GLOBAL HEALTH

• Common health problems across borders

• Health disparities
  – Between countries
  – Within countries
  – Global responsibility
COMMON PROBLEMS ACROSS BORDERS (1)

• Pandemics; e.g. HIV/AIDS, SARS, H5N1, cholera
• Environmental issues; e.g., Songhua/Amur River, Nov 2005
• Surveillance and control; e.g., H5N1, H1N1
• Immunization programs (polio eradication)
• Regulations; e.g., inter-country control of toxic/infectious materials, air pollutants (e.g., crop burning)
COMMON PROBLEMS ACROSS BORDERS (2)

- Migration; e.g. international migrant groups
- Refugees
- War
- Global warming
- Natural disasters (e.g., tsunamis, earthquakes)
HEALTH DISPARITIES

• Within countries
  – Gender
  – Ethnic minorities
  – Economic
  – Educational
  – Health and health care access

• Between countries
  – Developing countries; e.g., Bangladesh, Laos
  – Transitional countries; e.g., China, Brazil
  – Developed countries; e.g., USA, Europe, Australia
THE LEADING CAUSE OF POOR HEALTH GLOBALLY IS POVERTY
POVERTY VS. DISPparity

Redistribute wealth vs. alleviate poverty
AVERAGES HIDE DISPARITIES

8 = 7 + 1 = 4 + 4

Rural China
Favella dwellers (Brazil)
Inner cities (U.S.)
“Rich get richer;
Poor get poorer”
"Next to oxygen, water is indisputably the most precious resource we have, and the shortage of freshwater is the biggest long-term problem facing the planet Earth. Even energy is a distant second--with energy, we have alternatives. With water there are none."

Gil Grosvenor, chairman of the National Geographic Society
Water Sources and Usage

- Nearly 97% of the planet's water is salt water in seas and oceans.
- Close to 2% of Earth's water is frozen in polar ice sheets and glaciers.
- Only a fraction of 1% is available for drinking, irrigation, and industrial use.
- Agriculture accounts for 70% of all water use.
Lack of Clean Water and Safe Waste Disposal

- The average American uses a hundred gallons of water at home every day
- In developing countries, nearly one billion people worldwide have no access to clean water
- 2.5 billion people (40% of world’s population) have no safe way to dispose of human waste
Dirty Water and Lack of Hygiene

Dirty water and lack of a toilet and proper hygiene kill 3.3 million people around the world annually, most of them children under age five.
Reasons for Lack of Clean Water

- Climate (drought, deforestation, climate changes) and dropping water tables worldwide (unsustainable rate of water use)
- Poverty (inability to build wells or to afford piped water or water purification tablets if available)
- Rural dwellers- remote, sparsely populated, drought-stricken villages of the world are least likely to be reached for water provision, education, etc.
- Pollution
Waterborne Illnesses and Parasites (1)

- More than five million people die each year from water-related diseases such as cholera and dysentery (diarrhea-related ailments); in 2008, 750 million deaths in Africa and 690 million in SEARO

- Infectious diseases are transmitted via microbial agents (helminths, protozoa, bacteria and viruses) in water
Waterborne Illnesses and Parasites (2)

According to the World Health Organization, the incidence of diarrheal diseases (2,533 million cases) topped all other diseases in the Southeast Asian (SEARO) and WPRO regions in 2004, accounting for 72.8 million disability-adjusted life years (DALYS) - 4.8% of all DALYS worldwide due to both infectious and non-infectious diseases.
Diarrheal Diseases (1)

- According to the World Health Organization in 2005, 1.8 million people died of diarrheal diseases, nearly 70% of whom were young children.

- Worldwide, diarrheal diseases are the third leading cause of mortality and morbidity (exceeded only by respiratory infections and HIV/AIDS).
Diarrheal Diseases (2)

- Oral-fecal route of infection (contaminated water)
- Leads to rapid dehydration and inability to absorb nutrients from food; survivors may have impaired growth and development, malnutrition, long-term GI disorders, reduced immunity
Steps to Reduce Waterborne Diseases

- Safe disposal of human waste (latrines)
- Hand washing
- Education about sanitation
- Piped treated water
Politics of Water

The United Nation's General Assembly voted to make water a basic human right. But 41 countries, including the United States, opted out, saying they were waiting for more data!
<table>
<thead>
<tr>
<th>Country</th>
<th>Improved Sanitation Facilities Urban</th>
<th>Rural</th>
<th>Drinking Water Sources Improved (piped) Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>87*</td>
<td>18</td>
<td>81 (55)</td>
<td>56 (5)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>67</td>
<td>36</td>
<td>89 (37)</td>
<td>71 (8)</td>
</tr>
<tr>
<td>Laos</td>
<td>86</td>
<td>38</td>
<td>72 (55)</td>
<td>51 (4)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>96</td>
<td>95</td>
<td>100 (99)</td>
<td>99 (91)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>86</td>
<td>79</td>
<td>75 (15)</td>
<td>69 (2)</td>
</tr>
<tr>
<td>Philippines</td>
<td>80</td>
<td>69</td>
<td>93 (60)</td>
<td>87 (25)</td>
</tr>
<tr>
<td>Thailand</td>
<td>95</td>
<td>96</td>
<td>99 (85)</td>
<td>98 (39)</td>
</tr>
<tr>
<td>Singapore</td>
<td>100</td>
<td>100</td>
<td>100 (100)</td>
<td>---</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>76</td>
<td>40</td>
<td>86 (28)</td>
<td>63 (11)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>94</td>
<td>67</td>
<td>99 (56)</td>
<td>92 (9)</td>
</tr>
</tbody>
</table>

Ψ Improved sanitation: separation of human excreta from human contact
§ Other improved drinking water sources: public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs or rainwater collection
± Piped water on premises: piped household water connection located inside the user’s dwelling, plot or yard
*Percent of population covered

THE EPIDEMIOLOGIC TRANSITION

The worst of both worlds

- Infectious diseases persist
- Diseases of affluence (e.g. cardiovascular) increase
Ebb and flow. China has brought infectious diseases to heel only to find that smoking, poor diets, and a lack of exercise are taking an increasing toll.

SETTING PRIORITIES IN DEVELOPING COUNTRIES

e.g., HIV vs. malaria

(numbers, severity, impact)
THE EPIDEMIOLOGY OF HIV/AIDS
Adults and children estimated to be living with HIV | 2009

Total: 33.3 million [31.4 million – 35.3 million]
Estimated number of adults and children newly infected with HIV | 2009

**Total:** 2.6 million [2.3 million – 2.8 million]
## Global Summary of the AIDS Epidemic 2009

### Number of People Living with HIV

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>33.3 million</td>
<td>[31.4 million–35.3 million]</td>
</tr>
<tr>
<td>Adults</td>
<td>30.8 million</td>
<td>[29.2 million–32.6 million]</td>
</tr>
<tr>
<td>Women</td>
<td>15.9 million</td>
<td>[14.8 million–17.2 million]</td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>2.5 million</td>
<td>[1.6 million–3.4 million]</td>
</tr>
</tbody>
</table>

### People Newly Infected with HIV in 2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2.6 million</td>
<td>[2.3 million–2.8 million]</td>
</tr>
<tr>
<td>Adults</td>
<td>2.2 million</td>
<td>[2.0 million–2.4 million]</td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>370 000</td>
<td>[230 000–510 000]</td>
</tr>
</tbody>
</table>

### AIDS Deaths in 2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1.8 million</td>
<td>[1.6 million–2.1 million]</td>
</tr>
<tr>
<td>Adults</td>
<td>1.6 million</td>
<td>[1.4 million–1.8 million]</td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>260 000</td>
<td>[150 000–360 000]</td>
</tr>
</tbody>
</table>
Over 7000 new HIV infections a day in 2009

- About 97% are in low and middle income countries
- About 1000 are in children under 15 years of age
- About 6000 are in adults aged 15 years and older, of whom:
  - almost 51% are among women
  - about 41% are among young people (15-24)
HIV/AIDS – USA 2009

Living with HIV/AIDS = 1.2 million
Incidence = 56,000/year
  MSM = 53%
  Heterosexuals = 31%
  IDUs = 12%

Ethnicity
  – African-American = 45%
  – African-American women vs European/Caucasian women = 15:1
  – Hispanic-Americans vs European-Americans = 3:1

Percent unaware and potentially transmitting = 20%
Cost per lifetime treatment = $355,000
MODES OF TRANSMISSION

- Blood
- Semen/genital secretions
- Vertical
RISK ACTIVITIES THAT PROMOTE TRANSMISSION OF HIV (1)

- Receiving blood contaminated with HIV
- Being born to an HIV-infected mother
- Engaging in anal intercourse with an HIV-infected partner
- Engaging in vaginal intercourse with an HIV-infected partner
RISK ACTIVITIES THAT PROMOTE TRANSMISSION OF HIV (2)

- Engaging in oral-genital intercourse with an HIV-infected partner
- Sharing needles with an HIV-infected individual
- Being exposed to HIV-infected material; e.g., health or laboratory worker
RISK GROUPS

- Homosexual/bisexual
- Intravenous drug users
- Promiscuous heterosexuals
- Blood product and organ recipients
- Children of infected individuals
- Health/laboratory workers
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Risk (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfusion of 1 unit of blood</td>
<td>90-95%</td>
</tr>
<tr>
<td>From mother to fetus/infant</td>
<td>7-39%</td>
</tr>
<tr>
<td>During birth</td>
<td>10-20%</td>
</tr>
<tr>
<td>During breastfeeding</td>
<td>5-15%</td>
</tr>
<tr>
<td><em>In utero</em></td>
<td>5-10%</td>
</tr>
<tr>
<td>ART at delivery</td>
<td>6-8%</td>
</tr>
<tr>
<td>With HAART 4th-9th months</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
### Sexual intercourse*

<table>
<thead>
<tr>
<th>Type</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive anal intercourse</td>
<td>1-30%</td>
</tr>
<tr>
<td>Insertive anal intercourse</td>
<td>0.1-10%</td>
</tr>
<tr>
<td>Vaginal intercourse – female</td>
<td>0.1-10%</td>
</tr>
<tr>
<td>Vaginal intercourse – male</td>
<td>0.1-1%</td>
</tr>
<tr>
<td>Oral-genital</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

*STDs multiply risk

### Other

<table>
<thead>
<tr>
<th>Type</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental exposure (laboratory or clinical worker) per exposure</td>
<td>0.09%</td>
</tr>
<tr>
<td>Injection drug use (per sharing episode)</td>
<td>0.67%</td>
</tr>
</tbody>
</table>
The major force maintaining the epidemic is persons who do not know they are infected
Impact of the HIV/AIDS Epidemic On the Individual

- Uncertain future
- Contemplating painful death
- Stigmatization and social isolation
- Loss of employment
- Limited access to health care
- Loss of self-esteem
Impact of the HIV/AIDS Epidemic

On the Family

- Potential infection of spouse and children
- Loss of economic support of family
- Ostracism and social isolation
- Children become orphans
Impact of the HIV/AIDS Epidemic

On Society

- Loss of productive segment of society
- Increased number of dependents
- Breakdown of family structure
- Sense of fear and distrust
Impact of the HIV/AIDS Epidemic in Developing Countries

Increased Health Care Costs

• Diversion of funds from other urgent health problems
• Issues and costs of care and hospitalization
Impact of the HIV/AIDS Epidemic in Developing Countries

Alteration of the Producer:Dependent Ratio

• Decreased productivity due to illness
• Removal of producers by death
• Increased number of dependents:
  – Sick babies
  – Increased number of orphans
Impact of the HIV/AIDS Epidemic

On the Economic and Political Well-Being of the Nation

- Alteration of the producer:dependent ratio
- Increased health care costs
- Social impact
- Political impact
Impact of the HIV/AIDS Epidemic in Developing Countries

Political impact

- Political instability
- Increased dependency on rich nations
Key Elements for Successful Intervention (1)

- Mobilization of political will and commitment
- Good surveillance
- Learn and adapt from past experiences
- Unified national planning
- Multisectoral response
- Rapid implementation
Key Elements for Successful Intervention (2)

• Focused intervention; e.g., involve marginalized and high-risk groups
• Assure access to intervention tools; e.g. condoms, testing, drugs
• Early education
• Community involvement
Key Elements for Successful Intervention (3)

- Reduce barriers to intervention
  - Address restrictive cultural norms (e.g. refusal to acknowledge sexuality)
  - Stigmatization
  - Promote testing (opt out)

- Treatment
  - Adults
  - Pregnant women

- Development of effective vaccine
Key Elements for Successful Intervention (4)

- Development of an effective microbicide
  - Issues of testing i.e. mandatory condom use
  - Recognition of risk by participants
  - Adherence
  - Drug resistance for anti-HIV microbicides
  - Irritation of vaginal mucosa
    - Same microbicide for low risk and high women?
  - Efficacy of tenofovir – 43%
HIV/AIDS PREVENTIONS THAT WORK (CDC) (1)

- Surveillance for HIV
- HIV testing
- Counseling of persons living with HIV/AIDS
- Condom promotion and availability
- Partner services/notification
- Reaching populations in need; e.g., pregnant women
HIV/AIDS PREVENTIONS THAT WORK (CDC) (2)

- Harm reduction for IDUs
  - Needle exchange
  - Methadone maintenance
- Antiretroviral therapy
- Circumcision
- Screening and treatment of STDs
- Tenofovir prophylaxis
FORECASTING THE EPIDEMIC (1)

A. Increase in homosexual transmission
B. Decrease in pediatric cases (depends on screening efforts and treatment)
C. Improved, cheaper treatments increase survival
D. Increased costs to society as survival increases
FORECASTING THE EPIDEMIC (2)

E. Increasing incidence of HIV-related cancers
F. Aging is accelerated
G. Conversion to an endemic disease
H. Greater impact on poor countries
I. Countries capable of social, cultural and economic change survive
FORECASTING THE EPIDEMIC (3)

J. Increasing dependence of developing countries on “rich” countries (economic colonialism)

K. Development of vaccine will impact primarily developing countries

L. Treatment issues in developing countries:
   1. Need for greater acceptance of testing
   2. Need for infrastructure for clinical management
   3. Need for inexpensive low-tech markers of disease progression/remission