"Building a real-time Logistics Management Information System (LMIS) for the vaccine supply chain in Nigeria"

Speakers: Webinar Presentation by the Team Lead Dr M. Z.Mahmud
Facilitator: Dr Chilunga Puta, BID Initiative

17 June 2014

Background on the BID Initiative

The Better Immunization Data (BID) initiative's vision is to empower countries to enhance immunization and overall health service delivery through improved data collection, quality and use.

The BID Learning Network

- Brings countries together to identify shared problems and solutions and connect with peers.
- Uses this knowledge to design common information system products, practices, and data policies.
- Experiments with these designs in countries to determine their applicability.
- Uses this experience to inform national and global decision-making.

[" BUILDING A REAL-TIME LOGISTICS MANAGEMENT INFORMATION SYSTEM (LMIS) FOR THE VACCINE SUPPLY CHAIN IN NIGERIA"]

Introducing our speakers

Dr M Z Mahmud

- Currently the director of the department of logistics and health commodities with National Primary Health Care Development Agency (NPHCDA) .He holds a degree in Medicine and a Masters in Public Health

- He has been active in the public health sector especially in immunization space for the last 16 years, private sector for 13years prior and has participated in formulating, designing, managing, monitoring and evaluating immunization programmes.

- Presently very keen on making sure Nigeria meets all her goals as enshrined in the 2013-2015 National Strategic Routine Immunization Plan (NSRIP) for which he was at the forefront of designing

Introducing our speakers

Pharm. Inuwa Yau

- A public health specialist with 14 years of experience in immunization, primary healthcare and drug revolving fund management. He holds a Master's degree in Pharmaceutical chemistry and Masters in International health .

- Inuwa's work has been with National Primary Health Care Development Agency (NPHCDA) where he worked in country-level Immunization activities. He served as National focal point that oversaw the development and implementation of stock performance management dashboard

- Inuwa recently joined UNICEF Nigeria as Immunization specialist.

Introducing our speakers

Michelle Arnot-Kruger

- A pharmacist with an MBA, Michelle leads UNICEF Nigeria's Cold Chain & Logistics work.

- Passionate about immunization and health programs

- She has worked in several African countries, in both the public and private sector, and more recently transitioned into the development space.

- Her most recent work in Nigeria includes driving supply chain performance where she utilizes her team networked in all 37 states and 6 zones across the country.

Introducing our topic: what will you learn?

This webinar will focus on practical lessons learned in the process of building a real time LMIS system for vaccine supply in Nigeria. The presenters will share the key learnings in terms of:

- Keeping the system simple and impactful
- Adopting a step wise approach
- Redesigning the system
- Automating what makes sense
- Addressing issues of visibility for lower levels and the challenges encountered
- Requirements for performance management system

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Webinar Presentation by the Team Lead Dr M. Z.Mahmud

June 2015

Agenda for today

- **Context and motivation for change**

- The LMIS transformations

- Challenges and lessons learnt

- Next steps

Background:
Nigeria, 174 million+ people, 250 languages, many cultures

Governance

Federal system, 6 geopolitical zones/"regions", 36 states/"provinces", plus the Federal Capital Territory, 774 Local Government Areas (LGAs)/"districts"
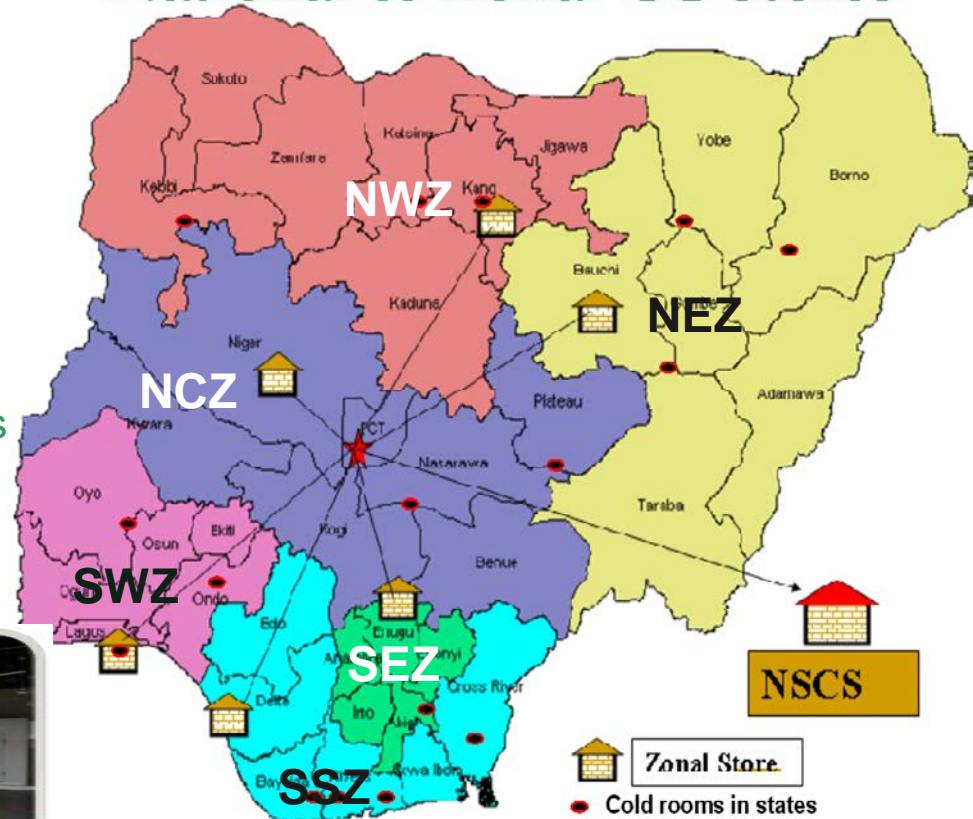
Demography and Health Indices

- Large under five population, Large National birth cohort: 7.207,183 ; birth registration 30%; under-five mortality rate 157, infant mortality rate 75; 25, 413 HFs offering routine immunization
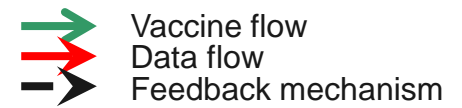
Positive cold storage capacities in 000s Litres
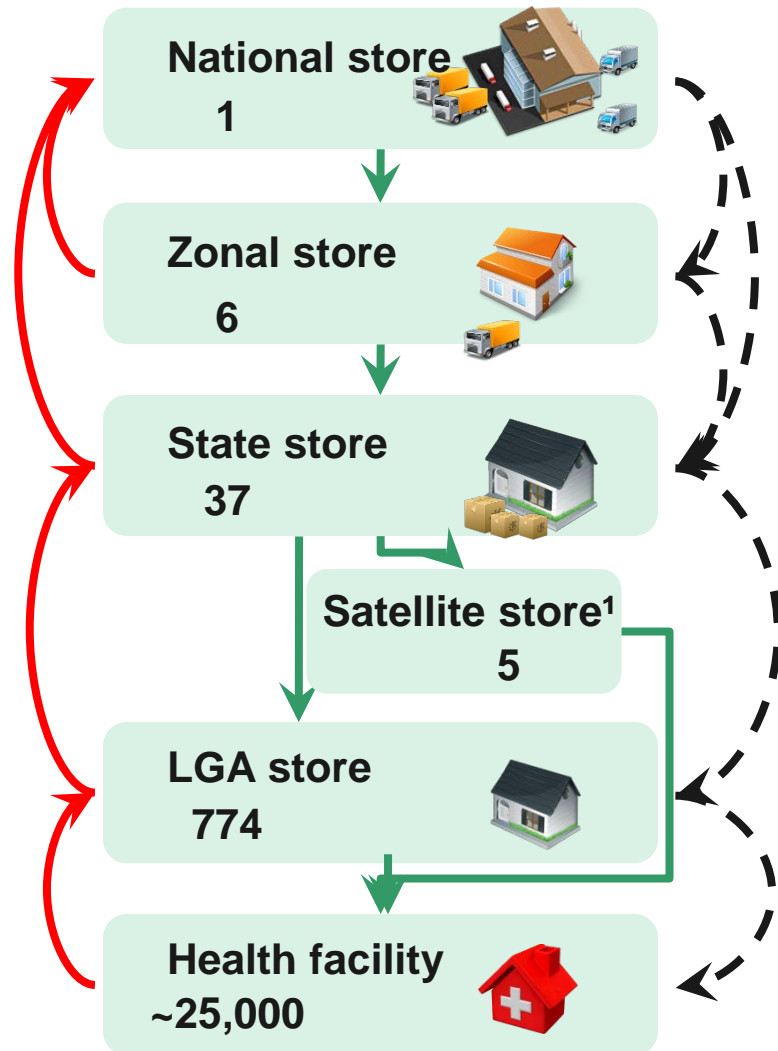
- **National 210**
- **States 321**
- **LGAs 97**

National & Zonal CC Stores

Overview of the vaccine supply architecture

Legend:
→ Vaccine flow
→ Data flow
➡ Feedback mechanism

5 levels/nodes along the supply chain

- National store — 1
- Zonal store — 6
- State store — 37
- Satellite store[1] — 5
- LGA store — 774
- Health facility — ~25,000

Insights

- Vaccines and devices flow from national and zonal stores on quarterly basis to the States

- State stores distribute on a monthly basis to the LGAs which passes them to Health facilities as at when required

- LGAs **stock balances are now obtained and aggregated at the state stores every week** and reported to the National store

- Data is aggregated from all lower levels on stock availability, analyzed and responses sent out

- Feed back is given to Zones, States and Partners every week through email

1. This system exists in Lagos, Kano and Bauchi states. Satellite stores conduct direct vaccine deliveries to health facilities
SOURCE: NPHCDA

Different diagnostics conducted between 2010 and 2012 revealed ineffective logistics management system

2010

Effective Vaccine Management (EVM) Assessment

2011

Cold Chain Assessment

2012

Vaccine audit

- 81% of LGAs and 54% of HFs did not have vehicles for vaccine distribution
- 96% of HFs visited had no refrigerators for vaccine storage, which severely impacted vaccine availability at the HF level.

- 43% of Cold Chain Equipment (CCE) at LGA and health facility level were non-functional
- 75% of these non-functional equipment were repairable

- Persistent vaccine shortages at Health Facilities (HFs) despite adequate supplies at the national level
- 76% of states and 65% of LGAs assessed did not have funds available for vaccine distribution

In the 2013-2015 RI strategic plan, NPHCDA set out to build a real-time Logistic Management Information System to gain visibility to all levels

Stock visibility along the supply chain, pre-2013

Level	Visibility	Tool	Data frequency
National	Yes	▪ SMT	▪ Monthly
Zonal	Yes	▪ SMT	▪ Monthly
State	Yes	▪ SMT	▪ Monthly
LGAs	No	▪ DVD-MT	▪ Monthly
Health facility	No	▪ DHIS/ DVD-MT	▪ Monthly

Before the 2013-15 plan, existing systems provided delayed visibility only through the state level

Priority area 1.2 of 2013-2015 RI strategic plan

Logistics and vaccine stock visibility

Agenda for today

- Context and motivation for change

- **The LMIS transformations**

- Challenges and lessons learnt

- Next steps

The leadership set up a steering committee to oversee transformation

The leadership at the highest level...

- Took into account all the findings of the various diagnostics that had been conducted

- Realized that a lot of these systemic issues could be tackled and managed with real time visibility into vaccine stock management at all levels

- Adopted a step-wise approach beginning with quick wins

- Set a goal to make improvements to the system and in longer term redesign the system for sustainability

...results in fundamental changes

- **Implementation of quick-wins like de-clogging of the stores**

- **Pilots of small initiatives and system redesigns in Kano and Lagos**

- **Introduced a stock performance management system to give stock visibility at all levels of the supply chain**

- **Procured, repaired and distributed cold chain equipment (CCE) to bridge the gaps at the lower levels**

Manual state dashboards were introduced and later upgraded to Excel sheet after successful adoption across the country

The process has four basic steps

1 **Take inventory**

Reminder SMS to Local Immunization Officers (LIOs) on Thursday/Friday by State Cold Chain Officers (SCCOs)

LIO takes physical inventory and text or call in current stock figures for each antigen and device (11 data points)

2 **Record results**

SCCO enters the stock data manually and in an Excel sheet and wallcharts. Each stock level is then compared against predetermined levels-maximum, reorder & safety/"minimum"

− Stock below reorder levels triggers allocation

− Stock below safety threshold is color coded red for follow-up

3 **Determine actions**

SCCO creates a report summarizing LGA performance, allocations, critical stock gaps, and actions to remedy the gaps

The report is sent to all LIOs and to senior state health officials

4 **Execute actions**

SCCO ensures the actions required to close the stock gaps are executed first thing on Monday (e.g., delivers or calls the LIO to come in for a pickup)
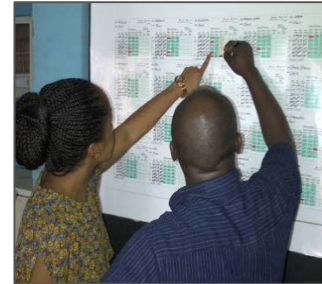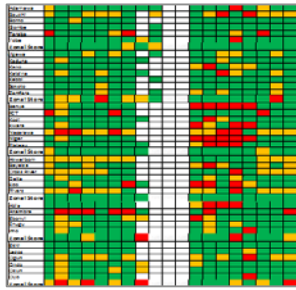

Characteristics of the state dashboard

- A semi-automated excel tool that allows for easy transmission of data and analytics

- Stock allocation is determined by target population

- Stock data is collated on a weekly basis by state cold chain officer (SCCO) and depending on "Push" or "Pull" system, action is taken by state team to restock LGAs

- **Stock thresholds for LGAs:**

  − Max stock: 5 week stock

  − Reorder stock: 2 week stock

  − Minimum stock: 1 week stock

SOURCE: NPHCDA

The dashboards are aggregated weekly to give visibility of vaccine stocks (National, Zonal, State and LGAs) in the supply chain providing a decision frame for ensuring adequacy
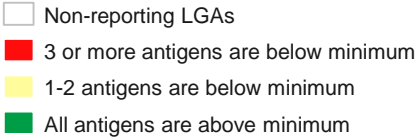

Characteristics of the National dashboard

- Validation of stocks at state level including LGA spot check is sent to the national by partners

- Stock data is collated at National level showing zonal, state and LGA stock balances

- Analysis of state stock balances to determine if states have enough stock to meet population needs for at least 6 weeks

- LGA stock data is analyzed to determine sufficiency across the country each week

Response to the weekly National dashboard

- **Weekly feedback by email** is given to all states, partners and national level officials generating healthy online conversation.

- **Allocation/restocking decisions:** A team on a weekly basis to review stock performance across all levels and advise the National Logistics Working Group (NLWG)

- **NLWG:** Departmental staff, stakeholders and partners review stock performance bi-weekly and take further decisions on interventions to procure, accelerate shipments, deep dive to states, escalate for high-level advocacy

- **Field intervention:** State logistics teams in each state help to conduct deep dives into persistently underperforming local governments and resolve issues of stock availability

- **Monthly newsletter** escalating single important issue to Governors has commenced

SOURCE: NPHCDA

Improved and sustained stock adequacy at LGA levels across the country at around 80% from a baseline of 34%

Legend:
- ☐ Non-reporting LGAs
- 🟥 3 or more antigens are below minimum
- 🟨 1-2 antigens are below minimum
- 🟩 All antigens are above minimum

Average LGA stock adequacy across states (% of LGAs across Nigeria)
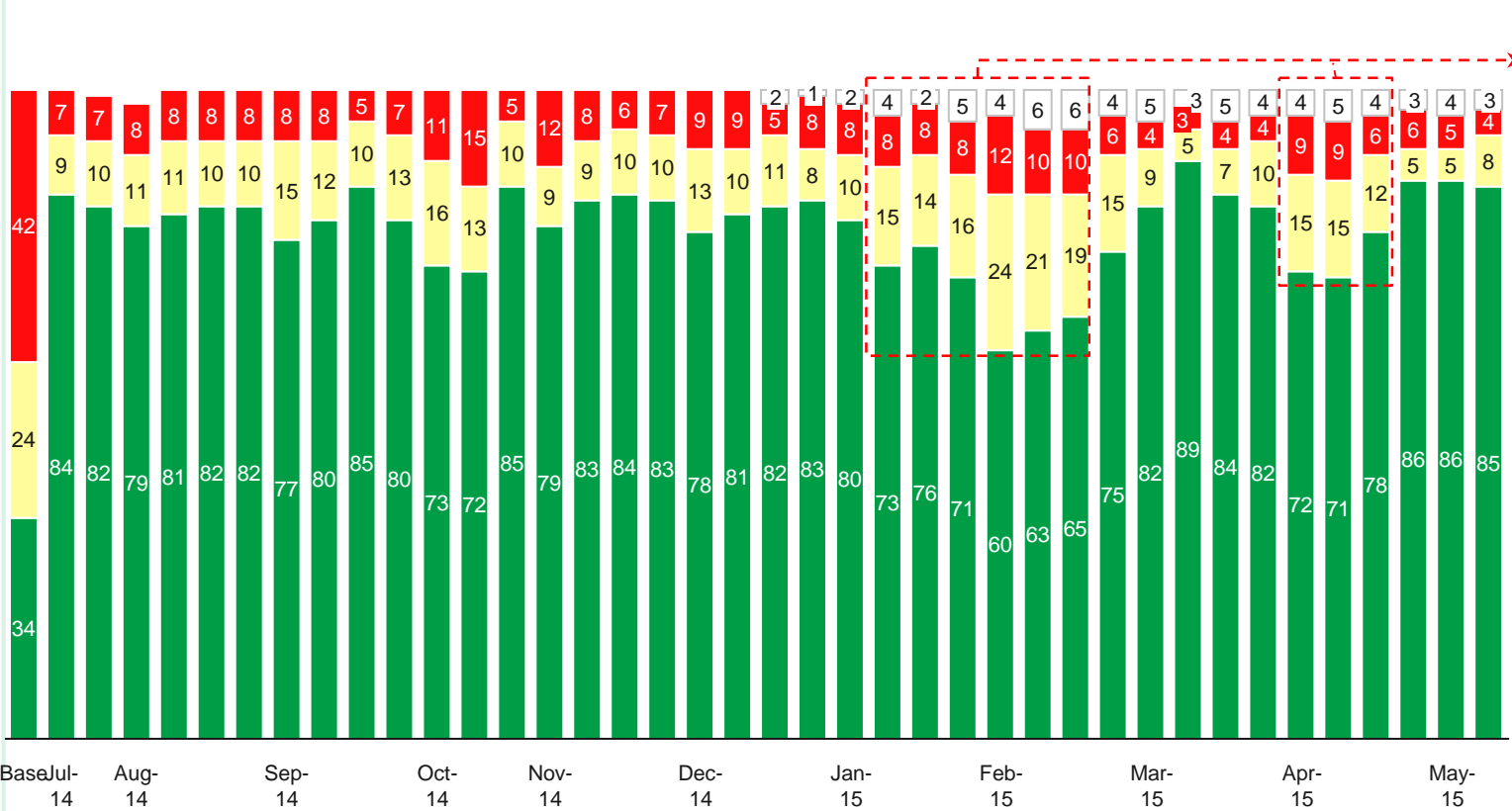
Dips in performance were due to the following

1. **Persistent systemic issues surrounding operational funding and transport**

2. **Inadequate cold chain capacity**

3. **Labour unrest**

4. **Political transition**

11

Insights gained from the dashboard meant new initiatives were to be rolled out in response to system deficiencies revealed

● On track   ● Under development

Insights	Initiative	Description	Status
1 LGAs frequently lacked means to pick up vaccines from state stores	**PUSH System**	▪ States transition to proactive delivery of vaccines to LGAs but more preferably to health facilities	●
2 Varying weekly consumption patterns overtime	**Consumption tracking**	▪ Graph consumption of vaccine stock distributed in relation to target population estimates	●
3 Analysis of consumption quarterly reveals fast and slow consuming states	**Revising allocations**	Calibrate and adjust periodically the actual state needs every 3 quarters	●
4 The need for weekly visibility of stock performance at HFs highlighted	**Last mile visibility**	▪ Roll-out tools to get vaccine stock and visibility at health facilities on a weekly basis	●
5 Inefficiencies means we may need to reduce the nodes in the system	**System re-design**	▪ 3-hub national stores delivering directly to states and states directly to HFs	●

PUSH system was introduced to overcome the bottleneck at the LGAs and health facilities by making states responsible for restocking vaccines

ILLUSTRATIVE

↑ PULL
↓ PUSH

System dynamics

From "PULL" system…

7	National and zonal store
37	State store
774	LGA store
~25K	PHC PHC PHC PHC

… to "PUSH" system

7	National and zonal store
37	State store
774	LGA store
~25K	PHC PHC PHC PHC

Core responsi-bilities
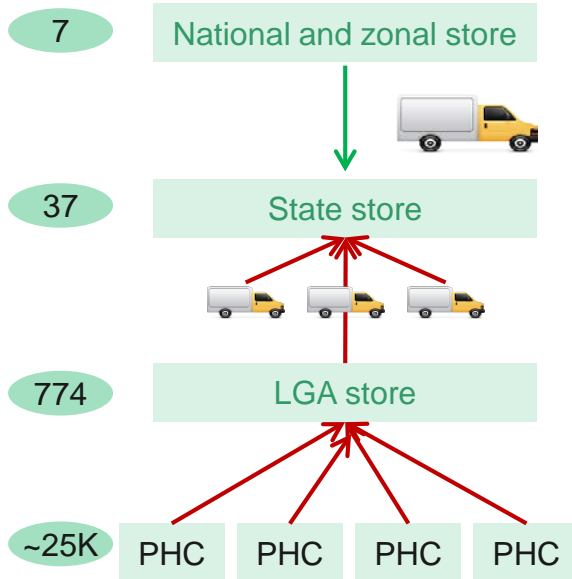
- LGAs are responsible for decisions to restock and pick up vaccines
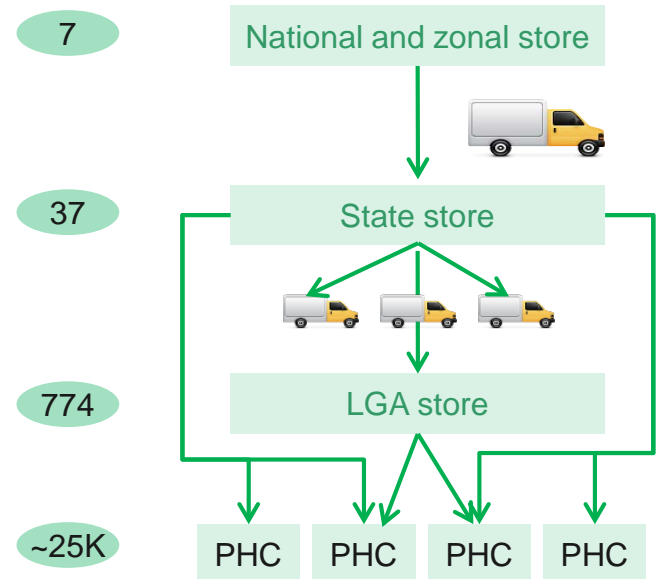
- State is responsible for decision to restock based on weekly stock reports from the dashboard

Examination of consumption tracking data reveals patterns, providing valuable information for revising allocation decisions

Actual vs. expected consumption

Consumption in doses

Example of slow consumption

- - - - Expected consumption
——— Actual consumption
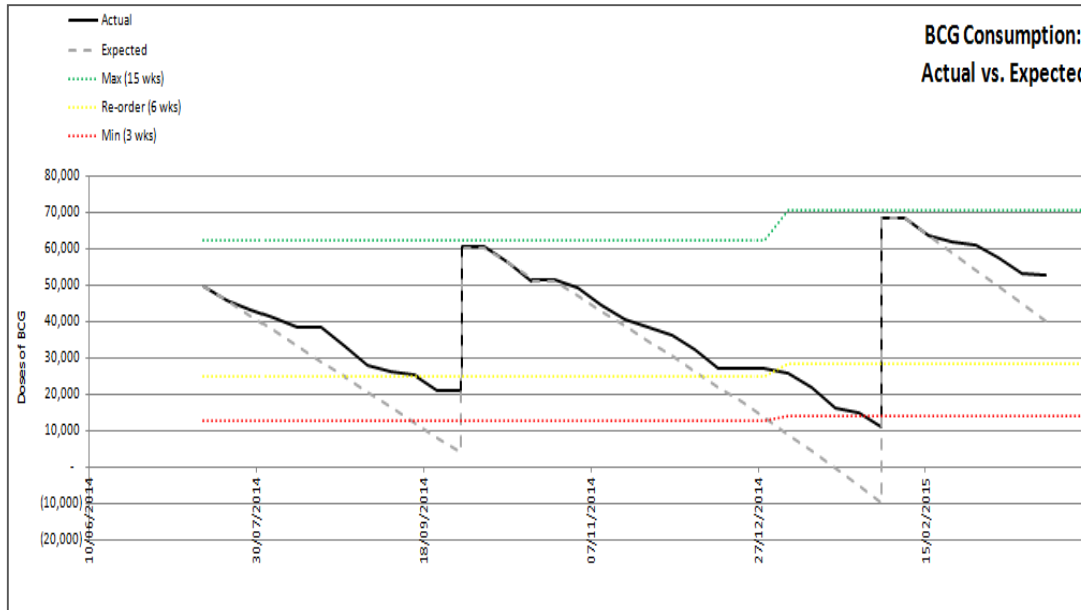
Observed in Ekiti state over the last 3 quarters for all vaccines

Further analysis before action

- Confirm LGA stock sufficiency from stock dashboard

- Confirm if LGAs regularly pick up vaccines from the state as needed (or if states are regularly pushing)

- Look at immunization rates to see if coverage or session frequency is low

- If target population is over estimated, revise allocation to states by -10%

Data from direct vaccine deliveries piloted in Kano state provide facility level stock visibility and has showed increased stock availability in health facilities

Percent of antigens that are out of stock, below buffer or in stock at facilities receiving direct deliveries through e-Health

Legend: ■ Stock outs ■ Below buffer ■ Adequate Stock

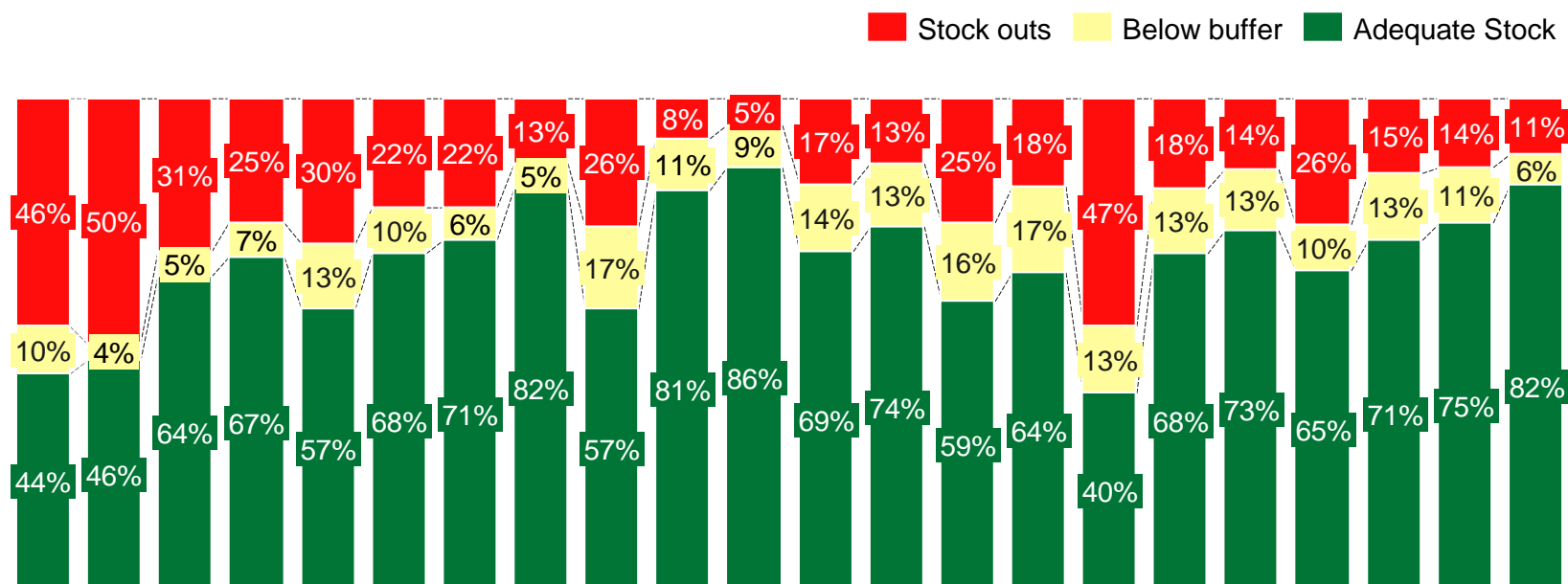| Delivery cycle	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd
Stock outs	46%	50%	31%	25%	30%	22%	22%	13%	26%	8%	5%	17%	13%	25%	18%	47%	18%	14%	26%	15%	14%	11%
Below buffer	10%	4%	5%	7%	13%	10%	6%	5%	17%	11%	9%	14%	13%	16%	17%	13%	13%	13%	10%	13%	11%	6%
Adequate Stock	44%	46%	64%	67%	57%	68%	71%	82%	57%	81%	86%	69%	74%	59%	64%	40%	68%	73%	65%	71%	75%	82%
Parent Facilities	67	120	138	140	163	166	167	169	178	178	178	178	190	190	215	215	215	215	241	241	241	241
Cascade Facilities	0	0	0	0	190	194	197	197	208	208	208	222	222	241	458	480	480	480	480	480	480	480

SOURCE: Direct vaccine delivery summary report (e-Health Africa),SLWG analysis;

We are automating and redesigning the system at the national and state levels with the introduction of Navision

The proposed system will handle online Requisitions, Issuances, Receiving , Stock Classification, Stock Level Management, Audit and Inspection, Stock Expiry Date Tracking, Reporting, Web Support, Document Approvals

Progress of Navision implementation

Completed	Pending
✓System design set up to integrate with LoMIS (used in Kano) & DHIS (Health facility & ward information set up on the system, even though the system ends at state level with limited visibility at LGA level)	▪ Entry of pre-advices (to be done once all sites are ready)
✓Users created with roles assigned	▪ Physical stock count information to be entered into NAV as starting point of each site database
✓User training of all CCOs, Assistant CCOs, UNICEF VSLs & state level staff of WHO, CHAI & eHealth	▪ "Go real Live" by 1st July 2015
✓Administrator training: NPCHDA (2) & UNICEF (1)	▪ Integration of stock performance dashboard into NAV (to be done once current system is running satisfactorily)
✓Desktops & internet dongles currently being distributed to all sites	▪ Shelving of stock data on a monthly basis to feed into the DHIS
✓"Go test live" plan adopted	

A "Push plus visibility" is being pre-tested to provide last mile visibility into stock status and CCE functionality at the health facilities

ILLUSTRATIVE

Process uses SMS on the u-report platform

- **Pre-registered health worker on the u-report platform respond by SMS weekly**
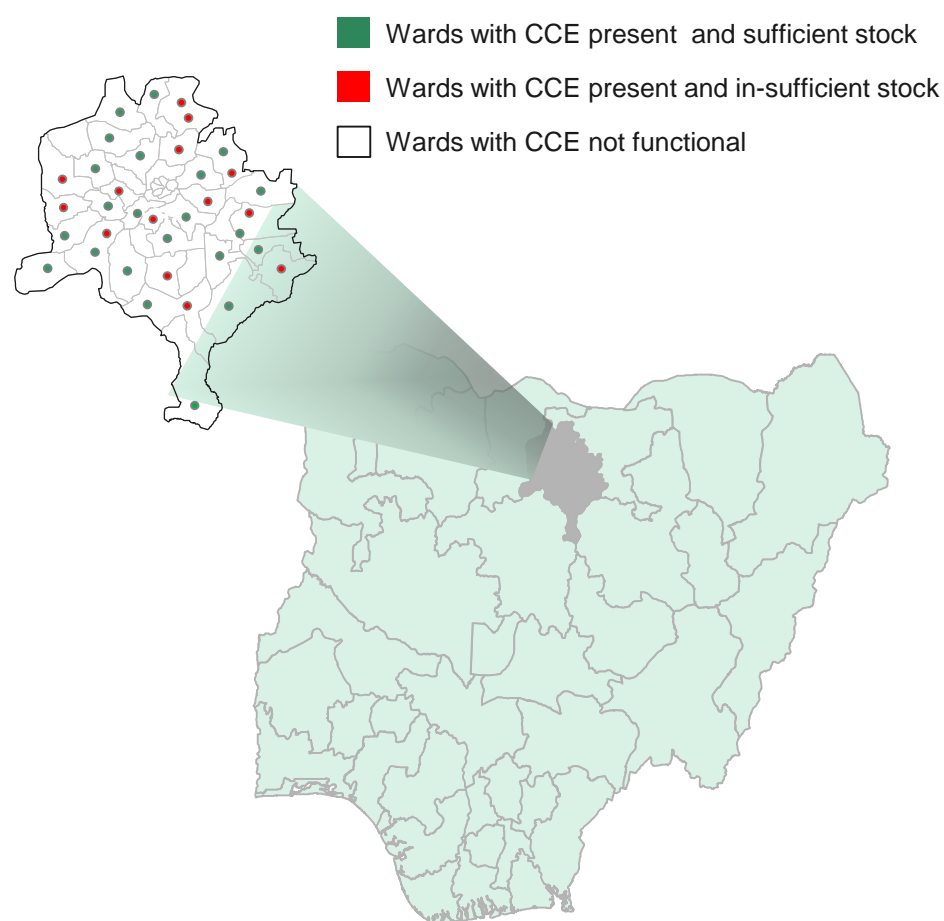 - **Cold chain equipment functionality**
  - **Stock Availability:**

Visibility has some immediate advantages…

- **Coverage:** Clear cartography and correct mapping of the CCE coverage
- Map areas of interventionClear status of CCE functionality in the country
- **Availability:** Knowledge of stock availability at the various facilities

… and enables us to direct intervention quickly

- **Respond** to CCE breakdown
- **Re-supply** stock to deficient facilities
- **Prioritize** wards to supply CCE

Illustrative map of Kano State showing key indicators

- Wards with CCE present and sufficient stock
- Wards with CCE present and in-sufficient stock
- Wards with CCE not functional

Two systems are already in place in Kano and Lagos states that give facility-level visibility into stock performance and currently working to expand to other states

Agenda for today

- Motivation for change

- The LMIS transformations

- **Challenges and lessons learnt**

- Next steps

Successful implementation was plagued with its fair share of challenges …

Challenges	Details	Resolution
1 **Human resource**	▪ Availability of adequately well-trained staff. ▪ Getting people to transit from old ways of operations to new ones was a major challenge to roll out of these initiatives	▪ Cascade trainings were conducted at all levels by trainers centrally trained at the national level ▪ Engagement at the highest level and capacity building programs were introduced with every initiative
2 **Teething challenges**	▪ Initial stages of implementation of the dashboard faced periods of misreporting and non-reporting ▪ Power, connectivity challenges and ineffective training on Navision	▪ Continuous practice and weekly accountability, analysis and feedback helped smoothen most of the roll-out phase issues ▪ Supportive supervision to be extended for Navision to address training gaps
3 **Funding**	▪ Funding from the government was not readily available for implementation of these changes ▪ Push and direct deliveries are still shaky without sustainable funding from lower levels of government	▪ Support from Partner organizations helped transition thoughts into reality especially from UNICEF Nigeria ▪ Support of partners is presently providing leverage and span financial resources, use of local manpower and material resources
4 **Interoperability with existing systems**	▪ Ensuring all existing systems are operational with some of the old systems posed some challenge	▪ Steering committee on integration has been formed to ensure that existing and newly developed stock management systems are linked (DHIS, Navision, LoMIS and Push Plus visibility)

SOURCE: NPHCDA, Team Analysis

...but revealed four major learning points

Learning from implementations

Simplicity

- All initiatives rolled out so far have been simple, easy to use, replicate and maintain
- This has greatly aided adoption and sustainability

- The department has successfully set up a performance management system that is responsive at all levels to ensure stock availability
- Attention of all stakeholders is on the stock every week

Response

Co-ordination

Analytics

- Rapid analytics (consumption tracking) are now conducted in response to data available
- Better demand planning

- All initiatives rolled out across the country required co-ordination of stakeholders across the country
- This has fostered synergy among all players in the supply chain
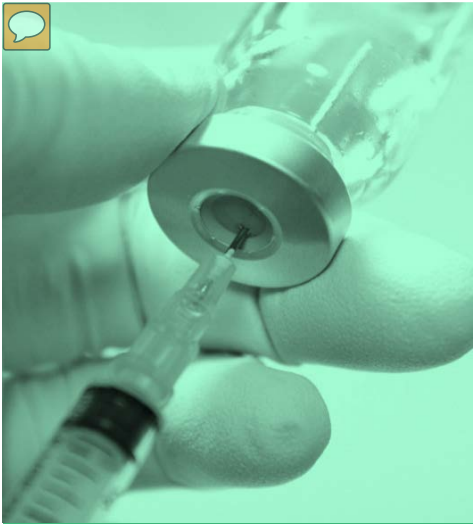
Agenda for our conversation today

- Motivation for change

- The LMIS transformations

- Challenges and lessons learnt

- **Next steps**

As next steps, our ultimate goal is to have real-time transactional visibility that connects supply with demand

4 **Real-time Transactional visibility**

3 **Achieve inter-operability with all tools of last mile and Navision**

2 **Roll –out of push plus visibility tool across all Health facilities in Nigeria**

1 • **Improvements on the dashboard and successful use of Navision**

We therefore welcome new innovations that will give this real-time transactional visibility at affordable cost

Innovations	Description
1 **Immunization registry**	▪ A **confidential, population-based, computerized information system** that attempts to collect vaccination data about all persons within a geographic area. It consolidates immunization records from multiple sources for each person living in the area
2 **Visibility analytics network**	▪ VAN is a concept based on **people**, **processes**, and **technology** that aims to **improve supply chain visibility** across silos and enable **coordinated, data-driven decision-making**.

NPHCDA will require assistance to roll-out and sustain these initiatives in Nigeria

Acknowledgement
- **All our Partners**
  - **BMGF**
  - **CHAI**
  - **eHEALTH**
  - **EU-SIGN**
  - **SOLINA**
  - **UNICEF**
  - **USAID**
  - **WHO**
- **Listeners all over the world**
- **Better Learning Network of BID initiative**