

# Implementing a large-scale community digital health platform in Mozambique:

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Lessons learnt from upSCALE

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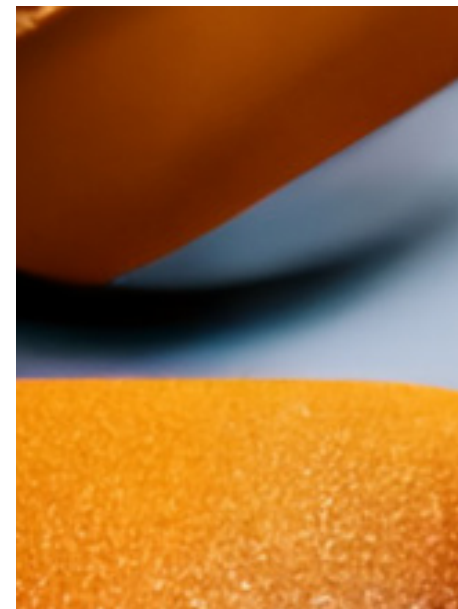


# Introduction

## Malaria Consortium and the role of digital health

Mobile technologies have shown incredible potential for improving our capacity to overcome barriers to the optimal performance of health systems.<sup>[1]</sup> Since the early 2000s, enthusiasm surrounding the use of mobile digital wireless technologies for health (digital health) has surged along with the rapid adoption of mobile devices throughout low- and middle-income countries (LMICs). Short-term evaluations suggest that the use of digital health offers opportunities to improve health and health system outcomes. In particular, digital health is appropriate for addressing many of the health system constraints that currently inhibit services for reproductive, maternal, newborn and child health in LMICs. Digital health is also a critical investment that can strengthen health systems and monitor them more to drive the global universal health coverage (UHC) agenda and goal attainment.<sup>[2]</sup>

At Malaria Consortium, we work closely with local governments and future system users to develop digital solutions that target enhanced disease surveillance and community-based primary healthcare. We see digital health as a key approach to achieving our strategic objectives of improving access to quality case management and advancing health sector resilience. Moreover, we recognise that digitisation of health programmes strengthens equitable access to such services through stronger enumeration, planning and monitoring. While we understand the potential of digital strategies to strengthen health systems, we only implement these if they are the best available solution and are contextually appropriate. Digital health strategies should complement and enhance existing service delivery models and should strengthen people-centred care. We also promote evidenced-based interventions and, as such, are mindful of the need for more data around the effectiveness of digital health strategies — something we are working to address through our research.



## Community health in Mozambique: Background and challenges

Scaling up interventions that increase access to timely and appropriate treatment at the community level could prevent more than 60 percent of deaths according to the World Health Organization (WHO).<sup>[3]</sup> As a way of increasing access to treatment for sick children, several African countries are investing in community health workers (CHWs) as a cost-effective way of extending preventive and curative health services to people living far from health facilities.

One of the countries leading in the effort to reduce child mortality is Mozambique, where under-five mortality was estimated at 71 per 1000 live births in 2017<sup>[4]</sup> — about a 60 percent reduction from the rate in 2000. However, preventable illnesses such as diarrhoea, pneumonia and malaria still claim almost two million lives among newborns, infants and children under five each year. In Mozambique, insufficient access to health services, which stood at 68 percent in 2018<sup>[5]</sup> (especially in remote rural areas), has resulted in poor indicators for nutrition; maternal, infant and neonatal mortality; diarrhoeal diseases and malaria. This is compounded by the ratio of health professionals to the population, which is six per 10,000.<sup>[5]</sup>

Mozambique's National Health Sector Strategic Plan 2014–2024 has identified as a priority the rollout and acceleration of community-based interventions to reach the last mile for health promotion, disease prevention and the provision of primary healthcare. Despite the recent scale-up of some community health interventions, the integration of community-level data into national health management information systems (HMIS) remains a persistent challenge. To date, the visibility of community data is poor, yet these data tell a compelling story: of the health of a population, their care-seeking behaviours and systemic bottlenecks at a granular level.



Typically, data from more vertical, dominant programmes are included at the national level, frequently overshadowing community primary health indicators — despite the fact that the latter boast a detailed depiction of health outcomes at the individual and household levels. It is, therefore, a priority action for Malaria Consortium, in partnership with the Ministry of Health (MoH), to promote the inclusion of this granularity of community data to gain exposure and prominence, as part of our efforts to deliver on UHC.



## The role of community health workers

In Mozambique, the main providers of healthcare at the community level are CHWs — known locally as *agentes polivalentes elementares* (APEs) — and they play a key role in rural areas where health facilities are scattered.<sup>[6]</sup> APEs are community members who are trained to provide basic healthcare to the communities in the remote areas in which they both live. APEs conduct health promotion activities and provide integrated community case management (iCCM) for malaria, pneumonia and diarrhoea to children 2–59 months. They treat all age groups for malaria and diarrhoea, and refer newborns and pregnant women with danger signs — as well as cases of acute malnutrition — to the nearest health facility. In 2014, the services APEs provide were expanded to include family planning, pregnancy tracking, antenatal care, postpartum care, healthy child check-ups, and tuberculosis and HIV patient follow-up for treatment adherence counselling. Since then, the number of APEs employed by the government has doubled, growing to over 7,000 in 2019. This number is expected to increase to 8,800 by 2022, according to the APE programme.<sup>[7]</sup>

APEs in Mozambique are equipped with a range of skills to provide iCCM to their target populations. Following an 18-week training period in health promotion, disease prevention, first aid and management of common diseases, each APE is responsible for healthcare provision to 500–2,000 inhabitants in communities situated up to 25 kilometres from the nearest health facility. APEs also receive monthly supervision visits from a staff member at the nearest health facility who reviews register books and distributes new commodity kits. To perform their work, APEs receive a modest subsidy and work materials, including a bicycle, torch, vest, medicine bag, identification badge, hat, calculator, thermometer and stopwatch.

# The upSCALE digital platform

## Evolution of upSCALE

Between 2009 and 2016, Malaria Consortium, in close partnership with the MoH, set out to improve the quality of care provided by APEs and to scale up the programme to the whole country. Supported by the Bill & Melinda Gates Foundation, we launched Innovations at Scale for Community Access and Lasting Effects (inSCALE), a five-year research and implementation programme in Inhambane province, with implementation commencing in 2014 in six districts.<sup>[8]</sup> The inSCALE programme sought to evaluate innovative approaches to APE motivation, supervision and performance by increasing the frequency and quality of supervision, improving the status of APEs in the community, and strengthening linkages between APEs and the health system.

As part of inSCALE, Malaria Consortium and Dimagi developed the inSCALE application. Primarily, the app aimed to improve APE motivation and strengthen their skills to provide a high quality of care. We provided APEs with tools for improved diagnosis and treatment of malaria, pneumonia and diarrhoea in children under five. The software was tailored for APE use — based on their existing job aids — walking them through the consultation process to ensure that no symptoms or signs were missed, and providing treatment guidance at the end of the consultation.

Over the course of the programme, we recognised that the inSCALE app had the potential to be tailored and adapted for wider health systems strengthening. We would be able to expand its existing features and add elements to improve healthcare through community-based

delivery systems, as well as knowledge exchange between different health facility levels.

With funding from UK Aid, via UNICEF, we expanded and scaled up this application in Mozambique in 2017, developing upSCALE in partnership with the MoH, Dimagi and UNICEF. This partnership has supported the creation of a national digital strategy that uses both mHealth and eHealth activities to strengthen community delivery and disease surveillance. The MoH has acknowledged the importance of embedding upSCALE into the new national community subsystem strategy for APEs and aims for national expansion by 2023. Moreover, key government-level stakeholders are in support of integrating upSCALE data into the national HMIS system to support not only community health, but other health sectors that would benefit from such data sharing.

## What upSCALE does

The upSCALE digital health platform has been developed to improve quality and coverage of health services at the community level by addressing the following APE programme challenges: inadequate adherence to clinical guidelines; insufficient supply of commodities; and lack of access to community health information. The platform includes all modules from the expanded APE curriculum and the APE app, as well as a complementary APE supervisor app, and performs four key functions:

- Thanks to its collecting data in real time, and geographic information system (GIS) locations to identify where challenges are taking place, upSCALE supports subnational and national-level stakeholders with data-informed decision-making. This has additionally strengthened surveillance and response to diseases — including malaria — and the early detection of disease outbreaks.
- The platform assists APEs in their ongoing management of patients in the community: like its predecessor, the upSCALE app guides APEs through the diagnostic process and provides treatment recommendations; however, the new app additionally issues targeted behaviour change messages for patients and collates inputted data.
- upSCALE has a robust health facility supervisor module that allows for real-time support to APEs. Through this module, APEs can provide feedback to supervisors about challenges they have experienced in the field; supervisors can then log into the platform and take appropriate action. In turn, supervisors are able to monitor APE performance and reach.
- The platform provides detailed stock commodity workflows with a dedicated module that is disaggregated by location. This means that, at any given point in time, a supervisor is able to visualise the real-time stock levels of all their APE clusters for

non-medical and medical commodities. This allows them to plan accordingly, recalling APEs on low stock levels to avoid total stock-out scenarios.

upSCALE has not only allowed us to digitise the APE training curriculum, but it has also supported the collection and aggregation of data from different programme activities. At present, all the APE data are stored on a District Health Information Software 2 (DHIS2) visualisation dashboard that Malaria Consortium hosts on a server. One of the next priority activities in 2022 is to fully integrate the upSCALE data (historical and future) into the MoH's national HMIS, known as SISMA, which is run on DHIS2 software.

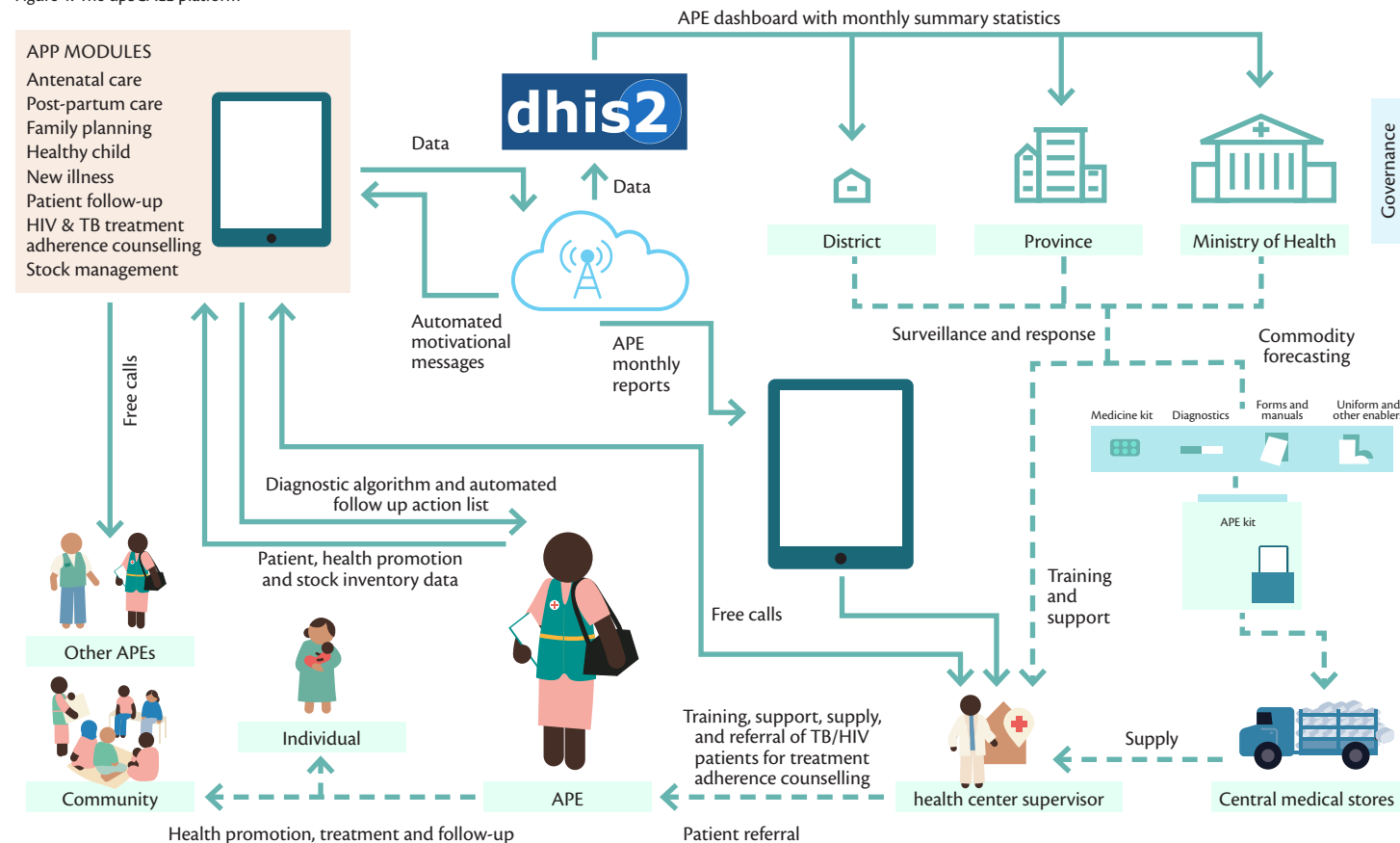
for all APE monthly indicators, as outlined in the MoH's Monitoring and Evaluation plan for the APE programme. In terms of data flow, automated performance reports on how APEs and supervisors are using the applications are emailed on a weekly and monthly basis to district, provincial and national levels (see Figure 1).

The programme is currently being implemented in seven out of 11 provinces, with over 3,200 and 299 supervisors using the app to date. The MoH is planning to roll out the platform to all 8,800 APEs and 1,300 supervisors nationally by the end of 2023. A full data integration plan with DHIS2 is ongoing to optimise strategic decision-making, with support from Malaria Consortium to lead on this integration and capacity development at the national level. The new CommCare and DHIS2 integration currently enables the MoH to access community-level data at the district, provincial and national levels: the data collected from each community are fed back to it in the form of improved and tailored services. In 2022, full integration of upSCALE into HMIS/SISMA will take place so that decision makers beyond the national APE programme staff will be able to access community data for full use.

## How it works

The upSCALE APE and supervisor apps are built using CommCare, an open source, multi-media rich software running on Android that can work offline. The upSCALE data sets are pushed from CommCare to DHIS2 each time the apps submit a case file to the server after an APE has completed a data collection exercise. Dashboards on DHIS2 can then display the aggregate data

Figure 1: The upSCALE platform



Mozambique upSCALE Malaria Consortium technician and APE cross-checking data books with upSCALE app

# Lessons learnt

In early 2021, Malaria Consortium set out to generate perspectives and reflections, and capture experiences from upSCALE's previous four years of programme implementation. We led a qualitative evaluation in which a consultant (employed by Malaria Consortium) conducted interviews with a wide range of upSCALE team members across locations, functions, and external stakeholders to capture challenges, successes and lessons learnt.

We conducted interviews virtually from March to May 2021 with 12 key stakeholders who had significant involvement with upSCALE. These included representatives and partners from the Centers for Disease Control and Prevention (CDC, USA), Dimagi, PATH and UNICEF, as well as an MoH coordinator and a range of Malaria Consortium technical and programme staff.

Using a semi-structured topic guide, we led discussions with interviewees, all of whom gave their consent for verbatim notes to be taken during interviews and to be included anonymously in this paper. We analysed notes line by line, thematically, organising these into four overarching categories: advocacy, engagement and acceptability; data collection and uptake; technology and usability; and ownership and sustainability. After comparing notes across interviewees to identify commonalities and differences, we synthesised and collated emergent themes, with recommendations from interviewees.

## Advocacy, engagement and acceptability

**Proactive, established relationships at the beginning of the project, accompanied by close engagement on planning activities, promoted successful implementation.**

Supported by MoH leadership and ownership of upSCALE, we collaborated closely with UNICEF and various implementing partners, as well as PATH, CDC and Dimagi to promote the acceptability and uptake of the platform. Interviewees commented on the importance of regular communication and engagement throughout implementation. They emphasised that close engagement on planning and advocacy activities at different levels within the MoH contributed to effective scale-up, and that the clear communication of expectations and deliverables fostered a positive working relationship with the donor and partners, which

they generally perceived to have improved over time. MoH ownership, and its drive to scale the platform nationally, has been key to upSCALE's sustainability.

“[The] MoH has always been involved in development, here the MoH involved [the NMEP] since the beginning — this was designed with PNAPE (Programa Nacional de Agentes Polivalentes Elementares — Community Health Workers' Programme)...Other organisations don't do this; instead, it is siloed. This project made sure they had this buy-in since the beginning. Maybe they still have to get buy-in on other parts, like reporting and how to use data, but developing the app, there is no doubt the government thinks [it is] useful and...a good tool for their APES to use in the field...I also think that the involvement of the funder and Malaria Consortium have been

super conducive for success.”  
Dimagi interviewee

**Provision of equipment can be perceived as creating an inequitable working environment.**

While mobile phones have been provided to APes and their supervisors, we found that at the primary health facility level, the use of digital tools was largely not implemented. Moreover, APes at the community level were often more digitally aware and competent than health staff at primary and secondary levels of care. An interviewee highlighted this disparity, indicating that it could create tension among health facility staff, who might perceive APes as being more digitally advanced. This could also be perceived as inequitable by policy makers, which could impact on how successfully upSCALE is adopted.

It is worth noting that upSCALE only targeted APes — digitising health workers at the facility level was not in its original scope. This has been highlighted in partner engagement meetings as an area of priority for future funding to ensure digital equity of tools and resources, and from a health systems strengthening perspective.



upSCALE app



APE with solar testing equipment, Inharrime district, Inhambane province, Mozambique



Mozambique upSCALE working group for solar panel testing

## Data collection, uptake and use

### Data quality and timeliness are key considerations for decision-making.

Interviewees have praised the extensiveness and richness of the upSCALE data collected, which includes Power BI dynamic dashboards that provide data visualisations for actionable data (Figures 2 and 3). The platform allows supervisors, subnational and national-level stakeholders to identify programmatic inconsistencies, stock-outs and reporting issues that can be identified at the village level, thanks to upSCALE's GIS capabilities. This, in turn, facilitates improvements in data quality over time.

“...this level of detail, offering all these modules and services, I think it's only upSCALE, it is the only digital platform that captures individual household data, goes down to the individual.”

Malaria Consortium interviewee

In general, interviewees stated that they found the data to be more comprehensive than the routine data typically collected at the community level. This feedback, which we received from initial dashboards, has informed revisions that we are currently implementing. Interviewees also noted the value of upSCALE data for decision-making across different levels of the MoH, including the unique contribution of individual-level community data to address knowledge gaps that persist in malaria research (such as characterisation of severe malaria at the community level, factors influencing comorbidities, and spatio-temporal trends of disease at a very granular level). They mentioned that this was particularly pertinent for the malaria dashboards and data visualisations that included geolocation of cases, which helped identify hotspots that could be isolated down to the village level.

However, some interviewees emphasised that it is essential for data to be timely and of high quality, as this will impact on how stakeholders

view, and ultimately use, the data for decision-making around health interventions. One interviewee explained that it would be useful for APE supervisors to be able to visualise the data for their particular understanding and use. Our ongoing training and supportive supervision activities in the next upSCALE phase will use the lessons learnt to adopt a stronger provincial- and district-level ownership model through enhanced supportive supervision.

“When you have a digital system, having data available faster [reduces] issues around data quality — for example, entry and transcription — and also opens up possibilities to do more refined analyses, geolocation of homes and things like that...As I look at the upSCALE system, it does those things, but also has a lot more data than you'd routinely have than a routine system because it has all these job-aid related aspects as well.”

CDC interviewee

### Linking data, uptake and use at various levels of the health system presents a challenge.

Since its inception in 2016, the use-case for upSCALE has grown. Originally, the platform was created to strengthen APE supervision. The resulting data generated were then used to tailor supervision efforts to those APEs who needed additional monitoring. By 2019, the platform use-case had evolved to integrate a decision-support tool to all APEs, primarily for iCCM service delivery protocols. During this iteration phase, we collected, and consequently generated, more data. We needed to analyse and use this new indicator data, and to explore the tool's capabilities to potentially become a community surveillance solution that could support decision makers.

One interviewee reflected that the MoH faces a challenge in advocating for the inclusion of community data into broader, national donor-led data repository investments such as USAID's m-DIVE project and the country's integrated malaria information storage system (iMISS),

which are currently missing these valuable data. It remains for partners to further support the MoH in this regard.

At the end of 2021, Malaria Consortium secured funds to support the integration of upSCALE data into the national HMIS/SISMA in Mozambique for improved central-level decision-making. Integration within the local HMIS system will improve multi-sectoral decision-making by other divisions such as the NMCP, and the Nutrition and Child health departments, who will be better able to visualise data collected on the platform.

At present, upSCALE data sit on a stand-alone DHIS2 visualisation dashboard, to which other ministry sectors (such as the Nutrition and Family Planning divisions) have limited access. They cannot, therefore, use these data for any data-informed decision-making, such as planning, preparedness and response. Interviewees suggested that having better data use and research uptake plans, and improved dissemination of the findings, offered a valuable opportunity to support data to action.

“The platform was always the government's; Malaria Consortium was always there to support the use of the platform and [their] task was to train the government to use the platform, help IT, train the provincial coordinator, the district level, to coordinate with the MoH, transfer knowledge to the MoH for their ownership...What's missing is the coordination between the community data and with the DHIS2, when the APE fills out the form. What's missing is this link — the data collected and the system. They know how to do this from the community and they can analyse right now, it's just this link that's missing. But they have been trained on how to link this data.”

Malaria Consortium interviewee

Figure 2. Example of a pneumonia dashboard created using PowerBI

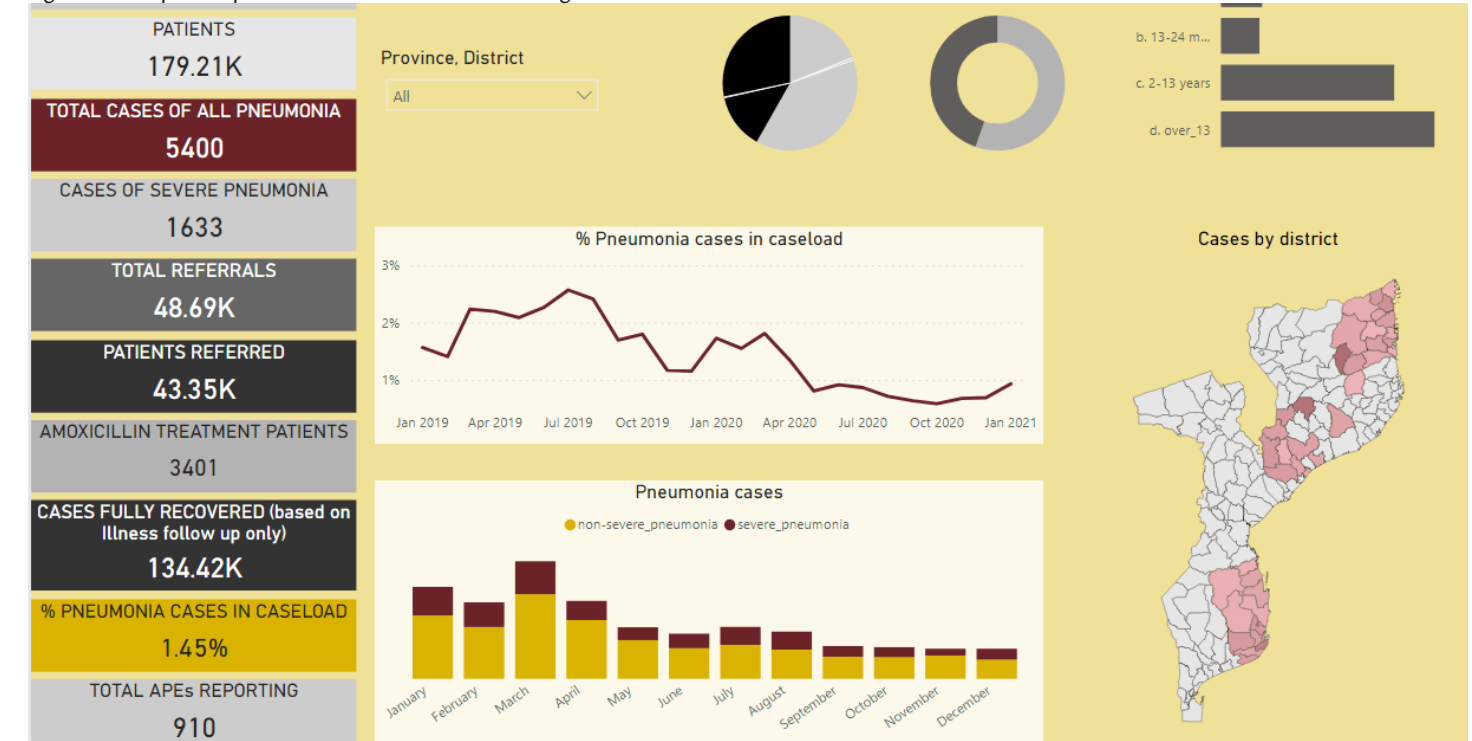
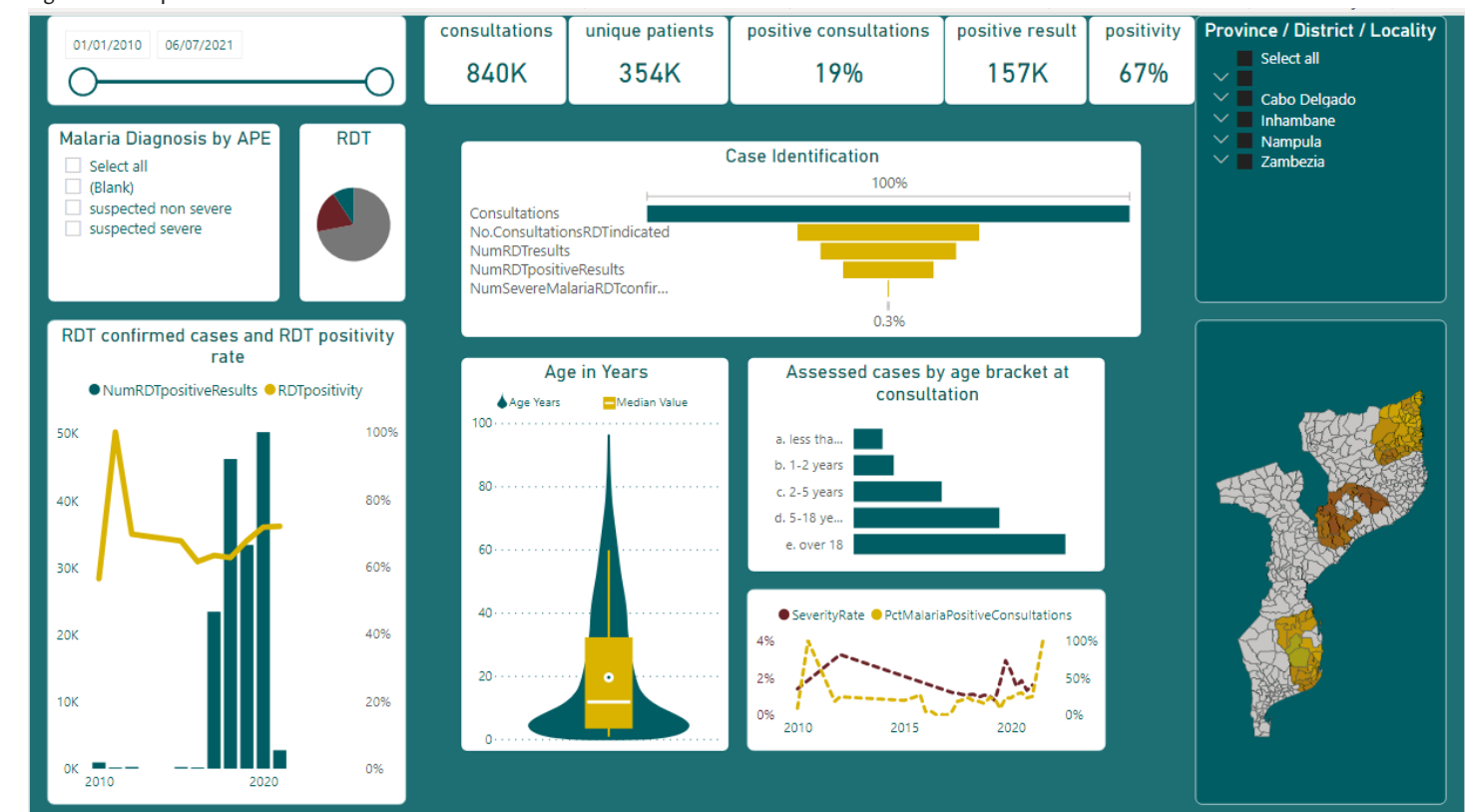


Figure 3. Example of a malaria dashboard



**The integration of data into the national health information system is key for sustainability and fostering a data-to-action culture.**

Interviewees raised interoperability with the wider HMIS as critical to ensure sustainability of the platform and enable effective contribution of community health data into the wider health information system. Interoperable data systems — that is, different data systems that can communicate and exchange information with one other — have been shown to improve the continuity of care and, with it, the chances of positive health outcomes. One of the current key challenges of the upSCALE data is that the system does not offer a simple way to visualise the data collected across the various levels. Interviewees offered several suggestions for how integration could be best achieved, specifying two priorities in particular.

**“It matters where ownership is housed, where data live...”**  
 CDC interviewee

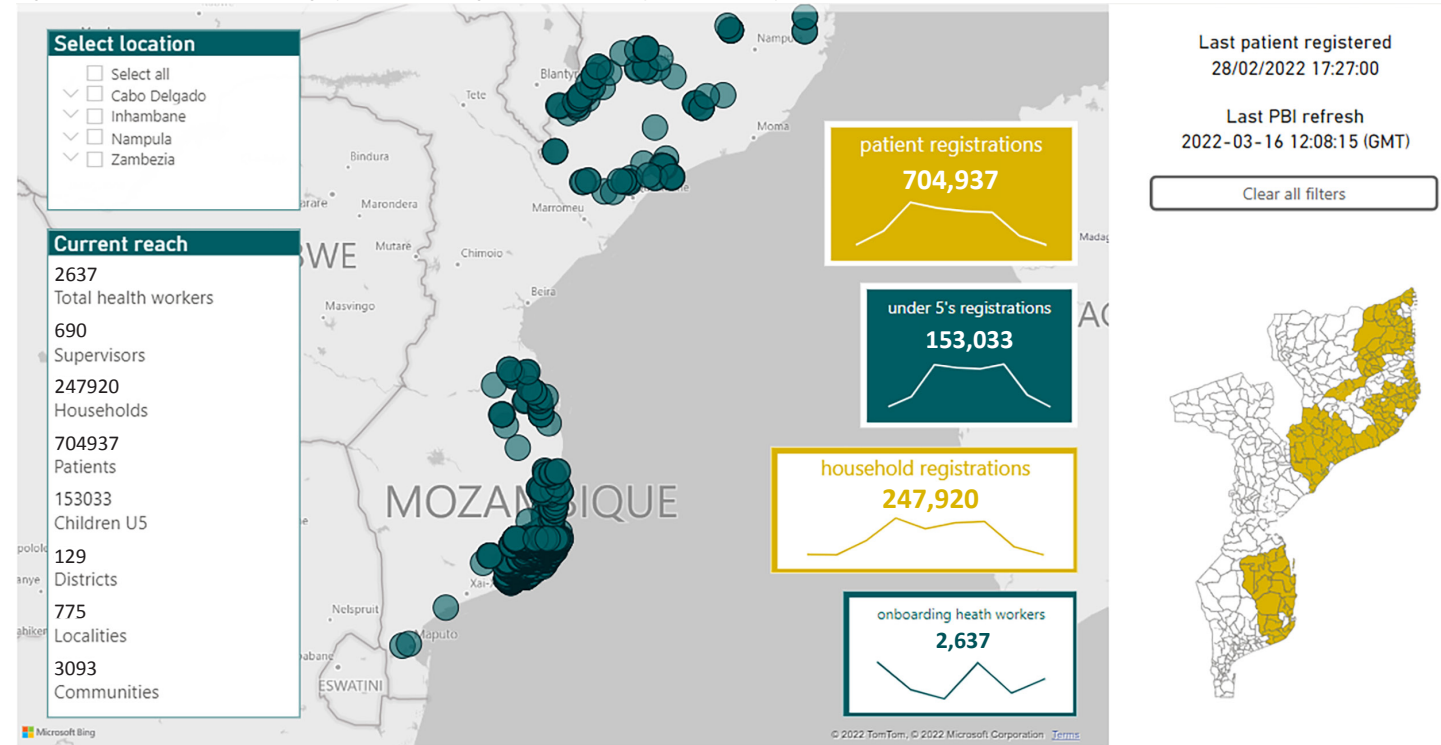
First, to be truly effective for decision-making, these data need to be integrated into the national health system — or a platform that is able to produce visualisations and dashboards and is interoperable with the DHIS2/HMIS. To address these challenges, in 2022, Malaria Consortium will work in collaboration with the MoH to fully integrate upSCALE into HMIS/SISMA with support from technical partners in country to achieve the objectives outlined above. The MoH will lead on what types of indicators they want to integrate into the system based on their strategic needs, and we will support on monitoring the data flow and integrity during this transition process.

Second, interviewees recommended that the MoH host their own data locally in country for greater sustainability and stronger data sovereignty. To facilitate this, Malaria Consortium will provide technical support and start-up funds acquired via a grant from the Global Fund to Fight Aids, Tuberculosis and Malaria (Global Fund) to explore the local server infrastructure

within the ministry and determine what is required to achieve a transition from third-party hosted servers to MoH-owned data.

Given the vast quantities of data that the platform collects (Figure 4), translating the data into action will require several important steps. Drawing on interviewees’ insights, we have identified: agreeing key parameters to track and visualise at lower resolution levels; developing user-friendly dynamic visualisations that respond to the data needs at each administrative level; and developing capacity to sift through, interpret and act upon this information. Developing a concrete monitoring and data use plan, along with research uptake and dissemination plans to support implementation, will help give direction to where the data are most valuable and how they can be used.

Figure 4. Dashboards showcasing upSCALE coverage and reach in implementation provinces from 2016 to 2022



## Technology and usability

**The provision and maintenance of equipment, such as mobile phones, is a costly, yet valuable investment.**

Maintaining the required inventory of up-to-date and functional equipment at the community level has been a challenge.<sup>[9]</sup> We found that breakdowns and malfunctions appeared to be much more common in the field due to the conditions in which the devices were used (e.g. in adverse weather conditions), the intensity of their usage, and a lack of previous experience with smartphones on the part of many APEs.

Even though upSCALE selected more shock-resistant phones with faster processors and stronger visualisation capabilities than inSCALE, about 15 percent of the devices required specialised hardware repair within the first 12 months. Initially, devices were sent to Maputo — thousands of kilometres away — for repair, leaving APEs without phones for extended periods of time. This prevented them from reporting data in real-time and using the app as a decision support tool during diagnosis.

To avoid large delays, we outsourced skilled hardware repairs to local providers, reducing repair times of 3–6 months to less than one month. However, where spare parts were required that were unavailable on the domestic market, repairs could still take up to two months and were more costly.

**Comprehensive, timely training, adapted to the needs of users, is essential to promote accurate use of technology and knowledge retention.**

upSCALE users require comprehensive training to use the platform. Early on in the programme, we identified minor issues relating to app installation and device storage limits being reached, most of which were the result of a lack of technical knowledge. Now, for newly recruited APEs, a minimum of five days’ face-to-face training is performed, from full orientation on the hardware

technology itself and troubleshooting, to detailed walk-throughs of each of the modules with simulated case studies to assess users’ competencies before they are signed off by the technical team for readiness to move on to the live platform.

However, interviewees highlighted that a time lag between training and actually using the phone application in the field was a challenge that needed to be addressed. Insufficient knowledge retention led to data quality data quality issues as a result of incorrect app usage or mismanagement. While, currently, all trainings are conducted face to face, one respondent noted that a remote training model in future would not only prove cost-effective, but also ensure skills are regularly refreshed.

We are currently working to address this issue through supportive supervision. We have built a competency checklist that supervisors use when visiting APEs post training to ensure knowledge retention and the quality of service delivery. Where performance gaps are identified, supervisors can provide APEs with more intensive follow-up. Similarly, we have built in a series of small self-led APE digital questionnaires, which are scored and then shared with APE supervisors on the interface to monitor performance. This remote training and follow-up approach has helped to cut down expensive face-to-face training costs when considering a model for scale.

Training and efficient supervision have additionally ensured that usability issues can be solved locally. The platform generates weekly activity reports and informs supervisors when APEs are not submitting data. Supervisors can then arrange for on-site technical consultations. By integrating the process for reporting and solving device-related problems into regular supervision visits, we have been able to handle issues more efficiently.

**“The biggest challenge is the time it took for the actual users to start. We would train, then after training, there’s the whole period they’d have to wait until they actually have their phones and application, so between training and time they initiated activities, then APEs would forget what they had learned.”**

Malaria Consortium interviewee

**upSCALE can be adapted to, and successfully used in, emergency settings.**

UpSCALE has proved to be a key tool that can support case management practices in humanitarian settings. Since 2017, we have been implementing the programme in Cabo Delgado. Over the course of the programme lifecycle, the province has destabilised due to soaring conflict.

With the continually changing situation in this province, and the compounding nature of the COVID-19 pandemic, we found that the upSCALE programme had to be adapted accordingly. We conducted a small-scale research study in this province to understand if, and how, a digital platform could be agile to the needs of an increasingly unstable environment, in which health facility services were becoming scarcer and population movement impacted.

As the case studies on page 14 show, we were able to continue to provide remote support to APEs and displaced community members. This was largely thanks to the fact that upSCALE as an information and communication platform can disseminate updated and real-time guidance on an evolving pandemic safely and remotely.

## CASE STUDIES

### Continued healthcare in conflict-affected regions

“...the platform has continued to be used throughout, which shows how adaptable and supportive it is. More and more we should consider how it can be used in unstable and conflict situations. We can send messages, updated remotely, even during conflict. There is an opportunity here.”

Malaria Consortium interviewee

It is well documented that armed conflict delivers exceptional challenges for the provision of both emergency and day-to-day healthcare in affected areas. One such challenge is populations reaching a health facility safely and moving frequently between conflict corridors.

In Cabo Delgado province, where an estimated 350 APEs are operating, conflict and violence in the region hindered upSCALE implementation over a 12-month period (from approximately 2020) as the conflict escalated. APEs had to address a range of challenges in adverse conditions, primarily due to the displacement of communities and APEs; lost phones, and interruption of data collection and reporting; and poor network connectivity. Despite these challenges, some APEs continued to use the platform to support the healthcare needs of their communities, providing upSCALE services door-to-door and ensuring that health services could continue. This was hugely beneficial to those who were unable to move safely to the few health facilities that remained open at the height of the conflict. Similarly, communities moving from one conflict area to flee violence within the province were still able to meet and receive services. One APE noted that they were able to provide health services to displaced individuals by registering them as residents in their community.

upSCALE was able to provide comprehensive assessment and treatment to displaced communities, echoing the importance of digital health interventions being agile and adapting to geographical disparities and upsurges of demand at the community level. Typically, within a conflict environment, there will also be disruption to equitable clinical service delivery. Being able to maintain upSCALE during such a humanitarian crisis meant that populations were all able to access APE services with a level of clinical consistency, and that they trusted the care they received. This has been a positive step in our efforts towards achieving UHC.

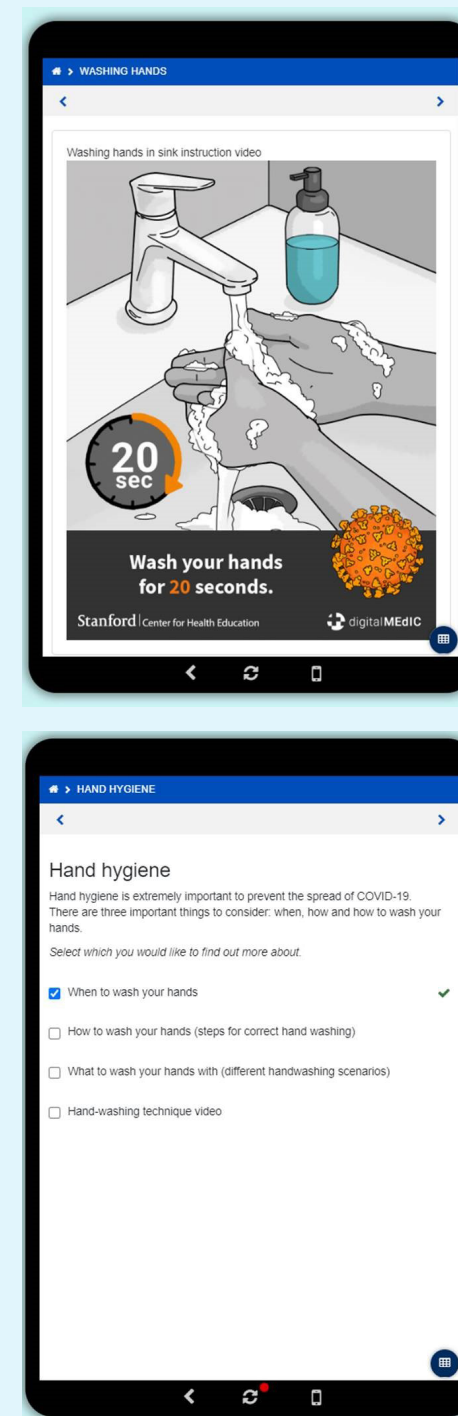
### Rapidly adapting to COVID-19

In addition to providing healthcare in a conflict-affected area, APEs faced the additional hurdle of providing services against the backdrop of a global pandemic. As at April 2021, technical guidance on COVID-19 surveillance, case definitions and testing strategies had been developed to support APEs; however, communicating this information across a wider APE network posed a significant challenge, largely due to restrictions on travel, face-to-face meetings and training. Other challenges included incorporating COVID-19 surveillance into existing surveillance networks and diagnosing the disease at the community level. Routine activities were hampered as a result of similarities between COVID-19 symptoms and those of malaria and pneumonia; misinformation about the virus; and limited access to affordable testing — which, in turn, led to inadequate data on caseloads.

Through close consultation throughout the iterative process, the MoH, with Malaria Consortium's support, adapted the upSCALE platform<sup>[10]</sup> to include content on COVID-19 (Figure 5), adding specific modules (with links to pre-developed materials) to the existing platform to help APEs identify and refer suspected COVID-19 cases in patients. This consequently enhanced their differential diagnoses for malaria, pneumonia and diarrhoea. We also modified existing algorithms on the platform, communicating updates to APEs and delivering COVID-19-related messaging via the app — including SMS, audio and video messages — to communicate changes in government advice and new symptoms as they were identified. To address surveillance needs, we added COVID-19 case-mapping surveys that allowed APEs to monitor deaths and the secondary impact on routine health services. The platform also enabled APEs to document their experiences, while identifying knowledge gaps.<sup>[11]</sup>

In July 2021 we implemented a stock-management system to track equipment levels (e.g. of personal protective equipment) as procurement began in country. We developed a COVID-19 dashboard to report on geospatial outbreaks and key outcomes relating to the disease at the community level. On an ongoing basis, we evaluated the intervention by monitoring the app's usage and conducting online and SMS-based questionnaires and telephone interviews to assess APEs' and caregivers' perceptions on its usability and acceptability during the study period. This agility demonstrated that the platform can rapidly respond and adapt to new demands and provide intelligence required to inform decisions. The rapid modification of adding new content to the platform has proved to be highly valuable to the MoH, whose continued ownership and leadership of upSCALE will optimise government capacity to respond to the changing needs of the country and its population.

Figure 5. Messaging on COVID-19-adapted content



### Ownership and sustainability

#### Government ownership will encourage sustainability.

Several interviewees highlighted how government supervision and ownership of upSCALE are critical to the programme's sustainability. Malaria Consortium continues to support the government to seek funding sources and provides overall technical leadership while integration of APE/upSCALE data into HMIS/SISMA takes place and the APE system matures.

To encourage greater ownership, the government has identified local server hosting of data as a priority for the future, moving away from a cloud-based system. This is consistent with interviewees' recommendations. For upSCALE to continue successfully, however, considerations around costs, time, and roles and responsibilities for platform maintenance and use are required. These include clear funding mechanisms; a government-hosted local server; a long-term mobile device management system to monitor the use of devices at scale; platform management subscription costs to Dimagi; embedded local knowledge of how upSCALE works; linking and integrating upSCALE fully into the national system; bringing innovation to the app through workflow and content enhancements; and continued capacity development from partners, particularly in terms of server infrastructure.

“The reality is everything we have developed is owned by MoH...In terms of sustainability, there has to be knowledge locally of how to maintain the system long term and how to use the data which is more interesting for the MoH, and they see that and how they consult the data. But that takes time for MoH to start using and discussing the data that comes from the system.”

Dimagi interviewee

“Ultimately, in the future, we are looking [at] a global partnership agreement, with lower costs and a sustainability model. This would empower the Ministry to take over their own data sovereignty and to move away from cloud-based hosting, which has benefits, confidentiality etc. This would migrate to the government, get rid of costs and support sustainability.”

Malaria Consortium interviewee



# Next steps and recommendations

Drawing on the lessons that have emerged from conducting the learning review presented in this paper, we have mapped out a series of short-term adaptations to the upSCALE platform, as well as broader recommendations to strengthen the overall programme. The adaptations and recommendations that follow respond directly to interviewees' insights into priority areas for development and highlight the key actions we are taking, notably: integration of upSCALE with the wider health system; local ownership; improved use of upSCALE data for decision-making, and continued support to APEs to analyse and interpret data through improved dashboards, training and supervision. The recommendations are of value to any implementers or governments seeking to establish similar digital health platforms to improve health outcomes.

## Short term adaptations for 2022

- The MoH, with support from Malaria Consortium and the Global Fund, will fully integrate upSCALE and all data sets into HMIS/SISMA to strengthen data use, visualisation and data to action. Partnerships have been identified with Zenysis, a key integration partner to support this deliverable. We are aiming to complete this interoperability by end of 2022.
- Dimagi will support the MoH and Malaria Consortium on the transition from third party upSCALE server hosting to locally hosted data under MoH digital infrastructure. As part of this process, Dimagi will support the capacity development of MoH staff on maintenance and quality checks throughout the 12-month project lifecycle. This effort will promote sustainability and reduce ongoing server hosting fees.
- We will make on-going Power BI data visualisation refinements based on stakeholder dissemination and recommendations. This will take place bi-annually with data refreshes on the dashboards through investments from Malaria Consortium and technical assistance to the MoH.
- We will continue to provide refresher trainings to provincial staff and national level APE programme teams on data analysis, interpretation, surveillance and monitoring to facilitate data to action and decision-making.
- We aim to provide technical assistance to the MoH to conduct geospatial mapping of disease outbreaks to help foster better quality surveillance.
- With over 750,000 households registered onto the system, Malaria Consortium, with support from Dimagi and leadership from the MoH, will explore how patient files can be imported across other public health systems for efficiency to avoid duplicate registration efforts at community level. We will also explore these case files to support other health systems strengthening efforts and public health programme implementation.

## Recommendations

1. Prioritise future investment in digitising primary- and secondary-level health workers to improve the digital connectivity between health systems and data flow
2. Sensitise all MoH stakeholders on how to access and use the data and its applications, including data visualisation
3. Explore options for better integration of upSCALE into the MoH. These include feeding upscale data into the HMIS, and hosting data on a local government server for greater sustainability as well as stronger data sovereignty, responsiveness and accessibility
4. Promote technical capacity development of digital skills and knowledge sharing within all levels of the MoH throughout implementation, to facilitate the embedding of technical knowledge and skills at all levels
5. Explore future opportunities for a long-term funding strategy; opportunities could include a global partnership agreement with a sustainability model, vaccine monitoring function in the app, online training and telemedicine
6. Expand remote training to reduce costs and ensure APEs have regular training and supportive supervision to maintain knowledge. All training needs to be updated when clinical guidelines and protocols change. Regular trainings will help reduce knowledge erosion and ensure workforce retention
7. Encourage the adoption of upSCALE at the provincial level, as well as with improved district-level ownership, through the identification of champions to promote implementation and sustainability. This will, in turn, strengthen access to data and promote its use for decision-making
8. Develop a data analysis and uptake plan, and improve evidence synthesis and dissemination through a health technical working group at the national level, with representation from cross-sectors of the MoH. This will improve coordination and collaboration, as well as pooling of resources and technical expertise, thereby preventing duplication and encouraging a stronger data-informed culture. Moreover, the MoH should identify key partners, donors and academics to support and improve the governance structure
9. Support the scale-up of using the technology and platform to reach all APEs in each province
10. Promote better coordination between programmes working with APEs/MoH to maximise the use of upSCALE and resources

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