

"If it's not cold, it's not sold": Leveraging a private sector service network to improve cold chain uptime and vaccine availability in Lagos, Nigeria

Adeola Ayedun¹, Sarah Christie¹, Rudi Lensley², Rushika Shekhar², Katherine LaMonaca¹, Emily Cherlin¹, Erika Linnander¹

1. Global Health Leadership Initiative (GHLI), Yale School of Public Health, USA, 2. Project Last Mile, Lagos, Nigeria



Project Last Mile

Yale Global Health Leadership Initiative

Background

Nigeria faces challenges maintaining cold chain equipment (CCE), limiting safe storage and availability of vaccines. With a high under-five mortality rate (120 per 1000 live births), over 866,000 deaths in the under-five population in 2019, and low vaccine coverage rates compared to peer countries, maintaining CCE to ensure effectiveness of vaccines is of critical importance.

Project Last Mile (PLM) is a global health partnership that leverages the logistics and distribution expertise of The Coca-Cola Company (TCCC) to improve availability of life-saving medicines in Africa. PLM works directly with local health departments, sharing technical knowledge from the Coca-Cola system with the public sector to address country-specific priorities with context driven solutions. Since 2010, PLM has been active in 10 African countries.

PLM in Nigeria

Since 2016, PLM has partnered with Nigeria's National Primary Healthcare Development Agency (NPHCDA), the Lagos State Primary Health Care Board (PHCB), the Clinton Health Access Initiative (CHAI), the Nigerian Bottling Company (NBC) and Frigoglass (a local cold chain service provider for NBC) to improve availability of vaccines by strengthening public sector CCE capacity. In early activity, PLM supported training for CCE technicians using a curriculum adapted from NBC. This resulted in capacity building for:

- 8 NPHCDA engineers in the six geopolitical zones in Nigeria
- 121 technicians via trained NPHCDA engineers

As NBC's sole service provider, Frigoglass contributed valuable technical knowledge and resources, amassed from their maintenance of 77,000 refrigeration units throughout Nigeria, resulting in 99.5% uptime. This included:

- 5 service centers strategically positioned throughout the country (Map 1)
- Team of 44 skilled technicians, 26 service vehicles
- \$1,111,000 in spare parts holding
- Guaranteed servicing within 24-48 hrs, through dedicated hotline

From February to August 2019, PLM piloted an outsourced CCE maintenance and repair model in 15/20 local government areas (LGAs) in Lagos State, contracting with Frigoglass (Map 2). For this pilot, they allocated 2 vehicles with drivers, parts, and 4 technicians to provide CCE services (Figure 1).

Methods

GHLI serves as the monitoring and evaluation (M&E) partner for PLM.

GHLI uses mixed-methods to track quantitative data to identify changes in key performance indicators (inputs, outputs, outcomes and impact) as well as qualitative data from stakeholder interviews to learn about strengths, challenges, and lessons learned.

In October 2019, GHLI conducted a field visit in Lagos State to learn about PLM's work in Nigeria and identify the successes and challenges of this public-private partnership. The team used a purposive sampling approach with snowball sampling to identify key informants. The team conducted 12 interviews (Figure 2); 4 researchers iteratively coded interviews and thematically analyzed data using Atlas.ti 8.

Results

At the start of the pilot, PLM and Frigoglass assessed 362 CCE units across Lagos State, revealing 124 (34%) units were non-functional. By the end of the 6-month pilot, PLM and Frigoglass technicians had returned 134 non-functional units to service and provided preventative maintenance for 359 CCE (99% coverage). See Figure 3.

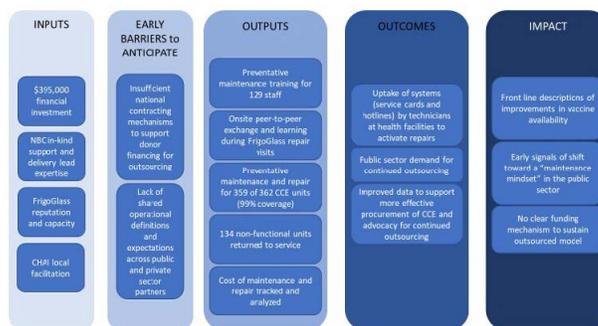


Figure 3. Results of mixed-methods evaluation of PLM in Nigeria

Qualitative findings reveal key takeaways:

1. Frigoglass was uniquely qualified to provide specialized expertise in CCE maintenance as a highly-resourced outsourced provider with a vast service network, through NBC.
2. Stakeholders described a direct link between pilot activities (repairs and maintenance) and vaccine availability - ability to administer vaccines improved as a result of readily available vaccines in CCE.
3. Cold chain officers valued the opportunity to observe Frigoglass technicians at the front lines and learn about CCE maintenance. Frigoglass demonstrated CCE could remain functional through regular maintenance.
4. Stakeholders began to describe a shift towards a "maintenance mindset" among public sector officials.
5. Public sector supports ongoing outsourced CCE maintenance as a viable mechanism for improving CCE uptime.

Based on pilot results, PLM projected the annual cost of maintenance and repairs for 500 CCE units without warranty across Lagos State to be ~\$24,000 (assuming average equipment failure rate of 37% as seen in pilot). Outsourced maintenance will cost ~\$5,000 for annual preventative maintenance for 500 units with warranty, far below the cost of replacing non-functional CCE.

Discussion

The value of utilizing Coca-Cola's service network is a key learning from this pilot, demonstrating how private sector assets (accumulated skills, infrastructure and suppliers) can be leveraged for public good. Cost projections indicate outsourced maintenance may be a sustainable, cost-effective, and context-appropriate approach for Nigeria to maintain functional CCE units. Further, public-private partnerships may be uniquely positioned to broker effective models for outsourced maintenance in settings where weak CCE infrastructure prevents adequate immunization coverage.



Map 1. Frigoglass Service Centers across Nigeria



Map 2. PLM Pilot Area

Illustrative quotes from stakeholders

"The success is that equipment were fixed and functional, so that translates to more vaccines being stored at the facility, which translates to more children getting immunized. That is the success of the pilot."
(NG3, Public Sector Partner)

"It's a question of people having the mindset about maintenance, having a sense of ownership. Understanding that though this is a public asset it serves me as an individual because it serves my family members, it serves my community members, it serves people who are related to me in diverse ways, and being able to take ownership of those equipment and manage them."
(NG4, Private Sector Partner)

Activity	Description
Refrigeration System Repair	Activities to ensure system is cooling (replace compressor, fan motors, capacitors, charge controllers, batteries, repair gas leaks)
Functional Item Repair	Activities to maintain temperature range (replace door seals on fridges, thermostat settings, top up refrigeration gas and repair slow gas leaks)
Safety Repairs	Activities to ensure health and safety (repair of electrical cables that could impact equipment safety)
Aesthetic Repairs	Activities that do not impact on cooling performance or safety (refurbishment)
Preventative Service	<ul style="list-style-type: none"> Clean Refrigeration System: Ensure improved airflow to avoid system contracting Clean Solar Panels: Ensure sufficient power supply from the solar-powered systems Position equipment for optimized airflow: Place equipment away from walls and other fixtures to improve airflow Clean equipment area: Clear away dust and items that restrict airflow, e.g., boxes

Figure 1. Description of Preventative Maintenance and Repair Services

Stakeholder	# of respondents
Public Sector Partners	
Lagos State PHCB	2
Apapa Cold Store	2
CHAI	1
Private Sector Partners	
Coca Cola Nigeria Ltd	1
Frigoglass	3
Project Last Mile	
PLM in Nigeria	3
TOTAL	12

Figure 2. Interview Participants