MDR-TB: Challenges in Drug Supply Chain Logistics

Prashant Yadav
MIT-Zaragoza International Logistics Program

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Background

- UNINTERRUPTED supply of second line drugs (SLD) is an IMPERATIVE for an MDR-TB program to be successful
- An uninterrupted supply requires that every step in the SLD supply chain, from the manufacturer to the patient, is run synchronously with other steps
- DOTS was focused on reducing stock outs
- Effectiveness (more than efficiency) was the main focus
- Overstocking risks are lower because (First Line Drugs) FLDs are relatively inexpensive
- For SLDs, overstocking that can waste scarce financial resources that could otherwise be used for expanding the MDR-TB program
- MDR-TB programs needs to maintain a fine balance between effectiveness and efficiency
Challenges in the supply chain for MDR-TB drugs

Typical structure. May not hold for all countries

1. Uncertainties in timing of grant disbursement
2. Long lead times (up to 36 weeks)
3. Delays in procurement due to archaic procurement processes and too few suppliers
4. Weak distribution infrastructure and skeletal MIS
5. No capacity to manage inventory or consumption tracking
6. A periodic distribution frequency
# Total lead time from plan to receipt

<table>
<thead>
<tr>
<th>World Region</th>
<th>Mean</th>
<th>St. Deviation</th>
<th>Min</th>
<th>Max</th>
<th>Observations</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Africa and Indian Ocean</td>
<td>129.1</td>
<td>115.3</td>
<td>0</td>
<td>830</td>
<td>436</td>
<td>0.89</td>
</tr>
<tr>
<td>East Asia and the Pacific</td>
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<td>133.9</td>
<td>0</td>
<td>1042</td>
<td>533</td>
<td>1.33</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>121.4</td>
<td>110.1</td>
<td>0</td>
<td>660</td>
<td>535</td>
<td>0.91</td>
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<tr>
<td>Latin America and Caribbean</td>
<td>78.8</td>
<td>70.2</td>
<td>0</td>
<td>501</td>
<td>642</td>
<td>0.89</td>
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<tr>
<td>Middle East and North Africa</td>
<td>81.8</td>
<td>78.6</td>
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<td>1,099</td>
<td>341</td>
<td>0.96</td>
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<tr>
<td>India</td>
<td>131.4</td>
<td>94.5</td>
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<td>659</td>
<td>2,225</td>
<td>0.72</td>
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<tr>
<td>South and West Asia, not India</td>
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<td>71</td>
<td>4</td>
<td>536</td>
<td>261</td>
<td>0.97</td>
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<tr>
<td>Southern Africa</td>
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<td>50.8</td>
<td>0</td>
<td>439</td>
<td>1,008</td>
<td>0.85</td>
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<tr>
<td>West and Central Africa</td>
<td>79.4</td>
<td>71.5</td>
<td>0</td>
<td>556</td>
<td>509</td>
<td>0.9</td>
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</table>

<table>
<thead>
<tr>
<th>Type of Drug</th>
<th>Mean</th>
<th>St. Deviation</th>
<th>Min</th>
<th>Max</th>
<th>Observations</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-malaria</td>
<td>94.9</td>
<td>76.9</td>
<td>0</td>
<td>726</td>
<td>460</td>
<td>0.81</td>
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<tr>
<td>Anti- TB</td>
<td>146.3</td>
<td>142.9</td>
<td>0</td>
<td>1042</td>
<td>571</td>
<td>0.98</td>
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<tr>
<td>Anti-retroviral</td>
<td>92.3</td>
<td>72.6</td>
<td>0</td>
<td>830</td>
<td>3,919</td>
<td>0.79</td>
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<td>Diagnostics</td>
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<td>41.2</td>
<td>0</td>
<td>200</td>
<td>198</td>
<td>0.62</td>
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<tr>
<td>HIV Prevention</td>
<td>124.3</td>
<td>135.2</td>
<td>0</td>
<td>659</td>
<td>915</td>
<td>1.09</td>
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<tr>
<td>Malaria Prevention</td>
<td>116.8</td>
<td>99.7</td>
<td>2</td>
<td>1099</td>
<td>424</td>
<td>0.85</td>
</tr>
</tbody>
</table>

TLT by world region and type of drug - Descriptive Statistics and Coefficient of Variation (CV)

Source: Rashkova, Gallien and Yadav (in progress). Please do not quote or cite
1. Uncertainties in timing of funds disbursement

- Global Funds have to follow stringent procedures before grants can be disbursed; often leads to delays in disbursement of committed funds.

- Similarly, MOH budget disbursement also have delays in release of funds.

- Procurement rules do not allow initiating procurement without “money in the bank”.

- This is one of the leading causes of stock-outs at the national level.

- Innovative bridge financing arrangements can help alleviate this problem.
Creative bridge financing solutions can help mitigate risk of stock outs due to disbursement uncertainties

1. Financier makes pledge
2. Country program request mechanism to cover product cost
3. PGH verifies pledge with financier and establishes MOU
4. Country program procures through existing process
5. Mechanism pays manufacturer or procurement agent
6. Manufacturer ships product to country program
7. Financier pays the mechanism

Note: PGH is hosted by the UN Foundation

Source: Existing McKinsey and JSI Deliver analysis; Dalberg analysis

Note: PGH is hosted by the UN Foundation
2. Long lead-times from manufacturers

- Most SLD manufacturers do not start production till final purchase orders are received: Most SLD production is make-to-order

- Some formulators procure active ingredients (APIs) only after receipt of purchase order

- Very few API sources for many SLDs

- For some SLDs the manufacturers rely primarily on GDF procured volumes; for others there is a large market outside of GDF

- Manufacturers cite poor forecasts and small market as reason for long lead-times and make to order production
Current Push-Pull Boundary in SLD supply chain

Source: Adapted from Yadav, Sekhri and Curtis (2006)
Volume guarantees can shift the push-pull boundary

1. Financiers and countries estimate annual purchasing volume for specified products.
2. MVG decides on volume of product and amount of risk to assume.
3. Countries programs place individual orders under master contract.
4. Manufacturer ships products directly to country program.
5. Manufacturer informs MVG of unused volume.
6. Sale or storage of unused product.

Secondary Markets?

Joint work with Dalberg Global Development Advisors
Shifted Push-Pull Boundary in SLD supply chain

Source: Adapted from Yadav, Sekhri and Curtis (2006)
Strategic stockpiles can reduce lead-times

- Reduced lead-time
- Reduced stock-outs
- Reduced logistics cost
- Increased competition in the distribution segment

Challenges in the supply chain for MDR-TB drugs

Typical structure. May not hold for all countries

- Suppliers
- Procurement Agent
- National TB Program
- State Stores
- District Stores
- DOTS Plus site

- External Financing
- MoH Financing

Weak distribution infrastructure and skeletal MIS

Limited capacity to manage inventory or consumption tracking

A periodic distribution frequency

Poor forecasting and needs quantification
Planning and Distribution Challenges

- Learn to distinguish between Forecasts and Targets
- Translating a program coverage target into projected needs almost always leads to a poor forecast
- Forecasts will be poor unless supplemented with field consumption data
- Synchronized LMIS and surveillance data
Planning and Distribution Challenges

- **Number of stocking points in the supply chain for MDR-TB drugs does not have to mimic the administrative/governance structures of Central, State, District.**

- **Number of stocking points and how much buffer to hold at each level**
  - To minimize stock outs and maximize efficiency (transport costs and wastage)
  - Independent of administrative government structure
Understanding Facility Level Demand

Innovative solutions to understand demand at service delivery point

Joint work with Jeremie Gallien, Zachary Leung and Ana Chen

\[
\text{demand estimate} = \text{consumption} + \text{lost demand estimate}
\]

\[
\text{service level} = \frac{\text{consumption}}{\text{demand estimate}}
\]
Accurate demand forecasts for the State, District and Facility Level

Joint work with Jeremie Gallien, Zachary Leung and Ana Chen

Yadav, Global Health Supply Chains
Two things that changed the retail industry
And would matter the most for running an effective and efficient SLD distribution system

- Consumption data from point of sale flowing to all levels in the planning hierarchy
- High frequency of delivery (made possible through LTL and horizontal distribution collaboration)