

## **Chapter 1**

### **THE NATURE AND ETIOLOGY OF DISEASE**

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#### **[A] The State of Health in the World**

Global health conditions improved more in the past 60 years than in all of the years before. Worldwide, life expectancy has risen to an average of 66.12 years (CIA 2009) and death rates have declined, especially among young children (World Bank 2010). In the wealthiest countries, average life expectancy climbed from roughly 67 years in 1950 to 78.8 years in 2007; in the developing countries, life expectancy jumped from 40 to 64 years. Even in the least developed regions, such as sub-Saharan Africa, average life expectancy climbed from 36 to 52 years in 1998; however, the prevalence of HIV/AIDS has since reduced life expectancy to 47 years, compared to estimates of 62 years without the presence of AIDS (Avert 2010). Another exception to these positive regional trends occurred in the transitional economies of the former Soviet Union, where life expectancy for men declined to 1980 levels in all 12 republics, reaching a low of 57.7 years in the Russian Federation in 1994 (WHO 1996). Today, Russian life expectancy has reached 68 years, but still remains low, at 61.8 for Russian men (World Bank 2010). Major strides have also been made in reducing child mortality. As recently as 1950, 287 children out of every 1,000 born in the developing countries would die before reaching age five; by 2008, that number had dropped to 67 out of every 1,000 (World Bank 2010).

Yet this incredible progress should not mask the fact that health conditions remain dismal in many parts of the world, and huge disparities exist between the richest and the

poorest countries and, indeed, between the rich and the poor within the same country or even the same city. For example, in sub-Saharan Africa, the child mortality rate is still 167 per 1,000 live births, compared to 6 per 1,000 in developed nations (UNICEF 2007).

### **[A] Poverty and Health Status**

Despite dramatic global economic growth, almost half of the world's population, 3 billion people, live in extreme poverty on less than \$2.50 per day. At least 80 percent of the world's population lives on less than \$10 per day (Cehn and Ravallion 2008).

Poverty not only increases the risk of poor health and the vulnerability of people, it also has serious implications for the delivery of effective healthcare, including reduced demand for services, lack of continuity or compliance in medical treatment, and increased transmission of infectious diseases.

Poverty is not just a lack of money. It generally includes the following elements: inadequate income; lack of education, knowledge, and skill; poor health status and lack of access to healthcare; poor housing; lack of access to safe water and sanitation; insufficient food and nutrition; and lack of control over the reproductive process.

In the lowest-GDP countries, a special effort is needed to enhance the health status of their populations and to reduce the gap with respect to the industrialized world and even to other developing countries. Swaziland—a country that has been ravaged by the HIV/AIDS epidemic—has a life expectancy of roughly 32 years, which is the lowest in the world; it is less than half that of Japan, which boasts the highest life expectancy worldwide at nearly 82.6 years (CIA 2009). These figures confirm a blatant inequality. In fact, average life expectancy in the low-GDP countries is about 56 percent of that in the

United States and other industrialized nations (UNDESA 2009). Similarly, although huge improvements in child survival have been made, it must be noted that more than 15 percent of children born in the low-GDP countries will die before reaching age 5 (in Afghanistan, nearly 26 percent of children will die); in the richest countries, less than 1 percent will (UNDESA 2009). Nearly 80 percent of under-5 mortality occurred in sub-Saharan Africa and South Asia (UNICEF 2011).

In addition to child deaths, the lifetime risk of maternal deaths in the world is 1 out of 140. This risk jumps astronomically to 1 in 37 in the low-GDP countries, compared to 1 in 4,300 in the developed nations (UNICEF 2011).

According to a 2007 UNICEF study,

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A review of recent evidence shows that while a number of middle-income countries have made progress in reducing maternal deaths, less progress has been achieved in low-income countries, particularly in sub-Saharan Africa. Across the developing world, maternal mortality levels remain too high, with more than 500,000 women dying every year as a result of complications during pregnancy and childbirth. About half of these deaths occur in sub-Saharan Africa, and about one third occur in South Asia—the two regions together account for about 85 percent of all maternal deaths. In sub-Saharan Africa, a woman's lifetime risk of maternal death is a staggering 1 in 22, compared with 1 in 8,000 in industrialized countries (UNICEF 2007).

[END BLOCK QUOTE]

An excessively large gap is observed with regard to children's and women's health in the low-GDP countries: The average mortality rates of children under 5 and of mothers

are at least 10 and 30 times as high, respectively, as the corresponding rates in industrialized countries (UNICEF 2011). (

Exhibit 1.1 shows basic indicators for developing nations; Exhibit 1.2 compares these figures with those of the more developed, wealthier nations.

[EXHIBITS]

**Exhibit 1.1 Basic Indicators for Low-GDP Countries**

**Exhibit 1.2 Basic Indicators for High-GDP Countries**

[End EXHIBITS]

As expected, among those countries facing high levels of poverty, one can see higher infant and child mortality rates, substantially lower life expectancies, and other diminished health indicators. Most notable is the magnitude of the differences in health status between the wealthy and impoverished nations.

Since 1990, the United Nations Development Programme has employed a Human Development Index (HDI) that serves as a scale for its annual development report. HDI scores are between 0 and 1, with scores closer to 1 demonstrating higher levels of development. The HDI accounts for the following:

[BL]

- Life expectancy at birth
- Knowledge (adult literacy rate)
- Standard of living (gross domestic product)

[END BL]

[GLOSSARY]

**Human Development Index (HDI).** Created by the United Nations Development Programme as a scale for its annual development report. HDI measures life expectancy at birth, adult literacy rate, and gross domestic product. HDI scores are between 0 and 1, with scores closer to 1 demonstrating higher levels of development.

[END GLOSSARY]

Developing nations, not surprisingly, have overall lower scores on the HDI scale. Large portions of the populations of developing countries do not have access to necessities, such as healthcare and safe water, and this leads to a plethora of diseases that, although they are not exclusive to developing nations, often define mortality in these countries. Ninety percent of the 1.3 billion people who live in absolute poverty live in South Asia, sub-Saharan Africa, and China.

#### **[A] Poverty and Disability**

Despite all their benefits, mortality figures do not capture the huge burden of sickness and disability caused by diseases that do not result in death but still prevent adults from working, keep children out of school, and generally slow economic and social development. Statistics on morbidity, which is the measure of disease incidence, are even harder to come by than mortality numbers.

#### **[B] *Disability-Adjusted Life Years (DALYs)***

Over the years, various investigators have attempted to overcome these limitations by developing new metrics that factor in disability or quality of life along with mortality. One such measure is the **disability-adjusted life year (DALY)**. DALYs combine losses

from premature death (defined as the difference between the actual age of death and the life expectancy at that age and loss of healthy life that results from disability. In simple terms, a DALY strives to tally the complete burden that a particular disease exacts. Key elements to consider include the age at which the disease or disability occurs, how long its effects linger, and its impact on quality of life. Losing one's sight at age seven, for instance, is a greater loss than losing one's sight at 67. Similarly, a bout of acute illness that is over quickly carries less weight in the DALY calculation than an illness, such as persistent worm infections, that leaves lingering weakness.

[GLOSSARY]

**Disability-adjusted life year (DALY).** A metric that combines losses from premature death (defined as the difference between the actual age of death and life expectancy) and loss of healthy life that results from disability.

[END GLOSSARY]

Examined from this perspective—which considers not just premature death but disability as well—the huge toll of ill health in developing countries stands out even more starkly. Nearly nine-tenths of the global burden of disease occurs in developing regions where only one-tenth of global health expenditures occur. As Exhibit 1.3 illustrates, the burden of ill health in Africa and Southeast Asia is nearly five times that found in the richest countries and regions.

[EXHIBIT]

Exhibit 1.3 Disease Burden by Region per 1,000 Population

[END EXHIBIT]

When measured with DALYs, communicable diseases are the single most important cause of ill health globally, accounting for 44 percent of the total, with respiratory

infections and diarrheal diseases heading the list (WHO 2008a). DALYs also underscore the disproportionate burden of ill health borne by the world's children. Children under age 15 account for almost half of all DALYs worldwide. Exhibit 1.4 further illustrates comparisons between mortality and DALYs.

[EXHIBIT]

Exhibit 1.4 Comparing Causes of Death Worldwide with DALYs

**[END EXHIBIT]**

### **[A] The Epidemiological Transition**

Until recently, it was widely assumed that, with increasing economic growth, the developing countries would follow the same paths as Europe and North America and experience what has become known as the **epidemiological transition**; this term refers to a change in the type of diseases and illnesses experienced within a society. Changes in mortality structure are the principle outcome indicator by which the epidemiological transition is assessed.

[GLOSSARY]

**Epidemiological transition.** A change in the type of diseases and illnesses experienced within a society.

[END GLOSSARY]

Humankind has undergone multiple epidemiological transitions, beginning with a cultural shift from a foraging to an agricultural society that led to the development of new diseases, including zoonotic infections that resulted from the domestication of animals.

The first modern epidemiological transition resulted from the development of urban centers. Early in their history, large urban settlements began to experience problems

involving waste disposal and contaminated water and food sources. Communicable diseases such as cholera, which is transmitted by contaminated water, became problematic. Viral diseases, such as measles, mumps, and smallpox, threatened epidemic proportions as the close urban living quarters allowed for repeated and multiple exposures.

With industrialization came an even greater environmental and social transformation. City dwellers were forced to contend with industrial waste and polluted water and air. Slums arose in industrial cities and became focal points for poverty and the spread of disease. Epidemics of smallpox, typhus, diphtheria, measles, and yellow fever were well-documented. Tuberculosis and respiratory diseases, such as pneumonia and bronchitis, were even more serious problems, and they were exacerbated by harsh working situations and crowded living conditions.

The next part of this chapter will focus on the second epidemiological transition, which involved the rise of chronic and degenerative diseases, and the third transition, which was a reemergence of infectious diseases with antibiotic resistance.

### ***[B]* The Second Epidemiological Transition: The Rise of Chronic and Degenerative Diseases**

The second epidemiological transition was the shift from acute infectious diseases to chronic, noninfectious, degenerative diseases. The increasing prevalence of these diseases is related to an increase in longevity. Cultural advances result in a larger percentage of individuals reaching the oldest age segment of the population. Simultaneously, the technological advances that have allowed for increased longevity can also lead to



environmental concerns that threaten health, and these advances arguably lead to new chronic diagnoses. Interestingly, within developing countries, many of the chronic diseases first appear in the wealthier segments of the population or in those segments with greater access to Western products and practices.

With increasing developments in technology, medicine, and science, a better understanding of the source of infectious disease arose, followed by an increased ability to control these diseases. The development of immunizations resulted in the control of many infections and the eradication of many diseases, such as smallpox. The decrease in infectious diseases and the subsequent reduction in infant mortality have resulted in greater life expectancy at birth. In addition, longevity has increased for adults, and this has resulted in an increase in chronic and degenerative diseases.

Many of the diseases of the second transition share common factors related to human adaptation, including diet, activity level, mental stress, behavioral practices, and environmental pollution. For example, the industrialization and commercialization of food often results in malnutrition. Obesity, which is another form of malnutrition, is a direct result of an increasingly sedentary lifestyle in conjunction with increasing caloric intakes.

Chronic diseases are a recent factor in human morbidity, indicating a strong environmental factor in disease etiology. Although biological factors such as genetics are clearly important in determining who succumbs to disease, genetics alone cannot explain the widespread changes seen in the second epidemiological transition.

### ***[B]* The Third Epidemiological Transition: Reemergence of Infectious Diseases**

The third epidemiological transition is marked by the emergence of new infectious diseases, which have the potential for a global impact. This transition is a result of an interaction of social, demographic, and environmental changes that have resulted in the adaptation and genetic mutation of the microbe; international commerce and travel, technological change, the breakdown of public health measures, and other factors have influenced this change. Ecological changes, such as agricultural development projects, dams, deforestation, floods, droughts, and climatic changes, are believed to have resulted in the emergence of diseases such as hantavirus and possibly HIV and AIDS.

The catalyst driving the reemergence of many diseases is ecological change that brings humans into contact with pathogens. The development of antibiotic resistance in any pathogen is the result of medical and agricultural practices. Antibiotics have been used indiscriminately and inappropriately, resulting in multidrug-resistant strains of bacteria that infect a large number of patients (Mayo Clinic 2011). Similarly, agricultural uses of antibiotics, such as supplementation of animal feed, have become more prevalent; there is debate about whether this may lead to antibiotic resistance in humans.

### **[A] The Demographic Transition**

The **demographic transition** model seeks to explain the transformation of countries from agricultural to industrial societies. The model approximates occurrences in Western Europe and to some extent the experience of most developed nations. In developed countries, this transition began in the eighteenth century and continues today; LDCs are still in the midst of earlier stages in the model.

[GLOSSARY]

**Demographic transition.** A model that explains the transformation of countries from agricultural to industrial societies. As countries become developed and industrialized, they experience declines in death rates followed by declines in birth rates. As a result, nations move from rapid population growth to slow growth, then to zero growth, and finally to a reduction in population.  
[END GLOSSARY]

As countries become developed and industrialized, they experience declines in death rates followed by declines in birth rates. As a result, nations move from rapid population growth to slow growth, then to zero growth, and finally to a reduction in population; this is the essence of the demographic transition model. Demographers have observed that this transition takes place in four distinct stages, as described below.

[NL]

1. Preindustrial stage. In this first stage, when the economy is underdeveloped, both birth and death rates are high. High birth rates are attributed to such factors as early marriages and religious and social customs; death rates are high due to poor diet, ill health, and the absence of medical facilities. As a result, population growth is slow in the preindustrial stage.
2. Transitional stage. In this second stage, which typically occurs shortly after industrialization, national and per capita incomes rise because of the implementation of developmental programs. The standard of living is high, health and sanitary conditions improve, and diseases are controlled. Consequently, the death rate falls, but the birth rate continues to be high. As a result, population growth is high, and a population explosion results.
3. Industrial stage. The third stage of the transition occurs as industrialization becomes widespread. When development reaches an advanced stage, many

changes occur in the economic and social structures. People understand the benefits of family planning, and they deliberately restrict the size of their families. Restriction of family size is equated with higher standards of living, so birth and death rates are low at this stage. The advanced countries of the world are now in this stage.

4. Postindustrial stage. The fourth and final stage occurs when birth rates decline even further to equal the death rate, thus causing the rate of population growth to reach zero. The birth rate eventually falls below the death rate, and total population size slowly decreases.

[END NL]

The formal demographic transition theory had only four stages; however, some theorists now suggest that a fifth stage is needed to represent nations with sub-replacement fertility levels. The higher-GDP countries in Europe and North America—as well as Japan, Australia, and New Zealand—are growing by less than 1 percent annually. Population growth rates are negative in many European countries, including Russia (-0.5 percent), Estonia (-0.4 percent), Hungary (-0.3 percent), and Ukraine (-0.8 percent) (PRB 2010).

Exhibit 1.5 provides a graphical representation of the demographic transition (stages 1 through 4).

[INSERT EXHIBIT—WAITING FOR NEW VERSION]

Exhibit 1.5. The Demographic Transition

[END EXHIBIT]

*[B] Developing Nations and the Demographic Transition*

Many developing nations are currently in the transitional stage, sometimes called the *demographic trap* because it is a dangerous stage from the perspective of population growth. An estimated 17 percent of the world's current population—more than 67 nations—are in this stage, leading to record increases in population size (WHO 1998).

One example of a region that is in this demographic trap is sub-Saharan Africa, which has experienced nearly constant fertility rates coupled with a decrease in death rates because of longer life expectancy. Mortality has decreased without a corresponding change in fertility, which has led to a population explosion in this region that is mirrored worldwide.

It is worth noting that the demographic transition theory may be less applicable to less economically developed countries. The theory was validated primarily in Europe, Japan, and North America, where demographic data cover several centuries. However, high-quality demographic data for most low-GDP countries did not become widely available until the mid-twentieth century (Lee 2003). The demographic transition model does not account for recent phenomena such as AIDS, which has become the leading source of mortality in many developing areas of the world. Disturbing trends in waterborne bacterial infant mortality are occurring in countries such as Malawi, Sudan, and Nigeria, where progress in the demographic transition clearly stopped and reversed between 1975 and 2005 (Population Action International 2006). Therefore, although the demographic transition model is a useful tool for analysis, it should not be viewed as the set path of progression for all developing nations.

## **[A] Diseases of Poverty**

The diseases of poverty are typically acute ailments caused by poor nutrition, environment, and lack of access to appropriate care. Whereas wealthier nations frequently treat and prevent these diseases with ease, in impoverished nations these diseases often present issues of life and death.

In the poorest nations, child health is of primary concern; children's less-developed bodies are more prone to the diseases themselves and to the underlying causes of these diseases that keep children from developing fully functional immune systems and other natural defenses.

## **[B] *Infant and Child Mortality***

In 1955, 21 million children under age 5 died worldwide; in 2008, about 8.8 million died (down from 12.5 million in 1990). This number is expected to drop to 5 million for 2025, when the world population is projected to reach 8 billion. Under-5 mortality rates per 1,000 live births for 1955, 1990, and 2008 are 210, 90, and 65, respectively (UNICEF 2009).

Similar to child mortality, the world infant mortality rate declined from 126 per 100,000 in 1960 to 45 in 2008 (UNICEF 2010). Infant mortality is linked to several predictive correlates, including the following:

[BL]

- Birth order

- Economic conditions
- Ethnicity and culture
- Low birth weight (often resulting from premature birth)
- Maternal age
- Maternal education
- Gender

[END BL]

These correlates have a large impact in the prenatal period, during which a fetus may not receive the proper medical care and nutrition needed to develop fully. In fact, more than half of all infant deaths take place within the first few days of life, largely because of inadequate care for the mother during pregnancy and childbirth (WHO 2000a). An entire international body of literature exists that discusses correlations between maternal education, age, and external cultural factors and prenatal care and proper nutrition.

### ***[B] Malnutrition***

Each year, more than 11 million children die from the effects of disease and inadequate nutrition. In some countries, more than 1 in 5 children die before they reach their fifth birthday, and many of those who do survive are unable to grow and develop to their full potential.

Thirty-five percent of all under-five deaths are associated with malnutrition (Black et al. 2008). Additionally, approximately 27 percent (168 million) of children under age five are underweight, which increases their risk of mortality from infectious illnesses, such as diarrhea and pneumonia (Rice et al. 2000) and may result in poor cognitive development

and neurological impairment. In adulthood, they are at an increased risk for cardiovascular disease, high blood pressure, obstructed lung disease, diabetes, high cholesterol concentrations, and renal damage (WHO 2000b).

**Protein energy malnutrition (PEM)** affects more than a third of the world's children, with a range of underweight children from 8 percent in the region with the least PEM (South America) to 60 percent in the poorest region (Southeast Asia). PEM is caused by a combination of insufficient food intake and infectious diseases, and it is closely related to insufficient knowledge, poor sanitation, poverty, and insufficient access to medical care. PEM and other dietary deficiencies of vitamins and minerals can lead to learning disabilities, mental retardation, poor health, low work capacity, blindness, and premature death.

[GLOSSARY]

**Protein energy malnutrition (PEM).** A nutritional deficiency caused by insufficient food intake and infectious diseases; closely related to insufficient knowledge, poor sanitation, poverty, and insufficient access to medical care.

[END GLOSSARY]

**Micronutrient malnutrition**, which affects at least 2 billion people of all ages, refers primarily to an insufficient dietary intake of iodine, iron, and vitamin A. Some functional consequences of the micronutrient deficiencies are described in Exhibit 1.6.

[GLOSSARY]

**Micronutrient malnutrition.** An insufficient dietary intake of iodine, iron, and vitamin A.

[END GLOSSARY]

[EXHIBIT]

Exhibit 1.6. Consequences of Selected Micronutrient Deficiencies

[END EXHIBIT]



Infection—particularly frequent or persistent diarrhea, pneumonia, measles, or malaria—undermines nutritional status. Poor feeding practices that contribute to malnutrition include inadequate breastfeeding, offering the wrong foods, giving food in insufficient quantities, and not ensuring that a child eats her share. For these and other reasons, malnourished children are more vulnerable to disease.

**[B]** *Food Safety*

In addition to malnutrition, food contamination is one of the most widespread health problems today, and it is an important cause of reduced economic productivity. Hundreds of millions of people, particularly infants and children, suffer from diseases caused by contaminated food and water sources. In industrialized countries, up to 30 percent of the population suffers from foodborne diseases each year. While less well documented, developing countries bear the brunt of the problem because of a wide range of foodborne diseases, including those caused by parasites. The high prevalence of diarrheal diseases in many developing countries suggests major underlying food safety problems (WHO 2007a).

**[B]** *Acute Respiratory Infections*

Acute respiratory infections are estimated to be the leading cause of death for all age groups in developing nations (WHO 2008b). According to the World Health Organization (WHO), most young children worldwide have from four to eight episodes of respiratory infection per year, and most of these episodes are self-limiting infections of

the upper respiratory tract. However, the incidence of acute lower respiratory infections, particularly pneumonia, is high in developing countries because of the many individual and environmental factors that heighten the risk of developing these conditions, especially low birth weight, poor nutrition, low income, and indoor air pollution. About 2.94 million people in the poorest nations die from these infections each year, mostly as a result of pneumonia (WHO, 2008b).

Control of acute respiratory infections is difficult because many of the causal agents are airborne. Some diseases such as measles can be reduced through immunization. Immunization against pneumonia, however, is difficult because 83 different serotypes are known, and each is immunologically unique.

Beyond specific disease-causing agents, exposure to certain ambient air pollutants (e.g., sulfur dioxide and particulate matter) causes severe respiratory problems throughout the world. Road traffic emissions of lead and nitrogen oxides and other air pollutants from localized sources are also often encountered. In the indoor environment, exposure to nitrogen oxides, volatile organic compounds, and tobacco smoke have significant effects on human health and comfort (WHO 2000c).

### ***[B] Diarrheal Disease***

Another 2 million children in developing countries die each year from diarrheal diseases, making these diseases the second highest killer of children under five worldwide. Diarrhea can, in most cases, be prevented and treated. Basic causes of diarrheas include toxins, allergies, lactose intolerance, and malaria. However, by far the

most common causes of diarrheas in children are pathogens ingested through contaminated food or water, particularly in developing countries.

The immediate result of acute diarrheal disease is dehydration. Loss of approximately 5 percent of body weight through dehydration can typically be tolerated, although this may be accompanied by symptoms such as lightheadedness from a drop in blood pressure. A loss of 10 percent of body weight, as is often seen in children in developing countries, can produce real danger with possibilities of shock, kidney failure, and death.

The introduction of **oral rehydration therapy** (ORT) in recent years has proved effective, is relatively simple and inexpensive, and has saved perhaps millions of pediatric lives. ORT replaces lost fluids orally rather than intravenously, and it works regardless of which agent caused the episode because it counteracts the resulting dehydration rather than the cause.

[GLOSSARY]

**Oral rehydration therapy.** A simple and inexpensive treatment that replaces lost fluids orally rather than intravenously, and it works regardless of which agent caused the episode because it counteracts the resulting dehydration rather than the cause.

[END GLOSSARY]

However, no treatment, including ORT, is perfect. In addition to relatively minor side effects such as increased stool production, ORT does require access to certain resources such as clean, safe water. Although water may seem like a feasible resource, in many nations clean, safe water is costly and out of reach of those most in need. Consequently, many children in need of ORT do not truly have access.

In 2002 WHO introduced an improved oral rehydration salts (ORS) formula, which decreased stool production and resulted in less vomiting and need for intravenous hydration. The formula reduces the severity and duration of acute diarrheal illness. WHO

estimates the formula could prevent 14,000 deaths and save \$7.1 million for every 1 million diarrhea episodes (USAID 2009). WHO estimates some 50 million children have been saved thanks to the mixture, which costs only 30 cents per dose. In 2004, WHO and the United Nations Children's Fund (UNICEF) recommended the use of zinc treatment with ORS as a two-pronged approach to treatment of diarrhea.

*[B] Adult Illness and Poverty*

The standard international health framework discusses illness in poorer countries in terms of communicable and reproductive diseases. As with child health, adults in developing and impoverished nations have long been believed to suffer most often from the following diseases:

[BL]

- Diarrheal disease
- Tuberculosis
- Malaria
- Venereal diseases
- Respiratory infections
- Maternal and perinatal illness
  - HIV and AIDS

[END BL]

The causal factors associated with these illnesses are the same for adults as for children, including a lack of safe drinking water and food, poor sanitation, poor housing

conditions, malnutrition, chronic parasitic infections, and lack of effective curative measures.

Higher mortality rates among the poor may also result from noncommunicable diseases. The specific determinants of these differences are not always evident, but poor nutrition, stress, indoor air pollution (in select countries), smoking, and workplace hazards are important factors for consideration. Access to effective medical care is also likely to have a significant impact on mortality from noncommunicable diseases.

### **[A] Health Problems of Affluence**

In contrast with developing and poor nations, the more affluent, developed nations of the world have largely conquered communicable and reproductive diseases with medical science. That is not to say that no communicable and reproductive diseases exist in wealthier nations, but these health problems are secondary causes of morbidity and mortality.

In wealthy nations, major sources of morbidity and mortality result from chronic and noncommunicable diseases. Many of these diseases are related to lifestyle, such as increased lung cancer because of smoking or high rates of cardiovascular disease that result from obesity and lack of exercise.

Common diseases among wealthy, developed nations include the following:

[BL]

- Arthritis
- Cancer
- Cardiovascular disease

- Diabetes
- Hypertension

[END BL]

Note that these are not diseases that result from malnutrition or lack of access to health services; they may be related to excesses in personal lifestyle or they may simply be due to increased longevity, which causes the body to become more susceptible to such conditions.

Similarly, because these diseases are not caused by a single contaminant or pathogen, medical treatment often focuses on management of these diseases rather than their cure. Consequently, the wealthy nations of the world have populations with substantial chronic disease prevalence and, therefore, continual healthcare needs. These needs may seem less extreme than those present in the poorer countries, but the resources required to treat diseases of affluence are significant.

### **[A] The Changing World Scene**

As epidemiological transitions progress on a more global level, similar changes are observed among specific nations and societies. Among developing nations, the more traditional frameworks for evaluating health needs in poverty-stricken nations no longer hold strictly true to form. Although impoverished nations have not largely improved their economic standing, the people of these nations are beginning to develop the diseases of affluence in addition to the diseases of poverty.

Most low- and middle-income countries are already facing a double burden of disease. They suffer a backlog of common infections, malnutrition, and reproductive

health problems. At the same time, without having addressed these challenges, they have to cope with the emerging problems represented by noncommunicable diseases, heart disease, cancer, new infections, and injuries.

What is causing this addition of new diseases in less-wealthy nations? Development seems to be the primary factor. Economic development, as touted by organizations such as the World Bank and the United Nations Development Programme, has many positive consequences. However, economic development also brings to less-developed nations the modern determinants of health, which arise primarily from changes in behavior and from the hazards of new and imperfectly understood technology. As the wealthier nations of the world reach out to help developing nations grow and become “civilized,” both positive and negative influences are introduced. Among the negative influences involved is the introduction of unhealthy habits.

### **[B]** *Tobacco Use*

The causal relationships between tobacco usage and several noncommunicable diseases such as lung cancer and emphysema are well-established. Smoking may also have an impact on cardiac health, premature and complicated births, and many other health problems. Although tobacco consumption in developed nations has been on the decline (largely because of increased public health efforts designed to inform people about the dangers of the drug), the reverse is true in developing nations for several reasons.

First, antismoking campaigns essentially do not exist in less-wealthy countries, so the public health effects of public awareness are virtually nonexistent. Similarly, in less-

wealthy nations, few if any restrictions are placed on advertising, resulting in unchecked, widespread campaigns that target the entire population. Finally, low-GDP nations typically have no controls on the content of tobacco products. Therefore, although the percentage of tar used in cigarettes in wealthier nations has been consistently on the decline, tar levels in cigarettes in poorer nations remain very high. As a consequence of all these factors, the wealthier nations have introduced a vice to developing nations that is not coupled with any of the controls that are often taken for granted in the higher-income countries.

The total number of tobacco-attributable deaths is projected to rise from 5.4 million in 2005 to 6.4 million in 2015 and to 8.3 million in 2030. Tobacco is projected to kill 50 percent more people in 2015 than HIV/AIDS and to be responsible for 10 percent of all deaths (WHO 2007b). According to the latest estimates, more than 80 percent of the 8.3 million deaths attributed to tobacco projected to the year 2030 will occur in low-income and middle-income countries (Mathers and Loncar 2006).

### **[B]** *Alcohol Use*

Ethyl alcohol, the active ingredient in all alcoholic drinks, is a toxic compound with addictive properties. Alcohol consumption may lead to a number of acute and chronic health problems in addition to possible mental health concerns. Alcohol can cause alcohol poisoning, acute gastritis, and suicidal behavior, and it may contribute to accidents. Long-term exposure to alcohol can also cause cirrhosis of the liver, stomach ulcers, diabetes, and fetal alcohol syndrome. Alcohol dependency may also lead to a series of social and economic problems.



Average alcohol consumption is increasing in most nations of the world. However, this increase is substantially larger among less-wealthy nations. Alcohol consumption has led to numerous socioeconomic consequences in impoverished nations; one of the primary results is a decreased workforce due to chronic intoxication.

**[B]** *Intentional Violence: Suicides, Homicides, and Warfare*

Suicide is a major cause of mortality in all countries. Worldwide, about a million suicides occur each year. Several psychological factors have an impact on suicidal tendencies, including social isolation, crises, depression, and alcoholism.

Suicide is a complex issue, and few effective preventive methods have been discovered. However, high socioeconomic status and community support seem to be highly correlated with the success of suicide prevention.

As with suicide, homicide is also related to a variety of social factors. However, homicide rates vary to a much larger degree across nations, possibly as a reflection of differences in culture and laws. Homicide rates are higher in most low-GDP nations than in their wealthier counterparts. Within developing countries, homicide rates also vary by numerous factors including gender (males have higher rates), income (the poor have higher rates), place of residence (rates are higher in urban areas), and ethnicity.

In addition, warfare kills and disables substantial portions of the populations of many low-GDP countries, especially in the Middle East, southern Africa, Central America, and Southeast Asia. Although accurate data are often difficult to obtain because of the nature of war and the less-developed tracking systems in low-GDP nations, warfare mortality is often caused by conflicts between criminal gangs and police agencies as well as conflicts

among gangs themselves. Warfare of this sort is often tied to the ever-increasing presence of illicit drug trafficking.

### **[B]** *Dietary Imbalance*

As noted earlier, the major dietary problem in the developing world is lack of food. However, as nations develop, food supplies often increase, and diets change. Whereas the old diets of many lower-income nations, when adequate, typically included large amounts of carbohydrates (e.g., rice, polenta), soy or lentils, and perhaps some fish or meat, newer diets consist of more processed foods. These new diets are typically much higher in saturated fat and sodium and lower in simple fiber. Although the exact impact of diet on disease manifestation is still up for debate, considerable evidence links this more “westernized” diet with a number of chronic diseases, including hypertension and certain forms of cancer.

### **[B]** *Changes in Physical Activity*

It is well established that regular physical activity promotes greater health. Regular activity, whether occupational or recreational, leads to decreases in coronary heart disease and possibly decreased risk for stroke, cancer, and other diseases. In low-GDP countries, most people have enough activity in their daily lives to maintain a health benefit. In high-GDP countries, however, levels of activity have been on a steady decline because of conveniences such as automobiles and many other labor-saving devices. As countries mature and adopt many of these conveniences, the populations of these countries begin to face the same deficit of physical activity as is seen in wealthier nations.

### **[B]** *Mortality and Automobiles*

Automobile collisions are one of the major causes of adult mortality in the developing world, and about half a million deaths each year result from these types of accidents. In 1990, road traffic accidents were the ninth leading cause of disease burden; by 2020, they are expected to be the third leading cause (WHO 2008a). As the number of automobiles has increased in developing countries, the levels of associated morbidity and mortality have grown at alarming rates. Similarly, countries with high proportions of motorcycles and other unprotected vehicles (e.g., many counties in Southeast Asia) have even higher risks of driver and passenger injury from motor vehicle collisions.

Whereas in high-GDP nations the majority of accidents occur to people between the ages of 15 and 24, in low-GDP nations the majority of accidents occur to those over age 25. As vehicle ownership becomes more widespread, these demographics will likely begin to mirror those found in wealthier nations.

### **[B]** *The Environment*

As discussed previously in this chapter, contaminated drinking water, food, and indoor air are major causal factors of ill health in impoverished nations. Industrialization and modernization of many low-income countries have created new sources of clean water and food, but they have simultaneously produced increased pollution that may add to health problems unless adequate preventive measures are taken.

Air pollution is a growing problem in many poorer countries. The main sources of pollution vary among nations, but in general they are motor vehicles, power plants,

industry, and residential heating and cooking devices. Pollution given off from these sources can damage the lungs and other organs. Such pollution likely also contributes to chronic diseases of the lungs, such as asthma.

Chemical contamination of food and water sources is also of growing concern in poorer nations. Many industries in low-income nations contaminate water through various production processes. When polluted waterways are used for drinking water, cooking, irrigation, or as a source of fish, these contaminants can cause severe health problems.

Food contamination is largely a problem of biological contamination (naturally occurring contaminants such as dangerous bacteria), but chemical contamination is also an issue. Poisoning outbreaks have occurred from contamination during food processing.

Depletion of the ozone layer and the greenhouse effect are also problems that affect low-income nations. As industry develops, these nations are adding to ozone depletion by using manufactured products.

### ***[B] Workplace Injuries***

Deaths from workplace injuries are approximately ten times more likely in low-income nations than in wealthier nations. Injuries are common in agriculture, construction, transport, and the primary industries such as mining; all of these industries constitute important sources of employment in poorer countries.

Unlike the wealthier nations, the poorer nations of the world do not yet have organizations and regulatory agencies dedicated to improving workplace safety (e.g., the Occupational Safety and Health Administration in the United States). Without these types

of organizations, accidents are more likely to occur. The effects of workplace hazards are substantial. Occupational injuries are estimated to kill more than 300,000 workers worldwide every year and to cause many more cases of disability (Takala 1998) and these numbers are likely underestimated because of poor data reporting in many countries. These accidents result in increased healthcare costs, decreased productivity, and substantial morbidity and mortality.

### **[A] Conclusion**

What is the state of health in the world today? Clearly no definitive answer to this question exists. Although global health conditions improved more in the past half-century than in all of the years before, there is still a long way to go. A large proportion of the world's population faces dramatic poverty and illness. Even in the wealthier nations of the world, illness—albeit chronic rather than acute—is still present at substantially high levels.

How should these mounting challenges be handled? Perhaps health professionals need to reevaluate approaches to healthcare around the world; perhaps new paradigms are needed. Healthcare professionals must continue to fight against the growing inequalities and deficiencies in health systems around the world.

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