



amp

The Alliance for  
Malaria Prevention



Photo by Harandane Dicko for CRS

# Review of the Use of Technology to Facilitate Insecticide-Treated Net Distribution for Vector Control in Complex Operating Environments

**CASE STUDY:** Strengthening insecticide-treated net (ITN) and seasonal malaria chemoprevention (SMC) campaigns in Mali through digitalization, where security allows.

## Background

Mali is one of 11 countries prioritized under the World Health Organization's high-burden, high-impact malaria initiative and accounts for 3.1% of global malaria cases and 2.4% of malaria deaths annually. Following key malaria control efforts, Mali reduced both malaria incidence and deaths from 2015 to 2023.<sup>1</sup> Yet malaria remains a significant public health issue in Mali, accounting for an estimated 34% of reported morbidity and 27% of reported mortality, with children under 5 years and pregnant women among the most affected populations.<sup>2</sup> According to the 2021 Malaria Indicator Survey,

national malaria prevalence was 19%,<sup>3</sup> with variation across regions. In the southern and central regions, where 90% of the population lives, malaria is endemic, while in the north it is epidemic-prone, with unstable and sporadic transmission.<sup>4</sup>

Since 2012, conflict and violence have affected large proportions of Mali's population, with a significant increase since 2018. Population movement, nonfunctioning health facilities, the presence of armed groups, improvised explosive devices and kidnappings pose serious

1 World Health Organization. (2024). *World malaria report 2024*. World Health Organization.

2 PMI REACH Malaria. (2025, July). *Rapport de fin de passage P1 CPS 2025*.

3 Ibid.

4 Severe Malaria Observatory. (2025). *Mali: Malaria facts*. Medicines for Malaria Venture. <https://severemalaria.org>

challenges and limit movement.<sup>5</sup> More than one-quarter of the population, some 6.4 million people, needs urgent humanitarian assistance, with catastrophic hunger predicted in conflict-affected northern and central regions.<sup>6</sup> Approximately one in four health facilities in northern and central Mali are nonfunctional due to insecurity, leading to staff and supply shortages. More than 402,000 people are internally displaced, and some 12,000 refugees from Burkina Faso are in Koro, Mali. Mali is also classified as a challenging operating environment (COE) by the Global Fund due to factors such as weak governance, limited access to health services and human-made or natural crises.<sup>7</sup>

## Methods

This case study focuses on leadership by Mali's National Malaria Control Programme (NMCP), in collaboration with partners, to strengthen ITN mass distribution and SMC campaigns. It forms part of a review of the use of technology to facilitate ITN mass distribution in COEs coordinated by the Alliance for Malaria Prevention (AMP) Humanitarian and Displaced Populations Working Group and Catholic Relief Services. The aim is to better understand how technology is being used to quantify, plan, deliver, track or report on ITN delivery interventions in COE settings, identifying current efforts, successes and challenges. This case study presents learning and challenges based on key informant interviews with the NMCP, AMP and partners, as well as a review of documents from cited sources.

## Previous ITN mass distribution and SMC campaigns

To reduce the malaria burden despite a complex operating environment, Mali has implemented ITN distribution campaigns since 2007 and annual SMC campaigns since 2011. Following a 2007 ITN campaign targeting children under 5 years and



Photo by Ollivier Girard for CRS

pregnant women, Mali led universal coverage campaigns in 2011–13, 2015, 2018, 2019–20, and 2023. Because of security and logistical constraints, the 2023 ITN mass distribution was implemented in two phases. The first phase took place in June 2023, targeting 46 health districts in the southern and central regions and distributing 10.8 million ITNs. The second phase covered 23 health districts in the northern regions in May 2024.<sup>8</sup>

SMC campaigns involve administering a full course of antimalarial medicines to children during the high-transmission period, typically the July–October rainy season. Of the 75 health districts, 57 are eligible for three to five rounds of SMC.<sup>9</sup> A fifth round of SMC has been conducted in two pilot districts, Niena and Yanfolila.<sup>10</sup> Because of the difficulty of distributing ITNs during the rainy season, ITN and SMC campaigns have to date been conducted separately in Mali.<sup>11</sup>

## Campaign digitalization

### SMC campaign digitalization:

The digitalization of SMC campaigns began with a pilot phase in 2022, introducing digital tools in 10 districts. This was extended to 16 districts for the 2023 SMC campaign. Challenges in 2022, such as poor training

5 Mali National Malaria Control Programme. (2024, June). *Challenging operating environment: Survey results*.

6 The Global Fund. (2022, April 29). *Conflicts, crises and displaced people: How the Global Fund works in challenging operating environments*. <https://reliefweb.int/report/world/conflicts-crises-and-displaced-people-how-global-fund-works-challenging-operating>

7 Ibid.

8 Ministry of Health, National Malaria Control Programme, & Catholic Relief Services. (n.d.). *The role of digitization in improving data quality for ITN distribution campaigns in Mali, analysis of the ITN distribution in districts with digitalized and non-digitalized systems* [PowerPoint presentation].

9 Cissoko, M., Magassa, M., Cissé, I. A., Coulibaly, S., Samaké, D. S., Sanogo, V., et al. (2025). Geo-epidemiological risk stratification to select malaria interventions: Case of Mali. *PLOS Global Public Health* 5(11), e0004796. <https://doi.org/10.1371/journal.pgph.0004796>

10 PMI REACH Malaria. (2025, July). *Rapport de fin de passage P1 CPS 2025*.

11 Ibid.

and supervision and delayed payments to field workers, led to lessons learned and improvements in the 2023 approach. In 2025, the initiative moved from using Bluesquare infrastructure to the national District Health Information Software 2 (DHIS2) platform, aligning it with Ministry of Health systems to improve interoperability and data centralization.<sup>12</sup>

**ITN campaign digitalization:** The 2023 campaign marked the first time Mali's NMCP piloted the digitalization of its ITN distribution campaign. In the first phase, data was

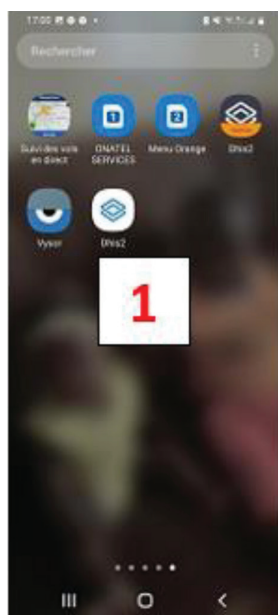


Figure 1: DHIS2 smartphone application, Mali  
Source: Manuel de dénombreurs et distributeurs

collected digitally in 29 health districts, while the remaining 17 nondigitalized districts used paper forms and Excel templates. The digitalized districts were selected based on the security situation, with any district deemed too insecure excluded from the digitalization effort. For this purpose, 8,115 smartphones, 5,980 power banks, 597 solar chargers and two charging stations were acquired to support the process.<sup>13</sup>

The ITN campaign used DHIS2 as its digital platform. All villages were mapped and incorporated

into the system to enable detailed data analysis at all levels of the health system. Data was collected by enumerators and distributors at the community level using smartphones and unique quick response (QR) code coupons.

#### For both campaigns:

- The DHIS2 mobile application is pre-loaded onto campaign smartphones provided to enumerators and distributors. Data is collected offline and synchronized daily when an internet connection is available, either via Wi-Fi or a cellular network. The real-time data is then used for dashboards that are updated every two hours to avoid server overload. In contrast, nondigitalized

areas use paper collection and Excel files, which is slow and often leads to errors.

- The security context in northern Mali does not allow for carrying a digital device in public. As a result, for both ITN and SMC campaigns, digitalization in COE areas of Mali has been limited to supply chain management and supervision, which are conducted from office settings. Carrying a phone in public in northern Mali can pose a security threat, as it may be viewed with suspicion for espionage. A careful approach and community reinforcement are needed to ensure communities understand that the devices are for health purposes. The government is also wary of such devices and requires device identification numbers, a process that can entail lengthy approval timelines.

**The main campaign components** that have been digitalized include the following:

- **Household registration:** This process involves registering households and their members to determine the number of ITNs required. It is conducted using smartphones and unique QR codes on coupons. The process is designed to prevent duplication by first searching for existing households. The enumerator captures the village, the head of household's name and phone number, and the household's location using GIS coordinates.
- **ITN distribution:** Community agents use the QR code or the head of household's phone number to retrieve household information and record the number of ITNs received.
- **Supervision:** The performance of campaign teams is managed digitally. Supervisors

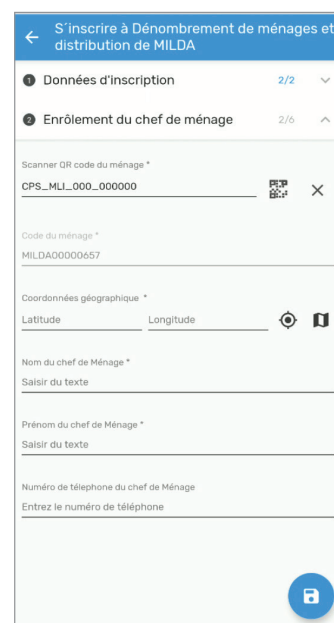


Figure 2: Household enrollment data collection interface, Mali  
Source: Manuel de dénombreurs et distributeurs

12 Maiga, B. (2025). *Le rôle de la digitalisation dans l'amélioration de la qualité des données pour les campagnes de distribution de MILD au Mali* [Presentation]. AMP ITN Campaign Digitalization Meeting, Nairobi, Kenya.

13 Ministry of Health, National Malaria Control Programme, & Catholic Relief Services. (n.d.). *The role of digitization in improving data quality for ITN distribution campaigns in Mali, analysis of the ITN distribution in districts with digitalized and non-digitalized systems* [PowerPoint presentation].

can track campaign volunteers and their movements using geospatial data, making supervision easier and more efficient. They can monitor volunteer locations and verify that households are being properly registered.

- **Logistics:** Reception, transfer, storage and inventory management are also digitalized. The use of technology, specifically the eLMIS platform, helps logistics teams quantify ITNs.

## Results

During the 2024 ITN distribution campaign, the distribution rate across the 46 districts was very high at 99.26%. This included a 98.8% distribution rate for the 29 digitalized districts and 99.2% for the 17 nondigitalized districts, demonstrating strong access in COE settings.<sup>14</sup> Similarly, during the 2024 SMC campaign, coverage in the 16 digitalized districts increased from 60% in 2022 to 95%.<sup>15</sup> Several factors contributed to these increases:

- **Geo-enabled household registration:** Digitalization of the ITN campaign significantly improved tracking of household registration coverage through geospatial analysis, providing instant access to detailed maps and identification of uncovered areas. This has also enabled in-depth comparative analysis of demographic data between SMC and ITN campaigns.
- **Strengthened supervision:** Geospatial tracking of enumerator movements made supervision easier and more effective, helping ensure that households were properly registered.
- **Data visualization:** Digitalization enabled real-time visualization through ITN and SMC campaign dashboards, facilitating fast and efficient decision-making.
- **Context-sensitive household identification:** Digital processes allowed for more precise identification of large households that did not conform to the standard definition because of cultural contexts, including extended, multigenerational families sharing a compound.

- **Near real-time decision-making:** The availability of real-time data—enabled by daily or periodic synchronization—supported faster and more efficient decision-making, helping ensure more even and complete distribution of resources across the territory. With synchronized data from household registration and ITN distribution activities and digitalized supervision reports, Ministry of Health teams at each level could identify geographic areas or populations missed during ongoing activities and implement rapid corrective actions to reinforce coverage. The NMCP has increasingly incorporated daily review of campaign data into Ministry of Health-led campaign planning and review meetings at district, provincial and central levels.
- **Rapid technical problem resolution:** Support agents using information and communication technologies for development resolved technical challenges more quickly.

### Digitalization has also been instrumental in addressing challenges faced in Mali's ITN campaigns.

- **Poor data quality:** Digitalization reinforces harmonized data collection and management, leading to faster, more efficient and more accurate household registration and distribution. Real-time data visualization helps identify and correct issues while the campaign is ongoing, improving coverage and access.
- **Inaccessible areas:** Geospatial analysis enables the instant mapping of uncovered areas, directing campaign teams to improve coverage. This is particularly important in COE settings, where access is difficult because of insecurity or flooding.
- **Complex stock management:** Digital tools provide real-time visualization of resource distribution, ensuring more even and complete distribution of resources.
- **Identifying vulnerable groups:** Digitalization enables the collection of detailed household-level data, including the number of pregnant women and children

14 Ministry of Health, National Malaria Control Programme, & Catholic Relief Services. (n.d.). *The role of digitization in improving data quality for ITN distribution campaigns in Mali, analysis of the ITN distribution in districts with digitalized and non-digitalized systems* [PowerPoint presentation].

15 Maiga, B. (2024). *Rapport et analyse globale des résultats de la campagne de chimioprévention du paludisme saisonnier 2024 dans les 16 districts digitalisés* [Internal report]. Catholic Relief Services. Submitted to the National Malaria Control Programme and the Global Fund.

under 5 years, allowing for improved analysis of populations at risk. A decision was made to limit the number of ITNs to 50 for households with more than 100 members, as they do not fit the standard definition of a household.

- **Delayed data reporting:** With paper-based tools, data was only available after the campaign concluded. Digitalization provides real-time data to project managers and officers through daily dashboards, offering accurate and timely awareness of what is happening on the ground.

## Challenges of Digitalization

Despite its successes, digitalization of ITN and SMC campaigns in Mali has faced several challenges:

- **Device management:** Device procurement encountered difficulties, with more than 20% of initially procured devices experiencing operating system issues. Devices can also be lost, become obsolete or experience slow performance.
- **Connectivity:** Limited smartphone and internet network coverage, as well as the sabotage of telecommunications infrastructure, presents a major obstacle. The application's ability to collect data offline and automatically synchronize when a connection is available helps mitigate this challenge.
- **Human resources and processes:** Technology alone cannot solve all challenges. Ensuring the accuracy of information, such as phone numbers for mobile money payments, is a long and complex process. Poor training, weak supervision and delays in paying field workers have also affected motivation. To mitigate these challenges, campaign organizers:
  - Tested digital tools before the full campaign to anticipate and manage issues, improving performance during implementation.
  - Used adaptive and continuous training, including video demonstrations in local languages, as practical tools for training and correcting errors.



Photo by Moussa Magassa/CRS

- Leveraged digital supervision results to help prioritize troubleshooting and provide targeted support to those most in need.

## Campaign Integration

Building on the successes of digitalization to date, the NMCP and its partners are exploring the integration of data from ITN and SMC campaigns to further improve planning and resource allocation.

## Mali's planned 2026 ITN and SMC campaigns

Mali's next ITN distribution campaign is planned for 2026 and will be organized across 53 health districts—44 in the southern and central regions and nine in the northern region. The ITN distribution strategy is based on a community distribution approach. In some districts in Menaka and in selected health districts in Tombouctou and Gao regions, a community distribution approach will be used to mitigate security risks, relying on community leaders to count and distribute ITNs.

The 2026 campaign will also continue the distribution of new-generation ITNs, including nets with the synergist piperonyl butoxide and dual-active ingredient ITNs, to combat mosquito resistance to pyrethroids.