

## Computing and Global Health Lecture 5 Logistics

Winter 2015  
Richard Anderson

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## Today's topics

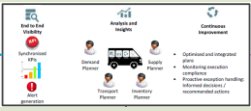
- Ron Pankiewicz, Village Reach 
- GAVI Supply Chain Strategy
- Logistics requirements
- Logistics processes
  - Forecasting
  - Delivery
  - Ensuring product quality

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## Readings and Assignments

- Logistimo
- SMS For Life (to assigned)
- Assignment 5: Design a data collection system for a Visibility & Analytics Network
- Assignment 6: Develop a syntax for an SMS reporting system

Date	Topic
Jan 7, 2015	Overview
Jan 14, 2015	Surveillance
Jan 21, 2015	Tracking
Jan 28, 2015	Medical records
Feb 4, 2015	Logistics
Feb 11, 2015	Patient support
Feb 18, 2015	Treatment support
Feb 25, 2015	Health worker support
Mar 4, 2015	Behavior change
Mar 11, 2015	Finance

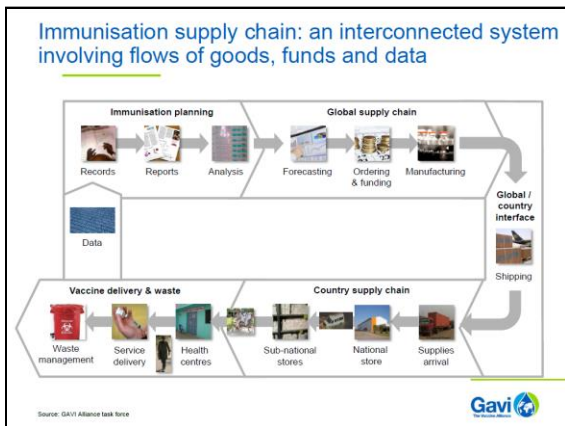


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## GAVI Supply Chain Slides

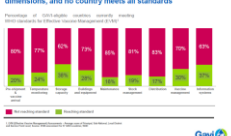


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#### Immunisation supply chain challenge

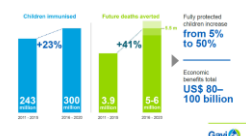
Most Gavi-eligible countries do not meet standards for most dimensions, and no country meets all standards.



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#### ACCELERATING IMPACT 2016-2020

With US\$ 7.8 billion over 5 years:




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#### The challenge will get greater: higher volumes, doses and vaccine cost

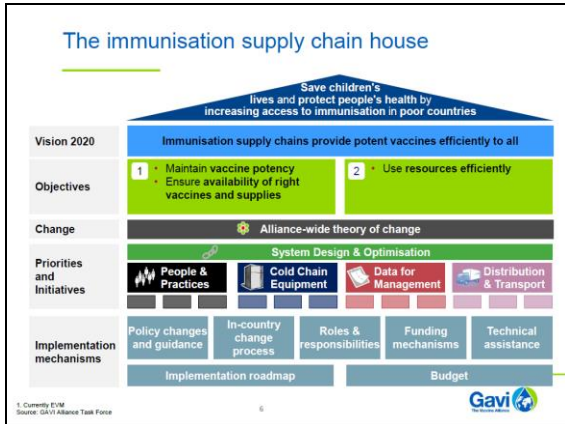


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#### Gavi Alliance partners jointly developed a strategy, approved by Gavi Board in June



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### Putting fundamentals in place

**Supply chain managers**

Supply chain managers are in place in all countries to manage the growth and change of the immunisation supply chain.

Key messages:
 

- Access to professional training for supply chain managers
- Job descriptions and guidance for hiring supply chain managers
- Best practices for managerial processes and decision-making

Technical assistance to develop managerial capacity:
 

- Change professional development opportunities – improved support of high quality training

**Strategy encourages countries to consider supply chain convergence and partnership with private sector**

**Supply chain convergence**

Opportunities for economies of scale, increasing and clarification of roles and responsibilities

**Private sector and social enterprises**

Opportunities in parts of supply chain to leverage expertise and services

Build on existing projects e.g. Project Optimise, Deliver. Countries already integrating supply chains e.g. Senegal, Ethiopia, Madagascar

Case studies show private sector can play effective role in managing or supporting parts of supply chain

Scale possible – requires strong change management and technical assistance. Services for countries based on local convergence and needs.

**Implementation**

What to expect in 2014 and beyond.

Timeline: 2014, 2015, 2016-2020

Key messages:
 

- 2014: Professional training for supply chain managers
- 2015: Job descriptions and guidance for hiring supply chain managers
- 2016-2020: Technical assistance to develop managerial capacity

### Supply Chain and Logistics

- Supply chain 101
  - Push process
  - Pull process

**Public Processes:** Procurement Cycle, Manufacturing Cycle, Replenishment Cycle

**Pull Processes:** Customer Order Cycle

DECOUPLING POINT

Customer Order Arrives

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### Global health logistics

- Large scale public sector
  - National scale distribution
  - Usually externally sourced products
  - Commercial or non-commercial goods
  - Multiple financing models
- Local logistics
  - Regional or NGO distribution of goods

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### Private sector

- We will ignore the private sector, but . . .
- Some LMIC engage private sector in logistics
- Some goods are available both in public system and in the markets
  - Parallel public and private networks

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### Basic logistics models

- Multiple levels
  - National
  - Regional
  - Facility

Level 1: National Delivery Team (Individuals, Families, and Health Workers)

Level 2: Distribution Centers (Local or Regional Distribution Centers, Program Managers, District Managers & Logistics)

Level 3: National Ops (Program Managers & Logistics)

Level 4: Part of Entry-level County Headcount (Program Managers & Logistics)

Level 5: Transportation/Logistics (Transportation & Logistics, District & Logistics, District & Logistics)

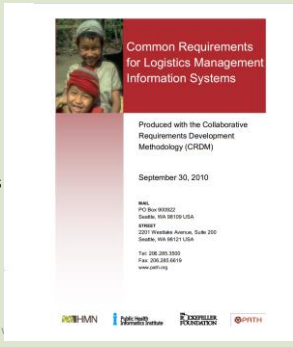
Level 6: Production/Manufacturing (Production/Manufacturing, Sales, Managers, Agents, Distribution/Logistics)

Level 7: Raw Material Supply (Production/Manufacturing, Sales, Managers, Agents, Distribution/Logistics)

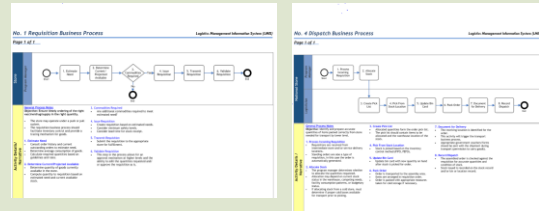
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## Logistics Requirements

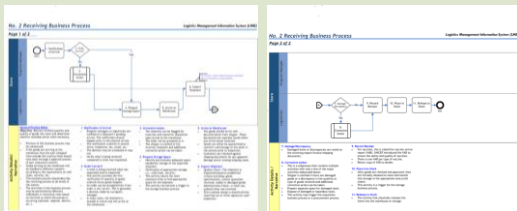
- Requirement derived from country workshops and visits
- Country independent requirements
  - What is common across countries



## Business processes

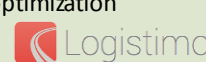


## Business Processes



## Computing and logistics

- Tracking
- Visibility of Inventory
- Management of Transactions
- Warehouse management
- Forecasting
- Alerts
- Supply chain optimization



## Global health logistics vs. corporate

### Proctor and Gamble

- Daily deliveries
- Centralized control
- Thousands of products
- End to end visibility



### Tanzania EPI

- Quarterly or monthly deliveries
- Decentralized system
- Small number of products
- Single level visibility



## Logistics challenges

- Service delivery – stocks not available
- Other issues
  - Overstock
  - Delivery timing
  - Lost stock and spoilage
  - Transportation costs



### Causes of stock outs

- Insufficient overall supply
- Misallocation
- Lack of funds
- Lack of transport
- Demand variation
- Delay in transport
- Improper ordering
- Spoilage
- Leakage



### Visibility and analysis

- Goals
- Components
  - Planning
  - Delivery
  - Quality of product
  - Quality of supply chain



### Planning

- How do you know how much stuff to order



### EPI Forecasting

$$\text{Vaccine demand} = \text{Doses} * \text{Population} * \text{Coverage} * \text{Supply Period} / (52 * (1 - \text{Wastage}))$$

$$\text{Min Stock} = \text{Doses} * \text{Population} * \text{Coverage} * \text{Reserve Period} / (52 * (1 - \text{Wastage}))$$

$$\text{Max Stock} = \text{Vaccine demand} + \text{Min Stock}$$



### Delivery

- Receive order
- Approve order
- Arrange transport
- Pack order
- Send shipment
- Receive shipment
- Verify / record shipment
- Unpack shipment
- Store shipment



### DVDMT Reporting

## Bar coding



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## Stock data reporting

- Regular reports of stock levels to SMS sent to a server
- SMS for Life
  - Reporting project supported by Novartis
  - Weekly reports of supplies of Malaria medication
  - Pilot studies show significant drop in stock outs
  - Scales quickly (reach 5000 health facilities 7 months)
  - Reported costs: “operational cost of less than 80 USD per health facility”

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## SMS for Life

Figure 1: SMS stock levels and interpretation



- 14: Custom Yellow, for babies 5–15 kg: 4 boxes
- 83: Custom Blue, for children 15–25 kg: 3 boxes
- 82: Custom Red, for children 25–35 kg: 6 boxes
- 51: Custom Green, for children above 35 kg and adults: 2 boxes
- 099: Quinine equivalent: 99

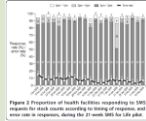


Figure 2: Proportion of health facilities reporting to SMS. The stock counts according to range of masses, and their color as response, among the 21 main SMS for Life pilot.

The mobile phone credit was an incentive to motivate health workers to send the message on time and also to recognize the additional tasks they had to perform for the pilot above their normal workload.

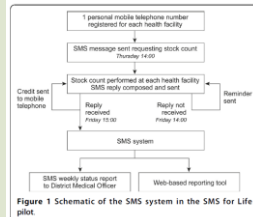


Figure 1 Schematic of the SMS system in the SMS for Life pilot.

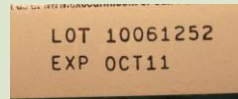
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## Product quality

- Product spoilage
- Product expiration



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## Supply chain quality

- How good is the supply chain infrastructure



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## Cold chain equipment inventory

### 1. Health facility data



### 2. Refrigerators, freezers, cold room, cold box data



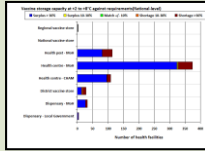
### 3. Vaccine and equipment reference data



## Cold chain capacity analysis

- Maximum volume of storage necessary to store all vaccines
  - VFIC: Volume per fully immunized child
  - $POP * VFIC / Supply\ Interval$

Country	Population (millions)	Supply Interval (months)	VFIC (liters)	Total Volume (liters)
India	1100	12	100	110000000
China	1300	12	100	130000000
USA	300	12	100	30000000
UK	60	12	100	6000000
France	60	12	100	6000000
Germany	80	12	100	8000000
Italy	60	12	100	6000000
Spain	40	12	100	4000000
Japan	120	12	100	12000000
South Korea	40	12	100	4000000
South Africa	40	12	100	4000000
Kenya	30	12	100	3000000
Kenya (rural)	20	12	100	2000000
Kenya (urban)	10	12	100	1000000
Kenya (total)	30	12	100	3000000

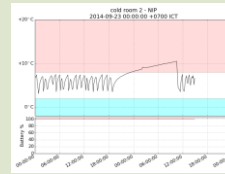


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## Temperature monitoring



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## Supply chain optimization



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## US Vaccine Supply Chain

- 1994: 64 distribution networks, 430 depots
- 2008: single distribution network, 4 depots

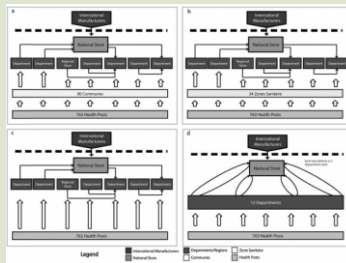
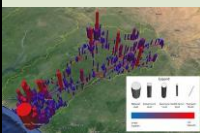
	1994	2008
Public-sector cost	US\$200 million	US\$3 billion
Number of vaccines	6	12
Funds allocation	64 lines of credit and multiple fund allocations each year	One centralized account
Distribution	64 independent distribution systems operating their own storage depots (430 nationwide)	One company distributes vaccines with a few depots and guarantees performance
Delivery	Up to 4 weeks	3 to 8 days

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## Supply chain modeling



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## Next week

- Patient Support



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