UNDERSTANDING THE COLD CHAIN MAINTENANCE SYSTEM IN NIGER

Using a human-centered design approach to improve cold chain maintenance

MOMENTUM Routine Immunization Transformation and Equity

APRIL 2024

MOMENTUM works alongside governments, local and international private and civil society organizations, and other stakeholders to accelerate improvements in maternal, newborn, and child health services. Building on existing evidence and experience implementing global health programs and interventions, we help foster new ideas, partnerships, and approaches and strengthen the resiliency of health systems.

MOMENTUM Routine Immunization Transformation and Equity is funded by the U.S. Agency for International Development (USAID) as part of the MOMENTUM suite of awards and implemented by JSI Research & Training Institute, Inc. with partners PATH, Accenture Development Partnerships, Results for Development, and CORE Group under USAID cooperative agreement #7200AA20CA00017. For more information about MOMENTUM, visit USAIDMomentum.org. The contents of this report are the sole responsibility of JSI Research and Training Institute, Inc. and do not necessarily reflect the views of USAID or the United States Government.

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Suggested Citation
MOMENTUM. *Understanding the cold chain maintenance system in Niger: Using a human-centered design approach to improve cold chain maintenance*. 2024. Washington, DC: USAID MOMENTUM.

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ACKNOWLEDGEMENTS

The project greatly appreciates the time, ideas, and contributions from all who participated in the in-depth interviews and co-creation workshop. We especially thank the Ministry of Health and the Directorate of Immunization for helping us explore ways to strengthen the cold chain maintenance system.

PROJECT CONTEXT AND INTENT

MOMENTUM Routine Immunization Transformation and Equity (the project) applies best practices and explores innovations to increase equitable immunization coverage in USAID-supported countries. The project is USAID's flagship technical assistance mechanism for immunization and is active in 12 and has supported over 18 countries. It works to build countries' capacity to identify and overcome barriers to reaching zero-dose and under-immunized children and older populations with life-saving vaccines and other integrated health services, including rebuilding immunization systems adversely affected by the pandemic. It also supports COVID-19 vaccine rollout across countries with a wide range of circumstances and needs.

As immunization programs expand with the introduction of new vaccines and technologies, the role of the supply chain and cold chain equipment (CCE) to ensure the quality and availability of vaccines when and where they are needed has become more critical. Although maintenance is important to ensure CCE performance, maintenance systems (which encompass preventive and corrective) are often slow to respond, underfunded, and maintenance is often not conducted.

In Niger, the health system has four levels: national, regional, departmental, and facility. While CCE maintenance is ultimately the responsibility of SERMEX, the government entity for maintaining all health equipment, many other government staff are also involved. At a health facility, preventive maintenance is typically done by staff involved in immunization; at higher-level storage points, it is typically done by the logistics team. Corrective maintenance is performed when equipment fails, shows signs of failure, or requires replacing parts, and typically done by a cold chain maintenance technician (TPM).

CCE preventive maintenance involves cleaning equipment regularly, defrosting as necessary, and responding to temperature excursions. It also involves recording temperatures on paper charts twice a day. In addition to paper charts, Niger uses remote temperature monitoring devices across regions and districts. These devices transmit data to a dashboard and generate SMS alerts in the event of a temperature excursion. At the facility level, temperature loggers are frequently used, requiring manual downloading for report generation.

The project, the Ministry of Health (MOH), and the Directorate of Immunization (DI) conducted a human-centered design (HCD) activity to delve into challenges within Niger's cold chain maintenance system, considering the perspectives of various stakeholders. The project aimed to uncover ways to improve the system by maximizing stakeholder strengths and fine-tuning procedures and guidance for cold chain operations.

PROJECT OVERVIEW AND APPROACH

The project had the following objectives:

1. **UNDERSTAND OBSTACLES TO A RELIABLE AND FUNCTIONING COLD CHAIN MAINTENANCE SYSTEM**. Understand the current and potential barriers that EPI managers, supply chain logisticians, and TPM face at national and sub-national levels.
2. **DESIGN A FUNCTIONAL CCE MAINTENANCE SYSTEM**. Co-create with stakeholders ways to improve the national CCE maintenance system.

HCD improves products, services, and systems by considering end-users' perspective from beginning to end, and was central to our methodology. The team conducted extensive research, including in-depth interviews with national, regional, district, and health facility stakeholders and partners involved in CCE maintenance. In addition to interviews, the project conducted a participatory co-creation design workshop to develop solutions to some challenges identified

in the research phase. By placing end-users at the core of the design process, we hope to develop solutions tailored to their needs with the expectation that these solutions would ensure greater effectiveness and usability.

QUALITATIVE DATA COLLECTION OVERVIEW

After receiving approval from the DI to commence the project, the project collected data for two weeks in January and February 2023. Data collection covered Niger's Tahoua and Maradi regions, with representatives from the departmental and health facility levels (Table 1).* The project used data collection guides containing a series of open-ended questions and probes to understand CCE maintenance system challenges and barriers.

TABLE 1. KEY STAKEHOLDERS INTERVIEWED, BY LEVEL

Participants	Tahoua	Maradi
TPM (national/regional/departmental)	1	2
SERMEX (national/regional/departmental)	1	1
Regional immunization coordinator	1	1
Departmental immunization coordinator (district)	2	2
Chief of Financial Affairs Department (regional)	1	1
Financial manager (district)	2	1
Health facility in-charge	2	2
TOTAL	**10**	**10**

* UNICEF participated in report-back sessions during co-creation. KIIs focused on insights from technicians.

FINDINGS AND INSIGHTS

Data synthesis revealed three primary themes within the CCE maintenance system, accompanied by various insights for each.

TABLE 2. CCE MAINTENANCE SYSTEM THEMES AND INSIGHTS

Theme	Insight
Agility of system and optimization of available resources	1. Dependence on external partners to conduct cold chain maintenance creates a system that is rigid and unable to respond quickly or efficiently to maintenance needs.
	2. Ad hoc unstructured communication between key actors involved in the cold chain maintenance system is a barrier to its agility. Interviewees said that when faced with CCE problems, they were often unsure who to ask for help.
	3. Temperature data are collected daily, but the absence of clear guidelines on how to use them for informed and strategic decisions limits optimization of financial and human resources.
Prioritization of cold chain	4. Many interviewees working at the departmental and/or facility levels said that partner contributions were too concentrated at national and regional levels.
	5. CCE management and maintenance is not seen as an independent priority of the health system: it is an "add-on" to larger immunization service delivery training and falls short of the details and nuance required for proper training. All staff need cold chain-specific trainings and accessible information.
Knowledge sharing and training needs across the system	6. National decision makers and cold chain staff have different expectations about knowledge sharing and training. TPMs say that they do not receive enough tailored or detailed training and must figure out repairs themselves. Cold chain staff prefer training that focuses on specific aspects of maintenance and guidance on repairing and replacing spare parts for the various cold chain models within the system.
	7. Limited understanding of roles and responsibilities and the link between respective roles stymie information sharing and overuses human resources.

CO-CREATION

Co-creation starts with identifying challenges. However, framing challenges as negative statements can stifle imagination. Instead, designers convert problems into design challenges by asking "how might we" questions. Once participants prioritize design challenges, ideation begins.

Ideas that meet needs include different ways of solving a problem and align with the context in which they would be adopted are prioritized for concept development. A concept is an idea that details the way it is foreseen in a tangible reality. It answers the questions: *What, how, when, and who?*

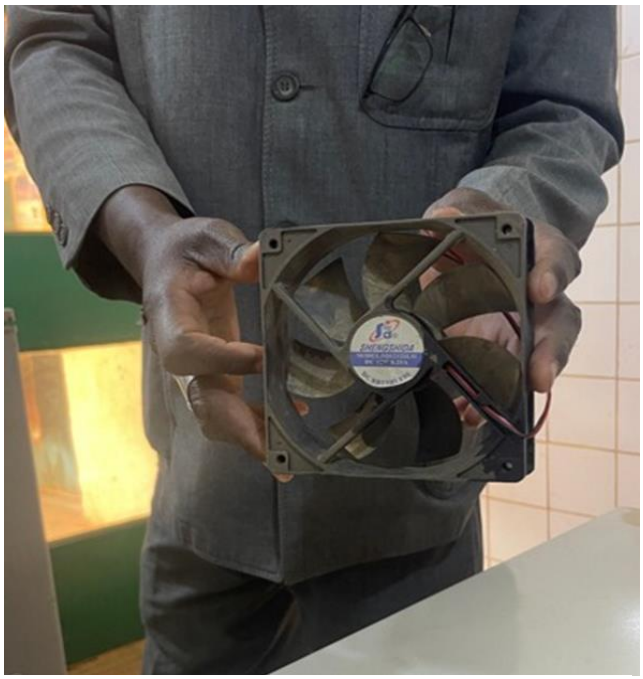
A two-day co-creation workshop facilitated by HCD experts was held in March, 2023 for people who had been interviewed. The workshop was extended another half-day, welcoming the national EPI manager, supply chain team, technical partners from UNICEF and WHO, and funders such as Gavi and USAID. This extended session aimed to validate the insights and potential solutions identified during the co-creation workshop.

Participants identified four main concepts to be developed and expanded upon in the next phase of this project.

CONCEPT 1. ONLINE PLATFORM

This concept proposed the creation of an online platform to connect cold chain technicians and others involved in CCE management and maintenance. The platform would have:

- Individual profiles where people can upload content and communicate with each other.
- Discussion forums.
- Instructional video library.
- Frequently asked questions and a link to contacts for further questions.



The platform would allow people to gather information in one place, ensuring not only good documentation but a more agile and individualized approach to accessing resources, whether content or people. It would facilitate engagement and motivation to collect and share information.

This concept is linked to insights 1, 2, and 3; related to the ad hoc and unstructured communication and slowness of responding to maintenance issues. More advanced than and WhatsApp group, this platform would have enhanced capabilities for managing and sharing technical resources.

CONCEPT 2. BAYREY

Bayrey is a local word for "knowledge." In this concept, participants proposed different formats for technical resources on cold chain maintenance best practices, challenges, and knowledge. These resources and trainings would cover use of equipment, solve preventive and corrective maintenance, and create an opportunity to update CCE maintenance knowledge.

Participants identified three formats and purposes for the bayrey concept:

- *Physical material:* Printed materials would be used daily to help people maintain CCE (e.g., checklist with frequency and activities, dos and don'ts, visual representation of how to do maintenance). Materials developed should be highly visual and in line with primary gaps noted by CCE users, for example, a simple graphic of CCE that should be checked during preventive maintenance. Materials would be tailored to the technical needs of the staff, including different local languages.
- *Videos*: Videos are a more interactive way to share knowledge and could be created based on new equipment, technologies, and challenges that equipment maintainers face. This is linked to Concept 1, as short videos could be shared and stored on the online platform. Ideally, these videos would be developed by various stakeholders, such as the TPM demonstrating preventive maintenance and the district immunization coordinator showing how to read, understand, and use temperature data.
- *Training*: Training is necessary whenever new people or equipment arrive. A training manual with theoretical and practical knowledge and activities on maintenance would help ensure that knowledge is passed along and people have confidence to do their jobs. Ideas discussed included combining training formats such as buddy systems, videos, and physical resources to accommodate all needs; and organizing trainings led by locals with internal knowledge instead of waiting for national trainings.

This concept responds to insights 1, 5, 6, 7; identifying slow response of the maintenance system, gaps in knowledge sharing and training, and the convoluted roles and responsibilities across CCE maintenance stakeholders.

CONCEPT 3. REGIONAL MAINTENANCE SUPERSTAR

This concept explores the use of games and friendly competition to motivate health system staff to value and conduct maintenance. These competitions can be offline and/or online (using the same online platform designed under Concept 1). Specific ideas included:

- *Weekly challenges:* Weekly challenges can be held in each district or region using quizzes, creating videos, collecting temperature data, or completing a task checklist. All challenges should be tied to preventive maintenance and specific facility-level tasks. Staff scores could be shown on a dashboard with weekly winners.
- *Offline events*: At the end of the year, everyone involved in CCE maintenance would be invited to an event to nominate a regional 'maintenance superstar.' Those chosen could become points of contact for others struggling and create videos or tools to help.

An important aspect of the competition would be bringing it to the online platform to make it more accessible, interactive, and competitive. Extra challenges such as "help a buddy" or "upload a content video" could promote an increase in platform use.

This concept is related to Insight 3; the use of temperature data by providing a system that supports collecting, sharing, and using data to make the process easier. It is also related to Insight 7 as an opportunity to increase understanding of each individual's responsibilities. The competitive aspect of this concept could strengthen ties and motivate individuals to remain committed to the data collected.

CONCEPT 4. REAL-TIME TRACKING SYSTEM

This concept involves giving tablets equipped with reminder system to people who are responsible for maintenance. Reminders would be set to a particular days or months, prompting staff to perform tasks such as collecting temperature data, cleaning CCE, and removing dust. Visual guides on how to conduct these tasks could be integrated into the tablet's interface. Additionally, the reminder system would allow remote tracking of tasks, facilitating confirmation of their completion. This real-time tracking system would help ensure that CCE maintenance activities and tasks are performed on time.

This concept is linked to Insight 1, presenting an opportunity to create a more reactive and responsive maintenance system. It involves tools that are familiar to staff to create a user-friendly solution to a common problem. Tablets offer the advantage of integrating various functionalities such as a camera, instructional videos, and an alarm.

NEXT STEPS

This project revealed underlying causes of known challenges to the CCE maintenance system in Niger that were not previously well understood. Importantly, the collaboration of cold chain technicians, supply chain managers, and partners led to the co-design of innovative, tailored, and responsive potential solutions to CCE management and maintenance challenges.

The next step will be to test low-fidelity prototypes of these potential solutions, which the DI will support when funding is available. After the prototyping phase, priority concepts can be further developed, implemented, and revised as needed.