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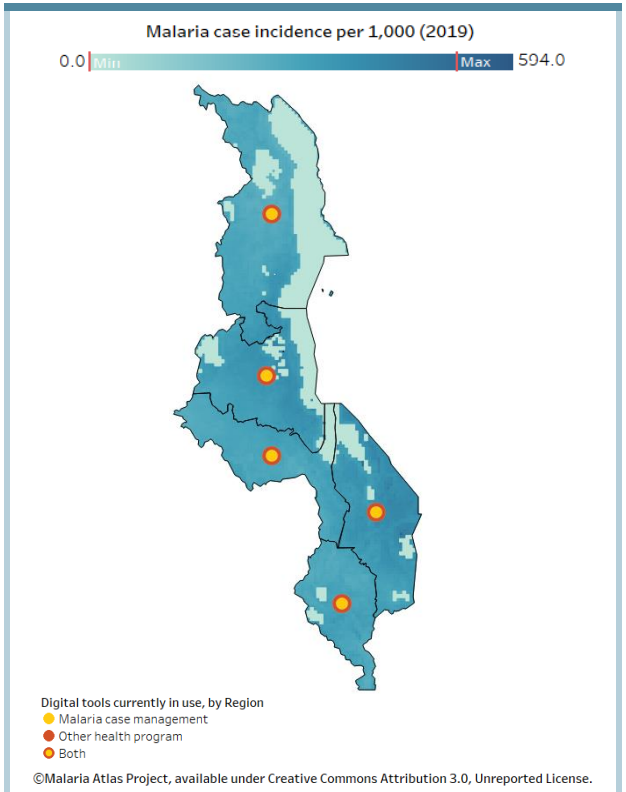
Role of Digital Tools in Fighting Malaria at the Community Level

MALAWI

Executive Summary

While the Malawi Ministry of Health (MOH) recognizes the importance of integrating digital health approaches into strategy to prevent and reduce malaria incidence, a number of challenges inhibit implementation: limited community health worker training and feedback on malaria data collection and use, a fragmented and piecemeal approach to piloting digital tools, and low Internet connectivity across the country (18%).[1] Improved processes to ensure the interoperability and scale-up of digital tools and increased digital readiness of the Health Surveillance Assistant (HSA) community health cadre are needed to strengthen digital health implementation and the delivery of efficient and high-quality malaria services.

Despite these challenges, Malawi's has a strong national enabling environment for community-level digital health integration. Malawi has a newly updated *National Digital Health Strategy*, and its current *National Community Health Strategy* includes digital health as one of its high-priority pillars. The MOH plans to launch the integrated community health information system (iCHIS) in 2021, which should streamline malaria reporting, improve harmonization of data collection at the community level, and increase access to community health data on malaria.



MALARIA

Incidence per 1,000 people in 2020[2]

385

PEOPLE

Health Surveillance Assistants

9,551 Health Surveillance Assistants
5 per 10,000 people

GOVERNANCE

National Digital Health Strategy

YES

SYSTEMS

Digital Health Index

SCORE: 2

JULY 2021

digital square

Recommended Actions

PEOPLE

Community health workers (CHWs) and other decision-makers

Establish a district-level electronic data collection training program for HSAs

Support the MOH to implement electronic data collection training that aligns with the iCHIS requirements and includes an HSA exam, as well as to create easily accessible refresher trainings. The training should reinforce that supervisors are required to provide regular feedback to all data collectors. Although the MOH Community Health Services Unit revised the HSA training curriculum to include digital training when transitioning from paper-based to District Health Information Software 2 (DHIS2) data collection and recommended training be managed at the district level, this training has not been put in place.

Support integrated community case management (iCCM) training for 4,000 program-specific CHWs

Support the MOH to provide iCCM training to the 4,000 current HSAs who currently do not have the technical capacity to provide case management services for malaria.

GOVERNANCE

Strategies and policies

Establish a digital health review board and develop interoperability guidance

Support the MOH to develop standard operating procedures to guide the interoperability of new tools and to establish a formal review system for each tool prior to development and deployment.

Develop National Malaria Control Program (NMCP) integrated digital health strategy

Support the NMCP to establish an integrated digital health strategy to inform its three main strategies: integrated vector management, social behavior change communication and community engagement, and case management. This strategy will need to be consistent with the *National Digital Health Strategy 2020–2025* and *National Community Health Strategy 2017–2022*. A costed implementation plan should be included to improve the likelihood of sustainability.

Mobilize public domestic funding for the iCHIS

Although the MOH has conducted a situational assessment to understand needs, securing internal funding for the iCHIS strategy remains a challenge. Encourage the sustainability of the iCHIS by supporting lobbying and advocacy to build iCHIS implementation into the government's annual budget.

SYSTEMS

Processes and digital tools

Develop and roll out an electronic system for HSAs to use in data collection, interpretation, and use

Support the Community Health Services Unit to develop and implement the DHIS2 App data capture form in alignment with data collected by HSAs. The app should also provide digital linkages to the logistics management information system and master health facility registry as well as enable offline data input to ensure usability in low-bandwidth areas. Better alignment of HSA data collection with DHIS2 will help streamline reporting systems.

Support end-stage implementation of a data collection tool for HSAs

After HSA-collected data has been aligned with DHIS2 and a digital data collection tool for HSAs has proven successful in initial pilots, support the Community Health Services Unit to develop a costed implementation plan for the national scale-up of the tool and identify funding sources to support national scale-up.

Develop public-private partnerships to improve health center electricity and mobile/Internet access

Electricity and Internet access are required to support iCHIS effectively, yet less than 15% of Malawi's communities are connected to the national electricity grid. A public-private partnership could equip health centers with mounted solar panels and improve mobile/Internet coverage in high-priority areas.

Methodology

The country profile for Malawi was developed through the following process: conducting a desk study, deploying an online survey focused on the digital landscape, conducting key informant interviews, and a workshop to validate the results and prioritize recommended actions. Due to COVID-19, to protect stakeholders, the interviews were mainly conducted remotely, or in-person with social distancing and the workshop was conducted in a hybrid format. See Appendix D for detailed information on the results of the online digital tools survey. See Appendix C for a list of key informant interviewees and workshop participants.

DESK REVIEW	SURVEY	INTERVIEWS	WORKSHOP	ANALYSIS
In **September 2020**, **8** documents were reviewed to establish a foundation of knowledge on the malaria strategy, community health programs, governance, data systems and architecture, role of data in decision-making, and infrastructure. See Appendix A.	In **January 2021**, a survey was sent to **15** stakeholders at all levels of the health system, global policymakers, funders, and private-sector partners. The survey was open for **three** weeks and received **15** responses.	Interviews were conducted with **15** individuals from organizations such as the **NMCP, MOH Central Monitoring and Evaluation Division, VillageReach, and Baobab Health Trust** between **February 2021** and **March 2021.**	A workshop was conducted with **20** participants in **February 2021.** The workshop aimed to validate results from previous steps and identify opportunities for digital tools to increase malaria program impact.	Following the workshop, outputs from each step were reviewed and developed a country profile highlighting recommendations developed in consultation with the **NMCP and the MOH.** Data were last collated in **February 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, governance structures, and their implementation ("Governance"); and data flow, digital tool structures, functionalities, and use ("Systems"). Together, these components describe the *desired state* for CHWs' 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 who 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

HSAs perform a variety of malaria-related activities as part of the iCCM package, including rapid diagnostic testing and treatment with artemisinin-based combination therapy for children under five years of age, as well as administration of rectal artesunate before referral for treatment of severe malaria.[3] Over half (54%) of HSAs are trained in iCCM. A key 2022 target in the *National Community Health Strategy* is for 75% of HSAs to deliver the community components of the Essential Health Package, MOH's basic health services package offered at the community level, which includes iCCM. However, despite funding from the President's Malaria Initiative and the Global Fund to Fight AIDS, Tuberculosis and Malaria, which are the largest supporters of HSAs' malaria activities,[4] the MOH currently lacks funding to scale up iCCM training for the remaining HSAs who provide program-specific community health services.

9,551 **Health surveillance assistants in country**	**Compensation Policy:** **PAID** **Paid by external party**
4,592 **Providing malaria community case management**	**Compensation Policy:** **PAID** **Paid by external party**

Malawi aims to have one HSA per 1,000 people, but there is currently a shortage of 7,000 HSAs. HSAs are unevenly distributed across the country due to limited accommodations and poor incentives for HSAs in hard-to-reach areas, as well as weak enforcement of recruitment and deployment guidelines.[5] HSAs also lack clarity on their roles and tasks, adequate training and supervision, and access to transportation. Other cadres offering malaria community case management include Community Health Nurses and Community Midwives; however, these cadres are small and usually operate from the district hospital or health center—outside the community. Recognizing the importance of community-level data collection, the MOH is developing the first iCHIS, which will digitalize all community-based health services and include 111 community health indicators, 84 of which are not captured in DHIS2 currently. The successful rollout of this system should improve the harmonization of data collection at the community level and eliminate parallel reporting systems, but the MOH currently lacks funding to complete system development and rollout at the national level. The *National Community Health Strategy's* digital health targets for 2022 include 75% of HSAs using the standardized village electronic health register and 50% of all community health cadres using mHealth for integrated service delivery, data collection, and supervision. Progress toward these targets is slow given the limited scale-up of digital technologies for HSAs.

Community health worker digital readiness

Malawi has a wide range of HSA-facing digital tools to assist with malaria case management (Mobile Village Toolkit), supervision (Integrated Supportive Supervision Toolkit), and stock management (cStock). Although these HSA-facing digital tools exist, only 1,823 HSAs (20% of the cadre deployed) are currently using digital tools for community health service delivery.[6] Having completed the Malawi School Certificate of Education, HSAs are literate. Additionally, they are supported by Senior HSAs at the facility level and DHIS2-trained officers at the district level. While a priority in Malawi's digital health strategy is to train HSAs on information and communications technology (ICT), there is an implementation gap in offering ICT trainings, and most HSAs have not received the digital health session within their pre-service training package.

Data-driven decisions at each level of health system

The *Malawi National Health Information System Policy* designates the Central Monitoring and Evaluation Division as the coordinating body for digital health strategy and requires all public and private programs and partners collecting health data on basic health services to use the centralized health management information system (HMIS). National policy promotes an integrated and consolidated approach using DHIS2 as the main health management system and data repository.

While the HMIS has privacy and confidentiality measures in place, weaknesses, including parallel reporting systems, make accessing data more complicated. Not all data that HSAs collect are integrated in DHIS2, and HSAs submit separate monthly forms that are more comprehensive for different programs, including malaria, tuberculosis, HIV, and family planning. In addition to the *Health Sector Strategic Plan* monitoring and evaluation (M&E) framework, there are parallel program-specific M&E frameworks, which have created structural challenges that weaken the mainstream M&E system. The parallel systems create confusion in recording, extracting, and reporting data, and thus degrade data quality. Due to this, most health facilities are not able to collect and submit the required data on time. Although some M&E systems have been computerized, there is no interoperability in their current state, making it difficult for health actors at each level to access and use the data for decision-making.

NATIONAL LEVEL	The Central Monitoring and Evaluation Division, led by the National Health Program Manager, verifies national DHIS2 data and uses the information to generate national reports, in collaboration with the NMCP. M&E staff in each department review, clean, and share data with their department heads. DHIS2 informs policies, strategies, evaluation interventions, resource mobilization, and national health high-priority courses of action. The national level also provides data collection and validation feedback to the zonal level.
ZONAL LEVEL	At the zonal level, the Health Program Manager uses DHIS2 data to generate reports and provide feedback to districts. Zonal Officers access the data uploaded in DHIS2 to plan and evaluate interventions, mobilize resources from external donors, and quantify and procure drugs and other resources used at district and health centers in the zone.
DISTRICT LEVEL	At the district level, the Health Program Manager verifies DHIS2 data from health facilities, provides feedback to the health facility leads, and collects and analyzes data at the district level. The data are used to inform district health priorities.
HEALTH FACILITY LEVEL	The focal person at the health facility collects and compiles data within the facility and assists the HSA to enter the community-level data on DHIS2. The focal person also provides coaching and feedback on data collection to the HSAs on their Community Health Team. The health center uses the data for commodity and consumable forecasting (medication volumes and supplies required).
COMMUNITY LEVEL	While MOH intends to transition HSA data collection from paper forms to the DHIS2 app, no clear plan or funding exists. Besides the Mobile Village Toolkit and cStock pilots, HSAs have limited training and exposure to digital health tools for malaria data collection. Community data are used at all levels for planning and evaluating interventions, mobilizing resources, and quantifying and procuring commodities. However, HSAs use the data collected mainly for quantifying and procuring drugs. HSAs currently receive limited feedback on data they collect. cStock had a feedback mechanism, but it is no longer in use due to a lack of funding.

Governance

	DIGITAL	COMMUNITY HEALTH	MALARIA
Name	*National Digital Health Strategy*	*National Community Health Strategy*	National *Malaria Strategic Plan*
Current strategy dates	2020–2025	2017–2022	2017–2022
Coordinating body	The Central Monitoring and Evaluation Division within the MOH is responsible for M&E of the *National Digital Health Strategy*.	No official coordinating body, but the Community Health Technical Working Group, organized by the Community Health Services Unit within the MOH, currently coordinates strategy implementation. The Medical Council of Malawi oversees all medical practice in the country, including iCCM.	The Malaria Advisory Board, organized by the National Malaria Control Program, provides guidance to the Secretariat. There are different technical working groups, including for case management, malaria in pregnancy, and diagnostics. The Medical Council of Malawi oversees any medical practice in the country, including malaria case management.
Funding strategy	Small funding commitment from national budget; in process of soliciting external donors to fund the strategy.	Small funding commitment from national budget; in process of soliciting external donors to fund the strategy.	Some small funding from the national budget; however, the country relies on the Global Fund and President's Malaria Initiative

The *National Community Health Strategy 2017–2022* lists ICT as one of its six priority pillars, with the goal of promoting a harmonized community health information system, including multidirectional flow of data. Key interventions to achieve this goal include harmonizing data management practices, exploring integrated mHealth solutions for HSAs, training all HSAs on the Community Health Team on ICT, managing data, and launching two-way feedback and data review systems between communities and the health system.[5] A curriculum for HSAs has been revised to ensure that all recruited HSAs will be oriented on ICT and digital health. While clear synergies and opportunities exist between the *National Digital Health Strategy* and the *National Community Health Strategy*, the national *Malaria Strategic Plan* has yet to establish digital health integration opportunities.

Network and power infrastructure and coverage need to be addressed for the Malawi Government to have an enabling infrastructure for digital health systems. Additionally, interdepartmental turnover and bureaucratic obstacles have stalled the adoption of already proven digital health technology. For instance, the integrated Management of Childhood Illnesses program secured funding from the Global Fund to procure and install a server and thus revive cStock in Malawi. However, due to extensive procedural requirements, the Procurement Directorate has not yet approved required documents, although they have been reviewed, vetted, and approved by the integrated Management of Childhood Illnesses program.

GOVERNANCE policies define digital health and health data governance roles, responsibilities, and structures.	The Government of Malawi has eHealth governance structures, strategies, policy, and legislation governing digital technology at the national and ministerial levels. The Ministry of Information, Communication and Technology is the custodian of all digital technologies and, through the Department of E-Government, has seconded staff in all the ministries. The Department of Planning and Policy Development oversees digital health technologies in the MOH; however, digital health is specifically under the purview of the Central Monitoring and Evaluation Department.
DATA MANAGEMENT policies provide specifications for data access, privacy, security, and confidentiality and outline stipulations for data sharing.	The Malawi Communications Regulatory Authority is currently working on a data privacy and security act and a national enterprise architecture for all digital technologies in the country. The government has a health management information system with controlled access. Users are assigned user names and passwords and granted differential access depending on their respective functions in the system. For example, users who only review data are restricted from entering data. However, a user who enters data might be allowed to view data in addition to data entry. There are standard protocols in place that govern sharing of data with other systems.
STANDARDS AND INTEROPERABILITY policies describe an enterprise architecture, normative standards (e.g., health information standards), and digital identity.	While the national enterprise architecture is currently being developed, digital health technology strategies and policies at the national and ministry levels provide needed policy guidance and direction. Policies include the National ICT Policy, Digital for Development Strategy, Standards and Guidelines for Digital Health Technologies, Electronic Transactions and Cyber Security Act, and the Access to Information Act.
INFRASTRUCTURE policies define data hosting and storage (e.g., local or cloud), mobile device management, and telecommunications access.	DHIS2 data are stored on local servers and connected to an online hosting/network service. The MOH has prioritized the provision of adequate computing infrastructure, including laptops, desktops, and tablets; implementation of a hospital-wide electronic health record system to allow digitalization of all clinical services; delivery of telehealth services to address the shortage in specialized health personnel; delivery of continuous professional development through e-learning; and improvement of the availability of digital health human resources.
WORKFORCE policies describe workforce job structures and responsibilities, plans for training, digital literacy expectations, and incentives for digital adoption.	The Community Health Services Unit is responsible for reviewing and updating the roles and responsibilities of community health cadres. These include HSAs, Community Health Nurses, Community Midwives, Medical Assistants, and Nurse Midwife Technicians. HSAs were considered overburdened with work; as a result, their roles were reviewed and clarified. To ease HSAs' work burdens, MOH elaborated a clearer division of responsibilities among the community health cadres regarding the iCHIS and included more in-depth training as part of the HSAs' onboarding curriculum.

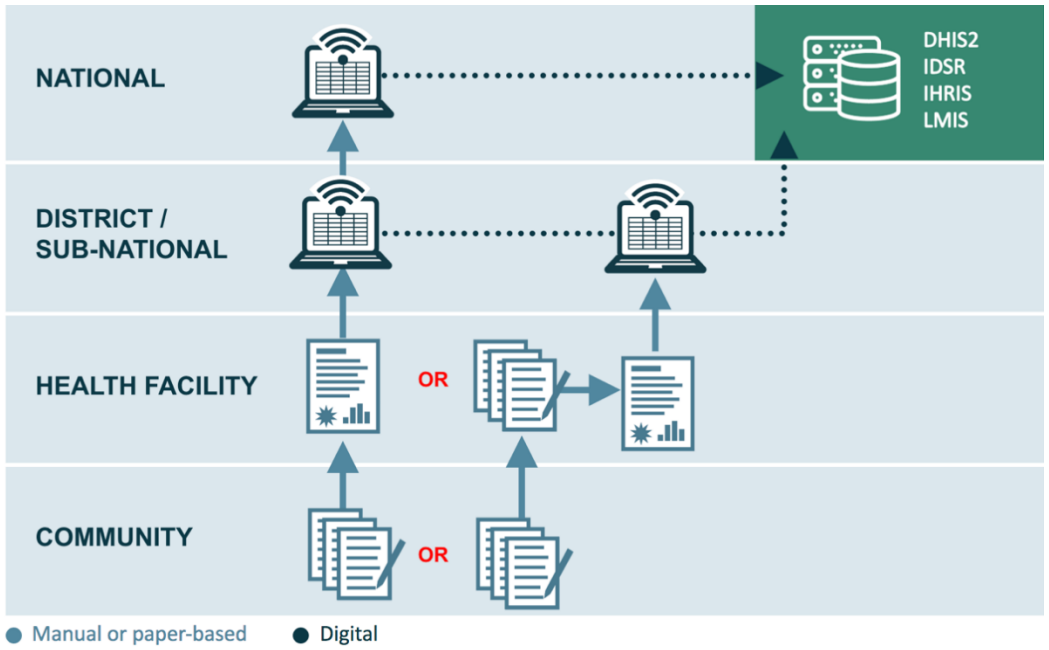
Systems

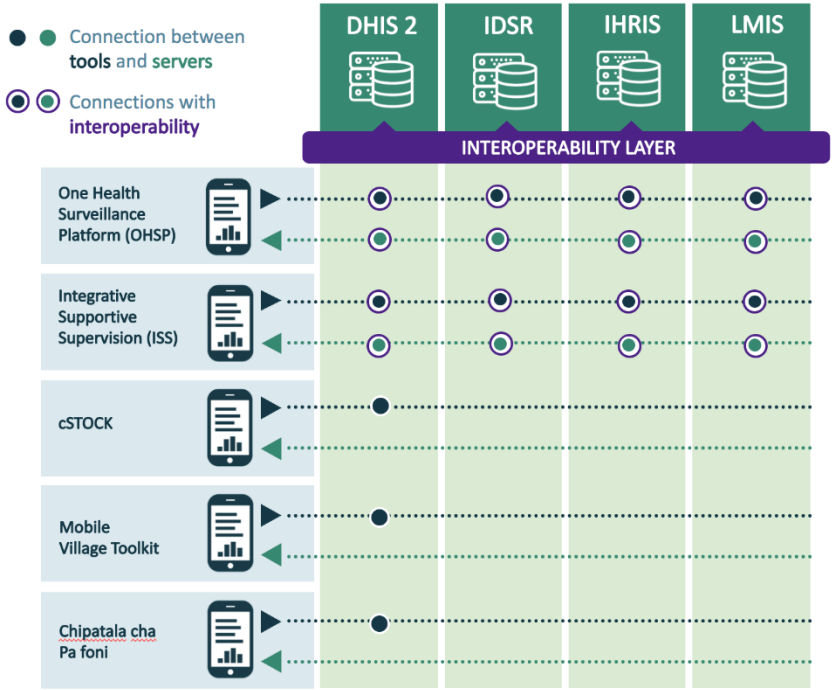
Data flow

At the community level, HSAs record health information and resources used during appointments with clients in village clinic registers. On a monthly basis, HSAs collate information from the village clinic register to the paper-based Form1A, which they submit to the Senior HSAs at the health center. Senior HSAs collate the data received from all HSAs who report to the health center onto the paper-based Form1B. The Senior HSAs then submit Form1B to the district Health Information Office, where officers enter the information into DHIS2 directly. HSAs also complete separate monthly reporting forms for different programmatic areas, including malaria. Senior HSAs transfer the data from these program forms to the paper-based HMIS Form 15 (a replica of the DHIS2 form). At the district level, HMIS Officers then use the HMIS Form 15 to enter the data into DHIS2. Both Zonal Officers and National Officers can access the community health data uploaded in DHIS2. Not all malaria data collected by HSAs are uploaded to DHIS2. The monthly malaria reporting forms prepared by HSAs are forwarded to Program Coordinators based at district hospitals to supplement electronic data in DHIS2.

Current challenges with community data flow include the lack of data use and data access. Information flow between actors in the community health system is limited; community health workers are therefore unable to use data to plan, implement, or improve community health services. HSAs do not receive regular feedback on the data they collect and share. As a result, HSAs do not have ownership of the data and do not see the value in the elaborate data collection requirements placed on them. There is a need to reinforce data ownership and put relevant data user agreements in place to improve data access for health actors in the country. The national HMIS policy states that all data from Malawi should be stored in Malawi; however, due to the multitude of repositories, especially on cloud servers, data are sent to development partners abroad, while Malawian analysts are often unable to access key indicators.

A priority for MOH is to promote interoperability of digital health solutions to enable information sharing for continuity of care; however, no national enterprise architecture for digital health technologies currently exists. The Malawi Communications Regulatory Authority is currently working on a data privacy and security act and national enterprise architecture. Due to the Malawi Communications Regulatory Authority's implementation delays, MOH is currently rolling out its own interoperability roadmap and interoperability architecture. In 2020, the MOH developed an interoperability layer for data exchange that includes a master health facility registry, terminology registry, and a logistics management information system that is interoperable with DHIS2. Work is still in progress to develop standards for a health worker registry and master patient index, which was initially championed by Baobab Health Trust. Since the interoperability layer was only recently established, only digital tools that are compatible with DHIS2, such as the One Health Surveillance Platform and the Integrated Supportive Supervision Toolkit, can be integrated within the digital enterprise architecture.

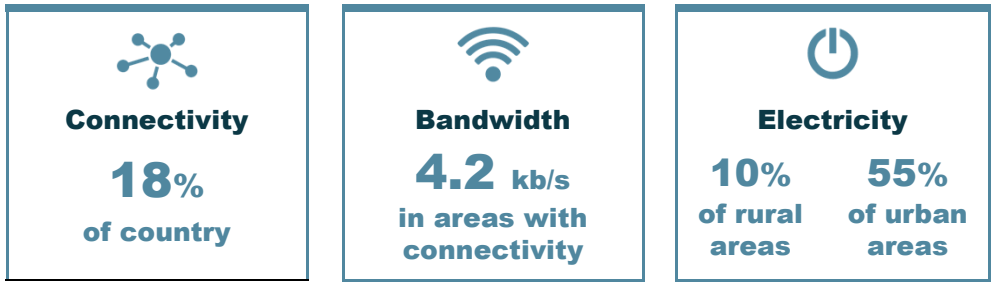




Abbreviations: DHIS2, District Health Information Software 2; IDSR, Integrated Disease Surveillance and Response; IHRIS, Integrated Human Resources Information System; LMIS, logistics management information system;

Digitally enabling infrastructure

There are many barriers for Malawi to integrate digital data collection at all levels of the health system. Eighty-four percent of Malawi's population live in rural areas and only 4% of rural households have access to electricity.[7] Less than half of men and only about a quarter of women in rural areas own mobile phones. Malawi's eHealth Strategy discusses the need to improve national eHealth information standards, computing infrastructure, national connectivity services, identification and authentication, reliable power supply, and information protection as foundations for ICT infrastructure. Network and power infrastructure and coverage remain obstacles to the implementation of community-based digital health technologies. MOH is prioritizing the development of connectivity infrastructure to all health facilities to enable access to key health resources.



Digital health tools in use and functionality

Digital tools at the end stage of development have been handed over to the government. Used by HSAs, the Mobile Village Toolkit and cStock have overlapping functionalities, including malaria community case management and tracking of malaria screening with referrals. While small in scope, HSA supervisors use both the Integrated Supportive Supervision Toolkit and the DHIS2-based One Health Surveillance Platform for aggregate malaria case reporting and analytics.

The primary digital tool functionality gap identified is the lack of funding for end-stage implementation. While international partners have financially supported the pilot and scale-up versions of the tools, crucial funding is lacking for the handover to government phase. This lack of funding has caused delays in rollout and suspended the implementation of several digital tools, including the Mobile Village Toolkit and cStock. While the Global Fund is in the process of reinvesting in and reinstating cStock, a funding source has yet to be identified to reimplement the Mobile Village Toolkit.

USE CASE(S)	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
Providing malaria community case management	■	■	■	■	■
Tracking malaria proactive and reactive case detection	■	■	□	■	■
Tracking malaria screening with referral	■	■	■	■	■
Transmitting messages on malaria to community	□	■	□	■	□
Training health workers	■	■	■	■	■

USE CASE(S)	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
Tracking routine long-lasting insecticidal net distribution during antenatal care or Expanded Programme on Immunization visits	■	□	■	□	■

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

CASE MANAGEMENT FUNCTIONALITIES	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
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 health management information system Tool sends information to the official national health information system	■	■	■	■	■
Offline capability Tool functions, at least partially, offline	■	□	■	■	■

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

MANAGEMENT & SUPERVISION FUNCTIONALITIES	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
CHW identification Tool uniquely identifies community health workers	■	■	■	■	■
CHW catchment location Tool identifies CHW associated position in org unit hierarchy/link to health facility/system	■	■	□	■	■
Community health worker 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

Appendices

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APPENDIX A

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APPENDIX B

Abbreviations

CHW	community health worker
DHIS2	District Health Information Software 2
HMIS	health management information system
HSA	Health Surveillance Assistant
HSSP	Health Sector Strategic Plan
iCCM	integrated community case management
iCHIS	integrated community health information system
ICT	information and communications technology
M&E	monitoring and evaluation
MOH	Ministry of Health
NMCP	National Malaria Control Program

APPENDIX C

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Abbreviations: MOH, Ministry of Health of Malawi; ONSE, Organized Network of Services for Everyone's Health; USAID, United States Agency for International Development.

APPENDIX D

Community digital health tools*

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	2.1 Client identification and registration 2.2 Client health records 2.3 Healthcare provider decision support 2.9 Prescription and medication management 2.10 Laboratory and diagnostics imaging management 3.3 Public health event notification 4.1 Data collection, management, and use 4.4 Data exchange and interoperability	Public Health Institute of Malawi (MOH), Luke International (UNICEF, Bill & Melinda Gates Foundation, Kuunika Project: Data for Action)	National In 28 districts Used by: 1,050 people	Malaria active or reactive case detection (visiting communities to find additional cases)
CHIPATALA CHA PA FONI	1.1 Targeted client communication 1.3 Client to client communication 1.4 Personal health tracking 1.5 Citizen based reporting 1.6 On demand information services to clients 2.1 Client identification and registration 2.2 Client health records 2.2 Client health records 2.3 Healthcare provider decision support 2.4 Telemedicine 2.5 Healthcare provider communication 2.8 Healthcare provider training 3.1 Human resource management 3.3 Public health event notification 3.4 Civil Registration and Vital Statistics (CRVS) 4.1 Data collection, management, and use 4.2 Data coding 4.3 Location mapping	MOH (USAID ONSE Health Activity, GIZ, Johnson & Johnson, Vitol Foundation, Skoll Foundation)	National In 28 districts Used by: 10 million people	Malaria screening with referral Communication/messaging to community on malaria Routine LLIN distribution during antenatal care or Expanded Programme on Immunization visits

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
cSTOCK	2.4 Telemedicine 3.2 Supply chain management 4.1 Data collection, management, and use	MOH/IMCI Unit, MOH/HTSS, Dimagi (Bill & Melinda Gates Foundation through John Snow, Inc.; Global Fund to Fight AIDS, Tuberculosis and Malaria)	National In 28 districts Used by: Between 3,700 and 4,500 Health Surveillance Assistants and their supervisors.	Malaria case management Malaria screening with referral Routine LLIN distribution during antenatal care or Expanded Programme on Immunization visits
MOBILE VILLAGE TOOLKIT	1.1 Targeted client communication 1.2 Untargeted client communication 1.4 Personal health tracking 1.5 Citizen based reporting 2.1 Client identification and registration 2.3 Healthcare provider decision support 2.5 Healthcare provider communication 2.6 Referral coordination 2.8 Healthcare provider training 2.10 Laboratory and diagnostics imaging management 3.1 Human resource management 3.2 Supply chain management 3.4 Civil Registration and Vital Statistics (CRVS) 3.7 Facility management 4.1 Data collection, management, and use 4.2 Data coding 4.3 Location mapping	MOH/Community Health Services Section (USAID ONSE)	Subnational In 8 districts: Salima, Chikwawa, Zomba, Mulanje, Nkhotakota, Nkhatabay, Mchinji, Karonga, Used by: Between 500 and 1,000 Health Surveillance Assistants	Malaria case management Malaria screening with referral Malaria active or reactive case detection (visiting communities to find additional cases) Communication/messaging to community on malaria Training of health workers Routine LLIN distribution during antenatal care or Expanded Programme on Immunization visits Intermittent preventative therapy in pregnancy
INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT	2.2 Client health records 3.1 Human resource management 3.7 Facility management 4.1 Data collection, management, and use	ONSE (USAID)	National In 28 districts Used by: 99 Health Surveillance Assistants' supervisors.	Malaria case management Routine LLIN distribution during antenatal care or Expanded Programme on Immunization visits Intermittent preventative therapy in pregnancy

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
MALARIA SURVEILLANCE ELECTRONIC MEDICAL RECORD SYSTEM	2.1 Client identification and registration 2.2 Client health records 2.3 Healthcare provider decision support 2.6 Referral coordination 2.9 Prescription and medication management 2.10 Laboratory and diagnostics imaging management 3.2 Supply chain management 4.1 Data collection, management, and use 4.4 Data exchange and interoperability	Baobab Health Trust (President's Malaria Initiative)	Subnational In 4 districts: Mchinji, Mulanje, Blantyre, Lilongwe Used by: 30 clinicians, medical assistants, nurses, pharmacy personnel, HMIS officer, and data clerks.	Malaria case management

Abbreviations: GIZ, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH; HMIS, health management information system; HTSS, Health Technical Services and Support; IMCI, integrated Management of Childhood Illnesses; MOH, Ministry of Health; ONSE, Organized Network of Services for Everyone's; USAID, United States Agency for International Development.

*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.

APPENDIX E

Next-generation digital health tool functionalities for malaria case management

CASE MANAGEMENT FUNCTIONALITIES	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
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 (Integrated Human Resources Information System, logistics management information system, etc.)	■	□	■	■	■
Referral coordination Tool allows community health worker to notify local health facility of referrals and track them	■	□	■	■	■
Scheduling & work planning Tool allows community health worker to plan and schedule key activities in the community	□	□	■	■	■

MANAGEMENT & SUPERVISION FUNCTIONALITIES	DHIS2/ONE HEALTH SURVEILLANCE PLATFORM	CHIPATALA CHA PA FONI	cSTOCK	MOBILE VILLAGE TOOLKIT	INTEGRATED SUPPORTIVE SUPERVISION TOOLKIT
Decision support Tool provides algorithms or checklists to guide community health worker 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 community health worker geolocation data for monitoring and planning distribution	■	□	■	■	■
Supervision Tool can be used by supervisors to assess community health worker skills and capacity	■	□	■	■	■

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