



World Health
Organization

REGIONAL OFFICE FOR THE **Americas**

Vaccine Vial Monitors – The Little Big Thing

Taking social innovation to scale in the PAHO region

Executive Summary



The Problem

- Children keep dying from vaccine preventable diseases globally
- High vaccination coverage reported, but the burden persists

Our Solution

- Implement pilot VVM program in Brazil for ‘newer’ vaccines to address wastage
- Possible future scale-up to entire PAHO region?
- Health system strengthening activities to improve cold chain management

Alternatives

1. Roll-out in all PAHO countries in both rural and urban regions
2. Pilot the VVM in a single PAHO market
 - Focus on the market with potential maximum added value

Evaluation criteria

– Relevance & Appropriateness

- Is there political will?
- Are all relevant stakeholders considered and willing to support?
 - Pharmaceutical manufacturers, policy makers, program implementers, etc

– Effectiveness

- Is there sufficient value addition?
- Will VVM reduce wastage?

– Feasibility

- Is the health system ready to implement VVM?
- Are manufacturers able to meet demand?

– Scalability

- Is it affordable?



PAHO footprint in South America

69 million individuals impacted by vaccine preventable diseases in PAHO

1. Brazil	4. Colombia	7. Ecuador	10. Suriname
Rural Pop: 29M	Rural Pop: 11.3M	Rural Pop: 5.9M	Rural Pop: 0.19M
2. Paraguay	5. Argentina	8. Bolivia	11. Chile
Rural Pop: 2.7M	Rural Pop: 3.6M	Rural Pop: 3.4M	Rural Pop: 1.85M
3. Venezuela	6. Peru	9. Guyana	12. Uruguay
Rural Pop: 3.5M	Rural Pop: 6.7M	Rural Pop: 0.55M	Rural Pop: 0.16M



Brazil Background



Brazil has a population of 204.4 million

Health expenditure increased from 7.2% to 8.0% of the GDP

Vaccination program since 1973 | 1.2 b USD in 2017

30,000 death	1 out of 100 child mortality
90,000 death	3 out of 100 under 5 mortality

Pan American Health Organization. Health in the Americas+, 2017 Edition. Summary: Regional Outlook and Country Profiles. Washington, D.C.: PAHO; 2017.

Brazil Background

Vaccination rates 2016



1- Brazilian Ministry of Health

2- Pereira DD, Neves EB, Gemelli M, Ulbricht L. Analysis of the utilization rate and loss of vaccines in the national immunization program. Cadernos Saúde Coletiva. 2013;21(4):420-4.

Since 2000, new life-saving vaccines

- Rotavirus
- HPV
- Pneumococcal disease














Worst immunization rate in the last twelve years¹

Problems in the cold chain²

Losses of vaccines from 13% till 70%



Score Card

Alternatives	Relevance & Appropriateness	Effectiveness	Feasibility	Scalability
Full Implementation PAHO		 		
Pilot in Brazil				
No change				

Recommendation

#1: Implement pilot VVM program in Brazil to address wastage of vaccines and improve health outcomes of vaccine-preventable diseases

#2: Initially implement existing VVM technology and incorporate lessons learned to scaled platform with future technologies, VVM+

Value Proposition – Diarrheal Disease

(\$US)	GNI/Capita	DALYs	GNI Lost	Indirect and Direct Medical costs
Benefits	14,840	581,322	8,626,818,480	12,229,177

(\$US)	Cost
Incremental cost of disease/vaccine	700,000

**TTL Net Benefit/Yr:
\$13.07b**

Implementation

Put a little change in the big thing

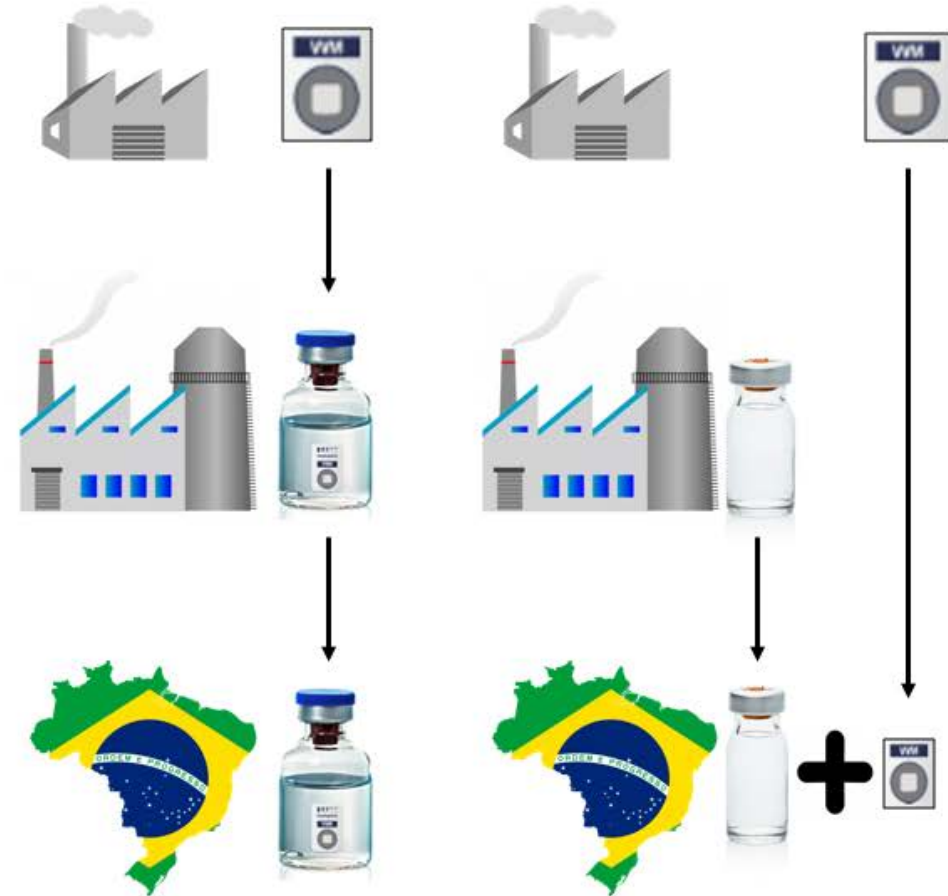


- Minimal price increase for PAHO



Previous idea

New idea

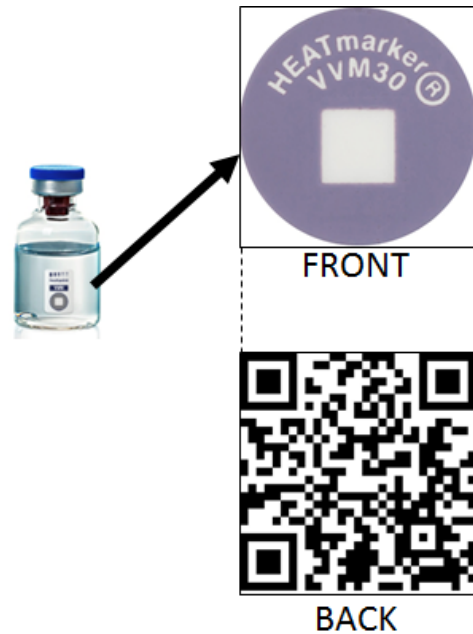


Implementation – Monitoring System

*Monitoring System

1. Training local staff : takes time, difficult to evaluate
2. Patients also be a watcher

*Add in VVM+



Patient
give small gift

report



if problem,
give instruction to
medical worker



What kind of information we can collect

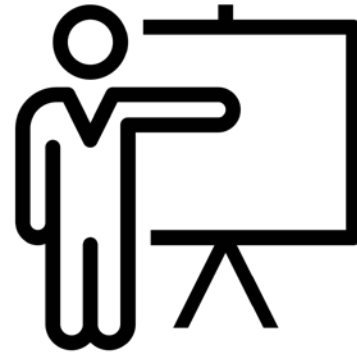
- which LOT it used
- when it used
- where it used
- the number of vial wasted
- the number of temperature exposed
- static stock

Budget – 1 year



VVM | QR code

0.04\$ USD/ VVM
18M vaccines/year
0.7\$ M USD per year



Training

4 h training in cascade
70.000 nurses re trained in 1y
1.5\$ M USD One-off



Monitoring

Apps development
Evaluation Study
3 M USD One-off

Risks



Antitrust

Temptime has a record of fair pricing



VVM supply problems

Brazil will manage the VVM stock, experience in vaccine handling and production



Incorrect use of VVM

Retraining all vaccine cold chain managers and nurses.
Positive spillover on wastage

Thank you

Q&A

APENDIX Budget breakdown

Vaccine	N person/year	Vac Rate	Doses/per Y	Total (M units)	VVM cost/unit	Total cost M \$ USD
Rota	2.9	0.9	2	5.22	0.0415	0.21663
HPV	2.9	0.9	1	2.61	0.0415	0.108315
Pneumo	2.9	0.9	4	10.44	0.0415	0.43326
				18.27		

VVM	Price VVM unit	Total Million USD
	0.04	0.7308

Training	Nurse price \$/ hour	Number of nurses	Hours	Total cost USD
	3.38	70000	4	946400
		2 per facility		

Country Selection criteria

- Burden of disease
- Data availability
- Health Infrastructure
- Infrastructure to deploy
- Early adopters of technology

South America Demographic

1	2	3	4
4. Brazil DALYs 1: 277 DALYs 2: 13 DALYs 3: 127 Rural Pop: 29M	5. Colombia DALYs 1: 159.86 DALYs 2: 9.46 DALYs 3: 116.18 Rural Pop: 11.3M	9. Ecuador DALYs 1: 256.27 DALYs 2: 5.3 DALYs 3: 112.38 Rural Pop: 5.9M	4. Suriname DALYs 1: 474.24 DALYs 2: 19.17 DALYs 3: 212.05 Rural Pop: 0.19M
2. Paraguay DALYs 1: 400 DALYs 2: 19.67 DALYs 3: 228.42 Rural Pop: 2.7M	6. Argentina DALYs 1: 92.37 DALYs 2: 17.03 DALYs 3: 182.79 Rural Pop: 3.6M	10. Bolivia DALYs 1: 515.29 DALYs 2: 10.96 DALYs 3: 198.06 Rural Pop: 3.4M	8. Chile DALYs 1: 60.19 DALYs 2: 9.39 DALYs 3: 121.60 Rural Pop: 1.85
3. Venezuela DALYs 1: 374.87 DALYs 2: 12.35 DALYs 3: 187.07 Rural Pop: 3.5M	7. Peru DALYs 1: 250.67 DALYs 2: 7.19 DALYs 3: 137.81 Rural Pop: 6.7M	11. Guyana DALYs 1: 443 DALYs 2: 16.36 DALYs 3: 251.53 Rural Pop: 0.55M	12. Uruguay DALYs 1: 80.73 DALYs 2: 7.16 DALYs 3: 199.10 Rural Pop: 0.16M

DALYs 1- Diarrheal disease
 DALYs 2 - Pneumococcal meningitis
 DALYs 3 - Cervical cancer



Why VVMs in Brazil?

Important for PAHO's Mission & Significant Social, Health and Economic Impacts

- Immunisation 'best buy' in global health as it is crucial in achieving 14 / 17 SDGs
 - Healthy population (SDG3)
 - Improved learning (SDG4)
 - More productive workforce (SDG8)
- Effectively reduces high burden of diseases targeted by 'newer' vaccines
 - e.g. rotavirus: 18 DALYs averted / 1000 children
- High vaccination coverage but reported high wastage

Existing health infrastructure

- 35,000+ vaccination centres nationally

APPENDIX Vaccination crisis in Brazil

In 2016, Brazil had a drop of overall immunization rates from 95% to 84%. This drop could result in creation of pockets of susceptible population and outbreaks (i.e. Measles outbreak in Pernambuco)

Brazilian Ministry of Health

Reports highlight that the waste of vaccines can range from **13% to 70%** depending of the vaccine. The reasons can vary from problems related with expiration date, cold chain problems, bad management of stock.

Waldman EA. Mesa-Redonda: Desigualdades sociais e cobertura vacinal: uso de inquéritos domiciliares. Rev Bras Epidemiol. 2008;11(Suppl 1):129-132. DOI:10.1590/S1415-790X2008000500013

In a study done in Rio, 24 health facilities reported power outages, and 50% reported waste of vaccines

Dias, Bárbara Ferraz Relação entre perdas vacinais e variáveis de infraestrutura em salas de vacinação de uma cidade do Sudeste brasileiro/ Bárbara Ferraz Dias. – Rio de Janeiro: UFRJ/COPPE, 2016.

PATH and PAHO recommended cold-chain monitoring in 2009

UNICEF Regional Office for Latin America & the Caribbean (UNICEF-TACRO) Program for Appropriate Technology in Health (PATH)

Value Proposition – Pneumococcal Meningitis

Brazil (\$US)	GNI/Capita	DALYs	GNI Lost	Indirect and Direct Medical costs
Benefits	14,840	26,024	386,196,160	31,507,012

Brazil (\$US)	Cost
Cost per vial	433,000

Net Benefit:
\$417M

Value Proposition – Cervical Cancer

(\$US)	GNI/Capita	DALYs	GNI Lost	Indirect and Direct Medical costs
Benefits	14,840	267,810	3,974,300,400	1,321,683

(\$US)	Cost
COST per vial	108,000

**Net Benefit:
\$3.98 billion**

Implementation – No price increase –



- install labelling machine
- quality control is driven by manufacturing company
- manufacturing company can use contractor in Brazil