and illnesses. Disease related to malnutrition is even more pervasive. In 2010, it was estimated that 925 million people were malnourished—one in every seven persons worldwide. Children are disproportionately affected by undernutrition, which accounts for more than 50% of childhood mortality worldwide. Estimating the burden of disease in the general population caused by nonoccupational exposures to toxic agents is complicated by the diversity of agents and difficulties in determining the extent and duration of exposures. But whatever the precise numbers, it is clear that environmental diseases are major causes of disability and suffering, and constitute a heavy financial burden, particularly in developing countries.

In this chapter, we first consider two key issues in global health: the global burden of disease, and the emerging problem of the health effects of climate change. We then discuss the mechanisms of toxicity of chemical and physical agents, and address specific environmental disorders, including those of nutritional origin.

Environmental Effects on Global Disease Burden

Since 1990 a World Health Organization project entitled "The Global Burden of Disease" (GBD) has set the standard for reporting global health information. The GBD estimates the burden imposed by environmental disease, including those caused by communicable and nutritional diseases. It does so in part by applying a metric called *DALY* (disability-adjusted life year), which is defined as the sum of years of life lost due to premature mortality and years of life lost to disability in a population. DALY reporting provides a high degree of uniformity for health information gathered about acute and chronic diseases in different parts of the world and at multiple locations in a single country. A comparison of causes of morbidity and mortality from 1990 to 2010 generated by the GBD project has revealed the following trends:

- **On a worldwide basis, there were dramatic increases in mortality due to HIV/AIDS and associated infections**, which peaked in 2006. Other changes included an 11.2% decrease in aggregate deaths from infectious disease, maternal, neonatal, and nutritional disorders; a 39.2% increase in deaths from noncommunicable diseases (e.g., cancer, cardiovascular diseases, and diabetes); and a 9.2% increase in deaths from injuries (Fig. 9-1). All are attributable in part to aging of the world's population from a mean age of 26.1 years to a mean age of 29.5 years. As a consequence of these shifts, the global healthy life expectancy at birth, an estimate of expected years of life free of disability, rose for men from 54.4 years to 58.3 years and for women from 57.8 years to 61.8 years.
- **Undernutrition is the single leading global cause of health loss (defined as morbidity and premature death).** It is estimated that about one third of the disease burden in developing countries is, directly or indirectly,

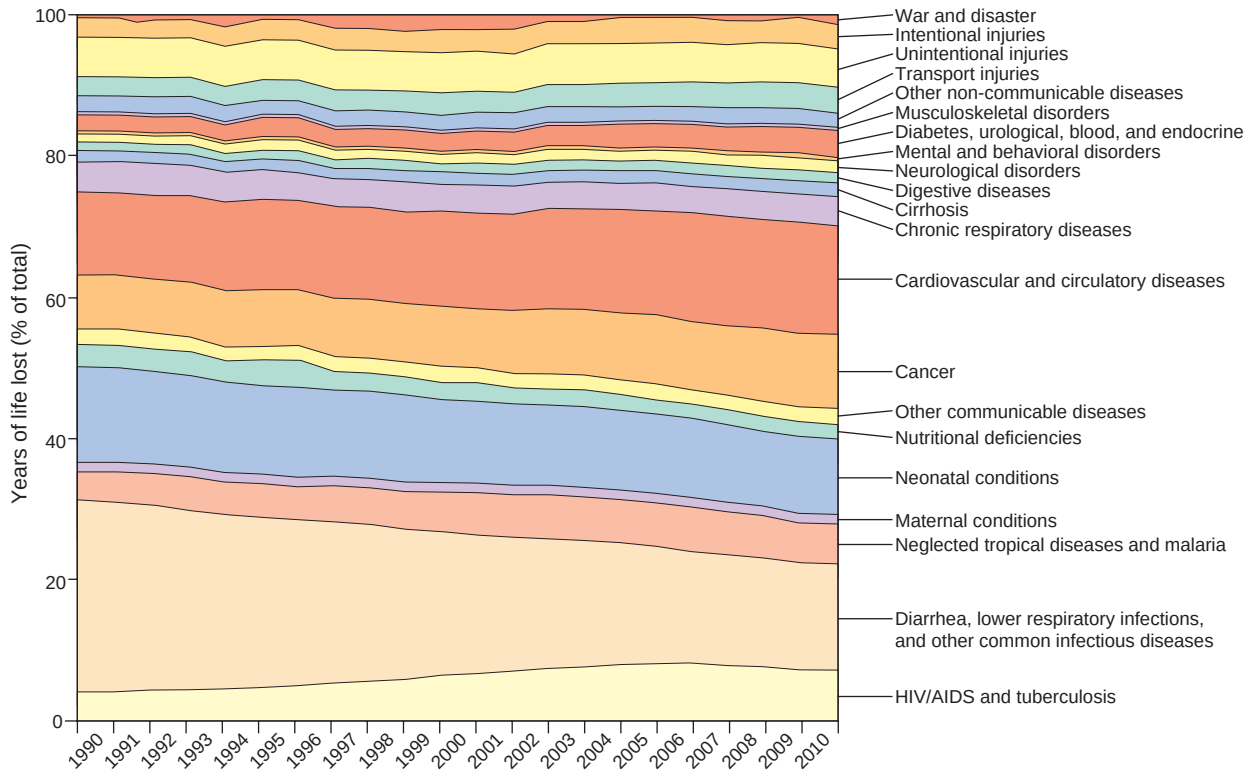

Figure 9-1 The changing global burden of disease, 1990-2010. Estimated percentage of years of life lost to diseases, accidents, war, and disaster is shown for this 20-year period.

www.PTools.ir