

Surveillance systems for elimination: lessons from rapid reporting across four countries

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Background

Robust, high quality, and easy-to-use surveillance systems are necessary to move malaria-endemic countries from malaria control to malaria elimination.

Shifting to elimination requires significant resources, training, and a cultural shift among health system managers to utilize malaria surveillance as an intervention rather than as only a monitoring tool.

Over the course of several years, the PATH Malaria Control and Elimination Partnership in Africa (MACEPA) team worked with four national malaria control programs in Ethiopia, Kenya, Senegal, and Zambia to put in place different forms of electronic, paper-based, and blended routine malaria surveillance systems in different settings.

Coverage

- ⇒ Ethiopia: 213 health facility catchment areas in eight woredas (districts)
- ⇒ Kenya: 15 health facility catchment areas in one sub-county
- ⇒ Senegal: 215 health facility catchment areas in 3 regions
- ⇒ Zambia: 474 catchment areas in two provinces

Methods

PATH has worked with each country to enhance the functionality of the malaria surveillance system by working with recipient governments to develop customized solutions drawn from PATH's steps to malaria elimination.

The level of investment, coverage, and the length of time in each country varies, making a cross-country comparison challenging.

Rapid reporting is a key component of each country program in which mobile phones or use of the internet are used to increase the speed of reporting transmission and the frequency of reports.

Particular modes of report transmission within the rapid reporting umbrella vary across countries and offer insight into the variation of methods available and most well-suited for a malaria information system (see table).

Feedback on the surveillance systems was compiled from MACEPA project officers, in-country data review meetings, routine facility data quality audits, and informal discussions with ministries of health, stakeholders, and other partners.

Country	Coverage	Report origin	Device	Pathway	Frequency	Data Storage	Data quality audits
Ethiopia	8 districts (213 facilities)	Facility-level surveillance assistant	Android phone	Surveillance assistant tallies data from facility registers and enters into DHIS2 using Android phone	Weekly	DHIS2	Yes
Kenya	15 health facility catchment areas	Community health volunteer (CHV)	Android phone	CHV submits paper form to Community Health Extension Worker (CHEW) who enters mobile data	Monthly	DHIS2	No
Senegal	10 districts (215 facilities)	Health facility	Computer at district level	Health facility nurse orally communicates data by phone to district health information officer, who enters into DHIS2 via computer at district office	Weekly	DHIS2	Yes
Zambia	32 districts (474 facilities)	Facility level	Java-based phone	Designated health worker tallies and enters data into DHIS2 using Java-based phone	Weekly	DHIS2	Yes
	22 districts (over 2000 CHWs associated with 265 facilities)	Community health worker (CHW)	Java-based phone	Community health worker (CHW) submits paper form to Data CHW (typically one per facility catchment), who enters data into DHIS2 using Java-based phone	Monthly	DHIS2	Yes

Discussion

Zambia uses a dual level system, gathering information monthly from the community and weekly from the facility level using a combination of paper-based forms for data aggregation before transmitting data using inexpensive java-based feature phones. Simple technology effectively leverages existing health structures and human resources to produce regular and reliable data sustainably. Data quality audits are conducted regularly by district officers trained by MACEPA to assess reporting accuracy, provide feedback, and develop responsive action plans with facility staff to improve overall data quality.

In **Ethiopia**, surveillance officers were employed by MACEPA and assigned to health facilities to aggregate and report surveillance data using smartphones. The surveillance officers were eventually tasked with and trained in additional functions, including reactive case detection. While this approach led to very high quality data according to data quality audits, the system is overly resource intensive to implement at scale at this time, especially in terms of the additional human resources required.

Senegal employs an innovative rapid reporting system, transmitting information by phone calls to district information officers who then enter the data into DHIS2 by computer over the internet. The method is inexpensive and leverages existing infrastructure. While there is an additional step in transmitting information compared to the other three countries, data quality audits indicate good reporting accuracy and high acceptability of and commitment to the system, possibly due to not introducing additional technology demands at lower levels of the health system. Data quality audits take a group approach led by district information officers, where facility head nurses gather with registers and audit each other's reported data. This highly participatory approach has generated very positive feedback.

Kenya is piloting a smaller program and operates a community-based system similar to Zambia. Data is submitted monthly by community health volunteers to a supervisor, who then transmits the data to DHIS2 by smartphone. This more limited approach is meant to reduce the malaria case load seen in health facilities, and introducing more detailed malaria case management data than the national HMIS was collecting. While community level reporting is essential to elimination, it is not sufficient and must be complemented by a more comprehensive facility-based malaria surveillance system.

Recommendations

The system deployed in **Ethiopia** has been shown to be overly resource intensive to implement at scale there. Malaria burden in Ethiopia is low and lays bare the primary complication in pursuing malaria elimination. Generating financial support and political interest for data collection is challenging once the salience of malaria cases has mostly disappeared. Further unpacking of the Ethiopia case should prove to be invaluable as PATH continues to develop surveillance systems as an intervention for elimination. In the attempt to backfill a lack of technical expertise, PATH may have set the bar too high and the resulting efforts became unsustainable.

Zambia's system continues to effectively pilot and implement new innovations in surveillance that generate more high quality data that are deployed to produce interventions for elimination. Effectively leveraging existing human capital with appropriate technology, the system there presents a case for best practice in developing a surveillance system. This was accomplished by gathering information from end-users in 2009–2010 during MACEPA-supported provincial and district data workshops. The resulting rapid reporting system co-generated with the Ministry of Health until the present has been effectively gathering quality data used to target interventions including MDA and reactive case detection. The quality of rapid reporting data continues to improve due to continued training and technical innovations such as data visualization dashboards and automated SMS reminders about missing data.

Innovation in **Senegal** reveals the range of methods possible to effectively generate surveillance data for elimination. While unconventional in a world moving toward purely digital data collection, it is a tremendous improvement from the paper-based systems with no data quality audits, as deployed elsewhere in the country. Cost-effective innovation in rapid reporting can therefore have a tremendous impact in countries with rudimentary surveillance systems.