

NETWORKS OF KNOWLEDGE CREATION AND ACQUISITION

External Sourcing of Scientific & Technological Knowledge

Perspective of the Pharmaceutical Industry

Total R&D > 41.8 Bn US\$ (2000)/43.6 Bn US\$(2001e)

Average Cost of New Chemical Entity (NCE)

NCE = 600 Million US\$ (2000)

Mean Development Time = 10 Years (Past Decade)

Average Number NCE/Year = 41 (Past Decade)

**References: Kettler et al. London Office Health
Economics, 1999; CMR International 2001**

Merck & Co., Inc.

- **A Leading Worldwide Pharmaceutical Company**
- **Total Sales = 40 Billion US\$ (2000)**
- **R&D Spend = 2.3 Billion US\$ (2000)**
- **R&D Employees = 8,000 (2000)**
- **Therapeutic Areas = 20 (2000)**

STRATEGIC ISSUES FACING “BIG PHARMA” IN 2001

Avalanche of Information

Human Genome (FEB01)

Proliferation of Sophisticated Technologies

Genomics/Proteomics/Bioinformatics

Erosion of Profit Margins

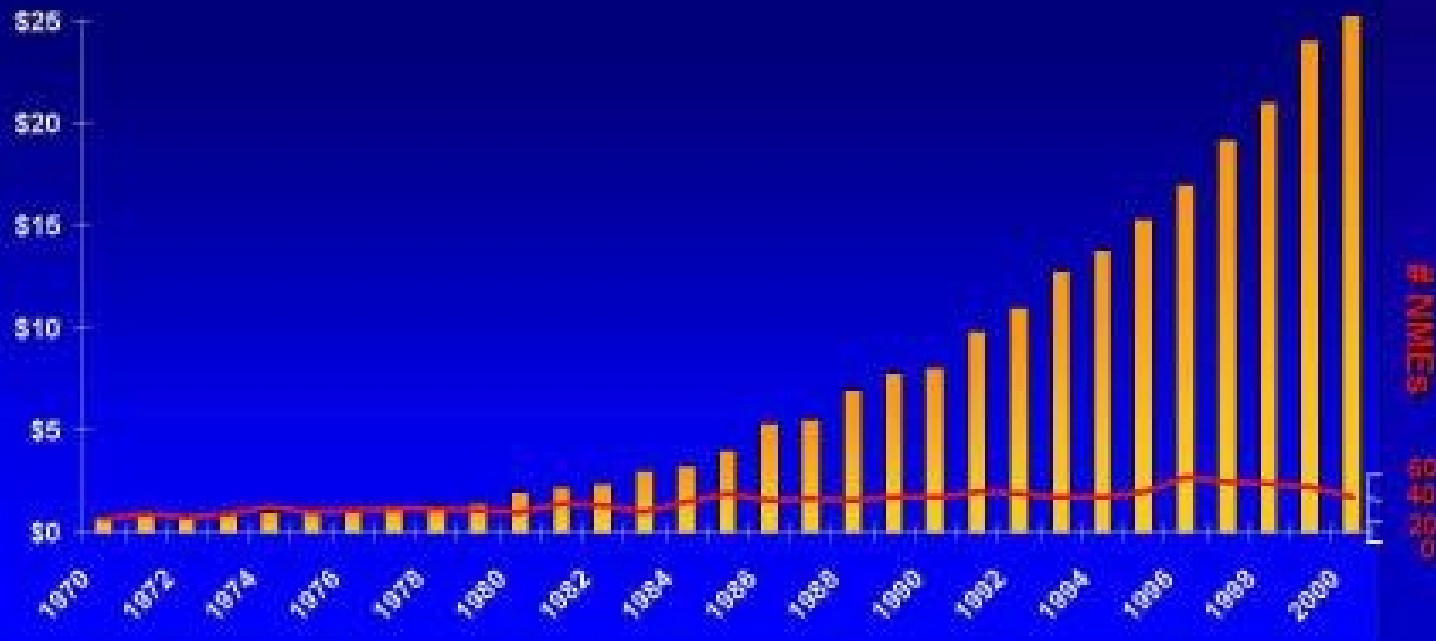
Managed Care/Governmental Regulations

Shrinking Market Exclusivity/Patent Expiries

Drugs Worth Over \$31 Billion Will Lose Patents (2000-2005)

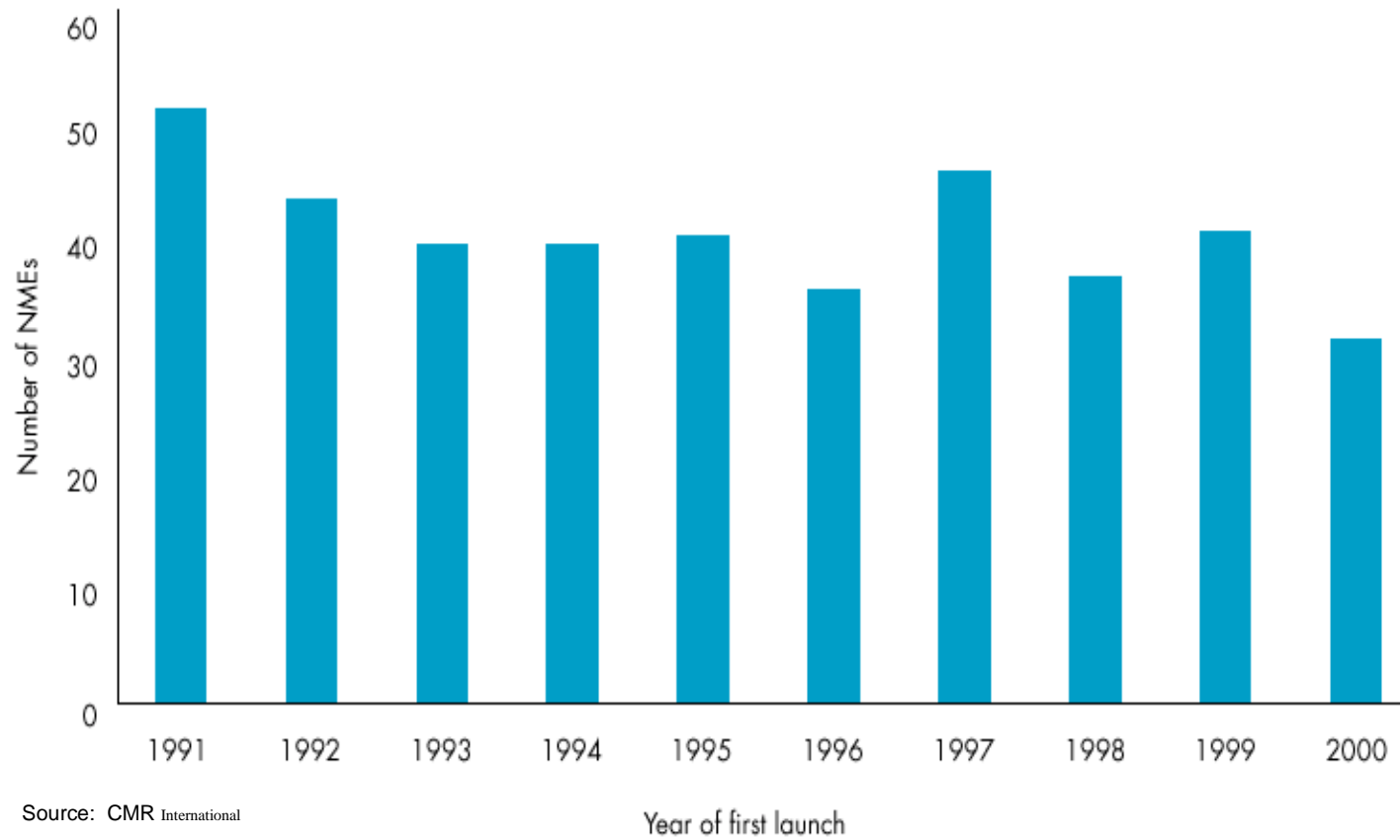
Industry Productivity vs. Investment

Total R&D Investment (\$ Billions)

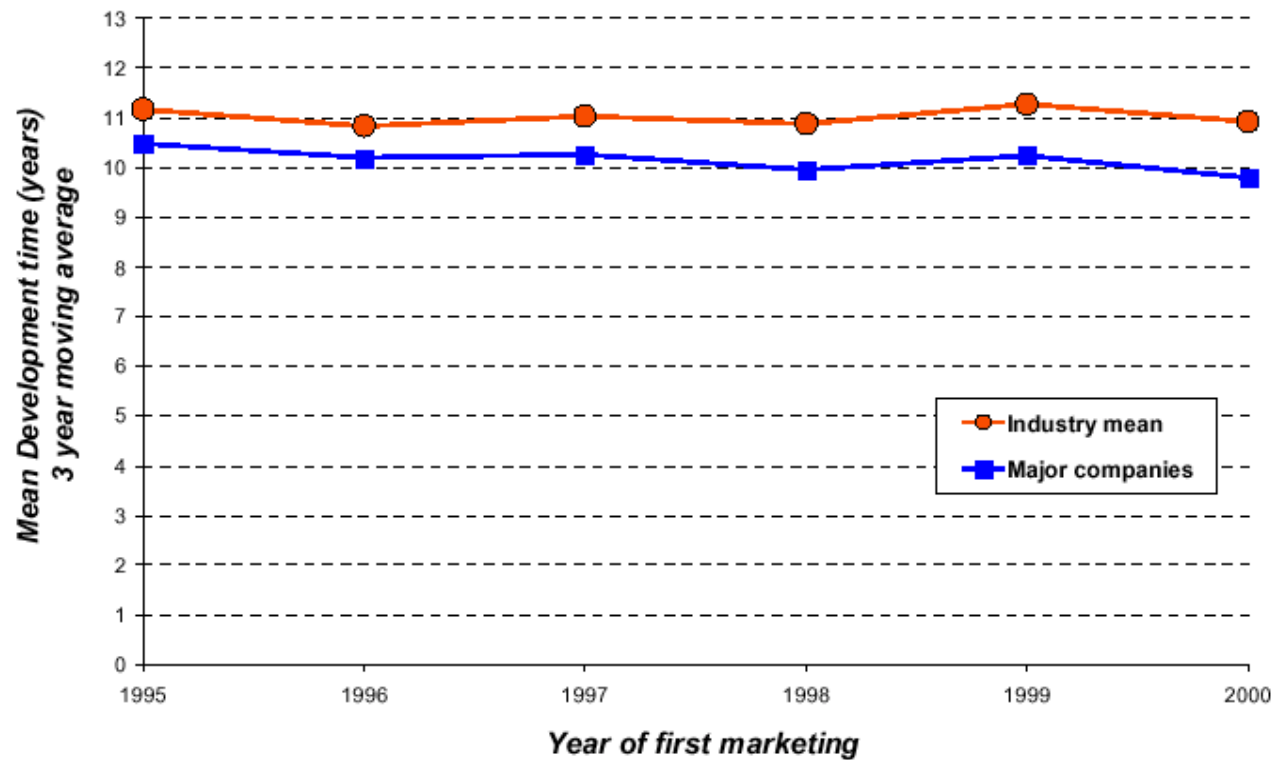


Source: PhRMA annual survey, 2000

NMEs First Launched in 1991-2000



Development times for NMEs launched onto their first market (1995-2000)



Source: CMR International

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WHERE ARE THE NEXT BLOCKBUSTERS?

STRATEGIES

Mergers and Acquisitions

Restructuring

Strategic Alliances

Licensing

Corporate Venture Capital

(Academia/Biotech/Government/Other Pharma)

Public Private Partnerships

Access To External Research Extends Our Research Capacity



Each Merck scientist is charged with building a “virtual lab” by mounting the best scientific program in their area, whether it comes from internal research, external collaborations or both



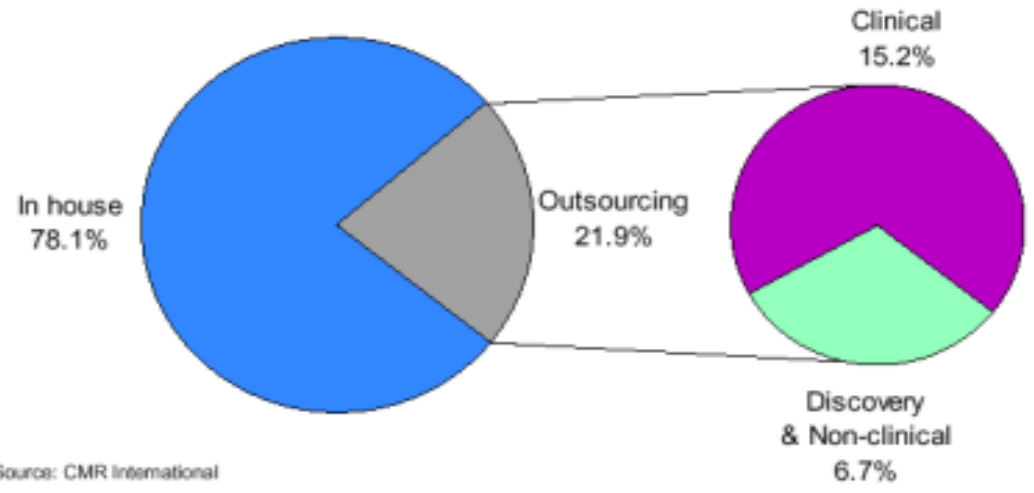
*No matter how
productive we are, we
recognize that 99% of
biomedical research
occurs outside of Merck*



- Scale of competition is significantly increasing from recent merger activity
- Increasing number of important drug targets
- New technologies (e.g., genomics, proteomics, etc.) will likely revolutionize drug discovery within 5 -10 years

Total Outsourcing (commercial and academic)

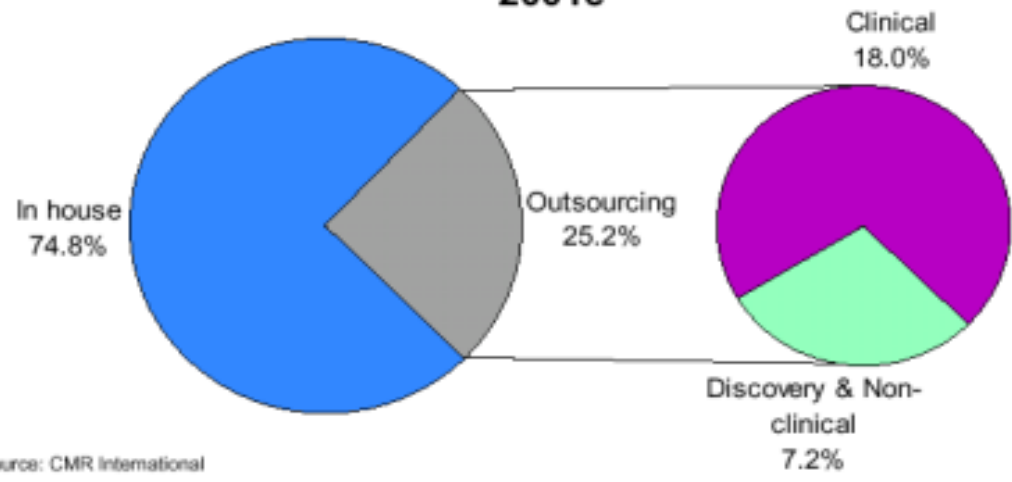
2000



Source: CMR International

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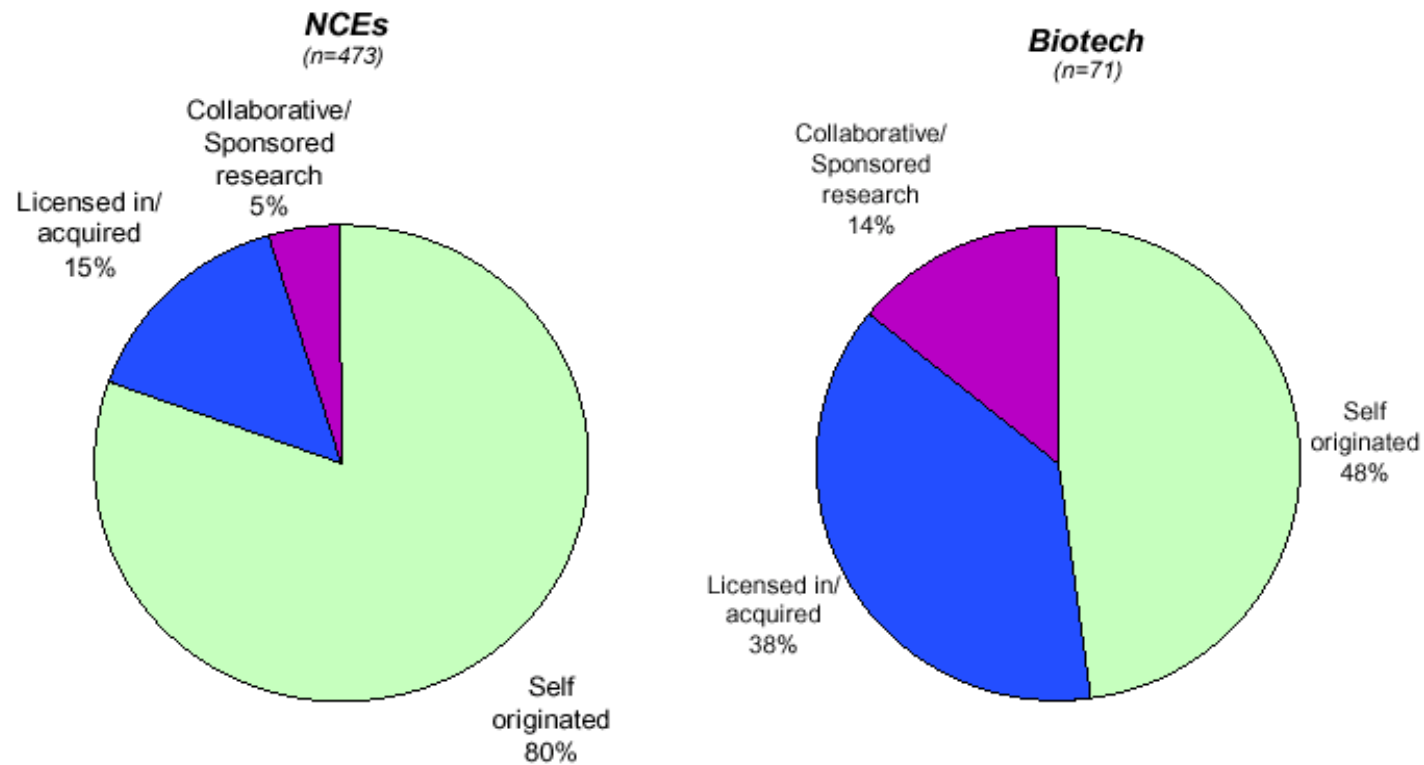
2001e



Source: CMR International

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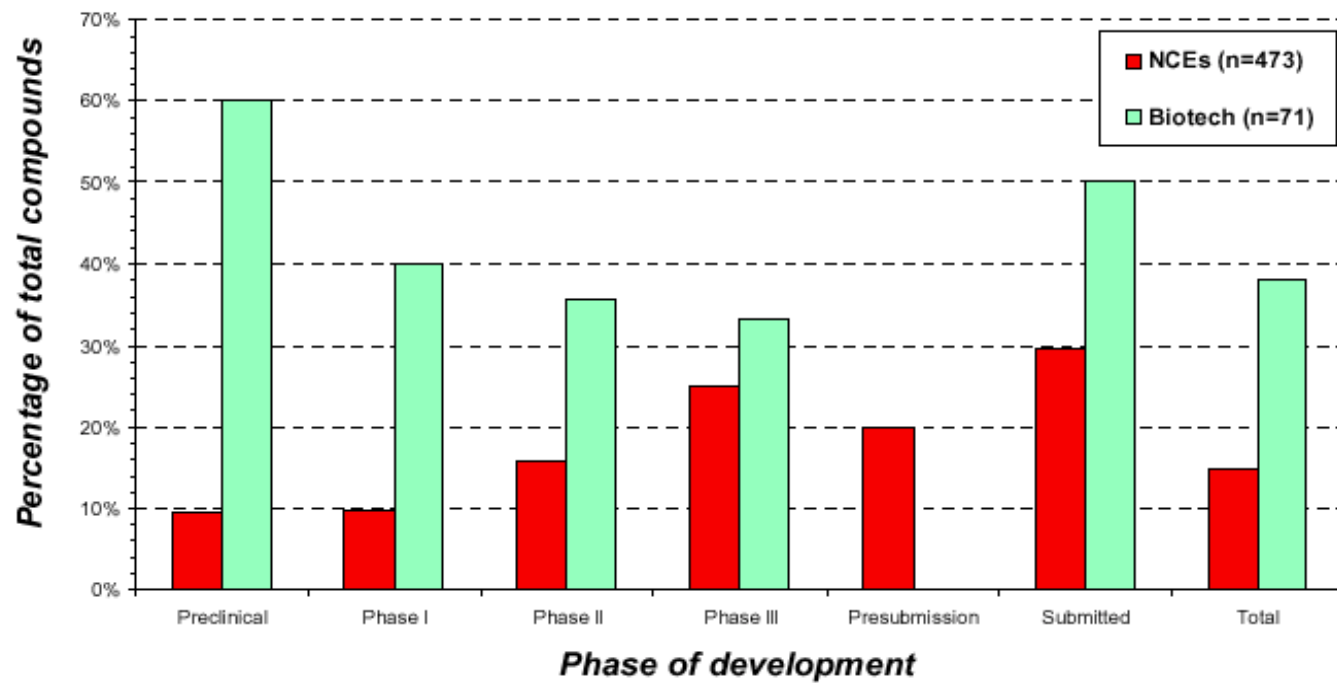
Origin of NCEs and Biotech products in active development



Source: CMR International

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In licensing & acquisition of NCEs and Biotech products by phase of development



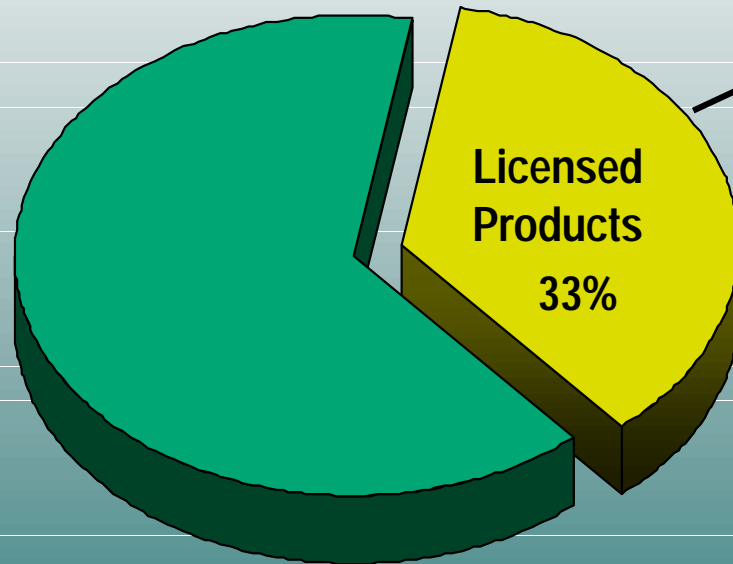
Source: CMR International

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Importance of Alliances to Merck



Over one-third of Human Health Sales are attributed to licensed products, patents or formulations



2000 Merck Human Health Sales
\$20.2 Billion

Including:

COZAAR / HYZAAR

FOSAMAX

PEPCID

RECOMBIVAX HB

VARIVAX

MAXALT RPD Formulation

Others

PHARMACEUTICAL COMPANY

Mergers and Acquisitions

\$US 27 Billion (↑ 6 BILLION) in 1H'01

Corporate Venture Capital

121 deals in 1H '01

\$US 1.5 Billion in 1H'01

**Types: Biochip, Bioinformatics, Clinical Trial,
Genomics, Prediction and Prevention, Proteomics,
Application and Services Companies**

Sources: (PwC/ Thompson Financial Securities)/ Venturewire

MERCK ACQUIRES ROSETTA IN PHARMATICS

Proprietary screening technology to validate and refine the computational predictions about genes and their role in disease and about medicine and their interactions in the body.

Announced May 2001

\$ 620 Million US\$

PUBLIC-PRIVATE PARTNERSHIPS (PPP) FOR HEALTH

Examples:

Global Alliance for TB Drug Development

Medicines for Malaria Venture

International AIDS Vaccine Initiative (IAVI)

WHO Children's Vaccine Initiative

Roll Back Malaria Program

Donations/Distribution Partnerships

**Global Alliance for Vaccines & Immunizations
(GAVI)**

Mectizan Donation Program

Botswana Comprehensive HIV/AIDS Partnership