Introduction

The Nigerian National Primary Healthcare Development Agency (NPHCDA) oversees primary health-care services, including child health and immunizations. The agency has been focused on raising vaccine coverage in recent years and, among other improvements, succeeded in raising DPT3 coverage from 42 per cent to 66 per cent over a three-year period (2012–2014).

The country's immunization supply chain system consists of five tiers of storage:

- National Strategic Cold Store (NSCS)
- Zonal stores (6)
- State stores (37)
- Local government areas (LGA) stores (774)
- Health facilities (20,000+).
Programme objective

The NPCHDA’s goal was to raise overall vaccine coverage to 87 per cent by 2015.

With the support of UNICEF, Gavi, the Bill & Melinda Gates Foundation and other partners, the NPHCDA created a dashboard to address these two areas, the national Vaccine Stock Performance Management (VSPM) dashboard.

Reaching this goal meant increasing the availability of vaccines and immunization supplies at the right location, in the right condition and at the right time.

To help achieve this programme objective, NPHCDA focused on two areas to strengthen the supply chain system:

1. Improve stock visibility and help eliminate antigen and device stock-outs nationwide down to the LGA level as a step toward ultimately eliminating stock-outs at all facilities.
2. Establish a performance- and action-driven culture in cold chain staff across all levels, using data for decision-making with dialogue established between all levels of the supply chain.

Situational Analysis

An analysis of the current supply chain system determined that national and sub-national stock availability was adequate, but that a challenge existed at the LGA and health facility level – the ‘last mile’. As noted in Figure 1, the baseline performance of LGAs was low, with only 34 per cent of stores stocking an adequate supply of all antigens.

To achieve the programme objective and address the last mile challenges, the NPCHDA focused on measuring vaccine availability and increasing the visibility of vaccine availability down to the LGA level.
Define and/or adapt indicators

The primary indicator selected was Supply Adequacy (similar to the primary key indicator Stocked According to Plan, see Indicator Reference Sheets), defined as stocked with a supply sufficient to address at least one week of demand for the entire LGA.

The primary data required to measure Supply Adequacy was stock on hand for each antigen and injection device. Stock on hand data would then be compared to the national inventory policy that defined the maximum and minimum stock levels. The minimum is defined as the amount of stock needed before the next resupply interval. The maximum is the minimum quantity plus the quantities used during the resupply period. State stores are resupplied on a quarterly basis from the federal zonal stores, and LGA stores are resupplied monthly from the state stores; most health facilities receive supplies from LGAs every week. Health facilities in Lagos and Kano States are supplied twice monthly directly from the state stores, bypassing the LGA supply chain level.

Gap analysis

The reporting system in existence before dashboards were implemented did not capture weekly stock on hand at each supply chain level. The already existing paper or electronic stock management system in place meant that the stock on hand data could be retrieved and reported to next supply chain level.
The weekly dashboard is based on an Excel template pre-programmed with the minimum and maximum stock levels and reorder points for each zonal, state and LGA store. The system was implemented without use of an electronic logistics management information system, relying instead on phone calls, SMS text messaging of stock counts, email of Excel templates, and regular follow-up from partners. The dashboard development process begins at the end of each week, when the LGA store staff submits their stock on hand data to the state store which is color-coded (see Table 1). The LGA stores’ stock on hand data are aggregated by state staff using Excel spreadsheets. The dashboards based on the LGA store data is generated and used by the LGA staff for decision-making at this level (see Figure 2 and 3). In addition, the state staff submits their dashboard to the NPCHDA staff, who develops the national dashboard (see Figure 7).

The LGA stores also use reusable posters to visualize maximum stock level, reorder stock level and the minimum stock level for vaccines and related supplies (see Figure 4).

**Implementation**

Kano and Lagos States were selected to implement the VSPM dashboard in its pilot stage, which began in 2013. Over the following eight months, the weekly dashboards were reviewed and used by state and national staff.
Dashboards were reviewed and used by state and national staff. Based on the success of the dashboard pilot in these two states, NPHCDA used a phased national roll-out to all states over a four-month period. National training of trainers and a training cascade were used to train all staff in dashboard use: The nationally trained trainers conducted waves of training down the supply chain levels from zonal to states to LGAs. All 774 LGAs now provide stock levels to the state level dashboards.

![Figure 5](image)

Average LGA stock adequacy across states (percentage of LGAs).

**Using and incorporating dashboards into management**

Four months after introducing VSPM dashboards, the number of LGAs with sufficient stocks for all vaccines had increased to above 80 per cent (620 LGAs). This good performance has remained stable through October 2015.

![Figure 6](image)

Weekly completion of visual dashboard.

The completeness of LGAs reporting has consistently exceeded 90 per cent, with gaps primarily caused by conflicts in the northeast of the country where conduct of basic PHC activities has become very difficult. These initial successes resulted in an expansion of the dashboard to include all routine Immunization devices and diluents.
NPHCDA shares the dashboards with stakeholders and policymakers on a weekly basis. This has greatly helped to strengthen governance and accountability of immunization systems at national, state and LGA levels. Commissioners of health, executive chairmen, state primary health-care boards and other relevant stakeholders are using dashboard reports and subsequent follow-up both to determine when restocking is required and to understand and act on any potential problems occurring at the LGAs. At the national level, NPHCDA’s executive director has used dashboard reports to identify and, on some occasions, intervene by reaching out to poorly performing states, leading to a positive response and action by state policymakers.

With the dashboard and related follow-up surveys, NPHCDA was able to identify the remaining barriers to achieving the desired 100 per cent stock sufficiency at all LGAs. These have included inadequate resupply quantities, funding constraints for transporting vaccines and devices, delayed budgetary release and poor supervisory checks on stock status and vaccine management. One of the challenges in identifying the root cause when states or LGAs turn from green to yellow or red (see Table 1), i.e., from adequately stocked to inadequate levels, has been due to the absence of regular data collection to compute additional indicators such as availability of funding and budgetary constraints, or availability of transport.

**Developing, implementing and using dashboards** has been an invaluable experience that will inform change and lead to further improvements.

**The lessons learned include:**

1. The data collection and dashboard generation processes are not automated, so at each supply chain level, a significant amount of staff time is used to complete these tasks.
2. Improved performance depends on whether staff actually use the data for resupply decisions or simply push immunization supplies according to
population targets.

3. Visibility has been extended only to the LGA level and not yet to the health facility, so last mile visibility is still incomplete.

4. Full availability has peaked at 80–84 per cent of LGAs in full supply, with instability in the remaining LGAs contributing to less than full availability.

Future plans

Through the introduction of the new Microsoft Dynamics NAV and a Visibility and Analytics Network approach, the plan is to expand the scope of data collection to help policymakers move from narrative-based, ad hoc root cause analysis to more systematic and data-driven analysis and actions. In addition, with UNICEF support, the NPHCDA will automate data capture with outputs presented in customized dashboards in Microsoft Dynamics.

Moving forward, the NPHCDA has recently asked states to align themselves with the national recommendation to scale up the distribution system to a modified push system, in which states deliver vaccines to the LGAs, instead of the ad hoc pull system currently used in most states, where LGAs collect products. The change of distribution systems will help ensure more regular delivery schedules and the availability of vaccines and supplies when and where they are needed. The NPHCDA is working with implementing partners to resource a push plus or informed-push delivery model from state stores directly to health facilities. This approach has been adopted in Kano and Lagos States, where it has helped ensure facility-level product availability in excess of 90 per cent. There are immediate plans for expansion in Bauchi State.

Nigeria’s effort at increasing the visibility and use of data through dashboards has been cited as a strong example of improving performance through better supply chain processes and use of data.

1Microsoft Dynamics NAV is an enterprise resource planning (ERP) system to help small and mid-sized businesses manage supply chains.

2The Visibility and Analytics Network (VAN) is an initiative led by the Bill & Melinda Gates Foundation.