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Success in Digitizing LLIN Mass Distribution Campaigns to Combat Malaria in Chad

The United Nations Development Programme (UNDP) works with Chad Ministry of Health in scaling a digital health solution for the mass distribution of long-lasting insecticidal mosquito nets (LLINs) to combat malaria. This case study was developed by the UNDP Digital Health for Development Hub in partnership with the Chad Country Office to promote exchange of knowledge and South-South collaboration on digital health. The case study provides valuable insights and learnings, serving as a resource to guide other UNDP country teams for working on national digital health initiatives.

Introduction

Chad has an estimated population of 17 million and consistently ranks as one of the poorest countries in the world, with a stagnant economy and insufficient human resources.¹ The health system is fragile and vulnerable to epidemics and outbreaks, making it difficult to progress towards achieving Sustainable Development Goal 3: good health and well-being.

Contributing to these public health concerns is a high malaria burden. Around two-thirds of the country's population live in high malaria transmission areas, and it is one of the leading causes of childhood mortality for children under age 5.^{2,3} In 2022, there were an estimated 1.7 million cases of malaria, including 2,700 deaths.⁴ In recognition of this, the National Health Policy 2016–2030 sets a goal of reducing malaria-related morbidity and mortality by at least 90 percent by 2030.⁵ To combat malaria, the National Malaria Control Programme works

closely with cross-sector partners to design and implement measures that strengthen health and community systems. These efforts include public awareness campaigns, the distribution of LLINs, community engagement, the provision of antimalarials, health worker training and other supportive activities. An LLIN is a bed net that individuals at risk of malaria sleep under, as it provides a physical and chemical barrier against mosquitos.⁶

Until 2020, the National Malaria Control Programme – in partnership with UNDP Chad and other partners – was planning and managing the mass distribution of LLIN campaigns using paper forms. This paper-based approach posed several challenges, including difficulties in tracking coverage, managing stock, ensuring data quality and addressing inconsistencies. Additionally, issues with data completeness and timely access to information were common, and archiving problems often led to forms being lost or unavailable for future review and analysis.

To optimize the mass distribution of LLINs and enable more data-driven decision-making, UNDP Chad proposed that the National Malaria Control Programme adopt a digital solution that could be used down to the household level for the 2023 LLIN distribution campaign. This approach built on the positive experiences and lessons learned from a 2022 seasonal chemoprevention campaign, where a digital tool – version 2 of the District Health Information System (DHIS2) – was successfully tested. The tool captured and shared field data to support the delivery of antimalarial medicine to children at high risk of severe malaria living in areas with seasonal transmission.⁷

Given the historical challenges the malaria programme experienced with paper-based distribution processes, the National Malaria Control Programme was motivated to digitize the 2023 mass distribution campaign and collaborated with UNDP Chad, the Global Fund Alliance for Malaria Prevention, the Against Malaria Foundation and other partners to undertake planning and implementation activities. The Global Fund partnered with UNDP Chad to provide funding for the planning and implementation of the digital solution, developing the capacity of national government leaders and strengthening policy and programme quality.

To support the digitization of the malaria mass distribution campaign, UNDP Chad worked with the Ministry of Health and partners in developing plans, coordinating stakeholders, hiring expert resources, building the capacity of end users, and implementing and scaling the digital solution.

Stakeholder coordination and staffing

The National Steering Committee led the planning and coordination of the 2023 LLIN distribution campaign and was supported by several subcommittees focused on key thematic areas. UNDP Chad led the Digitization Subcommittee to coordinate the effort with the National Malaria Control Programme, the Alliance for Malaria Prevention and the Against Malaria Foundation.

In addition to strong partner coordination, there was a critical need to build local technical capacity to support the planning, adoption and use of the digital solution. To facilitate this, UNDP Chad recruited national and international consultants to provide advisory support and assist with project planning and implementation activities. Through the National Malaria Control Programme, 25 district technicians were recruited to serve at the district level, providing on-the-ground support to end users with tablets, training and troubleshooting. These technicians also acted as liaisons between the field and the national-level stakeholders, relaying essential information. Additionally, the National Malaria Control Programme hired technical staff to further support the digitization efforts.

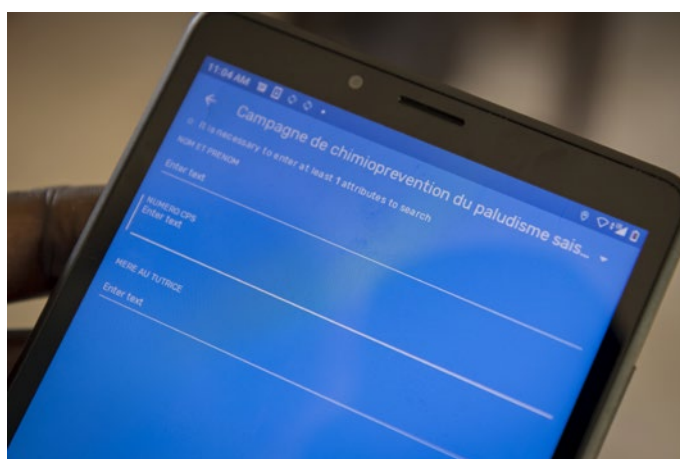
Planning and change management

To start planning for the digital solution, the UNDP Chad team conducted a desk review and then worked closely with stakeholders to define project objectives and success criteria. This process included reviewing the lessons learned from the 2022 seasonal chemoprevention campaign and identifying successes and challenges to inform the 2023 LLIN distribution campaign. Based on this analysis, the team developed an operational plan broken down into several phases. These phases included establishing a technical committee, hiring technical staff, purchasing hardware, training end users, piloting the solution, adjusting the plan based on pilot feedback and, finally, rolling out full implementation.

A key step in preparing for digitization was reviewing the existing workflows and paper forms to develop standard operating procedures. This iterative process involved engaging with stakeholders to validate and define each step of their business processes, including identifying key actors and outlining their roles and responsibilities. The standard operating procedures clearly mapped out the standardized steps, phases and workflows, specifying where and how the digital solution would be integrated into each phase in the mass distribution campaign.

As part of this effort, UNDP Chad supported the National Malaria Control Programme in digitizing five key paper forms used in the LLIN campaigns: the distribution count sheet, the stock sheet, the distribution summary sheet, the daily summary sheet and the reconciliation sheet. This process, led by UNDP Chad, laid the groundwork for establishing and prioritizing the technical requirements and informed the design of the digital solution.

To prepare end users for adopting the digital solution, UNDP Chad developed a comprehensive training plan and supporting materials, including job aids. The training began with ‘train-the-trainer’ sessions for central-level technical staff, covering micro and macro planning, campaign strategies and use of the new digital tools. This was followed by a series of provincial training sessions, which cascaded down to district management teams. These district teams were responsible for training the community actors, including enumerator/



distributor teams, community supervisors, site managers, storekeepers and mobilizers.

The training sessions emphasized counting, distribution and the practical use of the digital solution. At the request of the National Malaria Control Programme, the sessions focused on hands-on exercises and interactive question-and-answer games to ensure mastery of the counting sheet, tablet use and photographing delivery slips with the tablet in the field. Within each district, district technicians played a critical role in supporting end users as they implemented the digital solution. Additional support was provided through a WhatsApp group, which facilitated real-time communication and problem-solving.

“A critical element has been the engagement of the health technicians from the districts. They have been instrumental in supporting both community health workers and other health personnel, not only by resolving technical problems with smartphones but also by correcting the information that was collected by the community health workers.”

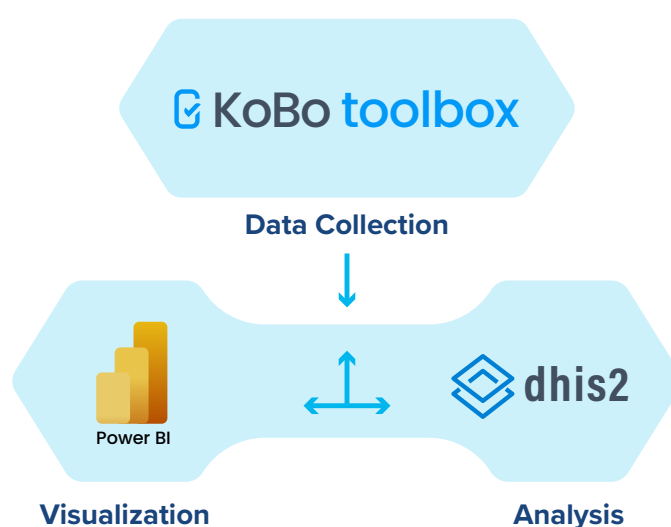
– **Abel Diomba Dobar, CDM Focal Point, National Malaria Control Programme, Ministry of Health, Chad**

Implementation and scaling

After assessing different digital systems and drawing on lessons from the 2022 seasonal chemoprevention campaign with DHIS2, the UNDP Chad team recommended a combination of KoboToolbox, DHIS2 and PowerBI. They then proceeded to design and implement this integrated solution for the Ministry of Health.^{8,9} The KoboToolbox system was designed for the collection of data by the end users at the household level and inventory management on an Android application. KoboToolbox was installed on Android tablets in preparation for use in the field during the campaign and provided for offline data collection

that could be synched with the server when the tablet was connected to the internet. Leveraging historical investments in the Ministry of Health’s national health information system, the DHIS2 system was included for data analysis and monitoring functionalities. In addition, the team used the PowerBI system to strengthen data analysis and visualization capabilities. All three digital solutions are cloud-based, eliminating the need for UNDP Chad to install in-house infrastructure for hosting servers and equipment. This significantly reduced the upfront costs of adoption. To ensure interoperability and exchange of data, the UNDP Chad team configured connections between the three systems to support the needs of campaigns.

Figure 1. Chad digital solution for mass distribution campaigns



To test the digital solution before full-scale implementation, the UNDP Chad conducted a pilot in the district of Massakory in Hadjer-Lamis province, involving 2,671 households. The pilot assessed system performance and end-user experience in data collection, form completion, supervision, workflow monitoring, data correction processes and the effectiveness of guides and communication resources. It also allowed for revisions to the stock sheet. Following the pilot, the UNDP Chad team brought together stakeholders from the district management team, central-level technical team and others to share their experiences, discuss challenges, propose solutions and explore further opportunities for improvement. A key finding was the importance of ensuring daily reporting from the district management team to the central level and having the central-level technical team monitor the campaign in real time by accessing data in KoboToolbox and PowerBI. The pilot provided valuable insights to refine the campaign plans and scale the digital solution.

“The pilot was crucial for identifying challenges and learning from the experience. Conducting it prior to the campaign was essential, allowing us to address those challenges and put plans in place for effective solutions.”

– **Aicha Mohamed Ali, Programme Monitoring and Evaluation Specialist, UNDP Chad**

UNDP Chad worked with the National Malaria Control Programme and partners in rolling out the LLIN distribution campaign province by province using the digital solution. The digital solution allowed stakeholders to access the KoboToolbox server to monitor field data collection and track the number of LLINs distributed via the stock management form. Local teams could access their respective district-specific data on the KoboToolbox server and view campaign data and dashboards in DHIS2. The national team had an overview of data collection and performance across all districts, with access to DHIS2 dashboards and the PowerBI system for generating visuals and assessing key indicators by province and district.

The digital solution played a critical role in ensuring a successful campaign, enabling stakeholders to access data, reports and visualizations in real-time to track progress and make informed decisions.

Key achievements of the use of the digital solution for the 2023 LLIN mass distribution campaign:



17 of the 23 provinces were supported with the distribution of mosquito bed nets.



Real-time access to LLIN stock data at all levels allowed staff to anticipate potential shortages and quickly respond with stock replenishments.



Over 3,500,000 households were counted and geolocated for the campaign.



Monitoring of dashboards and indicators in real time allowed **data-driven decision-making**.



Over 9,400,000 bed nets were distributed.



More **effective supervision** of actors engaged in enumeration (counting) and distribution activities.



An additional **150,000 bed nets** were provided to refugees fleeing Sudan.¹⁰

Key learnings

The adoption of a digital solution for the 2023 LLIN mass distribution campaign achieved significant successes by addressing administrative challenges, resolving human resources issues and improving coverage tracking and stock management. The experience also provided a valuable learning opportunity for UNDP Chad, the government and partners, highlighting both what worked well and the challenges that need to be addressed for success.

“The digitization allowed us to track the teams and where nets were distributed. In addition, we have been able to collect more information than initially planned, beyond the mass campaign. For example, household information that could be helpful for other health services.”

– Oumar Abdel-aziz Mahamat, Digitization Consultant, UNDP Chad

UNDP Chad’s experiences highlighted key promising approaches that contributed to the success of the digitization effort and can be replicated in other countries.

- ✓ **Expert technical resources:** As part of the planning process, the UNDP Chad team realized it was critical to consider the staffing model and the necessary skills and expertise to support the digitalization project. This led to the early recruitment of information technology interns, consultants and district technicians. Sufficient resources with specialist expertise were needed to successfully support the digitization process and aid end users.
- ✓ **Leveraging experiences and a pilot phase:** At the start of the project, the UNDP Chad team sought out learnings from other projects and worked to adapt their own approaches after the pilot phase to enable more successful and sustainable implementation. Learning from the 2022 seasonal chemoprevention campaign and the use of DHIS2 was a valuable input in shaping plans for the LLIN campaign. In addition, piloting the digital solution before scaling enabled the UNDP Chad team and partners to test the digital solution, identify issues and adjust before the full-scale implementation of the campaign. For example, during the pilot phase, it was observed that the stock form was too complex and needed to be simplified to ensure ease of use for end users on the tablet.

- ✓ **Robust end-user support:** UNDP Chad’s efforts to design multifaceted and easily accessible support to meet the needs of users on the ground in real-time were an important way to build trust and support the adoption of a digital solution. The combination of trainings, job aids and access to technical support staff proved effective in helping end users adopt and use the digital solution for the LLIN campaign. In particular, the creation of the WhatsApp group enabled real-time access to technical support staff to quickly resolve issues on the ground and maintain communications with health centre managers.
- ✓ **Collaborative digital solution design:** The UNDP Chad team worked closely with stakeholders through country-led governance committees to collaboratively design the digital solution to meet their collective needs and requirements. The combination of KoboToolbox, DHIS2 and PowerBI enabled stakeholders to preserve raw data in DHIS2 for integrity and archiving, while using PowerBI for data cleaning, analysis and reporting. Understanding stakeholder requirements and co-designing digital solutions with partners takes different perspectives, needs and priorities into consideration.

Key challenges

Several challenges were experienced during the implementation and scaling of the digital solution that the UNDP Chad team carefully navigated through successful mitigation strategies.

- 🚩 **Limited internet connectivity:** The UNDP Chad team faced infrastructure challenges in remote areas with limited internet connectivity, which affected communication with health facility managers and delayed the real-time synchronization of data collected. The use of offline data collection proved to be an important approach where there were internet connectivity limitations. When working in communities with limited or no connectivity, UNDP and other implementers must always consider alternative ways to collect and share data.
- 🚩 **End-user capacity gaps:** In some cases, the health centre managers and community health workers engaged in the 2023 LLIN distribution campaign required more support than originally anticipated to master the use of the tablets and collect data in the correct forms for submission. District health teams were not as engaged as expected; therefore, the district technicians were valuable resources providing extra support to the end users to help work through these challenges. It is essential for UNDP country teams to consider the readiness and capacity of end users, and design robust training and capacity-building plans to effectively meet those needs, from learning to use a device to the use of the actual digital solution.

Data quality issues: The UNDP Chad team adapted and improved the data collection forms during the early phases of the project, which posed a risk at sites where there was limited or no connectivity. The team had to work to manage version control and redeployment of updated forms. In addition, during the campaign the team noted discrepancies between register data and tablet data that required investigation. Over the course of the project, the UNDP Chad team used these experiences to improve their workflow processes to ensure alignment. It is critical to engage in workflow and process mapping early in a digitization project to understand end-user needs, identify opportunities for improvements and efficiencies, and develop data quality and assurance plans to monitor for and address issues.

Future plans

Building on the successes of the 2023 LLIN mass distribution campaign, the Ministry of Health intends to fully digitize future campaigns, including with the upcoming 2026 LLIN distribution, with continued support from UNDP Chad. To support these efforts, UNDP Chad will conduct a formal evaluation of the 2023 campaign to gather additional insights. It is already planning for increased resources and technical support to scale the initiative further.



¹ United Nations Children's Fund, 'Chad Country Office Annual Report 2023', UNICEF, N'Djamena, 2023, <https://www.unicef.org/media/152981/file/Chad-2023-COAR.pdf>.

² Malaria Consortium, 'Where We Work: Chad', Malaria Consortium, 2024, <https://www.malariaconsortium.org/where-we-work/chad.htm>.

³ Moukéné, A., Moudiné, K., Ngarasta, N. et al., Malaria infection and predictor factors among Chadian nomads' children, *BMC Public Health* 24 (2024), 918, <https://doi.org/10.1186/s12889-024-18454-5>.

⁴ United Nations Development Programme, 'Safe from conflict and malaria', UNDP, 9 January 2024, <https://www.undp.org/stories/safe-conflict-and-malaria>.

⁵ Malaria Consortium, 'Chad Country Strategy 2021-2025', Malaria Consortium, N'Djamena, 2021, <https://www.malariaconsortium.org/gallery-file/01090145-64/chadcountrystrategy.pdf>.

⁶ United Nations Children's Fund, 'Fighting malaria with long-lasting insecticidal nets (LLINs)', UNICEF, 5 February 2022, <https://www.unicef.org/supply/stories/fighting-malaria-long-lasting-insecticidal-nets-llins>.

⁷ For additional information on DHIS2, see <https://dhis2.org/>.

⁸ For additional information on KoboToolbox, see <https://www.kobotoolbox.org/>.

⁹ For additional information on PowerBI, see <https://www.microsoft.com/en-us/power-platform/products/power-bi>.

¹⁰ United Nations Development Programme, 'Safe from conflict and malaria', UNDP, 9 January 2024, <https://www.undp.org/stories/safe-conflict-and-malaria>.

UNDP's work on digital health for development contributes to the [Pact for the Future](#) and accelerating progress on the Sustainable Development Goals and the pledge to leave no one in behind. The [UNDP Digital Health for Development Hub](#) is a one-stop shop with technical, advisory and partnership support for the introduction and scale up of digital and AI for health as part of its HIV and Health Strategy 2022-25. UNDP is working across 89 countries to identify, adapt and scale up appropriate digital and AI solutions that strengthen health systems and improve health outcomes. The Hub focuses on strengthening policies, capacities and institutions in line with the [UN Global Digital Compact](#) and WHO guidance. The Hub also supports knowledge and learning on digital health for development and AI for health across its network of Country Offices, regional hubs and global teams.

Get in touch

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