Miracles of science: Vaccines and ensuring access for all

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CEO GAVI Alliance

Manhica Foundation Annual Seminar at the Faculty of Medicine, Universidade Eduardo Mondlane
Maputo, 12 March 2012
The intimidating Manhica Global Health Lecture…

Graça Machel, former Chair of GAVI Board

Her Royal Highness Princess Cristina of Spain
Overview

- Part 1: Power of vaccines
- Part 2: Why GAVI
- Part 3: Mozambique: challenges and opportunities
Part 1: Power of vaccines
Vaccine development timeline: 1798-1910
Vaccine development timeline: 1910-2010

1910-1920:
- Tuberculosis (Bacille Calmette-Guérin) 1927
- Tetanus toxoid 1926
- Pertussis 1923
- Yellow Fever 1935

1930-1940:
- Typhus 1938
- Influenza 1936
- Diphtheria toxoid 1923

1950-1960:
- Polio (injected inactivated) 1955
- Mumps, live (1967)
- Anthrax, secreted proteins (1970)
- Pneumococcus polysaccharides (1977)

1970-1980:
- Adenovirus, live (1980)
- Rabies, cell culture (1980)
- Meningococcal polysaccharides (1974)
- Rubella, live (1969)
- Polio (oral live) (1963)
- Measles, live (1963)
- Tick-borne encephalitis (1981)
- Hepatitis B surface antigen recombinant (1986)

1990-2000:
- H. influenzae type B polysaccharide (1985)
- Cholera (WC-rBC) (1991)
- Cholera (recombinant Toxin B) # (1993)
- Varicella (1995)
- Lyme OspA, protein† (1998)
- Pneumococcal conjugate, heptavalent* (2000)
- Meningococcal quadrivalent conjugates* (2005)
- Japanese encephalitis (Vera-cell) (2009)
- Cholera (WC only) (2009)
- Human papillomavirus recombinant bivalent (2009)

2010:
- 13 valent pneumococcal conjugates (2010)
- Zoster, live (2006)
- Rotavirus (attenuated and new reassortants) (2006)
- Cold-Adapted Influenza (2003)
- Rotavirus reassortants (1999)
- Meningococcal conjugate* (group C) (1999)
- Acellular pertussis, various (1996)
- Hepatitis A, inactivated (1996)
- Cholera, live attenuated (1994)
- Typhoid (Vi) polysaccharide (1994)
- Japanese encephalitis, inactivated (1992)
Cumulative number of vaccines developed
## Unprecedented Results: 1980-2009

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<thead>
<tr>
<th></th>
<th>1980</th>
<th>2009</th>
<th>Change</th>
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<tbody>
<tr>
<td>Global population</td>
<td>4,424,952</td>
<td>6,808,999</td>
<td>+54%</td>
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<tr>
<td>Diptheria Cases</td>
<td>97,511</td>
<td>857</td>
<td>-99%</td>
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<tr>
<td>Measles Cases</td>
<td>4,211,431</td>
<td>222,318</td>
<td>-95%</td>
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<tr>
<td>Pertussis Cases</td>
<td>1,982,355</td>
<td>106,207</td>
<td>-95%</td>
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<tr>
<td>Polio Cases</td>
<td>52,795</td>
<td>1,779</td>
<td>-97%</td>
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<tr>
<td>Tetanus Cases</td>
<td>114,251</td>
<td>9,836</td>
<td>-91%</td>
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</tbody>
</table>

WHO Global and regional immunization profile; 2010
Disease eradication and elimination

- Smallpox – 1979
- Rinderpest - 2011
- Guinea worm
- Polio?
- Measles??
When the Global Polio Eradication Initiative was launched 1988, 125 countries were endemic for wild poliovirus, and more than 350,000 children were paralyzed every year.

In February 2012, India was declared to be no longer polio endemic. Still endemic in Pakistan, Nigeria & Afghanistan

http://www.polioeradication.org/Dataandmonitoring/Poliothisweek.aspx
Impact on the ground
Eliminating Hib meningitis in Kenya (Kilifi district):

Hib vaccine introduction

Hib cases (per 100,000)

Year

Source: Cowgill KD et al. 2006
Causes of child deaths in low-income countries

Source: WHO, World Health Statistics 2011
Africa opportunities: Pneumococcal

- Every year, more than half a million children die of pneumococcal disease, 90% in Africa
- 13% of under-five deaths in Mozambique caused by pneumonia
- Use of pneumococcal vaccine was shown to be associated with a 39% reduction in hospital admissions due to pneumonia from any cause
Pneumococcal benefits

- Pneumococcal vaccine trial in Malawi found that PCV 7 prevented 3 out of 4 cases of pneumococcal disease in HIV-infected adults.

- HIV-infected children in Africa younger than 2 years have about 40-times greater risk of invasive pneumococcal disease than uninfected.
Part 2: Why GAVI

Photo: UNICEF/Pirozzi
New commitments, new mechanisms 1975-2000

“Preventable childhood diseases... against which there are effective vaccines... are currently responsible for the great majority of the world's 14 million deaths of children under 5 years and disability of millions more every year.”

“Effective action can and must be taken to combat these diseases...”

UNICEF 1990 World Summit for Children
GAVI’s mission and four strategic goals

**Mission:** To save children’s lives and protect people’s health by increasing access to immunisation in poor countries

- **Accelerate the uptake** and use of underused and new vaccines
- **Contribute to strengthening the capacity of integrated health systems** to deliver immunisation
- **Increase the predictability** of global financing and **improve the sustainability** of national financing for immunisation
- **Shape vaccine markets**
GAVI Alliance: a partnership
Accelerating Hib vaccine introduction in low-income countries

Source: WHO, Vaccine introduction database
Driving equity in vaccine access

Routine use of vaccines in high- and low-income countries

Source: WHO, Vaccine introduction database.
Vaccination benefits beyond cost effectiveness: increases cognitive ability and leads to higher earnings potential in adults*

1. Healthy Children attend school; learn effectively
2. Less illness; lower out of pocket expenditures
3. Living longer; 1 year increase in life expectancy increased labor productivity by 4%
4. Demographic Dividend; invest more in fewer children

Rate of Return 12.4-18%
Compare education Primary, secondary, higher 19%, 13%, 11% respectively

Fully immunized child @ 11 years increase in IQ, language & math testing

*David Bloom, The Value of Vaccination (July, 2005)
Immunisation: a building block for contact with health services
Burkina Faso, January 2011
Factors Affecting Vaccine Availability
Tiered pricing

**Average price per dose for 3-dose vaccines between 2006–2009.**

**2010 price for 13-valent vaccines (US public market) and price for AMC vaccines (UNICEF/GAVI market). Under the AMC, companies will receive an additional payment of US$ 3.50 per dose for approximately 20% of the total number of doses they provide. This additional payment is funded by donor commitments.**

**2010 average price per dose assuming 3-dose equivalence among available products (US public market). Price through UNICEF not yet available.**

Source: UNICEF Supply Division; CDC
Increased competition reduces vaccine price

Number of manufacturers and price decline of pentavalent vaccine

Source: UNICEF Supply Division, 2011
Co-financing of new vaccines

TOTAL OF COUNTRIES CO-FINANCING

Voluntary payments
Mandatory requirements

Co financing amount paid by countries

Amount in millions $
## Projected vaccine costs as a share of projected public spending on health, 2015

In graduating countries, vaccines would be < 1 % of government spending on health

<table>
<thead>
<tr>
<th>New Co-financing Categories</th>
<th>Per capita government spending on health</th>
<th>Government spending on health as % of government spending</th>
<th>Government spending as % of GDP</th>
<th>Vaccines as % of government spending on health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low income</td>
<td>$14.83</td>
<td>10.0%</td>
<td>25.0%</td>
<td>4.2%</td>
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<tr>
<td>Intermediate</td>
<td>$35.84</td>
<td>9.1%</td>
<td>31.2%</td>
<td>1.5%</td>
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<tr>
<td>Graduating</td>
<td>$107.43</td>
<td>8.7%</td>
<td>37.0%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Data Sources: World Bank/ WHO National Health Accounts/ GAVI Demand Forecast

Note: Eritrea, India, Korea D.R., Somalia and Zimbabwe excluded from analysis
Taking stock: the immunisation gap

136 million surviving newborns in 2010:

- **DTP, BCG, Polio, Measles**: 82% vaccinated, 18% not vaccinated
- **Hepatitis B**: 70% vaccinated, 30% not vaccinated
- **Hib**: 40% vaccinated, 60% not vaccinated
- **Pneumococcal**: 11% vaccinated, 89% not vaccinated
- **Rotavirus**: 9% vaccinated, 91% not vaccinated

Source: Johns Hopkins Bloomberg School of Public Health; UN, DESA, Population Division; WHO/UNICEF
Pneumococcal vaccine introductions: introduced, approved and forecast

Forecast: +21 countries

Pneumococcal vaccine:
- Introduced
- Approved
- Forecast

GAVI-eligible countries

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of countries per year</th>
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<tbody>
<tr>
<td>2009</td>
<td>2</td>
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<tr>
<td>2010</td>
<td>1</td>
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<td>2011</td>
<td>13</td>
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<td>2012</td>
<td>16</td>
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<tr>
<td>2013</td>
<td>21</td>
</tr>
<tr>
<td>2014</td>
<td>2</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
</tr>
</tbody>
</table>
Rotavirus vaccine introductions: introduced, approved and forecast

Rotavirus vaccine:
- Introduced
- Approved
- Forecast

Number of countries per year:
- 3 (2009)
- 1 (2010)
- 1 (2011)
- 8 (2012)
- 22 (2013)
- 8 (2014)
- 7 (2015)
- 4 (2015)

Forecast: +25 countries

GAVI-eligible countries
Over 19 million children still missing out

Global number of under-five children unimmunised with 3 doses of DTP

% unimmunised as % overall population

GAVI-eligible:* 15.4 million

7.1 million India 0.58%
1.7 million Nigeria 1.07%
1.0 million DR Congo 1.44%
0.6 million Pakistan 0.33%
0.6 million Uganda 1.69%
0.4 million Ethiopia 0.48%
0.4 million Afghanistan 1.32%
0.2 million Kenya 0.61%
0.2 million Niger 1.45%
0.2 million Mozambique 0.89%

3.0 million Rest of GAVI-eligible


*From 2011, GAVI has 57 eligible countries.
Acceleration of new vaccines development, 1980-2020


Source: Applied Strategies – Project Optimize Vision Workshop, Landscape Overview, June 2010
Comparison of cervical cancer incidence and mortality by country-income

Advantages of introduction go beyond health
• Need is greatest in developing countries
• Entry to adolescent girls; can be bundled with FP, MCH, HIV prevention, SRH, Nutrition, etc.
• New cooperation with MOE, SRH, FP groups
• New mechanisms outside of school for high risk girls

Potential new vaccines

**HPV**  The cause of cervical cancer, which kills over 270,000 women every year; 85% of deaths are in developing countries

**Rubella**  More than 90,000 Congenital Rubella Syndrome cases in GAVI countries

**Japanese Encephalitis**  Regional infection; 50-100,000 cases; 30% fatal

**Typhoid**  200,000-600,000 cases per year

**Malaria**  Major cause of child mortality in Africa. 1st phase III results promising; 1st phase III results in EPI age group due shortly

**Dengue, TB, etc**  All in development, keeping close watch… and of course, HIV which is undergoing a renaissance…
Part 3: Mozambique - challenges and opportunities
### Per capita Government expenditure on health (PPP int. US$): regional comparisons

<table>
<thead>
<tr>
<th>Country</th>
<th>Per capita Expenditure (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>281</td>
</tr>
<tr>
<td>Mauritius</td>
<td>259</td>
</tr>
<tr>
<td>Namibia</td>
<td>256</td>
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<tr>
<td>Lesotho</td>
<td>91</td>
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<tr>
<td>Zambia</td>
<td>52</td>
</tr>
<tr>
<td>Tanzania</td>
<td>50</td>
</tr>
<tr>
<td>Rwanda</td>
<td>44</td>
</tr>
<tr>
<td><strong>Mozambique</strong></td>
<td><strong>41</strong></td>
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<tr>
<td>Malawi</td>
<td>29</td>
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<tr>
<td>Madagascar</td>
<td>27</td>
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</tbody>
</table>

**Total government expenditure on health, Mozambique: 281**

**General government expenditure on health as a % of total expenditure on health: 75.5 %**

**Social security expenditure on health as a percentage of general government expenditure on health: 0.3 %**

**Per capita government expenditure on health (PPP int. US$): 41**
Mozambique: immunisation situation

- 2001: Mozambique was one of the first countries to get GAVI support. Introduced DTP-Hep B.
- 2009: Mozambique switched to pentavalent and has GAVI support to 2013
- Eliminated MNT since 2009
- Approved for PCV introduction (2012/2013)
WHO-UNICEF estimates for DTP3/MCV/Polio3 in Mozambique
Reported measles cases and measles vaccination coverage, 1990-2010, Mozambique

Data source:
Measles cases - reported by national authorities to WHO annually
Measles vaccination coverage - WHO/UNICEF immunization coverage estimates 1990-2010, as of August 2011;
SIA activities: WHO/EPI supplementary immunization activities database
Date of slide: 15 August 2011
Mozambique, Measles Coverage 2009 to 2011

2009

2010

2011
Mozambique, Penta 3 Coverage, 2009 to 2011

2009

2010

2011

Mismatch

< 50%

≥ 50% to < 80%

≥ 80% to < 90%

≥ 90%

GAVI ALLIANCE
Mozambique, OPV3 Coverage, 2009 to 2011
How NGOs can help: Village Reach project at Cabo Delgado

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cabo Delgado</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1.6 million</td>
</tr>
<tr>
<td>GDP Per Capita</td>
<td>$82</td>
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<tr>
<td>Life Expectancy</td>
<td>42 years</td>
</tr>
<tr>
<td>Infant Mortality</td>
<td>178/1,000</td>
</tr>
<tr>
<td>Health Centers</td>
<td>88</td>
</tr>
<tr>
<td>DPT-Hep B3 Coverage Rate</td>
<td>68%</td>
</tr>
</tbody>
</table>
Village Reach project: Last Mile Health Logistics System

1. Leave with:
   - medical supplies
   - propane
   - equipment, parts
   - knowledge

2. Site visit:
   - record & stock inventory
   - service equipment
   - collect data
   - supportive supervision

3. Return with:
   - data

4. Field coordinator office
   - input data
   - analyze information
   - prepare for next trip
   - training
Village Reach project: results

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage Rates (DPT-Hep B3)</td>
<td>68%</td>
<td>95%</td>
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<tr>
<td>Vaccine stock outs</td>
<td>80%</td>
<td>1%</td>
</tr>
<tr>
<td>Cold chain functioning</td>
<td>~40%</td>
<td>96%</td>
</tr>
<tr>
<td>DPT1-3 Dropout Rate</td>
<td>12%</td>
<td>3.8%</td>
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<tr>
<td>Trust in the public health system</td>
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91% visited in last month despite:

- 47% of families living over two hours away;
- 85% of them having to walk to get there;
- most common reason for vaccination failure being “place of immunization too far.”
90% coverage achieved nationally this year with Penta could avert 1500 future deaths
Some Opportunities for GAVI support over time in Mozambique

**Immunization challenges**

- 75% coverage
- Measles outbreaks
- Pneumonia = 16% of U5 mortality (WHO 2008)
- Diarrhoea = 11% of U5 mortality (WHO 2008)
- Cervical cancer = about 33% of all female cancer

**GAVI Opportunities**

- GAVI health system strengthening (HSS)
- Measles second dose; later MR
- Pneumococcal vaccine approved 2012/3
- Rotavirus vaccine
- HPV vaccine

Photo: Ben Fisher/GAVI/2011
National leadership

Pneumococcal vaccine launch, Kenya, 14 February 2011

Pneumococcal vaccine launch, Mozambique, Date ???

Photo: GAVI/2011/Riccardo Gangale
Local leadership – Darazo town, Nigeria, April 2007

Photo: GAVI/07/Christine Nesbitt
The immunisation landscape

Synergies and shared learnings

- Polio eradication
- Traditional vaccines
- New vaccines
- Regional vaccines
- Measles elimination
- R&D: vaccine improvements
- R&D: future vaccines
Davos 2010: A Call for the Decade of Vaccines

- Call to governments, private sector to partner
- BMGF committed $10 billion over 10 years
- Emphasized efforts for vaccine discovery, development, delivery

Goals:
- Accelerating the pipeline
- Achieving Universal Coverage
- Finishing the job

Methodology:
- Deploy Pedro Alonso among others
- Complex arrangement and consultations
- Going to World Health Assembly in May
Thank you
## GAVI support for Mozambique: current commitments

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<tbody>
<tr>
<td>Immunisation Services Support</td>
<td>$1,665,502</td>
<td>$924,000</td>
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<td>Injection Safety Support (INS)</td>
<td>$835,881</td>
<td>$835,881</td>
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<td>Penta (NVS)</td>
<td>$41,271,000</td>
<td>$24,253,927</td>
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<tr>
<td>Pneumo (NVS)</td>
<td>$81,009,459</td>
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<tr>
<td>Tetra DTP-HepB (NVS)</td>
<td>$16,897,319</td>
<td>$16,897,319</td>
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<tr>
<td>Vaccine Introduction Grant</td>
<td>$694,500</td>
<td>$388,500</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$142,373,662</strong></td>
<td><strong>$43,299,628</strong></td>
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Red line on table indicates duration of support based on commitments: Multi-year programme budgets endorsed in principle by the GAVI Board. These become financial commitments upon approval each year for the following calendar year.