The Power of Vaccines: where they are needed the most

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CEO GAVI Alliance

Protecting the Future: Vaccines, Prevention and Health

Institute of Medicine
Arlington, 17 October 2011
Overview

1. The power of vaccines
2. Equity and the developing world
3. Why GAVI
4. Long term sustainability
5. Future challenges and opportunities
Part 1: The power of vaccines
Vaccine development timeline: 1798-1910

- Smallpox 1798
- Typhoid 1886
- Cholera 1896
- Rabies 1885
- Plague 1897
Vaccine development timeline: 1910-2010
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><strong>Global population</strong></td>
<td>4,424,952</td>
<td>6,808,999</td>
<td>+54%</td>
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<tr>
<td><strong>Diptheria Cases</strong></td>
<td>97,511</td>
<td>857</td>
<td>-99%</td>
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<tr>
<td><strong>Measles Cases</strong></td>
<td>4,211,431</td>
<td>222,318</td>
<td>-95%</td>
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<td><strong>Pertussis Cases</strong></td>
<td>1,982,355</td>
<td>106,207</td>
<td>-95%</td>
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<td><strong>Polio Cases</strong></td>
<td>52,795</td>
<td>1,779</td>
<td>-97%</td>
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<tr>
<td><strong>Tetanus Cases</strong></td>
<td>114,251</td>
<td>9,836</td>
<td>-91%</td>
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WHO Global and regional immunization profile; 2010
Disease eradication

- Smallpox – 1979
- Savings in treatment and prevention costs total US$ 1.3 billion a year – more than ten times the total cost of the eradication campaign.*

Parchment signed in Geneva on 9 December 1979, by the members of the Global Commission for Certification of Smallpox Eradication.


Prisca Elias, the last case of smallpox in Botswana, with a Surveillance Officer of Smallpox Eradication Programme, 1974.
Disease eradication

- Smallpox – 1979
- Rinderpest - 2011
Disease eradication

- Smallpox – 1979
- Rinderpest - 2011
- (Guinea worm)
Disease eradication and elimination

- Smallpox – 1979
- Rinderpest - 2011
- Guinea worm
- Polio?
- Measles??
Today, India is one of four remaining Polio endemic countries
As of October 11th, 2011, there has only been one reported case of Polio in India this year

http://www.polioeradication.org/Dataandmonitoring/Poliothisweek.aspx
Impact on the ground

Eliminating Hib meningitis in Kenya (Kilifi district):

Source: Cowgill KD et al. 2006
Impact on the ground

Hib meningitis in Uganda drops 85% in 4 years (3 sentinel hospitals)

Source: Lewis et al. 2008
Reduction in deaths due to diarrhoeal disease: Mexico after the introduction of rotavirus vaccine


Courtesy: AVI Special Studies
Taking stock: the immunisation gap

136 million surviving newborns in 2010:

Source: Johns Hopkins Bloomberg School of Public Health; UN, DESA, Population Division; WHO/UNICEF
Literature base supporting fact that GAVI vaccines are cost-effective: even in developing countries

- **Hepatitis B** in developing countries (1)
- **Hib** in Kenya (2)
- **Pneumococcal** in the 68 poorest countries (3)
- **Rotavirus** in GAVI-eligible countries (4)
- **Japanese Encephalitis** in Indonesia (5)

NCDs? Cancer known to be caused by infectious agents worldwide

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<tr>
<th>Agent</th>
<th>Site</th>
<th>#CA</th>
<th>%CA</th>
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<tr>
<td>H Pylori</td>
<td>Stomach</td>
<td>592,000</td>
<td>5.5%</td>
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<tr>
<td>HPV</td>
<td>Cervix, other</td>
<td>561,200</td>
<td>5.2%</td>
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<tr>
<td>HBV, HCV</td>
<td>Liver</td>
<td>535,000</td>
<td>4.9%</td>
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<tr>
<td>HHV-8</td>
<td>Kaposi’s sarcoma</td>
<td>54,000</td>
<td>0.9%</td>
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<tr>
<td>Schistosoma</td>
<td>Bladder</td>
<td>9,000</td>
<td>0.1%</td>
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<tr>
<td>HTLV-1</td>
<td>Leukemia</td>
<td>2,700</td>
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**Total**  1,900,000  18%

DM Parkin (2006) Int J Cancer; Cancer cases were from 1980 estimates
Courtesy Dr Mark A Kane
Hepatitis B carrier prevalence in children before and after immunisation introduction

Source: WHO, Courtesy: Dr. Mark Kane
Part 2: Equity and the developing world

Photo credits: GAVI/09/Dan Thomas
Accelerating Hepatitis B vaccine introduction in low-income countries

Source: WHO, Vaccine introduction database
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.
Comparison of cervical cancer incidence and mortality by country-income

India: Reaching universal coverage

Vaccine coverage disparities between regions:

- Average for India for 2005-2006: 44% of children fully immunised by 24 months
- Range for all Indian states in that year: 21%-81%

National Family Health Survey, India, 2007 (most recent available figures)
Coverage differences in poorer and rural areas

Full children immunisation in India

Source: Immunization in India, HNP discussion paper, March 2006, data available from 1999

Courtesy of DoV collaboration
Over 19 million children still missing out

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

GAVI-eligible: *
15.4 million

Non GAVI-eligible:
3.9 million

India: 7.1 million
Nigeria: 1.7 million
DR Congo: 1.0 million
Pakistan: 0.6 million
Uganda: 0.6 million
Ethiopia: 0.4 million
Afghanistan: 0.4 million
Kenya: 0.2 million
Niger: 0.2 million
Mozambique: 0.2 million
Rest of GAVI-eligible:
3.0 million

*From 2011, GAVI has 57 eligible countries.

Part 3: Why GAVI
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
The GAVI Alliance: an innovative partnership
GAVI Alliance: a partnership

unicef

World Health Organization

THE WORLD BANK

Bill & Melinda Gates Foundation
Over five million future deaths prevented

Results from routine immunisation and one-off tactical investments, by vaccine

- Polio: 30,000
- Yellow fever: 140,000
- Measles: 1,200,000
- Pertussis: 474,000
- Hib: 560,000
- Pneumococcal: 8,000
- Rotavirus: 1,000
- Hepatitis B: 3,407,000

Source: These estimates and projections are produced by the WHO Department of Immunization, Vaccines and Biologicals, based on the most up to date data and models available as of November 2010.
Targeting support where it is most needed

Pneumococcal disease cases

Incidence in children under 5 (new cases per 100,000):

- `> 3,000`
- `2,000 to 3,000`
- `< 2,000`
- `GAVI-eligible countries`

Source: WHO
GAVI support for pentavalent vaccine 2001 to 2011

* Some countries and territories provide the five antigens that are included in the pentavalent vaccine as separate vaccines or in different formulas.

Note: Albania was approved for pentavalent vaccine support in GAVI phase 1 but does not qualify for new support in phase 2.
GAVI support for pneumococcal vaccine 2007 to 2011

- Approved
- Qualifying for pneumococcal vaccine support
US$ 5.7 billion committed to countries

As at 30 April 2011

Source: GAVI Alliance data as at 30 April 2011
Priorities for polio-funded TA are driven by strength/weaknesses of broader health system

HR Capacity of the Health System
- Weak
- Moderate
- Strong

DTP3 Coverage
- <50%
- 50-79%
- >=80%

Courtesy: Bruce Aylward, Global Polio Eradication Initiative
Health system strengthening (HSS) support

- Strong health systems essential to expand and sustain immunisation coverage
  - Examples:
    - Health workforce
    - Supply, distribution, maintenance
    - Organisation, management
  - Platform for harmonising HSS funding
    - Partnership with the Global Fund, the World Bank and WHO

Courtesy of Aga Khan Health Services, Pakistan
Immunisation: a building block for contact with health services
Burkina Faso, January 2011

Photo: UNICEF/Jonhatan Shadid
Part 4: Long term sustainability

Photo: WHO/Olivier Asselin
Factors Affecting Vaccine Availability
Ramsay pricing
Tiered pricing

<table>
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<tr>
<th>Vaccine</th>
<th>UNICEF/GAVI market</th>
<th>US public market</th>
</tr>
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<tbody>
<tr>
<td>Pentavalent* (DTP3-HepB-Hib)</td>
<td>2.58</td>
<td>29.70</td>
</tr>
<tr>
<td>Pneumococcal**</td>
<td>3.50</td>
<td>91.75</td>
</tr>
<tr>
<td>Rotavirus***</td>
<td>(2.50)</td>
<td>55.73</td>
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</tbody>
</table>

* 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
GAVI Market Shaping in action 2011+

Short Term
*Price decreases*
- Pentavalent price decreases to $1.75 from $3 two years ago
- 67% price reduction offer on rotavirus - $2.5/dose
- 67% price reduction offer on HPV - $5/dose

Medium Term
*New entrants*
- 3 potential new entrants for rotavirus, yielding a further 40% price reduction target
- New entrants for pneumo, yielding a further price reduction of approx. 40%
- Graduating country price commitments

Long Term
*Innovation*
- Foster incremental innovation for appropriate and affordable new and follow-on products
- Improvements in vaccine technology
National leadership - Pneumococcal vaccine launch, Kenya, 14 February 2011

Photo: GAVI/2011/Riccardo Gangale
The co-financing policy is very successful.

### TOTAL OF COUNTRIES CO-FINANCING

- **Voluntary payments**
- **Mandatory requirements**

<table>
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<tr>
<th>Year</th>
<th>Voluntary Payments</th>
<th>Mandatory Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>6</td>
<td>20.9</td>
</tr>
<tr>
<td>2009</td>
<td>5</td>
<td>31.0</td>
</tr>
<tr>
<td>2010</td>
<td>8</td>
<td>31.0</td>
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</table>

### Co financing amount paid by countries

- **2008**: $20.9
- **2009**: $31.0
- **2010**: $31.0
Projected vaccine costs of 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>
</tr>
<tr>
<td>Intermediate</td>
<td>$35.84</td>
<td>9.1%</td>
<td>31.2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Graduating</td>
<td>$107.43</td>
<td>8.7%</td>
<td>37.0%</td>
<td>0.5%</td>
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Data Sources: World Bank/ WHO National Health Accounts/ GAVI Demand Forecast

Note: Eritrea, India, Korea D.R., Somalia and Zimbabwe excluded from analysis
Examples of Innovative Financing Mechanisms

- **International Financing Facility for Immunisation (IFFIm)**
  - Funds GAVI Alliance through sale of donor-backed AAA bonds; raised $3.4B

- **Advance Market Commitment**
  - Incentivised development, manufacturing of pneumococcal vaccine for the developing world by guaranteeing a market through donor commitments.

- **1 + 1 + 1 Matching Fund**
  - **Donor + Corporate + Customer/employee**; new champions from the private sector
Part 5: Future challenges and opportunities

GAVI/2011/ Doune Porter
Future challenges and opportunities

- Data quality
- Anti-vaccine movement
- Exciting R&D; new R&D models like PDPs and Innovation pile-up
- Traditional vaccine costs versus costs of new vaccines
- Graduating countries/lower middle income countries
Challenges in synthesising different data sources: DTP3 Nigeria

Conflicting data from surveys

Percentage of population (%)

WHO-UNICEF estimate

Official government estimate

Administrative coverage

Survey 12-23 months of age, card or history

Source: Rick Rheingans, University of Florida
New data tools and techniques

- Need high quality, timely data on immunisation in developing countries
- Uncertainty about vaccine coverage rates
- Need for new survey methodology
- Use of bio-markers for validation?
- Take advantage of new IT tools and methods; real time data
- New ways to diagnose diseases
Vaccine denialists
Local leadership – Darazo town, Nigeria, April 2007
Acceleration of new vaccines development, 1980-2020


Source: Applied Strategies – Project Optimize Vision Workshop, Landscape Overview, June 2010
Potential new vaccines for GAVI

- 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, phase III results shortly
- Dengue, TB, etc. all in development, keeping close watch… and of course, HIV which is undergoing a renaissance…
Unvaccinated children (DTP3) among 1 year olds (2005-2010)

The immunisation landscape

Synergies and shared learnings

- Polio eradication
- Traditional vaccines
- Regional vaccines
- New 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
Thank you
Additional slides

[Image of people handling boxes, caption: WHO/Olivier Asselin]
Under-five mortality declined in all regions between 1990 and 2010

“Over half of the (30%) drop in child mortality since 1990 is attributable to immunization.”

Dr Margaret Chan, Director-General, World Health Organization

Percent of government spending on health necessitated by GAVI co-financing requirements in graduating countries

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<tr>
<td>Angola</td>
<td>0.02%</td>
<td>0.10%</td>
<td>0.62%</td>
<td>1.05%</td>
<td>1.45%</td>
<td>1.79%</td>
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<tr>
<td>Republic of Congo</td>
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<td>2.1%</td>
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<td>Timor-Leste</td>
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GAVI Matching Fund
A three-way public-private partnership

Donor

Corporate

Customer/employee

1 + 1 + 1

US$ 130 million

Utilises a Gates Foundation or UK Government contribution that matches the support of corporations, their customers and employees

Support a vital global health cause – immunisation – knowing that the business will be making a significant and effective global impact

Enhance the business’ reputation and generate interest amongst customers and employees by developing a campaign to engage their participation
The GAVI concept: sustainable introduction of new vaccines