination against Covid-19. And according to the government, 1,959 cases were notified, including 34 serious ones treated.

To support this process supported by the African Union, Africa CDC, the United Nations Economic Commission for Africa and Afreximbank, it is important to create a platform (web or mobile) for reporting side effects after vaccination by people vaccinated. This will help build confidence in vaccines among African populations and achieve their adoption throughout the country.

R2.5. Development of digital tools for self-declaration and anonymous proximity self-detection

Given the complexity of this functionality in the national context of Ivory Coast, it is necessary to review the governance of data protection before exploring software opportunities that can be exploited for a quick gain. The development of such a digital tool should consider the realities of the local context and the following aspects:

- Mobile phone location data must not in any way violate privacy or infringe on civil liberties.

- Automated mass anonymous contact tracing via Bluetooth signals is an innovative technology that respects privacy and civil liberties, which could be leveraged.
- Features should avoid relying only on minimal data from a respondent base that would be biased in favour of urban elites.

R2.6. Online training for digital health stakeholders on open-source digital tools and global goods used at the national level

It is important to consider online learning (e-learning) and/or digitally reinforced training/reminders functionalities for digital health professionals. It would be relevant to extend the functionalities to respond to the identified gaps in the digital health ecosystem, starting with preparation for the digital pandemic.

R2.7. Create an online health training platform

The deployment of a digital tool that would allow healthcare personnel to regularly update their skills in response to a pandemic would meet the needs of this DPP functionality gap.

In view of the digital culture of personnel, ICT is widely used by health personnel at all levels. However, most health establishments do not have ICT equipment and are not covered by the internet. In the context of Covid-19 and the scarcity of health HR, online learning (e-learning) and/or digitally reinforced training/reminders functionalities in applications not only make it possible to avoid the risks of conventional face-to-face training but also the continuity of services.

4 Summary

The digital pandemic preparedness assessment of Ivory Coast made it possible to identify (36) software which constitutes the digital health ecosystem. This study was carried out through a desk review and interviews with stakeholders using the digital pandemic preparedness assessment tool (DPPA) and the EDIT tool (Digital Health Initial Stage Investment Tool).

The results obtained at the end of this evaluation showed not only the state of the health system in Ivory Coast with a score of 2.9/5 which is above average and highlighted, functional gaps and opportunities in the country's health system.

However, several recommendations were addressed to the Ministry of Health on each gap listed with a view to optimal digital preparation for the pandemic adapted to Ivory Coast.

The following questions would allow a follow up assessment if necessary:

- **Are there any other stakeholders?**
- **Are there any other initiatives underway to assess the ecosystem?**
- **Do the recommendations cover the needs of the digital health ecosystem?**
- **Are there other digital health solutions that should have been considered?**
- **How to prioritise recommendations?**
- **How to define a Challenge for the DIPC project?**
- **How can partners be engaged to facilitate the implementation of certain measures?**

ANNEX 1: List of persons consulted

Table 5: Stakeholders List

N°	Nom et prénom (s)	Structure de provenance	Titre
1	M. Soro Gorgoh	Direction Général de la santé	Point focal DPPA
2	Dr PONGATHIE Adama Sanogo	Direction de l'Informatique et de l'Information Sanitaire	Directeur
3	KOUAKOU Koffi Alain	Direction de l'Informatique et de l'Information Sanitaire	Chef de Service Informatique
4	Dr Alimata Diakite Sow	UNICEF	Conseiller Technique Partenaire de mise en œuvre
5	M. Michael Reich	KFW	Responsable Portfolio
6	M. Braud Konan Bertrand	JHPIEGO	Conseiller Technique Partenaire de mise en œuvre
7	Mme Natalie Tibbels	John Hopkins University	Conseiller Technique Partenaire de mise en œuvre
8	M. ALLOUIN Alexandre	ONUSIDA	Partenaire de mise en œuvre
9	M. SIDIBE Rodrigue	Save The Children	Partenaire de mise en œuvre
10	M. Graig Drown	The mSupply Foundation	Partenaire de mise en œuvre

ANNEX 2: Qualitative EDIT interviews

Table 6: Qualitative EDIT interviews

OUTIL NUMERIQUE	DESCRIPTION DANS LE CONTEXTE DU COTE D'IVOIRE	CAS D'UTILISATION DPP
AFRIDOCTOR	AfriDoctor est une plateforme en ligne qui digitalise les parcours de soins des patients et rapproche les prestataires de santé de leurs patients. La plateforme permet aux patients de prendre rendez-vous en ligne avec leurs prestataires et de recevoir des rappels gratuits par SMS. La plateforme met à disposition des prestataires un outil de gestion d'agenda, de facturation et de gestion des dossiers médicaux et de visibilité/référencement des structures de santé.	Administration des établissements de santé, Gestion des cas
PESP (PLATEFORME ELECTRONIQUE DE SUIVI DES PATIENTS SOUS ARV) COMMCARE	CommCare est une plate-forme mobile de collecte de données et de prestation de services hors ligne utilisée dans plus de 80 pays. CommCare est populaire pour ses capacités de gestion de cas hors ligne qui se sont avérées efficaces à grande échelle. Il est conçu pour tout, des enquêtes simples au suivi complet des données longitudinales. Il permet une numérisation facile des enquêtes, dispose de formulaires intuitifs pour les utilisateurs finaux, utilise un déploiement simple de l'appareil et inclut des fonctionnalités de traduction. Actuellement utilisé en Côte d'Ivoire par les agents de santé de première ligne pour gérer le modèle de soins chroniques pour les personnes vivant avec le VIH. Avec l'adoption récente de CommCare par le MSHP, le système sera synchronisé avec le dossier de santé électronique SIGDEP du ministère.	Communication de risque et engagement communautaire, Gestion des cas, Traçage des contacts, Interopérabilité, Analyse visualisation et utilisation des données
DHIS2 CI	District Health Information Software 2 (DHIS2) est une plate-forme HMIS open source basée sur le Web. DHIS2 prend en charge la collecte, l'analyse, la visualisation et le partage de données agrégées et individuelles, y compris la collecte de données mobiles et hors ligne à l'aide de l'application Android DHIS2. Le développement du logiciel de base DHIS2 est géré par le HISP de l'Université d'Oslo. HISP est un réseau mondial qui fournit un soutien direct quotidien aux ministères de la santé et aux exécutants locaux du DHIS2. DHIS2 Tracker permet à l'utilisateur de définir un type particulier de chose (personne, marchandise, échantillon de laboratoire, zone de chalandise, etc.) qu'il souhaite suivre dans le temps (une entité suivie), de définir les données qu'il souhaite collecter sur cette entité (éléments de données), placez les éléments de données dans un ordre spécifique et avec toute condition ou logique d'accompagnement (programme, règles de	Coordination et Opérations, Gestion des cas, Surveillance, Systèmes de laboratoire, Traçage de contacts, Interopérabilité, Formation du personnel de santé, Analyse visualisation et utilisation des données.

	programme), et déterminez les analyses qui doivent être produites (indicateurs de programme, rapports d'événements, visualisations de données, etc.).	
DATATOCARE	DataToCare est Une suite d'applications intégrées qui collecte et diffuse les données de diagnostic et de surveillance des laboratoires distants aux acteurs régionaux et nationaux et permet aux équipes médicales d'accéder aux données pour la prise de décision. Le bureau DataToCare est installé dans tous les laboratoires pour collecter et transférer les données de diagnostic et les envoyer via Internet ou SMS aux bases de données centrales. Le serveur DataToCare est installé au niveau central et calcule les données diagnostiques ou épidémiologiques des points de soins et des laboratoires distants. À partir du serveur, un tableau de bord fournit un aperçu national/régional/provincial des données en temps réel. La notification de la disponibilité des résultats est envoyée aux personnes définies par SMS dès que les résultats des tests sont validés par l'opérateur.	Coordination et Opérations, Gestion des cas, Surveillance, Systèmes de laboratoire, Traçage de contacts, Interopérabilité, Analyse visualisation et utilisation des données.
DVD-MT (DISTRICT VACCINATION DATA MANAGEMENT TOOL)	Un outil gratuit basé sur Excel utilisé pour planifier, administrer/documenter les soins, mesurer et analyser les performances et gérer le stock de vaccins.	Administration des vaccins
ESIGL-SYSTEME D'INFORMATION ELECTRONIQUE DE GESTION LOGISTIQUE (OPENLMIS)	eSIGL (Système d'Information Electronique de Gestion Logistique) est un SIGL complet déployé à grande échelle à l'aide de la plateforme OpenLMIS. OpenLMIS est un puissant système d'information de gestion logistique électronique (LMIS) open source et basé sur le cloud, spécialement conçu pour gérer les chaînes d'approvisionnement en produits de santé. OpenLMIS gère le processus SIGL électronique dans plus de 10 000 établissements de santé dans 8 zones géographiques à travers l'Afrique, dans tous les principaux programmes de santé, y compris les vaccins. Chaîne d'approvisionnement : OpenLMIS a adapté son outil afin que les pays puissent optimiser leur utilisation du logiciel pour encourager une bonne gestion de la chaîne d'approvisionnement des fournitures COVID. OpenLMIS a lancé une instance séparée et simplifiée appelée OpenLMIS COVID-19 Edition, qui est un outil de démarrage plus léger et plus rapide pour aider les pays à démarrer immédiatement pour gérer les produits liés au COVID et a été adapté pour le COVID-19 en Côte d' Ivoire.	Coordination et Opérations, Logistique de la chaîne d'approvisionnement et des établissements de santé.

EXTRACT, TRANSFORM, LOAD (ETL) APPLICATION (DHIS2)	West Africa Health Informatics Team (WAHIT)/ L'équipe d'informatique sanitaire de l'Afrique de l'Ouest (WAHIT) a développé une application Extract, Transform, Load (ETL), qui automatise l'importation hebdomadaire des données de surveillance intégrée des maladies et de riposte (IDSR) à partir du formulaire Excel utilisé par les pays vers l'Organisation ouest-africaine de la santé (OOAS) plate-forme régionale basée sur DHIS2. En utilisant le nouveau processus, les gestionnaires de données des pays sont désormais en mesure de fournir facilement des informations à la plate-forme régionale afin que l'OOAS puisse continuer à surveiller les événements sanitaires dans la région.	Coordination et Opérations, Interopérabilité
IHRIS	iHRIS est un logiciel open source gratuit qui aide les pays du monde entier à suivre et à gérer leurs données sur les personnels de santé afin d'améliorer l'accès aux services. Les pays l'utilisent pour capturer et maintenir des informations de haute qualité pour la planification, la gestion, la réglementation et la formation des personnels de santé. Au Sénégal, il est utilisé comme outil de cartographie et de gestion des ressources humaines pour la santé.	Administration des établissements de santé, Interopérabilité, Formation des Agents de santé, Analyse visualisation et utilisation des données
ISS: INTEGRATED SUPPORTIVE SUPERVISION (ODK)	ISS est une liste de contrôle électronique utilisée pour la supervision pendant la recherche active de cas et la vaccination de routine.	Administration des vaccins, Interopérabilité, Gestion des Cas
MAGPI	Magpi est une application de téléphonie mobile en ligne utilisée par les volontaires pour effectuer des visites à domicile avec une approche et un ensemble de messages uniformes. Les volontaires ont documenté les visites à domicile à Magpi afin que l'information soit relayée à tous les niveaux de gestion de la campagne. Le ministère de la Santé de Côte d'Ivoire, en collaboration avec le CDC, a mis en place un système impressionnant de surveillance communautaire des maladies incorporant à la fois la collecte de données mobiles Magpi ainsi que la notification par SMS à l'aide de Frontline SMS. L'agent de surveillance épidémiologique saisit les cas suspects de maladies sur le serveur du site Web de Magpi, qui fonctionne comme une application mobile privée basée sur le cloud.	Surveillance, Coordination et Opérations, interopérabilité, Communication de risque et engagement communautaire,
MSUPPLY	mSupply peut être utilisé pour n'importe quelle combinaison de gestion des stocks, d'affichage de données agrégées sur des tableaux de bord, d'enregistrement par le patient de la distribution de vaccins (y compris le calcul des taux de vaccination et la production d'une liste de personnes pour envoyer des rappels par SMS), la surveillance de l'équipement de la chaîne du froid à l'aide de capteurs Bluetooth réaction indésirable aux médicaments enregistrement,	Coordination et Opérations, Gestion des cas, Surveillance, Systèmes de laboratoire, Traçage de contacts, Interopérabilité, Formation du personnel de santé,

	enregistrement des réactions indésirables aux médicaments, etc. Depuis son implémentation, l'application mSupply est utilisée dans l'ensemble des sites de la phase I, bien qu'un suivi rapproché et un mécanisme de renforcement des capacités des utilisateurs contribueraient à améliorer significativement le niveau d'utilisation de mSupply. Elle permet la dispensation, la gestion de stock et la commande des produits de santé (médicament intrant et consommable). La troisième phase de déploiement est prévue sur 449 sites en 2020 avec l'appui Fonds Mondial et 40 sites avec l'appui NPSP/DAF santé. La quatrième phase se réalisera au troisième trimestre 2020 sur 85 sites avec l'appui de la BM. Au total, il s'agira de déployer l'application dans toutes les aires sanitaires des 113 districts soit 2500 sites identifiés d'ici 2021. La version mobile de mSupply sera développée 2021 et sera déployée sur l'ensemble du territoire avec l'appui technique de SusSol à travers un financement du FM Cet outil permet de gérer en routine les stocks de produits de santé dans tous les établissements sanitaires. Il permettra de disposer de données de qualité et disponibles à temps, depuis le niveau périphérique et ce de bout-en bout de la chaîne d'approvisionnement. Version actuelle : V4.14 Niveau de déploiement : 555 sur 3565 sites (RASS 2020)	Analyse visualisation et utilisation des données, Administration des Vaccin.
M-VACCIN	Le projet « M-Vaccin Côte d'Ivoire » utilise la technologie mobile d'Orange pour informer les parents sur l'importance de la vaccination en envoyant des SMS et des messages vocaux dans la langue locale. Des messages ciblés aideront également à s'assurer que les parents ne manquent pas les séances de vaccination en leur rappelant l'horaire et les dates de leurs enfants.	Gestion des cas, Interopérabilité, Analyse visualisation et utilisation des données, Administration des Vaccin.
OPENELIS	L'Open Enterprise Laboratory Information System (OpenELIS) est un logiciel open source mondial. Il sert de système d'information de laboratoire adapté aux laboratoires de santé publique dans des environnements à ressources limitées pour soutenir les meilleures pratiques de laboratoire et l'accréditation. OpenELIS peut fonctionner hors ligne et est disponible en anglais et en français. Dans le but d'assurer la pérennisation du logiciel OpenELIS en Côte d'Ivoire, une Cellule d'Assistance Technique aux utilisateurs CATOE à vue le jour en 2017 dont l'objectif est de porter une assistance rapprochée aux utilisateurs de OpenELIS.	Système de Laboratoire

	A ce jour, plus de 85 laboratoires (CHU, CHR, HG) et 27 laboratoires des Centres Antituberculeux (CAT) utilisent l'application OpenELIS	
OPENMRS	OpenMRS est une plateforme logicielle et une application de référence permettant de concevoir un système de dossiers médicaux sur mesure. OpenMRS a adapté son logiciel pour faciliter le dépistage, le test et la gestion des patients (outils de diagnostic) par 5 500 implémentations existantes et la transmission efficace des données au DHIS2 pour la surveillance de la santé publique.	Gestion des cas, Analyse visualisation et utilisation des données, Interopérabilité
QUANTIMED	Quantimed est un outil qui quantifie les médicaments et fournitures essentiels. Quantimed est conçu pour améliorer la précision de la planification et de la budgétisation des commandes en proposant une approche systématique de l'organisation et de l'analyse des données. Quantimed facilite le calcul des besoins en produits en utilisant une seule méthode ou une combinaison de l'une des trois principales méthodes de quantification : consommation passée, schémas de morbidité et consommation indirecte. Selon la disponibilité des données, Quantimed peut être appliqué au niveau local avec une installation, au niveau régional avec plusieurs installations ou au niveau national pour un programme de contrôle national.	Coordination et Opérations, Logistique de la chaîne d'approvisionnement et des établissements de santé, Analyse visualisation et utilisation des données
QUICKRES (ORA SOFTWARE)	QuickRes est une application en ligne qui permet à tout membre du public de faire facilement des réservations pour des services de santé à l'aide d'un smartphone, d'une tablette ou d'un ordinateur portable. Il s'appuie sur le logiciel ORA existant.	Gestion des cas
RECOVR (ODK)	Le suivi de la façon dont la vie des gens est affectée par la pandémie de COVID-19 peut permettre aux décideurs politiques de mieux comprendre la situation dans leur pays et de prendre des décisions politiques fondées sur des données. Pour répondre à ce besoin, l'IPA a développé l'enquête RECOVR, une enquête par panel qui facilitera les comparaisons, documentera les tendances en temps réel des préoccupations politiques et informera les décideurs sur les communautés les plus durement touchées par le coût économique de la pandémie.	Coordination et Opérations
RUMOR MANAGEMENT SYSTEM (DHIS2)	Ce système basé sur DHIS2 recueille les rumeurs et les informations erronées des lignes d'assistance nationales (et des contributeurs communautaires, lorsqu'ils sont financés), les enregistre dans un journal des rumeurs standard et les code par district, date, source, sujet et "déclarations de croyance" (le cas échéant) puis organise sur des tableaux de bord pour les communicateurs des risques dans le pays. Le système a en fait été développé pour les zoonoses prioritaires/initiatives One Health dans le cadre du GHSA mais a été utilisé presque exclusivement pour le COVID-	Surveillance, Analyse visualisation et utilisation des données, One Health, Communication de risque et engagement communautaire.

	19, car il a été lancé fin février 2020. Pour le COVID-19 en Côte d'Ivoire : le système de gestion des rumeurs est suivi des rumeurs COVID-19 soumises aux lignes directes (et en 2020, l'équipe engageait également des contributeurs communautaires en tant qu'auditeurs pour soumettre des rumeurs à signaler dans le cadre du processus d'écoute dynamique et de gestion des rumeurs du JEE). L'équipe collecte les rumeurs, les code et les présente au groupe de travail technique national sur la communication des risques.	
SAGE 1000	Système de planification des ressources d'entreprise pour placer et localiser les stocks de produits et enregistrer les mouvements de stock. Il distribue les produits de santé à 82 districts de santé et à environ 200 des plus grands établissements de santé sur une base mensuelle ou bihebdomadaire.	Coordination et Opérations, Logistique de la chaîne d'approvisionnement et des établissements de santé.
SAVED BY TECH - DRONE LOCAL	Saved by tech est une fondation ivoirienne dirigée par trois grandes entreprises locales spécialisées dans la conception de drones. Elle a développé trois prototypes de drones pour des usages spécifiques pour lutter contre le COVID-19. L'un, peut être utilisé pour mesurer la température à l'aide d'une caméra thermique, un autre pour transporter 20 litres de solution liquide pour assainir plus de 70 hectares d'espaces publics en une journée, et un troisième est équipé d'un mégaphone pour diffuser des messages pré-enregistrés/en direct sur la façon de prévenir le COVID-19 dans les zones rurales.	Logistique de la chaîne d'approvisionnement et des établissements de santé, Communication de risque et engagement communautaire.
SGS (SYSTEME DE GESTION DES STOCKS)	SGS ou Système de gestion des stocks est un système de gestion des stocks en Côte d'Ivoire.	Logistique de la chaîne d'approvisionnement et des établissements de santé
SORMAS	SORMAS (Système de gestion et d'analyse de la réponse aux épidémies de surveillance) est un logiciel open source qui traite les procédures de contrôle des maladies et de gestion des épidémies. SORMAS fournit également une surveillance numérique en temps réel des établissements de santé périphériques et des laboratoires, ce qui facilite la détection précoce des épidémies.	Coordination et Opérations, Gestion des cas, Surveillance, Systèmes de laboratoire, Traçage de contacts, Interopérabilité, Formation du personnel de santé, Analyse visualisation et utilisation des données, Administration des Vaccin.
TRACE TUBE	Le système a été mis en place pour assurer la traçabilité des tubes de prélèvement afin d'accélérer le processus	Gestion des cas, Surveillance,

	de traitement et d'obtention des résultats des tests effectués.	Systèmes de laboratoire
UGA	UGA (Unite de gestion des approvisionnements) implémenté par l'Institut Pasteur de Côte d'Ivoire	Systèmes de laboratoire
U-REPORT (RAPIDPRO)	U-Report est un outil de messagerie qui permet aux jeunes du monde entier de s'engager et de s'exprimer sur des questions qui les intéressent. Il fonctionne en recueillant les opinions et les informations des jeunes sur des sujets qui les intéressent - allant de l'emploi à la discrimination et au mariage des enfants. Les U-Reporters répondent aux sondages, signalent les problèmes et soutiennent les droits de l'enfant. Les données et les idées sont partagées avec les communautés et connectées aux décideurs politiques qui prennent des décisions qui affectent les jeunes. U-Report a été utilisé comme une application mHealth ciblée, fournissant spécifiquement des conseils mobiles en temps réel et menant des sondages coordonnés sur le VIH/SIDA parmi les adolescents et les jeunes.	Communication de risque et engagement communautaire
VANTAGE	Vantage est une plate-forme cloud compatible avec l'IA qui permet aux professionnels de la santé de prendre des décisions. La plate-forme basée sur le cloud est capable d'analyser instantanément les données, de communiquer les résultats et de diriger des actions significatives via des tableaux de bord générés automatiquement et des notifications push ciblées.	Coordination et Opérations
VIGIFLOW	VigiFlow est un système de gestion d'enregistrement, de traitement et de partage des déclarations d'effets indésirables des produits médicaux. VigiFlow permet un contrôle local maximum et fournit un moyen efficace pour la revue de direction et l'analyse des données nationales. VigiFlow prend en charge la collecte, le traitement et le partage des données des rapports de sécurité des cas individuels (ICSR) pour faciliter une analyse efficace des données et pour une utilisation par les centres nationaux de pharmacovigilance du Programme OMS de surveillance internationale des médicaments.	Logistique de la chaîne d'approvisionnement et des établissements de santé, Analyse visualisation et utilisation des données
WELLVIS COVID-19 TRIAGE TOOL	Wellvis COVID-19 Triage Tool est une application qui permet aux utilisateurs d'auto-évaluer leur catégorie de risque COVID-19 en fonction de leurs symptômes et de leur historique d'exposition. Il est gratuit pour les utilisateurs. L'application permet également des rendez-vous médicaux numériques qui peuvent être payés en ligne.	Gestion des cas
MALARIA PREVENTION COTE D'IVOIRE V1 (COMMCARE)	La composante CommCare Rappel des Rdv de CPN, est une solution digitale mis en place par Save the Children International en Côte d'Ivoire à travers son Projet de lutte contre le Paludisme financé par le Fonds Mondial. La technologie est actuellement déployée dans plus de 1116 aires sanitaires surnles 1273 que couvre le projet. Il s'agit pour les sage-femmes d'enregistrer à travers l'application toutes les femmes enceintes qui viennent en	Coordination et Opérations, Gestion des cas, Analyse visualisation et utilisation des données, Administration des Vaccin,

	consultation prénatale pour la première fois dans leur centre depuis la mise en service de l'application. Les femmes enceintes enregistrées reçoivent deux sms de rappel de rdv pour chaque CPN. Un sms de rappel est envoyé 2 jours avant la date, et un autre sms le jour J. Le suivi des autres rdv se fait à chaque CPN.	Communication de risque et engagement communautaire.
DOSSIER PATIENT INFORMATISE	Un Dossier Patient Informatisé (DPI) est un dossier informatique rassemblant les données médicales de patients. Les agents hospitaliers, à l'aide d'un logiciel, vont pouvoir accéder aux informations contenues dans le dossier des patients. La Côte d'Ivoire s'est dotée depuis 1995 d'un Système d'Information et de Gestion (SIG) des données sanitaires afin de collecter, d'analyser et de produire des données de bonne qualité. Cette plateforme vise à permettre l'informatisation du Dossier Patient Physique et a pour objectif d'améliorer la prise en charge des clients et la qualité des données. Ce projet pourra à terme mettre à niveau les infrastructures informatiques existantes et garantir la disponibilité du système et la sécurité des informations des clients ;	Gestion des cas, Analyse visualisation et utilisation des données
IDENTIFIANT UNIQUE DU PATIENT	Dans le cadre du renforcement du Système d'Information Sanitaire, de la surveillance du VIH/sida et de la riposte face à cette épidémie, le Ministère de la Sante, de l 'Hygiène Publique et de la Couverture Maladie Universelle (MSHPCMU) à travers la Direction de l'Informatique et de l'Information Sanitaire (DIIS) et le Programme National de Lutte contre le sida (PNLS), avec l'appui technique de l'ONUSIDA et un financement du CDC/PEPFAR, a initié un projet d'identification unique des patients infectes par le VIH en Côte d'Ivoire. La solution développée avec l'appui technique de SEJEN Cote d'Ivoire repose sur une technologie fiable qui permet d'identifier de façon unique les patients qui se présentent dans les différents centres de prise en charge de Cote d'Ivoire. En pratique, le système d'identification unique des patients (IDUP) permettra de constituer une base de données centralisée qui constituera un registre national des patients garantissant l 'unicité des codes d'identification et facilitera leur traçabilité, en vue d 'améliorer leur prise en charge.	Gestion des cas
MTB VIH	Cette application permet de relancer (SMS ou appel vocal) les malades TB et VIH sur le renouvellement des ordonnances et des rendez-vous avec les médecins et de garantir la rétention des patients dans les soins et l'observance au traitement. Sensibiliser les malades et les populations, Assurer le suivi des malades, Sondage, Questionnaires (quizz)	Gestion des cas
OPENDCH	Utiliser pour l'affichage et l'analyse des données à travers une carte, les graphiques	Analyse visualisation et

		utilisation des données
SITUATION ROOM	Créer des tableaux de bord pour aider les décideurs à la prise de décision. Cette plateforme permet d'extraire et d'harmoniser des données de différentes sources (DHIS2 étant la source principale) et de concevoir des tableaux de bords facilitant l'aide à la prise de décision.	Analyse visualisation et utilisation des données
OPISMS	OPISMS est une plateforme d'envoi de SMS de rappel de RDV aux patients pour qu'ils se rendent au centre de santé pour leur vaccination. Possibilité d'avoir son calendrier vaccinal via l'application mobile OPISMS et un certificat de vaccination numérique accepté par l'INHP	Gestion des cas, Analyse visualisation et utilisation des données, Administration des Vaccin.

ANNEX 3: Overview of gaps and opportunities of existing digital tools

Table 7: List of digital gaps and opportunities

S/N	Fonctionnalités du DPP	Progiciels: DÉPLOYÉS	Progiciels: Existants mais NON DÉPLOYÉS
1.1	Rapportage en temps réel des données agrégées sur les individus présentant des symptômes, confirmation en laboratoire, etc. (ref. Coordination & Operations)	2	2
1.2	Spécification d'un sous-ensemble de points de données critiques minimaux pour le rapportage afin de faciliter une analyse et une planification rapides	2	1
1.3	Surveillance d'alerte précoce basée sur des données provenant de recherches sur le web concernant les symptômes courants ou d'analyses de sentiments dans les médias sociaux (ou de mots-clés)	2	2
2.1	Lien entre le patient ainsi que le personnel de la santé et l'échantillon du patient envoyé au laboratoire pour analyse	3	2
2.2	Conseils (au personnel de santé) sur la méthode pour prélever un échantillon	2	2
2.3	Notifications lorsque les résultats sont disponibles (au patient, à l'établissement de santé pour procéder à la recherche des cas contacts, etc.)	2	2
2.4	Intégration avec l'application de gestion des cas et les outils de surveillance (pour confirmer que les cas suspects sont positifs ou non)	3	2
3.1	Enregistrement des patients dans le système avec un identifiant unique	13	2
3.2	Historique de santé du patient disponible dans le système	7	2
3.3	Saisie des coordonnées du patient	15	2
3.4	Saisie des données démographiques, des signes vitaux, des facteurs de risque et des symptômes du patient	13	2
3.5	Création de demandes de laboratoire	2	7
3.6	Communication avec le patient par téléphone (via l'application)	5	6
3.7	Communication unidirectionnelle avec le patient par messagerie (par ex: SMS, médias sociaux, in-app, WhatsApp)	11	4
3.8	Communication bidirectionnelle avec le patient par messagerie (par ex: SMS, médias sociaux, in-app, WhatsApp)	1	3
3.9	Suivi et mise à jour des autres interactions avec le patient et des résultats	6	3
3.10	Visualisation d'un dossier récapitulatif et des services fournis pour un client par rencontre	12	2
3.11	Modification du dossier en cas d'erreur	13	2
3.12	Inscription des voyageurs qui se sont rendus dans des lieux à haut risque aux points d'entrée à des fins de surveillance et de suivi (dépistage et suivi aux points d'entrée)	3	7

4.1	Documentation de l'historique détaillé des contacts concernant le moment, le lieu et la personne pour chaque rencontre à haut risque	1	2
4.2	Création d'une liste de contacts à haut risque liés à des cas suspects ou existants	1	2
4.3	Création d'un enregistrement pour saisir les données démographiques et les facteurs de risque du contact à haut risque	1	2
4.4	**Communication avec le patient par téléphone (via l'application)**		2
4.5	Communication unidirectionnelle avec le patient par messagerie (par ex: SMS, médias sociaux, in-app, WhatsApp)	2	1
4.6	**Communication bidirectionnelle avec le patient par messagerie (par ex: SMS, médias sociaux, in-app, WhatsApp)**		2
4.7	Mise à jour des fiches de contact avec les nouveaux changements/symptômes	2	1
4.8	Modification de l'enregistrement du contact en cas d'erreur	2	1
4.9	Fonctionnalité adaptée à une réponse épidémique généralisée (pas strictement COVID-19)	1	2
4.10	Permet la gestion simultanée de plusieurs types d'épidémies	1	2
4.11	Compatibilité avec le système d'information de gestion de la santé publique du pays (HMIS)	1	2
5.1	**Recherche automatisée de contacts anonymes de masse via signaux Bluetooth par smartphone (ou bracelet)**		
5.2	**Notification (facultative) du diagnostic positif de l'infection chez les contacts à haut risque via l'application smartphone de l'utilisateur**		
5.3	**Fonctionnalité adaptée à une réponse épidémique généralisée (pas strictement COVID-19)**		
6.1	Accès facile aux données agrégées en temps réel pour guider la réponse	10	1
6.2	Visualisations claires des indicateurs clés	11	1
6.3	Communications efficaces et efficientes avec les établissements de santé et le personnel de terrain	9	3
6.4	Modélisation de scénarios d'impact épidémique pour préparer la réponse (simulations)	1	2
6.5	Visualisation claire des facteurs de risque (indice de risque) au niveau sous-national	5	4
6.6	Suivi des capacités de réponse (personnel de santé concerné, lits d'hôpitaux, équipements, équipes médicales d'urgence nationales ou internes)	5	1
6.7	**Analyse du "Big Data" (par ex: surveillance de la mobilité basée sur les données des téléphones portables, surveillance des rumeurs basée sur l'analyse des médias sociaux)**		
7.1	Enregistrement des établissements de santé	7	
7.2	Collecte et communication de données sur les consommables spécifiques à l'épidémie (vaccins, équipements de protection individuelle (EPI), etc.), par ex:, stockage et prévision des stocks, suivi de la chaîne du froid (pour les vaccins)	8	1

7.3	Collecte et communication de données sur les équipements spécifiques aux épidémies (appareils de radiographie, lits de soins intensifs, respirateurs, etc.)	7	2
7.4	Collecte et communication de données sur les paramètres opérationnels spécifiques aux épidémies (par ex: capacité disponible des unités de soins intensifs, les niveaux de personnel actuels, etc.)	5	2
8.1	Gestion fiscale	1	
8.2	Rapports sur la conformité des bailleurs de fonds (prévention des fraudes, suivi transparent, etc.)	1	
8.3	Gestion des ressources humaines	2	
9.1	Surveillance des symptômes spécifiques à l'épidémie	1	1
9.2	Utilisation d'équipements de protection individuelle (EPI), délivrance de vaccins, etc.	1	2
9.3	Protocoles de sécurité pour les installations	1	1
10.1	Outils de communication au point de service (vidéos via une application, etc.)	2	1
10.2	Outils de communication de masse intégrés (web, médias sociaux, SMS, robocalls, etc.)	5	
11.1	**Suivi des foyers de maladies infectieuses chez les animaux domestiques (bétail, etc.)**		1
11.2	**Suivi des épidémies de maladies infectieuses chez les animaux sauvages**		1
11.3	**Surveillance écologique de l'environnement pour détecter les changements susceptibles d'accroître le risque d'infection zoonotique**		1
12.1	Interface Standardisée (IHE,OpenHIE, REST API, HL7, HL7-FHIR, qui soutient l'architecture et le workflow ouverts de l'Echange d'Information de Santé - EIS)	7	2
12.2	Support pour les Normes de Codage des Soins de Santé (ex: ICD-9, ICD-10, LOINC, SNOMED)	5	3
13.1	(Intégration avec) le registre d'immunisation	3	2
13.2	Programmation des vaccins (calendrier de vaccination)	4	1
13.3	Surveillance, enregistrement et suivi de la vaccination/de l'immunisation au niveau du patient	3	1
13.4	**Rapportage sur les effets secondaires**		4
13.6	Microplanning	1	2
14.1	Fonctions intégrées de visualisation des données	12	1
14.2	Agrégation des données à plusieurs niveaux et accès des utilisateurs pour éclairer la prise de décision	12	1

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Special thanks
Our thanks go to all stakeholders for their availability and their multifaceted contributions to the success of this evaluation.

On behalf of
German Federal Ministry for Economic Cooperation and Development (BMZ)
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Bonn and Eschborn, 24.08.2022