THE NEED FOR PUBLIC-PRIVATE MALARIA SURVEILLANCE

Prior to 2016, the role of the private healthcare sector in supporting malaria elimination in Lao PDR was very limited, with an existing but inactive Public-Private Mix (PPM) program. In 2016, Population Services International (PSI) partnered with the national Center for Malariology, Parasitology and Entomology (CMPE) to revive the program. The Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) program, with the support of the Bill & Melinda Gates Foundation, was established to expand availability of high-quality malaria care through the private sector – particularly in higher prevalence areas that were out of reach of the public sector – and to make malaria surveillance data from the private sector available to support government decision-making.

An electronic reporting system was needed that could provide real-time data in a user-friendly, cost effective, and ultimately sustainable way. Building on previous experience, PSI implemented an evolving series of electronic surveillance solutions, with a later focus on sustainability and transition to government management. The following four key iterations of surveillance solutions were implemented throughout GEMS (2016 – 2019) and GEMS+ (2020 – 2022):

1. Malaria case surveillance app, supported by paper records
2. Social media chatbot
3. Government database
4. Government ownership

THE NEED FOR PUBLIC-PRIVATE MALARIA SURVEILLANCE


PSI adapted an Android-based malaria case surveillance (MCS) smartphone app that had been developed by PSI in Cambodia for use in Lao PDR.

Figure 1: Images from the malaria case surveillance app
The app, deployed in March 2017, was translated into the Lao language, and the visual interface was adapted to the Lao context (see Figure 1). Data points were aligned with the national forms required by CMPE, and data reported through app were integrated into the national HMIS (health management information system) and housed in DHIS2 (District Health Information Software version 2).

Providers who used the app were still required to submit paper forms to their local District Health Office so that health authorities could check and validate the electronically submitted data against the paper forms. While this required double reporting from providers who used the app, it ensured that CMPE could manage data quality, and PSI could both support providers to become familiar with the new electronic reporting system and improve the timeliness of reporting.

Although overall reporting rates reached 97% by December 2017 and 100% in 2018, of the 525 PPM providers in the network at the end of 2018, only 48% had reported via the app at least once.

The app had some significant limitations. First, as a stand-alone application, the MCS app required users to undergo extensive training, create accounts, remember their username and password, and routinely update the app in order to share data. The app was also not compatible with iOS devices, so some providers would send photos of their paper forms to PSI staff via WhatsApp for data entry into DHIS2. In the interests of cost effectiveness and sustainability, CMPE and PSI chose not to address this challenge by purchasing phones for providers. These limitations reduced widespread adoption of the MCS app. The remaining providers had reported by sending photos of the paper-based reporting form. With over half of the reports requiring data entry, this process was quite labor-intensive for the PSI team.

**ITERATION 2: MOVING TO SOCIAL MEDIA CHATBOTS (2019–2022)**

In 2019, PSI designed a social media chatbot solution for malaria data reporting to overcome the MCS app’s limitations. The chatbot was incorporated into Facebook Messenger – the most popular messaging app in Lao PDR. PSI engaged various stakeholders throughout the design process, developing the chatbot based on government and donor reporting requirements and feedback from private providers and PSI field staff to ensure user friendliness.

*Figure 1: Screenshot of the chatbot interface on Facebook Messenger*

This platform supported real-time data submission to the national system, was easier to use than the MCS app, and could be used on all smart phones. The chatbot enabled private providers to report malaria positive cases, aggregate monthly testing data, and track malaria commodities stock. Malaria data could be reported through the chatbot anywhere with an internet connection. Per the national strategy, providers were expected to report cases confirmed by RDT (rapid diagnostic test) through the chatbot within 24 hours and to submit aggregate data reports at the beginning of each month. The chatbot also sent case notifications to the appropriate government authorities, in addition to reporting directly to DHIS2.

By the end of 2020, 42% of the 429 PPM outlets in...
the network, or 179 outlets, had registered as chatbot users.

The chatbot was limited to users who had a smartphone and internet connection, which was a disadvantage for older providers and those in more remote areas. The system also required double reporting by providers on paper forms and electronically in order for PSI staff to verify data—although few mistakes were found, indicating a high level of data quality. Positive aspects of the chatbot were that limited training was needed, no additional installation, configuration, or updates were required, and data could be entered from any Facebook Messenger user account (which was helpful when providers shared a phone with family members).

**Figure 3: Malaria cases reported by chatbot users as a proportion of all RDT-positive cases reported by the PPM network, 2021-2022**

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmed positive malaria cases, PPM network</td>
<td>200</td>
<td>117</td>
</tr>
<tr>
<td>Proportion of positive cases reported by PPM chatbot users</td>
<td>24%</td>
<td>35%</td>
</tr>
</tbody>
</table>

As a part of the GEMS+ transition to government ownership (see iteration 4), PSI began refining the PPM network in 2020 by transitioning selected provider engagement activities to government oversight and discontinuing support in low-prevalence settings. Even as PSI’s PPM network shrunk, the number of chatbot users continued to grow throughout 2021. By the end of 2021, 217 of the remaining 330 providers—or around 66% of the network—had registered for the chatbot, of whom 19% were using the app to report malaria cases. In 2021, 200 positive malaria cases were detected by PSI’s network, of which 48 (24%) were reported by chatbot users. In 2022, the network was further refined to 101 PPMs, with 52 outlets (51%) registered for chatbot use.

The percentage of chatbot-registered providers who reported any cases through the system was 24% in 2021 and 35% in 2022 (Fig. 3). The low reporting rates were largely due to the low incidence of cases detected within the network; providers who did not detect any cases would often fail to report zero case detection using the chatbot. In addition, the timing of the chatbot introduction coincided with the transition of private provider network engagement to government oversight, and some PPMs chose not to use the chatbot for reporting as the government had yet to incorporate chatbot reporting into the national monitoring system.

**ITERATION 3: MOVING TO THE HMIS (2020-2022)**

After the introduction of the MCS app in 2019, malaria cases reported to PSI by the PPM network were uploaded in the government’s HMIS through a custom malaria data integration app that was built in DHIS2. However, these data were in the form of case reports aggregated at the district level, as the national HMIS did not support data from individual private health care providers—meaning that individual private providers or private provider outlets did not exist as “organization units” in DHIS2. In late 2020, alongside the launch of the Facebook chatbot, PSI began moving all the PPM clinics and pharmacies in its database to the government’s HMIS in partnership with CMPE and other entities within the Ministry of Health, including the Department of Planning and Cooperation (DPC), the Food and Drug Department, and the Curative Department. By November 2022, 429 PPM outlets—including outlets that had transitioned out of PSI’s network as well as those remaining in the network—were added to CMPE’s HMIS to enable the government to enter and view data by provider.

By adding private sector healthcare providers to the HMIS, the government gained direct access to detailed data about each PPM outlet for data analysis and decision-making. Having these organization units in the HMIS has been useful to
track malaria trends, but it has also laid a foundation for the Ministry of Health and other partners to analyze and monitor data related to other health areas and to conduct wider disease surveillance at the outlet level.

ITERATION 4: TRANSITIONING THE SYSTEM TO GOVERNMENT OWNERSHIP

The government’s HMIS includes dashboards that are used for analysis, supporting decisions related to planning, setting targets, ordering commodities, and conducting outbreak response. The government values the integration of private sector data into the system, as it offers a more comprehensive and granular perspective on malaria trends. CMPE is therefore eager to maintain access to this information and potentially leverage private sector data beyond malaria. In November 2022, PSI conducted a training workshop with CMPE and DPC staff on chatbot development and maintenance for long-term sustainability, relevant to both malaria reporting and other health areas. In December 2022, CMPE and PSI trained health workers at the provincial and district levels on DHIS2 data entry at the PPM level to prepare PPMs to report on their own in 2023. Currently, most providers report receiving RDTs and ACTs (artemisinin-based combination therapies) as required, with very few reporting delays in commodity supply. The Ministry of Health will need to mobilize resources to monitor and supervise PPMs by conducting regular supervision visits to review reports and provide tests, malaria treatment, and other treatment and reporting supplies.

LESSONS LEARNED

Throughout the process of implementing an innovative technology platform for data collection, PSI learned lessons that can inform future data collection and integration efforts.

1. Early involvement of stakeholders in the planning stage is key

Involving the Ministry of Health and the World Health Organization from the beginning was critical to designing a fit-for-purpose tool that was accepted by key stakeholders. The consultative design process not only fostered agreement among stakeholders, but also built commitment for long-term government ownership.

2. Technology is a powerful tool, but is not always the solution

Technology innovations need to be developed in context not simply as a technical solution, but as a holistic one. While the tool was fit for purpose, its success depended on user uptake, which depended on willingness to change habits, access to or comfort with using technology, and internet access. These factors can change over time, as must the assistance provided to users. Technology serves as one tool among many that can be deployed when appropriate, in conjunction with others.

3. Capacity building requires continued investment

As this technology is novel for the technical team at the Ministry of Health, ensuring its sustainable adoption requires investment in strengthening the capability of the technical team to continue maintaining and improving the platform. While PSI provided an initial training and comprehensive user guide to enhance the capacity of staff on chatbot development and maintenance, this will require continued support.

THE POWER OF TECHNOLOGY TO SUPPORT MULTI-SECTORAL SURVEILLANCE AND RESPONSE

The government recognizes the importance and challenges of integrating private sector data to achieve and certify malaria elimination. PSI learned that having an appropriate technical tool is not sufficient on its own. Processes must be in place to validate private healthcare providers before including them in the HMIS and to verify data to ensure data quality. Now that this system is in place and has been successfully mobilized for malaria, further efforts can continue to incorporate more private sector providers and their data into the HMIS. Private providers will continue to be a significant source of healthcare for a large proportion of the population, and lessons from malaria data integration can be used as a blueprint for surveillance and response in other health areas.
**ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Artemisinin-based combination therapy</td>
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<tr>
<td>CMPE</td>
<td>Center for Mariology, Parasitology and Entomology</td>
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<tr>
<td>DHIS2</td>
<td>District Health Information Software version 2</td>
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<tr>
<td>DPC</td>
<td>Department of Planning and Cooperation</td>
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<td>HMIS</td>
<td>Health management information system</td>
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<td>PPM</td>
<td>Public-Private Mix</td>
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<td>PSI</td>
<td>Population Services International</td>
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<td>RDT</td>
<td>Rapid diagnostic test</td>
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**REFERENCES**


