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Role of Digital Tools in Fighting Malaria at the Community Level

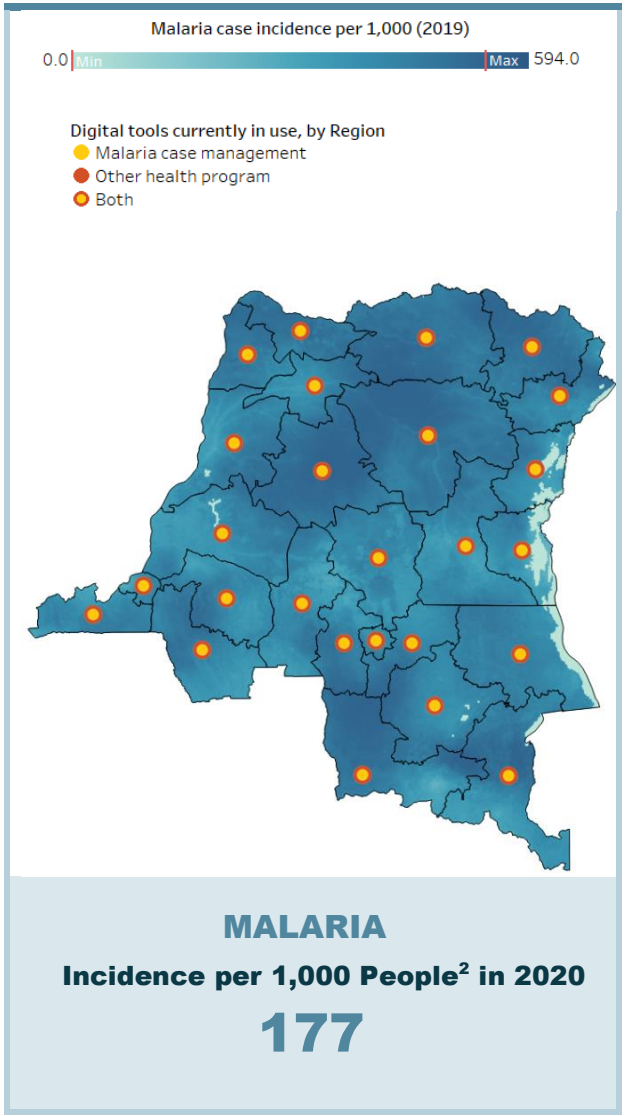
DEMOCRATIC REPUBLIC OF CONGO

Executive Summary

Malaria remains among the leading causes of death in the Democratic Republic of Congo (DRC).[1] The DRC's National Malaria Control Program (NMCP) developed the National Strategic Plan for Malaria Control 2020-2023 with the goal of reducing malaria-related mortality by 50 percent and morbidity by 40 percent.[2, 3] The NMCP is committed to improving the delivery and continuity of quality health services and care by improving the coverage of community care sites (CCS) and community health workers (CHWs). Strengthening the use of digital health (DH) tools to improve malaria surveillance at the community level is central to this strategy.[4]

Although the DRC adopted a DH plan in 2014, DH tools are not disseminated across the country and are mainly used for pilot projects in a limited number of provinces.[5] In recent years, many projects have used mobile phone-based systems for data collection – some of which have developed into information system tools designed for CHWs. However, while there are digital tools currently in use in DRC, inadequate training and qualification of health personnel affect the quality of the data transmitted for decision-making at all levels of the health pyramid.[2]

Improving DH architecture will require the standardization of DH tools and training of healthcare providers. The Ministry of Health (MOH) envisions training 20,000 additional health personnel and computerizing 3,400 health centers by 2024.[6] This investment will integrate different data collection tools already active in the country to make them interoperable and strengthen DH at the community level.



MALARIA

Incidence per 1,000 People[2] in 2020

177

PEOPLE

Community Health Workers (CHW)

15,750 CHWs[7]

200 per 10,000 people

GOVERNANCE

National Digital Health Strategy

YES

SYSTEMS

Digital Health Index[8]

SCORE: 2

digital square

Recommended Actions

PEOPLE

Community health workers and decision-makers

Develop a standardized DH training module for CHWs

Support the creation of a technical working group to develop a DH module for integration into the CHW training curriculum in order to strengthen community digital health.

Train CHW in the use of DH tools for malaria surveillance

Using the validated national malaria surveillance guide, train CHWs in the use of digital tools for surveillance of malaria indicators.

Sustain CHW DH capacity all levels

Develop a monitoring and evaluation plan to assess the integration of routine CHW DH training at the community level. Adapt existing national structures and processes to the provincial and health zone levels.

Develop DH plan at the community level

Engage partners and decision-makers to develop a national DH architecture to harmonize efforts, including: 1. A community health digitalization strategy that focuses on open-source frameworks and standards to facilitate building interoperability into new systems, and 2. A living "pre-competitive information" guide for interoperability standards.

GOVERNANCE

Strategies and policies

Expand investments in DH at the community level

Develop a budget enabling the expansion of DH at the community level by leveraging the National Health Informatics Development Plan (NHIDP) II investment roadmap.

Develop a plan to improve data quality and use

Develop a plan to ensure access to malaria dashboards and other decision support features for CHWs using DHIS2, including timelines for updating appropriate tools and strategic documents. Clearly describe the role of CHWs in data analysis processes at the community and health facility levels.

Refine and disseminate written protocols and guidelines

Refine existing national regulatory documents and develop new policies related to data use such as procedures, registries, national e-health enterprise architecture, and dictionaries.

SYSTEMS

Processes and digital tools

Support NHIDP II implementation

Support the implementation of the NHIDP II and adoption of digital tools by the Ministry of Public Health, Hygiene, and Prevention (MPHHP) to improve case management and strengthen malaria surveillance data collection, use, and sharing.

Validate the malaria surveillance guide

Validate the malaria surveillance guide using the Community Health Strategic Plan. Include community-based surveillance, checklists, job aids, and supervision and training plans for actors at all levels (including the community level) to improve the monitoring of malaria indicators using digital tools.

Scale the use of digital tools interoperable with the DHIS2

Define standards for interoperability with DHIS2 and assess existing digital tools. Scale appropriate tools to enhance coverage across the country to support surveillance, management and distribution of health services and products, and policy development. Scale the use of digital tools for automatic extraction of data from electronic health records and produce dashboards for evidence-based decision-making. Design studies to evaluate the impact of digitalization on data quality.

Methodology

PATH compiled this profile through consulting various data sources (desk review, survey, interviews) and reviewing them during a workshop between August 2020 and March 2021. Documents consulted are listed in Appendix A, and interviewees / workshop participants are listed in Appendix C.

DESK REVIEW

In **August 2020**, **63 key documents** were reviewed to assess DRC's malaria strategy, community health program(s), governance, data systems and architecture, infrastructure, and the role of data in decision-making.

SURVEY

In **October 2020**, an online survey was sent to **77 stakeholders**, including national and global policymakers, donors, and private sector partners. The survey was open for 16 weeks and received **15 responses**.

INTERVIEWS

PATH conducted one-on-one **interviews** with **12 individuals** from organizations such as NMCP between **October 2020** and **December 2020**.

WORKSHOP

A workshop was conducted with **17 participants** in **March 2021**, including representatives from the **Directorate of Epidemiological Surveillance**, **Global Fund**, **MEASURE Malaria**, **NMCP**, **PATH**, **USAID**, and **WHO**. The aim was to validate results from previous steps and identify opportunities for digital tools to increase malaria program impact.

ANALYSIS

Following the workshop, the team reviewed outputs from each step and developed a country profile highlighting recommendations developed in consultation with key partners. Data were last collated in **May 2021**.

Information collected through the methods described above was categorized according to key components within three domains: people, governance, and systems. These domains and their underlying components were informed by an existing maturity model and adapted to incorporate malaria-specific content. The components include personnel, training, and technical support ("People"); policies, strategies, and governance structures, and their implementation ("Governance"); and data flow, digital tool structures, functionalities, and use ("Systems"). Together, these components describe the *desired state* for CHW to use digital tools for malaria case management, a state in which community health programs can leverage digital tools to generate and use data that improve malaria programming to decrease the local malaria burden.

PEOPLE

People highlight the Community Health Workers, supervisors, information technology support staff, and other decision-makers contributing to the effective use of digital tools and data in malaria community health programs.

GOVERNANCE

Governance describes the national strategies and policies that provide the framework for community health programs' use of digital tools for malaria and their implementation.

SYSTEMS

Systems describe the processes and digital tools that enable community health platforms to effectively use digital technology and data to strengthen malaria and other health programs.

People

In the DRC, CHWs support community-level health activities by promoting disease prevention and control, collecting health information, supporting disease surveillance during outbreaks, and conducting home visits. Specific to malaria, CHW cadres support preventive (distribution of long-lasting insecticidal nets [LLIN]), curative (treatment of uncomplicated malaria cases), and promotional (community sensitization and surveillance) activities.[9]

Since MPHHP allocation of health providers and services does not currently extend outside the national health centers, the DRC relies on volunteer CHWs to operate CCS.[3] CCS are designed to serve hard-to-reach communities and currently operate in 78% of health zones. Each CCS includes a "promotional" CHW that focuses on health education and a "provider" CHW that focuses on integrated community case management of malaria, diarrhea, respiratory and other diseases. The DRC aims to introduce 3,484 additional CCS to extend malaria surveillance at the community level.[2, 7] The NMCP plans to begin this expansion in four high-burden provinces by the end of November 2021.

15,750 **Community health workers in-country[7]**	**Compensation:** **VOLUNTEER** **But receive incentives from partners**
650 **Providing malaria community case management[7]**	**Compensation:** **VOLUNTEER** **But receive incentives from partners**

CHWs submit paper reports to their local CCS head nurse, village chief and/or community animation unit. CHWs are supervised by the nurse supervisor at the health center where they submit health data; in 2020 between 25-50% of CHWs were regularly supervised in the management of malaria cases.[10] Partners and donors such as UNICEF, USAID, SANRU, and Global Fund support the CHW program with guidance from the NMCP.

CHWs are not integrated into the formal health workforce and do not receive financial compensation from the government. However, routine “motivation mechanisms” are in place to support CHWs financially and recognize their contribution to community health (free routine medical care for CHWs and their families, provision of bicycles for transportation, etc.).

Community health worker digital readiness

There is currently no standardized DH training for CHWs to support their use of digital tools for health information management and disease monitoring. CHWs in several health zones have been exposed to digital tools (generally Open Data Kit [ODK] via cellphones and tablets) through the implementation of pilot programs, however there is no protocol governing digital tools at the community level or for evaluating the use of digital tools at the end of such programs. Achieving CHW digital readiness will require the establishment of a robust national health information system capable of integrating digital data collection tools into an interoperable platform, with CHWs playing a key role in the transition from paper-based to digital data collection. Recommendations include the development of data use and quality assurance protocols, increased DH funding at all levels and particularly the community level, and the provision of training and operational support during scale up.

Data-driven decisions at each level of the health system

Routine data are reported through the DRC's health management information system (HMIS) called the District Health Information System 2 (DHIS2), and an integrated disease surveillance and response (IDSR) system. Although HMIS data collection and analysis mechanisms are established via DHIS2, data compilation, use, and feedback remain low and vary across health zones.[11] National planning, resource allocation, mobilization, and performance monitoring depend on data generated by individual studies, meaning that health decisions are based on data from various sources that may not reflect the needs and realities of the country as a whole. Additionally, policy documents and organizational guidelines on data use are poorly utilized and need to be updated.

NATIONAL LEVEL	Data are consolidated weekly via IDSR and monthly via DHIS2 and disseminated to decision-making partners and are stored in DHIS2. Strategic and operational plans are developed based on community-level data. IDSR and DHIS2 systems are central to ensuring routine data quality control, facilitating analysis, and dissemination. A key responsibility of the IDSR at this level is to identify outbreaks and monitor case thresholds and trends.
PROVINCE LEVEL	Consolidated health zone-level data are reported to the province for further review, quality control, analysis, and feedback. Data are shared with different partners working at the provincial level to build capacity and support care facilities at all levels. Service evaluations are conducted weekly, monthly, and semi-annually to improve the management and sharing of health information. One of the essential responsibilities of the IDSR at this level is to verify case thresholds and report outbreaks.
HEALTH ZONE LEVEL	Health facility-level data are compiled, validated, and entered into DHIS2. Data is analyzed at monthly meetings, and feedback is provided to health facilities. The head of the health zone conducts monthly, trimester, and annual data reviews to improve data quality. Data is transmitted to the province level weekly via IDSR and monthly via DHIS2.
HEALTH FACILITY LEVEL	Community-level and health-facility level data are compiled, merged, and entered into a hospital or health center template, and archived. Monthly reviews and audits are conducted to provide feedback to community-level CHWs, guide commodity requests, and improve data quality and use. Some health facilities use data to monitor case loads and to target communities for outreach.
COMMUNITY LEVEL	CHWs complete paper-based collection of data related to disease surveillance and services offered through CCS and submit monthly paper-based reports to the local health facility. Health data is not analyzed for decision-making purposes at this level.

Governance

	DIGITAL	COMMUNITY HEALTH	MALARIA
Name	*Plan National du Développement de l'Informatique de Santé* (*National Health Information Development Plan)*	*Plan Stratégique de la Santé Communautaire en RDC (DRC Community Health Strategic Plan)*	*Plan Stratégique National de Lutte contre le Paludisme (National Strategic Plan for Malaria Control)*
Current strategy dates	2020–2024	2019–2022	2020–2023
Coordinating body	*Agence Nationale d'Ingénierie Clinique, de l'Information et d'Informatique de Santé (National Agency for Clinical Engineering, Information and Health Informatics)*	*Direction Générale d'Organisation et de Gestion des Services des Soins de Santé (General Directorate of Organization and Management of Health Care Services)*	*Programme National de Lutte contre le Paludisme / National Malaria Control Program*
Funding strategy	YES	YES	YES

Following the Ebola outbreak in 2018, the Ministry of Health created a DH agency, the National Agency for Clinical Engineering, Information, and Health Informatics (*Agence Nationale d'Ingénierie Clinique, de l'Information et d'Informatique de Santé*, ANICiiS), with the goal of improving the use of DH tools and initiatives and address interoperability issues at the national level.[3] To date, the DRC has yet to develop a DH strategy for the efficient implementation of malaria control at the community level. Apart from a few health zones supported by technical and financial partners, malaria surveillance strategies are inconsistently implemented which is reflected in the quality of data generated and transmitted to the national level. The most significant governance capacity gap is the lack of digitization at the community level; health information is collected and transmitted to the health zone on paper.[12] This has real, negative impacts on malaria surveillance.

Several action items are recommended to enhance malaria surveillance strategies and improve digital health coverage throughout the DRC. The MOH should develop a standardized selection process for digital tools, and provide approved digital tools to all public and private health facilities, along with standardized training, data collection, and data control protocols, with a particular focus on supporting CHWs and CCS. CHWs should also be fully integrated into the health system, including receipt of financial compensation, to promote the smooth implementation of malaria and other health programs at the community level. Improving access to electricity and internet nationwide will improve data collection and transmission across all initiatives.

GOVERNANCE Policies define digital health and health data governance roles, responsibilities, and structures.	The President of DRC promulgated in 2019 the National Digital Plan for 2025, aiming to expand universal healthcare coverage across the country.[5] MPHHP ccoordinates with various stakeholders in the implementation of the digital policies at all levels. The 2014 NHIDP I & II established policies governing DH in the DRC and a DH agency, ANICiiS, was launched in 2019 to oversee and implement all DH initiatives and projects.
DATA MANAGEMENT Policies provide specifications for data access, privacy, security, and confidentiality and outline stipulations for data sharing.	The DRC has yet to develop legal frameworks for protecting personal data. Independent administrative authorities are not established to ensure that the processing of personal data complies with international privacy rules.[13]
STANDARDS AND INTEROPERABILITY Policies describe an enterprise architecture, normative standards—such as health information standards—and digital identity.	While the DRC has not yet adopted an enterprise architecture for the health sector, the NHIDP II plans for its implementation, including the development of a framework for the standardization and interoperability of health information systems to create a unique digital identity for the DRC.[4, 5] This architecture is essential to facilitate the interoperability of digital tools and consolidate the health information exchange platform. This plan recommends that ANICiiS develop a national digital architecture.[13]
INFRASTRUCTURE Policies define data hosting and storage (e.g., local or cloud), mobile device management, and telecommunications access.	While the DRC does not have a regulatory framework to manage data hosting and storage, the National Digital Plan for 2025 has established the basis for local data reception and regulation policy. Additionally, the National Council for Regulation of Information and Communication Technologies proposed the creation of a Universal Communication Services Access Fund to provide grants focused on bridging the digital gap between urban and rural areas.[14]
WORKFORCE Policies describe workforce job structures and descriptions, plans for training, digital literacy expectations, and incentives for digital adoption.	The NHIDP II proposes the designation of data management staff to support DH in most institutions across the health facility, health zone, and provincial levels. However, the Department of Health does not have a strategic human resources plan to identify the competencies and functions needed to support HMIS across all levels.

Systems

Data flow

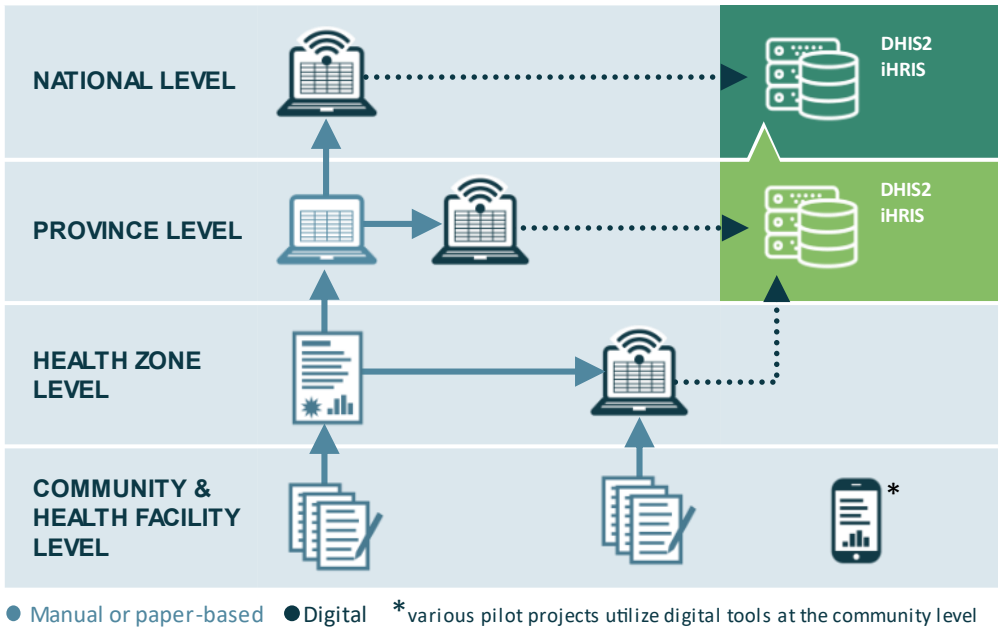
Overall, health data are primarily used to monitor trends and generate reports. At the community level, CHWs collect individual health data on paper-based forms and submit them to the local health facility. At the health facility, data are entered into a hospital or health center paper template, archived, and submitted to the local health zone. Submitted data are consolidated, reviewed, entered into the DHIS2 and IDSR systems, analyzed, and reported monthly to the province level for further analysis and feedback. Finally, data are submitted to the national level for review, analysis, and dissemination. Recommendations are referred to lower levels of the health system throughout the data flow process to correct inconsistencies and errors.

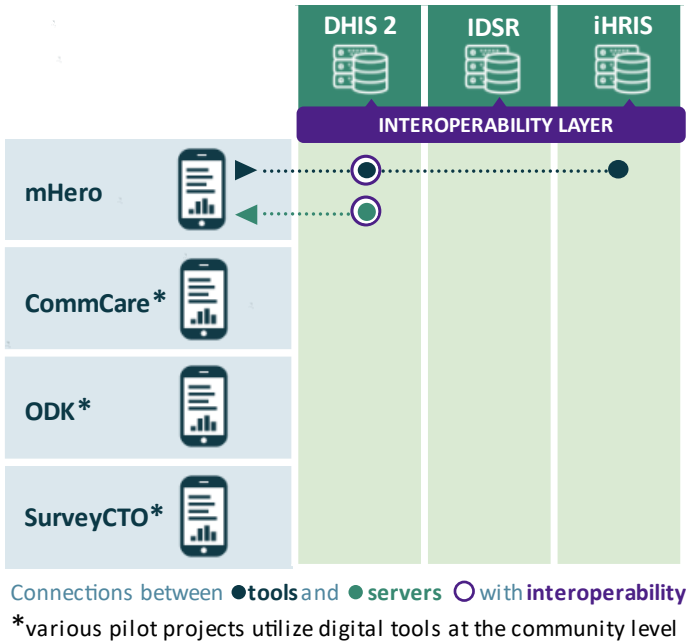
Designated staff oversee data management and review at all levels. At the national level, the NMCP conducts quarterly meetings and an annual review of submitted health data. The U.S. President's Malaria Initiative supports provincial advisors in nine provinces in their initial analyses of malaria data for decision-making, quarterly data quality audits, and biannual reviews.[12] The NMCP organizes joint quarterly supervision in the provinces; province-level management then conduct quarterly supervision of health zones, and health zone-level management conduct monthly supervision of CCS and CHWs. Though there is currently no standardized protocol for review meetings at the health zone-level, monthly data analysis meetings are held where data is reviewed and follow-up actions are developed.

In the DRC, the majority of facilities are public (51%) and report into the DHIS2, with private facilities and religious facilities making up 20% and 11% of reporting into DHIS2 repectively. However, new private facilities close and open frequently, and since health facility information is not modified in the DHIS2 platform on a rolling basis due to lack of a designated structure to do so, data regarding health facility type, number, and location may not always be accurate. Additionally, as the network of CHWs in the DRC expands, ensuring regular data capture from all CHWs into DHIS2 remains a challenge.

DHIS2 was introduced in January 2017, but training on the new tool has not occurred, and some inconsistencies in the reporting process have been noted; for example, the paper reporting template used at health facility-level hospitals does not request data on malaria-related mortality. Additionally, DHIS2 does not house complete data – for instance, financial data are not included in the database. In these cases, alternative sources must be identified, resulting in the development of an increasing number of information systems to house different types of data. An interoperability framework will be essential to identify data sources with the potential to interoperate with DHIS2, which would allow decision-makers to pull all pertinent information from the same platform.

In addition, the NMCP harmonizes data quality assessment tools used by various partners to promote one tool for all partners to use nationally. Despite providing all 516 health zone offices with VSAT (Very Small Aperture Terminal) antennae for data transmission and connectivity, considerable challenges remain to ensuring regular connectivity and full DHIS2 functionality across the country.[6] As a result, the NMCP and the MPHHP developed a 2018–2020 health management information system/DHIS2 multi-donor project to harmonize efforts across the country.

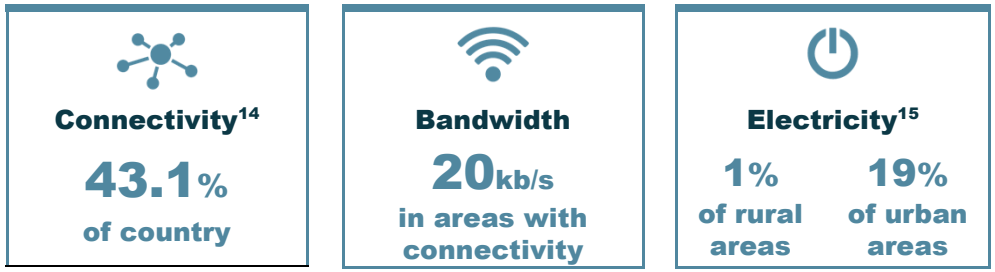




In DRC, there is currently no interoperability between tools and systems. Tools such as mHero and CommCare, along with services like ODK and SurveyCTO, have been used in pilot implementations in various provinces. Only mHero has been interoperable with DHIS2 and the integrated Human Resource Information System (iHRIS). Other tools such as the iHRIS *can* be interoperable with DHIS2, but because this functionality has not yet been operationalized in DRC iHRIS data does not currently integrate with DHIS2, creating fragmentation and presenting challenges in the use of data for decision making. ANICiiS is in the process of developing a roadmap to coordinate integration of the various DH tools into a single platform for efficient interoperability. ANICiiS will also create a technical and legal framework for the evaluation, expansion, and dissemination of digital tools available across the country with the capacity to operate in areas with limited access to electricity and the Internet.

Digitally enabling infrastructure

The mobile phone market in the DRC experienced substantial growth in Internet services in early 2020, particularly in mobile data and money services. As a result, the DRC's major mobile operators (Airtel, Vodacom, Orange, and Africell) experienced a 1.1% positive change in connectivity penetration rate and increased their number of subscriptions by 2.6%.[14] This general progress was not observed in the health sector, where digital penetration remains low.



While most national- and provincial-level health providers have access to a local network, health zone offices must rely on VSAT or local mobile data signal to access and report digital information to DHIS2. Hospitals and health centers, usually located in 3G-accessible areas, are generally not connected to the Internet.[13] Furthermore, limited supply and access to electricy exacerbates connectivity issues, most acutely in rural areas where the electrification rate stands at only 1%. The MPHHP has unreliable internet access, so the HMIS is dependent on external partner funding for short-term projects. Limited bandwidth is also a challenge, resulting in weak or unstable internet connections for many services that report data.

Digital health tools in use and functionality

The MPHHP, collaborating with ANICiiS and international partners, is working to develop digital tools that are interoperable with DHIS2. Primary considerations for effective DH tools include appropriate project design, technology and resources, integration into the healthcare system, and stakeholder participation. In recent years, various epidemics have accelerated the development and use of digital tools in the DRC. During the a Ebola outbreak, CommCare piloted a project in Kinshasa for electronic payments and registration of staff and CHWs.[16] IMA World Health's malaria-focused "Hang-up and Track" project used ODK to collect information on socioeconomic status, malaria perception, and treatment. Early Warning, Alert, and Response System (EWARS) and SuveyCTO used androids to support data collection by CHWs at the community level[17].

USE CASE(S)	ODK	Commcare	SurveyCTO	DHIS2
Providing malaria community case management	■	■	■	■
Tracking malaria proactive and reactive case detection	■	■	■	□
Tracking malaria screening with referral	■	■	■	□
Transmitting messages to community on malaria	■	■	■	□
Training health workers	■	■	■	□
Tracking routine LLIN distribution during ANC or EPI visits	■	■	■	□

■= Current use ■= Possible, but not currently in use □= Does not meet use case

CASE MANAGEMENT FUNCTIONALITIES	ODK	Commcare	SurveyCTO	DHIS2
Aggregate case reporting and analytics Tool collects aggregate case data and has data analytic functions in tool or online	■	■	■	■
Individual case entry and analytics (*important in low burden or elimination settings*) Tool collects individual case data and has data analytic functions in tool or online	■	■	■	■
Case geolocation (*important in low burden or elimination settings*) Tool allows collection or use of geospatial data for individual cases	■	■	■	■
Interoperability with HMIS Tool sends information to the official national health information system	□	□	□	■
Offline capability Tool functions, at least partially, offline	■	■	■	■

MANAGEMENT & SUPERVISION FUNCTIONALITIES	ODK	Commcare	SurveyCTO	DHIS2
CHW identification Tool uniquely identifies CHWs	■	□	□	□
CHW facility catchment location Tool identifies CHWs associated position in org unit hierarchy/ link to health facility/system	□	□	□	□
CHW performance analytics Tool has analytic functions (data validation, graphs, charts) that support data quality, quality of care or other performance issues	□	□	□	■
Communication Tool allows two-way communication between peer groups, associated health facilities, or supervisors	■	□	■	■

■= Current functionality ■= Possible, but functionality not currently in use □= Does not have functionality

Abbreviations: CHW, community health workers; DHIS2, District Health Information Software 2; HMIS, Health Management Information System; ODK, Open Data Kit.

Appendices

Digital Square is a PATH-led initiative funded and designed by the United States Agency for International Development (USAID), the Bill & Melinda Gates Foundation, and a consortium of other donors. This country brief was made possible by the generous support of the American people through USAID. The contents are the responsibility of PATH and do not necessarily reflect the views of USAID or the United States Government.

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APPENDIX A

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APPENDIX B

Abbreviations

ANICiiS	National Agency for Clinical Engineering, Information, and Health Informatics *[Agence Nationale d'Ingénierie Clinique, de l'Information et d'Informatique de Santé]*
CCS	Community care sites
CHW	Community health worker(s)
DHIS2	District Health Information System 2
DRC	Democratic Republic of Congo
EWARS	Early Warning, Alert, and Response System
HMIS	Health Management Information System
IDSR	Integrated Disease Surveillance and Response
LLIN	Long-lasting insecticidal net
LMIS	Logistics Management Information System(s)
MPHHP	Ministry of Public Health, Hygiene, and Prevention
NHIDP	National Health Informatics Development Plan I & II
NMCP	National Malaria Control Program
ODK	Open Data Kit
SANRU	Health for all in Rural Area [*Santé pour tous en milieu Rural*]
UKAID	United Kingdom Agency for International Development
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VSAT	Very Small Aperture Terminal antenna
WHO	World Health Organization

APPENDIX C

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APPENDIX D

Community digital health tools*

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
CommCare	**3.1** Human resource management **3.2** Supply chain management **3.6** Equipment and asset management **3.7** Facility management **4.1** Data collection, management, and use **4.2** Data coding	Ministry of Health World Health Organization	Kinshasa (Capital City)	• LLIN distribution • Training of health workers (CHWs)
ODK	**4.1** Data collection, management, and use **4.3** Location mapping	Global Fund UKAID	North Ubangi, South Ubangi, Mongala, Kasai Central, Kasai, Ituri, Tanganyika, Haut Lomami	• Malaria treatment • screening and referral • LLIN distribution • Intermittent Preventive Treatment in Pregnancy (IPTp) • Active or reactive detection of malaria cases • Communication / messaging to the community on malaria • Training of health workers (CHWs)
SurveyCTO	**4.1** Data collection, management, and use **4.3** Location mapping **4.4** Data exchange and interoperability	PATH	National	• Malaria treatment • screening and referral • LLIN distribution • Intermittent Preventive Treatment in Pregnancy (IPTp) • Active or reactive detection of malaria cases • Communication / messaging to the community on malaria • Training of health workers (CHWs)
Zero Mothers Die*	**4.1** Data collection, management, and use	Advanced Development for Africa Millenia 2025 Universal Doctor Project Congolese Society of Midwife Practice, North Kivu Province (SCOSAF)	North Kivu	• Other (Maternal, newborn, and child health)

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
Mediscout*	**4.1** Data collection, management, and use	ALTB Inoviris Savics	South Kivu	• Other (Tuberculosis)
Viamo*	**1.1** Targeted client communication	CONCERN UNICEF Viamo	Eastern DRC	• Other (WASH, Cholera, Yellow Fever, COVID-19, Ebola)
Safe Delivery App*	**2.8** Healthcare provider training	IMA World Health UKAID	Maniema	• Other (Maternal, newborn, and child health)
DHIS2	**1.1** Targeted client communication **1.4** Personal health tracking **2.2** Client health records **2.3** Healthcare provider decision support **2.9** PresCHWiption and medication **2.10** Laboratory and diagnostics imaging management **3.2** Supply chain management **3.3** Public Health event notification **3.4** Civil registration and vital statistics **3.7** Facility management **4.1** Data collection, management, and use **4.2** Data coding **4.3** Location mapping	MPHHP Global Fund USAID	National	• Malaria treatment • screening and referral • LLIN distribution • Intermittent Preventive Treatment in Pregnancy (IPTp) • Active or reactive detection of malaria cases • Communication / messaging to the community on malaria • Training of health workers (CHWs)
EWARS*	**2.2** Client health records **3.3** Public Health event notification **4.1** Data collection, management, and use	World Health Organization	Lingwala, Ngaliema, Barumbu, Selembao, Kasa-Vubu, Lemba, Matete, Ngiri-Ngiri, Kalamu, North Kivu, Ituri, Equateur	• Other (Ebola, COVID-19)
DHIS2 Tracker*	**2.2** Client health records **3.3** Public Health event notification **4.1** Data collection, management, and use **4.3** Location mapping	World Health Organization	Gombe, Binza-Ozone, Binza-Meteo, Limete, Kokolo, Nsele, Biyela, Kingasani	• Other (Ebola, COVID-19)

*Data come from the survey and have not been independently validated aside from tools featured within the profile.

†See Classification of digital health interventions v1.0, World Health Organization, 2018.

APPENDIX E

Next-generation digital health tool functionalities for malaria case management

CASE MANAGEMENT FUNCTIONALITIES	ODK	CommCare	SurveyCTO	mHero
Notifications Tool sends and receives notifications	☐	■	☐	■
Stock reporting & analytics Tool collects stock data and has analytic functions to support stock and logistics data analysis and decision-making	■	■	■	☐
Interoperability with other national health systems Tool sends information to other national systems (iHRIS, LMIS, etc.)	■	■	■	■
Referral coordination Tool allows CHW to notify local health facility of referrals and track them	☐	■	☐	■
Scheduling & work planning Tool allows CHW to plan and schedule key activities in the community	■	■	■	☐

MANAGEMENT & SUPERVISION FUNCTIONALITIES	ODK	CommCare	SurveyCTO	mHero
Decision support Tool provides algorithms or checklists to guide CHW service provision	■	■	■	■
Training materials & resources Tool provides access to training materials, policies, or other useful reference documents	■	■	■	☐
CHW geolocation Tool allows collection or use of CHW geolocation data for monitoring and planning distribution	■	■	■	■
Supervision Tool can be used by supervisors to assess CHW skills and capacity	■	■	■	■

■= Current functionality ■= Possible, but functionality currently not in use ☐= Does not have functionality