Mozambique: Visualize, analyse, improve

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Introduction

Mozambique's Expanded Programme on Immunization (EPI) has struggled with a lack of accurate and timely data regarding the performance of the country's immunization supply chain. A typical model for immunization supply chains relies on a large number of health workers, particularly at the health centre and district levels, to collect and report accurate information in a timely fashion.
As a consequence, data collection is inconsistent and immunization programme managers responsible for supply chain logistics find they have little to no visibility as to how their immunization supply chain is performing. Managers are unable to answer questions such as whether they are meeting the government’s goals for reducing stock-outs and wastage, cold chain equipment uptime, delivery regularity and forecasting accuracy.

Because the health workers are trained and incentivized to provide clinical care rather than collect and report on supply chain data and perform other logistics tasks, the collection and reporting of supply chain data usually falls to the bottom of an already overwhelming list of tasks.
To address this challenge, in five (and soon to be six) out of 10 provinces in Mozambique, provincial Ministry of Health authorities have shifted responsibility for many immunization supply chain tasks, including tasks related to supply chain data collection, from a large number of highly dispersed health centre and district workers to a small number of full-time, professional, government-employed logisticians who operate out of provincial offices (coordenadores de campo or field coordinators). This new approach, based on an informed push model, is known in Mozambique as the Sistema Dedicado de Logística (Dedicated Logistics System, or DLS). It has provided the basis for a new information system for managing the immunization supply chain.

The immunization supply chain system consists of four tiers:

1. National store (Central de Medicamentos e Artigos Médicos, CMAM)
2. Provincial stores (10)
3. District stores (144)
4. Health facility stores (> 1,100)

The DLS information system

The DLS information system includes three key activities:

1. Visualize. Collection and presentation of supply chain performance data to provide end-to-end visibility of performance across the entire supply chain. A dashboard is used to provide a quick view of the data.

2. Analyse. Analyses of the supply chain performance data to assess how well the supply chain is functioning and where improvements are needed. Development of an improvement plan containing a set of recommended changes designed to improve supply chain performance.

3. Improve. Implementation of the improvement plan which, as it is implemented, should reveal improvements in performance and be reflected in the data collected over time.
The field coordinators use tablets running an OpenLMIS-based electronic vaccine logistics management system software application, Sistema Electrónico de Logísticas de Vacinas (SELV) to collect data from different sources at the health facility to confirm validity, compare actual stock on hand with stock records and provide immediate feedback to health workers on data quality (see Figure 1). This approach also provides the provincial and national levels with near real-time data from the lower levels.

For data visualization, the DLS information system uses a dashboard with alerts for quick reference (see Figure 2). Monthly reports contain the full information in an easy-to-use searchable format to enable managers to drill deep into the data to solve problems highlighted by the dashboard. The data can be viewed in aggregate or separately for any level or location within the provinces operating the DLS.
The next step in the DLS information process is a systemized process for utilization of the dashboard and further data analysis where needed. After each monthly distribution, participatory follow-up sessions are held where the field coordinators review the dashboard and monthly reports with the provincial EPI manager, medical chief and logistics supervisor. In this monthly review, the team identifies bottlenecks and ways to improve subsequent distribution activities and also checks previous deliveries and consumption figures to find gaps in data that may not have been properly recorded during the month.

Finally, the field coordinators implement their improvement plan during the next month’s visits to their respective districts and health centres. The effectiveness of the improvements can be assessed based on the data collected in the following months.

Transforming data into action: Regular distribution

Like all other supply chain systems, the DLS’s success depends on regular commodity deliveries to all the locations it serves. The goal is to achieve monthly deliveries; however, delays inevitably occur. Erratic delivery schedules lead to poor vaccine availability, higher stock-outs and wastage, because health centres are either under-supplied or over-supplied if the next visit date is unknown. So the first key performance indicator shown in the DLS information system dashboard tracks the intervals between distribution visits and shows whether or not deliveries are meeting the <33-day interval goal set by EPI managers. The drill-down capability of the monthly reports allows insight into the reasons for delay – a lack of funds to purchase fuel, a problem with transport, or if weather prohibited travel or access, to name a few.

In July 2014, the EPI logistics team in Mozambique’s Niassa Province reviewed their dashboard indicator for regular deliveries (see Figure 3). Their goal was to have at least 80 per cent of their monthly vaccine deliveries to health centres occur within the 33-day interval window. If successful, the dashboard indicator would show the orange bar above 80 per cent every month. The team had made good progress improving performance from November 2013 through March 2014, but from April through July 2014 that progress had fallen apart. Looking deeper into the monthly report, the team found the root cause of their problem: Monthly vehicle maintenance was scheduled too close to each month’s delivery date. Too often the maintenance wasn’t finished in time to meet the delivery schedule, causing a cascading series of delivery delays. The team’s improvement plan was to schedule the vehicle maintenance earlier in the month to be sure each vehicle would be out of the shop and ready to go on the delivery date.

figure 3
In the following months, the Niassa Province team was very pleased to see the success of their improvement plan reflected in the dashboard (see Figure 4). In November 2014, they reached the 80 per cent delivery interval goal for the first time, which encouraged them to use the dashboard and reports to reach that goal every month.

Transforming data into action: Cold chain equipment

The DLS information system dashboard also contains a chart showing cold chain uptime each month recorded at the time of distribution. The goal is for refrigerators in the health centres and districts to be within the required 2–8 degrees Celsius range at least 95 per cent of the time. After reviewing the dashboard indicator for cold chain uptime, in July 2014 the Niassa
team implemented an improvement plan to increase refrigerator uptime: Send the province’s cold chain technician to selected health centres with the monthly deliveries to provide ongoing and regular preventive and corrective maintenance. The health centre nurses had been trained in preventive maintenance, but adding the technician to the distribution routes provided another set of eyes, along with the technical expertise necessary to resolve any problems immediately. By the end of 2014, the cold chain improvement plan had worked: The rate of functioning refrigerators increased to over 90 per cent, very close to the 95 per cent uptime goal (see Figure 5).

![Figure 5](/iscstrengthening/images/2016/08/25/figure5.png)

An increase in uptime of the cold chain equipment after implementation of the improvement plan in August.

The Niassa team, however, was not able to sustain the financial support to continue the cold chain technician’s participation in the monthly deliveries past December 2014, and without this added technical expertise, cold chain uptime reverted to its earlier level (see Figure 6).

![Figure 6](/iscstrengthening/images/2016/08/25/figure6.png)

A decline in cold chain equipment performance in December.

The Niassa team continued to use the evidence generated through the information system to request the financial resources needed to re-implement and sustain the proven solution.

**Summary of supply chain performance improvements**

Despite the significant challenges and limited resources, Mozambique’s EPI managers are
using data to get the maximum performance from their immunization supply chain. The ‘visualize, analyse, improve’ approach has become a model for managing immunization supply chains in other countries.

Summary of results:

- Four provinces in Mozambique reduced vaccine stock-outs from approximately 35 per cent to below 3 per cent each month over the course of the year
- Cold chain uptime across the four provinces improved significantly, from around 40 per cent to consistently above 90 per cent each month

Most importantly, many more children in Mozambique, even those in the most remote, rural areas, are now receiving life-saving vaccines.

Gavi
The Vaccine Alliance

Bill & Melinda Gates Foundation

World Health Organization

UNICEF
for every child