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, polio in Syria
- 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)
- Food safety
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. DISPARITY

Redistribute wealth vs. alleviate poverty
AVERAGES HIDE DISPARITIES

8 = 7 + 1 = 4 + 4

Rural China
Favella dwellers (Brazil)
Inner cities (U.S.)
WIDENING GAP

“Rich get richer; Poor get poorer”
WATER
TRUMPS
OIL
"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
The burden of thirst. National Geographic 2010
The burden of thirst. National Geographic 2010
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

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 Western Pacific (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 lower respiratory infections and cardiovascular diseases).
Diarrheal Diseases (2)

- Oral-fecal route of infection (contaminated water and food)
- 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
• Food safety
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!
## Improved Sanitation and Drinking Water Sources in Southeast Asian Countries (2008)

<table>
<thead>
<tr>
<th>Improved Sanitation Facilities</th>
<th>Drinking Water Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td><strong>Rural</strong></td>
</tr>
<tr>
<td>Cambodia</td>
<td>67*</td>
</tr>
<tr>
<td>Indonesia</td>
<td>67</td>
</tr>
<tr>
<td>Laos</td>
<td>86</td>
</tr>
<tr>
<td>Malaysia</td>
<td>96</td>
</tr>
<tr>
<td>Myanmar</td>
<td>86</td>
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<tr>
<td>Philippines</td>
<td>80</td>
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<tr>
<td>Thailand</td>
<td>95</td>
</tr>
<tr>
<td>Singapore</td>
<td>100</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>76</td>
</tr>
<tr>
<td>Vietnam</td>
<td>94</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)
Public Health Interventions
Public Health Intervention Strategies

- Biologic; e.g., vaccines
- Behavioral – individual, community
- Political – lobbying
- Structural – laws and regulations
Biological Strategies

- Immunizations
- Prophylaxis
- Improved nutrition
- Mother and child health programs
- Microbicides
- Improved sanitation
- Improved water quality (including oceans, etc.)
Behavioral Strategies

- Promote good health habits; e.g., exercise, diet
- School health programs
- Promote immunization programs and other interventions
- TV, radio and media public health messages
- Promote safe sexual behavior
- Incentives
Political Strategies

• Lobby legislators
• Promote healthy, safe communities
• Promote and enforce appropriate health laws and regulations
• Promote universal access to health care, especially preventive care
• Improve standard of living (e.g., housing)
• Reduce poverty and inequalities
Structural Strategies (1)

• Monitoring and surveillance of diseases and health hazards
• Safe drinking water
• Safe waste disposal
• Regulations to protect workers
• Regulate driving (e.g., speed limits, auto and road safety)
• Legislation and regulations for safety; e.g., occupational, vehicular, roads, etc.
Structural Strategies (2)

• Laws to ban smoking, require helmets, etc.
• Regulate air and water quality (ocean, lakes, waterways)
• Enforcement of health and safety laws
• Establish safe communities and parks
• Establish universal medical access
• Taxation (e.g., cigarettes, alcohol)
• Regulation of drugs and food (FDA)
Using Anxiety as a Public Health Tool

<table>
<thead>
<tr>
<th>Level of Anxiety</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too little</td>
<td>No action</td>
</tr>
<tr>
<td>Sufficient</td>
<td>Appropriate action</td>
</tr>
<tr>
<td>Too much</td>
<td>Fatalism and no action</td>
</tr>
</tbody>
</table>
Isolation and Quarantine

- Isolation of cases (e.g., SARS, Ebola)
- Quarantine of exposed individuals (e.g., yellow fever, SARS, H1N1)
- Culling (murder) of diseased flocks, herds (e.g., H5N1)
Eradication

**Eradicated:**
- Smallpox
- Dracunculus (close)

**Targeted:**
- Polio?
- Measles?
Figure 1. Global Distribution of Wild-Type Poliomyelitis Cases, January 1, 2010–June 1, 2010.
WPV1 and WPV3 denote cases of wild-type poliovirus types 1 and 3, respectively. The total number of cases is 254. Data are from the WHO Global Poliomyelitis Eradication Initiative.
Figure 2. Current Outbreaks of Circulating Vaccine-Derived Poliomyelitis.

The abbreviation cVDPV denotes circulating vaccine-derived poliovirus, and cVDPV2 and cVDPV3 denote types 1 and 3, respectively. Data are from the WHO Global Poliomyelitis Eradication Initiative.

Modlin JF. Focus on research: The bumpy road to polio eradication. NEJM 362(25):2348, 2010
FIGURE 1. Laboratory-confirmed wild poliovirus type 1 cases (N = 458), by week of paralysis onset and age group — Tajikistan, 2010

Abbreviation: SIA = supplementary immunization activity.

Improved Standard of Living (1)

• Less crowding decreases respiratory spread (e.g., TB)
• Better quality of food (fresh, healthy, and uncontaminated) decreases gastrointestinal and chronic diseases
• Year-round access to vegetables and fruit (eliminates vitamin deficiency diseases such as beri beri)
Improved Standard of Living (2)

• Refrigeration allows fewer preserved foods (salted or chemically modified), which may reduce some cancers
• Improved nutrition
• Promotion of education
• Reduced poverty
• Better methods of primary, secondary, and tertiary prevention (structural, behavioral, and medical)
Objectives of Vaccination

- Prevent infection
- Prevent disease
- Prevent transmission
Requirements for a Vaccine

- Must be safe
- Should be easy to administer (e.g., nasal spray, oral)
- Must elicit a protective immune response
- Must stimulate both humoral and cellular immunity
- Must protect against all variants of the agent
- Must provide long-lasting immunity
- Must be practical to produce, transport and administer (e.g., lyophilized)
Vaccines - Sociopolitical Considerations

- Cost of development – federal government and/or private industry?
- Responsibility for liability – federal government, industry, or insurance companies?
- Priorities for funding and distribution of vaccine
- Appropriateness and acceptability of vaccine for target population(s)
Primary Issues for Vaccine Evaluation

• Evaluation/testing procedures (animal models?)
• Level of efficacy against infection
• Level of efficacy against transmissibility
• Level of efficacy against clinical disease
• Acceptability
Innovative Strategies

Smallpox eradication

(search and contain)
Popular Opinion Leader Model
(targeting of natural leaders in a social group)

• Examples
  – Gay bars
  – Markets in Fuzhou, China
  – Dormitories in St. Petersburg, Russia
Community Intervention

- Getting the community to recognize the problem
- Getting the community to accept responsibility and implement change
- Changing community norms (e.g., smoking, condoms)
- Co-opt business marketing strategies
Legislative Change

• Requires political will

• To be effective, also requires enforcement (e.g., smoking prohibition, seat belt laws, maximum highway speeds, safety regulations, pollution laws)

• Requires constant vigilance (e.g., attempts to repeal of motorcycle helmet laws, weaken pollution laws, and environmental protection etc)
Need for Evaluation of Intervention Strategies

- Some logical interventions are unsuccessful
- Continuation of ineffective interventions prevents implementation of other potentially successful interventions, and wastes money and personnel
- Elements of evaluation
Elements of Evaluation (1)

• Are the appropriate risk groups and areas identified and targeted (e.g. HIV/AIDS vaccine)?

• Is the intervention strategy culturally and economically appropriate and acceptable to the target group and the community? (e.g., township health workers in China and changes in blood collection strategy)
Elements of Evaluation (2)

• How is the effectiveness of the intervention strategy measured (process variables (e.g., number of vaccine recipients) vs. outcome (e.g., reduction in incidence of disease))?

• Is the existing public health system and community structure a part of the evaluation scheme?

• Is the strategy cost-effective?

• Can the intervention be scaled up?
TAKE-HOME MESSAGES

• Sleep 7-8 hours per night
• Eat breakfast
• Brush your teeth
• Take the bus, save the environment
• Cultivate a social network, promote your community
• Exercise regularly, use the stairs, not the elevator
• Drive safely
• Don’t do it – **BUT** if you must, wear a condom
• Be kind to your professor!
GO FORTH AND INTERVENE!