Chapter Eleven

Communicable Diseases

The Importance of Communicable Diseases

- 40% of the burden of disease in low- and middle-income countries
- Disproportionately affect the poor
- Enormous economic consequences
- Relevance to MDGs
- Burden of communicable disease is unnecessary, many can be prevented or treated

Key Terms, Definitions, and Concepts

- Communicable disease- transmitted from animal to animal, animal to human, or human to human
- Spread and contracted through food, water, bodily fluids, vector, inhalation, nontraumatic contact, and traumatic contact
- Controlled with vaccination, mass chemotherapy, vector control, improved water and sanitation, improved care seeking and disease recognition, case management, and behavioral change

Table 11.2: Communicable Disease Definitions

- **Case**—An individual with a particular disease.
- **Case fatality rate**—The proportion of persons with a particular condition (cases) who die from that condition.
- **Control (disease control)**—Reducing the incidence and prevalence of a disease to an acceptable level.
- **Elimination (of disease)**—Reducing the incidence of a disease in a specific area to zero
- **Emerging infectious disease**—A newly discovered disease
- **Eradication (of disease)**—Termination of all cases of a disease and its transmission and the complete elimination of the disease-causing agent.
- **Parasite**—An organism that lives in or on another organism and takes it nourishment from that organism.
- **Re-emerging infectious disease**—An existing disease that has increased in incidence or has taken on new forms

Source: Adapted from Centers for Disease Control and Prevention. Reproductive Health Glossary. Available at: http://www.cdc.gov/reproductive health/EpiGlossary/glossary.htm. Accessed April 15, 2007; Dowdle, WR. The Principles of Disease Elimination and Eradication. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/su48a7.htm. Accessed December 27, 2010.

The Burden of Communicable Diseases

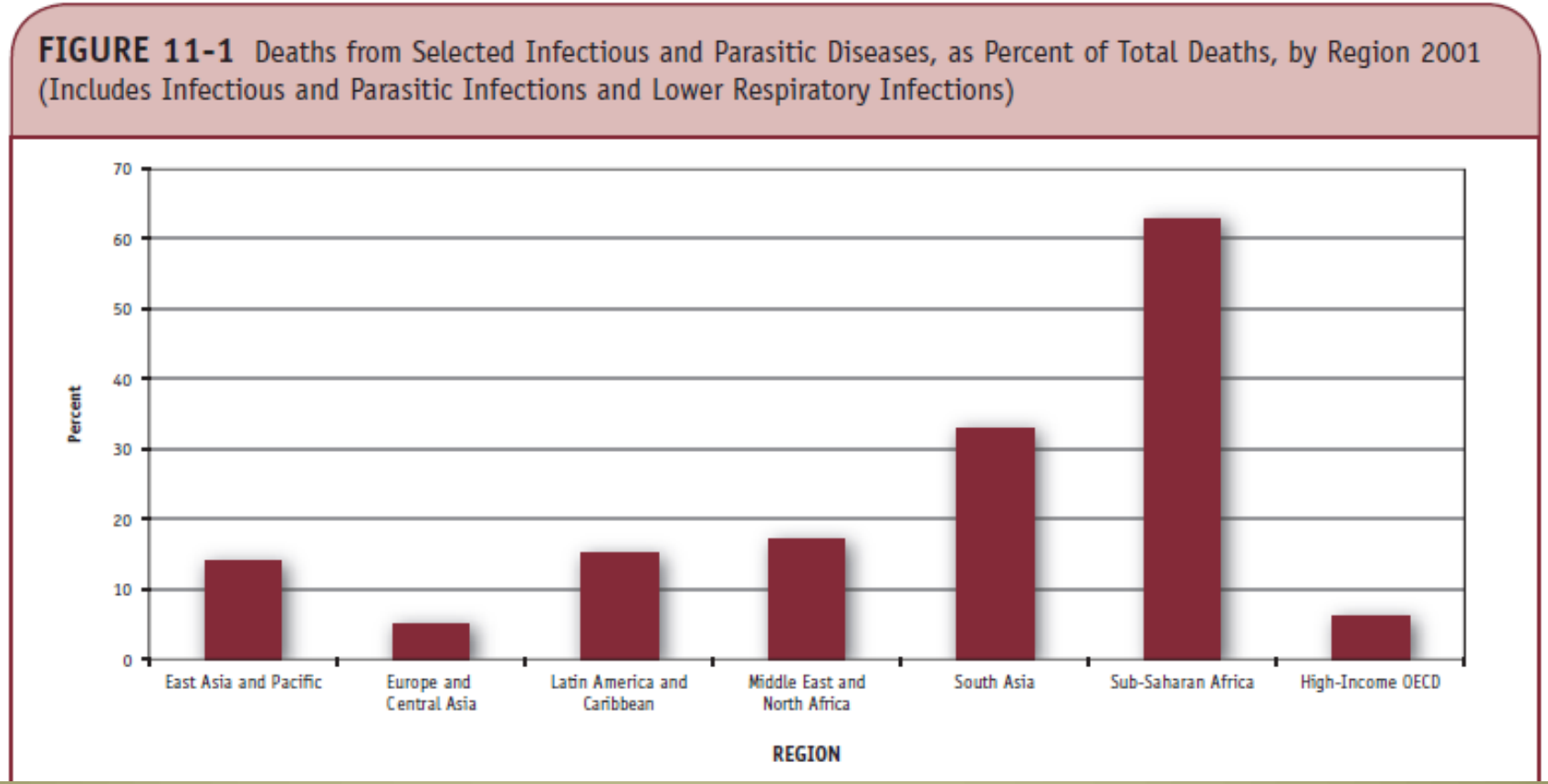
- 36% of total deaths, 40% of total DALYs lost annually in low- and middle-income countries
- Relative importance compared to noncommunicable diseases and injuries varies by region
- South Asia and sub-Saharan Africa have highest relative burden of deaths from communicable diseases
- Relative importance of specific communicable diseases varies by region, age group

Table 11.3: Leading Causes of Death from Selected Communicable Diseases, 2001, by Number of Deaths in Thousands

Condition	World	Low- and Middle-Income
Lower Respiratory Conditions	3753	3408
HIV/AIDS	2574	2552
Diarrheal Diseases	1783	1777
Tuberculosis	1606	1590
Malaria	1208	1207
Measles	763	762

Source: Data with permission from Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL. Measuring the global burden of disease and risk factors 1990–2001. In: Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL, eds. *Global Burden of Disease and Risk Factors.* Washington, DC and New York: The World Bank and Oxford University Press; 2006:8.

Figure 11.1: Deaths from Selected Infections and Parasitic Diseases, as Percent of Total Deaths, by Region 2001



Source: Adapted from United Nations. Millennium Development Goals. Available at: http://www.un.org/millenniumgoals/goals. Accessed July 11, 2006.

Table 11.4: Leading Causes of Death in Low- and Middle-Income Countries

TABLE 11-4 Leading Causes of Death in Low- and Middle-Income Countries by Broad Age Group, 2001, as Percentage of Total Deaths

Aged 0–14		Aged 15–59	
Cause	**Percent of Total Deaths**	**Cause**	**Percent of Total Deaths**
Perinatal conditions	20.7	HIV/AIDS	14.1
Lower respiratory infections	17.0	Ischemic heart disease	8.1
Diarrheal diseases	13.4	Tuberculosis	7.1
Malaria	9.2	Road traffic accidents	5.0
Measles	6.2	Cerebrovascular disease	4.9
HIV/AIDS	3.7	Self-inflicted injuries	4.0
Congenital anomalies	3.7	Violence	3.1
Whooping cough	2.5	Lower respiratory infections	2.3
Tetanus	1.9	Cirrhosis of the liver	2.2
Road traffic accidents	1.5	Chronic obstructive pulmonary disease	2.2

Source: Data with permission from Lopez AD, Mathers CD, Murray CJL. The burden of disease and mortality by condition: data, methods, and results for 2001. In: Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL, eds. *Global Burden of Disease and Risk Factors*. Washington, DC and New York: The World Bank and Oxford University Press; 2006:70–71.

The Costs and Consequences of Communicable Diseases

- Constrain health and development of children, having an effect on education and productivity
- Strong stigma and discrimination associated with HIV, TB, and others
- Limit productivity of adult workers
- Costs of treatment burden families
- High rates reduce investment in a country's development

The Leading Burdens of Communicable Diseases

The Burden of Emerging and Re-Emerging Infectious Diseases

- Resistant forms of disease emerge or re-emerge when bacteria, parasites, and viruses are genetically altered
- Critical global health problems because they can arise anywhere, at anytime, and spread rapidly
- Drug resistance limits ability to treat infection

Table 11.9: Key Factors Contributing to the Emergence and Re-emergence of Infectious Diseases

Microbial adaption and change
Human susceptibility to infection
Climate and weather
Changing ecosystems
Economic development and land use
Human demographics and behavior
Technology and industry
International travel and commerce
Breakdown of public health measures
Poverty and social inequality
War and famine
Lack of political will
Intent to harm

Source: Data from Smolinski MI, Hamburg MA, Lederberg J, eds. *Microbial Threats to Health*. Washington, DC: The National Academies Press; 2003:4–7.

The Leading Burdens of Communicable Diseases

Consequences of Emerging and Re-Emerging Infectious Diseases

- Direct costs of treating disease
- Indirect costs include declines in tourism and trade
- Increased costs of treating a drug resistant case

The Leading Burdens of Communicable Diseases

Addressing Emerging and Re-Emerging Infectious Diseases

- Sensitive surveillance systems
- Rapid detection of new outbreaks
- Mechanisms for effective containment
- Willingness to share information with other countries

The Leading Burdens of Communicable Diseases

Future Challenges

- Impact of economic crisis on governments' ability to fund public health functions
- Rapidly evolving pathogens, population growth, climate change will increase number of emerging diseases
- Possibility of a major pandemic
- Accelerating drug resistance
- Limited number of anti-infective drugs being developed

HIV/AIDS

The Burden of HIV/AIDS

- Spread through unprotected sex, birth or breastfeeding, blood, or transplanted tissues
- Attacks the immune system, leaving the body susceptible to opportunistic infections
- Main routes of transmission vary by location
- Highest rates are in Central and Southern Africa

Table 11.12: HIV/AIDS Basic Facts

Number of people living with HIV/AIDS: 33.3 million
Number of new HIV infections: 2.6 million
Number of AIDS deaths: 1.8 million
Prevalence among adults: 0.1% in East Asia to 5.0% in sub-Saharan Africa
Distribution of infection by sex: 15.9 million women and 14.9 million men
Children under 15 with HIV: 2.5 million
Number of HIV-positive people being treated with antiretroviral therapy: 5.2 million

Source: Data from UNAIDS. UNAIDS Outlook Report 2010. Available at: http://data.unaids.org/pub/Outlook/2010/20100713_outlook_report_web_en.pdf. Accessed December 21, 2010; UNAIDS. UNAIDS Report on the Global AIDS Epidemic 2010. Available at: http://www.unaids.org/globalreport/Global_report.htm. Accessed December 21, 2010.

HIV/AIDS

The Costs and Consequences of HIV/AIDS

- Enormous impacts in high prevalence countries that go beyond morbidity and mortality
- A person with full-blown AIDS cannot work and will become dependent on others for care
- Creates exceptional number of orphans
- Highly stigmatized condition
- Direct cost of treatment high for the poorest countries

HIV/AIDS

Addressing the Burden of HIV/AIDS

- Focus on prevention of new infections
- Successful efforts have included strong political leadership and open communication
- Approach to prevention must vary with nature of epidemic
- Efforts need to combine education and behavioral change, bio-medical approaches, and structural approaches

HIV/AIDS

Critical Challenges in HIV/AIDS

- Developing a vaccine to prevent the 2.6 million new infections per year
- Cost-effective approaches to prevention in different settings
- Universal treatment for all those who are eligible
- Management of TB and HIV coinfection

Tuberculosis

- 8th most important cause of death worldwide
- Spread through aerosol droplets
- HIV dramatically increases chance of developing active TB
- Risk factors include living in crowded circumstances, undernutrition, inadequate health care
- Increase in multi-drug resistant cases

Table 11.13: TB Basic Facts: 2009

Number of people living with TB: 14 million
Number of new TB cases: 9.4 million
Number of TB deaths: 1.7 million
Estimated number of new multi-drug resistant TB cases, among notified patients: 250,000
Global distribution of prevalence: 35% of cases in South-East Asia, 30% in Africa, and 20% in the Western Pacific Region; half of all new cases in Bangladesh, China, India, Indonesia, Pakistan, and the Philippines
Target of the Global Plan to Stop TB: halve 1990 prevalence by 2015

Source: Data from WHO. The Global Plan to Stop TB 2011-2015. Available at: http://www.stoptb.org/assets/documents/global/plan/TB_GlobalPlanToStopTB2011-2015.pdf. Accessed December 22, 2010; WHO. Global Tuberculosis Control 2010. Available at: http://whqlibdoc.who.int/publications/2010/9789241564069_eng.pdf. Accessed December 22, 2010.

Tuberculosis

The Costs and Consequences of TB

- Costs to families, communities, and countries is very high
- Large number of people sick, long course of illness
- Stigmatized condition
- Economic growth of a country inversely correlated with the rate of TB

Tuberculosis

Addressing the Burden of TB

Directly Observed Therapy, Short-Course (DOTS)

- Political commitment to TB program
- Access to quality-assured sputum spears and microscopy
- Standardized regimens of directly observed chemotherapy
- Regular supply of TB drugs
- Monitoring and evaluation for program supervision

Tuberculosis

Management of TB/HIV Co-infection

- TB is an opportunistic infection of HIV
- Leading cause of death of adults who are HIV-positive and not on antiretroviral therapy
- WHO recommends testing all HIV-positive people for TB, and all those with TB for HIV

Tuberculosis

Challenges in TB Control

- Need for more effective vaccines, inexpensive and rapid diagnostics, and drug therapy that will lessen duration of treatment
- Improving identification and treatment of MDR-TB and XDR-TB
- Linking providers of TB diagnosis and treatment with a national TB control program

Malaria

- 2.9% of global DALYs lost annually
- 9th leading cause of death in low- and middle-income countries
- Sub-Saharan African children account for 98% of global burden of malaria
- Caused by parasites carried from one person to another by *Anopheles* mosquito
- Pregnant women and fetuses are at high-risk of anemia and death from malaria

Malaria

Costs and Consequences of Malaria

- Individuals often have malaria up to 5 times per year
- Indirect costs are greater than direct costs of treatment because due to lost days of work
- Roll Back Malaria suggests that economic costs in countries with a high burden are equal to 1.3% of GDP per year

Malaria

Addressing the Burden of Malaria

- Prompt treatment of those infected
- Intermittent preventative therapy for pregnant women
- Long-lasting insecticide-treated bed nets for people living in malarial zones
- Indoor residual spraying of homes
- Getting artemisinin, a new drug, into use to delay advent of resistance

Malaria

Challenges in Addressing Malaria

- 100% coverage for people at risk with bed nets, indoor residual spraying, and intermittent therapy for pregnant women
- Encouraging behavioral change to ensure bed nets are being used properly
- Bridging gaps in diagnosis and treatment
- Developing a safe, effective, affordable vaccine
- New drugs to keep up with drug resistance

Diarrheal Disease

The Burden of Diarrheal Disease

- Responsible for about 1.5 million deaths per year- 20% of all childhood deaths
- Significant decline over past 30 years due to better nutrition, disease recognition, oral rehydration therapy
- Most significantly impacts the poor because of poor housing, lack of refrigeration, poor personal and community hygiene

Diarrheal Disease

Addressing the Burden of Diarrhea

Disease prevention strategies:

- Promotion of exclusive breastfeeding for the first 6 months
- Improved complementary feeding, introduced at 6 months
- Rotavirus immunization
- Measles immunization
- Access to clean water supply and sanitation

Case management interventions:

- Oral rehydration therapy
- Zinc supplementation
- Antibiotics

Neglected Tropical Diseases

The Burden of Neglected Tropical Diseases

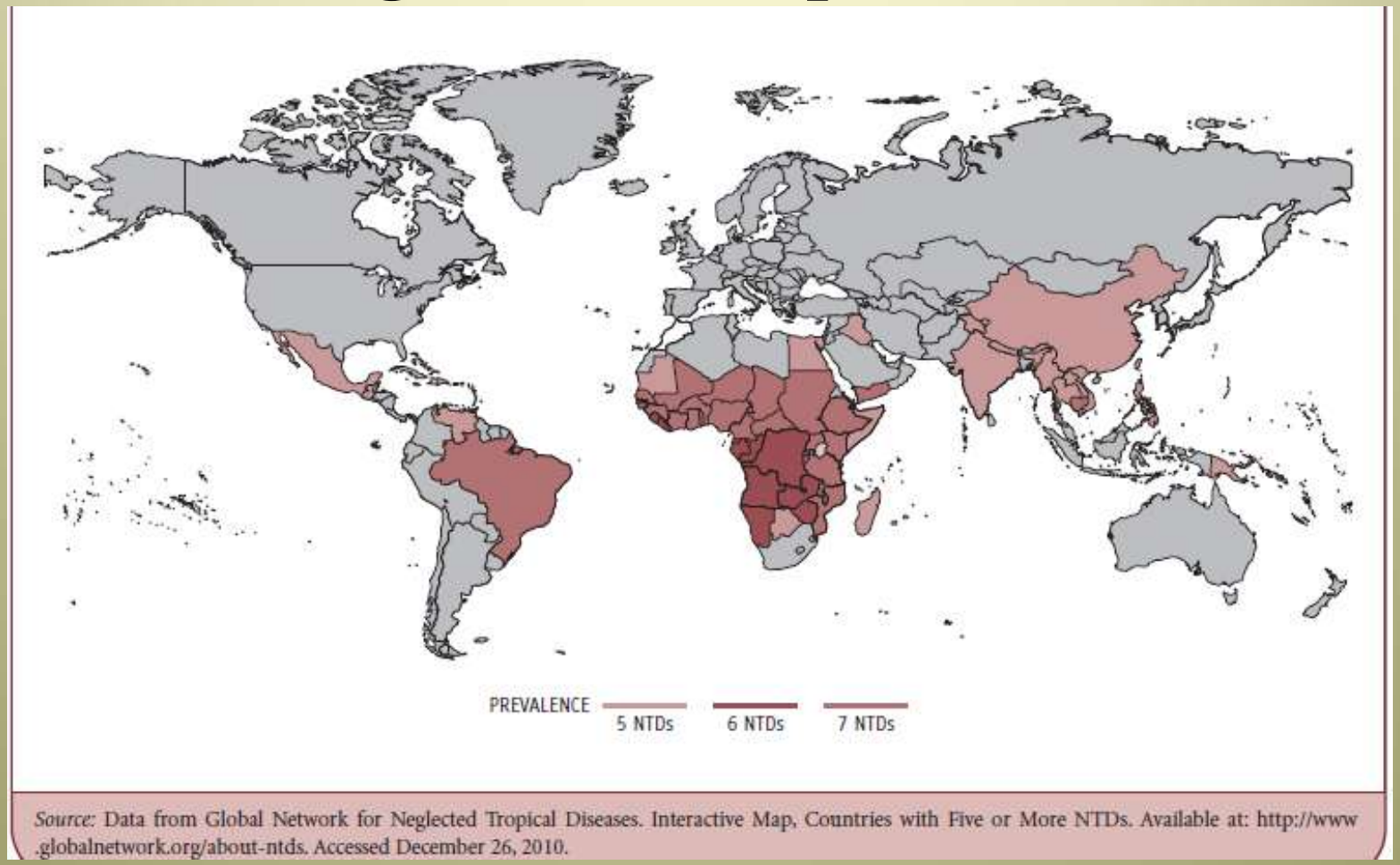
- More than 1 billion people infected with one or more of the NTDs
- Most common afflictions of world's poorest people
- Impede child development, harm pregnant women, cause long-term debilitating illness

Table 11.14: The Major Neglected Tropical Diseases, Ranked by Prevalence

Ascariasis (roundworm)
Trichuriasis
Hookworm infection
Schistosomiasis
Lymphatic filariasis (elephantiasis)
Trachoma
Onchocerciasis (river blindness)
Leishmaniasis
Chagas disease
Leprosy
Human African trypanosomiasis
Dracunculiasis
Buruli ulcer

Source: Data from Hotez PJ, et al. Current concepts: control of neglected tropical diseases. *New Eng J Med.* 2007;357(10):1019.

Figure 11.3: Countries with Five or More Neglected Tropical Diseases



Source: Data from Global Network for Neglected Tropical Diseases. Interactive Map, Countries with Five or More NTDs. Available at: http://www.globalnetwork.org/about-ntds. Accessed December 26, 2010.

Neglected Tropical Diseases

The Consequences of the Neglected Tropical Diseases

- Major impact on health including, but not limited to blindness, anemia, growth retardation, and permanent disability
- Increase susceptibility to other infectious diseases
- Social stigma
- Impact on productivity

Neglected Tropical Diseases

Addressing the Neglected Tropical Diseases

- Rapid-impact package of drugs for the seven most common NTDs
- Guinea worm- teaching people to filter water
- Trachoma- SAFE strategy
- Lymphatic filariasis- annual administration of donated drugs
- Periodic de-worming of young children

Neglected Tropical Diseases

Future Challenges

- Hookworm and schistosomiasis vaccine
- Develop new drugs to combat the NTDs more effectively and combat resistance
- Introduce underlying risks such as hygiene, unsafe water supply, worm and parasite breeding sites

Future Challenges to the Control of Communicable Diseases

- Continued cooperation in and among countries to combat infectious diseases
- Strengthening health systems in low- and middle-income countries
- Sustained political and financial support
- Strengthening surveillance at local, national and global levels
- Adequately trained and appropriately deployed human resources
- Reaching a balance between prevention and treatment
- Technical challenges including new vaccines, treatment and diagnostics