Computing and Global Health
Lecture 5
Logistics

Winter 2015
Richard Anderson
Today’s topics

- Ron Pankiewicz, Village Reach
- GAVI Supply Chain Strategy
- Logistics requirements
- Logistics processes
  - Forecasting
  - Delivery
  - Ensuring product quality
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
Immunisation supply chain: an interconnected system involving flows of goods, funds and data

Immunisation planning
- Records
- Reports
- Analysis

Global supply chain
- Forecasting
- Ordering & funding
- Manufacturing

Global / country interface
- Shipping

Vaccine delivery & waste
- Waste management
- Service delivery
- Health centres

Country supply chain
- Sub-national stores
- National store
- Supplies arrival

Source: GAVI Alliance task force
Immunisation supply chain challenge

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

ACCELERATING IMPACT 2016–2020

With US$ 7.5 billion over 5 years:

- Children immunised: +23%
- Future deaths averted: +41%

Fully protected children increase from 5% to 50%

Economic benefits total US$ 80–100 billion

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

Gavi Alliance partners jointly developed a strategy, approved by Gavi Board in June
The immunisation supply chain house

Immunisation supply chains provide potent vaccines efficiently to all

**Objectives**

- Maintain vaccine potency
- Ensure availability of right vaccines and supplies

- Use resources efficiently

**System Design & Optimisation**

- People & Practices
- Cold Chain Equipment
- Data for Management
- Distribution & Transport

**Implementation mechanisms**

- Policy changes and guidance
- In-country change process
- Roles & responsibilities
- Funding mechanisms
- Technical assistance

**Implementation roadmap**

**Budget**

1. Currently EVM
Source: GAVI Alliance Task Force
Supply chain managers are in place in all countries to manage the growth and change of the immunisation supply chain. Help countries establish or reinforce the post of immunisation supply chain manager and ensure that he or she has the appropriate level of expertise, authority, and resources to oversee the supply chain within a strengthened overall management system.

GAVI Alliance partners will support countries to hire and strengthen supply chain managers by providing focused technical assistance, tools, access to training, and other resources.

Examples of support from People and Practice working group:
- 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
- Ongoing professional development opportunities – improved supply 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, streamlining and clarification of roles and responsibilities

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

Private sector and social enterprises

Opportunities in parts of supply chain to leverage expertise and services

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

Implementation

What to expect in 2014 and beyond.

Three fundamentals
1: Supply chain managers
2: Comprehensive supply chain plans linked to multiyear plans
3: Dashboards to monitor performance

System design
1: (selected countries only) Redesigned supply chain systems
Systems become more efficient in more countries

Supporting Environment
Assess and monitor (EVM + + daily monitoring)
Plan (EVM linked to DMP, advocacy platforms)
Fund (HBS, bilateral, government, donor)
Implement (new equipment, training, information systems etc.)
Support (TA, tools, guidance, policies)

Supportive environment helps countries adopt systems for continuous improvement of supply chain performance

Gains possible – requires strong change management and technical assistance. Decision by countries based on local circumstances and needs.
Supply Chain and Logistics

• Supply chain 101
  – Push process
  – Pull process
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
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
Basic logistics models

• Multiple levels
  – National
  – Regional
  – Facility
Logistics Requirements

- Requirement derived from country workshops and visits
- Country independent requirements
  - What is common across countries
No. 1 Requisition Business Process

1. Estimate Need
   - The store may operate under a push or pull system.
   - The requisition process should balance inventory control and provide a tracking mechanism for goods.

2. Determine Current Projected Available
   - Determine the quantity required.
   - Computer quantity to requisition based on estimated need and current available stock.

3. Commodity Required
   - Determine commodity required to meet estimated needs.

4. Issue Requisition
   - Create requisition based on estimated needs.
   - Consider minimum safety levels.
   - Consider lead time for stock receipt.

5. Transmittal Requisition
   - Submit the requisition to the appropriate store for fulfillment.

6. Validate Requisition
   - This step in the process allows for an approval mechanism at higher levels and the opportunity to modify the quantities requested and approve the requisition as is.

No. 4 Dispatch Business Process

1. Process Requisition
   - The store requisition is processed and sent to the appropriate store for fulfillment.

2. Allocate Stock
   - The program manager determines whether to allocate the quantities requested.
   - Quantity is based on the inventory control method (IFS, IFS, IFS).

3. Pick From Stock Location
   - Stock is assigned to the inventory control method.

4. Update Bin Card
   - Quantity is used with new quantity on hand and item is marked for order.

5. Pack Order
   - Order is transported to the assembly area.

6. Record Dispatch
   - The assembled order is checked against the requisition for accurate quantities and completeness.

7. Document for Delivery
   - The assembled order is identified for the delivery location.

8. Record Dispatch
   - The ordered item is recorded on the stock record and/or inventory record.

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University of Washington, Winter 2015

1/28/2015
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

Vaccine demand =
Doses * Population * Coverage * Supply Period / (52 * (1 – Wastage))

Min Stock =
Doses * Population * Coverage * Reserve Period / (52 * (1 – Wastage))

Max Stock = Vaccine demand + Min Stock
Delivery

• Receive order
• Approve order
• Arrange transport
• Pack order
• Send shipment
• Receive shipment
• Verify / record shipment
• Unpack shipment
• Store shipment
### Status of Vaccination Supplies Distributed Per Month

<table>
<thead>
<tr>
<th>Districts</th>
<th>Surviving (Jan-09)</th>
<th>Surviving (Feb-09)</th>
<th>Surviving (Mar-09)</th>
<th>Surviving (Apr-09)</th>
<th>Surviving (May-09)</th>
<th>Surviving (Jun-09)</th>
<th>Surviving (Jul-09)</th>
<th>Surviving (Aug-09)</th>
<th>Surviving (Sep-09)</th>
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</table>

### Monthly Vaccination Data in Fixed Strategy

<table>
<thead>
<tr>
<th>Districts</th>
<th>Month of the Report</th>
<th>Timelessness of monthly reports</th>
<th>No. of doses</th>
<th>TT Vaccinations</th>
<th>BCG Vaccinations</th>
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<tr>
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<td>39</td>
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</table>

The table continues with similar data for other districts.
Bar coding
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”
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.
Product quality

- Product spoilage
- Product expiration
Supply chain quality

• How good is the supply chain infrastructure
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
  - $\text{POP} \times \text{VFIC} / \text{Supply Interval}$
Temperature monitoring

![Temperature monitoring equipment and graph](image)

- **Temperature Monitoring Equipment:**
  - Image of a temperature monitoring device.

- **Graph:**
  - Title: cold room 2 - NIP
  - Date: 2014-09-23 00:00:00 +0700 ICT
  - X-axis: Time (00:00 to 12:00, 12:00 to 00:00)
  - Y-axis: Temperature (0°C to +20°C)

- **Temperature Alert:**
  - Image of a temperature alert device.
  - Reading: ALARM 10:49 11.2°C
Supply chain optimization
US Vaccine Supply Chain

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

Vaccine Modeling Initiative

Legend
- International Manufacturers
- National Store

a) International Manufacturers
b) International Manufacturers
c) International Manufacturers
d) International Manufacturers
Next week

• Patient Support