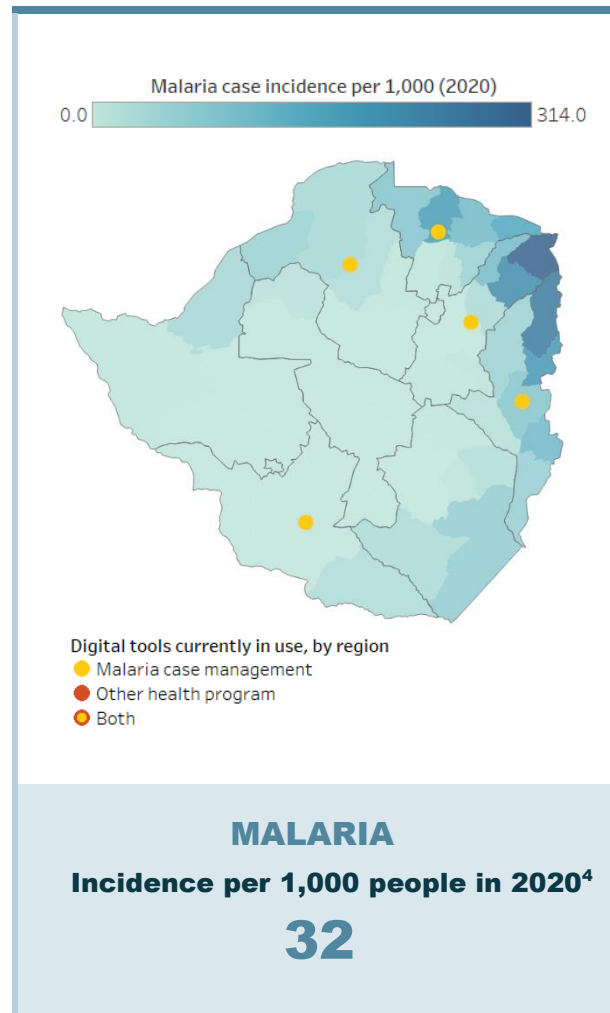# ZIMBABWE

Executive Summary

Malaria incidence declined by 84% in Zimbabwe between 2000 and 2019, before exhibiting an increase in 2020.[1] Geographical and seasonal variation in transmission remains a challenge for malaria control and elimination. Malaria burden is highest in the low-lying northern and eastern regions, which are characterized by high temperatures and rainfall. Mashonaland Central, Mashonaland East, and Manicaland Provinces account for approximately 80% of the reported malaria cases annually. Malaria transmission happens throughout the year, but the peaks are usually from November to May.[2]

Malaria services at the community level are provided by village health workers (VHWs). The mandate of this cadre is to conduct malaria community case management, including administering rapid diagnostic tests (RDTs), treating cases with artemisinin-based combination therapies, and administering rectal artesunate as pre-referral treatment of severe malaria.[2] Under the new community health strategy, the aim is to call them community health workers (CHWs) in the future, which is how they are referenced in this profile.

Key digital health recommendations in this profile include supporting information and communication technology (ICT) skills of CHWs and enforcing policies for all digital tools to be interoperable through the Ministry of Health and Child Care's (MOHCC) enterprise architecture.

Malaria case incidence per 1,000 (2020)
0.0 — 314.0

Digital tools currently in use, by region
- 🟡 Malaria case management
- 🔴 Other health program
- 🟠 Both

MALARIA
Incidence per 1,000 people in 2020[4]
32

PEOPLE
Community health workers

17,400 CHWs in 2020[2]
12 per 10,000 people

GOVERNANCE
National Digital Health Strategy

Yes

SYSTEMS
Digital Health Index[3]

SCORE: 2

Recommended Actions

PEOPLE
Community health workers and other decision-makers

Support development of the ICT skills of CHWs
Develop an ICT module as part of revised CHW training, including an ICT competency assessment. Make an addendum to the new community health strategy to include a plan for ICT skills training. The module should be relevant to health facility staff, as they also need ICT skills training.

Standardize work tools needed for CHWs in the performance of duties
Work with the MOHCC to ensure all CHWs have access to a standard package of resources and tools to perform their duties (e.g., registers, uniform, and bicycle). Additional tools CHWs need—solar lamps capable of recharging phones and storage cabinets—should be considered as standard resources as well.

Support MOHCC efforts to formalize CHWs
In tandem with the new community health strategy, support the MOHCC to operationalize efforts to formally recognize CHW cadres through certificates and additional performance-based incentives.

GOVERNANCE
Strategies and policies

Ensure the new digital health strategy includes the needs of CHW programs
Make an addendum to the new digital health strategy to include focused plans for CHW cadres with set milestones and metrics for success.

Implement MOHCC policy on data privacy and protection
Ensure implementation of the MOHCC ICT policy published in 2018 for compliance with the data security, privacy, and data ownership of digital health stipulations outlined in the current ICT policy.

Identify dedicated funds for digital health for community health programs
Work with the MOHCC to determine set budget allocations for digital health applications in community health programs.

Establish a policy for interoperability of community digital tools with the national enterprise architecture
Set up and enforce a policy for current and future CHW digital tools to comply with existing interoperability standards. Establish guidelines for acceptable digital tools for CHWs to guide funders and implementors.

SYSTEMS
Processes and digital tools

Digitize tools used by CHWs
Work with the MOHCC and partners to identify or develop tools for supportive supervision and data collection, and job aids for malaria and febrile illness case management.

Conduct a mapping exercise and analysis of CHW connectivity and electricity infrastructure
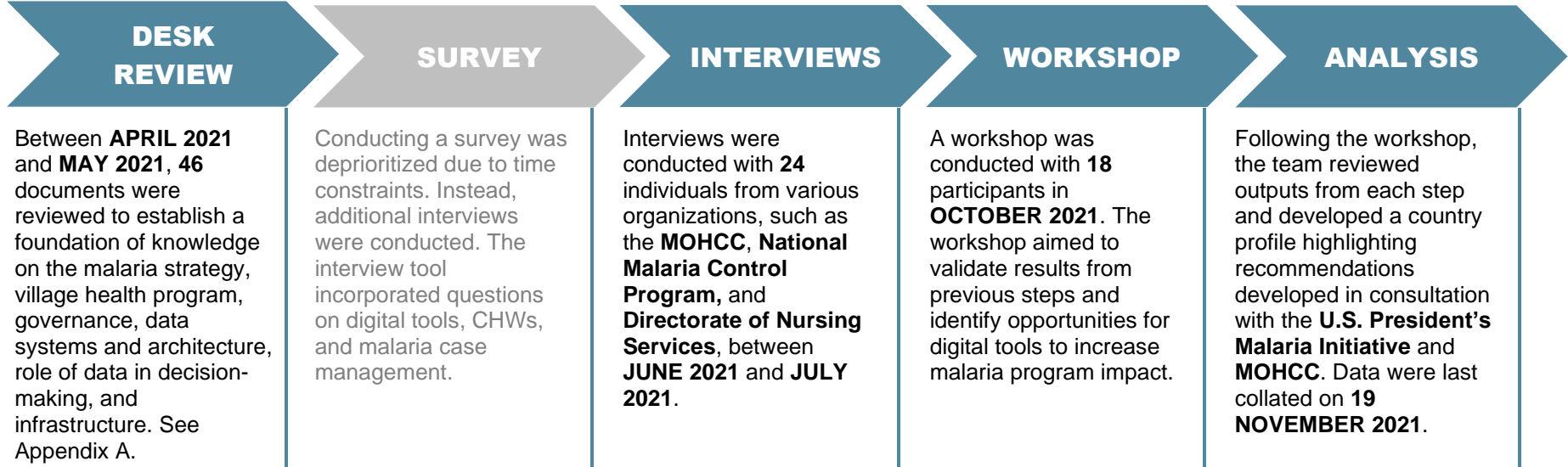As part of the mapping exercise, incorporate inputs from efforts of the Ministry of Education and Ministry of Information and Communications Technology and identify opportunities to leverage the improved electricity and connectivity at the health facility level being introduced as part of the electronic health records rollout to support community health digital systems.

Develop a plan for hardware device procurement and maintenance
Adapt existing policies to meet the needs of the CHW program, including centralized, coordinated provision of hardware, airtime, and data for CHW tools and systems.

Methodology

A desk review and key informant interviews were conducted to develop this profile. Due to time constraints, a survey was replaced with additional interviews, which included questions on digital tools that were developed for the survey. Findings from these activities were validated during the workshop and used to develop the recommendations.

DESK REVIEW	SURVEY	INTERVIEWS	WORKSHOP	ANALYSIS
Between **APRIL 2021** and **MAY 2021**, **46** documents were reviewed to establish a foundation of knowledge on the malaria strategy, village health program, governance, data systems and architecture, role of data in decision-making, and infrastructure. See Appendix A.	Conducting a survey was deprioritized due to time constraints. Instead, additional interviews were conducted. The interview tool incorporated questions on digital tools, CHWs, and malaria case management.	Interviews were conducted with **24** individuals from various organizations, such as the **MOHCC**, **National Malaria Control Program**, and **Directorate of Nursing Services**, between **JUNE 2021** and **JULY 2021**.	A workshop was conducted with **18** participants in **OCTOBER 2021**. The workshop aimed to validate results from previous steps and identify opportunities for digital tools to increase malaria program impact.	Following the workshop, the team reviewed outputs from each step and developed a country profile highlighting recommendations developed in consultation with the **U.S. President's Malaria Initiative** and **MOHCC**. Data were last collated on **19 NOVEMBER 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 use of 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 with the ultimate aim to decrease the local malaria burden.

PEOPLE

People highlights the community health workers, supervisors, information technology support staff, and other decision-makers that contribute to 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 describes 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

The current CHW program in Zimbabwe is housed under the MOHCC Directorate of Nursing Services. As of 2020, there are approximately 17,400 CHWs with a target ratio of 2 CHWs per village.[5] CHWs are nominated and selected by village members and leaders. In Harare City, there are also CHWs called "Health Promoters," who report to the Health Promotions department. In Manicaland Province, School Health Coordinators also conduct malaria activities, including case management, reporting, and health education.[2] These health coordinators are teachers working at primary and secondary schools in high malaria burden areas who are trained and provided with consumables to enable them to offer malaria case management services to students at their respective schools, working as volunteers.[27] CHW selection criteria include maturity (over 25 years of age), literacy, reputation, communication skills, and interest in health and development. CHWs undergo 20 weeks of training (8 weeks in a classroom, 8 weeks of field training, and 4 weeks of attachment). The curriculum includes health areas such as infectious diseases (including malaria), maternal and neonatal care, and disaster risk reduction.[6] Refresher trainings are supposed to be conducted twice a year but are not routinely held due to lack of funding, which is driven by partner nongovernmental organizations (NGOs) for specific programmatic needs. In 30 high malaria burden districts, CHWs receive an additional, intensive three-day training session on testing and treating malaria.[7] MOHCC policy includes a mandate for CHWs in high malaria burden areas to provide rapid diagnostic testing, initiate treatment, and refer severe cases. CHWs also educate the community on malaria, promote use of long-lasting insecticidal nets (LLINs), and community participation in indoor residual spraying (IRS).[2,8] Additionally, CHW distribution of intermittent preventative treatment in pregnancy is being piloted in six districts.[7] Approximately 44% of malaria cases were reported by CHWs in 2020. However, diagnosis, treatment, and reporting of malaria by CHWs varies by province based on access to health care.[4]

17,400 Community health workers in country	Compensation Policy: VOLUNTEER
17,400 Providing malaria community case management	Compensation Policy: VOLUNTEER

CHWs are currently considered volunteers, but receive a basic stipend (US$14/month) and resources such as bicycles, bags, and uniforms with contributions from donors, including The Global Fund to Fight AIDS, Tuberculosis and Malaria, the U.S. President's Malaria Initiative (PMI), FHI 360, World Vision International, and the United Nations Children's Fund (UNICEF);[6,9] however, not every CHW has access to these resources.[10] CHWs are supervised by the nurse-in-charge at a local health clinic and supported by the ward health team. Supervisors provide technical support, resupply commodities, and collect data for reporting.[6] The main challenge in the program is failure to retain CHWs, resulting in a shortage of these health workers, due to limited funding and barriers to receiving the stipend, which requires going to banks far from villages.[5] The newly signed National Community Health Strategy for Zimbabwe intends to recognize a formal CHW cadre within the MOHCC that will receive a salary, including performance-based incentives.

Community health worker digital readiness

The main challenges to community digital systems and readiness of CHWs are lack of reliable electricity supply and mobile network accessibility, the capacity to operate digital tools, the cost of data being borne by CHWs, and lack of devices for data collection. There is no digital health curriculum as part of pre-service training for CHWs.[9] Some CHWs are provided with hardware devices or data, but this is inconsistent and depends on project funding. Short

message service (SMS)–based solutions are seen to be effective in reducing the need for smartphones and data.[5] A mapping exercise is recommended to understand the gaps in CHW infrastructure and how rollout of the national electronic health records (EHR) system could support community health digital.

Data-driven decisions at each level of the health system

Within Zimbabwe, monthly malaria surveillance meetings are held at the district, provincial, and national levels to review and discuss surveillance trends and response.[11] Provincial and district health team review meetings were previously held quarterly with support from the National Malaria Control Program (NCMP), the Global Fund, and UNICEF; however, regular funding is a challenge.[7] In malaria elimination regions, efforts are ongoing to strengthen case-based surveillance and foci management. However, the National Malaria Control and Elimination Strategic Plan for 2021–2025 suggests that there is low data use by workers and health facilities, resulting in most of the data analysis and use happening at higher levels. Other challenges for decision-making include insufficient capacity for data analysis and monitoring and evaluation at all levels, lack of unified databases for malaria data, lack of financial support for surveillance and monitoring and evaluation, and low or non-reporting by private-sector institutions.[1] There are standardized tools for data reporting at the health facility and CHW levels; however, discrepancies have been noted between information in paper-based registers maintained by CHWs and health facilities and data in District Health Information Software 2 (DHIS2). These discrepancies are attributed to the inconsistent data gathering as the result of CHWs' lack of access to data collection tools such as paper registers.[2]

NATIONAL LEVEL	National malaria data are used to develop national strategy documents and applications for resources from donors and partners. In addition to data collected in DHIS2, the NMCP maintains an Excel-based database for other malaria intervention and programmatic data, used to monitor trends, identify gaps, inform resource allocation, and guide prioritization and decision-making.[11] The NMCP reviews community-level data on case management and death investigations to see whether there are challenges in testing and treating at a subnational level. The Rapid Disease Notification System data housed in DHIS2 is used for weekly disease bulletins executed at the national level.[12]
PROVINCE LEVEL	DHIS2 data submitted by districts are checked for completeness and timeliness at the provincial level, where malaria staff watch for outliers and identify any errors.[13] Staff monitor malaria transmission and report any unexpected increases in transmission to the NMCP vector control team to monitor the need for insecticide-treated nets and IRS.[2] Unexpected increases in transmission also go to the Case Management Officer or to the Surveillance, Monitoring, and Evaluation Officer. Weekly quality assessments are conducted by provincial malaria staff.[10]
DISTRICT LEVEL	DHIS2 malaria data are accessed starting at the district level. District Nursing Officers hold monthly meetings in which malaria data are also discussed. District Environmental Health Officers hold monthly meetings with all Environmental Health Technicians (EHTs), where discussions on malaria surveillance, especially insecticide-treated net distribution, IRS activities, and entomological data, are part of the agenda. Hospital Medicine and Therapeutic Committee meetings are held quarterly and include discussions of malaria.
HEALTH FACILITY LEVEL	Data collected at health facilities are used to monitor trends and set targets for malaria thresholds, which helps to determine outbreak identification and catchment area mapping. Supervising nurses review the data to monitor potential outbreaks, as well as assess how CHWs are managing malaria cases, and discuss any areas for improvement. Weekly surveillance meetings are held with health facility staff and monthly with CHWs in each catchment area. CHWs are supposed to attend monthly surveillance meetings to hear trends in malaria cases and discuss feedback on how to manage any changes in malaria cases. Supervisors also discuss performance of CHWs and provide feedback if cases are not being managed appropriately.[7] Discussion of data sometimes happens with CHWs via WhatsApp.[5]
COMMUNITY LEVEL	CHWs submit monthly activity reports to supervising nursing staff and EHTs at local health facilities, which are used to report on key indicators, restock health commodity supplies, and prioritize tasks for the following month.[9,14] They also alert health facilities to increases in community malaria cases or deaths. Social and environmental surveillance is conducted to detect changing demographic movements and vulnerabilities (e.g., migrant farmers, cross-border dwellers/travelers), as well as changing environmental conditions/events (major construction, hurricane damage, etc.). The Zimbabwe Assistance Program in Malaria II project is an example of an NGO-supported initiative, funded by PMI, conducting small-scale, peer-to-peer data support and review where CHWs discuss data and provide support, sometimes via WhatsApp.[7] Quarterly, CHWs undergo a supervision review by the EHTs and supervising nurses to assess their management of cases.[5]

Governance

	DIGITAL	COMMUNITY HEALTH	MALARIA
Name	National Digital Health Strategy	National Community Health Strategy	National Malaria Control and Elimination Strategic Plan
Current strategy dates	2021–2025	2020–2025	2021–2025
Coordinating body	MOHCC Health Informatics and Data Analytics department	MOHCC Director of Community Health Services	National Malaria Control Program
Funding strategy	No	Yes	Yes

Following the Zimbabwe eHealth Strategy, operational from 2012 through 2017,[15] the updated National Digital Health Strategy 2021–2025 was drafted and published in 2021. The digital health strategy was developed through technical support by the World Health Organization, using the eHealth Strategy development toolkit and supported by the International Telecommunications Union. The new strategy does not mention specific digital tools used by health workers. No published documentation on funding for digital health exists; however, commitments have been made through a cabinet resolution to fund the MOHCC's digital health initiatives from government of Zimbabwe funds.[10] The MOHCC is still heavily reliant on funding from external partners, mostly sourced from outside the country. As a result, the architecture and functionalities of eHealth platforms are influenced by organizations from the outside, often through the provision of technical assistance.[16] The new National Digital Health Strategy has an organogram of digital health governance, which will map out the responsible entities overseeing aspects of the new strategy.[10] A Health Informatics and Data Analytics Directorate has been set up in the MOHCC to oversee digital health. In addition, the National Health Information Technical Committee (NHITC) was established as the coordinating body for national health information system. The NHITC meets quarterly and reports to the National Health Information System Management Committee. A separate Innovations Technical Working Group is established under the Policy, Planning, Monitoring, & Evaluation department. A community health information system is currently in development, led by the MOHCC Health Information and Surveillance department.[10]

The newly developed National Community Health Strategy 2020–2025 establishes a national coordinator responsible for overseeing community health policy, strategy, and implementation. While the strategy does not directly speak to malaria activities, it does acknowledge the significant malaria disease burden and need for malaria community case management to reduce malaria mortality. While Phase 1 of the strategy lays out the foundational activities, Phase 2 focuses on digitalization of community health service delivery and reporting. Additionally, the use of technology to strengthen the health delivery system is acknowledged in the National Health Strategy 2016–2020; however, no budget allocation for digital health is included in the strategy.[17] Any digital health initiative at the community level must be approved by the Permanent Secretary of the MOHCC, in consultation with relevant departments.[5]

The National Malaria Control and Elimination Strategic Plan (NMCESP) 2021–2025 has a focus on data and digital approaches, as well as community health. One of the key objectives of the NMCESP is to strengthen surveillance and monitoring with a focus on data availability and quality. The strategy prioritizes transitioning manual data management systems to electronic reporting for IRS and LLINs, malaria outbreaks and deaths, and scorecard development at subnational levels. Ensuring appropriate digital tools and training health workers in data collection and use will be necessary to support the prioritization of data availability and use. The NMCESP has a detailed budget and funding analysis showing a funding gap of 47%. A resource mobilization plan is in place to address the projected funding gap.[1]

GOVERNANCE
Policies define digital health and health data governance roles, responsibilities, and structures.

The MOHCC's 2018 ICT policy describes the key principles, infrastructure, resources, processes, and services that guide the governance, management, and provision of ICT services. The policy identifies the ICT unit as the official authority of the MOHCC, responsible for setting rules, procedures, and guidelines for ICT-related initiatives. The policy also serves the governance and management functions of ICT Services within the MOHCC. The Health Informatics and Data Analytics Directorate has been appointed and will oversee digital health.[18]

DATA MANAGEMENT
Policies provide specifications for data access, privacy, security, and confidentiality, and outline stipulations for data sharing.

The Data Protection and Privacy Act was established to protect citizen's personal data. The ICT Policy for Health Framework outlines an electronic data protection and privacy policy in compliance with this legislation. The policy includes a statement and commitment regarding recordkeeping, security measures, use of private information, and stipulations for data sharing. The framework also notes that a focal point will be identified to develop and implement the data protection and privacy policy in accordance with the framework.[5,10] There is a need to enforce the MOHCC ICT policy for greater compliance with the principles of data security, privacy, and data ownership.

STANDARDS AND INTEROPERABILITY
Policies describe an enterprise architecture, normative standards—such as health information standards—and digital identity.

The ICT Policy for Health Framework notes that the MOHCC will be tasked with developing and maintaining an ICT enterprise architecture operating framework to include principles, governance, and standards of enterprise architecture. The Team Leader for Strategy, Architecture, and Governance within the MOHCC will be responsible for managing the creation, maintenance, and compliance of the ICT enterprise architecture.[18] Specific data standards and interoperability policies to regulate new tools and systems are still needed.

INFRASTRUCTURE
Policies define data hosting and storage (e.g., local or cloud), mobile device management, and telecommunications access.

The Ministry's ICT policy includes general guidelines on the procurement, management, maintenance, and disposal of ICT equipment used by the MOHCC. The policy notes that the MOHCC ICT unit is responsible for developing and updating minimum specifications for ICT equipment and infrastructure, including hardware specifications from the Directorate of e-Government Standards document.[18] Currently, no specific policies on data hosting, storage, or telecommunications access are documented or published. There is also the need to adapt existing policies to meet the needs of the CHW program, including centralized, coordinated provision of hardware, airtime, and data for CHW tools and systems.

WORKFORCE
Policies describe workforce job structures and descriptions, plans for training, digital literacy expectations, and incentives for digital adoption.

The Ministry's ICT policy calls for the development of an "ICT Staff Skills Development Policy" aligned with existing MOHCC policies on human resources development. The proposed policy outlines roles and responsibilities within the MOHCC, levels and modes of training, and types of resources and certifications aligned with ICT training. The ICT Policy for Health Framework states that a committee of ICT unit and Human Resources department staff will be tasked with implementing the ICT Staff Skills Development Policy.[18]

Systems

Data flow

Health management information system

District Health Information Software 2 is the national repository for health data in Zimbabwe. DHIS2 currently houses aggregate monthly and weekly malaria data for analysis, dissemination, and use. CHWs maintain paper-based registers that track key health indicators. The two main malaria data collection tools used by CHWs are the RDT/Malaria Medicines Register and the Monthly Return Forms. These are designed to be paper-based standard booklets for routine use.[7] The RDT/Malaria Medicines Register captures data on patient assessment, diagnosis, and management of malaria. The CHW Monthly Return Form records community health data separately from health facility data and includes suspected malaria cases, number of RDTs conducted, number of positive cases, number of patients referred, coarthemether doses given, LLINs distributed, and rectal artesunate doses given.[5,14] CHWs submit these monthly paper reports in person to their health facility, where they are collated into a Health Facility CHW Return report. This provides an opportunity for feedback on the quality of data from CHWs. Currently, the MOHCC and UNICEF are working on harmonizing digital CHW data collection with SMS using RapidPro to send data across health programs into DHIS2 for aggregate reporting and dashboards.[19,20] Zimbabwe started reporting on LLINs in DHIS2 in 2020 and entomology data were incorporated into DHIS2 in 2021. Partners working in LLINs conducted trainings and data are being entered into DHIS2 for both mass and continuous distribution. IRS data are included in DHIS2 Tracker reporting.

Health facilities in Zimbabwe use a variety of data collection tools, which are primarily manual and paper based. The primary tool is the outpatient department register, which collects all the primary patient disease information. Information from this register is combined with that from other reporting registers into the T5 Monthly Return compiled by nurses at health facilities. Data aggregated and extracted from CHWs, and health facility reports are submitted to the district level for consolidation and entry into DHIS2. At the district level, these data are integrated with other reports and entered into DHIS2.[9] DHIS2 Tracker has been deployed in 29 elimination districts to support malaria case–based surveillance reporting at the facility level.[11,21]

Some key malaria intervention and programmatic indicators are not yet integrated into DHIS2; they are maintained separately by the NMCP in an Excel database, including larval source management, survey data, and training data.[11]

Additional data systems that support community health and malaria program data include:

- Integrated Disease Surveillance and Response System/Rapid Disease Notification System: The weekly Rapid Disease Notification System report aggregates CHW and health facility data and includes number of RDTs conducted, number of positive RDT results (malaria cases), and number of cases treated or referred. The flow of data from CHWs is mostly paper based, but unofficially CHWs can also submit data to health facilities via SMS, WhatsApp, or through a voice call, although this has a limited scale.[7] The weekly surveillance reporting from the health facility was primarily designed to be an electronic-structured reporting, but over the years due to infrastructure breakdown (broken phones, server downtime, etc.), health facilities have been using the best available methods (in-person, WhatsApp, SMS, etc.). Once all the data get to the district level, the data are manually entered into DHIS2. CHW data and health facility data are maintained as separate modules within DHIS2.
- Electronic Logistics Management Information System (eLMIS): Stock cards or medicine registers are used for manual tracking and ordering commodities at the facility level. However, stock data from CHWs are not consistently captured. A pilot was conducted with CHWs in two districts using paper forms to submit malaria stock–level data to facilities, where the data were then uploaded to the Zimbabwe Assisted Pull System using laptops from the Directorate of Pharmacy Services. In addition, an eLMIS is being adopted by the MOHCC with support from the United States Agency for International Development and is being piloted in selected facilities to support the logistics and supply chain system to capture data on quantity of stocks dispatched and to what facility they were delivered.[2] The expectation is the eLMIS will enable order processing and stock visibility at the facility

level. The eLMIS is also expected to be integrated into other MOHCC health information systems, but this is not currently enabled. For malaria, quantification and ordering happens at district pharmacies on a quarterly basis with the Zimbabwe Assisted Pull System to manage commodity distribution. Navision software is used by the National Pharmaceutical Company of Zimbabwe for procurement and inventory control of health commodities.

- National EHR system: For patient data and health records, the MOHCC and partners have been focused on developing and piloting a national EHR system called Impilo, which includes a malaria module to capture data from health facilities. Impilo is currently deployed in 181 facilities in eight rural districts and three cities, and there are plans for rollout to all health facilities in all ten provinces by 2023.[11] The EHR system is designed to be interoperable with DHIS2, which will extract and aggregate data from the EHR system. The Impilo EHR system is based on previous implementation of vertical health patient management systems, including for HIV and tuberculosis.[22]

- The MOHCC has also deployed other health information systems, including laboratory and human resources information systems.[5]

Enterprise architecture and interoperability

The MOHCC has adopted a high-level health information system enterprise architecture that includes a health interoperability layer. Key components of the central enterprise architecture database include a shared health record, a terminology service, a health Master Facility List (MFL), a provider registry, and a client registry.[22] The MFL is maintained as part of DHIS2 and has unique identifiers for each facility. The system for updating the MFL is not documented; however, updating is done on an ongoing basis, as new facilities are registered, or as old facilities are closed. Currently, the national EHR system, DHIS2, and the eLMIS are all using the interoperability layer. However, the DHIS2 Tracker (case-based surveillance) is not currently passing through the interoperability layer and none of the data are being pushed to the EHR system. A Health Information Exchange is operational but undergoing improvements.[5,10] MOHCC headquarters has a data center that is currently being used to host the macro-database to link the EHR system and DHIS2.[18]
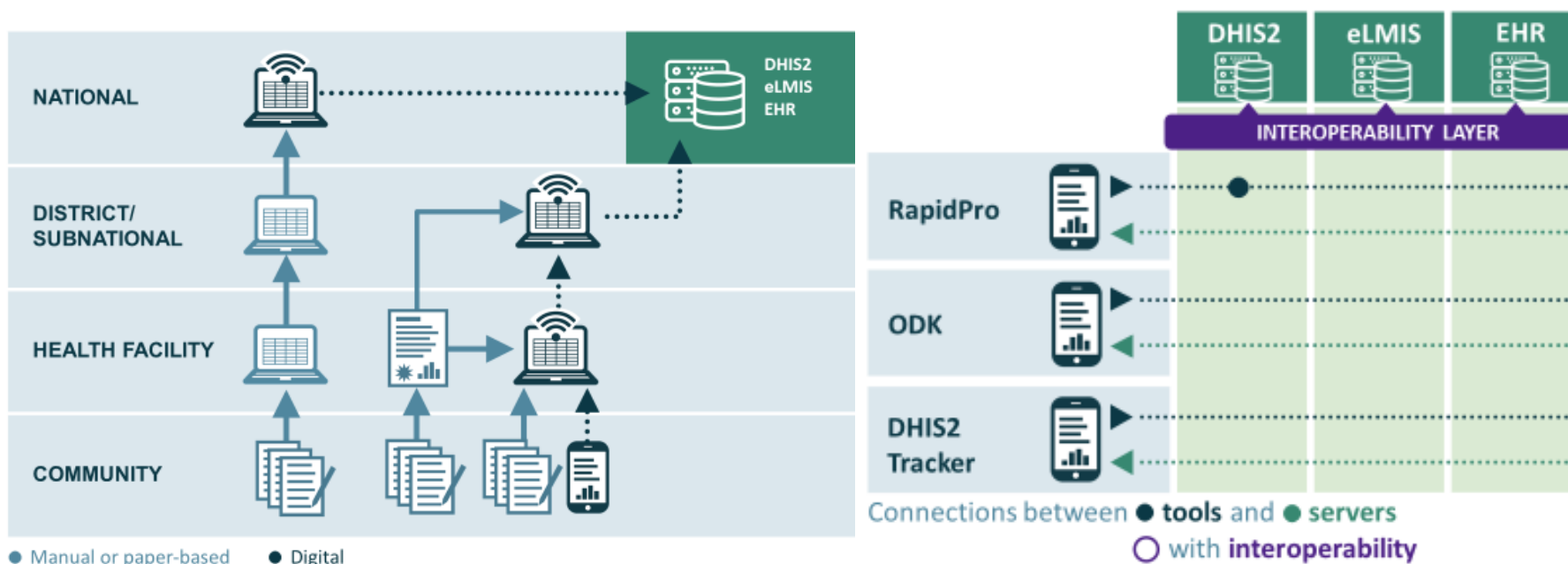
Abbreviations: DHIS2, District Health Information Software 2; eLMIS, electronic Logistics Management Information System; EHR, electronic health records; ODK, Open Data Kit.

Digitally enabling infrastructure

The three main mobile operators in Zimbabwe are Econet, NetOne, and Telecel. Econet is the largest operator, capturing nearly 70% of active mobile subscribers. As of March 2020, the total number of registered mobile telephone subscriptions in Zimbabwe was reported as 24.4 million (for a reported population of 14.86 million); however, only 44% of registered users had active mobile subscriptions. WhatsApp is the predominant source of mobile and internet usage in Zimbabwe for both businesses and individuals, accounting for 41% of total mobile internet and data usage in the first quarter of 2020. Mobile infrastructure in the country relies on 2G and 3G, with more limited LTE coverage.[26]

Connectivity[23]	Bandwidth[24]	Electricity[25]	
50%	**20** kb/s	**10**%	**60**%
of country	in areas with connectivity	of rural areas	of urban areas

Projects by private telecom providers are ongoing to increase 4G spread across the country.[10] Electricity coverage in rural areas is a significant problem in Zimbabwe, especially in the bordering low-lying areas with very little infrastructure and network coverage. Approximately 68% of the population in Zimbabwe lives in rural areas.[25] The MOHCC has supported backup power supply, along with the Global Fund, which has been the main funder of solar power installations to support health facilities without adequate electrical infrastructure.[5]

In the past, multinational organizations have supplied mobile devices to CHWs in some provinces: the NMCP supplied devices in Manicaland with Global Fund support, and the Zimbabwe Assistance Program in Malaria distributed smartphones in Mbire District.[10] A survey of health facilities in Zimbabwe indicated that most staff used personal devices to receive communication and report electronic data. Concerns have been expressed around the use of personal devices by CHWs related to data protection and security; however, this may be more cost effective than supplying new devices to CHWs. Only 7% of facilities surveyed used an electronic method for referral of patients. Further, most facilities did not have solar power backup for electricity, although the proportion was higher in Chitungwiza, Harare, and Manicaland. However, the government of Zimbabwe has implemented a virtual, private network for EHR in all hospitals. Availability of charging for mobile devices is another barrier to CHW use of digital tools.[5]

Digital health tools in use and functionality

CHWs have stated interest in the data collection registers they use being electronic or digitized.[10] However, no comprehensive digital tool(s) exist for CHWs in Zimbabwe. Most tools are specific to health areas, and many have not moved beyond pilot phase and are not scaled broadly. SMS is widely available on all types of phones and the platform does not require an active internet connection, making it a feasible approach in areas of limited internet coverage in Zimbabwe. Key challenges for digital tools for CHWs have been scaling tools beyond pilots, sustainability of tools, lack of network coverage and electricity for charging, inconsistent data collection and transmission, and lack of hardware and replacement or maintenance strategies for hardware.
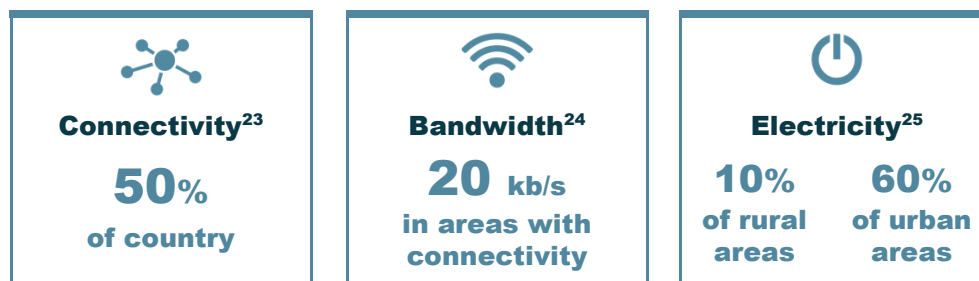
USE CASE(S)	Open Data Kit	RapidPro	DHIS2 Tracker
Providing malaria community case management	■	☐	■
Tracking malaria proactive and reactive case detection	■	☐	■
Tracking malaria screening with referral	■	☐	■
Transmitting messages to community on malaria	☐	■	■
Training health workers	■	■	■
Tracking routine LLIN distribution during ANC or EPI visits	■	■	■

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

Abbreviations: ANC, antenatal care; DHIS2, District Health Information Software 2; EPI, Expanded Program on Immunization; LLIN, long-lasting insecticidal net.

CASE MANAGEMENT FUNCTIONALITIES	Open Data Kit	RapidPro	DHIS2 Tracker
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	■	■	■

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

Abbreviations: DHIS2, District Health Information Software 2; HMIS, health management information system.

MANAGEMENT & SUPERVISION FUNCTIONALITIES	Open Data Kit	RapidPro	DHIS2 Tracker
CHW identification Tool uniquely identifies CHWs	▪	☐	▪
CHW catchment location Tool identifies CHW 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 worker; DHIS2, District Health Information Software 2.

Appendices

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Abbreviations

ANC	antenatal care
DHIS2	District Health Information Software 2
eHealth	electronic health
EHR	electronic health records
EHT	Environmental Health Technician
eLMIS	electronic Logistics Management Information System
EPI	Expanded Program on Immunization
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV	human immunodeficiency virus
HMIS	health management information system
ICT	information and communication technology
iHRIS	integrated Human Resources Information System
IRS	indoor residual spraying
LLIN	long-lasting insecticidal net
MFL	Master Facility List
MOHCC	Ministry of Health and Child Care
NGO	nongovernmental organization
NHITC	National Health Information Technical Committee
NMCESP	National Malaria Control and Elimination Strategic Plan
NMCP	National Malaria Control Program
ODK	Open Data Kit
PMI	U.S. President's Malaria Initiative
RDT	rapid diagnostic test
SMS	short message service
UNICEF	United Nations Children's Fund

APPENDIX C

Contributors

Informant name	Organization
Wilson Chikomba	Community health worker, Chiredzi District
Anderson Chimusoro	World Health Organization
Anthony Chisada	Zimbabwe Assistance Program in Malaria
Busisani Dube	Former National Malaria Control Program
Ivan Dumba	National Pharmaceutical Company of Zimbabwe
Robert Gongora	Ministry of Health and Child Care
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Edwin Magodi	Maisha Health
Julia Masamba	Community health worker, Nyanga District
Alex Matonhodze	Chemonics
Hamish Mubata	Ministry of Health and Child Care
Gladwin Muchena	FHI 360
Manes Munyanyi	Ministry of Health and Child Care
Shepherd Mutsiwegota	United Nations Children's Fund
Simon Nyandundu	Ministry of Health and Child Care, Provincial Medical Directorate
Sister Samanga	Ministry of Health and Child Care, Directorate of Nursing Services
Tungamirai Simbini	University of Zimbabwe
Farai Tenhere	Community health worker, Nyanga District
Emma Tshuma	Ministry of Health and Child Care, Directorate of Nursing Services
Gertjan Van Stam	Independent consultant

Community digital health tools*

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
District Health Information Software 2 Tracker	**4.1** Data collection, management, and use	Ministry of Health and Child Care, Clinton Health Access Initiative (Bill & Melinda Gates Foundation, The Global Fund to Fight AIDS, Tuberculosis and Malaria)	Matabeleland South Province Manicaland, Mashonaland East, Mashonaland Central	Case detection
Open Data Kit	**4.1** Data collection, management, and use	Zimbabwe Assistance Program in Malaria (United States Agency for International Development/U.S. President's Malaria Initiative)	Manicaland, Mashonaland East, Mashonaland Central	Case detection Reporting of malaria commodities
RapidPro	**4.1** Data collection, management, and use	Ministry of Health and Child Care (United Nations Children's Fund)	Mashonaland East	Aggregate reporting

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

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

Next-generation digital health tool functionalities for malaria case management

CASE MANAGEMENT FUNCTIONALITIES	Open Data Kit	RapidPro	DHIS2 Tracker
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	Open Data Kit	RapidPro	DHIS2 Tracker
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

Abbreviations: CHW, community health worker; DHIS2, District Health Information Software 2; eLIMS, electronic Logistics Management Information System; iHRIS, integrated Human Resources Information System.