

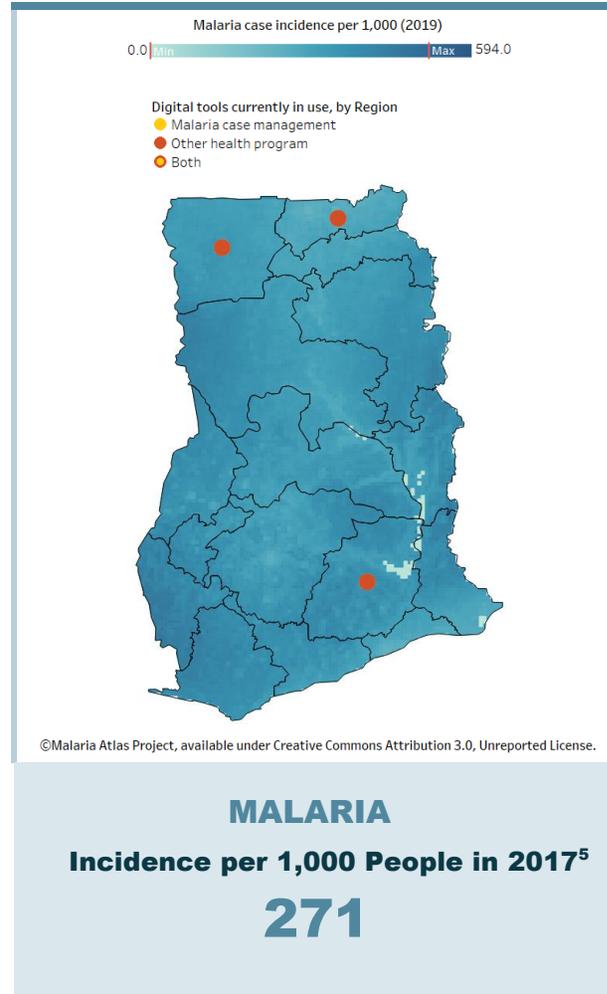
GHANA

Executive Summary

Malaria is endemic and perennial in Ghana. Although Ghana's entire population is at risk of malaria infection, children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity. There has been steady progress in malaria prevention and control over the years, and the country is poised to start targeted interventions based on malaria risk at the district and sub-district levels.<sup>1</sup>

Ghana's trained Community Health Workers (CHWs) implement its Community-based Health Planning & Services (CHPS) strategy, including malaria prevention and treatment, across the country. Ghana's 2020 National Health Policy contains digital health as part of its strategy to enhance data use and access to care. Digitally enabling infrastructure access is improving, with mobile network coverage available for almost 90%<sup>2</sup> of the population. In addition, a variety of digital tools, some related to malaria interventions, are being piloted at health facilities and/or by CHWs.

Ghana must overcome challenges related to policy and strengthening CHPS staff to achieve greater community-level use of digital health tools. This report includes concrete recommendations to improve the digital health landscape for community-level malaria services in Ghana.



**PEOPLE**  
Community Health Worker (CHW)



**15,456** CHWs<sup>3</sup>  
5 per 10,000 people

**GOVERNANCE**  
National Digital Health Strategy



**YES**

**SYSTEMS**  
Digital Health Index<sup>4</sup>



**SCORE: 3**



# Recommended Actions

## PEOPLE



Community health workers and other decision-makers

### Improve data validation processes for CHPS and sub-districts

Support key staff in the Policy, Planning, Monitoring, and Evaluation Directorate (PPMED) of the Ghana Health Service (GHS) to develop data validation indicators in District Health Information Management System 2 (DHIMS2), including key malaria indicators, to better track compliance with data validation procedures, such as reports checked and uploaded. Enhance staff training on validation processes and elaborate supervision and reporting timelines and structures for data validation under the supervision of the PPMED.

### Strengthen data analysis and supervision capacity and practices

Train District Health Management Teams (DHMTs) to provide better oversight on case management and feedback to CHPS health workers by increasing DHMT skills in supportive supervision, data analytics, and the provision of data-driven feedback using digital reporting features. Follow-up with supportive supervision by GHS staff.

## GOVERNANCE



Strategies and policies

### Strengthen oversight capacity of HMIS/ICT

Enhance the Health Management Information System (HMIS)/Information, Communications & Technology (ICT) Committee's oversight capacity by supporting senior PPMED managers to develop an implementation plan that ensures consistency with the country's HMIS strategy and is based on recommendations previously developed to strengthen the committee. Support outreach efforts with government officials and development partners to confirm that the committee's mandate is understood, respected, and followed by all stakeholders.

### Develop new training curriculum to include HMIS

Support the GHS and academic board to develop and implement a new HMIS curriculum for community health training institutions, including a strong focus on malaria data. After approval by the GHS, support the rollout of a national training of trainer's course for instructors from community health training institutions.

### Update mobile handheld device policy

Support PPMED efforts to update Ghana's mobile handheld device policy on

## SYSTEMS



Processes and digital tools

### Support deployment of digital tools

Support the GHS to identify funding sources for the purchase of required equipment, including tablets and computers, to enable data entry for malaria and other key community health indicators at the CHPS compound and health facility level. The PPMED has previously assessed its equipment needs and intends to use internally generated funds for maintenance and replacement, but support from partners is needed to purchase equipment for the national rollout of the digital register e-tracker system.

### Identify partners to improve the digitally enabling infrastructure

Assist the PPMED to identify partnership opportunities with telecommunication companies and partners such as USAID/Power Africa and corporate social responsibility initiatives in order to supply CHPS facilities with equipment to ensure reliable electricity and internet connectivity needed to support the use of digital tools.

### Improve interoperability between e-tracker and DHIMS2

Support the GHS to build an interoperability layer between the e-tracker (which does not include most malaria data) and DHIMS2 to ensure data collected via the e-tracker can be directly entered into DHIMS2 and eliminate current inefficiencies that reduce

maintenance and replacement of lost or damaged devices. To inform this effort, support the PPMED to carry out an assessment to determine whether the current policy should be revised, or a separate policy developed in order to strengthen enforcement mechanisms, ensure proper maintenance of devices, reduce costs, and define Ghana's budgetary commitment for mobile devices.

data quality and timeliness. Study the possibility of adding malaria data to e-tracker.

# Methodology

The Ghana Country Profile was developed through the following process: conducting a desk review (documents published from 2015 to present); deploying an online survey focused on the digital tool landscape; executing key informant interviews with experts in digital health, community health, and malaria; and facilitating a workshop to validate findings and prioritize recommended actions. To protect interviewees and participants during the COVID-19 pandemic, interviews were conducted virtually, and the workshop was conducted in a hybrid format (small group of socially distanced, in-person participants coupled with virtual access to the meeting). Consult Appendix C for a list of key informants interviewed and workshop participants. Consult Appendix D for detailed information on the online digital tool survey results.



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



Ghana's CHPS is a national strategy to deliver essential community-based health services. Community Health Officers (CHOs) and Community Health Nurses (CHNs), the primary community health worker cadres, provide the following malaria services: rapid diagnostic testing, artemisinin-based combination therapy, intermittent preventive treatment in pregnancy through antenatal care (ANC), insecticide-treated net (ITN) distribution, rectal artesunate suppositories, and referral for severe malaria and malaria in pregnancy.

In addition to 15,456 CHOs and CHNs, non-salaried Community Health Volunteers are trained to support CHOs within their CHPS zone. These volunteers support specific activities, such as seasonal malaria chemoprevention campaigns. Health programs supported by nongovernmental organizations recruit and support program-based volunteers and traditional birth attendants who operate in communities. Nongovernmental organization cadres are not officially connected to the CHPS but may refer clients to CHPS compounds or health centers. Ghana continues to refine the CHPS design to increase the number of community health providers and service delivery points to improve access to primary health care.

PMI, the Global Fund, and the Bill & Melinda Gates Foundation provide funding support for national malaria control. These partners are engaged in an ongoing effort to harmonize financial, supply chain, and programmatic data. The government of Ghana's primary contribution is in the form of paying health worker salaries and purchasing medicines at times of shortages and gaps. CHOs are paid approximately US\$300 per month.

## Community health worker digital readiness

CHOs must first be trained as CHNs, and receive a CHN, field technician, or midwifery certificate. After two years of training, CHOs are placed in a CHPS zone and trained by the Sub-district Health Management Team on health promotion, prevention, case detection, mobilization, and referrals. Malaria prevention and case management is a key part of this training. This extensive education background indicates that CHOs should be able to successfully use digital health tools; however, digital health is currently not part of pre-service training requirements for health professionals or CHWs.

Facility Health Information Officers (FHIOs) are responsible for the collection and verification of data from facility departments at the end of each month and for submission to the District Health Information Officer (DHIO). In 2016, training to improve data quality was conducted at the national, district, and facility levels for all Health Information Officers. This scale of training has not been repeated due to a lack of funds, but in-service training for Health Information Officers is carried out periodically. The GHS is implementing a DHIMS2 e-tracker, developed by the GHS with support from the University of Oslo, to serve as a digital register and eventually eliminate the need for manual registers. However, limited resources exist to train e-tracker users, and device management is difficult due to lack of adherence to the GHS hand-held device policy.

<b>15,456</b> <b>Community health workers in country</b>	<b>Compensation Policy:</b> <b>PAID</b> <b>Paid by government</b>
<b>15,456</b> <b>Providing malaria community case management</b>	<b>Compensation Policy:</b> <b>PAID</b> <b>Paid by government</b>

## Data-driven decisions at each level of health system

DHIMS2 is the data platform for all health facilities in the country. Controlled access is provided for authorized staff with user accounts. Users can be administrators, data managers, or other health workers tasked with data entry and analysis. Access varies for different levels of the health care delivery system. Ghana’s Surveillance, Monitoring and Evaluation strategy for malaria prioritizes DHIMS2 data validation, analysis, and use at all levels of the health system through quarterly data review meetings at the district level and capacity building of Health Information Officers in districts, sub-districts, health centers, and CHPS compounds.

<p><b>NATIONAL LEVEL</b></p>	<p>At the national level, Ghana conducts regular data review meetings and produces quarterly bulletins, presented on dashboards, by the PPMED. The Ghana NMCP adapts its malaria interventions using various data sources, including DHIMS2, periodic household surveys, and supportive supervision visits. For example, the data show that more than 90% of the malaria in the country is <i>Plasmodium falciparum</i>, so the GHS is procuring rapid diagnostic test kits that are specific to identifying <i>Pf</i>. However, if any of the malaria sentinel sites collect data that show other types of malaria, the GHS will order rapid diagnostic test kits to detect multiple parasites. Use of the National Malaria Control M&amp;E Strategic Plan reinforces health information systems and processes to provide timely, accurate, and reliable data for programmatic planning, management, and decision-making.</p>
<p><b>REGIONAL LEVEL</b></p>	<p>The Regional Health Management Teams (RHMTs) supervise the districts and coordinate an annual regional review meeting, which brings together all the districts in the region to review malaria and key health indicators. Regional data validation teams look at data trends at monthly meetings. RHMTs analyze district-level data and make recommendations for improving management and service provision.</p>
<p><b>DISTRICT LEVEL</b></p>	<p>The District Health Management Teams (DHMTs) review data at least monthly and flag issues at the data validation meeting before the data are entered into the DHIMS2 platform. The DHMTs analyze district-level data to inform program decisions and conduct an annual review of CHPS implementation progress in the district. They then make recommendations for improving CHPS activities and addressing any related challenges at the sub-district and CHPS levels.</p>
<p><b>HEALTH FACILITY LEVEL</b></p>	<p>The sub-districts supervise the activities of CHOs and CHNs at the CHPS level. Activities are supervised at least once a month, but when there is a major challenge the sub-district team moves in quickly to address such challenges. Most CHOs and CHNs take their aggregated health data to the sub-districts for entry into the DHIMS2 platform. The sub-district team validates the data entered. At times the data is validated at the district level depending on the availability of computers for data entry.</p>
<p><b>COMMUNITY LEVEL</b></p>	<p>FHIOs are responsible for the collection and verification of data from facility departments at the end of every month and for submission to the DHIO. CHPS zones without tablets rarely see their data integrated in DHIMS2. Supervisors hold data review meetings with CHWs to help them understand how to analyze the data they collect, and monitoring charts are printed so that CHWs can visualize their indicators. Some CHWs use creative methods, such as plotting their data on cardboard for easy reference, which assists them in tracking selected indicators.</p>

# Governance



	DIGITAL	COMMUNITY HEALTH	MALARIA
<b>Name</b>	Ghana National eHealth Strategy	The National Community-based Health Planning & Services (CHPS) Policy	The National Malaria Control Strategic Plan
<b>Current strategy dates</b>	2010	2016	2021–2025
<b>Coordinating body</b>	An HMIS/ICT Committee has been formally constituted but is not fully functional or meeting regularly.	Policy, Planning, Monitoring, and Evaluation Directorate	National Malaria Control Program
<b>Funding strategy</b>	Planned	Yes	Yes

Ghana’s 2010 National eHealth Strategy provides a framework for the design and rollout of digital initiatives in the health sector. Key strategies include streamlining the regulatory framework for health data and information management, building sector capacity for eHealth, increasing access and bridging equity gaps through the use of ICT, and building a paperless record and reporting system. The HMIS/ICT Committee is responsible for ensuring partner coordination and alignment with Ghana’s HMIS strategy but in practice is not able to carry out its mandate or enforce approval procedures for ICT initiatives due to a lack of resources and low prioritization by GHS leadership. Although a review was carried out to strengthen the committee, recommendations were not implemented.

The 2016 CHPS policy aims to reach every community with an essential package of services, which includes testing and treatment for malaria, to address health inequities. As a result, the NMCP and community health strategies are aligned and utilize CHOs and CHNs for community health service delivery. Staff at the community-level CHPS compounds are supervised by a Physician Assistant or midwife based at the sub-district level. As supervisor, the Physician Assistant or midwife both manage full-time health care responsibilities at the health center and oversee the CHPS compound. This can lead to infrequent supervision at the CHPS compound level. At the district level there is a director whose primary role is manager for the entire district. The 2020 National Health Strategy includes digital health and serves to link community health and malaria to eHealth initiatives. Currently, there are a variety of piloted digital tools used by CHWs in Ghana that may eventually be expanded to the national level. Government oversight and coordination within and outside the GHS are needed to move forward in implementation of an enabling environment for digital health at the community level.

## **GOVERNANCE**

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

Ghana's 2020 National Health Policy includes digital health as part of its strategy to enhance access to care and timely use of reliable, accurate data. Included in the policy are plans to institutionalize the use and expansion of electronic records and digital health platforms (including tele-consultation, tele-radiology, mHealth, big data analytics, and artificial intelligence). The NMCP's goal is to improve strategic investments in malaria control and increase coverage toward universal access to malaria treatment and prevention through overall health sector development. Ghana's 2017 Health Service standard operating procedures on health information provide guidance for Routine Health Information System data collection, reporting, and analysis.

## **DATA MANAGEMENT**

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

The National Information Technology Agency, the technical arm of the Ministry of Communication, is responsible for legislation on electronic data interchange, data security, privacy, computer misuse, and electronic fraud. The agency has developed an electronic Government Interoperability Framework, but no regulatory framework currently exists for electronic data interchange in the health sector. Within the health sector, a medical records policy has been developed to guide the content of medical records across the board. However, this policy has not been extensively disseminated.

## **STANDARDS AND INTEROPERABILITY**

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

A national digital health architecture and health information exchange, including semantic, syntactic, and organizational layers, has been proposed but not approved. Some digital health and health information standards for data exchange, transmission, messaging, security, privacy, and hardware have been adopted and/or are currently in use.

## **INFRASTRUCTURE**

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

Certain digital health and health information standards for data exchange, transmission, messaging, security, privacy, and hardware have been adopted. In addition, a law on data security (storage, transmission, use), relevant to digital health has been implemented but not consistently enforced. Although a mobile handheld device policy exists to regulate maintenance and replacement of mobile devices, and the GHS has indicated its intention to use internally generated funds for maintenance and replacement, no government funding or budget line is currently available. Data storage is located on local and cloud-based servers.

## **WORKFORCE**

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

No digital health curriculum is included in pre-service or in-service (continuing education) training for health professionals, health care providers, or CHWs from community health training institutions. Digital health roles and responsibilities are mapped for the government's health workforce, but less than 50% of the needed public-sector digital health workforce is currently in place.<sup>6</sup>



## Data flow

Ghana uses DHIMS2 as its main surveillance system and source of data for tracking and measuring programmatic progress. The DHIMS2 web-based platform is managed by the PPMED through the Center for Health Information Management. This system is used for reporting and analyzing district-level data from health facilities, is available in all districts, and includes a customized dashboard to report malaria-focused indicators. Entering patient information into this system is a multistep process. Comprehensive standard operating procedures are available to explain data elements and guide data entry.

Most CHOs and CHNs collect data using paper-based forms and maintain a community register. Data are then collated and aggregated from these registers into standardized reporting forms on a monthly basis. If there are errors in the data, the supervisors prompt the supervisees to correct such errors. Collated monthly data are entered directly into DHIMS2 at facilities with computers and internet access; otherwise, reporting forms are sent to the sub-districts or district health directorates for entry into DHIMS2. After data entry, data can be corrected on the DHIMS2 platform for 90 days, at which point data are locked for major decision-making. With regard to case management, errors detected are communicated to health workers so that they will not be repeated.

CHWs in three regions (Upper East, Upper West, and Eastern) collect data via tablets using a DHIMS2 e-tracker tool. However, the only malaria data currently captured through the e-tracker is for intermittent preventive treatment in pregnancy. There are plans to expand the e-tracker to other parts of the country, and the PPMED and NMCP are also working to include more malaria indicators. However, certain issues must be resolved before rollout, such as ensuring a sufficient number of digital devices for CHPS compounds and planning for maintenance and replacement.

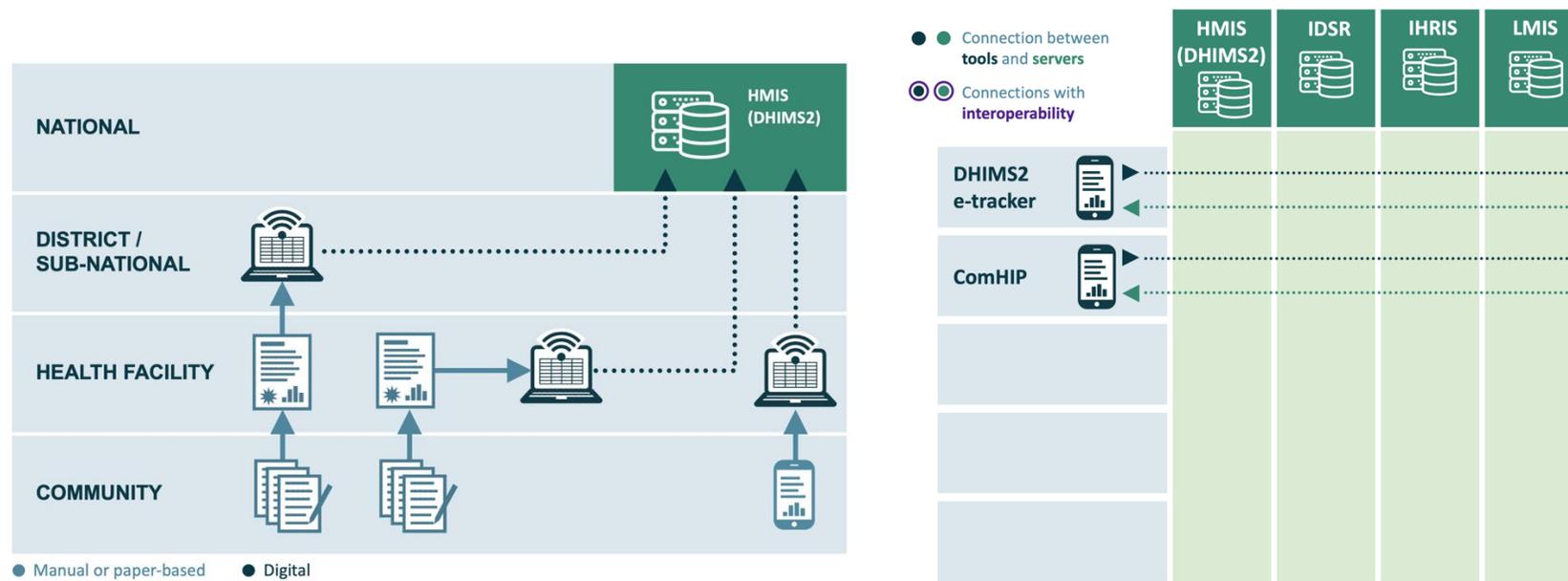
FHIOs, located at some district hospitals and some health centers, are responsible for the collection and verification of data from health facilities and submission to the DHIO. Data quality is checked monthly by a district validation committee, which provides recommendations to improve data quality. Ideally, the head of the facility reviews and endorses the collated facility data after they have been cleared by the data validation committee and before they are submitted to the district, but in practice data validation is not carried out consistently. Regional Health Directorates do not have data entry access. However, all Regional Health Directorate staff and National Officers have access to view facility reports. Capacity exists at the district, regional, and national level to solve technical challenges related to DHIMS2, depending on the magnitude.

The reporting structures for the Routine Health Information System (RHIS), which includes malaria data, come from 6,815 public, private, quasi-government, and faith-based health facilities throughout the country. The main RHIS for malaria data is the DHIMS2 operated by the GHS on the DHIS2 platform. The NMCP accesses DHIMS2 data through its own account and determines indicators to include in monthly Anti-Malaria Reports from malaria-related summary sheets.

As of 2016, two of the four national teaching hospitals report into DHIMS2, while the other two have a parallel electronic health records system. This presents a challenge for the GHS to access their data. Some facilities within the Christian Health Association of Ghana, which is responsible for up to 40% of the health care provided in Ghana, currently use the Health Administrative System electronic database, where each health unit can enter data directly

as they see clients. Although close to 60% of data collected at Christian Health Association of Ghana facilities are entered into DHIMS2, the data are not entered in a timely manner.<sup>7</sup>

Surveillance data, including data from CHWs, are entered into DHIMS2 at the CHPS level. These aggregated data are used at the district, regional, and national levels for malaria surveillance. Data on health commodities are also available in DHIMS2, and the GHS is currently rolling out the Ghana Integrated Logistics Management Information System nationwide. Digital tools currently in use at the community and facility level do not connect directly to national data systems.

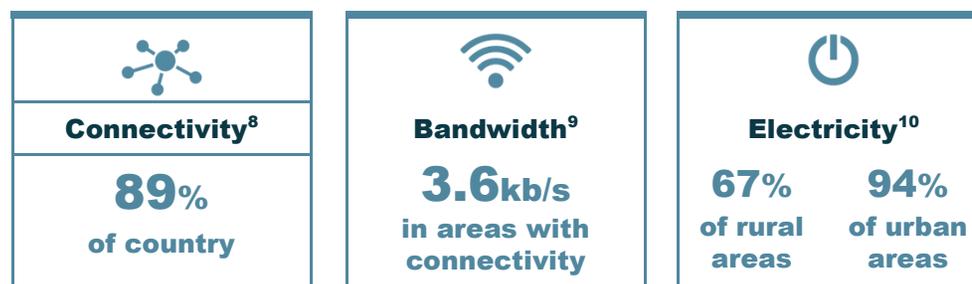


These digital tools do not connect directly to any government data systems.

*Abbreviations:* ComHIP, Community-based Hypertension Improvement Project; DHIMS2, District Health Information Management System 2; IDSR, Integrated Disease Surveillance and Response; HMIS, Health Management Information System; iHRIS, integrated Human Resource Information System; LMIS, logistics management information system.

## Digitally enabling infrastructure

The percentage of mobile phone subscribers in Ghana is very high, with mobile connections equivalent to 133%<sup>11</sup> of the total population as of January 2021. This indicates that many people have more than one mobile phone. Mobile internet use accounts for almost all internet use. Eighty-nine percent (89%) of the population lives in an area with access to 3G mobile coverage,<sup>12</sup> but signal strength and coverage by network carriers vary across regions. The MTN network works better in most regions and has the widest coverage. Cell service is good in most regional and district capitals, but signal strength drops in rural communities.<sup>13</sup>



Power supply in most regions of Ghana is generally reliable. Eighty-two percent (82%) of the population has access to electricity.<sup>14</sup> For the 43% of the population living in rural areas,<sup>15</sup> 67% have access to electricity. However, most health facilities do not have backup electric power. Infrastructure improvements needed to sustain digital health at the community level include backup power systems, internet bandwidth improvement, satellite deployment for rural communities, and provision of durable devices and protection cabinets for digital appliances.

## Digital health tools in use and functionality

Most digital tools in Ghana are in the pilot phase. The DHIMS2 e-tracker is used by CHWs in pilot districts to collect and report data; however, malaria case management data are not currently collected via the tool. Malaria data are collected using digital tools for the following interventions: seasonal malaria chemoprevention using the SiCapp electronic mobile application; school distribution of ITNs using the Net4schs mobile application; and mass distribution of ITNs using the NetApp Mobile application. Other pilot tools at the community level cover a wide range of health focus areas (e.g., hypertension, family planning, and remote supportive supervision across health sub-sectors). For example, FHI 360 tested the ComHIP tool with CHOs in Lower Manya Krobo District for community-based management of hypertension, including blood pressure screening in the community and ongoing management of hypertensive clients by community health nurses.

USE CASE(S)	ComHIP	DHIMS2 e-tracker
Providing malaria community case management	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tracking malaria proactive and reactive case detection	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tracking malaria screening with referral	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Transmitting messages to community on malaria	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Training health workers	<input type="checkbox"/>	<input checked="" type="checkbox"/>

USE CASE(S)	ComHIP	DHIMS2 e-tracker
Tracking routine LLIN distribution during ANC or EPI visits	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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

CASE MANAGEMENT FUNCTIONALITIES	ComHIP	DHIMS2 e-tracker
<b>Aggregate case reporting and analytics</b> Tool collects aggregate case data and has data analytic functions in tool or online	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Individual case entry and analytics (<i>important in low-burden or elimination settings</i>)</b> Tool collects individual case data and has data analytic functions in tool or online	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Case geolocation (<i>important in low-burden or elimination settings</i>)</b> Tool allows collection or use of geospatial data for individual cases	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Interoperability with HMIS</b> Tool sends information to the official national health information system	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Offline capability</b> Tool functions, at least partially, offline	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

MANAGEMENT & SUPERVISION FUNCTIONALITIES	ComHIP	DHIMS2 e-tracker
<b>CHW identification</b> Tool uniquely identifies CHWs	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>CHW catchment location</b> Tool identifies CHW associated position in org unit hierarchy/link to health facility/system	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>CHW performance analytics</b> Tool has analytic functions (data validation, graphs, charts) that support data quality, quality of care, or other performance issues	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**MANAGEMENT & SUPERVISION FUNCTIONALITIES**

ComHIP

DHIMS2 e-tracker

**Communication**

Tool allows two-way communication between peer groups, associated health facilities, or supervisors



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

*Abbreviations:* ANC, antenatal care; CHW, community health worker; ComHIP, Community-based Hypertension Improvement Project; DHIMS2, District Health Information Management System 2; EPI, Expanded Program on Immunization; HMIS, Health Management Information System; LLIN, long-lasting insecticidal net

# Appendices

APPENDIX A ► **References**

APPENDIX B ► **Abbreviations**

APPENDIX C ► **Contributors**

APPENDIX D ► **Community digital health tools**

APPENDIX E ► **Next-generation tool functionalities for malaria case management**



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## APPENDIX A

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## APPENDIX B

### Abbreviations

ANC	antenatal care
CHN	Community Health Nurse
CHO	Community Health Officer
CHPS	Community-Based Health Planning & Services
CHW	Community Health Worker
ComHIP	Community-based Hypertension Improvement Project
DHIMS2	District Health Information Management System 2
DHIO	District Health Information Officer
DHMT	District Health Management Team
EPI	Expanded Program on Immunization
FHIO	Facility Health Information Officer
GHS	Ghana Health Service
HMIS	Health Management Information System
HNQIS	Health Network Quality Improvement System
ICT	Information, Communications & Technology
iHRIS	Integrated Human Resources Information System
ITN	insecticide-treated nets
LLIN	long-lasting insecticide-treated net
LMIS	logistics management information system
NMCP	National Malaria Control Program
PMI	President's Malaria Initiative
PPMED	Policy, Planning, Monitoring, and Evaluation Directorate
RHIS	Routine Health Information System
RHMT	Regional Health Management Team
USAID	United States Agency for International Development

## APPENDIX C

### Contributors

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USAID – Evaluate for Health Project  
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President's Malaria Initiative - Impact Malaria project  
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PATH – Ghana  
Ghana Health Service / Family Health Division  
Ghana Health Service / Policy, Planning, Monitoring, and Evaluation Division  
PATH – Ghana  
Ghana Health Service / Policy Planning, Monitoring and Evaluation Division  
Ghana Health Service / National Malaria Control Program  
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Population Services International - Ghana

## APPENDIX D

### Community digital health tools\*

Name of Tool	Type of Digital Health Intervention†	Implementer (Funder)	Scale	Malaria Use Case
<b>DHIMS2 e-tracker</b>	Not available	Ghana Health Service (Government of Ghana, USAID, Samsung)	Subnational Used in three regions (Upper East, Upper West, and Eastern) by approximately 3,722 CHWs	Data collection
<b>ComHIP</b>	1.1 Targeted client communication	FHI 360 (FHI 360)	Subnational Pilot project tested in Lower Manya Krobo District	None
<b>HNQIS</b>	4.1 Data collection, management, and use	IMPACT Malaria, Ghana Health Service (USAID)	Subnational 80 users	Routine LLIN distribution during ANC or EPI visits Intermittent preventative treatment in pregnancy
<b>Net4Schs</b>	Not available	NMCP-GHS (Government of Ghana with support from partners)	All regions except indoor residual spraying regions	School distribution of ITNs.
<b>SiCapp</b>	Not available	NMCP-GHS (Government of Ghana with support from partners)	Sahelian parts of the country	Seasonal malaria chemoprevention

\*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	ComHIP	DHIMS2 e-tracker
<b>Notifications</b> Tool sends and receives notifications	<input type="checkbox"/>	<input type="checkbox"/>
<b>Stock reporting and analytics</b> Tool collects stock data and has analytic functions to support stock and logistics data analysis and decision-making	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Interoperability with other national health systems</b> Tool sends information to other national systems (iHRIS, LMIS, etc.)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Referral coordination</b> Tool allows CHW to notify local health facility of referrals and track them	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Scheduling &amp; work planning</b> Tool allows CHW to plan and schedule key activities in the community	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MANAGEMENT & SUPERVISION FUNCTIONALITIES	ComHIP	DHIMS2 e-tracker
<b>Decision support</b> Tool provides algorithms or checklists to guide CHW service provision	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Training materials &amp; resources</b> Tool provides access to training materials, policies, or other useful reference documents	<input type="checkbox"/>	<input type="checkbox"/>
<b>CHW geolocation</b> Tool allows collection or use of CHW geolocation data for monitoring and planning distribution	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Supervision</b> Tool can be used by supervisors to assess CHW skills and capacity	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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

*Abbreviations:* CHW, community health worker; ComHIP, Community-based Hypertension Improvement Project; DHIMS2, District Health Information Management System 2; iHRIS, integrated Human Resource Information System; LMIS, logistics management information system