CHALLENGES POSED BY INFECTIOUS DISEASES IN ASIA:
LOOKING BACK, LOOKING FORWARD

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INFECTIOUS DISEASES: A PLANETARY EMERGENCY

- Responsible for a 25 to 35% of all deaths worldwide
- Account for more than 50% of all deaths in children under age of 5
- Of the top 10 causes of death compiled by the WHO, five are due to IDs
- The top single agent killers are HIV/AIDS, malaria and tuberculosis
- The other top killers are Hepatitis B & C, lower respiratory infections and diarrheal diseases, which are caused by a variety of agents
TERMINOLOGY: Understand IDs

- **Epidemic**: widespread increase in the observed rates of disease in a given population. For e.g. mumps, measles and cholera
- **Endemic**: consistently heightened rate of disease observed in and associated with a given population over time. For e.g. malaria in a number of tropical zones
- **Pandemic**: sudden increase in the observed rates of disease across many populations globally. For e.g. Flu pandemic, HIV
- **Outbreak**: can refer to an epidemic or pandemic
- **Zoonoses**: diseases transmissible to humans by animals, insects and other vectors
EMERGING INFECTIOUS DISEASES (EID)

• EIDs are those that have recently appeared within a population, or whose incidence or geographic range is increasing rapidly.

• Diseases can emerge or re-emerge due to:
  ▪ appearance of a previously unknown agent
  ▪ evolution of a new infectious agent
  ▪ spread of an infectious agent to a new host
  ▪ spread of an infectious agent to new locations
  ▪ acquisition of resistance to anti-microbial drugs
  ▪ deliberate introduction into a population
• The number of outbreaks, and the number of kinds of diseases, have both increased significantly since 1980

• While the number of outbreaks appears to be increasing over time, the data suggest that per-capita outbreak cases are declining:

“Despite an increase in overall outbreaks, global improvements in prevention, early detection, control and treatment are becoming more effective at reducing the number of people infected.”

Dr.Gilada/UMRC/Mumbai
• 65% of the diseases were zoonoses
• In contrast, human-specific diseases are declining in diversity and in the impact
Emerging Zoonoses: Human-animal interface

- Avian influenza virus
- Bats: Nipah virus
- Ebola virus
- Marburg virus
- Borrelia burgdorferi: Lyme
- Deer tick (Ixodes scapularis)
- Mostomys rodent: Lassa fever
- Hantavirus Pulmonary Syndrome

Dr. Gilada/UMRC/Mumbai
Global infectious disease A global map plots cumulative outbreaks of human infectious disease since 1980. Darker shaded nations had more outbreaks.  Image: Brown University

Dr.Gilada/UMRC/Mumbai
Emerging Infectious Diseases: Hotspot Asia-Pacific

Figure 3: Global distribution of relative risk of an EID event.

Maps are derived for EID events caused by a, zoonotic pathogens from wildlife, b, zoonotic pathogens from non-wildlife, c, drug-resistant pathogens and d, vector-borne pathogens. The relative risk is calculated from regression coefficients and variable values in Table 1 (omitting the variable measuring reporting effort), categorized by standard deviations from the mean and mapped on a linear scale from green (lower values) to red (higher values).
MAJOR EPIDEMICS SINCE 1980

- Dengue/DHF-1970s, SE Asia, global
- HIV/AIDS-1980s-Africa, global
- Drug resistant TB-1990s, US, global
- Cholera-1991-Americas
- Plague-1994-India, global
- Foot & Mouth disease-1995,2000- Taiwan & UK
- West Nile-1990s-Mediterranean, Americas
- BSE-1990s- UK, Canada, US
- Swine fever, 1996- Netherlands
- H5N1 influenza-1997- HK-global
- Nipah encephalitis-1998-Malaysia, Asia
- SARS-2002- Asia, global
- Chikungunya-2004-Africa, Asia
- H1N1 influenza-2009-Mexico?, global
- Ebola- 2014- Africa
- Zika- 2015- Africa
REASONS FOR A DRAMATIC INCREASE IN EPIDEMICS?

• Demographic Changes:
  • Population Growth
  • Uncontrolled Urbanization
  • Agricultural/Land Use Practices and Animal Husbandry
  • Deforestation

• Modern Transportation (Globalization)
  • Increased Movement of People, Animals, Commodities

• Changing Life Styles/Behavior

• Complacency, Lack of Political Will, Policy Changes

• Lack of Public Health Infrastructure

• Microbial Adaptation: Drug resistance

• Climate Change

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Living Conditions
Plague Pandemics

- Justinian’s Plague (mid-6th Century A.D.)
- Black Death (mid-14th Century A.D.)
- Modern Pandemic (1894 – mid-1900s)
Potential Spread of Pnuemonic Plague out of India, 1994

Indian outbreak was a major surprise – no plague confirmed in India since 1966

- Clinical and lab diagnosis
- Media and panic driven epidemic
- First epidemic to impact global air transportation
- Caused huge economic loss for India (> $3 billion)
Microbial Threats to Health
Severe Acute Respiratory Syndrome: SARS

- SARS became readily transmissible in the 1990s.
- First documented case was identified in mainland China.
- It is transmitted by droplet aerosol and fomites deposited on the respiratory mucosal epithelium.
- Pneumonia like disease.
- 2002-2003 outbreak infected 8400+ with 916 confirmed dead.
Chain of transmission among guests at Hotel M—Hong Kong, 2003

Data as of 3/28/03

Health-care workers; † All guests except G and K stayed on the 9th floor of the hotel. Guest G stayed on the 14th floor, and Guest K stayed on the 11th floor; § Guests L and M (spouses) were not at Hotel M during the same time as index Guest A but were at the hotel during the same times as Guests G, H, and I, who were ill during this period.

DENV – 1; DENV – 2; DENV – 3; DENV – 4

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Neglected Tropical Diseases: Dengue Trends

Currently 24 countries are affected
- Reactive approach, little specific prevention or outbreak preparedness
- Severe lack of funding
Mumbai sees 2nd highest no. of dengue cases in the state

There has been a sharp rise in dengue cases across Maharashtra this year, according to recent figures. Mumbai has recorded the second highest number of cases followed by Nashik.

As many as 1,778 cases of the mosquito-borne disease were recorded in the state between January and July as against 786 cases in the corresponding period last year. This translates into a 126% rise. Nashik city topped the list with the maximum number of cases followed by Mumbai, Thane and Pune. In Mumbai, 209 cases of dengue have been reported. There has been one death so far this year.

A BMC official said that cases as well as deaths in the city have decreased since last year. "Under the BMC Act, doctors and hospitals have to report dengue much before the state made it mandatory last year. The surveillance for mosquito breeding has also been strengthened across the city, including cattle shelters," the official said. While state health officials said that the number of deaths too have reduced considerably, experts believe these cases are just the tip of the iceberg as most cases treated in private hospitals in Maharashtra are unreported despite the fact that dengue has been declared a notifiable disease.

The official also expressed
New Influenza A (H1N1),
Number of laboratory confirmed cases and deaths as reported to WHO

Status as of 27 May 2009
06:00 GMT

Total:
13,398 cases
95 deaths

Chinese Taipei has reported 4 confirmed cases of influenza A (H1N1) with 0 deaths. These cases have been included in the cumulative total.

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Map produced: 27 May 2009 06:30 GMT

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

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## Malaria: 20 Endemic countries in WP and SEA Regions

### 2012 (WMR 2013)

<table>
<thead>
<tr>
<th></th>
<th>SEAR</th>
<th>WPR</th>
<th>Afghanistan, Pakistan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated # malaria cases</strong></td>
<td>26.8 mio (21.7-32.5)</td>
<td>1.4 mio (1.2-1.7 mio)</td>
<td>376,768 3,485,366</td>
<td>32.1 mio</td>
</tr>
<tr>
<td><strong>Estimated # malaria deaths</strong></td>
<td>42,000 (25,000-60,000)</td>
<td>3,500 (2,100 – 5,200)</td>
<td>26 1970</td>
<td>47,496</td>
</tr>
<tr>
<td><strong>Population at risk (high and low transmission areas)</strong></td>
<td>1.6 billion</td>
<td>711 million</td>
<td>16,030,688 102,121,263</td>
<td>2.4 billion</td>
</tr>
</tbody>
</table>
Malaria: Countries projected to achieve >75% decrease in incidence of microscopically confirmed cases by 2015

- **SEAR**
  - Sri Lanka
  - Democratic People’s Republic of Korea
  - Thailand
  - Bangladesh
  - Democratic Republic of Timor-Leste
  - Nepal
  - Bhutan

- **WPR**
  - Cambodia
  - Solomon Islands
  - Viet Nam
  - Philippines
  - Lao People’s Democratic Republic
  - China
  - Malaysia
  - Vanuatu
  - Republic of Korea

- **India, Indonesia** and **Myanmar** (SEAR), **Papua New Guinea** (WPR), **Pakistan** (EMR) cannot be projected to achieve the 75% decrease by 2015

- In the SEAR, 3/10 countries, and in the WPR, 2/10 are in pre-/elimination phase

Source: World Malaria Report 2013
Malaria: Threats & Opportunities

THREATS
Losing the gains and investments made, malaria resurgence
    Shrinkinng financing
    Limited/declining programme capacity
    Decreasing government commitment once cases decrease
    Unregulated economic development

Artemisinin resistance
    Health systems issues, e.g pharmaceutical issues (OAMTs, counterfeit/substandard medicines, stockouts, irrational drug use)
    Malaria control and elimination services, e.g insufficient reach to migrant/mobile populations
    Insufficient engagement of the non-health sector

OPPORTUNITIES
Regional collaboration: ERAR, ASEAN, APMEN, APLMA, Pacific Malaria Initiative, IHR, RBM, Interpol, WHO, ADB
Malaria: Emergency Response Framework

- Emergency response based on strategic recommendations of a joint assessment by development partners
- Aim is to increase coordination, quality and coverage of interventions
- Launched in 2013 in Phnom Penh, Cambodia, where WHO has opened a Regional Hub to coordinate ERAR (supported by the Gates Foundation and Australia)
- Global Fund has committed 100 million USD to combat artemisinin resistance in GMS
- Funding gap was estimated at USD 450 mio/3 years, but will be higher due to recent TEG recommendation to expand Tier 2 throughout GMS
Measles: Disease Burden and Trends

Progress towards 2012 Measles Elimination Goal:
94% reduction in reported measles cases in the Region between 2000 and 2012 when historic low incidence was achieved; because of vaccination.

A relative resurgence in measles occurred in the Region in 2013 and 2014 with recent outbreaks in China, Papua New Guinea, the Philippines, and Viet Nam.
An important strategy to achieve measles elimination is high (>95%) coverage with two doses of measles vaccine.

Immunity gaps (pockets of susceptible persons, especially among migrants) allows measles virus to continue spreading.

4 (of 37) countries and areas have not yet introduced routine second dose:
• Lao People’s Democratic Republic
• Papua New Guinea
• Solomon Islands
• Vanuatu
**Measles: Financial Gaps**

Supplemental mass immunization campaigns are an important strategy to increase population immunity.

**Planned measles mass vaccination campaigns, Western Pacific Region, 2014-2016**

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Budget (USD)</th>
<th>Source</th>
<th>Gap (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Lao People’s Democratic Republic</td>
<td>1,161,800</td>
<td>Measles &amp; Rubella Initiative</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>Philippines</td>
<td>17,102,127</td>
<td>Self + partners</td>
<td>~1,000,000</td>
</tr>
<tr>
<td>2014</td>
<td>Viet Nam</td>
<td>32,003,878</td>
<td>GAVI</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>Papua New Guinea</td>
<td>4,872,549</td>
<td>GAVI</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>Solomon Islands</td>
<td>487,530</td>
<td>GAVI</td>
<td>0</td>
</tr>
<tr>
<td>Not scheduled</td>
<td>Vanuatu</td>
<td>496,000</td>
<td></td>
<td>496,000</td>
</tr>
</tbody>
</table>

Dr.Gilada/UMRC/Mumbai
**Estimated Japanese Encephalitis incidence among children <15 years old in the WPR, 2011**

(cases/100,000)

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**LEGEND:**
- No known risk of JE < 0.5
- 2.5 – 5.3
- 5.5 – 12.7

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### JE vaccination programmes in selected countries of the Western Pacific Region

<table>
<thead>
<tr>
<th>Country</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>Infant immunization in 3 provinces starting 2009, campaign up to 15 years of age in 4th province in 2013</td>
</tr>
<tr>
<td>China</td>
<td>National infant immunization starting 2008 (earlier in some provinces)</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Campaign up to 15 years of age in 6 northern provinces in 2013, two additional provinces in 2014</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Routine infant and child immunization in Sarawak</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>None</td>
</tr>
<tr>
<td>Philippines</td>
<td>None</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>Infant immunization in 80% of districts nationally (gradual increase in districts covered since 1997)</td>
</tr>
</tbody>
</table>

Note: Estimated incidences calculated from Campbell et al, Bull World Health Organ 2011;89:766-774E
EID: Distribution of Human Infections with Avian Influenza A(H7N9)

First reported in China in March 2013

*The boundaries and names shown on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.*

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Economic Impact of Selected Infectious Diseases

Dr. Gilada/UMRC/Mumbai
Average annual number of global airline passengers by decade, 1950-2010

Million of Passenger (Mil)

Decade

Dr. Gilada/UMRC/Mumbai
The global air network
Speed of Global Travel in Relation to World Population Growth


Dr.Gilada/UMRC/Mumbai

CDC
EID: Economic Impact

- SARS

- MERS-CoV, Philippines:
  - Testing all passengers on-board a plane carrying a MERS-CoV positive case ~ 2 million pesos\(^1\)

- H7N9 in mainland China:
  - Outbreaks estimated to have caused 60 billion yuan loss to the poultry industry (I/II 2013) and at least 40 billion yuan in 2014\(^2\)

Even our ERICE 2014 Seminars were cancelled due to Ebola epidemic

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2. Ministry of Agriculture
ANTIBIOTICS TIMELINE

Antibiotics introduced

- Penicillin: 1943
- Tetracycline: 1950
- Erythromycin: 1953
- Methicillin: 1960
- Gentamicin: 1967
- Vancomycin: 1972
- Imipenem and Ceftazidime: 1985
- Levofloxacin: 1996
- Linezolid: 2000
- Daptomycin: 2003
- Ceftaroline: 2010

Antibiotic resistance identified

- 1959: Tetracycline resistant shigella
- 1962: Methicillin resistant staph
- 1965: Penicillin resistant pneumococcus
- 1979: Gentamicin resistant enterococcus
- 1988: Vancomycin resistant enterococcus
- 1996: Levofloxacin resistant pneumococcus
- 2000: XDR (extensively drug resistant) Tuberculosis
- 2001: Linezolid resistant staph
- 2004: Pan-drug resistant acinetobacter and pseudomonas
- 2011: Ceftaroline resistant staph

Data from CDC, 2013. Graphic by Neil Murthy/MEDILL
Figure 1: Examples of Emerging and Re-emerging Infectious Diseases Throughout the World.

In the wilderness of several infections, we would like to focus on HIV, TB and Hepatitis.
TUBERCULOSIS

47% drop in TB death rate since 1990, with nearly all improvement since 2000

43 million lives saved between 2000 and 2014 through effective diagnosis and treatment

TB ranks alongside HIV as a leading cause of death with 1.5 million TB deaths in 2014*
**GLOBAL BURDEN**

**TB** is one of the world’s top health challenges:

MORE THAN 2 BILLION PEOPLE, equal to a QUARTER of the world’s population are infected with TB

Despite our best efforts...

...there is an unacceptable low rate of decline in incidence each year

**EACH YEAR**

1.5 MILLION DEATHS

9 MILLION NEW CASES

**EACH DAY**

24,000 NEW CASES

4,000 DEATHS

8,000 MISSED

Dr.Gilada/UMRC/Mumbai

WHO 2015
CHALLENGES

• Current diagnostic algorithms are not sensitive enough to detect TB patients early

• TB concentrates among high-risk and socially vulnerable populations who are difficult to reach

• Multi-drug resistant TB: only a small fraction of MDR-TB patients are diagnosed, ensuring treatment is also a challenge

• High percentage of external funding, esp through the Global Fund. Donor investment shrinking in the Region, which threatens sustainability of programs
Feasibility and Effectiveness of Xpert® MTB/RIF Assay in Diagnosis of Pulmonary TB in HIV-Infected Adults

Dr. Prapti Gilada
Dr. Preeti Mehta, Dr. Gita Nataraj, Dr. Swapna Kanade
Department of Microbiology, Seth G S Medical College and KEM Hospital, Mumbai
Xpert® MTB/RIF ASSAY

- Closed cartridge based nucleic acid amplification test (CB-NAAT)
- Detects presence of MTB and rifampicin resistance simultaneously
- Amplifies the 81bp RRDR in \( rpoB \) gene (hemi-nested PCR) and probes for mutation with molecular beacons
- Done directly on the sample and results are available in < 2 hours

That’s it !!!
Minimal Biosafety
No contamination
In the WPR, national TB programmes report a funding gap of over USD 200 million per year.

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LOOKING FORWARD

**Health and social care**
- Ensure universal access to high-quality TB services
- Focus on groups at highest risk who are the most vulnerable

**Determinants**
- Reduce underlying vulnerability by considering health in all policies

**National**
- Ensure political commitment to the domestic TB strategy

**Global**
- Support implementation of the global TB strategy
**HIV/AIDS in India**

**Total Number of People Living with HIV/AIDS**

- **2006**: 23.2 lakh
- **2011**: 20.89 lakh

**Prevalence Rate of HIV Among Adults (15 to 49 years)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>0.41</td>
</tr>
<tr>
<td>2007</td>
<td>0.33</td>
</tr>
<tr>
<td>2010</td>
<td>0.28</td>
</tr>
<tr>
<td>2011</td>
<td>0.27</td>
</tr>
</tbody>
</table>

**New HIV Infections Among Adults**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2.74 lakh</td>
</tr>
<tr>
<td>2011</td>
<td>1.16 lakh</td>
</tr>
</tbody>
</table>

(excluding 14,500 among children less than 15 years)

Source: National AIDS Control Organisation (NACO)

Preventive activities have been more or less abandoned as the focus has now shifted to treatment.

**Dr. I.S. Gilada**, President of AIDS Society of India

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HIV/AIDS
HIV and AIDS in Asia Pacific 1990-2012

- People living with HIV: 4.9 million
- Women living with HIV: 1.7 million
- New HIV Infections: 350,000
- Deaths: 270,000

HIV: Challenges in Financing HIV programmes

• Heavily Donor Dependent- Cambodia (89%), Lao PDR (93%) and Viet Nam (83%)
• Government should increase domestic public HIV spending
• Not enough is spent on key populations prevention programmes, only 24% of AIDS spending in the AP (2009-2012)
• India’s National AIDS Control Programme moving towards self sustainance from donor dependance
Microbicides for women
Abdool Karim Q, et al.[12]

Male circumcision
Auvert B, et al.[6]
Gray RH, et al.[7]
Bailey RC, et al.[8]

Treatment for prevention
Donnell D, et al.[16]
Cohen MS, et al.[17]

Behavioral positive prevention
Fisher JD, et al.[15]

Oral PrEP
Grant RM, et al.[3] (MSM)
Baeten JM, et al.[4] (couples)
Paxton LA, et al.[5] (heterosexuals)

Treatment of STIs
Grosskurth H, et al.[13]

Female condoms

Male condoms

HIV counseling and testing
Coates T, et al.[11]

Behavioral intervention
- Abstinence
- Be faithful

Note: PMTCT, screening transfusions, harm reduction, universal precautions, etc. have not been included; this is focused on reducing sexual transmission.
Condom Popularisation wasn’t easy

Wearing condom garland and addressing the crowds in redlight area was a daily routine in early 1990s

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Mobile Clinic Strategy

- Public Announcements
- Mobile Clinic Parked
- Group Meetings
- Q/A session IEC & Condom Distribution
- Mobile AIDS Exhibition
- HIV Counseling → Testing

Be Good!
If you can’t, be Careful!
In any case, be informed!
Changing Rules in Sexuality
Non-Penetrative Hugging, Kissing, Smooching, Mutual-Masturbation Vibrators E-sex

Extension of Gandhi’s Philosophy for 21st Century!
If you don’t like to take ART and spend on it, prevent HIV this way!
TB & HIV – CONJOINT TWINS

**TUBERCULOSIS**

- Zero% Preventable, 100% Curable
- After over a century of existence, only 12-13 molecules
- Always short of funds
- TB follows in almost all HIV patients

**HIV**

- 100% Preventable, Zero% Curable
- Within 30 years, HIV has 22 molecules and over 30 in pipeline
- No dearth of budget
- HIV may not follow TB
HIV & TB have reciprocal interactions with significant clinical impact
HEPATITIS B DISTRIBUTION OF ESTIMATED NUMBER OF ANNUAL DEATHS

- Asia Pacific: 77%
- Africa & Middle East: 13%
- Europe: 6%
- Americas: 4%

Courtesy of IHME – Global Burden of Disease Study

Dr.Gilada/UMRC/Mumbai
Immunization coverage with 3rd dose of HepB vaccines in infants, 2014


Dr.Gilada/UMRC/Mumbai
The Global Hepatitis Action Plan – Hepatitis B & C

Prevention & Control of Viral Hepatitis Infection:

Framework for Global Action

Axis 1: Partnerships, resource mobilization and communication

Axis 2: Data for policy and action

Axis 3: Prevention of virus transmission

Axis 4: Screening, care and treatment

Dr.Gilada/UMRC/Mumbai
HEPATITIS: GAPS AND CHALLENGES

• Poor awareness, advocacy, and financial engagement from national governments

• Lack of data, barrier to country-level dialogue/engagement

• Progress made in prevention, especially HBV immunization, but high coverage of birth dose vaccination remains a challenge in many countries, though it costs peanuts (40 cents/dose)!

• Remarkable advances in hepatitis treatment options, but equitable access to quality and affordable diagnostics and medicines still far for many countries.
## Diseases Prevented by Vaccination

<table>
<thead>
<tr>
<th>Traditional EPI?</th>
<th>Vaccine</th>
<th>Global/Regional Eradication/Elimination/Control Goal</th>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>BCG (childhood TB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>Polio</td>
<td>Global eradication</td>
<td>GAVI* for inactivated polio vaccine (IPV)</td>
</tr>
<tr>
<td>Traditional</td>
<td>Diphtheria-Pertussis-Tetanus (DPT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>Measles</td>
<td>Regional elimination</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>Hepatitis B</td>
<td>Regional control</td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td><em>Hemophilus influenzae</em> type b (Hib)</td>
<td></td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td>Human Papillomavirus (HPV)</td>
<td></td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td>Japanese encephalitis</td>
<td>Regional control (proposed)</td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td>Pneumococcal</td>
<td></td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td>Rotavirus</td>
<td></td>
<td>GAVI*</td>
</tr>
<tr>
<td>New</td>
<td>Rubella</td>
<td>Regional control (Regional elimination proposed)</td>
<td>GAVI*</td>
</tr>
</tbody>
</table>

*Support available to GAVI eligible countries and GAVI graduating countries

*GAVI eligible countries in the Western Pacific: Cambodia, Lao People’s Democratic Republic, Solomon Islands, Viet Nam
HCV infection worldwide
How Big Pharma greed is killing millions around the world and how India has proved to be the saviour
Without India, we could have seen millions of deaths worldwide, the fact which is seldom acknowledged globally.

## WHY INDIA IS THE PHARMACY FOR THE WORLD

<table>
<thead>
<tr>
<th>Disease</th>
<th>Drug</th>
<th>Cost per person per month ($)</th>
<th>Indian price as % of US price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis C</td>
<td>Sofosbuvir + Daclatasvir</td>
<td>50,000</td>
<td>0.5</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Entecavir</td>
<td>1,259</td>
<td>2.9</td>
</tr>
<tr>
<td>Blood cancer</td>
<td>Imatinib</td>
<td>8,983</td>
<td>0.7</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>Erlotinib</td>
<td>6,658</td>
<td>2.4</td>
</tr>
<tr>
<td>Kidney, liver cancer</td>
<td>Sorafenib</td>
<td>11,595</td>
<td>1.0</td>
</tr>
<tr>
<td>Drug-resistant TB</td>
<td>Linezolid</td>
<td>9,233</td>
<td>0.3</td>
</tr>
<tr>
<td>Asthma &amp; COPD</td>
<td>Fluticasone Propionate &amp; Salmeterol</td>
<td>300</td>
<td>1.3</td>
</tr>
</tbody>
</table>
### Cost of Glivec

<table>
<thead>
<tr>
<th>Country</th>
<th>Cost in ₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Africa</td>
<td>1,74,260</td>
</tr>
<tr>
<td>USA*</td>
<td>1,57,920</td>
</tr>
<tr>
<td>UK*</td>
<td>1,54,540</td>
</tr>
<tr>
<td>India</td>
<td>1,20,000</td>
</tr>
<tr>
<td>Brazil</td>
<td>67,420</td>
</tr>
</tbody>
</table>

### Indian Generic Drugs in ₹

- **NATCO**: 10,000
- **CIPLA**: 9,000

Generic prices range from ₹5,000 to ₹9,000 for a month's treatment.

*Government procurement price

---

Imatinib from Novartis
Anti-Cancer CML
One of the Allegations reported in India

‘CDC getting millions from pharma industry’

Rema.Nagarajan
@timesgroup.com

The image of the Centers for Disease Control and Prevention (CDC) in the US as an independent public health watchdog has taken a beating with an article in the latest issue of the British Medical Journal revealing how this globally renowned national public other countries too where it influences policies. CDC provides direct technical assistance on evaluating the disease burden, developing surveillance capacity, and understanding vaccine impact, through participation in partnerships including GAVI and the GAVI-funded Accelerated Vaccine Initiative. It provides technical support on the development
Advantage India! Generic Competition Brings Prices Down & reason- Why US President Obama was Furious with India/Indians?

Current lowest quote: 69$/year
~1% of Intl. cost, 100% Bio-equivalence

Lowest quoted cost $ 69

Dr. Gilada/UMRC/Mumbai
Vital Importance of Affordable Medicines

80% of Developing-Country ARVs are Generics Produced in India

80% of this achievement credited to India

HIV TREATMENT CAN NORMALIZE SURVIVAL

Expected impact of HIV treatment in survival of a 20 years old person living with HIV in a high income setting (different periods)


Dr.Gilada/UMRC/Mumbai
90–90–90 by 2020 | An ambitious treatment target to help end the AIDS epidemic (UNAIDS 2015) 
WHO, UNAIDS, US all could think of this because of Indian Pharma
SWOT ANALYSIS OF INDIAN GENERIC DRUG INDUSTRY:

STRENGTHS:
1. Low Price of the product:
Low Price products are preferred by the patient pool belonging to Middle class population. In Developing countries like India High class people buy branded medicines & middle class people or low class people prefer generic medicines over branded medicines.

COST OF THE DRUGS IS IN THIS ORDER:
Biologics > Biosimilars > Branded drugs > Branded Generics > Generics

2. Therapeutically equivalent:
Generic medicines are therapeutically equivalent to branded drugs. Drug products are considered to be therapeutic equivalents only if they are pharmaceutical equivalents and if they can be expected to have the same clinical effect and safety profile when administered to patients under the conditions specified in the labeling.

3. Lower expenditure on Advertising:
There is less spending on Advertising of these products & it is Cost-saving as well as time-saving.

4. Lower expenditure on R&D:
The investment needs are very much less & very less cost is incurred for manufacturing generics but in case of generic version of biologics the investment needs are comparatively high. The key areas of Union Budget 2015- To encourage innovation, in-house R&D exemption limit was expected to be raised from 200
## India - National List of essential Medicines

<table>
<thead>
<tr>
<th>Therapeutic category</th>
<th>Number of drugs added</th>
<th>Total drugs in NLEM 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antineoplastic, immunosuppressives and medicines used in palliative care</td>
<td>25</td>
<td>59</td>
</tr>
<tr>
<td>Anti-bacterial medicines</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Anti-tuberculosis medicines</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Anti-viral drugs</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>Cardiovascular medicines</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Dermatological medicines</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Dialysis solution</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Immunologicals</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Hormones, other endocrine medicines and contraceptives</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Psychotherapeutics</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>
Demonstration against EU-India Free Trade Agreement, requiring implementing patent protection

Dr. Gilada/UMRC/Mumbai
HAART Evolution: NNRTI based
Reduce Pill-Burdon: Combo ARVs - Gift of India

Thanks to Indian pharma companies - for the first line they combined all in one pill
And for second line the combos in pipeline

1998-9

2000

2001

2003

2006

Gilada/UMRC, Mumbai
The Medicines Patent Pool: An Innovative Licensing Mechanism for HIV

1. Enable generics versions of existing compounds
2. Promote Fixed-Dose Combinations
3. Facilitate development of adapted formulations (e.g. paediatrics)

Established in July 2010 with the support of UNAID

Dr. Gilada/UMRC/Mumbai
BUILDING PARTNERSHIPS ACCELERATING ACCESS

Dr. Gilada/UMRC/Mumbai
LOOKING FORWARD

• Prioritize high incidence countries
• Prevent movement of pathogens and vectors via modern transportation
• Improve international cooperation and data sharing
• Improve effective laboratory-based diagnosis and surveillance
• Foster greater collaboration between IDs and other national/regional initiatives, for synergies and cost saving
• Using internet and technology for improving disease surveillance
• Rebuild public health infrastructure to prevent & control vector-borne and zoonotic diseases
  - Understanding disease ecology
  - Trained personnel
  - Laboratory and epidemiologic capacity
  - Tools (vaccines, drugs, insecticides, mosquito control, etc)
• Political will
  • Economic support
  • Regional prevention and control programs
  • Foster regional partnerships
  • Initiate innovative funding models and pilot and evaluate them
Reducing the Spread of IDs

- Vaccines
  - Preventive that protect individuals who do not have
  - Therapeutic effect for persons who have
- Antimicrobial drugs
- Good personal hygiene and sanitation
- Protection against mosquitoes
- Quarantine
CHALLENGES FOR TODAY AND TOMORROW
We plan to tackle....

• MDR and XDR TB
• MDR and XDR HIV
• Resistance in OI / ID management
• IRIS – sometimes with fatal conditions
• HIV and Aging - focus on old-age diseases
• HIV+ marriages – young and old
• Generic CD4, VL kits on lines of Generic ARVs
• Socio-economic impact – recruiting volunteers
• Lack of medical care givers – Focus on trainings
• Cure and vaccine for HIV – Little that we can do, requires huge finances
• Adult Vaccination programmes, especially Hepatitis B
Sincere Thanks to

- Our patients – who have been a great source of learning/inspiration
- NACO, WHO, UNAIDS, MSF for data/graphics
- Several scientists, clinicians, with whom we interact regularly
- All of you for your presence and attention
- Prof. A Zichichi & Dr. Franco Buonaguro
- WFS and All the Volunteers
NATIONAL CONFERENCE OF AIDS SOCIETY OF INDIA
7th - 9th October 2016
Hotel Sahara Star, Mumbai

Eliminating HIV: Progress & Reality

DEADLINES

Early Bird Registration
Abstract Submission
Scholarship Application
15th August 2016

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PG Students INR 4500

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Medical Council Accreditation with CME Credits
Scholarships to Encourage Young Researchers
E-poster, Live Webcast & Conf. Proceedings DVD

ASI-All India Quiz Contest: 11th September 2016

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