Increasing Access to Medicines
the Private Sector in Zambia and Zimbabwe

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Advisor: Jarrod Goentzel

MIT SCM ResearchFest
May 22-23, 2013
Agenda

• Introduction
• Approach
• Conclusion
Agenda

• Introduction
  • Objectives
  • Company background
  • Country background
  • Challenges to address

• Approach

• Conclusion
Introduction

“The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being.” – WHO Constitution

• Objectives
  • Create an approach to investigate distribution networks of pharmaceuticals in less developed countries
  • Identify factors that can reduce patient price in Zambia and Zimbabwe
HealthCo Background

• Initiative to increase access to essential medicines in less developed countries
  • Southern African governments
  • Multinational financial institution

• Evaluation of supply chain of 2 pharmaceuticals
  - M1 penicillin antibiotic
  - O1 bronchodilator
Country Background

Zambia
Highest death rate in world due to asthma

Zimbabwe
HealthCo returned to country in 2010 after financial meltdown

- Over 60% live below poverty line
- Limited access to essential medicines

1 Index Mundi, 2012
Challenges to Address

• Diagnose the supply chain

• Develop a method to analyze distribution costs

• Determine expected impact on patient price
Agenda

- Introduction
- Approach
  - Methodology
  - Empirical Analysis
  - Sensitivity Analysis
- Conclusion
Methodology

- Semi-structured Interview
- Grounded Theory
- Value Chain
- Sensitivity Analysis
- Expected Impacts

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Empirical Analysis

Europe / South Africa ——————————————————— Zambia / Zimbabwe

Manufacturer → Wholesalers → Pharmacies

Product Flow

Information Flow

Financial Flow
Empirical Analysis

Low stock out rates at wholesaler level

Country managers maintained contact

High financing rates
Wholesalers hold burden of working capital
Empirical Analysis

Europe / South Africa

Zambia / Zimbabwe

Manufacturer
- Ordering Policy
- Inventory Levels
- Payment Terms

Wholesalers

Pharmacies
- Inbound Transport
- Clearing
- Duties
- Outbound Transport
- Warehousing / Rent
- Salary
- Other SG&A
- Taxes
- Net Income
Value Chain Map

South Africa ─────────────────── Zambia

Sales Price $8

Manufacturer ➔ Air
  ➔ Truck

Wholesalers

Mark-Up $6.84
Lead time 4 weeks
Payment days 45 days

Sales Price $15

Mark-Up $10.51
Lead time 0 – 1 day
Payment days -60 days

Pharmacies

Patient Price $25

Mark-Up $25
Lead time
Payment days

-60 days
Empirical Analysis

<table>
<thead>
<tr>
<th></th>
<th>Accounts Payable</th>
<th>Accounts Receivable</th>
<th>M1</th>
<th>O1</th>
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<tbody>
<tr>
<td>ZAMBIA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>30-60</td>
<td>0</td>
<td>2 months</td>
<td>3 months</td>
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<tr>
<td>B</td>
<td>0</td>
<td>0</td>
<td>1 month</td>
<td>2 months</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
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<td>n/a</td>
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<td>D</td>
<td>-4</td>
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<tr>
<td>E</td>
<td>0</td>
<td>0</td>
<td>3 months</td>
<td>3 months</td>
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<tr>
<td>ZIMBABWE</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>H</td>
<td>30</td>
<td>30-60</td>
<td>2 months</td>
<td>2 months</td>
</tr>
<tr>
<td>I</td>
<td>30, 60</td>
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<td>2 months</td>
<td>2 months</td>
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<tr>
<td>J</td>
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<td>N</td>
<td>0</td>
<td>0</td>
<td>doesn't stock</td>
<td>2 months</td>
</tr>
<tr>
<td>O</td>
<td>-</td>
<td>0</td>
<td>doesn't stock</td>
<td>1 month</td>
</tr>
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</table>

Example of data collection at pharmacy level
Empirical Analysis

### Zambia

<table>
<thead>
<tr>
<th></th>
<th>Wholesaler</th>
<th>Pharmacy</th>
</tr>
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<tbody>
<tr>
<td><strong>Cash-to-Cash Conversion Cycle</strong></td>
<td>-30 to 195</td>
<td>-60 to 180</td>
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<tr>
<td><strong>Days Receivable (DSO)</strong></td>
<td>0 to 90</td>
<td>0</td>
</tr>
<tr>
<td><strong>Days Payable (DPO)</strong></td>
<td>-15 to 60</td>
<td>0 to 90</td>
</tr>
<tr>
<td><strong>Days Inventory on Hand (DIO)</strong></td>
<td>30 to 90</td>
<td>30 to 180</td>
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</tbody>
</table>

### Zimbabwe

<table>
<thead>
<tr>
<th></th>
<th>Wholesaler</th>
<th>Pharmacy</th>
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<tbody>
<tr>
<td><strong>Cash-to-Cash Conversion Cycle</strong></td>
<td>0 to 165</td>
<td>-30 to 240</td>
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<tr>
<td><strong>Days Receivable (DSO)</strong></td>
<td>0 to 60</td>
<td>0 to 60</td>
</tr>
<tr>
<td><strong>Days Payable (DPO)</strong></td>
<td>-15 to 30</td>
<td>0 to 60</td>
</tr>
<tr>
<td><strong>Days Inventory on Hand (DIO)</strong></td>
<td>30 to 90</td>
<td>30 to 180</td>
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</table>
### P&L Statements

#### Zambian Wholesaler - P&L

<table>
<thead>
<tr>
<th></th>
<th>Low Volume</th>
<th>High Volume</th>
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</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>$ 2,000,000</td>
<td>$ 5,000,000</td>
</tr>
<tr>
<td>Procurement Costs</td>
<td>$ 1,040,359</td>
<td>$ 2,686,642</td>
</tr>
<tr>
<td>In-bound Transportation</td>
<td>$ 83,229</td>
<td>$ 214,931</td>
</tr>
<tr>
<td>Import Fees</td>
<td>$ 20,807</td>
<td>$ 53,733</td>
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<tr>
<td><strong>COGS</strong></td>
<td>$ 1,144,395</td>
<td>$ 2,955,306</td>
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<tr>
<td><strong>Gross Income</strong></td>
<td>$ 855,605</td>
<td>$ 2,044,694</td>
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<tr>
<td>Gross Margin</td>
<td>43%</td>
<td>41%</td>
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<tr>
<td>Out-bound</td>
<td>$ 22,888</td>
<td>$ 59,106</td>
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<tr>
<td>Warehousing</td>
<td>$ 67,347</td>
<td>$ 202,041</td>
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<tr>
<td>Salary</td>
<td>$ 21,363</td>
<td>$ 64,090</td>
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<tr>
<td>Other SG&amp;A</td>
<td>$ 114,440</td>
<td>$ 295,531</td>
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<tr>
<td><strong>Operating Expenses</strong></td>
<td>$ 226,038</td>
<td>$ 620,767</td>
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<tr>
<td><strong>EBITDA</strong></td>
<td>$ 629,567</td>
<td>$ 1,423,927</td>
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<tr>
<td>Operating Margin</td>
<td>31%</td>
<td>28%</td>
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<tr>
<td>Financing Costs</td>
<td>$ 67,723</td>
<td>$ 174,889</td>
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<tr>
<td><strong>EBT</strong></td>
<td>$ 561,844</td>
<td>$ 1,249,037</td>
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<td>Income Tax</td>
<td>$ 185,408.60</td>
<td>$ 412,182.37</td>
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<tr>
<td><strong>Net Income</strong></td>
<td>$ 376,436</td>
<td>$ 836,855</td>
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<tr>
<td>Net Margin</td>
<td>19%</td>
<td>17%</td>
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</tbody>
</table>
# Sensitivity Analysis: Unit Model

## Zambian Wholesaler: High Volume

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>O1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Price</td>
<td>$15.00</td>
<td>$3.74</td>
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<tr>
<td>Procurement Costs</td>
<td>$8.16</td>
<td>$1.82</td>
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<tr>
<td>In-bound Transportation</td>
<td>$0.65</td>
<td>$0.15</td>
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<tr>
<td>Import Fees</td>
<td>$0.16</td>
<td>$0.04</td>
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<tr>
<td><strong>Gross Margin</strong></td>
<td><strong>40%</strong></td>
<td><strong>46%</strong></td>
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<tr>
<td>Operating Expenses:</td>
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<td></td>
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<tr>
<td>Out-bound</td>
<td>$0.18</td>
<td>$0.04</td>
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<tr>
<td>Warehousing</td>
<td>$0.61</td>
<td>$0.14</td>
</tr>
<tr>
<td>Salary</td>
<td>$0.19</td>
<td>$0.04</td>
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<tr>
<td>Other SG&amp;A</td>
<td>$0.90</td>
<td>$0.20</td>
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<tr>
<td><strong>Operating Margin</strong></td>
<td><strong>28%</strong></td>
<td><strong>35%</strong></td>
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<tr>
<td>Financial Costs</td>
<td>$0.53</td>
<td>$0.04</td>
</tr>
<tr>
<td>Taxes</td>
<td>$1.19</td>
<td>$0.42</td>
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<tr>
<td>Net Income</td>
<td>$2.42</td>
<td>$0.85</td>
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<tr>
<td><strong>Net Margin</strong></td>
<td><strong>16%</strong></td>
<td><strong>23%</strong></td>
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</table>
Sensitivity Analysis
Payment Terms and Interest Rates

Zambia Price Tradeoff Curve:
High Volume, M1

Base case

% Price Reduction

-15 0 15 30 45 60 75 90

Wholesaler Payment Term Days

Interest Rate

0% 5% 10% 15% 20% 25% 30% 35% 40%

1% 2% 3%

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Sensitivity Analysis
Payment Terms and Warehouse Costs

Zambia Cost Tradeoff Line: Low Volume Wholesaler, O1

% Price Reduction
- 1%
- 2%
- 3%
- 4%
- 5%
- 6%

% Reduction In-bound Costs

Wholesaler Payment Term Days

Base case

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Agenda

• Introduction

• Approach

• Conclusion
  • Objectives Achieved
  • Next Steps
Objectives Achieved

• Approach to supply chain mapping
  • Process to identify supply chain costs
  • Value chain analysis of pharmaceutical distribution
  • Method to measure impact of these costs on end price

• Assessment that current initiatives have minimal impact on patient price
Next Steps

• Continue to identify cost factors and possible savings

• Investigate benefits of economies of scale

• Identify third party distributor business models

• Align incentives of upstream and downstream partners to reduce patient price
Thank You

Health Co
Pharmacists and wholesalers
in Zambia and Zimbabwe
Jarrod Goentzel, thesis advisor
MIT SCM

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