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

CASE STUDY: Somalia's Digital Transformation for Malaria Vector Control – Pioneering ITN Distribution and Innovative use of Technology in a Complex Operating Environment

Background

Malaria poses a major health risk in Somalia, which varies across populations. In endemic riverine areas – children under five, pregnant women and Internally Displaced Populations (IDPs) especially those from areas of unstable transmission are most at risk. Low transmission areas can be more susceptible to outbreaks for populations with low or no immunity.[1]

Several factors contribute to complex operating environments (COE) in Somalia, which affect ITN distribution. Somalia has been ranked as one of the most fragile states in the world for several years, further exacerbated by natural disasters, like the prolonged drought from 2022 to 2023, followed by heavy El Niño rainfall. These conditions provide additional mosquito breeding grounds and increase the risk of malaria transmission. Health management information systems (HMIS) are partially functional and reporting has often been disrupted by security and geographical access especially in South Central Somalia. Health service delivery overall, including for malaria, has experienced challenges to reach the high numbers of IDPs and nomadic

1 National Malaria Control Programs, Federal Government and Member States (2020). *Somali National Malaria Strategic Plan 2021-2025, Towards and Accelerated and Coordinated Path to National Elimination.* March 31, 2020.

communities with consistent quality care. As of late 2024, approximately 3.1 million people were displaced by conflict and violence, with an additional 733,000 displaced by disasters.[2] Measuring the impact of interventions is difficult within the fluidity of population movements.

Somalia has made significant progress, decreasing malaria prevalence from 20% in 2015 to 4% in 2023 despite challenges including flooding, drought, and the emergence of a new parasite strain of *Plasmodium falciparum,* and the urban invasive mosquito vector, *Anopheles stephensi,*[3] whose blood feeding behaviour reduces the effectiveness of ITNs.[4]

Introduction

This case study provides an overview of Somalia's 2025 ITN campaign, detailing the strategy, successes, challenges faced, and lessons learned from implementing a technology-based solution for campaign planning, implementation, and data collection in fragile and complex settings. As part of a *Review of the Use of Technology to Facilitate ITN Distribution in COEs,* coordinated by the Alliance for Malaria Prevention (AMP) Humanitarian & Displaced Populations Working Group and Catholic Relief Services (CRS), this case study presents inputs from key informant interviews with the national malaria program, AMP, and partners as well as cited sources.

Previous ITN distribution in Somalia

Since 2003, bed nets have been a key component of vector control in Somalia. ITNs are mainly distributed through campaigns, with distribution also through antenatal care (ANC) and Expanded Programme on Immunization services. ITNs are also provided for refugees, IDPs, mobile and migrant populations during humanitarian emergencies and in focal areas as needed, if not already receiving ITNs.[5] During the most recent campaign in 2023, 2.5 million people were reached.[6]

While ITN campaigns have reduced malaria in prioritized communities, flooding, displacement, and health infrastructure challenges make sustained ITN coverage difficult.[7] A study in Mogadishu, conducted during the COVID-19 pandemic November 2020 to March 2021, found that despite 38% ITN ownership at the time, ITN use was high among those with ITNs (84% reported using the night prior to the survey).[8]

ITN Campaign and Digitalization

To reinforce both ITN coverage and use, the Federal Ministry of Health (FMOH) and National Malaria Programs are distributing three million ITNs in 40 high-risk areas in 2025.

The 2025 ITN campaign in Somalia is designed to address previously noted challenges of data fragmentation from previous paper-based monitoring and monitoring of ITN distribution in fragile contexts. DHIS2 is now used for routine reporting of malaria cases as well as ITN Distribution for ANC. The country's health management information system (HMIS) used paper-based tools and database systems with inputs from various partners. This created significant difficulties for the FMOH in accessing and using data for planning and policymaking.

To overcome these issues, the FMOH, in collaboration with partners, decided to integrate health information systems into a single platform using the District Health Information System version 2 (DHIS2). DHIS2 is an open-source digital health platform that supports a wide range of use cases, including routine data collection, surveillance, and program tracking. A key feature of DHIS2 is its high configurability, allowing it to be tailored

2 International displacement monitoring center (2024). Country Profile, Somalia. Accessed August 24, 2025. https://www.internal-displacement.org/countries/somalia/#:~:text=An%20estimated%20316%2C000%20internal%20displacements,highest%20figures%20in%20the%20world

3 WHO News, Somalia's tangible progress on malaria, even in the face of new strains https://www.emro.who.int/somalia/news/somalias-tangible-progress-on-malaria-even-in-the-face-of-new-strains.html Accessed August 24, 2025

4 Machani, M. et al. (2025) Early-evening biting by Anopheles stephensi in Southern Ethiopia: A Challenge for Bed Net Use as Vector Control in Africa. bioRxiv. Pre-print. Accessed September 4, 2025. https://doi.org/10.1101/2025.08.25.672230.

5 National Malaria Control Programs, Federal Government and Member States (2020).

6 Health Information System Program (HISP)-Tanzania (2025). Digitizing Nets Distribution: A Basic DHIS2 Training. PowerPoint Slide deck.

7 Facility for Talo and Leadership (2025). Somalia Rolls Out 3 Million Anti-Malaria Nets to Protect Families. August 19, 2025.

8 Aweis A, Salad AA, Araye FA, Ahmed AM, Wehlie OA, Osman AA, et al. (2023) Long-lasting insecticidal nets (LLINs) use among household members for protection against mosquito bite in Mogadishu districts. *PLOS Glob Public Health* 3(3): e0000724. https://doi.org/10.1371/journal. pgph.0000724

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to specific needs, and its local ownership model, which ensures alignment with national policies. The FMOH is also using the Last Mile Monitoring application, which enables tracking of the movement of ITNs from the level of procurement to the district warehouses led by UNICEF country office. The digitalization of the 2025 ITN campaign is focusing on several key components:

- **Household Registration (HHR) and Data Collection:** ITN campaign personnel are using mobile applications and an Android platform to enter household information during registration and the number of ITNs given out during distribution. The system can collect beneficiary types, such as IDP, Village, Urban, and Rural, for more effective microplanning. Households are numbered and registered, and their data is digitalized.
- **Geospatial Tracking:** The system also maps where households have been registered, and where ITNs are distributed. As HHR and ITN distribution data are synchronized, this helps officials quickly identify and send ITNs to areas that might be missed or underserved.
- **Real-time Monitoring and Dashboards:** A dashboard allows for real-time monitoring of household registration and distribution information, providing a weekly situation report. This enables management and partners to review key steps, track geographical coverage, and identify any gaps in population coverage.
- **Offline Access:** The mobile application is designed to work in areas with no internet connectivity, allowing data to be entered offline and then synced once a connection becomes available.
- **Supply Chain and Stock Management:** The system helps track ITN stock in warehouses and distribution points to prevent shortages, and for accountability of ITNs during storage, transport, and distribution.

Challenges

While the digitalization of the campaign offered significant advantages, it also introduced specific challenges, particularly within Somalia's COE context.

- **Security and Insecurity:** HHR and ITN distribution staff and volunteers face security risks, including being robbed of their phones. In some areas, terrorist groups or gangs may demand money to allow distribution to proceed. Despite this, teams have successfully navigated these risks, for example through engagement of district commissions for security support.
- **Data Quality and Duplication:** The lack of a national identification system as well as similarity of some names which may be common across many individuals in Somalia creates a risk of people providing duplicate names or phone numbers to claim additional nets. The system aims to weed out the duplicate names through close collaboration and ongoing conversations with technical teams to understand the reality on the ground.
- **Logistical and Training Challenges:** The switch from paper-based systems to a digital platform also requires extensive training for teams who are not familiar with the new system. Due to funding constraints and donor instructions, much of the training and follow-up had to be done virtually, which was challenging. Continuous follow-up and support are needed for the teams to overcome issues.
- **Technical and Contextual Adaptation:** The contracted DHIS2 HISP team, based in Tanzania, cannot be familiar with some unique aspects of Somali context, particularly the nuances of different IDP populations (urban, rural, others). This necessitated numerous conversations to explain the different data points needed to accurately capture the situation on the ground.

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Outcomes and Achievements

The digitalization of the 2025 ITN campaign in Somalia has yielded several notable successes. These include:

- **Informed Decision-Making:** The use of the DHIS2 platform has greatly enhanced the ability to manage and analyses distribution data in real-time, leading to more informed decision-making and prompt action on the ground.
- **Improved Accountability and Transparency:** The system provides a live view of ITN distribution, ensuring that ITNs are reaching the right people and that the process is transparent to stakeholders, including the government, donors, and local communities. It also allows for spot checks of households using collected phone numbers to confirm visits and the number of ITNs received.
- **Enhanced Coverage and Follow-up:** The system helps identify areas where distribution is slow or insufficient, allowing for quick corrective action. It also enables follow-up with households that haven't received their ITNs.

Lessons Learned

Designing and operationalizing a new system

- **Importance of Local Context:** The campaign highlights the critical importance of having a deep understanding of the local context, particularly in a COE with highly mobile and diverse populations like IDPs and nomads. Continuous dialogue between the platform's technical development team and local implementers is essential to ensure the digital system meets the on-the-ground reality.
- **The Need for Integrated Systems:** The use of DHIS2 as a single, integrated platform led by the FMOH has proven effective in overcoming the data fragmentation caused by numerous partners using different systems. This approach reduces duplication and improves data quality and national ownership.
- **Human-Centered Support:** The campaign's success was heavily dependent on the dedication of local teams and leaders, such as the NMCP Coordinator, who provided continuous support and willingness to be on call day and night for troubleshooting. This "seek support anytime" policy instilled confidence in the partners.
- **Beyond Campaigns:** The digitalization of the ITN campaign has demonstrated the potential for using a digital platform for other public health initiatives in the future, such as logistics management information systems and routine vector surveillance.

The Somalia case study demonstrates that by addressing the challenges of designing and implementing a digital solution in COE settings, a configurable and adaptable platform is achievable, through commitment and continuous, on-the-ground support. The successes of both the ITN campaign and its digitalization offer a valuable blueprint for other countries operating in similar COE contexts.