PEQUEÑAS GRANDES COISAS
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2019 – 2023 VVMs in Brazil

2,508 lives saved
2019 – 2023 VVMs IN BRAZIL

2,508 LIVES SAVED × $8,649 GDP PER CAPITA
2019 – 2023 VVMs in Brazil

- **2,508 Lives Saved**
- **$8,649 GDP Per Capita**

$$2,508 \times $8,649 = $21.7\text{ Mill Economic Productivity Created}$$
SITUATIONAL ANALYSIS

Determining Initial Country of Entry
<table>
<thead>
<tr>
<th>Country</th>
<th>Disease Risk</th>
<th>Cold Chain</th>
<th>Healthcare System</th>
<th>Population</th>
<th>Economic Outlook</th>
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</thead>
<tbody>
<tr>
<td>Paraguay</td>
<td>Yellow</td>
<td>Red</td>
<td>Yellow</td>
<td>Green</td>
<td>Yellow</td>
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<tr>
<td>Brazil</td>
<td>Green</td>
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<td>Green</td>
<td>Yellow</td>
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</tr>
<tr>
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**Analysis**
- Brazil
- Chile
- Venezuela

**Benefits**
- Paraguay
- Brazil
- Chile
- Venezuela

**Risks**
- Paraguay
- Brazil
- Chile
- Venezuela

**Timeline**
- Paraguay
- Brazil
- Chile
- Venezuela

**Financials**
- Paraguay
- Brazil
- Chile
- Venezuela

**Summary**
- Paraguay
- Brazil
- Chile
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**Summary**

- Paraguay
- Brazil
- Chile
- Venezuela
Sao Paulo

Rural & Urban Areas

High Risk Communicable Disease

Responsible for 33.9% GDP
Benefits

Immediate & Long-term Benefits of VVM
2,508 LIVES SAVED

BETTER TOOL
SOCIAL BENEFITS

- 2,508 Lives Saved
- Better Tool
- $34,000 Saved per HEP B Patient
STAKEHOLDERS

PUBLIC

[Symbols of United Nations and other organizations]

SOCIAL

[Symbol of people]

Analysis
Benefits
Risks
Timeline
Financials
Summary
RISKS

Identifying And Mitigating Potential Obstacles
**Risks & Mitigations**

1. **Cold Chain**
2. **Lack of Training**
3. **Temptime Single Supplier**
4. **Government Pushback**

**Analysis**  |  **Benefits**  |  **Risks**  |  **Timeline**  |  **Financials**  |  **Summary**
Cold Chain

No Temperature Monitoring
Difficult Distribution
Como Ler Um VMM

Se a vacina não estiver fora do prazo de validade, use a vacina.

Não use a vacina. Informe seu/sua chefe.
Temptime Single Supplier

No Other Supplier

Economies of Scale

Analysis  Benefits  Risks  Timeline  Financials  Summary
Don’t Currently Have Regulations
IMPLEMENTATION

Timeline of Fulfillment and Future VVM Expansion
**Implementation Timeline**

### 2018
- **Analysis**
  - Exhaust Current Vaccines
- **Benefits**
  - PAHO Provides VVM Funds
  - $2.17 MILL

### 2019
- **Analysis**
  - VVM Distribution
  - Training
  - Cold Chain Investigation
- **Benefits**
  - $0.05 MILL

### 2020
- **Analysis**
  - UNICEF Resolution
- **Benefits**
  - Fix Issues
  - $0.15 MILL

---

**Financials**

- **2018**: $2.17 million
- **2019**: $0.05 million
- **2020**: $0.15 million
**Analysis**

2018: Exhaust Current Vaccines
- PAHO Provides VVM Funds
  - $2.17 MILL

2019: VVM Distribution
- Training
  - $0.05 MILL

2020: UNICEF Resolution
- Cold Chain Investigation
  - $0.15 MILL

2021: VVM All of Brazil
- Fix Issues
  - $6.17 MILL

2022: Bi-Annual Checkups
- $0.05 MILL

2023+: Expansion into remaining South American

**Benefits**

2018: $2.17 MILL

2019: $0.05 MILL

2020: $0.15 MILL

2021: $6.17 MILL

2022: $0.05 MILL

2023+: Barcodes
- Controlled Temperature Chain
- UN’s Sustainable Development Goals

**Risks**

2021: VVM All of Brazil

**Timeline**

2018: Exhaust Current Vaccines
- PAHO Provides VVM Funds

2019: VVM Distribution
- Training
  - $0.05 MILL

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2018: $2.17 MILL

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2023+: Barcodes
- Controlled Temperature Chain
- UN’s Sustainable Development Goals

**Summary**
VISION 2023

$9.93 MILL
TOTAL COST

$21.7 MILL
ECONOMIC PRODUCTIVITY CREATED

$11.77 MILL
NET ECONOMIC PRODUCTIVITY
FINANCING

Analysis of Who Will Financially Support VVM Integration
FINANCING

- Brazilian Government (via PAHO) 53%
- PATH / USAID 24%
- IPSAS 20%
- Temptime 4%

Analysis | Benefits | Risks | Timeline | Financials | Summary
PEQUENAS GRANDES COISAS

2,508 LIVES SAVED

$11.77 MILL NET ECONOMIC PRODUCTIVITY
APPENDIX

39. Financing Information
40. Financing Sources
41. Brazilian Vaccination Schedule
42. PAHO IPSAS
43. Vaccination Supply Chain
44. GDP vs. GNI
45. VVM Implementation
46. Coverage Costs Variation
47. Label Machine
48. Unit Costs
49. Country Matrix
50. Brazil Disease Burden
51. Vaccine Stability
52. HEP B
53. EPI
54. Lives Saved
Financing Information

2018: $672 thousand for VVMs statewide, $1.5 million for VVM labeler = $2.17mill

2019: $25 thousand for Cold Chain investigation, $25 thousand for training nurses $50k

2020: $50-300 thousand for repairing and maintaining Cold Chain $150k

2021: $3.17 million for VVMs nationwide, $3 million for VVM labelers $6.17mill

2022: $50 thousand for first biannual check on Cold Chain $50k

2023: Costs to be determined based on South American countries’ economies
Financing Sources

PAHO IPSAS Surplus Fund. We are aware of the $4 million in reserves for strategic initiatives, and we believe some could go toward this cause.

PAHO Revolving Fund for Strategic Health Supplies will help to decrease price of machine due to increased purchasing power.

PATH’s mission is to “improve the health of people around the world by advancing technologies, strengthening systems, and encouraging healthy behaviors.” They already work in Brazil to improve health systems, and this would give PATH a clearer direction to follow.
Brazilian Vaccination Schedule

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates</td>
<td>tuberculosis and type B hepatitis</td>
</tr>
<tr>
<td>1 to 2 months</td>
<td>diphtheria, tetanus and pertussis (DPT), polio*, hepatitis B and Haemophilus influenzae type B (Hib)</td>
</tr>
<tr>
<td>4 months</td>
<td>DPT, polio and Hib</td>
</tr>
<tr>
<td>6 months</td>
<td>DPT, Hib and polio</td>
</tr>
<tr>
<td>9 months</td>
<td>measles, yellow fever†, hepatitis B</td>
</tr>
<tr>
<td>15 months</td>
<td>measles, mumps and rubella and DPT</td>
</tr>
<tr>
<td>5 or 6 years</td>
<td>DPT and polio</td>
</tr>
<tr>
<td>15 years</td>
<td>diphtheria and tetanus</td>
</tr>
</tbody>
</table>

*oral Sabin vaccine is used for polio; †restricted to endemic regions.
PAHO IPSAS Surplus Fund

PAHO Financial Statements:

14.12 IPSAS Surplus Fund

The IPSAS Surplus Fund was established by Resolution CSP28.R16 of the 28th Pan American Sanitary Conference, 64th Session of the Regional Committee. This fund will be used to meet future unforeseen strategic and/or administrative initiatives. Future proposals for the use of this reserve may also include increases in any other existing funds.

(g) Reserve—$4,381,684: Although there are many opportunities for investment, it is considered prudent management of resources to leave a modest amount of unallocated surplus funds in reserve to meet future unforeseen strategic and/or administrative initiatives. Future proposals for the use of this reserve may also include increases to any of the items listed above, if necessary.
Vaccination Supply Chain

Figure 1. Example of a five-tier supply chain

- National (central) vaccine store
- Regional store
- Provincial store
- District store
- Commune health center
GNI v. GDP v. GDP (PPP)

GDP: Baseline economic production of a country each year. Best way to analyze the economic in this case because every dollar value is on the same level.

GDP (PPP): GDP adjusted to reflect the purchasing power of the country, in this case, to put GDP on the same playing field as the U.S. dollar. Here, not every cost is adjusted for purchasing power, so it may not be a good indicator of economic impact.

GNI: GDP adjusted to include income the country earns as a result of Foreign Direct Investment. Because we are not looking at vaccinating Brazilians abroad, this is not a good measure of productivity.
VVM Implementation Costs

Calculated using:
- Brazilian vaccination schedule
- Life expectancy estimates
- Population of Brazil (2018, estimated 2021)
- Estimated vaccination coverage rate (WHO)
- Average cost of vaccine (estimated, see appendix slide)
- VVM cost of $0.047 for an order of 4 million VVMs at a time
Implementation Costs Based on Coverage

Sao Paolo and Brazil Yearly Cost of VVMs

- Sao Paolo
- Brazil

Annual Cost of VVMs:
- $0.00
- $1,000,000.00
- $2,000,000.00
- $3,000,000.00
- $4,000,000.00

Coverage:
- 60%
- 70%
- 80%
- 90%

Costs:
- $530,512.50
- $601,247.50
- $2,502,750.00
- $2,836,450.00
- $3,170,150.00
- $671,982.50
Choosing a Labeling Machine

Estimated using Quadrel Pharmaceutical Labeling machine costs, each approximately $1.5 million

Each machine pastes at a rate of 300/minute
Assumed 8 hour workday, 5 days/week, 50 weeks/year = 36,000,000 labels attached/year
Labels needed according to VVM implementation calculations: 14.3 million for first 3 years
Unit cost of vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Cost per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hep B</td>
<td>0.3264</td>
</tr>
<tr>
<td>Hib</td>
<td>2.05</td>
</tr>
<tr>
<td>HPV</td>
<td>9.8</td>
</tr>
<tr>
<td>MMR</td>
<td>0.6</td>
</tr>
<tr>
<td>Pnuemo</td>
<td>6.8</td>
</tr>
<tr>
<td>Rota</td>
<td>6.5</td>
</tr>
<tr>
<td>Avg vaccine cost per year</td>
<td>1.133757</td>
</tr>
</tbody>
</table>

Source: PAHO
## Country Matrix

<table>
<thead>
<tr>
<th></th>
<th>Disease Risk</th>
<th>Cold Chain</th>
<th>Healthcare system</th>
<th>Pop.</th>
<th>Economic outlook</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paraguay</strong></td>
<td>Intermediate</td>
<td>-largely reliable</td>
<td>#57</td>
<td>1.28%</td>
<td>4.5%</td>
</tr>
<tr>
<td><strong>Brazil</strong></td>
<td>High</td>
<td>-no temp monitoring; hard-to-reach remote areas</td>
<td>#125</td>
<td>0.79%</td>
<td>2.95%</td>
</tr>
<tr>
<td><strong>Chile</strong></td>
<td>Intermediate</td>
<td>-limited capacity; high staff turnover</td>
<td>#33</td>
<td>0.81%</td>
<td>2.3%</td>
</tr>
<tr>
<td><strong>Venezuela</strong></td>
<td>High</td>
<td>-limited capacity; insufficient temp. monitoring</td>
<td>#54</td>
<td>1.29%</td>
<td>741%</td>
</tr>
</tbody>
</table>

**Source**
- CIA World Factbook
- European Commission Food and Veterinary Office; Unicef, PATH, USAID
- WHO
- World Pop. Review
- Trading Economics (Jan. 2018)
Brazil Disease Burdens

<table>
<thead>
<tr>
<th>Disease</th>
<th>DALYs (2016 annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hep B</td>
<td>35,008</td>
</tr>
<tr>
<td>HPV~ Cervical Cancer</td>
<td>267,801</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>304 (will rise with outbreak)</td>
</tr>
</tbody>
</table>

DALYs: sum of years of life lost due to premature mortality and years lost to disability (IHME)
### Vaccine stability matrix (PAHO)

<table>
<thead>
<tr>
<th>Most sensitive</th>
<th>OPV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measles, MR, MMR</td>
</tr>
<tr>
<td></td>
<td>DTP, <strong>DTP-Hep</strong> B, DTP-Hib, <strong>YF</strong></td>
</tr>
<tr>
<td></td>
<td>BCG, <strong>HPV</strong></td>
</tr>
<tr>
<td></td>
<td>HIB, DT</td>
</tr>
<tr>
<td>Least sensitive</td>
<td>Td, TT, JE</td>
</tr>
</tbody>
</table>
Hep B- savings estimate

Est. cost of chronic hepatitis B virus for Brazilian unified health system in 2005:

- Hep B virus places large financial burden on Brazilian health system

<table>
<thead>
<tr>
<th>CHBV</th>
<th>1st stage</th>
<th>2nd stage</th>
<th>3rd stage</th>
<th>4th stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (US $)</td>
<td>$392</td>
<td>$496</td>
<td>$8809</td>
<td>$34,948</td>
</tr>
</tbody>
</table>

15%-40% may develop complications of hepatitis B virus (HBV) infection, including cirrhosis, decompensation, and hepatocellular carcinoma (HCC)
Why EPI?

Benefit of family-vaccination:

- Establishment of herd immunity at family scale

Benefit of diseases targeted by “newer” vaccines:

- These are diseases which can have long-term sequelae
  - Human Papillomavirus → Cervical cancer
  - Hepatitis B → chronic Hep B & liver complications
Lives Saved

158,000 lives / 35 countries = 4514 / 9 years = 502*5 years = 2508

lives saved between 2019-2023 * Brazil GDP (8,649.95) = $21.7 million