Direct vaccine deliveries: A guide for deployment and implementation

Lessons from a state's routine immunization program (May 2014 – Jan 2016)





About this document

This document is...

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- ...a description of State X's experience from implementing direct vaccine deliveries
- ...a fact pack on the effects of direct deliveries on State X's RI program

This document is not...



- ...intended as an implementation manual
- ...a policy statement and is not intended to lay out or enforce policy direction

...an implementation guide for states' looking to deploy direct deliveries ...a firm prescription for specific course of action

Target audience of this document include:

- SPHCDA/SPHCMB leadership
- State logistics teams and working groups
- Routine immunization implementing partners



Executive summary... (1/3)

Background	In May 2014, State X commenced implementation of direct vaccine deliveries; one of a suite of interventions to transform its vaccine supply chain management system.
	 As of 2012, a weak vaccine supply chain system significantly contributed to poor immunization coverage rates in State X. The vaccine distribution system was characterized by a complex multi- layered architecture, inadequate funding and weak financial flow mechanisms resulting in largely ineffective delivery of vaccines to immunization service points.
	 Having instituted a tripartite MoU with BMGF and Dangote Foundation to strengthen RI, State X embarked on an ambitious transformation of its vaccine supply chain. One of the interventions involved streamlining the vaccine distribution architecture, by delivering vaccines directly from state cold stores to equipped health facilities.
	 Following an 18-week pilot in 13 equipped facilities, State X scaled up the direct vaccine deliveries to 408 wards/equipped facilities using both insourced (managed by a state-staffed delivery team) and outsourced (managed by a private vaccine distributor) delivery approaches.
	 The teams delivered vaccines to equipped facilities every 2 weeks, and ward technical officers cascaded the deliveries to unequipped facilities on their immunization session days.
Results from	Direct vaccine deliveries have been beneficial to State X's routine immunization program.
State X: Impact on stock	 Overall, stock adequacy increased from 54% in the first delivery cycle to 68% by cycle 33. Conversely, stock-out rates decreased from 41% to 10% over the same period.
& vaccinations	 The intervention created visibility into stock performance at facilities, and helped channel health worker time previously spent picking up vaccines to actual client care.
	 Although not necessarily generalizable, vaccinations in the few sentinel facilities tracked showed upward trends for all antigens except for HepB, which declined over the period. However, it is important to note that improved stock alone is inadequate to increase vaccinations. Other
	interventions like improved funding for outreaches and better supportive supervision, which were ongoing at the same time, presumably contributed to the increase in vaccinations observed.

Executive summary... (2/3)

Results from	The implementation of the direct deliveries has however not been without challenges; a lot of which were operational and negatively impacted stock performance at health facilities.
Operational challenges	 Delays in supply of vaccines from National led to incidences of stock rationing at the state level, and consequently under-supply of health facilities leading to stock outs.
	 High frequency of supplemental immunization activities, compounded by poor coordination with the logistics team resulted in unanticipated lability in vaccine consumption and stock outs.
	 Delays in funds disbursement due to bureaucracies (mostly during the transition of power to the new government) led to interruptions in deliveries and consequently resulted in stock outs. These lapses also hampered effective functioning of the private vaccine distributor.
	 Infrequent communication between the logistics team and SPHCDA/MB senior management mostly at the zonal level delayed remedial actions to address operational challenges.
Results from State X:	 Managing the costs of direct deliveries is a burning issue and State X SPHCMB has continued to explore opportunities to reduce overall delivery costs, without compromising its effectiveness
Implementation costs	 The unit cost of vaccine deliveries to each primary facility (excluding cascade delivery costs) were NGN 4,337 and NGN 6,772 for the insourced and outsourced delivery approaches respectively. Direct comparisons of these costs was however not possible as the scale and terrain of deliveries varied significantly across the approaches.¹
	 State X successfully transitioned from bi-weekly deliveries to monthly deliveries, reducing the total distribution cost significantly.
	 Transitioning from the traditional deliveries to direct deliveries decreased the vaccine distribution costs in State X by 19%; representing NGN 17m cost savings annually. Vehicle maintenance and vaccine distribution to unequipped facilities were responsible for the bulk of cost savings.
	 Direct deliveries have streamlined the funding system for vaccine distributions to one that is solely managed by the state. It ensures vaccine stock availability at no extra cost to health workers or facilities and reduced the need for out-of-pocket health worker spending for vaccine distribution.

Executive summary... (3/3)

Lessons for other states	 Benefits and potential pitfalls exist for both insourced and outsourced approaches. Ultimately, important trade-offs need to be made in selecting the best suited approach for each state.
	 While implementing the insourced approach ultimately builds in-house distribution management capabilities, timely fleet replacement and proper staff capability building and succession planning pose significant risks to sustenance of the approach.
	 On the other hand, the outsourced approach ultimately drives private sector innovation that improves efficiency. However, the absence of a vibrant local 3PL market and issues with the vendor selection and contract management processes in states are major limitations.
	 Though State X's decision to implement a mix of both approaches helped build in-house vaccine distribution capabilities while also benefiting from private sector innovations, the mixed model came at higher cost, as economies of scale are not fully leveraged with either approach.
	Regardless of the selected delivery approach, a few important structures need to be in place to drive effective implementation of direct vaccine deliveries. These include:
	 A functional State Logistics Working Group; with both state and RI partner representation to oversee deliveries operations and proactively problem solve issues as they are encountered;
	 LGA (mobile) CCOs to enforce proper vaccine management practices at equipped facilities; and
	 Adequate funding and seamless financial flow mechanisms to ensure there are no interruptions to delivery schedules and ultimately long term sustenance of the system.
	 Cost reduction strategies should be pursued provided they are not detrimental to direct delivery effectiveness.
	 Reducing the frequency of deliveries; increasing the number of facilities served; and the use of alternative vehicles e.g. tricycles where possible, are all viable options to reduce delivery costs.
Knowledge gaps	Though the State X experience provides guidance on implementing direct vaccine deliveries at scale, there is a need to review results of alternative delivery approaches (like properly funded traditional pull systems or 'fully outsourced' vaccine supply chain system) before conclusions can be reached on the

best suited model for prospective reformer states.

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Introduction

- Until recently, weak vaccine supply chain systems had significantly contributed to poor immunization coverage in State X, Nigeria. A combination of dilapidated cold chain infrastructure and complex inefficient vaccine distribution systems resulted in frequent stock outs of vaccines at service delivery points; consequently resulting in missed immunization opportunities.
- As of 2012, the vaccine distribution system in State X faced many challenges and was largely ineffective in delivering vaccines to immunization service points. The system was characterised by:
 - Complex multi-layered architecture involving a large number of stakeholders required to either PUSH or PULL vaccines at different levels, with no clear accountability;
 - Inadequate funding with weak financial flow mechanisms resulting in frequent interruptions in vaccine distribution operations; and
 - Absence of technical supply chain expertise on the state logistics team resulting in weak management and analytical capabilities to effectively manage the supply chain.
- The institution of a tripartite MOU to strengthen routine immunization between the State X Government, Bill and Melinda Gates and Dangote Foundations in November 2012, provided the platform and funding to transform the vaccine supply chain management system. This transformation involved the streamlining of the vaccine distribution architecture, and the engagement of a private vaccine distributor to complement governments' vaccine delivery efforts.
- 20 months since the inception of the "Direct Vaccine Deliveries", State X has seen improvements in vaccine stock availability at service points. The lessons learned from State X's implementation will help strengthen the existing knowledge base on streamlining vaccine distribution systems.
- This document lays out early results from a review of the "Direct Vaccine Delivery" program to serve as a guide for prospective reformer states implementing the model. It also provides practical advice on key elements to consider in deploying either an insourced or outsourced vaccine delivery model.

Please note...

This documer Vaccine Deliv	nt is based on the best readily available program data on the "State X Direct ery Program" as at January, 2016 <i>(20 months of implementation)</i>
	 Vaccine stock data (for 7 antigens) was obtained via physical stock count by vaccine distributors at equipped facilities, on each delivery round
Quantitativa	 Delivery completion rates were obtained from the daily vaccine delivery completion reports completed by vaccine distributors
data sets	 Vaccination data was obtained directly from immunization tally sheets at 30 sample equipped health facilities by a team of trained data collectors
	 Cost details were obtained via expenditure reports, market survey of cost items, structured internet research and interactions with implementers as required. Results were computed on an interactive excel-based costing model using a bottoms-up costing approach
	 Qualitative data was obtained via key informant interviews and focus group discussions with key stakeholders in State X, Nigeria.
Qualitative data	 End-user experience was obtained from health facility in-charges and immunization foal persons at equipped health facilities
	 Program success factor and challenges were obtained from State X SPHCDA/MB management team, logistics team and managers of both insourced and outsourced vaccine distribution teams

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A vaccine supply chain diagnostic conducted in State X in 2012 identified ineffective vaccine distribution as one of the key bottlenecks

Key vace	supply chain bottlenecks resulted in inadequate supply of cine for RI sessions…	and contributed poor vaccination
1	Inadequate cold chain and poor maintenance limiting vaccine availability at service points	other northern st
2	Complex and ineffective vaccine distribution architecture leading to frequent stock outs	
3	Inadequate and ad-hoc funding for vaccine transportation across all levels	
4	Faulty vaccine forecasting and allocation which did not adequately reflect demand	
5	Weak data management systems resulting in ineffective management decision making	1. 'Baseline' State X RI coverage
6	Lack of proper supportive supervision due to funding limitations and capacity gaps	 2014 showed a L coverage of 38% 2. This reflected the vaccination of status as @ Jan 2012 – May 2

The RI MoU executed between State X and its partners set up the governance framework and funding for the supply chain revamp

Contents	Brief description	
Program objective	Reaching a sustainable rate of 80% immunisation coverage by the end of the MoU period.	The MoU supported interventions across core RI thematic areas:
Roles and responsibili -ties	 These are summarized into 3 core buckets: Governance and leadership: The State task force on immunization (headed by the Deputy Governor) provided leadership and oversight for the RI program with support from BMGF and Dangote Foundation. Funding and financial management: The 3 MoU parties contributed funds annually through a basket fund mechanism to fund the RI program. State X SPHCDA/MB also established direct electronic funds disbursement system to LGAs and facilities. Operations: State X SPHCMB's RI team and working groups (headed by the Executive Secretary) was responsible program planning and implementation management. 	 Governance (PHCUOR policy implementation) Service delivery Vaccine supply chain Supportive supervision Data management and use Community engagement and social mobilization Training and capacity building

A re-design of the vaccine distribution system was one of a suite of interventions deployed to improve the effectiveness of the supply chain

Deploy live visibility on vaccine stock

1

2



 Weekly vaccine stock performance dashboards deployed at both LGA and ward levels to guide timely vaccine stock replenishment and other logistics decisions

Strengthen cold chain infrastructure



- Solar direct drive refrigerators procured to fill ward level cold chain gaps
- Walk-in cold rooms procured to fully equip 5 new state satellite cold stores

Vaccine distribution architecture re-design



Set-up working group to manage the transformation



- Vaccine distribution architecture streamlined to enable direct delivery of vaccines from state satellite stores to equipped health facilities
- Private vaccine distributor engaged to deliver vaccines to health facilities
- State logistics working group inclusive of all RI partners established to manage the supply chain transformation and routine logistics operations

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The vaccine distribution system re-design involved a detailed review of the old system, as well as consideration of international best practices

Deep dives ahead

	Description	Rationale
1 Review of State X's old system	 The diagnostic conducted a th of the old syste key bottleneck ineffectiveness 	 Review provided insights that guided targeted design options which addressed the weaknesses of the old system
2 International best practice considerations	 The diagnostic reviewed releving identify document distribution inner improved support effectiveness and 	 There was also a need to incorporate lessons from vaccine supply chain innovations being implemented in other resource-limited settings

1 Weaknesses with the old vaccine distribution system were identified to guide targeted system design options

Features of the delivery system	The old system was multi- layered, complex and mostly ineffective	The streamlined vaccine delivery system addressed the weaknesses of the old system	to yield a number of benefits
Direction of vaccine movement	Pull system relied on service providers having financial incentives to ensure vaccine availability	Vaccines are now delivered to the health workers who can focus on their work at the facilities	Time gained is spent attending to more clients
Number of storage tiers	High number of stakeholders required in the ordering process across all 3 storage tiers (state/satellite, LGAs and facilities)	Reduced number of ordering points and transportation legs by skipping LGA nodes	Reduced number of stops before the service points
Financial flow	Limited accessibility of funds for deliveries from the LGAs to service points	Reduced number of transactions required to complete a delivery cycle by bypassing the LGAs	Simplified funding system managed solely by state
Performance management	No clear ownership and accountability for supply chain performance due to complexity	State logistics officer and SLWG fully accountable for processes and results of the chain	SLWG in place to sustainably run the system
Opportuniti	es to leverage the private sector to c	omplement governments' efforts in	improving

Some international best practice examples were also considered to

guide the system re-design

Streamlining example

Streamlining plus outsourcing example

	Intervention summary	Effects of intervention on supply chain		
Senegal	Supply chain architecture streamlined by moving vaccines directly from	 33% rise in vaccine availability at facilities from baseline, plus ~100% timely deliveries 		
(St, Louis region) regional (state) stores to health facilities using "moving warehouses"		 No change in costs compared to traditional non-streamlined system 		
South Africa	Vaccine procurement, warehousing and distribution outsourced to a private	 More cost-effective than previous Government-run system 		
(Western Cape province) logistics company; and then streamlined to improve efficiency		 Improvement in timeliness of deliveries and improved accuracy in quantities ordered 		
Thailand	A vendor-managed inventory system (VMI) deployed for vaccine supply management and distribution:	 ~20% cost savings for total procurement and distribution costs in the first year 		
(Country-wide)	distribution subcontracted to a private logistics company	 Reduction in volume of vaccines distributed and time spent in storage 		

Implications for vaccine supply chain systems

- 1. Reducing the number of levels vaccine have to go through in the chain results in efficiency gains through reduction of time spent in storage, improved allocation accuracy and consequently reduced costs.
- 2. Outsourcing appropriate components of the supply chain to the private sector has the potential to significantly increase supply chain performance, and at the same time strengthen in-house government capacity to manage supply chain.

The redesigned system has state/satellite stores delivering vaccines directly to equipped facilities through an informed PUSH system

Pick up frequency

- Vaccines pushed
- Vaccines pulled
- Focus of intervention

Old vaccine logistics architecture



1. Target of 1 equipped (primary) facility per ward based on National policy 2. All other facilities in the ward are classified as unequipped (cascade) SOURCE: Team analysis

Re-designed vaccine logistics architecture



How the redesigned system (Direct Vaccine Deliveries) works

- Satellite stores deliver bi-weekly to equipped facilities initially, but transition to monthly once stock levels are optimized
- LGA stores hold stock as buffer for equipped health facilities in case of need for emergency top ups
- Equipped (primary) facilities push vaccines to unequipped (cascade) facilities for each session

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The Direct Vaccine Delivery system was successfully piloted across 13 facilities in State X with positive results & important lessons learned (1/2)

Pilot description

- Duration: (18 weeks)
- > # satellite stores: 1 satellite store
- > # Facilities covered: 13 health facilities
- > Delivery mechanism: Outsourced
- Delivery vendor: XXX
- Cost per delivery: NGN 11,849

Results of the pilot

- Vaccine stock out rates at pilot facilities reduced from 38% to 4% over the first 16 weeks of the pilot
- The number of children vaccinated improved at pilot facilities, while controls remained largely unchanged
- The time spent by health workers picking-up vaccines reduced by 76% and 81% in urban and rural facilities respectively

Challenges observed:

 Cold chain equipment breakdown and absence of health workers from facilities at the time of deliveries both resulted in occasional failed deliveries.



The Direct Vaccine Delivery system was successfully piloted across 13 facilities in State X with positive results & important lessons learned (2/2)

Pilot description

- Duration: (18 weeks)
- > # satellite stores: 1 satellite store
- > # Facilities covered: 13 health facilities
- > Delivery mechanism: Outsourced
- Delivery vendor: XXX
- > Cost per delivery: NGN 11,849

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Over 1,000 facilities are currently served by direct vaccine deliveries implemented through both insourced and outsourced approaches

LGAs covered by state

LGAs covered by private	Pescription	# satellite	# primary and cascade facilities	Primary to
Insourced	 State-run: Deliveries carried out by state drivers using state delivery trucks, and coordinated by state delivery manager 	2	Primary Cascade 212 354	1 : 1.5
Outsourced	 Private vendor-run: Vehicles and drivers provided by private vendor; deliveries coordinated by vendor delivery manager 	4	248 454 702	1:1.8
Total	<u>Note:</u> All inventory management and warehousing is managed by the state	6	390 666 1,050	1 : 1.7

Outsourcing in the State X's model is limited to transportation of vaccines to equipped facilities and return documentation

Core processes involved in State X's vaccine distribution system

Responsibility of the state both in insourced and outsourced delivery approaches

(X)

Responsibility of the state in insourced deliveries and of the private vendor in outsourced deliveries

Warehousing operations at State cold storage facilities Receive vaccine from National and update state inventories

- 2
- Distribute vaccines to state satellite stores
- Compute vaccine 3 allocation for equipped health facilities



Vaccine distribution to equipped health facilities



- On-load vaccines on 5 delivery trucks for distribution
- Deliver vaccines to 6 equipped facilities

- Conduct onsite vaccine 7 stock count and return documentation
- **Revise stock allocations** 8 where required and provide onsite TA

Vaccine storage and cascade from equipped health facilities



Take delivery of stock 9 from the vaccine distribution team

Conduct RI sessions as 10 planned



Conduct cascade deliveries to unequipped facilities

Collate and report 12 vaccine utilization data

SOURCE: Team analysis

Responsibilities along the supply chain are re-distributed across different teams in line with the delivery approach

Not core responsibility

	R	oles in traditional system		R	oles in direct delivery system	Insourced	Outsourced
State / satellite team (SLO, SCCO, ZCCO)	• •	Receives state vaccine allocation from National Operates State Store Allocates vaccines to LGAs and coordinates LGA pick-up sessions at state store		•	Receives state vaccine allocation from National and distributes to satellite stores Operates state and state satellite stores Allocates vaccines to equipped health facilities/ wards and monitors stock performance		
State delivery team (Drivers)	•	N/A		•	Picks up vaccines from state satellite stores and delivers to equipped health facilities/ wards		
3PL team (Vendor)	•	N/A		•	Picks up vaccines from state satellite stores and delivers to equipped health facilities/ wards Collates facility delivery stock reports		
LGA team (LIOs, LCCOs)	•	Picks up vaccines from State store Allocates vaccines to facilities and coordinates facility pick-ups from LGA		•	Joins vaccine delivery runs to facilities and ensures proper vaccine management practices Collates facility delivery stock reports		
Facility (OIC, RI FP)		Picks up vaccines from LGA store to facility; stores antigens if equipped Conduct vaccination activities <i>Delivery operations and data collect</i>	v tion be	• •	Receive and store vaccines delivered to facility Conduct vaccination activities <i>me the core responsibility of the 3PL team</i>	in the	

SOURCE: Team analysis

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State X direct vaccine delivery results at a glance

Effectiveness1(Impact on stock)	Effectiveness2(Impact on vaccination)
Decrease in stock out rates across 7 basic antigens at primary (equipped) facilities from 10%	>20% increase in total number of children vaccinated for 5 of 6 antigens tracked at sampled primary (equipped) facilities
Stock performance measured for 7 basic antigens across all primary HFs from Q2 2014 to Q1 2016	Vaccination trends tracked for 6 antigens across 30 primary HFs from Q1 2013 to Q3 2015
Reliability 3	User experience 4
(Timeliness of deliveries)	(Health worker time saved)
(Timeliness of deliveries) Vaccine deliveries from the state to primary (equipped) facilities were timely 78% of the time	(Health worker time saved) 100% of health workers expressed satisfaction with the direct deliveries which allows more time for active caring for patients

- 1. Data captured only for facilities served by the private vendor; state-side data not available
- 2. Focus group discussions

SOURCE: State X stock performance dashboard, Team analysis

There has been a significant reduction in stock outs at primary (equipped) facilities since inception of direct vaccine deliveries





- 1. Adequate stock: Percentage of antigens above minimum stock level (1 week stock)
- 2. Buffer stock: Percentage of antigens below minimum stock but not stocked out
- 3. Stock out: Percentage of antigens stocked out
- 4. Includes data for only January 2016 based on availability
- SOURCE: State X stock performance dashboard, Team analysis

Stock out rates have declined across facilities receiving vaccines through both insourced and outsourced models





 Greater ownership and accountability for stock performance results by LGA CCOs (who participate more regularly on vaccine deliveries to insourced facility) is driving the consistent stock out decline

• It will be critical to ensure LGA CCOs take full ownership of deliveries from inception regardless of the model deployed

Reanalysis of the trends excluding 5 outlier cycles showed statistically significant reduction in stock outs across both delivery models



Delivery model		# cycles	Stock outs		Below bu	Iffer	Adequate stock	
All delivery cycles			slope	p-value ¹	slope	p-value ¹	slope	p-value ¹
	Combined	33	-0.48	0.005	+0.41	0.111	-0.07	0.789
	In-sourced	26	-0.49	0.001	-0.73	0.006	+1.22	0.002
	Out-sourced	33	-0.33	0.110	+0.40	0.192	-0.07	0.828
Excluding outlier cycles ^{2,3,4}			slope	p-value ¹	slope	p-value ¹	slope	p-value ¹
	Combined	28	-0.65	0.001	+0.59	0.001	+0.10	0.600
	In-sourced	21	-0.52	0.004	-0.79	0.018	+1.31	0.000
	Out-sourced	28	-0.55	0.005	+0.53	0.001	0.02	0.936

1.2 sided test of null hypothesis that slope = 0 at alpha of 0.05.

2. Cycle 9 excluded because of poor performance following 5 days delays in commencement of the delivery cycle due to state wide stock-out of 5 antigens.

3. Cycle 16 (Feb 2015) excluded due to outlier poor performance following 2 missed cycles caused by state-wide health worker strikes.

4. Cycles 28, 29 and 30 excluded due to poor performance caused by back to back transitions from bi-weekly to monthly deliveries and from 1 state store to 6 satellite stores. SOURCE: State X stock performance dashboard, Team analysis

Vaccines discarded after 6 hours of opening account for 80% of the stock outs still experienced at health facilities



- Stock out of lyophilized vaccines is directly linked to high wastage rates of the antigens which have to be utilized at every session to reach children present
- The implementation of the 1-4-3 immunization strategy in State X which has every facility conducting at least 1 fixed and 1 outreach session per week has increased state vaccine requirement
- Conversation is ongoing with National to review stock allocation in line with the no. of planned session necessitated by 1-4-3 immunization strategy that was advocated

The number of cascade facilities served by a primary facility is a major determinant of stock performance





Cascade deliveries are required to deliver vaccine stocks to CCEunequipped health facilities for immunization sessions

Cascade deliveries logistics architecture for an apex facility





Apex facilities' vaccine stock requirement depends on the number of sessions conducted across all cascade facilities served, among other things, as wastage is expected to increase exponentially with increased number of sessions held to cover a given target population

A few unresolved challenges still hamper effective cascade deliveries to unequipped health facilities

Ke ca	ey elements of scade deliveries	Issues identified	Proposed recommendation			
1	Facility mapping	 Attempts to link all unequipped facilities to primary facilities in the same ward sometimes results in: Proximity challenges as assigned primary facilities are not necessarily the most proximal to cascade facilities Unmanageable workload as facility saturation varies significantly with wards managing between 0 – 9 cascade facilities¹ 		Primary to cascade facility mapping should consider proximity and workload, and not be solely based on administrative wards assignment		
2	Vaccine accountability	 Where WTOs² are not stationed at the primary facility, there is difficulty accounting for vaccines issued to cascade facilities and reconciling vaccinations to stock consumed 	•	WTOs in each ward need to be posted to the primary health facility to effectively coordinate cascade deliveries		
		 Challenges exist with complete and accurate 		Intensive data management		
3	Data tracking	collation of both stock consumption and vaccination data from all cascade facilities,		training is required to bring all front line health workers up to		
		hampering accurate vaccine stock allocation to each ward		speed with direct delivery data reporting		

Electronic LMIS solutions may be required to improve efficiency of data collation across all health facilities

1. To reduce burden, session days are spread out by facilities such that WTOs make 1-2 cascade deliveries per day; 2. Ward technical officers: Category of health workers in State X responsible for coordinating RI activities at the ward level, including cascade vaccine deliveries. 1 WTO is appointed per ward; usually the most senior health worker in the ward to make deliveries at 200 NGN per cascade facility

SOURCE: State X stock performance dashboard, Team analysis

Proactive data-driven problem solving is critical for effective implementation of direct vaccine deliveries



Various operational challenges have been experienced implementing direct vaccine deliveries...

- Weaknesses in traditional allocation if stock based on largely inaccurate population data resulted in lingering stock-outs at health facilities
- 2 Labile demand for vaccines due to high frequency of supplemental immunization activities also led to repeated cases of stockouts at health facilities
- Increased complexity of managing vaccine supplies at 6 satellite store locations, compared to 1 state store
- Delayed release of operational funds for state-led vaccine deliveries or payment of vendor invoices posed a risk to the new vaccine delivery model

...which are continuously managed by the state logistics working group

- Data-driven consumption-based revision of vaccine stock levels for wards/ primary health facilities to reduce the frequency of stock-outs or over-stocking
- 2 Set up emergency response systems where LGAs hold 25% buffer stock for health facilities and PUSH vaccines to facilities who stock out before the next delivery cycle
- Proactive pre-positioning of vaccine stock at state satellite stores in preparation for every round of deliveries to primary facilities
- Prompt approval and direct disbursement of funds for vaccine deliveries (both to state teams and private vendor), and to ward technical officers for cascade deliveries



1. Only 27 of 30 sampled facilities had complete usable data for the period in review

SOURCE: Data collected directly from health facilities in State X; Team analysis



1. Only 27 of 30 sampled facilities had complete usable data for the period in review

SOURCE: Data collected directly from health facilities in State X; Team analysis

Immunization trends suggests there is a 1-year lag before the impact of direct deliveries becomes clear





Average number of vaccinated children at surveyed health facilities in State X ('000)

The decline in HBV was due to a policy misconstrued by health workers as a directive to not administer beyond 24 hours.

- The lag period before vaccinations started to rise may be due to slow reestablishment of trust in the health system, following a prolonged history of eroded confidence by the communities
- Other interventions like improved funding for outreaches and better supportive supervision presumably contributed to rise in vaccinations
78% of vaccines deliveries to equipped health facilities were on-time

XX



Untimely deliveries³

Timely deliveries²

equipped facilities $\neg \vdash$ Transition to monthly deliveries



- Contractual agreement with private distributor stipulates ≥ 95% deliveries on-time; untimely deliveries recorded so far have been as a result systemic state bureaucracies and not defaults by the private vendor
- Data on timeliness of deliveries for the insourced approach had quality concerns and not included in this analysis; state needs to strengthen its delivery data reporting systems to ensure it supports informed decision making

1. Analysis covers only deliveries to health facilities made by private vendor SOURCE: State X stock performance dashboard, Team analysis

Timeliness of vaccine delivery correlates well with stock adequacy in reviewed facilities

Profile of direct deliveries timeliness across 238 health facilities in August

(number of facilities)



There is a direct relationship between delays in deliveries and increasing stock-out levels of vaccines. Any increase in the number of days of delay results in an increase in antigens stocked out at health facilities.



64

58

49

Percentage of facilities with adequate stock

(% of antigens)

The direct vaccine delivery has reduced time spent by health workers collecting vaccine and missed opportunities due to vaccine stock outs

Effectiveness [1	Effectiveness 2
(Impact on stock)	(Impact on vaccination)
Cumulative decrease in	>20% increase in total number
stock out rates across 7	of children vaccinated for
basic antigens at primary	5 of 6 antigens tracked at sampled
(equipped) facilities from	primary (equipped) facilities
Reliability	User experience 4
(Timeliness of deliveries)	(Health worker time saved)
Vaccine deliveries from the state to primary (equipped) facilities were timely 78% of the time	100% of health workers expressed satisfaction with the new system which allows more time for active caring for patients

Clients¹

"I have never been told that there are no vaccines for immunization"

- Client at LGA 1

"I have never had such problem such as coming to hospital just to be told that there is no syringe." -*Client at LGA 2*

Previously we have to wait for the arrival of the injection but now we always come and there is availability of it. When we come, they immunize our children. We don't experience waste of time

- Clients at LGA 1

Manager'

"Health workers do not spend money out of their pockets anymore to pick up vaccines"

- Zonal Director, Zone 1

"It allows us to properly support health facility in-charges with on the job training regarding vaccine and data management"

- SLO, State X SPHCDA/MB



RI partner

"Health workers now have time to do primary duties rather than going to the LGA cold store to pull vaccines "

- Partner representative, State X

Facility health workers "I used to go before and collect vaccines but now we have it enough and there is no shortage" - Health worker at LGA 1 "Even if our patient delivers we send the vaccine to the labour room to give the baby BCG and OPV because we have it available"

- Health worker at LGA 1

End users also provided insights on the challenges as well and recommendations to improve direct deliveries

Effectiveness [1]	Effectiveness 2
(Impact on stock)	(Impact on vaccination)
Cumulative decrease in	>20% increase in total number
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Approximate costs of implementing direct deliveries in State X was determined using a bottoms-up modelling approach



All capital expenditure have been amortized to reflect the values expensed over a one-year

The cost analysis compared the actual annual costs of direct deliveries in State X with the cost of the traditional distribution system

		Actual Simulated	l
Potential options		Description	
Delivery through LGAs	Traditional system	LGAs PULL vaccines from the state store and health facility RI focal persons pick-up vaccines from the LGA stores for immunization sessions	Costing for
Direct vaccine deliveries (Streamlined to by-pass LGAs) ¹	Insourced	State government delivers vaccines directly from state satellite stores to CCE-equipped facilities in each ward, and ward focal persons PUSH vaccines to non-equipped facilities for RI sessions	traditional deliveries are best estimates of simulated costs; actual costs were never documented during its
	Outsourced	State hires a 3PL to deliver vaccines directly from state satellite stores to CCE-equipped facilities in each ward, and ward focal persons PUSH vaccines to non-equipped facilities for RI sessions	implementation

1. State vaccine logistics architecture streamlined to permit vaccine deliveries directly to CCE-equipped HFs from state/satellite stores SOURCE: Team analysis

Transitioning to direct vaccine deliveries has decreased annual vaccine distribution cost by ~19%

Total annual cost¹ of bi-weekly vaccine distribution in State X OpEx CapEx (NGN millions)



1. Cost of implementing bi-weekly direct deliveries; 2. Computed from market costs of line items required to complete traditional deliveries SOURCE: Interviews with SLO and State delivery coordinator; eHealth direct delivery costing model; Team analysis

Vehicle maintenance and vaccine distribution to unequipped facilities were responsible for the bulk of the cost savings

		Funded by state	Funded by LGA Varied;	mostly out of health worker pocket
Total anr delivery	nual cost ¹ comparisor (NGN millions)	of traditional versus	direct vaccine	
		Traditional ²	Direct deliveries	
	Vehicle depreciation	19.9	20.3	Direct vaccine
0	Cold chain	2.2	2.0	deliveries have also:
СарЕх	Communication	0.2	0.8	Decreased the
	Furniture	0.1	0.1	need for out-of- pocket health
	Personnel	0.9	16.6	worker expenditure for
	Cascade deliveries	27.5	13.9	vaccine pick-up;
	Training	1.1	0.2	 Established a
ОрЕх	Vehicle maintenance	27.0	10.3	simplified vaccine
	Vaccine insurance	1.8	3.7	funding system,
	Office overhead	9.5	5.4	the states
	Total	12.7 49.9 27.5 9	90.1	73.2

1. Cost of implementing bi-weekly direct deliveries; 2. Computed from market costs of line items required to complete traditional deliveries SOURCE: Interviews with SLO and State delivery coordinator; Vendor direct delivery costing model; Team analysis

Reduction in the need for out-of-pocket health worker expenditure for vaccine deliveries has both supply and demand-side benefits

Reduction in the need for out-of-pocket health worker expenditure for vaccine distribution

	Primary outcome	Secondary outcome
Supply- side	 Reduces the influence of fund availability in health worker pockets on vaccine availability for immunization sessions 	 Improved vaccine stock availability at service points for immunizations sessions
Demand- side	 Reduces the incidence of transfer of cost for vaccine pick-up to immunization clients 	 Increased demand for immunization services at health facilities

Direct bi-weekly vaccine delivery per facility costs an average of 5,857 across both the insourced and outsourced models deployed in State X

Cost comparison of alternative means of state level vaccine logistics system (NGN)			Disaggregated of insourced & out	cost of tsourced⁴ <i>(NGN</i>)	
		Traditional	Direct deliveries	Insourced	Outsourced
# primary	facilities	390	390	142	248
# cascade	facilities	666	666	212	454
	Annual cost per child ¹	179	145	119	159
Bi-weekly	Annual cost per ward ²	8,886	7,223	5,531	8,192
	Unit cost per delivery ³	N/A ⁵	5,857	4,337	6,727 ⁶

- 1. Annual cost of vaccine distribution per child under-1;
- 2. Annual cost of vaccine distribution per ward includes distribution to both primary and cascade facilities;
- 3. Cost of vaccine per primary health facility (excludes cost of cascade deliveries to unequipped facilities);
- 4. Cost of insourced and outsourced models cannot be compared as both are not implemented on the same scale and terrains;
- 5. Not applicable;
- 6. Cost computed differs from #7,000 charged in State X per delivery as mark up is excluded

SOURCE: Team analysis

State X's direct vaccine delivery system has evolved overtime ultimately to reduce overall cost of implementation



Decisions on delivery frequency and number of hubs were systematic approach necessitated by the need to ensure that the delivery system was gotten right before addressing efficiency concerns

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The direct vaccine delivery system delivers immense benefits for the RI program



Improved vaccine availability: Stock availability at health facility and service points improves, consequently increasing the number of children vaccination by limiting missed opportunities.

Reduced costs and simplified funding system: The model significantly reduces vaccine distribution costs, compared to the traditional system. It also simplifies the funding system to one managed solely by state, eliminating out-of-pocket health worker expenditure for vaccine pick-up.

Ustomer Service

Funding

More focus on service delivery: Health worker spend more time delivering services to clients. Health managers focus more on developing policies and providing oversight for program implementation.

HELP SUPPORT

ADVICE

Improved stock data management: The model creates visibility into facility stock levels through onsite information capture and reverse data logistics. State logisticians are able to make decisions using near real-time data.

Additional opportunities for supervision: State and LGA logisticians leverage deliveries to mentor facility personnel on vaccine management, handling and CCE maintenance.

Additional benefits

- Distribution of other commodities e.g. data tools,
- Regular monitoring of CCE functionality
- Retrieval of safety boxes

Direct vaccine deliveries can be implemented through an insourced or outsourced model

	Description	Pros	Cons
1	 Deploys state-owned vehicles and state-employed drivers to deliver vaccines Responsibility for vaccine distribution fully owned by state logistics team 	 Dedicated vehicles to transport vaccines owned by the state 	 Significant training required for staff on logistics management
Insourced model		 Capabilities for implementing model acquired and owned by the state 	 Added cost of recruiting drivers, supervisors and purchasing trucks Elect management might
		 Greater involvement of LCCOs in delivery operations 	be inefficient and pose risk to program sustenance
2 Outsourced	 Contracts experienced logistics company with local industry experience 	 Aligned with global best practices Private sector usually provides highly efficient processes and deploy relevant technologies 	 Contract needs to be robust with clearly defined performance indicators Innovative, and therefore
model	 Company already has significant logistics and supply chain expertise 		may not be easily accepted by state
		 Easier for state to manage and supervise 	 Most capable vendors may be expensive
			 Hinged on rigor of the tendering processes

Regardless of the direct vaccine delivery approach, individuals are required to fill four distinct roles

	Roles	Highlight of key activities to be carried out
	Operations manager	 Supervises logistician, driver and engineer Regularly review reference stock levels based on consumption Contracts engineer as required to make curative repairs on CCE
(1) Operations manager	Mobile CCO	 Communicates with the health facility before day of delivery to determine allocation Travels with driver to supervise delivery
	Driver / 3PL ¹	 On load and off load vaccines Ensures allocated vaccines reach their destinations at the right time in the right state Return documentations and remaining product to satellite store
II) Oversight	Contract manager	 Convenes monthly review meeting with operations team Monitors implementation of next steps from the monthly review meeting

1. Driver called third party logistician in the outsourced approach SOURCE: Team analysis

Significant technical support from RI partners may be required by states to implement both delivery approaches

3PL-led with state

Minimal partner support

				overs	sight 🗶	No partner support
			Ins	ourced	Out	sourced
К о	ey elements f delivery	Processes involved	Responsible	Level of support required	Responsible	Level of support required
		 Review vaccine stock level and determine allocation 		\checkmark		\checkmark
		 Package and on-load vaccines and commodities 		∵ zzz		×
	Allocations	 Notify facility prior to delivery 		¥		Ş
I	and	 Deliver vaccines on time and ensure product safety in transit 		\checkmark		*
		 Collect and verify stock level information and allocation 		y ar (- y zz
		 Inspect CCE if faulty and effect repairs as required 		\checkmark		\checkmark
		 Return documentations and remaining product to satellite store 		₹.		×
	Monitoring	 Monitor vaccine stock balances to approve emergency top-ups 		\checkmark		\checkmark
n a r	reporting	 Analyze consumption and define reference stock levels 		\checkmark		\checkmark
111	On-going	 Ensure product availability at state / satellite store 		\checkmark		\checkmark
	operation	 Ensure accurate reporting and punctuality of deliveries 		\checkmark		\checkmark

• The delivery vaccines delivery approach will inform the choice of the personnel to carry out the operations involved

Level of partner support required and state's participation in vaccine haulage is reduced if delivery when outsourced

1. Third party logistician SOURCE: Team analysis

To successfully implement direct deliveries, states need to select appropriate deployment options and acquire the necessary capabilities

High-level activities	Key considerations	
Understand the different options available for the implementation of direct deliveries	 Review the insourced and outsourced approaches across: Capabilities required Benefits and potential pitfalls Other market considerations 	Oelivery operations management Oata management and analytics Fleet management Staff training and succession planning Vendor sourcing and selection Outract development and management Vendor relationship management In-house change management
2 Carry out cost comparisons for implementing each approach and consider levers that affect the costs	 Review the potential implementation costs for insourced and outsourced, layering on: Frequency of deliveries Scale of deliveries Types of vehicles deployed 	Believer options (Programmy, scale and flaw) Unit delivery cost per CCC. envigosed HE /rOX 0000 Annual delivery cost per CCC. envigosed HE /rOX 0000 (Programmy, scale and flaw) Insourced Duttourcent Duttourcent (Programmy, scale and flaw) 1000 2221 4.490 53 117 (Programmy, scale and flaw) 100 5.562 10.203 145 265 (Programmy, scale and flaw) 400 2.702 3.716 70 97 (Programmy, scale and flaw) 400 5.752 10.203 145 265 (Programmy, scale and flaw) 400 5.77 9.366 112 155 (Programmy, scale and flaw) 5.77 9.366 10.235 40 243 (Programmy, scale and flaw) 5.795 10.255 44 67 (Programmy, scale and flaw) 5.936 10.255 10 124 (Programmy, scale and flaw) 5.936 10.255 10 124 (Programmy, scale and flaw) 5.936 10.235 10 124 (Programmy,
3 Assess its current capabilities vis- à-vis established capability requirements for each approach	 Administer direct delivery capability assessment grid and identify specific gaps that need to be filled 	Number of the second
Develop a plan to acquire all necessary capabilities before implementation rollout	 Establish a functional state logistics working Identify resources required to fill capability gaps, agree actions steps and responsible persons 	Peak unit frait and an anti- Table Table

Carry out current state analysis of human resources for health Carry out human resource needs analysis for immediate and long term

st feedback session with the state team (Focus on assessment findings) nd feedback session with the state team (Focus on recommendations to fill gaps

Carry out gap analysis

States will need to bolster their capabilities across a few areas to successfully implement either an insourced or outsourced model



- Vendor sourcing and selection
- Contract development and management
- Vendor relationship management
- In-house change management



States require an optimally functioning fleet and effective delivery operations run by competent staff to successfully insource

Capabilities

Delivery operations management



SPHCDA should have capacity to:

- Develop optimized distribution maps and delivery plans
- Efficiently upload and offload vaccines
- Rigorously monitor and control in-transit temperature
- Procure and insure vehicles at best market costs
- Conduct rigorous preventive maintenance for fleet
- Execute bulk allocation purchase of fuel in case of scarcity



- Routinely collect data from facilities on vaccine stock levels, consumption, vaccinations and CCE operational status
- Analyse stock performance data to track effectiveness of deliveries and adjust stock allocations as required
- Staff training & succession planning
- Deploy robust training for mobile logisticians, data clerk, drivers and a manager to ensure effective implementation
- Efficiently manage staff succession to ensure sustenance of the model in events of staff attrition

Key enablers

IN Sourced

- Effective financial management processes that guarantee timely funds disbursement for deliveries
- Strong accountability system that holds all participating staff accountable for results of their work

There are benefits to implementing the insourced model...



operations effectively

...However, a few potential pitfalls may threaten the sustenance of the insourced approach

Area of focus	Potential risks	Risk score	¹ Mitigation/avoidance strategies
Fleet	Poor maintenance and delays in repairs of vehicles hampering regular deliveries		 States should consider fully outsourcing vehicle maintenance services
management	Absence of sinking fund for vehicles resulting in lack of funds for replacement		 SPHCDA should establish sinking fund that serves to replace fleet every 3 years
	 Use of vehicles for functions outside vaccine distribution; increasing wear and tear 		 GPS trackers should be installed on all trucks and travel data tracked by SLWG to drive accountability
Human resources	 Poor capacity building and succession planning for direct delivery staff, resulting in inadequacy of skilled practitioners 		 Establish a dedicated staff pool (with redundancy) for deliveries and deploy a structured direct delivery training program
	 Innovation is not incentivized, therefore little gains are made on quality improvement 		 Include continuous quality improvement on TOR of delivery coordinator and incentivize innovations that improve efficiency
Data management	 Weak data management practices can potentially result in declining vaccine availability at service points, and loss of confidence in the system 		 SLWG must ensure that all established data management processes are adhered to, and data always used to guide decision making
Performance management	 Weak performance management and accountability impairs staff performance and compromises quality of deliveries 		 States need to deploy performance management systems and ensure staff are held responsible for results of their work

1. Assesses potential impact on program if risk occurs SOURCE: Team analysis

States will need to develop a core set of in-house capabilities to effectively implement an outsourced direct delivery model

Capabilities

sourcing and

engagement

Vendor

SPHCDA should have capacity to:

- Distil required vendor competencies, conduct preliminary cost-benefit analysis and identify viable 3PLs in the setting
- Oversee and execute an end-to-end tender process in line with state procurement guidelines, and best practices
- Contract development

- Negotiate comprehensive service-level agreements (SLAs) that set target performance goals for 3PLs
- Develop and manage the execution of contracts with selected 3PLs

Vendor relationship management

- In-house change management
- Regularly review 3PL performance as outlined on SLA, and work toward continuous improvement
- Proactively monitor and manage potential risks by maintaining an open line of communication with 3PLs
- Build internal capacity and manage potential repurposing or redeployment of staff to better fit the outsourced model
- Internally, look beyond the life of the current contract to anticipate future service provision

Key enablers

- Effective financial management processes that guarantee timely payment of vendor invoices for services rendered
- Strong accountability system that holds all participating staff accountable for results of their work

OUT Sourced

3PLs can drive innovation in the implementation of direct deliveries, improving efficiency and reducing costs in the long run

Examples of innovative solutions deployed by eHealth Systems Africa (3PL) in State X and State Y direct vaccine deliveries			
Improving efficiency	 Primary and cascade facility delivery network maps and models that reduced transit distances and consequently fuel consumption costs A mobile-based information management system that enabled health delivery officers capture and upload delivery data while on the field 		
Leveraging technology	 A robust direct delivery dashboard that provided stakeholder with real-time delivery reports GPS vehicle trackers deployed to monitor the entire fleet of delivery trucks real-time, further save-guarding vaccines 		
Deploying robust people capabilities	 Well trained, multi-skilled health delivery officers who serve as both drivers and data clerks; and also capable of carrying out simple onsite surveys and root cause analyses 		
Outsourcing also enables state governments to better focus on defining policies and strategies to provide high-guality vaccination services			

The Nigerian 3PL market for vaccine deliveries is still very weak



Limitations to the establishment of a vibrant local 3PL market

- Weak demand for services as direct delivery model is still coming on-stream nationally¹
- Very few qualified and experienced 3PLs currently exist, especially with vaccines which require specialised vaccine management knowledge
- The perceived inability and sometimes reluctance of Government to pay 3PL services weakens the business case, especially with the heavy upfront capital investment required
- Parallel programming impedes ability for efficiencies through integration of other PHC products
- Limited demand for innovative cost saving delivery system

1. NPHCDA currently driving a national scale up of direct vaccine deliveries (PUSH PLUS strategy)

deliveries

SOURCE: NPHCDA, Last mile vaccine delivery: Building a business case (State X SPHCDA/MB); Team analysis



A few pitfalls also exist with outsourcing if the Government's contract management practices are weak

Outsourcing direct deliveries may fail if:

- Incompetent 3PLs are engaged to deliver vaccines which required a high level of specialization
- 2 Contracts are poorly drafted with no service level agreements (SLAs) or weakly defined ones
- 3 SPHCDA does setup adequate management oversight to track the performance of direct deliveries
- 4 Bureaucratic delays result in late payment of vendor invoices for direct delivery services rendered

Proactive steps that will ensure success

- State logistics working group should provide technical guidance to Tenders Board through the 3PL selection and engagement process
- State should engage partners or consultants with contract management capacity including knowledge in direct delivery operations
- SLWG should be assigned to track the performance of the direct deliveries and ensure 3PLs meets defined SLA
- SPHCDA should setup effective financial management processes that guarantees timely payment of vendor invoices

"Contracting private logistics service providers can be a unique opportunity to improve supply chain performance, but that performance depends on investing and executing long-term logistics contract management."

> - Logistics Outsourcing and Contract Management in Public Health Settings: USAID Deliver technical brief

Across both approaches, effective cascade delivery system is key to ensuring vaccine stock sufficiency at the last mile

A few structures need to be put in place for effective cascade deliveries ...

- Each primary facility must be linked to cascade facility(s) in their wards in a hubspoke model and vaccine distribution planned according to session schedules
- Vaccine stock requirement at cascade facilities must be determined and used to compute allocation to primary facilities
- A staff, Ward Technical Officer (WTO) needs to be dedicated to carrying out cascade deliveries, and recording stock utilization data and return unused vaccines¹
- A system for reconciling stock utilization and vaccination data to account for changes in stock requirement, and flag abnormally high vaccine wastage rates
- Effective system to finance cascade deliveries in a way that eliminates need for out of pocket expenditure
- 1. To include all unopened vials and opened non-lyophilized vials SOURCE: Team analysis

... but these do not come without operational challenges

- Mal distribution of facilities across wards in some cases may make workload of cascade deliveries unmanageable by the primary facility
- Accurately quantifying stock needs becomes more difficult with increasing primary to cascade facility ratio
- Where manpower at the primary facility is insufficient, WTOs who also double as primary facility in-charges are unable to manage the cascade delivery workload
- Data management and reporting systems are still very weak and administrative vaccination data still has quality issues
- Out of pocket expenditure greatly reduced but yet to be eliminated due to delayed disbursement at the beginning of the quarter

To successfully implement direct deliveries, states need to select appropriate deployment options and acquire the necessary capabilities

High-level activities	Key considerations
1 Understand the different options available for the implementation of direct deliveries	 Review the insourced and outsourced approaches across: Capabilities required Benefits and potential pitfalls Other market considerations
2 Carry out cost comparisons for implementing each approach and consider levers that affect the costs	 Compute potential implementation costs for: Insourced and outsourced Frequency of deliveries Scale of deliveries Types of vehicles deployed
3 Assess its current capabilities vis- à-vis established capability requirements for each approach	Administer direct delivery capability assessment grid and identify specific gaps that need to be filled
Develop a plan to acquire all necessary capabilities before implementation rollout	 Establish a functional state logistics working Identify resources required to fill capability gaps, agree actions steps and responsible

persons

back session with the state team (Focus on assessment findings) dback session with the state team (Focus on recommendations to fill gaps

We modelled market options for direct vaccine deliveries along 4 main factors

		Description	Options considered
Approach		 Parties responsible for delivering vaccines to health facilities 	 Insourced – State delivers vaccines Outsourced – State hires 3PL to deliver vaccines
2 Frequency		 Interval between delivery cycles to health facilities 	 Bi-weekly - vaccines delivered twice per month Monthly - vaccines delivered once per month
3 Scale		 Number of equipped facilities included on delivery schedule 	 100 facilities 200 facilities 400 facilities
4) Fleet	(?)	 Type of vehicles deployed to deliver vaccines across the state 	 Trucks alone Trucks + tricycles

It costs between 2,421 and 17,017 NGN to deliver vaccines to each CCEequipped health facility

Delivery options (Frequency, scale and fleet)		Unit delivery cost per CCE- equipped HF <i>(NGN)</i>		Annual delivery cost per CCE- equipped HF <i>(NGN)</i>		
		Insourced	Outsourced	Insourced	Outsourced	
Bi-weekly	Truck and tricycles	400	2,421	3,556	62,946	92,456
		200	3,796	6,021	98,696	156,546
		100	5,562	9,899	144,612	257,374
	Truck alone	400	2,702	3,716	70,252	96,616
		200	4,303	6,348	111,878	165,048
		100	5,377	9,350	139,802	243,100
Monthly	Truck and tricycles	400	3,696	5,545	44,352	66,540
		200	6,628	10,326	79,536	123,912
		100	9396	16,598	112,752	199,176
	Truck alone	400	4,349	6,423	52,188	77,076
		200	6,314	10,499	75,768	125,988
		100	8,641	17,017	103,692	204,204

• Cost of direct deliveries of vaccines varies with the combination of delivery options selected

• Feasibility of various options must be considered before deciding on the least cost approach

Toggling the delivery approach and the other 3 levers generates per delivery costs ranging from 2,421 to 17,017 NGN



SOURCE: Solina direct delivery costing model; Team analysis

It is cheaper to insource deliveries based on current 3PL market rates





- The personnel costs (includes salaries and management fees) and office overhead for the outsourced model account for the bulk of the difference when compared with the insourced model
- Establishment of a more vibrant 3PL market following expansion of direct deliveries to more states will ultimately drive down outsourcing costs

The outsourced model has greater economies of scale



A few options can be explored to reduce the cost of engaging 3PLs for direct vaccine deliveries

		Foasibili	i t., 1
High	Medium	Low	

OUT Sourced

	Description	Rationale	Feasibility ¹
Expand to more states	 Introduce the direct vaccine delivery model to more states and scale-up its implementation 	 Creates market incentives for 3PLs to emerge, increases economies of scale; encourages market entry; and drives down costs 	$\mathbf{\Theta}$
Consolidate payments	 Pay annual costs for direct vaccine deliveries in fewer instalments to the engaged 3PLs 	 Reduces the risk of payment defaults; encourages market entry and drives down costs 	
Increase contract duration	 Extend contract duration to 2 or 3 years or include clear terms for renewal of annual contracts 	 Strengthens business case for capital investments by guaranteeing work for longer duration 	
Integrate other commodities	 Leverage deliveries to distribute other PHC commodities like medicines, data tools, equipment 	 Creates additional value by distributing more products, thereby lowering overall distribution costs 	

Cost of both approaches can potentially be reduced where it is possible to replace delivery trucks with tricycles



1. Cost computation assumes that tricycles will be used to make deliveries across one-third of the CCE-equipped health facilities SOURCE: Partner direct delivery costing model; Team analysis

Switching the frequency of delivery from bi-weekly to monthly increases unit cost per delivery, but reduces the total annual delivery costs


Beyond cost, there are other important considerations that affect the feasibility of implementation of each option

		Options	Considerations
1 Approach		 Insourced vs. outsourced 	 States need to consider the capabilities required to not just deploy, but sustain the delivery approach selected e.g. inability to maintain a fleet of vehicles in the long term might favour an outsourced approach
2 Frequency		 Bi-weekly vs. monthly cycles 	 More frequent deliveries are required at the outset to assess actual stock requirements of wards without compromising stock performance e.g. states can deliver on a biweekly basis for 1 year before transitioning to monthly
3 Scale		 ~100 vs. ~200 vs. ~400 equipped facilities/ wards 	 The scale of deliveries is determined by the number of CCE-equipped facilities / wards, and it makes sense to address cold chain gaps before commencing direct deliveries
4 Fleet	(?)	 Trucks + tricycles vs. trucks alone 	 Use of tricycles or other smaller vehicles is limited to urban geographies with shorter transit distances between facilities. Trucks will still be required for rural and hard-to-reach areas

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To successfully implement direct deliveries, states need to select appropriate deployment options and acquire the necessary capabilities

High-level activities	Key considerations	
1 Understand the different options available for the implementation of direct deliveries	 Review the insourced and outsourced approaches across: Capabilities required Benefits and potential pitfalls Other market considerations 	Delivery operations management Dela management and analytics Fleet management Staff training and succession planning Vendor sourcing and selection Outract development and management Vendor relationship management In-house change management
2 Carry out cost comparisons for implementing each approach and consider levers that affect the costs	 Review the potential implementation costs for insourced and outsourced, layering on: Frequency of deliveries Scale of deliveries Types of vehicles deployed 	University of the CCE: Central delivery cost per CCE: Central delivery cost per CCE: University of the COX of th
3 Assess its current capabilities vis- à-vis established capability requirements for each approach	 Administer direct delivery capability assessment grid and identify specific gaps that need to be filled 	Direct vaschine delivery readiness assessment grill Russ Nummer Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Image: Strategrill Ima
Develop a plan to acquire all necessary capabilities before implementation rollout	 Establish a functional state logistics working Identify resources required to fill capability gaps, agree actions steps and responsible persons 	Taka sid its set site Taka sid its set site Taka Taka sid its set site Taka Taka sid its set site Taka Taka sid its set site Taka sid its set sid Taka sid its set sid Taka sid its set set set set set set set set set s

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Carry out gap analysis

Direct vaccine delivery readiness assessment grid

Required Not required

Areas of focus	Requirement	Assessment question	Insourced	Outsourced
	1. Fleet availability	1. Is there a functional fleet of trucks dedicated to vaccine deliveries (1 truck per 50 wards)?		
Fleet management	2. Fleet maintenance	2. Is an effective system in place for both preventive and corrective maintenance of the fleet?		
	3. Fleet replacement	3. Has a sinking fund been established to replace delivery vehicles after 3 – 4 years of use?		
Other	4. Cold boxes	4. Are RCW25 cold boxes available for packing vaccines (2 cold boxes per delivery vehicle)?		
equipment	5. Temperature loggers	5. Are electronic temperature loggers available for in-transit temperature monitoring (1 logger per cold box)?		
	6. Delivery manager	6. Has a senior SPHCDA staff been assigned to manage the deliveries on a full- time basis?		
Human	7. Mobile logisticians	7. Have the LGA CCOs been trained to join and manage delivery visits to facilities, include data collection?		
resources	8. Drivers	8. Has an adequate number of FRSC trained and experienced drivers been assigned to the delivery team full-time (1 driver per delivery truck)?		
	9. Data clerk	9. Has a well-trained dedicated data clerk been assigned to support the delivery team full-time?		
Data	10. Data tools	10. Have the appropriate data tools and KPI forms been developed for the deliveries?		
management	11. Delivery dashboard	11. Has an electronic dashboard been developed to report direct delivery data real- time?		
	12. Competency mapping	12. Does the state logistics team (inclusive of RI partners) have a good understanding of required 3PLs competencies?		
3PLsourcing &engagement	13. Tendering	13. Does the SPHCDA have a functional Tenders Board capable of executing the tender process in-line with state procurement guidelines and best practice?		
	14. 3PL availability	14. Has the state logistics team identified local 3PLs with experience in delivering vaccines?		
Contract	15. Contract drafting	15. Does the SPHCDA have staff capable of drafting robust contract documents in state legal guidelines and regulations?		
management	16. SLA tracking	16. Is the State logistics team (inclusive of RI partners) capable of negotiating a comprehensive SLA and tracking 3PL performance against it?		
Funding &	17. Funding	17. Has a comprehensive budget been developed and funds secured for the direct vaccine deliveries?		
financial mgt	18. Financial management	18. Are effective financial management processes in-place that guarantee timely disbursement of funds for delivery operations?		
	19. Performance indicators	19. Are there clearly defined key performance indicators to track the performance of the direct delivery program?		
Performance management	20. Performance mgt	20. Is there a robust performance evaluation system that assesses staff performance and links to consequences?		
	21. SLWG functionality	21. Is there a functional state logistics working group (inclusive of RI partners) that is capable of providing oversight for the direct vaccine delivery program?		75

The grid will assess the readiness of each state to implement the 2 direct vaccine delivery approaches Capacity required

Areas of focus	Requirement	Insourced recipe	State A	Matching	Outsourced recipe	State A	Matching			
	1. Fleet availability	!			!		N/A			required
Fleet	2. Fleet maintenance						N/A		Has capacity	/
manayement	3. Fleet replacement			×			N/A		Does not na	ve capacity
	4. Cold boxes				!		N/A	\checkmark	Match	
other equipment	5. Temperature loggers						N/A	🔀 No match		
	6. Delivery manager			x !			x	N/A	Not applicab	le
Humon	7. Mobile logisticians									
resources	8. Drivers				!		N/A			
	9. Data clerk			×			N/A			
Dete	10. Data tools				i			State A	<u>Results</u>	
management	11. Delivery dashboard			×	!			Readiness to implement insourced approach -		
	12. Competency mapping			N/A	!					11/16
3PLsourcing	13. Tendering			N/A						11/10
Gengagement	14. 3PL availability			N/A	!					
Contract	15. Contract drafting			N/A				Readine	ess to	
management	16. SLA tracking			N/A			√ !			11/14
Funding &	17. Funding							approa	ch -	
financial mgt	18. Financial management						∎ ✓ 🗄			
	19. Performance indicators									
Performance management	20. Performance mgt			×			×			
	21. SLWG functionality	!		∎ ✓ ¦			 ✓ 			
				:	1					/6

To successfully implement direct deliveries, states need to select appropriate deployment options and acquire the necessary capabilities

	High-level activities	Key considerations	
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2	Carry out cost comparisons for implementing each approach and consider levers that affect the costs	 Review the potential implementation costs for insourced and outsourced, layering on: Frequency of deliveries Scale of deliveries Types of vehicles deployed 	Defining options (Proposing, scalar and fame) Unit defining cost per CCC: exalapsed 16 r/cost Annual defining cost per CCC: exalapsed 16 r/cost Annual defining cost per CCC: exalapsed 16 r/cost Bisecetary Truck and torycels 400 2,22 4,459 6,811 64 177 Bisecetary Truck and torycels 400 2,702 3,716 70 97 Youk 400 2,702 3,716 70 97 Truck 400 2,702 3,716 70 97 Wome 400 3,096 5,545 44 67 Monthly Truck and Truck 400 3,696 5,545 44 67 400 3,696 5,545 44 67 103 199 Monthly 400 4,314 6,623 103 199 400 3,314 10,499 76 126 400 8,641 47,817 104 294
3	Assess its current capabilities vis- à-vis established capability requirements for each approach	 Administer direct delivery capability assessment grid and identify specific gaps that need to be filled 	Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction
4	Develop a plan to acquire all necessary capabilities before implementation rollout	 Establish a functional state logistics working Identify resources required to fill capability gaps, agree actions steps and responsible persons 	Tasks Proceeding with the second

A functional State logistics working group is required for the successful implementation of direct vaccine deliveries

Description of the working group

Objectives:

Ensure vaccines and supplies are available at all immunization service delivery points in the State at the right time, right quantities and in good condition

Membership

- State Cold Chain Officer/State logistics officer – (Chairman)
- State Immunization Officer
- Deputy SIO
- State logistician SPHCDA (Secretary)
- Deputy SCCO
- Representative of SPHCDA Maintenance Department
- Representatives of partner organizations

Working modalities

- SLWG meetings will be conducted two times a month at an interval of 2 weeks.
- Emergency meetings can be called by the Chairman at any time through the secretariat whenever the need arises.
- Attendance for all stakeholders is mandatory. If any member is not available for any reason, an official correspondence from such a member has to be sent 2 days prior to the meeting to the Chairman though the secretary
 - State officers and partner representatives who fail to attend four consecutive meetings without a valid apology invalidates their membership of the organization she/he represents

The working group must ensure consistent execution of its roles and responsibilities to achieve results from the direct vaccines deliveries

Roles	Specific responsibilities
Supply Chain Management	 Deploy and manage cost effective vaccine distribution system Distribute vaccines and devices to ensure stock sufficiency at all LGAs and HFs within the state Implement and monitor a robust planned preventative maintenance of all CCE in the State Conduct inventory of all cold chain equipment (CCE) in the state, identify gaps and make recommendation to SPHCDA as the need arises
	 Coordinate and track implementation of all planned vaccine supply chain activities
Monitoring and	Plan and support the introduction of new vaccines into the RI schedule
Planning	 Review NPHCDA annual vaccine forecast for State and track quantity of vaccines received quarterly from NPHCDA for consistency
	 Monitor state vaccine stock levels and trigger emergency deliveries from NPHCDA when required
	Ensure timely and accurate vaccination data collection and report dissemination
	Implement and routinely review the stock performance dashboard
	 Document and submit monthly reports to the Executive Director of the SPHCDA on all VSCM activities, highlighting challenges and next steps
	 Track Key Performance Indicators (KPIs) for all engaged vaccine 3PLs in the State
	Integrate vaccine supply chain supportive supervision plan into the overall RI supportive supervision
	 Keep abreast of all National RI policies as they affect vaccine supply chain, and advise SPHCDA on next steps for State
Capacity Building	 Plan and implement training programs for HFs and LGAs in cold chain, vaccine and logistics management Recommend incentives and sanctions for State, Zonal and LGA Cold Chain Officers as the need arises Provide technical guidance, support and training for HFs and LGAs in injection safety and waste management Develop and implement state cold chain equipment maintenance guidelines and procedures

The SLWG's decision on the delivery approach will inform the direct vaccine deliveries deployment plan option

	Highlight of deployment plan
	 Conduct specific training/on boarding session for all state personnel to implement direct deliveries
Insourced	Map delivery routes and commence deliveries
model	 Continue to monitor deliveries and evaluate program and staff performance
	Identify and engage delivery vendor
Outsourced	 On-board delivery vendor and state personnel to implement direct deliveries

- Map delivery routes and commence deliveries
- Continue to monitor deliveries and evaluate program and 3PL performance

Outsourced

model



Sample Gantt showing key activities for outsourced direct delivery deployment plan

	Month 1	2	3 4	
	Activities			Responsible
	 Finalize documents needed for rollout (RFP, contract, KPI and score card) 			SLWGProcurement unit
State	 State meet to align on delivery model and sustainability plan 			 SLWG
preparation	 Develop detailed budget and secure fund 			 SLWG
for roll-out	 Set up/reactivate and sensitize SLWG to manage direct deliveries 			 SLWG
	 Identify all primary CCE-equipped facilities 			 SLWG
	 Issue RFP for direct deliveries 			SLWGProcurement unit
Vendor	 Collate bids 			 SLWG
selection	 Assess received bids and select vendor 			SLWGProcurement unit
	 Award announcement and finalization of contract 			 SLWG
Commence	 Train state team and 3PL vendor on direct deliveries 			 NPHCDA personnel
direct	 Begin deliveries to facilities 			3PL/SIO/SCCO/LCCO
deliveries	 Continue to monitor deliveries and revise allocations where necessary 			 SLWG

IN Sourced

Sample Gantt showing key activities for insourced direct delivery deployment plan

	Month	1 2 3 4	
	Activities		Responsible
	 Finalize documents needed for rollout (Training materials, KPI and score card) 		 SLWG
State preparation for roll-out	 State meet to align on delivery model and sustainability plan 		 SLWG
	Develop detailed budget and secure fund		 SLWG
	 Set up/reactivate and sensitize SLWG to manage direct deliveries 		■ SLWG
	 Identify all primary CCE-equipped health facilities 		 SLWG
	 Train state team and vendor on direct deliveries 		 NPHCDA personnel
Commence direct	 Begin deliveries to facilities 		 SIO/SCCO/LCCO
deliveries	 Continue to monitor deliveries and revise allocations where necessary 		■ SLWG

To monitor the delivery system, the SLWG must routinely keep minutes of its meetings to guide and audit action points

Key to routine monitoring of the delivery program

De	liverables expected of the SLWG	Format	Frequency				
1	Updated vaccine stock performance dashboard (with action points and responsible persons)	Microsoft Excel (.xlsx) & Power point (.ppt)	Weekly				
2	Minutes of the meetings of the SLWG	Microsoft Word (.doc)	Bi-weekly				
3	VSCM update reports to SPHCDA	Microsoft Word (.doc)	Quarterly				
4	Updated state cold chain inventory	Microsoft Excel (.x/sx)	Bi-annually				
5	Budget for vaccine logistics to be incorporated into overall state RI budget	Microsoft Excel (.x/sx)	Annually				
6	Work plan for vaccine logistics to be incorporated in overall RI work plan	Microsoft Excel (.xlsx)	Annually				
7	Updates on vaccine logistics activities to Executive Director SPHCDA, and Key Partners	Microsoft Word (.doc)	As required				
	 Computer-savvy secretary and analyst must be identified within the working group to produce the outlined deliverables For direct vaccine deliveries to be effective and sustainable, the SLWG must update its stock performance dashboard every week and review the reports to make data driven decision 						

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Streamlining vaccine supply chain example

BACK-UP

Context and intervention description

- The introduction of new vaccines such as pneumococcal and rotavirus into Senegal's vaccine supply chain risked overwhelming an already stressed system
- To help address these challenges, Optimize¹ worked with the Senegalese MOH to design and implement a logistics chain that will meet the increasing demands
- For revamp, the supply chain was integrated and streamlined by moving vaccines and other commodities directly from regional (state) stores to health facilities using "moving warehouses"

Results

- Steady decline in stock-out frequency over one year
- 33% rise in vaccine availability from baseline across 4-5 districts
- Vaccine exposure to temp. outside normal range while in transit eliminated
- Delivery cost per dose remained unchanged when streamline but reduced by 17% following integration

Implications for vaccine supply chain systems

- Desired results from supply chain streamlining including stock-out elimination and vaccine stock availability can take a year to fully materialize
- 2 Health workers are likely to vaccinate more clients given increased stock availability driven by streamlined supply chain
 - There is reduced chance of vaccines losing their potency along the streamlined vaccine supply chain as temperature are better monitored
 - Integrating deliveries of other commodities with vaccines can potentially lower the supply chain operational costs
- 1. Project Optimize is a five-year partnership between the World Health Organization (WHO) and PATH to identify ways in which supply chains can be optimized to meet the demands of an increasingly large and costly portfolio of vaccines

SOURCE: Team analysis





4

Outsourcing warehousing and distribution example



BACK-UP

Context and intervention description

- In South Africa, the vaccine cost per fully immunized child increased from US\$25 in 2008 to US\$175 in 2010 following the decision to introduce the new vaccines
- As the cost of vaccines continued to rise, the system needed to increase efficiency to reduce stock out, minimize waste and ensure safety in vaccine management
- In response, the vaccine deliveries was outsourced and then streamlined for better and more effective management in the hands of the private logistics company

3

Results

- Timely deliveries and minimized risk to vaccines
- 100% agreement between quantity ordered and quantity delivered to health centers
- High lead time for delivering emergency orders remained
- Lack of monitoring system made it difficult to proactively resolve issues
- Temperature monitoring across health facilities as a quick win

Implications for vaccine supply chain systems

- With introduction of new vaccines, vaccine supply chains will need to be streamlined for efficiency
- 2 Data monitoring and evaluation system is required to make informed decisions on supply chain activities
 - Private logistics companies can be used to achieve effective vaccine distribution to service points
 - Vaccine delivery vendors may be leveraged to monitor cold chain equipment functionality

Outsourcing warehousing and distribution example

BACK-UP

Context and intervention description

- Thailand's vaccine supply chain comprised several distribution steps that were considered unnecessary and likely to result in vaccine wastage and expired vaccine
- Also, its inventory control and vaccine wastage were not traceable for lack of a reporting system.
- To streamline the vaccine supply chain and improve information flow, Thailand's DDC¹ contracted the GPO² who then introduced and implemented a vendor-managed inventory (VMI) system and subcontracted product distribution to a private logistics company in 28 and then all 76 provinces.

Results

- 96% of health facilities consistently receive >90% of their vaccine shipment on time
- 13% time spent on supply chain activities saved
- Logistics cost reduced by ~13%
- Elimination of pocket expenditure, which were not reimbursable
- Ability to respond to emergency demand decreased (-69%) with outsourcing

Implications for vaccine supply chain systems

Effective information flow system is required along with distribution improvement to permit informed deliveries

All provinces

of Thailand

- 2 Vaccine logistics system redesign improve distribution efficiency and reduces costs
- 3 Monetary and time cost savings to health workers from system redesign can translate to improved service delivery at facilities
 - Vaccine supply chains are likely to experience consistent timeliness in delivery of vaccines to service points if outsourced

1. Department of Disease Control; 2. Government Pharmaceutical Organization SOURCE: Team analysis

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Cost assumptions: State X Traditional vs. Direct vaccine deliveries

						CapEx OpEx
				Specific as	ssumptions	
Key cost elem	ents	General assumptions	Unit cost (NGN)	Traditional (unit)	DVD (unit)	Remark
Fleet	Vehicle	Costs N9,035,000 and amortized at 25%	2,285,750	44 vehicles @20% use rate	9 vehicles	3 insourced + 6 outsourced
TIEEL	Tricycle	Costs N535,000 and amortized at 50% (if hybrid)				
Cold chain	Cold boxes	2 per truck (1 per tricycle)	82,100	88	18	
equipment	Vaccine carrier	1 per ward	4,100	390 wards	390 wards	148 insourced + 242
	Laptops + accessories	Laptop, modem, hard drives and software	167,712	1	2	+6 tablets @240,000
Office	Phones	1 per delivery truck	5,000	44	9	Outsourced @ N28 000/ phone
equipment	Chairs and desks	Main chair, guests' chair (3), desk and cabinet (2) amortised at 25%	135,000	1	2	Insourced + outsourced
	Data clerk	Monthly salary @1FTE	64,320		2	Insourced + outsourced
Personnel cost	Driver / cyclist	Monthly @ 1FTE	33,151	44 @10% service rate	9	+N2,000 stipend/ delivery day(insourced) ;Outsourced @N52,500
	Programme coordinator	Monthly salary @ 1FTE	167,712		2	Outsourced @ 420,000 / unit
Vaccine	Fuelling	N87/L; fuel efficiency of 0.17L/Km;	370	44 trips/cycle	390 trips/cycle	148 insourced + 242
cost	Cascade deliveries	Deliveries made to all cascade facility per week	N500/week	1,056	666	212 insourced + 454 outsourced
	Cleaning services	Monthly salary @ 1FTE	10,000	1 Janitor	2 Janitors	Insourced + outsourced
	Telephone calls	N500, N3,000, N1,000 and N500 per month per clerk, SLO, CCO and driver respectively	Clerk: 500 SLO: 3,000 CCO: 1,000 Driver: 500	1 SLO 44 CCOs 44 drivers	1 clerk 1 SLO 44 CCOs 9 drivers	No clerk if outsourced 14 insourced + 30 outsourced LGAs
Office overhead	Rent	Rent at 1,000,000 per annum charged at 92% - being average time used by all engaged staff	920,000	1	2	Outsourced @ 1,000,000/annum
	Laptop maintenance	7.5% of procurement cost (N100,000)	7,500	1	2	Insourced + outsourced
	Papers, inks and pens	Per office per month	6,300	1	2	Insourced + outsourced
	Furniture maintenance	N6,150 and 3 guest's chairs at N2,951 per unit	9,101	1	2	Insourced + outsourced

Cost assumption: Direct delivery cost model

					CapEx OpEx
				Specific assumptions (M	Ionthly deliveries)
Key cost elemer	nts	General assumptions	Unit cost (NGN)	Insourced (unit)	Outsourced (unit)
	Vehicle	Costs N9,035,000 and amortized at 25%	2,285,750	1 vehicle / 7 HFs / day	1 vehicle / 7 HFs / day
Fleet Cold chain equipment Cold chain equipment Coffice equipment Personnel cost	Tricycle	Costs N535,000 and amortized at 50% (if hybrid)	267,500	1 tricycle / 7HFs / day	1 tricycle / 7HFs / day
Cold chain	Cold boxes	2 per truck (1 per tricycle)	82,100	6	6
equipment	Vaccine carrier	1 per ward	4,100	400	400
	Laptops + accessories	Laptop, modem, hard drives and software	167,712	1	1+ 3 tablets @ 240,000/unit
Office	Phones	1 per delivery truck	5,000	3	3 @ N28,000 / phone
equipment	Chairs and desks	Main chair, guests' chair (3), desk and cabinet (2) amortised at 25%	135,000	1	1
	Data clerk	Monthly salary 1FTE	64,320	1	NA
Personnel cost	Driver / cyclist	Monthly salary at 0.75FTE	33,151 / 25,000	3 (includes N2,000 stipend	3 @ 52,500
	Programme coordinator	Monthly salary @ 1FTE	167,712	1 1	1 @ 420,000 (+ 444,000 as mgt & supervision cost)
Vaccine	Fuelling	N87/L; fuel efficiency of 0.17L/Km (0.06L/Km if tricycle); 25Km/HF (20Km/HF if tricycle)	370 / 104 per delivery	400 trips/cycle	400 trips/cycle
cost	Cascade deliveries	Deliveries made to all cascade facility per week	N500/week	600	600
	Cleaning services	Janiitor's monthly salary @ 1FTE	10,000	1	1
		N500, N3,000, N1,000 and N500 per month per clerk, SLO,	Clerk: 500	1 clerk	1 clerk
	Telephone calls	CCO and driver respectively	SLO: 3,000	1 SLO	1 SLO
			CCO: 1,000	21 CCOs	21 CCOs
Office overhead	Rent	Rent at 1,000,000 per annum charged at 92% - being average time used by all engaged staff	Driver: 500 920,000	3 drivers 1	3 drivers 1
	Laptop maintenance	7.5% of procurement cost (N100,000)	7,500	1	1
	Papers, inks and pens	Per office per month	6,300	1	1
	Furniture maintenance	N6,150 and 3 guest's chairs at N2,951 per unit	9,101	1	1

Variations in underlying costing assumptions along variants of direct vaccine deliveries options inform the overall cost of deliveries

Implication on costing			Implication on costing		
(1	Approach	Parties responsible for delivering vaccines to health facilities	 Insourced – drivers receive salaries as well as stipend per delivery days; includes data clerk's salary and operating manager's salary Outsourced – drivers receive salary only; includes data mgt. required by 3PL and operating manager's salary and other supervision costs 		
(2	Frequency	Interval between delivery cycles to health facilities	 Bi-weekly –10 delivery days per cycle and 26 delivery cycles per year Monthly – 20 delivery days per cycle and 12 delivery cycles per year 		
(3	Scale	Number of equipped facilities included on delivery schedule	 100 facilities – deliveries made to 5 facilities per day 200 facilities – deliveries made to 6 facilities per day 400 facilities – deliveries made to 7 facilities per day 		
	Fleet	Type of automobile deployed to deliver vaccines across the state	 Trucks – procured at N9,000,000 per unit and amortized over 4 years Tricycles¹ – procured at N500,000 per unit and amortized over 2 years 		

1. Model assumes that tricycle covers one-third of the state, while trucks cover two-thirds

SOURCE: Team analysis

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Documents and tools required for direct vaccine deliveries

					Required if:	
То	ols		Description	Format	Insourcing	Outsourcing
1	RFP	F	Request for proposal to be issued to interested/identified delivery vendors	Hard copy		\checkmark
2	Contract	F	Sample contract to engage third party logistician	Hard copy		\checkmark
3	Handbook	Ba point P	Training guide for state staff and 3PL on direct vaccine deliveries implementation	Microsoft Power Point (*.ppt)	\checkmark	\checkmark
4	Dashboard		Visual representation of the direct vaccine delivery performance	Microsoft Excel (*.xlsx)	\checkmark	\checkmark
5	3PL tender evaluation matrix	F	Set criteria for tenders board to evaluate and then select 3PL	Hard copy		\checkmark
6	3PL interview questions	F	Set questions to assess 3PL along defined metrics	Hard copy		\checkmark
7	Key performance indicator tracker	Bar point	KPIs and score card to assess the performance of the direct vaccine deliveries	Microsoft Power Point (*.ppt)	\checkmark	\checkmark

DISTRIBUTOR VENDOR SELECTION

The bids will be comprehensively evaluated, prioritizing technical and financial performance

Key criteria	Points	
1. Timelines and completeness of RFP submission	10	
 Timely submission of RFP 	-5	
 Completion and accuracy of submission of RFP contracts 	-5	 Each distributor will be : evaluated and
2. Technical and operational capabilities	40	scored, with clear
 Demonstrated year of experience (not less than 2 years) 	-10	criterion
 Appropriateness of fleet (vehicles, equipment, insurance, etc.) 	-10	SLWG will conduct the
 Quick control plan (avoidance of damages temp. control) 	-10	evaluation and make the final selection
 HR capabilities 	-5	 Technical proposals
 Route optimization plan 	-5	will be evaluated and
3. Costing of the bid and financial strength of the company	40	the evaluation of the
 Financial robustness and strength of the company (2-year statements) 	-15	cost proposals.
 Total cost within state budget of services for duration of pilot 	-20	 Should the technical proposal not meet
 Potential for cost savings based on plan to improve efficiency 	-5	the minimum
4. Innovation, technology and capacity building	10	cost proposal shall
 Unique innovation to improve quality of service delivery 	-4	not be considered
 Use of appropriate technology 	-4	۱. ₁
 Plan to build capacity of KSPHCMB staff 	-2	
Total	100	

3PL INTERVIEW QUESTIONS

Sample Questions for Direct Delivery Vendor Interviews

A Introduction	 Please introduce yourself and the company you represent Why do you think you are the right company for the job? 	
B Relevant experience	 Tell us about your experience distributing health commodities in Nigeria? Does your experience include distribution of vaccines and/or working in State Y? What relevant qualifications and experience does your team bring to this engagement? 	
Vaccine C distribution processes	Can you walk us through your proposed vaccine delivery process from end to end? How do you plan to monitor in-transit temperatures to ensure cold chain is maintained? What security/disaster recovery plan will you put in place to safeguard the vaccines the event of an emergency during distribution? How do you plan to monitor and ultimately improve efficiency of deliveries if you are hired? What type of vehicles do you plan to use to execute this job and what maintenance plan do you have in place for your vehicles?	
Vaccine D distribution costs	 What is your proposed cost per delivery to: All equipped health facilities in the state (# facilities) from 2 cold stores in Town 1 and Town 2? Equipped health facilities in the Southern and Central zone (# facilities) from the Town 1 cold store? Equipped health facilities in the Northern zone (# facilities) from Town 2 satellite cold store? What other models do you propose to reduce the delivery costs and make the program more sustainable? 	
E Closing	 Are there any other value additions or innovative solutions you can deliver to improve the health commodities distribution system in the state? Do you have any other specific comments, thoughts or questions not yet discussed? 	
SOURCE: Team analysis	95	

Sample KPIs to evaluate effectiveness of the direct deliveries system

	KPI	Description	Target	Frequency
Stock level 1 Adequacy of stock		 Proportion of LGAs with at least one antigen below minimum 	■ 0-5%	 Weekly
	2 Stock data quality	 Discrepancy between vendor's data and data obtained during quarterly data validation exercise 	■ +/- 5%	 Quarterly
	3 On-time delivery	 Number of times actual delivery date does not match scheduled delivery date 	 0 times 	 Per delivery cycle (twice monthly)
Effectiveness of services	4 Condition of delivery vehicle	 Number of vehicle breakdowns causing significant delays in delivery schedules 	 0 breakdowns 	 Per delivery cycle (twice monthly)
rendered	5 Customer satisfaction	 Number of complaints received about the vendor's services from the cold store officials and health facility staff 	 0 times 	 Monthly
	6 VVM status during delivery	 Proportion of times vaccines vial status changed in the course of deliveries 	• 0%	 Per delivery cycle (twice monthly)
	Vaccines losses: damage, theft	 Number of times vaccines are lost or damaged while under the custody of the distributor 	 0 times 	 Monthly

KEY PERFORMANCE INDICATOR TRACKER

Sample capability assessment guide for routine monitoring and assessment of direct deliveries

January, 2016

Stock adequacy	WK 1 (%)	WK 2 (%)	WK 3 (%)	WK 4 (%)	Average for the month (%)
Proportion of HFs that reported insufficient vaccine stock balance on weekly visibility report					
2 Ratio of number HFs that reported broken down CCE on weekly visibility report to number of HFs flagged by 3PL to be with non functional CCE					
Proportion of scheduled deliveries that are completed					
4 Number of times that vaccines were lost or damaged in transit					
I, certify that the direct vaccine delive satisfactory; having scored above 70% across all service	eries for tl ce deliver	ne month y indicat	n of ors		_has been
Signature:					

Score card to completed by SCCO or other assigned officer and counter-signed by the SIO SOURCE: Team analysis

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Transitioning to direct vaccine deliveries has implications for the stock performance management reporting system

BACK-UP	Indicators tracked	Reporting process	Reporting platform
State cold store	 State stock balance for all antigens, diluents and devices Satellite stores with: Adequate stock for all antigens 	 Performs physical stock and obtains stock balance from satellite stores at the end of each week Enters stock balances on national dashboard excel Reviews facility stock reports on Google sheets 	 National excel dashboard (state and satellite stores reports)
	 1 – 2 antigens below min ≥ 3 antigens below min 	 Sends stock performance dashboard to national, with link for facility weekly dashboard 	
Satellite store	 Satellite store stock balance for all antigens, diluents and devices Proportion of antigens at equipped facilities that are: above minimum; below minimum but in-stock; and out of stock 	 Performs physical stock count and send balance as SMS/email to state logistics officer/ SCCO Reviews facility stock reports and prepares emergency distribution plan as required 	 SMS/ email (satellite store report) Google sheet¹ (facility reports)
LGA store	 LGA stock balance for all antigens, diluents and devices (buffer only) Proportion of antigens at equipped facilities that are: above minimum; below minimum but in-stock; and out of stock 	 Obtains stock balance from equipped facilities at the end of each week Enters the stock balances on Google sheets template and reviews facility stock performance 	 LGA excel dashboard (facility reports)
Equipped facilities	 Facility stock balance for all antigens, diluents and devices Proportion of antigens at equipped facilities that are: above minimum; below minimum but in-stock; and out of stock 	 Performs physical stock count and send balance as SMS to LGA CCO 	 SMS Delivery KPI forms (paper reports)

1. Excel-based platform deployed and tested in State X for recording and tracking stock reports obtained from direct vaccine deliveries

Direct vaccine deliveries has provided visibility into vaccine availability at equipped health facilities



BACK-UP	Information that will be captured and tracked at health facilities	Output that will be generated by the logistics data management system
Stock levels	 Weekly vaccine stock balances in relation to facility requirement Quantity of stock received at biweekly direct deliveries 	 Weekly stock balance at all facilities Stock level trends; highlighting stock outs Quantity of stock received at last delivery
Vaccine utilization	 Quantity of vaccine utilized over 2- week delivery cycle Quantity of vaccines wasted over 2-week delivery cycle 	 Quantity of vaccines utilized and wasted Trends in vaccine wastage rates Correlation trends in vaccine utilized and children vaccinated
Vaccinations	 Number of children vaccinated over 2-week delivery cycle Vaccination coverage based on assigned target population 	 Number of children vaccinated bi-weekly and facility vaccination coverage Trends in number of children vaccinated
CCE status	 Functionality status of CCE Temperature readings of CCE 	 Functionality status of all CCE; plus downtime for all non-functional CCE Trends in proportion of CCE functional
Vaccine delivery mapping	 Tracking of stock movement between store and facility and between primary facility and facility 	Map of primary (equipped) and cascade non-equipped) facilities

Direct vaccine deliveries has provided visibility into vaccine availability at equipped health facilities

Information routinely captured at deliveries	Output generated by the delivery dashboard		
 Vaccine stock balances at each equipped facility prior to delivery 	 Stock performance across all equipped facilities 		
 Quantity of stock 	 Stock level trends; highlighting stock outs 		
 Number of children 	 Vaccine stock consumption over delivery 		
 Functionality status of 	 Cycles Trends in number of children vaccinated 		

A wide range of stakeholders were interviewed to understand the working of the State X

Data callection	
medium	Respondent categories
	 Executive Secretary, SPHCDA/MB
Key informant	 State Logistics Officer
interviews	 State Cold Chain Officer
	 State Delivery Coordinator
	 Zonal Director, Zone 1
	 LCCO, LGA 1
	 Ward Technical officer, Health facility 1
	 Ward Technical Officer, Health facility 2
	 RI In charge, Health facility 1
	 RI In charge, Health facility 2
	 Partner representatives
	- Comple diente (Methere) from each of

Focus group discussion



- Sample clients (Mothers) from each of:
 - HF 1, LGA 1
 - HF 2, LGA 2
 - HF 3, LGA 1
 - HF 4, LGA 1

SOURCE: Team analysis