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Digital transformation of campaign delivery: Costs and efficiency insights from Mozambique's seasonal malaria chemoprevention programme

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Background and context

The story

- In Mozambique, malaria incidence increased by 19.5 percent from 2021 to 2023, with a prevalence of 32 percent in children under five.
- SMC is a preventive strategy for children under five in regions where malaria transmission is seasonal. It involves administering curative doses of antimalarial medicines at monthly intervals during the high-risk season.
- In Mozambique, over two million children are protected annually through SMC.
- SMC is delivered at community level through door-to-door campaigns.
- In 2023/24, we went digital, transforming how campaigns are planned, delivered and monitored in real-time.

Year 1

November 2020 – February 2021

- Two districts in Nampula province
- Pilot acceptability and feasibility

Year 2

January – April 2022

- Districts from year 1, plus two additional districts
- Pilot impact evaluation

Year 3

January – April 2023

- Scaling up implementation to all 23 districts of Nampula province

Year 4

February – May 2024

- SMC has now been scaled up to four provinces in northern Mozambique
 - SMC digitalised campaign.
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Background: The digital solution — SALAMA

Why use SALAMA

- Limitations of traditional paper-based campaigns
- Progress in digitalisation of SMC campaigns part of a broader vision for integrated campaign digitalisation in Mozambique
- Mozambique National Malaria Control Programme (NMCP) has shown strong leadership in exploring how health campaigns can be strengthened using digital tools
- SALAMA already being used in Mozambique for other health campaign digitalisation before SMC.

What SALAMA digitalises

- Household registration
- Drug distribution and stock management
- Referrals and adverse event reporting
- Supervision workflows
- Online/offline mobile data collection that captures real-time data on the number of children reached
- Real-time dashboards for progress tracking, coverage monitoring and targeted supervision.



The mobile application interface shows a form for 'Agregado Familiar' (Family Group). It includes fields for 'Nome do chefe do agregado familiar' (Name of the head of the family group), 'Unidade Organizacional' (Organizational Unit), and 'Contagem dos membros' (Number of members). Below this, there are two family members listed: 'Joseph Carlos' (Male, 20 years 0 months) and 'Joao Carlos Carlos' (Male, 19 years 6 months). The interface also features a 'Detalhe de administração' (Administration details) section with a dropdown for 'Tipo de SPAQ administrado*' (Type of SPAQ administered*) and a 'Comentário da entrega' (Delivery comment) field. At the bottom, there are buttons for 'Entregar SPAQ' (Deliver SPAQ), 'Incapaz de entregar?' (Unable to deliver?), and 'Submeter' (Submit).

Example of SALAMA application and dashboard

A group of diverse people, including men and women of various ages, are gathered in a room. The background wall is made of a light-colored material with a grid of small square openings, through which bright light is streaming. A woman in the center stands out, wearing a vibrant red headwrap and a red dress with a black and white geometric pattern. Other individuals are dressed in casual to semi-formal attire. The overall atmosphere appears to be one of a community meeting or a public health intervention.

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What we evaluated and how

Study objectives

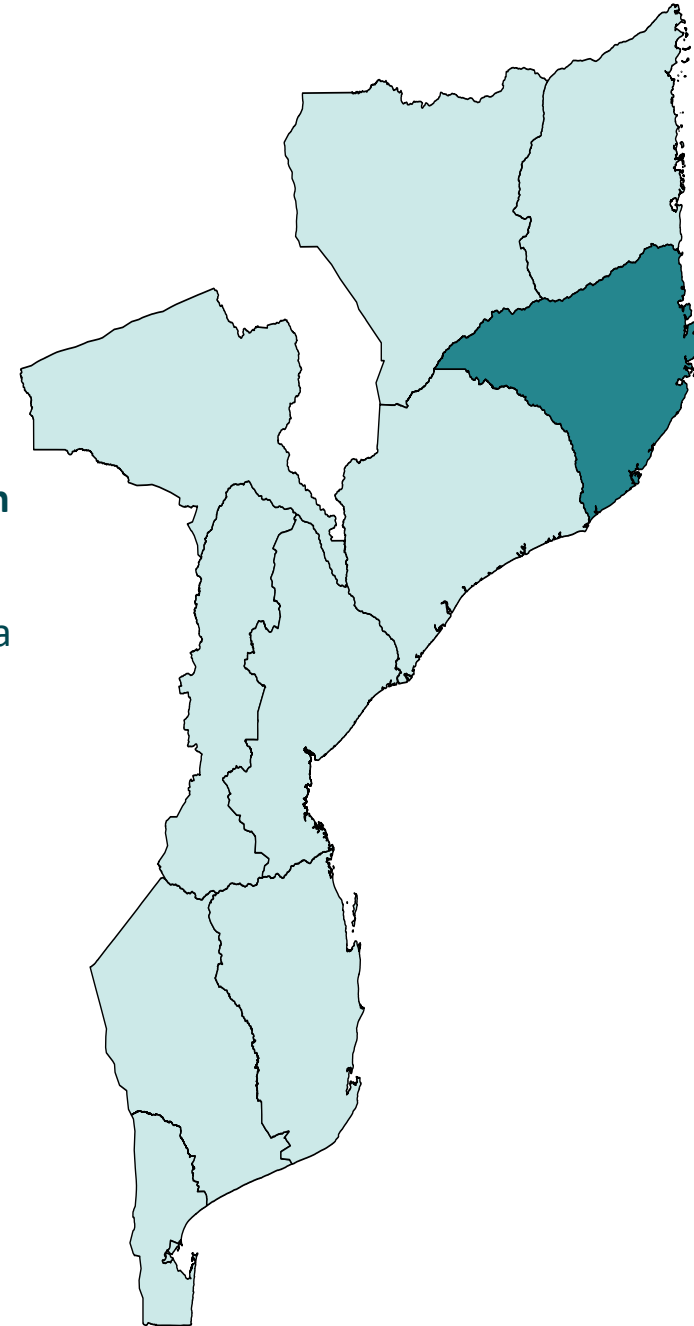
To evaluate the economic implications of Mozambique's large-scale transition from paper-based to digital SMC delivery in Nampula province

- Quantify **incremental costs** of digitalisation
- Assess **operational efficiency gains** (i.e. through personnel time savings)
- Model **future scenarios** and potential cost savings
- Provide decision-relevant evidence for sustainable digital transformation.

Methods: Overview

- **Methods:** Overview
 - Design: Mixed-methods economic evaluation
Setting: Nampula Province, Mozambique
- **Approach:**
 - Compared **paper-based delivery (2022/23)** vs **digital delivery (2023/24)**
 - Used **previous full economic evaluation** as baseline → focus on **incremental digitalisation costs only**
 - Projected **future (year 2+) costs** under multiple optimisation scenarios
 - Estimated incremental costs using an **ingredients-based programmatic approach** (financial economic costs)
 - Assessed operational benefits by comparing **digital vs paper workflows**, estimating **time saved** and converting into **person-days saved + economic value of efficiency gains**.
- **Data sources:**
 - Financial records, partner reports, KIIs, FGDs
- **Perspective:**
 - Programmatic, incremental digitalisation costs only
- **Ethics:**
 - Approved by Mozambique National Bioethics Committee.

¹Canana et al. 2025 *Seasonal malaria chemoprevention in northern Mozambique: a cost-effectiveness analysis (Malar J)*





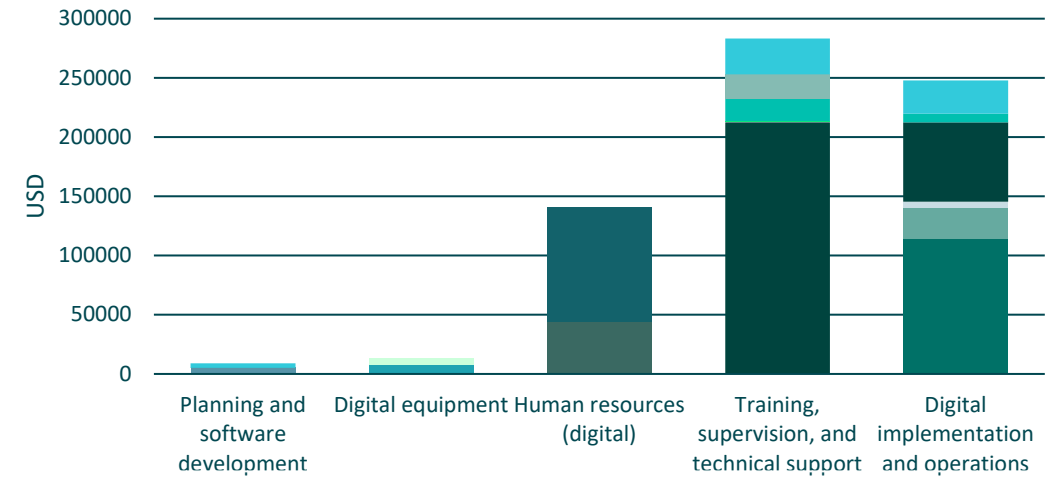
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Key results

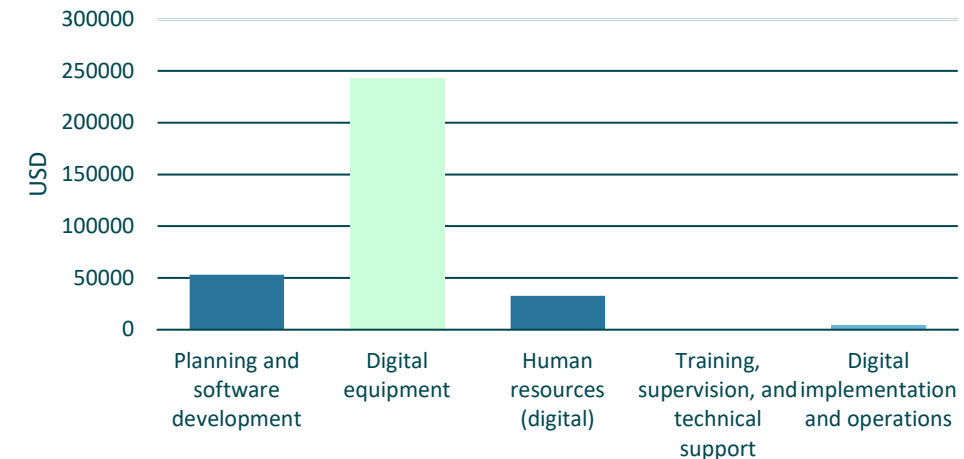
Costs by category

- Training/supervision and personnel costs drive most costs in the first year of digitalisation in Nampula (2023/24).
- Economic costs highlight the value of existing mobile devices and IT infrastructure.

Financial costs (2024)



Economic costs (2024)



- Connectivity (SIMs and data)
- IT/cloud infrastructure
- Per diems
- Staff time (opportunity cost)
- Travel, national
- Device transportation
- Mobile devices
- Salaries (device assistants)
- Training materials
- Vehicle and fuel costs
- Salaries (partner digital staff)
- Travel, international
- Venue and catering
- Office utilities and rent

Total incremental costs of digitalising SMC in 2023/2024

- Digitalisation increased year 1 costs modestly (8–13%)

	Total, US\$	Financial, US\$	Economic, US\$
Total incremental cost	1,013,330	680,348 (67%)	332,982 (33%)
Incremental cost per targeted child	0.68	0.46	0.22
Incremental cost per child treated	0.66	0.45	0.22

Incremental costs of digital SMC delivery relative to 2022/2023 full SMC costs¹

	2022/2023 costs (2024 US\$) ¹	% increase, total	% increase, financial
Total cost to deliver SMC	8,103,523	13%	8%
Cost per targeted child	6.23	11%	7%
Cost per child treated	8.08	8%	6%

¹2022/23 findings from Canana et al. 2025 inflated to 2024 US\$

Results: Time savings impact

- Digitalisation generated substantial operational efficiencies, resulting in an estimated 37,450 person-days saved—valued at approximately US\$ 237,000

Cadre (n)	Key activities impacted by digitalisation	Estimated time saved per individual	Person-days saved	Economic value (US\$)
Community distributors (11,600)	<ul style="list-style-type: none"> • Digital household registration • Dosage determination and drug administration recording • End-of-day data summary 	2–3 hours per administration day*	33,143 (19,886–49,714)	179,800 (107,880–269,700)
Community distributor supervisors (975)	<ul style="list-style-type: none"> • Automated data aggregation and reporting • Performance monitoring and targeted supervision 	5–6 hours per cycle	3,064 (2,786–3,900)	37,997 (34,543–48,360)
District, provincial and national supervisors (295)	<ul style="list-style-type: none"> • Automated reporting • Real-time data and dashboards on coverage gaps and anomalies • Performance monitoring and targeted supervision 	4–5 hours per cycle	759 (674–843)	11,758 (10,451–13,064)
SMC data managers (242 facilities)	<ul style="list-style-type: none"> • No manual data entry • Reduced data cleaning and validation checks • Automated reporting 	3.5 hours per cycle	484 (415–553)	7,502 (6,430–8,574)
Total:			37,450 (23,761–55,010)	237,057 (159,305–339,698)

*For community distributors, a 50% conservative factor was applied to account for variability across staff and location.

Results: Future year scenarios

- Digital delivery becomes less costly in future years under most scenarios.

Scenario	Description	Total incremental cost, US\$	Incremental cost per child treated, US\$ (financial only)
Base case	Full digital rollout in Nampula, efficiencies as in 2023/24	720,218	0.47 (0.28)
Digital efficiency only	Further digital workflow, training and supervision optimisation	531,115	0.35 (0.17)
Programme-wide optimisation	Digital efficiencies and broader SMC delivery improvements (e.g. targeted supervision, data-driven planning)	124,260	0.08 (-0.10)
Worst case	Digital rollout without efficiency gains; high support costs due to weak capacity, connectivity or logistics	1,110,622	0.73 (0.39)
Multi-campaign use	Platform shared across provinces; costs spread (figures for Nampula only)	502,957	0.33 (0.29)
Device purchase (One campaign life)	All devices bought new and used for a single campaign only	1,448,892	0.95 (0.92)

Results: Summary of qualitative findings

- What participants told us:

Benefits

Theme	Description
Real-time data use, adaptive supervision	<ul style="list-style-type: none"> • Enables close monitoring of campaign delivery and team performance leading to targeted corrective action/supervision • Allows rapid communication and issue response • Improves delivery in remote areas
Improved data quality and verification	<ul style="list-style-type: none"> • Improves accuracy through real-time entry, error prevention and standardised supervision • Reduces opportunities for data falsification
Operational efficiency	<ul style="list-style-type: none"> • Reduces data entry time and paperwork • Automates recall of household records
Data security and preservation	<ul style="list-style-type: none"> • Protects against data loss and prevents damage associated with paper-based systems • Enables long-term access to campaign data
Capacity building and staff motivation	<ul style="list-style-type: none"> • Improves digital literacy and confidence, supporting broader health system strengthening • Creates local trainers • Improves motivation and team morale
Other	<ul style="list-style-type: none"> • Increases community trust • Improves transparency and reduces disputes during implementation

Challenges

Theme	Description
Connectivity constraints	<ul style="list-style-type: none"> • Poor or variable internet access, especially in rural areas, delayed data synchronisation and real-time functions
Device issues	<ul style="list-style-type: none"> • Devices freezing, battery life and challenges charging in remote areas increase operational difficulties
Software/platform challenges	<ul style="list-style-type: none"> • Usability issues (e.g. login failures, software bugs) • Need for platform updates • Some challenges with data visualisation and analysis
Emerging data quality challenges	<ul style="list-style-type: none"> • Some data fabrication to fill gaps • Risk of data loss during system interruptions • Digital validations not always foolproof
Learning curve and variable technical literacy	<ul style="list-style-type: none"> • Slow initial adoption due to varying digital skills and short training periods
Resistance to change and performance pressure	<ul style="list-style-type: none"> • Initial scepticism and discomfort with changing processes and increased monitoring/performance feedback • Time pressure
Other	<ul style="list-style-type: none"> • Potential increases in admin workload for supervisors • Occasional suspicion or mistrust of devices by community members

Results: What national stakeholders told us

- *“With the real-time dashboard, we could see progress immediately and redirect teams.”*
- *“Data now comes through faster, and decisions get made quicker.”*
- *“Digitalisation helped us gain new skills with tablets and apps.”*
- *“Teams are more motivated; the system brings a sense of modernity.”*
- *“It’s easier to track who is doing what, increasing transparency.”*

Conclusion

Digitalising Mozambique's SMC campaign improved efficiency and data use at scale, showing that early digital investments, though slightly more costly at first, generate substantial time savings and pave the way for more sustainable, data-driven malaria control.

Study Limitation

- The study did not explicitly measure cost-benefits related to data quality or data use.
- Qualitative findings offer insights but do not quantify improvements in data quality, reporting or timely decision-making.
- This remains an important evidence gap, and future research should assess the extent to which digitalisation improves data quality and data-driven decision-making.

Key messages

- Digitalisation increased year 1 costs by ~8–11 percent, but generated major operational gains, including ~37,450 person-days saved, demonstrating strong potential for long-term efficiency.
- Digital systems strengthen accountability, data visibility and supervision, enabling faster decisions and better planning.
- While health outcomes and data quality improvements were not assessed, evidence suggests digitalisation can support more sustainable and efficient campaign delivery.
- Future optimisation could reduce costs further, with scenarios showing that digital delivery may approach cost-neutrality over time.

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Thank you

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