Chapter 1

Introduction:
The Environment at Risk
By the end of this chapter the reader will be able to:

• Describe how environmental health problems influence our lives
• Describe the potential impacts of population growth upon the environment
• State a definition of the term *environmental health*
• List at least five major events in the history of environmental health
• Identify current issues in the environmental health field
• Describe employment opportunities in the environmental health field
Maintaining environmental quality is a pressing task for the 21st century.
Healthy People 2010 Goals

• Goal Number 8, Environmental Health: “Promote health for all through a healthy environment.”
• Goal Number 8 Objectives include:
  – Outdoor Air Quality
  – Water Quality
  – Toxics and Wastes
  – Healthy Homes & Healthy Communities
  – Infrastructure and Surveillance
  – Global Environmental Health
Environmental Health Threats

- Trash that fouls our beaches
- Hazardous wastes (including radioactive wastes) leaching from disposal sites
- Continuing episodes of air pollution in some areas
- Exposures to toxic chemicals
- Destruction of the land through deforestation
Population and Environment: The Three P’s

- Pollution
- Population
- Poverty

Principal Determinants of Health Worldwide
Pollution

• Combustion of fossil fuels (e.g., petroleum and coal) that disperse greenhouse gases into atmosphere may cause
  ✓ Global warming
  ✓ Change in distribution of insect vectors
Overpopulation in developing nations is leading to the human population exceeding the carrying capacity of the planet.

– World population of 10-12 billion during 21st century?
– Related to urban crowding
Infectious disease epidemics: A consequence of crowding?

- Avian influenza A (H5N1) virus: outbreaks on poultry farms in Asia
  - Health officials were concerned that the virus might mutate, enabling human-to-human transmission and a resulting pandemic
- Swine flu (H1N1 influenza): spread through North America to other parts of the globe.
  - The WHO declared a pandemic.
Swine Flu (H1N1 2009 Virus)

- Concern that a large proportion of the population might be susceptible to infection with the virus.
- Seasonal influenza vaccine H1N1 strain might not provide protection.
- During the summer and fall months of 2009, influenza activity peaked.
- Week ending October 24, 2009—49 of 50 states reported geographically widespread disease.
- Worldwide (as of 31 January 2010) more than 209 countries and overseas territories or communities reported laboratory confirmed cases of pandemic influenza H1N1 2009, including at least 15174 deaths.
Poverty

• Linked to population growth
• One of the well-recognized determinants of adverse health outcomes
Significance of the Environment for Human Health

• Exposure to potentially hazardous agents accounts for many of the forms of environmentally associated morbidity and mortality.

• Examples of hazardous agents are:
  – Microbes
  – Toxic chemicals and metals
  – Pesticides
  – Ionizing radiation
Scope of Environmental Health Problems

• Environmental factors are thought to contribute significantly to many forms of chronic disease such as cancer, including cervical cancer, prostate cancer, and breast cancer.
Scope of Environmental Health Problems (continued)

- Large proportion of the burden of disease associated with environmental sources
- Prevalence of and mortality from asthma in the U.S. have increased since 1980 by 58% and 78%, respectively.
- High percentage of U.S. children with elevated blood lead levels
- Degrading air quality worldwide
Environmental Risk Transition

- Changes in environmental risks that happen as a consequence of economic development in the less developed regions of the world.
- Before transition occurs, poor quality of:
  - Food
  - Air
  - Water
After transition, a new set of environmental problems take hold. Examples include release of:

- Acid rain precursors
- Ozone-depleting chemicals
- Greenhouse gases
Population Growth

- Increasing at an exponential rate
- Threatens to overwhelm available resources
- May cause periodic food scarcity and famine in some areas of the world.
Causes of Population Growth

- Increases in fertility
- Reductions in mortality
- Migration
Trends in Population Growth

• As of June 1999, 6 billion people inhabited our planet.
• From 1931 to 1974 (a 43-year interval), the earth’s population doubled and is projected to double again during approximately the same interval (1974 to 2018).
Population Dynamics

• Refers to the ever-changing interrelationships among the set of variables that influence the demographic makeup of populations as well as the variables that influence the growth and decline of population sizes.
Fertility

- A measure of fertility is the *total fertility rate (TFR)*, which indicates how many births a woman would have by the end of her reproductive life.
- In the U.S., the fertility rate fluctuates from around 2.0 to 2.1 births per woman; the natural population replacement rate is estimated to be 2.1.
Fertility Trends

• U.S., Canada, Japan, South Korea, Thailand, China, and many European countries are at or below the replacement rate for fertility.
• Many Asian, Latin American, and African countries have a fertility rate of 4.0 births per woman.
Demographic Transition

• Refers to alterations over time in a population’s fertility, mortality, and make-up.
• Developed societies have progressed through three stages that have affected their age and sex distributions.
The Three Stages of Demographic Transition

**Stage 1:** Population mostly young, and fertility and mortality rates are high. Overall, the population remains small.

**Stage 2:** Mortality rates drop and fertility rates remain high. There is a rapid increase in population, particularly among the younger age groups.

**Stage 3:** Fertility rates drop and cause a more even distribution of the population according to age and sex.
Figure 1-5 The demographic transition in three stages of age and sex composition: stage 1 (left), stage 2 (middle), and stage 3 (right).

Epidemiologic Transition

• Describes a shift in the pattern of morbidity and mortality from causes related primarily to infectious and communicable diseases to causes associated with chronic, degenerative diseases.
Examples of Epidemiologic Transition

- Chronic, degenerative diseases include cardiovascular diseases, cancer, neuro-psychiatric conditions, and injuries; these conditions are becoming the major causes of disability and premature death in many nations.
Consequences of Population Increases

- Urbanization
- Overtaxing carrying capacity
- Food insecurity
- Loss of biodiversity
Urbanization

• Worldwide, the proportion of urban residents has increased from about 5% in 1800 to 50% in 2000 and is expected to reach about 66% by 2030.
Factors that Lead to Urbanization

- Industrialization
- Food availability
- Employment opportunities
- Lifestyle considerations
- Escape from political conflict
Hazards of the Urban Environment

1. Biological pathogens or pollutants including pathogenic agents and their vectors (and reservoirs)

2. Chemical pollutants including those added to the environment by human activities (e.g., industrial wastes) and chemical agents present in the environment independent of human activities
More Hazards of the Urban Environment

3. Reduced availability, increased cost, and lowered quality of natural resources on which human health depends—e.g., food, water and fuel.

4. Physical hazards (e.g., high risk of flooding in houses and settlements built on floodplains or of mud slides or landslides for houses on slopes)
5. Aspects of the built environment with negative consequences on physical or psychosocial health (e.g., overcrowding; inadequate protection against noise; inadequate provision of infrastructure, services, and common areas).
More Hazards of the Urban Environment

6. Natural resource degradation (e.g., of soil and water quality)

7. National/global environmental degradation with more indirect but long-term influences on human health
Carrying Capacity

• The population that an area will support without undergoing environmental deterioration

• The carrying capacity of an environment tends to limit population size.

• Food availability, reproductive behavior, and infectious diseases tend to keep animal populations in check.
Population Crashes

• If components of the human life support system are disrupted by overpopulation of the planet, the species *Homo sapiens* could suffer a population crash.
Key Terms and Definitions

• Environment
• Ecological model
• Ecological system (ecosystem)
• Environmental health
Environment

• Refers to “. . . the complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival.”
The Ecological Model

- Proposes that the determinants of health (environmental, biological, and behavioral) interact and are interlinked over the life course of individuals.
Figure 1-8

The ecological model of population health.

Ecosystem

• “An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit.”
  – Millennium Ecosystem Assessment, 2003
Environmental Health

• “...addresses all the physical, chemical, and biological factors external to the person, and all the related factors impacting behaviours.”

• Encompasses control of environmental factors

• Aims to prevent disease
  – Source: World Health Organization
Historical Background

• Ancient history
  – Greeks (Hippocrates)
  – Romans
• Occupational health contributions
• Post 1800 period
• Current “hot topics”
Hippocrates

- Hippocrates, a Greek philosopher who lived between 460 and 370 BC, often is referred to as “the father of medicine.” He emphasized the role of the environment as an influence on people’s health and health status in his work titled *On Airs, Waters, and Places* (ca. 400 BC).
Hippocrates (continued)

- Proposed that environmental and climatic factors such as the weather, seasons, and prevailing winds; the quality of air, water, and food; and one’s geographic location were influential in causing changes in human health.
Current Hot Topics

- Environmental justice
- Global climate change
- Nuclear power
- Pesticides and herbicides
- War and terrorism
Careers in Environmental Health

- Industrial Hygienist:
  - Responsible for control of hazards that may affect workers as well as hazards that may impact the community.
More Careers in Environmental Health

• Toxicologist:
  – The field of environmental toxicology specializes in the effects of toxic chemicals upon the environment and living creatures such as human beings and wildlife. Occupational and industrial toxicologists investigate the effects of chemicals found in the workplace upon the health of workers.
More Careers in Environmental Health

• Environmental Health Inspector:
  – Responsible for monitoring and enforcing government regulations for environmental quality.
More Careers in Environmental Health

• Occupational Health Physician/Occupational Health Nurse:
  – Involved with the prevention and treatment of occupationally related illnesses and injuries
  – Investigate hazards in the work environment
  – Develop procedures for abatement of hazards
  – Conduct health education programs