

Optimizing iCCM delivery through data-driven CHW deployment and decision-making in Zambia

MACEPA Zambia | January 2024–December 2025



Background and Rationale

Integrated Community Case Management (iCCM) is a ministry of health (MOH) strategy that brings essential treatment for childhood illnesses—malaria, pneumonia, diarrhea and malnutrition—directly to communities through community health workers (CHWs) and community health volunteers. As Zambia continues to scale up community-based services, ensuring equitable and efficient deployment of CHWs is critical for improving access to care and reducing child morbidity and mortality.

Between 2024 and 2025, PATH Malaria Control and Elimination Partnership in Africa (MACEPA) worked with the Zambia MOH to strengthen iCCM planning through a data-driven approach focused on optimizing CHW deployment. The initiative responded to key gaps including uneven CHW distribution, limited use of geospatial and programmatic data for planning, and increasing demands for evidence-based resource allocation during iCCM scale-up.

This technical brief summarizes the analytical work completed, the tools developed, and opportunities for continued integration of broader community health data, including the new Community Health Information Platform and other programmatic areas (TB/HIV; maternal, newborn, and child health; immunization; nutrition; and non-communicable diseases).

Objective

The overall aim of this work was to apply data-driven analytical methods and a collaborative stakeholder engagement process to optimize CHW allocation, support equitable iCCM expansion, and strengthen decision-making at national, provincial, and district levels.

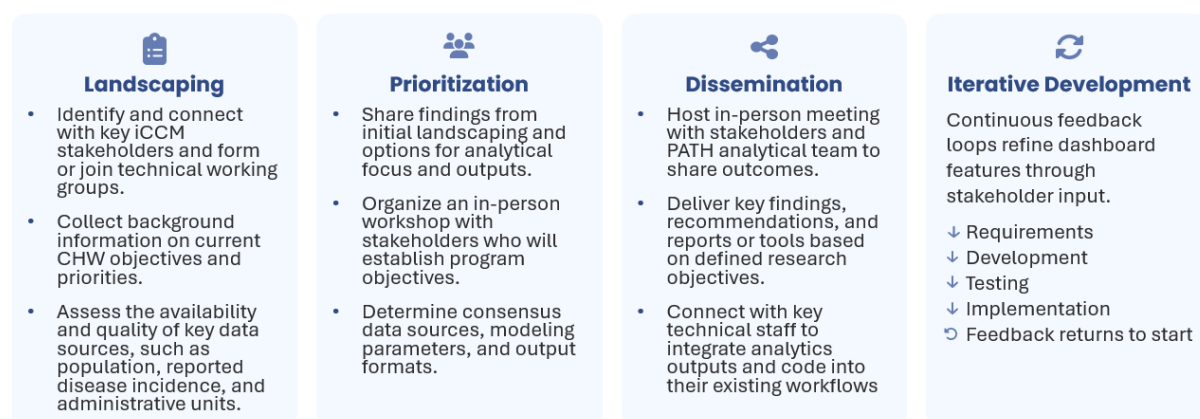
To achieve this aim, MACEPA:

- Facilitated workshops and alignment meetings to define priority questions that were needed to guide the modeling work.
- Analyzed geographic accessibility, estimated walking travel times to access health care, CHW workload, disease burden and coverage saturation to inform deployment scenarios.
- Developed reproducible R-based scripts and an interactive dashboard for use by the MOH for program planning.
- Built capacity among MOH and provincial staff through targeted trainings to interpret the dashboard and apply the tools in planning processes.
- Produced final geospatial datasets, reports, and visualizations to guide iCCM deployment decision-making.

Approach

MACEPA conducted the iCCM optimization work through a structured approach consisting of four stages: landscaping, prioritization, iterative development, and dissemination. From inception to dissemination, stakeholder engagement and participation were critical to aligning priorities, validating assumptions, and ensuring the utility and adoption of the tools developed. These engagements ensured that the analytic outputs continued to reflect in-country stakeholder priorities and supported MOH ownership of the process.

Figure 1. MACEPA's approach to optimized iCCM delivery through data-driven CHW deployment.



In partnership with the MOH, MACEPA led the following engagement efforts:

Prioritization Meeting, June 2024

The prioritization meeting aimed to establish data use cases to support the MOH in strategic iCCM expansion. Through discussions with national stakeholders, four analytical priority areas were identified to guide subsequent modeling and analysis:

Geographic Accessibility Mapping

Identify populations with limited access to community- or facility-based care. Key research questions include:

- How much of the population lacks timely access to primary health care services?
- Where are underserved populations located relative to existing providers?

CHW Landscape Summary

Improve visibility into iCCM expansion and gaps including CHW deployment, service delivery, and reporting. Key questions include:

- Where are CHWs trained and registered and yet not reporting data into DHIS2?

CHW Expansion Targeting

Prioritize geographies where CHW expansion would have the greatest impact. Key questions include:

- Which district has existing poor coverage areas and high burden of malaria and diarrheal diseases?
- In which district could CHW expansion in Zambia have the largest impact?

CHW Workload and Disease Burden

Assess whether the current and projected CHW workforce is adequate to meet population needs under varying disease scenarios. Key research questions include:

- How many CHWs would be needed to passively treat all malaria cases during peak transmission months? Or in a setting that had both high malaria cases and an outbreak of diarrheal disease?
- Is the current CHWs distribution adequate to meet the needs of the population?

Data Review Meeting, September 2024

As a follow-on from the prioritization meeting, MACEPA met with national stakeholders to validate datasets and modeling assumptions. These discussions ensured alignment on inputs, clarified key definitions, and strengthened relevance of the analyses to programmatic decision-making. Across defined priority areas, several cross-cutting themes emerged:

- **Alignment on CHW data:** Stakeholders emphasized the importance of establishing a validated CHW master list, clarified reporting expectations, and aligning on service delivery definitions across diseases and partners.
- **Refinement of workload and disease assumptions:** Inputs related to disease incidence, treatment-seeking behavior, seasonality, and time required per activity were reviewed and adjusted to better reflect program realities.
- **Clarification of analytical scope and priorities:** Discussions helped confirm which variables were most critical to decision-making and ensured analyses were tailored to practical program use.
- **Geographic access challenges:** Stakeholders highlighted how access barriers vary by province and emphasized the value of integrating local context into accessibility analyses to better prioritize interventions.

Dissemination Workshop, April 2025

Figure 2. Photo from dissemination workshop in April 2025 in Lusaka, Zambia.



Following the data review meeting and the iterative tool development using stakeholder inputs, MACEPA presented preliminary findings and gathered feedback. The workshop included training provincial health information officers on dashboards use and local dashboard updates (Figure 2). During the dissemination workshop, stakeholders participated in small group sessions to answer the following questions using the dashboard:

- Using the province-level summary tab, summarize the current situation in a selected province.
- Using the iCCM gaps tab, select two districts that have coverage gaps and respond to questions related to CHW needs to fill gaps, hours needed per week to work, and how many additional CHWs would be needed based on hours worked?
- Develop a prioritization in three steps to expand iCCM in Zambia using the dashboard and 1) targeting remote or underserved populations; 2) add targeting of areas with high malaria burden and; 3) target based on areas that currently have poor coverage of CHWs.

Data Analytics & Visualization Workshop, November 2025

After the dissemination meeting, there was a strong interest for key stakeholders to enhance capabilities in data visualization and data analytics for community case management. During this workshop, MACEPA built capacity in dashboard use, RStudio workflows, and interpretation of geospatial outputs with district-level health information officers from all ten provinces.

Key tools and outputs produced

Using analytics to guide decision making

To ensure the most relevant and accurate data informed recommendations for CHW placement and optimization, MACEPA used data gathered from DHIS2, geospatial datasets, population estimates, and CHW deployment data, to conduct analyses in line with stakeholder priorities. Outputs from these analyses were packaged together within a singular platform to facilitate their use in decision-making.

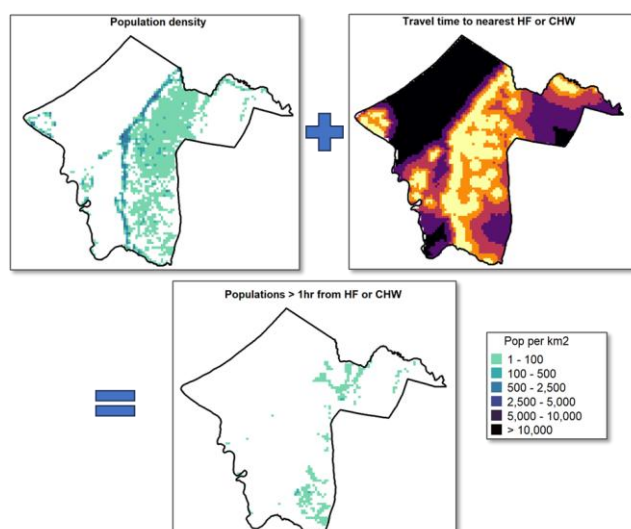
Table 1. Summary of key outputs produced by focus area

Focus Area	Completed Outputs	Data Sources
Accessibility Mapping	• National maps identifying populations greater than a one-hour walk from any CHW or health facility (Figure 3). • District summaries showing remaining underserved pockets post-expansion.	• Health facility and CHW geolocations. • Administrative boundaries (districts, wards, facility catchments).
CHW Landscape Summary	• Dashboard and reports summarizing CHWs as registered vs active, proportion of cases treated by CHWs, travel-time burden, and partner presence.	• CHW deployment data (MOH). • Population data (WorldPop and census projections). • Disease incidence data (DHIS2, Malaria Atlas Project). • Health facility and CHW geolocations.
CHW Expansion Targeting	• Prioritized districts where additional CHWs would have the highest impact by combining access gaps, malaria incidence, diarrheal disease burden, and mobility patterns. • Completed interactive expansion targeting dashboard.	• CHW deployment data (MOH). • Disease incidence data (DHIS2, Malaria Atlas Project).

Focus Area	Completed Outputs	Data Sources
CHW Workload & Disease Burden Analysis	- Quantified expected workload per CHW based on malaria peaks and diarrheal disease incidence. - Generated scenarios estimating additional CHWs needed for high-burden catchments.	- CHW deployment data (MOH). - Disease incidence data (DHIS2, Malaria Atlas Project).
Trend and Saturation Analysis	- Saturation maps showing the percentage of the population covered over time. - A summary of progress toward district iCCM saturation from 2024 to 2025.	Population data (WorldPop and census projections).
Data Sources Used	- Administrative boundaries (districts, wards, facility catchments). - CHW deployment data (MOH). - Population data (WorldPop and census projections). - Disease incidence data (DHIS2, Malaria Atlas Project). - Health facility and CHW geolocations.	

Table 1 Abbreviations: CHW, community health worker; RDTs, rapid diagnostic tests; iCCM, integrated community case management; MOH, Ministry of Health; DHIS2, District Health Information Software 2.

Figure 3. Example of a map produced to identify populations with poor access to care. Geolocations of currently operational health facilities and CHWs in Zambia are captured, alongside a map of all population settlements and estimates of travel times, are used to generate maps where there are underserved populations.



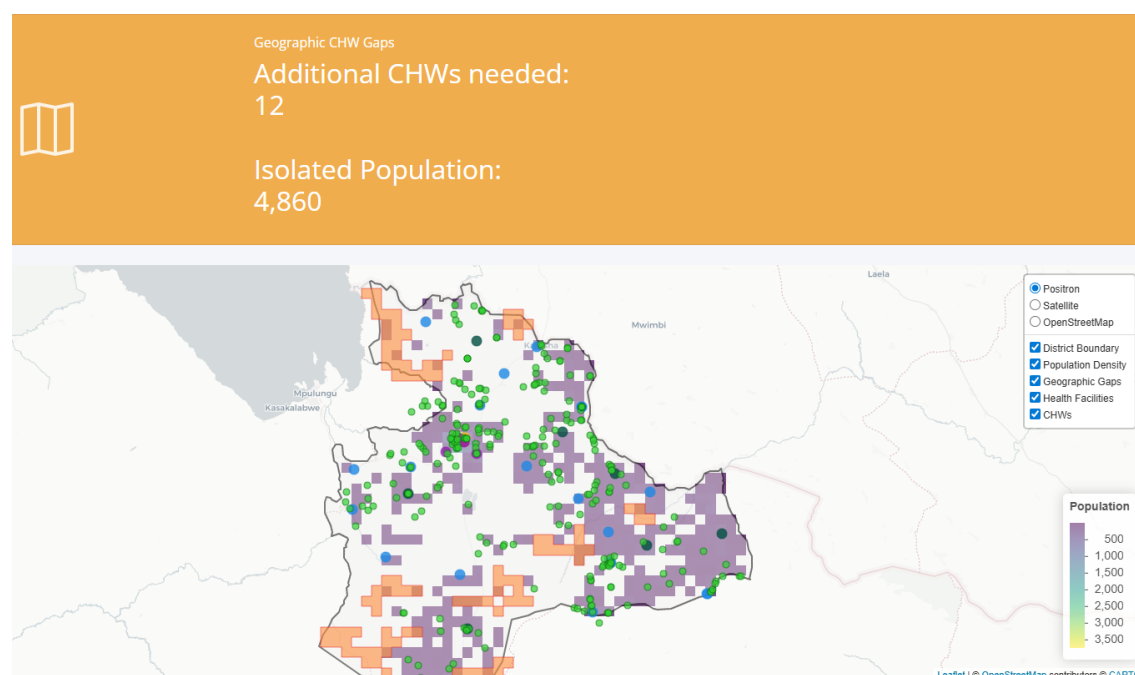
Decision support tools developed for the MOH

Interactive R-Based Dashboard

The final product for the MOH was an interactive RStudio dashboard that visualizes CHW deployment and coverage, accessibility gaps, workload scenarios, disease burden patterns, district saturation progress, CHW performance and reporting indicators (Figure 3).

The dashboard uses only data accessible at time of implementation, primarily **routine DHIS2 datasets**, and is fully reproducible using the accompanying R scripts.

Figure 4. Example from the interactive active dashboard showing estimated CHW expansion needs for Mbala district in Northern Province. The orange clusters identify where there is isolated population (total of 4,860) that is more than 60 minutes walking travel from either a health facility (large dots) or existing CHW (smaller green dots). Additional summary statistics, including workload estimation and burden scalars are in the dashboard.



Impact

The collaboration between PATH MACEPA and the MOH led to a successful improvement in data use to create evidence-based scenarios to optimize the placement of CHWs in Zambia. Through this work, stakeholders have an enhanced understanding of:

1. Improved evidence for rational, equitable CHW deployment.
2. District-level CHW expansion scenarios validated and ready for Global Fund-supported scale-up.
3. Clear identification of underserved populations.
4. Enhanced capacity within MOH and provinces to interpret geospatial data and use dashboards.
5. Stronger multisectoral collaboration across MOH departments.
6. A sustainable, adaptable analytic platform for future community health planning

Looking ahead and future opportunities

MACEPA successfully supported the MOH to apply data-driven methods for optimizing iCCM implementation, strengthening CHW deployment, and advancing equitable access to quality care. The R-based dashboard and associated analyses provide a strong foundation for continued evidence-informed decision-making.

As Zambia begins to expand its new cadre of polyvalent CHWs, offering a range of services to reflect the full scope of CHW activities, including TB/HIV; maternal, newborn, and child health; immunization; nutrition; and non-communicable diseases and WASH, and to manage their performance using the Community Health Information Platform, updating these dashboards to monitor progress in the expansion can be an important role in coordinating partners efforts and further supporting long-term system strengthening.