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Public Health in East and Southeast Asia: Challenges and Opportunities in the Twenty-First Century

### Permalink

<https://escholarship.org/uc/item/6354g2xv>

### ISBN

978-1938169-00-7

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### Publication Date

2012-06-01

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PUBLIC HEALTH IN EAST  
AND SOUTHEAST ASIA

Challenges and Opportunities in the  
Twenty-First Century



edited by  
**ROGER DETELS**  
**SHEENA G. SULLIVAN**  
**CHORH CHUAN TAN**

# Public Health in East and Southeast Asia

## Challenges and Opportunities in the Twenty-First Century

Edited by Roger Detels, Sheena G. Sullivan, and Chorh Chuan Tan

*Published in association with the University of California Press*

“This volume is unique in its comprehensive investigation of the changing face of public health in East and Southeast Asia. The region’s countries have experienced major challenges resulting from colonialism, conflicts, economic and

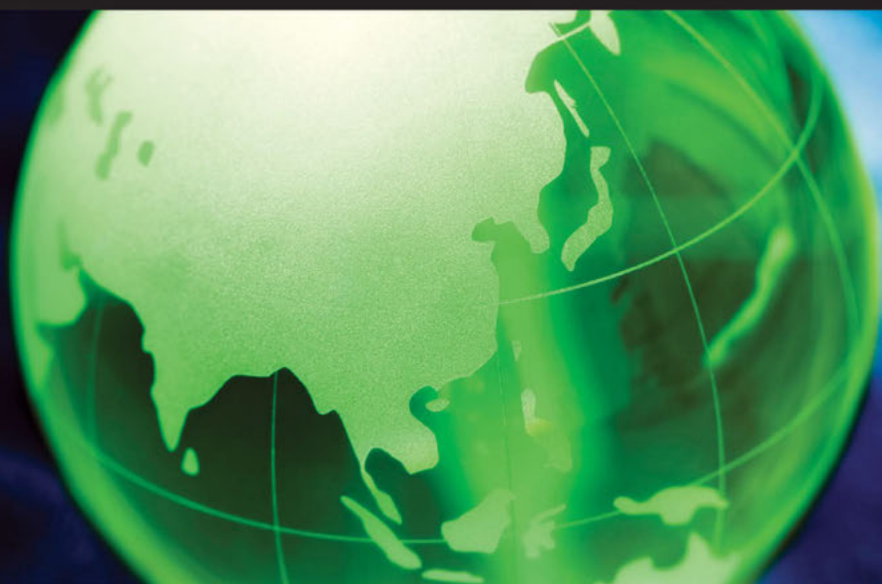
technological development, varying levels of government stability, widening disparities between social classes, uneven distribution of wealth, emerging epidemics, chronic diseases, occupational hazards, and changing health services. All of these issues are ably addressed by the authors, firsthand experts in their respective countries and fields. With its useful summaries and wealth of international sources, it will be an excellent resource for scholars and practitioners seeking an introduction to the region’s complex context and development.” **CHITR SITTHI-AMORN**, former president, International Epidemiological Association

**ROGER DETELS** is Distinguished Professor of Epidemiology and Infectious Diseases and former Dean of the School of Public Health at the University of California, Los Angeles. He is a former president of the International Epidemiological Association. **SHEENA G. SULLIVAN** is an epidemiologist at the WHO Collaborating Centre for Reference and Research on Influenza and was previously with the Chinese Center for Disease Control and Prevention. **CHORH CHUAN TAN** is President of the National University of Singapore and was previously the Director of Medical Services in Singapore’s Ministry of Health, in which capacity he was responsible for the medical response to the SARS epidemic in 2003.

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# PUBLIC HEALTH IN EAST AND SOUTHEAST ASIA

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Twenty-First Century



edited by  
**ROGER DETELS**  
**SHEENA G. SULLIVAN**  
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*Public Health in East and Southeast Asia*



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SHEENA G. SULLIVAN

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University of California Press  
Berkeley and Los Angeles, California

University of California Press, Ltd.  
London, England

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Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress.

Manufactured in the United States of America

21 20 19 18 17 16 15 14 13 12  
10 9 8 7 6 5 4 3 2 1

The paper used in this publication meets the minimum requirements of ANSI/NISO Z39.48-1992 (R 1997) (*Permanence of Paper*).

*For Mimi, in gratitude for more than forty-eight years of loyalty, perseverance, and fabulous salads—R.D.*

*To my daughter, Darani, born with this book—S.G.S.*

*To my mother, Ngee Khoon, who lived life fully with zest and humour—T.C.C.*





# Contents

1.	Introduction	1
	<i>Roger Detels, Sheena G. Sullivan, and Chorh Chuan Tan</i>	
2.	Changes in Social Values and Lifestyles	5
	<i>William Lavelly</i>	
3.	Emerging Infectious Diseases in East and Southeast Asia	43
	<i>Rajesh Bhatia, Jai P. Narain, and Samlee Plianbangchang</i>	
4.	Nutrition	79
	<i>Pattanee Winichagoon and Kraissid Tontisirin</i>	
5.	Tobacco	111
	<i>Sarah M. McGhee, Tai Hing Lam, and Anthony J. Hedley</i>	
6.	Chronic Disease	132
	<i>Thomas Tsang, Ting Hung Leung, Lilian W. C. Wan, Binh Y. Goldstein, Donald Maxwell Parkin, Zuo-Feng Zhang, Ee Heok Kua, and Sunbaunat Ka</i>	
7.	Accidents and Injuries	190
	<i>Wen-Ta Chiu, Lu Pai, and Shin-Han Tsai</i>	
8.	Environmental Issues in East and Southeast Asia	213
	<i>Chien-Jen Chen and Ling-I Hsu</i>	
9.	Occupational Health	238
	<i>Judy Sng and David Koh</i>	
10.	Economic Globalization and Public Health in Asia	259
	<i>Elizabeth A. Jahncke, Saumik Paul, Ramkishen S. Rajan, and Adeline Seow</i>	

11.	Health Services	283
	<i>U Than Sein and Kumnuan Ungchusak</i>	
12.	Opportunities and Challenges	322
	<i>Roger Detels, Sheena G. Sullivan, and Chorh Chuan Tan</i>	
	<i>Contributors</i>	331
	<i>Index</i>	335

# 1 Introduction

Roger Detels, Sheena G. Sullivan, and Chorh Chuan Tan

The twentieth century was a time of catastrophic turmoil, conflict, and progress. Most of the countries of Southeast Asia emerged from being colonies of European powers to become independent countries. However, this transition was a difficult one and, in some countries, was marked initially by the assumption of power by charismatic, but often not benevolent, leaders. Many of the countries experienced internal conflicts between ideologies and rival factions. By the latter part of the century, however, most of these conflicts had been resolved. Democratic forms of government developed, boundaries between countries became solidified, and the majority of the countries in the region experienced dramatic economic growth. However, the history and varied development of the countries of Southeast Asia mean that the current public health situation, challenges, and outcomes also vary substantially throughout the region.

Following the devastation of World War II, most of the countries of East Asia successfully industrialized, although at great cost to their environment. Commensurate with rapid industrialization and development, they have generally been able to invest more in their public health infrastructure than have other parts of Asia.

Most East and Southeast Asian countries have placed a singular focus on economic development. In this regard, globalization has been a key and generally positive driver, leading to massive increases in trade, investments, and the major development of manufacturing capacity in Asia (chapters 2, 10). These have, in turn, intensified the pace of urbanization, with mass movements of rural residents to urban areas to meet the demands of industrialization (chapter 2). However, development has also been accompanied by ever-widening disparities between the rich and the poor. Overall health has improved, with increases in life expectancy and

improvements in child health, but new health problems have emerged. Poorer countries have suffered from what has been termed the epidemiologic transition, experiencing the worst public health problems of both worlds, developed and developing. This refers to the coexistence within the same country of very substantial burdens of both noncommunicable and infectious diseases.

By the beginning of the twenty-first century, the majority of noncommunicable chronic diseases were occurring in developing countries, often without sufficient infrastructure to adequately treat them (chapter 6, 11). Changes in diet and lifestyle that have come with urbanization and development have been accompanied by increases in overweight and obesity and their associated conditions, such as diabetes, heart disease, and cancer, although undernutrition persists in some populations (chapters 4, 6). Asia's development has also been characterized by increased adoption of other unhealthy lifestyle factors, such as increased rates of smoking and alcohol and drug consumption, with few public health interventions to minimize the associated harms (chapters 2, 5, 11). This has caused a rising burden on health systems, which are often unable to cope effectively with the increased demands on them (chapter 11). An area in dire need of better infrastructure is support for mental health, which is grossly underserved and may even be exacerbated by the rapid development and changing lifestyles common in the region (chapters 6, 11). Economic development has also led to increased motor vehicle ownership, which in turn has been associated with increases in the rates of accidents and injuries (chapter 7) as well as contributing, together with rapid industrial growth, to ever-worsening air pollution (chapter 8). Injuries are also increasing in workplaces, as are occupational diseases, and few countries of the region have adequate safety measures to protect the health of workers; where they do, enforcement is often lax (chapter 9).

Although public health interventions have led to eradication or control of several infectious diseases, many still pose serious problems (chapters 3, 11). Some are perpetuated by persisting inadequate environmental controls, resulting in poor water safety and sanitation as well as rising air pollution (chapter 8). Southeast Asia and China have also become centers for emerging diseases, such as severe acute respiratory syndrome (SARS) and influenza (H1N1 and H5N1), and the reemergence of previously controlled infectious diseases, including malaria, tuberculosis, and sexually transmitted infections (chapters 3, 11). The health systems of many countries are ill equipped to deal with both long-standing and emerging communicable diseases while coping with the rise in noncommunicable diseases.

An adequate response requires substantial cooperation and support from other sectors of the government and the community to implement effective controls for all these diseases (chapter 11).

The intention of this book is to document the status and scope of public health in East and Southeast Asia (see figure 1.1) as we enter the twenty-first century and to consider the opportunities and challenges to public health and “health for all” in the region in the new millennium. To this end, the leaders and experts of the region have contributed chapters covering a range of public health issues of greatest relevance and significance for the peoples of this important and rapidly developing part of the world. The intended audience includes non-public-health Asian and Southeast Asian scholars, health professionals with an interest in the region, and individuals wishing to have an understanding of the changing context and development of public health in East and Southeast Asia. It should also be a useful introduction for students and public health professionals interested in contributing to health and public health in the area.



Figure 1.1. Localities included in this book.

## 2 Changes in Social Values and Lifestyles

William Lively

Despite their distinctive histories and cultural diversity, Asian nations are on a common developmental continuum, from traditional rural to modern urban-industrial societies. Virtually all have experienced, or are experiencing, urbanization, industrialization, increasing life expectancies, declining fertility, rising educational levels, a movement of women into the non-family labor force, and an unprecedented opening to international flows of people, goods, and ideas. With these social forces have come novel trends in social values and behaviors that include more equal gender roles, declining rates of marriage, weakening extended-family ties, relaxed sexual mores, and rising hedonism and consumerism. While traditional public health problems such as epidemic disease, sanitation, and malnutrition persist, diseases of affluence and modernity are on the rise. The continuing health transition will bring rising sensitivity to health risk, public demand for safer environments, and a readiness to change behaviors to achieve longer lives and better health.

### INTRODUCTION

For the analyst of social change, Asia is a region of obvious and discouraging diversity. Its constituent countries differ by size and natural endowments, family systems and religious traditions, political histories and incorporation into the world economic system—differences that have influenced their distinctive developmental histories. Japan industrialized early and began a fertility decline in the 1930s. Japan and the Asian “tigers”—Taiwan, RO Korea, Hong Kong, and Singapore—pioneered export-led growth in the 1960s and 1970s, a path followed two decades later by market-oriented Communist reformers in China and Vietnam.



China's Communist government orchestrated a rapid health transition after 1949, and after 1970 it engineered a rapid fertility decline. Size matters. City-states such as Hong Kong and Singapore and compact peninsulas and islands such as RO Korea and Taiwan are wholly or largely urbanized, whereas a subcontinental area such as China encompasses great conurbations as well as vast rural areas. Some states, most notably DPR Korea and Myanmar, intentionally cultivating isolation and autarky, have remained relatively distant from global economic and cultural influences.

To generalize about social change across East and Southeast Asia thus requires a determined focus on broad patterns of change along with a steadfast resolve to ignore the intricacies of national and subnational histories and cultures. Yet the complexity and specificity of these histories recede in importance when one views the record of macrosocial and economic change across broader spans of space and time. In the past half century, major demographic and economic forces have been at work across much of the non-Western world, namely, industrialization, urbanization, and rising affluence; the improvements in survival and declines in fertility sometimes encapsulated as "demographic transition"; and the expansion of international trade and revolution in communications technologies, latterly dubbed "globalization." These forces and their effects have been mediated by national characteristics, historical experiences, and state policies and thus are neither homogeneous nor synchronous, either across or within countries. Yet they plot a broadly similar evolutionary path.

Consider the revolution in health that has swept Asia in the past century, mainly in the past 50 years. Average life expectancy at birth has climbed rapidly in virtually every country. Figure 2.1 portrays the rise in life expectancy for 12 Asian countries, arrayed in order of life expectancy in the year 2000. Unique in the region, Japan's mortality transition began early. Life expectancy was already nearly 70 years by 1960 and continued to rise. However, all of Asia enjoyed rising survival in the period, and most converged at life expectancies of 70 or above. Even the countries with the least improvement in the period, Laos, Myanmar, and Cambodia, are part of the broader trend.

A fertility transition has also swept the region, as illustrated in figure 2.2. Fertility has fallen broadly across Asia and is converging on low levels. No longer do women expect to bear six or more children in a lifetime. Japan began the transition to low fertility decades earlier than the rest of Asia, attaining a total fertility rate of two children per woman by 1960. Most other countries began a sustained decline of fertility in the 1960s, with the notable exception of China and Vietnam, where the decline

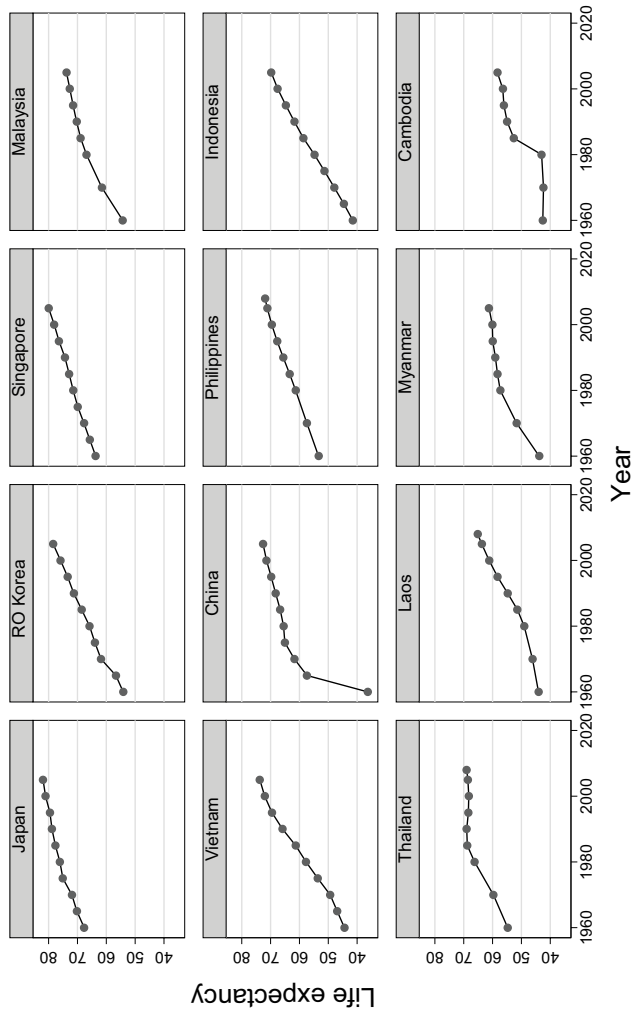


Figure 2.1. Life expectancy in Asia, 1960–2005. Source: World Bank, 2010.

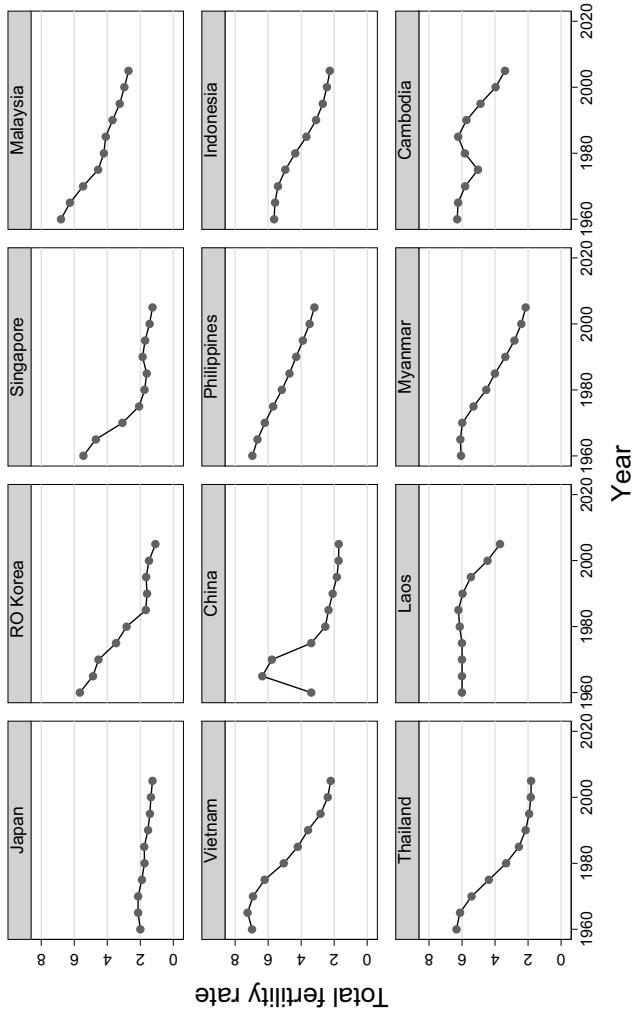


Figure 2.2. Total fertility in Asia, 1960–2005; Source: World Bank, 2010.

began a decade later. Only in Laos and Cambodia was the onset of decline retarded until the late 1980s. RO Korea's total fertility rate of 1.17 in 2005 is comparable to the lowest fertility levels of Europe. China, Thailand, and Vietnam have also attained fertility at below replacement level, while Indonesia and Malaysia are close to replacement level.

These revolutions in health and reproduction have occurred against a backdrop of rapid economic transformation. Only a few decades ago, the average citizen of Asia gained a living by tilling the soil; by the end of the twentieth century, most Asians resided in towns and cities. Urbanization is a region-wide trend, as may be seen in figure 2.3. Japan's urban-industrial revolution began in the nineteenth century, but for much of Asia it began in the latter half of the twentieth. The nations of mainland Southeast Asia have yet to join these ranks, but the trend is clear. Rural-to-urban migration accounts for a major portion of the urbanizing trend. Asia is in a period of unprecedented mobility. A 2009 official estimate for China puts approximately 145 million rural migrants away from their home townships for 6 months or more (Chan, 2010). As of 2000, according to a UN estimate, there were approximately 50 million international migrants in Asia (Asis, 2005).

Incomes have risen rapidly as well. Average income varies tremendously across, as well as within, nations. Japan is hugely wealthy compared with its neighbors. Its gross national income per capita in 2006 stood at US\$32,840, compared with US\$7,440 in Thailand and US\$1,550 in Cambodia (WHO, 2010). While Japan's rise in income has leveled off in recent decades, elsewhere in the region incomes have grown without exception, as may be seen in figure 2.4. Plots of the log of income facilitate comparison of rates of change. The plots reveal rapid rises across Asia, and rising incomes can also be observed in the poorest nations.

Along with these trends has come a revolution in telecommunications. Asians are awash in information and entertainment delivered via radio and television, much of it originating abroad. Except in DPR Korea, Myanmar, Laos, and Cambodia, television is now a standard household appliance. Thanks to the economics of mobile communications, many countries now have more mobile phones than landlines. In China, for example, mobile phone subscriptions grew from 7 per 100 persons in 2000 to 41 per 100 in 2007 (World Bank, 2010). Internet usage also grew explosively, although Laos, Myanmar, and Cambodia have been slower to adopt this new technology, and in DPR Korea usage is strictly controlled.

By placing the countries of Asia on a continuum of economic, social, and demographic transformation, and by stressing a set of common demographic, macroeconomic, and technological phenomena that are trans-

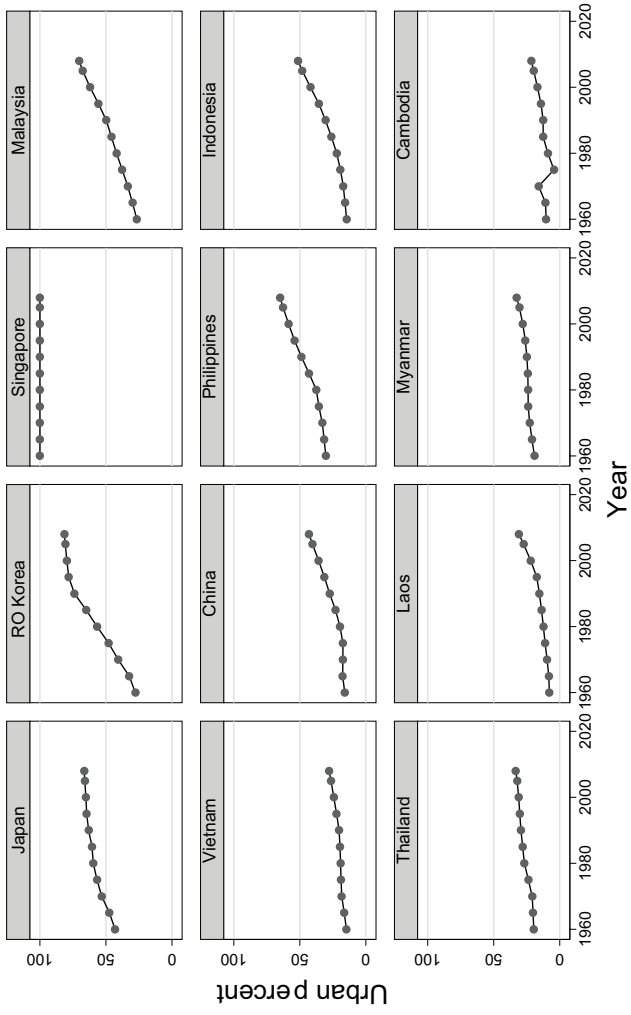


Figure 2.3. Proportion of the population living in urban areas, 1960–2005. Source: World Bank, 2010.

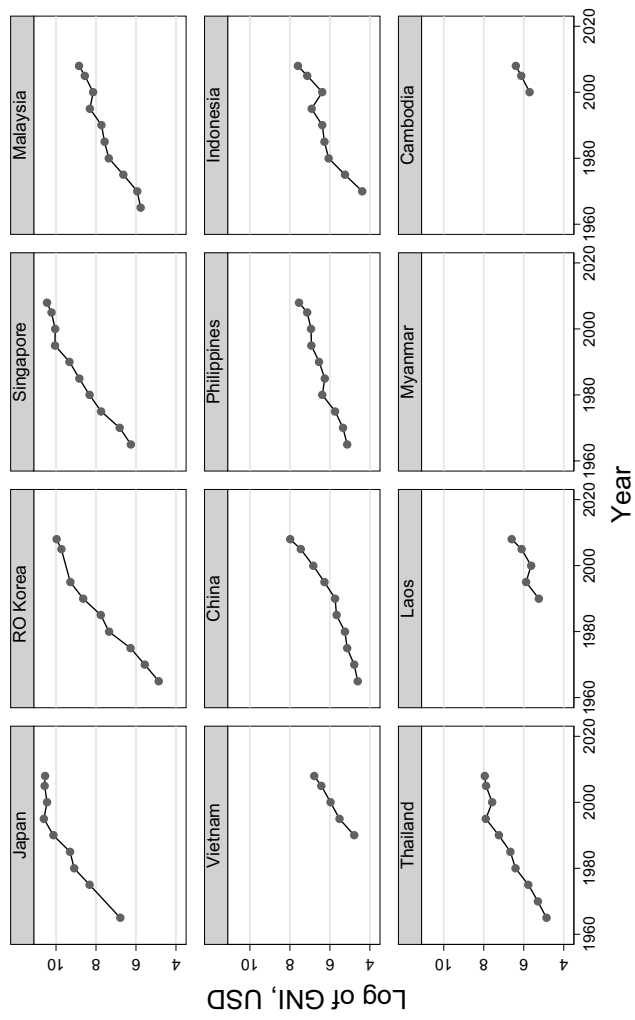


Figure 2.4. Log of GNI, 1960–2005. Source: World Bank, 2010.

forming these societies, we are adopting the perspective of modernization theory and the related concepts of demographic transition, epidemiological transition, and health transition. These are theories of social change induced by economic and technological innovation and the diffusion of ideas and models of behavior. They describe the transformation of social structure, culture, and behavior in the transition from “traditional” agrarian societies into “modern” urban-industrial societies. At a general level, these conceptions imply a tendency for convergence across societies, more rapid change in societies that begin the process later, and, with the spread of communication technologies, a general acceleration of cultural change.

This lofty perspective at once ignores specific developmental histories and implies that these broad trends are universal and unidirectional. Such blatant optimism and simplification facilitates the analytic task at hand. Economy and health obviously do not improve unceasingly: Vietnam endured decades of war; Cambodia, war and genocide. Still, while these events dented the record of progress, they did not notably alter overall trajectories in life expectancy viewed in decadal scale. Asia has been fortunate. The past half century has been an unusual period of rising prosperity and advances in health; it would be foolish to assume that a global or regional catastrophe could never put an end to it (Smil, 2005). Yet, looking ahead to the next half century, it would also be risky to assume that the era of progress is over.

The foregoing account is oversimplified in another way—its use of national averages that conceal within-country variability. This is a particularly egregious problem in the case of China, which accounts for over two-thirds of the population of the Asian region considered here; individual Chinese provinces in some cases exceed the populations of even sizable neighbors such as RO Korea, Thailand, and Myanmar. These large populations encompass a wide range of socioeconomic variability. Table 2.1 juxtaposes the distribution of life expectancy across Asian countries with that of China’s provinces and county-level units. The municipalities of Beijing and Shanghai rank with Taiwan, Singapore, and RO Korea in life expectancy. Most Chinese provinces are in the same category as Malaysia and Vietnam, at 70–74 years. Several others rank with the Philippines, Thailand, and Indonesia at 65–69; and one, Tibet, ranks with Laos and Myanmar at 60–64. Provincial averages conceal still more variability. A handful of Chinese urban districts have life expectancy above 80 years, while some rural counties have a life expectancy at birth of less than 60. Thus, on a continuum of health, the range separating China’s urban cores and remote peripheries is similar to that separating Japan and Cambodia.

TABLE 2.1 Life Expectancy at Birth by Asian Country, Chinese Province, and Chinese County-Level Unit, 2000

<i>Life expectancy at birth (E<sub>0</sub>) (years)</i>	<i>Countries</i>	<i>Chinese provinces</i>	<i>Chinese county-level units (N = 2,870)</i>
> 80	Japan	. . .	14
75–79	Singapore, RO Korea	Shanghai, Beijing, Taiwan	605
70–74	Malaysia, Vietnam, China	Zhejiang, 20 others	1,581
65–69	Philippines, Thailand, Indonesia	Inner Mongolia, 6 others	518
60–64	Laos, Myanmar	Tibet	123
< 60	Cambodia	. . .	29

SOURCES: World Bank, 2010; China NBS, 2002; for Taiwan—US Census Bureau, Population Division, 2010; for Chinese counties—Cai, 2005.

#### HEALTH TRANSITION AND MENTALITY

Mentality and health are intimately related. The connection is evident in this contemporary account of rural China in the early 1930s:

In the Kiangyin Registration Area, as in practically the whole of China, the conditions are quite favorable to the spread of disease. There is no sanitary sewage system, the garbage is generally thrown in front of the door, unsanitary open toilets are near the house, coffins with corpses are often unburied, being set on the ground near the dwelling. Houses are crowded, dirty, and badly ventilated. . . . The most common diseases are malaria, dysentery, tuberculosis, measles, influenza, cholera, diphtheria, and meningitis. The people are very ignorant, conservative, and superstitious in health matters. For instance, they do not believe that dysentery is caused by eating filthy food and drinking unboiled water, or that malaria is caused by the bite of a certain kind of infected mosquito. They believe that “life and death are destined five hundred years ago.” (Chiao et al., 1938: 49)

Ignorance and fatalism are clearly inimical to health, but the linkages between mentality and health are complex and generally not so obvious. Ideological and cultural change do not merely influence health-related behavior; they define and redefine what health is. “Health transition” is



a useful concept for understanding the influence of mentality and culture on health. The term “links changes in mortality to those in morbidity, or sickness, and to the modern decline of fertility. Thus this phrase associates survival and health with the demographic transition” (Riley, 2001: 6–7). Moreover, health transition “relates to the role that the cultural, social and behavioral determinants of health play in rising life expectancy at birth (mortality transition) and the decreasing proportion of all deaths caused by infectious diseases (the epidemiological transition)” (Johansson, 1991: 39).

The work of John C. Caldwell, a foremost developer of the concept, illustrates the ways in which belief systems encourage or deter the use of scientific cures. In his study of rural Karnataka, Caldwell argues that mortality decline is fundamentally connected not with the conditions of medicine and delivery systems but with profound changes in the nature of society. He describes how religious beliefs cause people to view their symptoms as moral rather than medical problems, thus impeding them from seeking medical care. Modern medical services can make little headway if prospective clients do not believe in their efficaciousness, or as Caldwell puts it, “the progress of modern medicine is even more a matter of demand than supply” (Caldwell et al., 1988).

Modern ideas are particularly important for improving child survival. Maternal education has a powerful influence on infant survival in developing country settings. Less educated mothers are fatalistic and more likely to resort to ineffectual or magical cures; educated women may know more about medical resources and how to access them and may be able to provide better nutrition at the same cost (Caldwell, 1976). Above all, education alters a woman’s outlook and roles in the family. An educated woman is more able to make decisions affecting the health of her children, such as when to take a child to the doctor, and is better able to allocate household resources to her children for nutrition and medical care.

Caldwell (1976) argues that women’s education precipitates changes in family relations that give rise to a more child-centered household. He envisioned an ideal type of the traditional extended family, characterized as a patrilineal, patriarchal, age- and gender-graded hierarchy, in which the younger generation serves the elder, in which a man has stronger emotional ties to his parents and kinsmen than to his wife, and in which a young mother has little power to make decisions about her own children. Modernizing influences, including nonfamilial employment, education, and Western models of family life, corrode traditional family ideology and cause the conjugal unit to emerge as a child-centered, companionate

marriage, a process Caldwell dubs “emotional nucleation.” As a result, “resource flows” increasingly go to children, and women gain autonomy, which empowers them to act on behalf of their children.

Demographic factors influence mentality, which in turn influences behavior. For example, high child mortality fosters parental detachment from children. In the early modern era of Europe, at least a third of children died before their fifth birthday, and many deaths were due to neglect. Families had several children to ensure that a few would survive. There was less sense of a child as an individual; newborns were often given the names of deceased siblings. Parents had limited psychological involvement with their children, as they could not allow themselves to become attached to something that was a probable loss (Ariès, 1962). Fast-forward to contemporary Asia where the odds of a death before age 5 are around 4 in 100, and far lower in urbanized areas. Demography is now driving attitudes in a new direction. Families of one or two children, whether due to state policy or to broader economic realities, are now the norm. Parents invest heavily in their children, with money and emotion, motivated as much by love and attachment as by expectation of future support (Fong, 2004). Parents are emotionally involved with their children, and child loss or injury is unthinkable. Changing attitudes have produced feedback to child health; the focus on children explains rising demand for pediatric care and a growing sensitivity to environmental hazards and food safety.

Changing norms and attitudes explain much about the incidence of disease, perceptions of risk, and new demands for health care. In the process of health transition, *sickness* undergoes continuous redefinition. Rising sensitivity to symptoms explains the paradoxical observation that in the course of transition from high to low mortality, observed levels of morbidity rise. Johansson (1991) provides a lucid account of this process, which she calls the “cultural inflation of morbidity.” She describes an objective “health continuum” running from near biological collapse to perfect well-being. The breakpoint in this continuum dividing the sick from the healthy is culturally determined. Modernized societies divide the health continuum differently than pretransition societies, moving the breakpoint “sick” from near-death states to suboptimal biological states that merely indicate the lack of perfect health. She notes that this shifting breakpoint is exemplified in the official definition of health adopted by the WHO, which “has committed itself to the position that health is a state of complete physical, mental, and social well-being, not merely absence of disease or infirmity” (Johansson, 1991: 51).

## DEMOGRAPHIC AND FAMILY CHANGE

Asia was until quite recently a family-centered world. Women could expect to marry early, bear many children, and have a family life largely ordered and circumscribed by relations with extended kin. For most Asians this world is no longer. Women marry later, bear one or two children, and have a family life more focused on spouse and children than on parents and in-laws. These changes reflect a profound ideological transformation with far-reaching implications for demography and public health.

In a broad sense this transformation accords well with the predictions of theorists such as William Goode (1963), who nearly five decades ago saw the developing world converging on the conjugal family, with the most important characteristic “the relative exclusion of a wide range of affinal and blood relatives from its every day affairs.” Moreover, late marriage and very low fertility in Asia sufficiently resemble contemporary European norms that one must ask whether this represents a “second demographic transition” reflecting an emerging postmaterialist, secular, and antiauthoritarian world view (Lesthaeghe & Neidert, 2006). The answer is probably no, or at least not yet. A closer view of the Asian family reveals distinctive elements that suggest limits to the convergence paradigm.

### *Low Fertility*

Given that fertility in Asia began to decline six or more decades later than in Europe, it is astonishing that their fertility rates are now very similar. Table 2.2 shows the total fertility rate circa 2005 for major Asian countries, arrayed in reverse order of fertility. Japan, Singapore, and China have rates comparable to those in Western Europe, such as in Germany (1.33), Italy (1.33), or Spain (1.35). RO Korea at 1.17 has a total fertility rate comparable to the lowest of Eastern Europe, such as Poland (1.15), Belarus (1.21), or Slovakia (1.26). Most countries of the region now have below-replacement fertility (approximately 2.1 children in low-mortality populations). Malaysia and Indonesia are close to replacement level, and only some Southeast Asian populations still have a total fertility rate at three children or above. Declining fertility has been the result of family planning programs, as well as the changing status of women and delays in marriage, discussed below.

### *The Decline of Marriage*

A prime cause of very low fertility is the Asian retreat from marriage. Only a few decades ago, women generally married soon after puberty, and

TABLE 2.2 Total Fertility Rate, circa 2005, and Percentage of Population Age 60 Years or Over, 2009 and 2050

	TFR <sup>a</sup> 2005	Population age 60 years or over (%)	
		2009	2050
RO Korea	1.17	15	41
Japan	1.27	30	44
Singapore	1.32	15	40
China	1.38	12	31
Thailand	1.89	11	26
DPR Korea	2.03	14	25
Vietnam	2.07	9	27
Myanmar	2.14	8	24
Malaysia	2.43	8	22
Indonesia	2.59	9	25
Cambodia	3.43	6	16
Philippines	3.58	7	18
Laos	4.55	5	14

SOURCES: For TFR except Myanmar—UNDESA, 2009a; for Myanmar—World Bank, 2010; for percentage 60 and over—UNDESA, 2010.

<sup>a</sup>TFR = total fertility rate.

nonmarriage was unusual; now, late marriage is the norm for both men and women and singlehood is common. A review of marriage practices in Asia revealed that in Japan, half the population age 25–34 has never married, and high rates of singlehood are typical of this age group in most of the populations of East and Southeast Asia that were included in the survey, with the notable exception of China (see table 2.3). While many young singles will marry eventually, 15% or even 20% of women may reach their early 40s—the end of their potential childbearing period—without marrying (Jones, 2007).

“Marriage is a package” (Jones, 2007) with obligations that do not necessarily pertain to Western marriage. These obligations often involve care for the husband’s parents and, increasingly, the woman’s own parents. At the same time, women now expect to work outside the home. In 2004, 74% of Japanese women 35–39, and 59% of women in RO Korea, were labor-

TABLE 2.3 Percentage of Persons Age 25–34 Never Married, by Country, 2000

<i>Country</i>	<i>Never married (%)</i>
China	11
Indonesia	17.9
Thailand	27.5
Malaysia	30.8
Myanmar	33.1
Philippines	33.5
RO Korea	37.6
Singapore	37.7
Taiwan	42.3
Japan	49.1

SOURCE: Jones, 2007, Table 3.

force participants (Jones, 2007). Rising educational levels and employment have raised the opportunity cost of marriage for women; at the same time, market forces have made the economic prospects of men less certain and made marriage with them a less dependable alternative. Hypergamy is the norm across most of Asia: women (and their families) are reluctant to consider a match below their station; this narrows the pool of potential spouses and creates a marriage squeeze for highly educated women in particular. Finally, in Asia, unlike in Europe, marriage without children is considered aberrant. Since it is assumed that a marriage will lead quickly to childbearing, delay of marriage may be a woman's best means to postpone childbearing.

While women are reluctant to marry below their station, nonmarriage among men is largely involuntary. Demographic factors are part of the problem. Fertility declines across Asia have contributed to a "marriage squeeze" for men. As fertility declines, each successive birth cohort is smaller than the one before. Men tend to marry women who are the same age or younger, thus larger cohorts of males seek mates among a smaller cohort of females. The marriage squeeze is further aggravated when underlying sex ratios are skewed by parental sex selection, an important phenomenon in China and, to a lesser degree, RO Korea and Taiwan.

### *Aging Populations*

Low fertility will cause rapid aging of Asian populations. Fertility, far more than mortality, shapes the age structure of a population. Fertility decline is responsible for the proportionate shift of population into the older ages, and more rapid declines produce more rapid aging. The second and third columns of table 2.2 show the proportion of the population age 60 or over in 2009 and the projected proportion in 2050. As may be seen, there is a rough correlation between the contemporary fertility level and the present and future age structure. Japan, which had the earliest fertility decline, now has the highest proportion over 60, about 30%. By 2050, 44% of Japan's population will be over 60. Singapore and RO Korea will not be far behind. China, which now has 12% over 60, will have 31% by midcentury.

Aging will have serious and inevitable macroeconomic and public health effects. In Japan in 2050, barring some major in-migration, there will be only one person in the working ages (15–64) for every person age 65 or above. In RO Korea there will be only two in the working ages for one elderly person, in China only three (UNDESA, 2010). Since the elderly are more prone to disease and chronic conditions that require care, aging will increase health care expenditures. Trends in family change suggest that much of the expense will be shifted to public-financed health services (ESCAP, 2004) but with fewer taxpayers to support them.

### *Intergenerational Relations*

Across Asia, not confined to the Confucian culture area comprising China, Japan, and RO Korea, it was traditionally assumed that elders would reside with adult offspring and be supported by grown children. It is still common for elders to coreside with children, but the norm is weakening. Annual surveys of Japanese women reflect a major change in expectations: in 1950, 65% of women responded that they expected to depend on children in old age; by 1990 this had fallen to 18% (Ogawa & Retherford, 1993). Actual rates of coresidence have in fact dropped. In Japan, elderly coresidence with a child fell from 77% to 52% between 1970 and 1997 (Knodel & Ofstedal, 2002). RO Korea experienced a similar large drop, but in Taiwan and Southeast Asia the coresidence custom has been more persistent. Surveys conducted in the Philippines, Thailand, Taiwan, and Singapore in the mid-1990s show that, among elders who had any living children, over 70% in each country were living with a child in the same household; over 80% lived with a child or adjacent to a child or saw a child daily (Knodel & Ofstedal, 2002).

Relations between parents and adult children are affected by the different institutional arrangements that affect urbanites and rural dwellers. This may be particularly true in urban China where, while there has been some decline in the incidence of coresidence, several studies point to continuing strong ties between generations and the persistence of filial obligations, with much support coming from married daughters (Whyte, 2003). A 1987 survey of nine cities found that 47% of parents age 60 and over resided with a son or daughter (Logan & Bian, 1999). The same survey showed that 44% preferred separate living arrangements. A 1992 survey of 12 provinces found that 53% of urban elderly received instrumental support from children, and 33% received financial support (Zimmer & Kwong, 2003). Urban institutions promote more traditional family relations by providing employment opportunities that keep children in proximity to parents and by providing dwelling units that can be shared with children and passed on to them. Increasingly, urban Chinese parents and adult children prefer proximity over actual coresidence.

Intergenerational relations in rural areas remain more traditional than urban but also more problematic. In rural China, the persistence of filial obligation is suggested by the same 12-province survey that found that 61% of the elderly received instrumental support from children and 44% received financial support (Zimmer & Kwong, 2003). But one ethnographic account of a peripheral village argues that ideological campaigns undermined the ethics of filial piety and communitarian values, while institutional change has deprived rural families of property that was once a binding force. According to this account, rural China has seen a breakdown of intergenerational reciprocity (Yan, 2003). Other rural areas of Asia have not shared China's revolutionary experience but have been affected by the disruptive effects of rural-urban migration. The departure of younger family members has the direct effect of reducing the availability of younger family members for support of the elderly. Familial support is needed most in impoverished regions with poor infrastructure and services. These are often the regions most affected by out-migration.

### *High Sex Ratios*

Son preference in Asia is largely limited to China, RO Korea, and Taiwan, where a patrilineal, joint-family system makes a male heir a necessity and devalues daughters in various ways (Skinner, 1997). In the traditional cultural ideal, a woman resides with her husband's parents, provides services for them, and produces male heirs to perpetuate the patriline and the family household itself. A son is thus a key to economic security and welfare

in old age, and the lack of one raises real existential problems and implies social failure. As we have seen above, family systems are changing under the influence of urbanization and industrialization; daughters are becoming a more important source of support for parents, and, as one might expect, son preference is on the wane (Das Gupta et al., 2009). But with the advent of one- and two-children families, a substantial proportion of couples face the prospect of not having a son. This circumstance, coupled with novel technologies for prenatal sex determination, has driven many couples to abort female fetuses rather than to bear the costs of another child.

The sex ratio of births, expected to be around 105 males per 100 females, stood at 120.5 in China in 2004 but was higher in specific provinces, such as Jiangxi (137.1), Anhui (132.2), and Shaanxi (132.1). In Taiwan it was 109.6 in 2007, and in RO Korea it was a virtually normal 106.1 in 2007, having peaked around 116 in 1990 (Das Gupta et al., 2009). There are signs that the sex ratio has peaked in China and that a decline, mirroring the one that occurred in RO Korea, may be under way. Even so, the effects of missing girls on marriage markets in China will persist for decades.

These effects are important and can be anticipated to have serious consequences for health and welfare. Ebenstein and Sharaygin (2009) have projected the share of men age 25 or older who fail to marry in China under different sex-ratio scenarios. Under the assumption that current (2005) ratios persist, the share of men 25 or older who fail to marry will rise from under 3% in 2010 to 8.6% in 2030 and 14.4% in 2050. But these are national-level projections that do not reflect the regional concentrations of missing girls. More importantly, they do not reflect the disproportionate effects of the marriage squeeze on men of low status. Where a shortage of women prevails, a man's ability to marry depends on his socioeconomic position; failure to marry thus affects the most vulnerable men, those from impoverished regions and with low levels of education. It is precisely these men for whom marriage is crucial for health and welfare. Their single status will reduce expected income and old-age security, place them at greater risk of sexually transmitted infections, and deny them marriage's protective effects on health.

While not the family-centered world it once was, Asia is less transformed than one might assume from its record of low fertility. Modernization and demographic transition have produced obvious features of convergence, but this picture needs to be qualified by noting some aspects of the Asian experience that remain distinct from the European. In Asia, low fertility is mainly due to delay of marriage and the popularity of one- and two-



child families, not due to nonmarriage and childlessness. Premarital sex and cohabitation are becoming more common, but this generally pertains to engaged couples as a prelude to marriage; nonmarital childbearing is rare. In the midst of rapid family change, coresidence with adult children remains common, and the ethics and assumptions of intergenerational obligations, although weakened in some regions, persist. Families increasingly rely on daughters; son preference, where it exists, is waning. But high sex ratios are likely to persist in China for the near term, which will disrupt marriage markets and create a substantial population of single men. Against a backdrop of late marriage, ultralow fertility, and rapid population aging, Asian families maintain some distinctive norms that, as we shall see below, interact with population health.

#### NUTRITION AND LIFESTYLE

A nutritional revolution is sweeping Asia, born of the rising availability of energy-rich foods and a shift to more sedentary lifestyles. With surprising suddenness, obesity and related diseases of overnutrition have emerged as public health problems, and because the movements underlying this trend—urbanization, rising affluence, and globalization—have yet to run their course, the obesity epidemic is just beginning.

Trends in nutrition correspond to broad patterns of social change. The “nutrition transition” is “one facet of a more general demographic, nutritional, epidemiological transition which accompanies development and urbanization” (Popkin et al., 2001: 3). In describing this transition, Popkin (2002) identifies five nutritional patterns corresponding roughly to technological epochs—from the high-carbohydrate, low-fat diet of hunter-gatherer populations (pattern 1) to emerging health-aware diets of post-industrial elites (pattern 5). The third pattern, that of “receding famine,” is characterized by increased consumption of fruit, vegetables, and animal proteins and declining importance of starchy staples, along with the beginning of a shift to more inactivity and leisure for more people. The fourth pattern, that of “nutrition-related noncommunicable disease,” is characterized by a diet high in total fat, cholesterol, sugar, and other refined carbohydrates as well as sedentary lifestyles and the prevalence of obesity. In this conception, contemporary Asian societies are moving rapidly into pattern 4. Indeed, the shift from pattern 3 to 4 is for many, as Popkin (2002) notes, synonymous with the term *nutrition transition*.

Asia’s transition to overnutrition is the dominant trend, but it should not obscure the fact that undernutrition remains an important problem in

some regions and subpopulations and can even coexist with overnutrition in the same household (see chapter 4). For example, various micronutrient deficiencies were still common among children in Southeast Asia in the 1990s; in Indonesia, half of preschoolers had vitamin A deficiency, while 10% of school-age children had goiter related to iodine deficiency. In Indonesia and the Philippines, roughly a quarter of children under 5 years were underweight (Marks, 2007). But what is notable about these examples of malnutrition (and many more that could be cited) is that everywhere the trend is downward. By contrast, overnutrition and its consequences are on the rise.

Dietary change has resulted from increased supplies of vegetable fats, most notably from the importation of edible oils, and from better affordability of eggs, poultry, beef, and pork. At the same time, urban-industrial lifestyles demand less energy than before. A shift of population out of farming into the service sector has reduced energy requirements, as has increased mechanization. Motorcycles and cars are replacing bicycles as transportation, and leisure-time activities are increasingly sedentary. Television ownership is virtually universal.

Malaysia has the highest percentage of overweight people in the region, with 47.9% having a body mass index (BMI)  $\geq 25$  in 2005–2006. Singapore and RO Korea are next, at 32.5% and 32.1% respectively (WHO, 2006a). In 2004, nearly a quarter of Japanese adults were in this category. Laos and Vietnam have the lowest rates of overweight, at 8.5% and 4.9% respectively. The overweight percentage is growing rapidly.

The health effects of obesity phase in over an extended period. There is a close association of obesity with hypertension, dyslipidemia, hyperinsulinemia, glucose intolerance, and multiple cardiovascular risk factors. Chronic diseases, such as adult-onset diabetes and cerebrovascular disease, emerge within a generation; colorectal and breast cancers emerge later (Popkin et al., 2001). The obesity percentages observed in Asia probably understate the ultimate health effects because the standard BMI cutoff points tend to underestimate obesity in Asian (and other) populations (see chapter 4).

Dietary change is often attributed to globalization, but the causes are varied and shaped by local cultures and policy environments. New patterns of consumption are in part the fulfillment of cultural ideals in an age of affluence. In many countries of Asia, copious amounts of meats were the traditional centerpiece of festival banquets that relieved the normal regime of grains and tubers. Rising incomes have made meats an everyday affair. Changing diets are also a response to changing lifestyles. Working moth-

ers with small families enjoy the convenience of supermarkets and instant foods. Globalization and westernization obviously affect food availability, supply chains, marketing, and attitudes. Accession to the World Trade Organization has eased entry by foreign franchisers into several countries. Mass advertising carried by television is creating markets for junk foods and shifting attitudes toward food and eating behaviors. Foreign food outlets like McDonald's, not yet important in overall consumption, nonetheless appear to have a big future in Asia. Yan's description of the McDonald's Beijing operation drives home this point. In the home of the one-child policy, McDonald's has focused its marketing strategy on children:

Beijing McDonald's has devised to introduce its product into the heart of Chinese families via the fantasy world of children. Birthday parties are a central feature of this strategy. Arriving with five or more guests, a child can expect an elaborate ritual performed free of charge, in a special enclosure called "Children's Paradise." The ritual begins with an announcement over the restaurant's loudspeakers—in both Chinese and English—giving the child's name and age, together with Uncle McDonald's congratulations. This is followed by the recorded song "Happy Birthday," again in two languages. Aunt McDonald then entertains the children with games, and she presents each of them with small gifts from Uncle McDonald. During the ceremony all foods and drinks are served by Aunt McDonald, making the children feel important. (Yan, 2006: 62)

McDonald's in China is, according to Yan, a symbol of Americana, popular among China's emerging middle class; its hamburgers and fries have been converted in Beijing into precious and stylish foreign cuisine. But McDonald's is on its way to converting them back into something routine and ordinary for Beijing residents; a new generation of consumers may soon consider hamburgers and fries to be local products (Yan, 2006).

#### SEXUAL ATTITUDES AND BEHAVIORS

The Asian sexual revolution is part of a global trend, a modernization process turbocharged by communications technologies, globalization, and in some cases, postsocialist market transition. Classical modernization theory sees changing sexual norms as a response to macrosocietal processes and ideological diffusion. The move of women into the paid labor force, delay of marriage, modern contraception, the declining salience of kin ties, and the replacement of close-knit rural communities by anonymous

urban environments tend to weaken the ability of families to control the sexual behavior of offspring and provide more opportunities for pre- and extramarital sexual contacts; at the same time, such cultural imports as advertisements, rock videos, and pornography provide models of sexual hedonism and a form of sex education where none previously existed. These processes have been accelerated by the advent of the Internet and large-scale migrations and urbanization.

To generalize about trends in sexual behavior and attitudes across Asia is a risky undertaking because of the cultural complexity and distinct historical trajectories of the region. Patrilineal family systems and Confucian ideology underlie a traditional sexual conservatism in Northeast Asia and Vietnam, with a recent experience of Communist puritanism in China and Vietnam. Bilateral family systems permitted a somewhat more relaxed sexual culture in Southeast Asia, with an overlay of Islamic conservatism in Indonesia and Malaysia. To these broad divisions add class strata, national legal institutions, and subcultural variation, and then superimpose the processes of economic development and globalization that have involved the region historically along a broad continuum.

And yet, some simple generalizations are possible. Well into the latter half of the twentieth century, Asian sexual mores were conservative even by traditional European standards. Women married young and with an expectation of premarital chastity. A sexual double standard was the norm, with low expectations for male fidelity. Commercial sex for the amusement of men was customary and, in places, even time-honored, although effectively curtailed in the socialist world. Homosexuality, existing at the margins and repressed to varying degrees, was anathema to mainstream morality.

The decades since the 1960s have seen important shifts. Asian sexual mores remain conservative relative to Western, but there are strong convergent trends. Sex before marriage with a fiancé is now widely accepted, and a dating culture implying multiple sexual partners is gaining ground. The double standard persists, but attitudes are moving in the direction of equality in sexual matters. Commercial sex is booming. Homosexuality, still stigmatized in most of Asia, has nonetheless found a subcultural niche and gradually rising acceptance.

The consumption of pornography is at once a symptom and a cause of changing sexual attitudes and behaviors. Among students drawn from a random sample of high schools and middle schools in Taipei, Taiwan, 56% of boys and 20% of girls had been exposed to Internet pornography, and 25% of boys and 11% of girls had viewed sexually explicit films on cable

channels, exposures that were correlated with sexual permissiveness (Lo & Wei, 2005). In China, among male respondents to a national 1999–2000 survey, 40% reported that they had viewed pornographic material in the past year; for men and women 20–29 the rate was 74% and 37% respectively, with no substantial difference by rural or urban residence (Parish et al., 2007).

Across Asia, the level of a country's development is a good predictor of sexual liberalization. A 2006 survey of youth in three metropolitan areas, Hanoi, Shanghai, and Taipei (ordered by stage of modernization), compared the proportion of females age 20–24 who had had coitus by age 18. The proportion was lowest in Hanoi (0.8), higher in Shanghai (2.1), and highest in Taipei (16.6; Zabin et al., 2009). In the same study, results for different ages suggest that change is a cohort process that is moving rapidly. At each site, the age 15–19 cohort reported higher rates of coitus than the age 20–24 cohort. This is consistent with other studies that show that attitudes vary by modernity and age, with more liberal attitudes associated with higher education, higher parental incomes, urban residence, and later cohorts (e.g., Ghuman, 2005).

Asians are still relatively conservative about sex. Sex with a fiancé is on its way to becoming the norm, but sex with multiple partners remains unacceptable for most. A study of Japanese college students found that 90% of males and 83% of females expect to have intercourse before marriage; yet only 16% of males and 10% of females considered it right to have sexual intercourse with casual partners before marriage (Yamamoto, 2006). A 2001 study of Hai Duong Province, Vietnam, found that premarital sex with a fiancé was considered unacceptable by a majority of respondents, but later marriage cohorts have more liberal views (Ghuman, 2005). In the Philippines, demographic and health surveys suggest that the prevalence of premarital sex has increased in the last two decades, from 2.6% in 1993 to 4.9% in 1998 to 7.1% in 2003 (Chiao, 2010). Males tend to be more liberal (and more experienced) than females, reflecting the sexual double standard, but with modernization there is convergence of attitudes and behaviors between the two sexes (Zabin et al., 2009).

While mainstream sexual culture remains fairly conservative, a small but growing proportion of people engage in sex with multiple partners. This group includes important sexual subcultures such as female sex workers, their male customers, and men who have sex with men. From a public health perspective they are important because they represent vectors for the diffusion of sexually transmitted infections (STIs). Asia has a thriving sex industry, most notably in Thailand, where half of young men visit com-

mercial sex workers (Morrison, 2004). Thailand's sex industry and reputation as a sex tourism destination was firmly established during the American war with Vietnam, when American soldiers would travel to Thailand for rest and recreation, which often involved purchasing sex. Other countries in the region have seen more recent, but rapid, expansion of their sex trade. The most remarkable of these is China, where commercial sex services have gone from virtual nonexistence in the Mao era to near ubiquity today. Estimates of the number of sex workers in China range from 3 to 10 million (Liu & Finckenauer, 2010).

There are many reasons for the upsurge of the sex industry in Asia. More liberal attitudes toward sex, market reforms, increased tourism, and increasing wealth have contributed to the expansion of the commercial sex industries throughout the region. Mass rural-to-urban migration has also contributed; sojourning males constitute a huge potential market for commercial sex, while millions of young women residing away from home in relatively anonymous urban settings constitute a pool of potential recruits into the sex trade. Because legitimate industrial and service work available to rural women is generally low paying, harsh, and monotonous, sex work is for many a viable alternative (Yang & Xia, 2006). In China, demand for commercial sex will rise in coming years because of the extreme dearth of girls in the cohorts born after 1990 (Ebenstein & Sharygin, 2009). Young, poor, unmarried "surplus men" age 20–40 are projected to increase from 640,000 in 2005 to 8.5 million in 2020 (Tucker et al., 2005), and many will join China's migrant underclass.

Demand for commercial sex may also be related to strict sexual norms for women. The age of onset of intercourse is fairly high in Asia, and the duration between engagement and marriage is short, limiting the availability of casual premarital sex among peers. The availability of casual sex may explain the declining demand for commercial sex in the West (Parish et al., 2007). The very ubiquity of sexual services in Asia, in brothels, hotels, spas, massage parlors, barber shops, and truck stops, to name but a few venues, no doubt contributes to loosening norms pertaining to commercial sex.

The growth of the sex trade has obvious public health implications. Female sex workers represent a critical and well-documented reservoir of STIs. Rates of STIs are extremely high among sex workers. For example, in Mongolia and Myanmar nearly 60% of sex workers had at least one STI prior to introduction of a 100% condom use program. Initially piloted in Thailand and later adopted by other countries, this program has substantially reduced the rate of STIs among sex workers and their clients in

Thailand and Cambodia and to a lesser extent in other countries of Asia (WHO, 2004). However, even in these countries, it has been difficult to sustain low rates of STIs, mainly because of the high turnover of girls in the industry.

The risk to clients (and to sex workers) extends to spouses and to their children through vertical transmission. Indeed, the rates of STIs in the general population, while not as high as among sex workers, have also soared in recent years. In China, the incidence of STIs increased annually by 17.3%, from 12 per 100,000 to 51 per 100,000 between 1989 and 1998 (Chen et al., 2000); in Singapore, after an initial decline in STIs in the 1990s, the country saw an increase in these diseases from 162 per 100,000 in 1999 to 195 per 100,000 in 2003 (Sen et al., 2006). An unintended consequence of the interventions among sex workers in Thailand has been that many young Thai men are now avoiding commercial sex and instead having more sex with their girlfriends and acquaintances (Morrison, 2004). This shift has been facilitated by increased willingness to engage in pre- and extramarital sex by Thai women. This could potentially spark a new wave of the STI/HIV epidemic, which would be far harder to control in the general population than among sex workers, who comprise a well-defined target group for intervention.

Another consequence of increased sexual liberalization is high rates of unwanted pregnancy. This issue is exacerbated by conservative ideologies that can make it difficult for youth to access contraception. Abortion rates in Asia are testimony to low rates of contraceptive use; in East and Southeast Asia, respectively, about 29 and 22 per 1,000 pregnancies ended in abortion (Sedgh et al., 2007). Abortion is legal, safe, and readily available in some parts of Asia, including Japan, China, and Vietnam. However, in others, such as the Philippines, Indonesia, Thailand, Myanmar, and Laos, abortion is legally restricted, clandestine, and potentially quite dangerous; nearly 60% of abortions in Southeast Asia are considered unsafe (Sedgh et al., 2007). Complications from unsafe abortions can result in hospitalization or death.

Same-sex sex has also been on the rise in Asia. Negative views of homosexuality are fairly pervasive, although these attitudes are probably changing among educated urbanites. A 1994 survey found that 87% of Japanese consider homosexual sex always or almost always wrong (Widmer et al., 1998), but a survey of college students in Fukuoka in 2002 found that 34% of men and 58% of women respondents professed no negative feelings toward sex by men with men (Yamamoto, 2006). The increasing visibility of homosexual lifestyles in Asia has not yet fundamentally altered the

stigma associated with men who have sex with men, thus homosexuality remains a largely underground phenomenon. Homosexuality is illegal in Brunei, DPR Korea, Malaysia, Myanmar, and Singapore, and no Asian country permits same-sex marriage, although Japan and Taiwan have legislation to protect the rights of same-sex partners. Men who have sex with men are a high-risk group for STIs; various surveys have reported a history of syphilis among this group as high as 5% in Phnom Penh, 11% in Beijing, and 3% in Bangkok (de Lind van Wijngaarden et al., 2009). HIV rates are also high in the region—as high as 9% in Hanoi and 28% in Bangkok. The stigma associated with sex between men greatly complicates the problem of public health outreach.

## SUBSTANCE ABUSE

### *Illicit Drugs*

Use of narcotics, common in eighteenth- and nineteenth-century East and Southeast Asia, has made a comeback. China outlawed the use of opium in 1909, followed by other countries in the region over the ensuing decades (Poshyachinda, 1993). But heroin use was first reported in Thailand in 1960 and became visible in Myanmar, Indonesia, Malaysia, Singapore, and the Philippines in the 1970s (Poshyachinda, 1993). In the Communist countries drug use reemerged following economic reforms, which coincided with a dual epidemic of heroin injecting and HIV in Thailand, Myanmar, Vietnam, southern China, and the northeast states of India (Beyrer et al., 2000).

East and Southeast Asians are now the world's largest consumers of opiates and amphetamines (UNODC, 2009). Overall, opiates are the biggest problem drug in terms of treatment (2.80 to 4.97 million users). Reduced production of opiates in Southeast Asia may have led to a decline in their use in recent years but it has been replaced by the rising use of amphetamines and, to a lesser extent, abuse of prescription drugs. Amphetamines are used by 4.60 to 20.56 million Asians and are currently the main problem drug in Thailand, Cambodia, the Philippines, Japan, and RO Korea (UNODC, 2009). This trend is worrying because treatment is less well established than for opiates. However, outside of Japan, amphetamines are not generally injected, thus the hazards associated with injecting are avoided (IHRA, 2008).

Asia has also been a major supplier to the world drug market; China, Myanmar, and the Philippines are the biggest producers of amphetamines, and until 2002 Myanmar and Laos produced the world's largest opium



crops, though they now account for roughly only 10% of the world's supply (IHRA, 2008). Illicit drugs are a lucrative business: in the eighteenth and nineteenth centuries, opium sales were a major source of revenue to British and Dutch colonial administrations in Asia; opium revenue funded the French war in Indochina; and contemporary antigovernment guerrillas in Shan State, Myanmar, fund their efforts through poppy cultivation and, more recently, amphetamine production (McCoy, 2003; UNODC, 2009).

Demand has increased in recent years as more markets have opened, particularly the Chinese market, and new drug trafficking routes have been established. Local populations along drug trafficking routes are particularly vulnerable to drug abuse and related social issues (Beyrer et al., 2000). Rising demand has coincided with increased freedoms, increased disposable income, and increasing economic disparities. Social change produces hardships for those not enjoying rising affluence, which can lead to a desire for escapism (Chen & Yin, 2008). Migrant worker populations are at particular risk, as are women and men who turn to prostitution.

The primary health concerns connected to drug use are the harms associated with injecting. In the last 50 years, opiate use in Asia has shifted from opium smoking to heroin smoking to heroin injection (IHRA, 2008). The proportion of 15–64-year-olds injecting drugs is estimated to range from as low as 0.02% in Cambodia to 0.47% in Japan to 1.33% in Malaysia (Mathers et al., 2008). While more cost-effective from the user's standpoint, injecting is far more risky than smoking, inhaling, or ingesting. The risks include infection with HIV, hepatitis B, and hepatitis C as well as infections at the injection site. The prevalence of HIV among injecting drug users in Asia is estimated at 16.7%, but estimates range from 1% in the Philippines to 43% in Indonesia, Thailand, and Myanmar (Mathers et al., 2008). The prevalence of hepatitis C is much higher: 90% in Thai injecting drug users, 60–98% in Indonesian, and 76–80% in Vietnamese (Aceijas & Rhodes, 2007). Coinfection with both HIV and hepatitis C virus (HCV) is also very common, with generally more than 90% of those infected with HIV also infected with HCV. Both HIV and HCV lead to premature deaths and involve primarily the working-age population.

Even without injecting, drug use increases people's risk of HIV infection and other STIs because it increases the likelihood of risky sexual practices, including multiple partners and nonuse of condoms. For example, in both Singapore and Cambodia, use of amphetamines has been associated with sexual transmission of HIV (IHRA, 2008). Moreover, drug use is closely related to the sex industry; many drug users purchase and sell sex

(IHRA, 2008). Drug use is associated with other social problems, including criminal behavior, lost productivity, family and social disorder, and increased utilization of health care.

Programs to mitigate the effects of injecting drug use, including needle exchange and opioid substitution therapy, are under way in China, Indonesia, Malaysia, Myanmar, Taiwan, Thailand, and Vietnam. Cambodia and the Philippines, which have smaller epidemics of injection drug use, have only needle exchange programs, and Hong Kong has only a methadone program (IHRA, 2008). However, there are many barriers to using these services, not least of which is insufficient coverage. Stigma and discrimination against drug use as well as HIV, whether enshrined in law or embedded in social values, is common in Asia. Service staff are often judgmental and interpret relapse as a failure rather than an expected milestone toward recovery (IHRA, 2008). Harsh law enforcement techniques, as have been used in Thailand and China, can also thwart intervention efforts.

### *Alcohol*

Far more widely used in Asia is alcohol. Official consumption rates range from below 1 liter of pure alcohol per capita in Brunei, Cambodia, Indonesia, and Myanmar, to much higher rates in countries such as Japan (7.38 L), RO Korea (7.71 L), Laos (6.72 L), and Thailand (8.47 L; IHRA, 2008). Problem drinking is rising in the region, except in Japan, which is seeing a decline (and where consumption is already very high), and it is diversifying to include women and youth (Desai et al., 2003; Higuchi et al., 2007).

Although the consumption of alcohol is not clearly linked with gross domestic product, in general high-income countries consume more alcohol than low-income countries (Chen & Yin, 2008). The lack of a clear trend is likely complicated by religious and cultural factors. Moreover, while consumption may be higher in high-income countries, poverty is a well-established risk factor for alcohol use (Chen & Yin, 2008). Other factors that are associated with alcohol abuse and dependence include having family members with substance or alcohol problems, being male, being unmarried, having a low education level, and having comorbid psychiatric disorders (Desai et al., 2003). As with drug use, the large migrant underclass share many of these risk factors. In China being married may be a risk factor, converse to observations from other countries. Rapid social change, social stress, and poor support resulting from marriage-related problems may contribute to the higher likelihood of alcohol dependence in married men (Xiang et al., 2009).

Advertising of alcohol is permitted in many countries in the region, although it may be restricted. For example, in Malaysia it is not permitted on television and radio, and in Singapore and Hong Kong the hours during which it can be advertised are restricted to those when children are less likely to be watching. Taxes are generally too low to act as a significant deterrent for purchase. As will be discussed in chapter 7, laws pertaining to driving while under the influence of alcohol have been introduced in most countries.

Excessive alcohol consumption is associated with a number of adverse health consequences and puts a significant strain on the health system, especially emergency care. It is listed as a carcinogen by the WHO (1998) and is associated with increased risk of diabetes, liver and kidney damage, gastrointestinal problems, and heart disease as well as neuromuscular, neurological, and psychiatric complications (Desai et al., 2003). Behavioral and emotional problems are also seen in users. For example, among youth in Thailand, alcohol use was associated with emotional problems, smoking, use of illicit and prescription drugs, carrying a weapon, attempted suicide, and being sexually active (Assanangkornchai et al., 2009). Domestic violence and road traffic injuries and fatalities are also associated with alcohol misuse (Higuchi et al., 2007; see chapter 7).

Treatment for people with alcohol dependence in the region is slowly improving but still far short of what is needed (Chen & Yin, 2008). Resources for mental health are extremely limited, and human resources with specialization in substance-abuse counseling are few. Pharmacotherapies are generally not available. Some NGOs provide services for alcohol users, though the quality of interventions offered is variable (Desai et al., 2003).

## OTHER EMERGING ISSUES

In low-mortality urban-industrial environments, health is more sensitive to behavior, and health problems are redefined by rising sensitivity to risks and hazards. The connections between health, lifestyle, and values can be illustrated by some emergent health issues in Asia.

### *Smoking*

The Asian smoking epidemic is mainly about men, but this could change. Smoking is the norm among men in Asia but relatively rare among women, reflecting traditional norms about gender roles. China, where two-thirds of men age 15 and above smoke, compared with 3% of women, is exemplary of this pattern. Modernization might be expected to produce a convergent

trend, as has occurred in Japan. There, male smoking rates have declined across ages from around 80% in the mid-1970s to around 40% in 2005, while female rates have seen declines at older ages and increases at younger ages (Sato et al., 2000; Honjo et al., 2010). In particular, rates of smoking among Japanese women age 20–29 rose from 12% to 22% over the past three decades (Morrow & Barraclough, 2003). Male rates may have declined in response to better health knowledge, but younger female rates responded to countervailing forces: new social roles for women that entail employment, disposable income, and relaxed norms of behavior. Younger cohorts of Asian women, increasingly independent of families and traditional social controls, may see cigarette use as a symbol of modernity and equality with men. Foreign tobacco companies, aware of the market potential, aggressively target female consumers (Morrow & Barraclough, 2003).

In the short run, economic change and globalization appear to promote tobacco use. Smoking increased among Chinese men from 1952 to 2000, particularly among men in middle-education groups. Kenkel and colleagues (2009) speculate that this occurred because market reforms increased the economic resources of these groups relatively more than it did less-well-educated men. Market openings to foreign tobacco companies are another factor. Many Asian governments, including Japan, RO Korea, China, Taiwan, and Thailand, once monopolized tobacco sales; free-trade agreements made these monopolies untenable. Wen and colleagues (2005) note that within 3 years of the opening of the Taiwanese cigarette market to imports in 1987, prevalence of adult male and youth smoking rose 6% and 13% respectively. In the Taiwan case, trade agreements permitted the advertisement and promotion of foreign cigarettes; foreign companies aggressively promoted light and mild cigarettes to young and new smokers and distributed them through thousands of new point-of-sale locations (Wen et al., 2005).

In the longer run, economic change and globalization seem more likely to inhibit tobacco use because of government antismoking programs and rising sensitivity to its health effects. In general there is an association between higher levels of socioeconomic status and smoking cessation (Kenkel et al., 2009); higher levels of education are also associated with knowledge of smoking's health effects (Yang et al., 1999). In Taiwan the market opening for tobacco created a backlash that stimulated a number of anti-smoking programs that included school-based programs; public campaigns for smoking control; a ban on smoking in public places such as government offices, classrooms, theaters, and public transportation; and various legal initiatives, including increased taxes on cigarettes (Wen et al., 2005).

Other Asian governments have adopted antismoking policies with similar measures (Morrow & Barraclough, 2003). Most Asian nations have ratified or accepted the WHO Framework Convention on Tobacco Control, which commits them to a range of tobacco-control policies, including a ban on smoking in public places, cigarette taxes, health warnings, and bans on tobacco advertising (WHO FCTC, 2010). (See also chapter 5.)

### *Motor Vehicle Accidents*

Motor-vehicle-related mortality and injuries have long been known as a “disease” of development (Wintemute, 1985), a side effect of increased wealth and use of cars and motorcycles. In recent decades vehicle ownership has increased dramatically in the region, as have road trauma and fatalities (see chapter 7). Kopits and Cropper (2005) project an 80% increase in motor vehicle fatalities between 2000 and 2020 in Asia.

There is an empirical relationship between national GDP per capita and motor vehicle fatality risk (vehicle fatalities / population): with rising income per capita, risk increases and then decreases in an inverted U-shaped pattern. This pattern reflects change in two components of risk: motor vehicles per capita, which rises with per capita GDP, and fatalities per vehicle, which declines. Rising income causes fatalities per vehicle to decline because of the move to safer vehicles (including from two-wheel to four-wheel vehicles), safer roads, better pedestrian safety, and changing attitudes toward risk (Kopits & Cropper, 2005). Based on international trends in the period 1963–1999, Kopits and Cropper (2005) estimate that fatality risk starts to decline when per capita income reaches US\$8,600 in 1985 dollars. In Asia, only Japan, RO Korea, Singapore, and Taiwan are above this threshold and thus should have declining traffic mortality risk. In fact, between 1975 and 1998 the traffic fatality risk declined 32% in Taiwan, whereas in China, which is below the income threshold, it rose 243% (Kopits & Cropper 2005).

Some fundamental causes of traffic fatalities and injuries, such as poor highway engineering, require infrastructural solutions, but driver, rider, and pedestrian attitudes and behaviors are also important. Modernizing governments of Asia have taken the lead in legislating traffic laws, including seat belt and motorcycle helmet regulations, but compliance is poor. For example, national seat belt legislation became effective in China in 2004, and seat belts were required in car rear seats the same year, but a study in two Lower Yangzi cities in 2005–2007 found that fewer than half of drivers used seat belts, and virtually no backseat passengers used them (Routley et al., 2008). The risks pertaining to motor vehicles are generally not well understood.

### *Mental Health*

Mental health problems in Asia generally go undiagnosed and untreated. A report of a major epidemiological survey of mental disorders in four Chinese provinces concluded that “173 million adults in the country have a mental disorder and 158 million of these have never received any type of professional help for their condition. A major redistribution of societal and health resources is needed to address a problem of this size” (Phillips et al., 2009: 2052). A recent commentary notes that “in Asia’s most developed countries, ordered, Confucian cultures are loath to confront mental illness. Patients with mental illness commonly endure workplace discrimination, receive limited family support, and feel completely stigmatized” (Chanpattana, 2010: 2).

Asia has a substantial backlog of mental health problems but an exceedingly weak infrastructure to address it. Vietnam had just 286 psychiatrists in 2005, or 0.9 per 100,000 population (WHO, 2006b), while Cambodia had just 26 in 2007, or 0.16 per 100,000 population (WHO, 2005); both countries have suffered decades of war and civil unrest, as well as recent rapid social change, and urgently need a stronger mental health workforce.

Rapid social change affects mental health across Asia. Chanpattana (2010: 2) writes that the transformation is “exacting an immense psychological toll on those who struggle to keep up with the manic pace of change. With tradition and a sense of security having given way to upheaval and uncertainty, Asians feel more psychological pressure than ever before. This is absolutely the dark side of Asia’s economic miracle.”

Social change is stressful. A glance at China’s changing landscape offers numerous examples. Opulent lifestyles and rampant consumerism demoralize those surviving at subsistence level. Market reforms have brought layoffs and insecurity to once-secure workers in state enterprises. Tens of millions of rural migrants to China’s cities live in legal limbo, uprooted from their rural communities but barred from putting down roots at their urban homes. Urban renewal and expansion have forced the relocation of millions, while hydroelectric and other development projects have uprooted thousands of rural communities. Village communities, emptied of working-age persons, have become places where the elderly and disabled care for left-behind children of migrants, who are themselves more subject to symptoms of anxiety and depression (Liu et al., 2009).

Specific subpopulations are vulnerable to mental illness. Rural women are under particular stress, having to negotiate new roles in the context of persisting patriarchal structures. It is notable that rural Chinese women

age 15–40 commit suicide at double the male rate, and among rural women age 20–29, suicide accounts for 30% of deaths (Phillips et al., 1999). Stigmatized groups, such as current and former sex workers, HIV carriers, and closeted homosexuals, are also vulnerable.

Demographic change will cause growth in two vulnerable populations in the coming decades. Population aging will increase the proportion of the elderly, who are more subject to depression and dementia; this will increase the need for mental health services and institutional care. The shortage of females, particularly in China, will expand the population of “surplus men” who are unable to marry. Poor and disadvantaged to begin with, these men will not benefit from the family supports and protective health effects of marriage, which are important to mental health.

Stoicism about mental disorders in Asia appears to be giving way, among prosperous urbanites, to demand for mental health services. A journalistic account notes a new interest in mental health among Chinese urbanites: “Rising wealth and expectations of happiness are behind unprecedented demand for counseling as well as psychiatric care. Meanwhile, the mental-health establishment is growing fast, while becoming more professional” (*Economist*, 2007). Urban elites appear to be leading a shift in attitudes about mental health, a shift that may signal the beginning of the end of the stigma surrounding mental illness. (See also chapter 6.)

## PROSPECTS

Demographic projections, built on the assumption of the persistence of recent trends, suggest that change in Asia will continue on the same track of increasing life expectancy, rising educational levels, and greater equality for women. The UN Population Division’s “medium variant” projection for the next two decades foresees a continuing progress in the regions defined as Eastern and Southeastern Asia, with Southeastern Asia improving more rapidly and thus tending to converge with Eastern Asia (see table 2.4). Life expectancy would continue to rise, the infant mortality rate would fall, and the total fertility rate would tend to converge at below two children per woman. The old-age dependency ratio would double in Eastern Asia but rise more slowly in Southeastern Asia, reflecting the earlier fertility transition of the former.

Education is also on a rising track. Researchers at the Institute for Applied Systems Analysis for the “China Region,” a major subset of East and Southeast Asian countries, project that the share of the population above 15 years of age with secondary education will rise between 2000 and

TABLE 2.4 Population Indicators for East and Southeast Asia, Current and Projected

<i>Indicator</i>	<i>East Asia</i>		<i>Southeast Asia</i>	
	2005–2010	2025–2030	2005–2010	2025–2030
Life expectancy	74.1	77.5	70.0	75.3
Total fertility rate	1.72	1.81	2.32	1.98
Infant mortality rate	21.8	14.5	28.3	15.4
Old-age dependency ratio <sup>a</sup>	13	26	9	16

SOURCE: UNDESA, 2009b.

NOTE: Projected numbers are from the UN Population Division’s “medium variant” projection. East Asia includes China, Hong Kong SAR, Macao SAR, DPR Korea, Japan, Mongolia, and RO Korea; Southeast Asia includes Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

<sup>a</sup>Dependency ratio data refer to 2010 and 2030.

2030, from 51% to 71% for males and from 35% to 60% for females. The projections imply a convergence of male and female educational attainment. As optimistic as they appear, these projections are the most conservative of three offered by the authors. Two other scenarios that incorporate rising rates of educational attainment and feedback imply more rapid improvement (Lutz & Goujon, 2001).

These trends imply a continuation of the epidemiological and health transitions, both for rural peripheries, still affected by malnutrition and infectious disease, and for leading-edge urban populations affected by diseases of affluence. Mortality will continue to decline, but paradoxically, morbidity will rise. Improved health will stimulate a rising sensitivity to health status and, at every level, a gradual redefinition of what it means to be healthy. There will be continued convergence with the West in affluence, values, and behaviors, even while distinctive Asian institutions and values persist. The general trends seem clear, but the health implications are less certain. To what extent will changing gender roles erode the female health advantage? Will Asian family values continue to provide a buffer of social security for the elderly? Will dietary change produce a generalized epidemic of obesity and related diseases? Will changing sexual norms lead to generalized epidemics of STIs? Will mental health issues continue to be neglected?



Social change brings new problems and novel solutions. Globalization and economic change, like mortality and health transitions, involve diffusion processes in which the pace of change increases with each wave, and each wave contains new and updated models and information. As a consequence, problems and responses may arrive in quick succession, just as the advent of fast food is followed by a countervailing “slow food” movement. Public health technologies and initiatives diffuse rapidly, and elites and governments combine with international organizations to counter the deleterious effects of change. Faced with the novel hazards of affluence and modernity, better informed citizens will articulate a desire for safer environments, healthier foods, and better therapies and be ready to change their behaviors to achieve longer, healthier, and happier lives. Profound shifts in mentality and behavior thus can be expected to mitigate the health problems arising from economic transformation and globalization.

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### 3 Emerging Infectious Diseases in East and Southeast Asia

Rajesh Bhatia, Jai P. Narain, and Samlee Plianbangchang

Emerging infectious diseases (EIDs) are diseases of infectious origin that are new, previously undefined diseases or old diseases with new features and whose incidence in humans has increased within the recent past or threatens to increase in the near future. They include sexually transmitted infections, vector-borne diseases, and airborne and blood-borne viruses. The existing close and continuous contact between humans and animals, compounded by a conducive environment and demographic profile, augur well for emergence and spread of infectious diseases. Emergence of resistance in many microorganisms to most of the commonly used antimicrobial agents has further increased the gravity of the problem. Outbreaks of emerging infectious diseases lead to huge economic loss as well as social upheaval. To combat these diseases, strong public health systems are essential. Countries need to adopt strategies that include political commitment and partnership building, epidemic preparedness and rapid response, strong public health infrastructure, efficient risk communication, and encouragement of appropriate research and its utilization.

#### INTRODUCTION

Infectious diseases account for 26% of annual deaths worldwide. According to the 2004 *World Health Report* (WHO, 2004), 29.9% of 1.49 billion disability-adjusted life years (DALYs) are lost every year to these diseases. In developing countries, communicable diseases represent 7 out of the top 10 causes of child deaths and account for nearly 60% of all deaths among children. Acute respiratory infections cause 18% of all deaths, and diarrheal diseases kill 15% of children. Nearly 2 million children under the age of 5 years still die annually of pneumonia and diarrhea in

the world, mostly in the developing countries of Asia and Africa (WHO, 2008a).

In spite of a major economic transition, communicable diseases continue to be major public health problems and influence the lives of the 2 billion people who inhabit East and Southeast Asia. Many infections, such as tuberculosis, helminthiasis (Narain et al., 2010), and diarrheal infections, are associated with poor sanitation, contaminated food, inadequate personal hygiene or access to safe water, and lack of basic health services—conditions common in rural and agricultural areas of many countries (WHO, 2008b; WHO & UNICEF, 2008).

In addition to the plethora of endemic communicable diseases, recent epidemics of severe acute respiratory syndrome (SARS) and influenza have amply demonstrated the vulnerability of the countries in the East and Southeast Asia region to the threat of these rapidly evolving microorganisms. These pandemics give credence to the belief that, given the confluence of existing environmental, socioeconomic, and demographic factors, Asia will be the most likely epicenter of any future pandemic—due to known, genetically modified, or unknown microbes. While the major and initial impact of these pandemics will be borne by developing countries with weak health systems, inadequate resources, and a feeble state of preparedness, the entire world will ultimately be at risk.

#### DEFINITION AND CLASSIFICATION

EIDs are diseases of infectious origin whose incidence in humans has increased within the recent past or threatens to increase in the near future. They include new, previously undefined diseases as well as old diseases with new features (box 3.1). These new features may include the introduction of a disease to a new location or a new population (e.g., it may present in youth where previously it was seen only in the elderly); new clinical features, including resistance to available treatments; or a rapid increase in the incidence and spread of the disease (Morse, 1996). Where a disease was once endemic but had since been eradicated or controlled, its reappearance would classify it as a reemerging infectious disease. Emergence may also be due to a new recognition of an infectious agent in a population or the realization that an established condition has an infectious origin.

An increase in the frequency and spread of such diseases has been observed globally. The world has enjoyed major successes in the fight against infectious diseases, such as with the discovery of antibiotics, increased

### BOX 3.1 Emerging Infectious Diseases

An attempt has been made by Morens and colleagues (2004) to classify emerging infectious diseases:

Newly emerging infections: HIV, SARS, Nipah, influenza virus subtypes

Reemerging/resurging infections: West Nile, plague, chikungunya

Deliberately emerging infections: Microbes used to deliberately harm human health

availability of vaccines, and the identification of oral rehydration salts to fight diarrheal infections. However, changes in lifestyle and the environment mean that existing pathogens are provided with ever-more opportunities to proliferate and over time develop resistance to pharmaceutical interventions to stop them. Moreover new pathogens, particularly viruses, remain unpredictable and continue to emerge and spread across countries. In the last three decades alone, 31 new pathogens have been discovered, of which 16 are viruses (table 3.1). Not only the health but the economic and social fabric of global communities has been affected by pathogens such as HIV, hepatitis B and C, SARS, and avian influenza.

#### MAGNITUDE OF THE PROBLEM OF MAJOR EIDS

##### *Sexually Transmitted Infections (STIs)*

East and Southeast Asia are experiencing increases in the prevalence of sexually transmitted infections (STIs), particularly among sex workers and men who have sex with men. In developing countries, lack of diagnostic support, management based on syndromic diagnosis, and the association of STIs with social taboos prevent faithful reporting of these diseases. However, many ministries of health require certain STIs—usually syphilis, chlamydia, and gonorrhea—to be reported. Patterns of STI vary greatly in Asia. Some countries have high rates of curable STIs, while others have controlled these infections and see more incurable STIs, such as herpes simplex virus type 2 (HSV-2). Syphilis prevalence among pregnant women is very low in Thailand and is declining in Myanmar. In contrast, China has experienced a rapid resurgence of the virus, from virtually no cases in



TABLE 3.1 Newly Discovered Microbes of Public Health Importance

Year	Microbe	Disease
1973	Rotavirus	Diarrhea
1975	Parvovirus B-19	Fifth disease
1976	<i>Cryptosporidium parvum</i>	Cryptosporidiosis
1977	Ebola virus	Ebola hemorrhagic fever
1977	<i>Legionella pneumophila</i>	Legionnaire's disease
1977	Hantaan virus	Korean hemorrhagic fever
1977	<i>Campylobacter jejuni</i>	Gastroenteritis (food poisoning)
1980	Human T-lymphotropic virus I (HTLV-I)	T-cell leukemia/lymphoma
1981	Toxin producing strains of <i>Staphylococcus aureus</i> (golden staph)	Various infections
1982	<i>Escherichia coli</i> O157:H7	Food poisoning
1982	HTLV-II	Lymphoma
1982	<i>Borrelia burgdorferi</i>	Lyme disease
1983	Human immunodeficiency virus (HIV)	AIDS
1983	<i>Helicobacter pylori</i>	Duodenal and gastric ulcers and stomach cancer
1985	<i>Enterocytozoon bieneusi</i>	Microsporidiosis diarrhea
1986	<i>Cyclospora cayetanensis</i>	Diarrhea
1988	Hepatitis E virus	Hepatitis
1989	<i>Ehrlichia chaffeensis</i>	Human monocytic ehrlichiosis
1989	Hepatitis C virus	Liver cancer (hepatocellular carcinoma)
1991	Guanarito virus	Venezuelan hemorrhagic fever
1991	<i>Encephalitozoon hellem</i>	...
1991	New species of <i>Babesia</i>	Babesiosis hemolytic disease
1992	<i>Vibrio cholerae</i> O139	Cholera
1992	<i>Bartonella henselae</i>	Bacteremia, endocarditis, bacillary angiomatosis, and peliosis hepatis
1993	Sin nombre virus	Hantavirus cardiopulmonary syndrome (HCPS), aka Four Corners virus or Navajo flu
1993	<i>Encephalitozoon cuniculi</i>	...
1994	Sabia virus	...
1995	Human herpes virus 8 (HHV-8)	Kaposi's sarcoma
1999	Nipah virus <sup>a</sup>	...
2002	SARS coronavirus <sup>a</sup>	Severe acute respiratory syndrome (SARS)
2003	Influenza A (H5N1) <sup>a</sup>	Avian influenza
2009	Influenza A (H1N1)	Swine flu

<sup>a</sup>First identified in Asia

the 1960s to a rate of 5.3 per 100,000 during 2000–2005 (Hesketh et al., 2008). In addition, overprescription of antibiotics has led to drug-resistant forms of certain STIs. Gonorrhea, for example, used to respond dramatically to penicillin but is now resistant to it and many other antimicrobial agents, including ciprofloxacin (Bhatia & Narain, 2010).

### *Hepatitis B*

Worldwide, 2 billion people, or roughly one in three people, are infected with hepatitis B virus, with an estimated 350 million people being chronic carriers. An inflammatory liver disease caused by the virus, hepatitis B is transmitted through percutaneous or mucous-membrane contact with infected blood (e.g., through unsafe injection, blood transfusion) or other body fluids (e.g., serous exudates from a wound or cut, saliva, semen or vaginal fluids during unprotected sex). Infants infected at birth become chronic carriers of the disease. Unlike other vaccine-preventable diseases, hepatitis B infection rarely causes disease in children. Instead, 90% of infants infected with hepatitis B will develop chronic infections leading to late-onset diseases such as liver cancer and cirrhosis. The risk of dying from hepatitis B–related cirrhosis and hepatocellular carcinoma in people chronically infected ranges from 15–25%. Hepatitis B is a hundred times more infectious than the AIDS virus, killing about 600,000 people a year all over the world and inflicting an enormous strain on public-sector health systems (WHO, 2008d).

Most countries in Asia are either endemic or hyperendemic for hepatitis B, making it an important public health priority. Interrupting transmission of the disease at the earliest opportunity is the best strategy, and vaccination remains the best means of doing so. All countries in Asia, except for Timor-Leste, have introduced hepatitis B vaccine into their national immunization programs, although some countries have yet to introduce the vaccine nationwide. Japan follows a nationwide high-risk approach with the screening of all pregnant women and provision of hepatitis B vaccination for infants born to hepatitis B–positive mothers and other high-risk groups (WHO 2008c).

### *HIV/AIDS*

Ever since its discovery, the human immunodeficiency virus (HIV) has emerged as a global disaster. The first few cases of AIDS were reported in Asia from China (1 case), Hong Kong (3), Japan (11), Philippines (2), and Thailand (1) in 1985. By 1987, an estimated 1% of injecting drug users in Bangkok, Thailand, were infected with HIV. This number grew to 30% by

the end of 1988 when injecting drug users in southwest Yunnan, China, were also identified as HIV infected. Soon HIV cases were detected in Vietnam (1990), Laos, and Cambodia (1991). The infection spread rapidly in Thailand, and in 1994 its prevalence in sex workers had reached 33%—one of the highest in the world at that time. Only 4 years after the first report of HIV infection in Cambodia, the prevalence among female sex workers, male military, and pregnant women was 37.9%, 8.4%, and 2.6%, respectively. In the mid-1990s, homosexual and/or bisexual transmission of HIV accounted for 28.7% of HIV infections in Singapore, 33% in the Philippines, 32% in Hong Kong, and 16% in Japan. Cambodia, China, Myanmar, Thailand, and Vietnam now account for the majority of the region's HIV case load (WHO, 2008c). Around the world, AIDS has led to more than 20 million deaths. Over 33 million people are living with HIV today, and it is estimated that more than 16 million children have lost one or both parents to AIDS (UNAIDS, 2010). Asia bears a substantial burden of HIV/AIDS, with more than 2 million infected (table 3.2).

The disease is transmitted from human to human via contaminated body fluids, including blood, genital secretions, and breast milk. In most of Asia, HIV infection is concentrated in certain high-risk populations, namely injecting drug users, commercial sex workers, and men who have sex with men. The group bearing the heaviest burden varies between countries and over time. For example, China's first outbreak was among heroin users, but with time the main route of transmission has become sexual (Rou et al., 2010). However, evidence of a more generalized epidemic, which is frequently determined as a prevalence in excess of or nearing 1% among female antenatal clinic attendees, is apparent in Cambodia (0.5%), Myanmar (0.6%), and Thailand (1.3%). While these rates do not yet compare with those seen in sub-Saharan Africa, where prevalence is reported in double digits, an epidemic of even half the severity of Africa's would translate into a far higher toll, given the considerably larger population in Asia. Indeed, with few exceptions, the HIV/AIDS pandemic has grown significantly in the region. Recent increases in reported HIV cases in Indonesia show the potential for HIV to reach epidemic proportions even in countries with previously low HIV prevalence rates. As many of the behaviors that lead to HIV infection are heavily stigmatized, the governments of many Asian countries have been slow to react to early warning signs and have been reluctant to implement sometimes-controversial control strategies.

In the absence of a vaccine, prevention programs directed at reducing transmission among high-risk groups are gradually being scaled up in the region to control further spread of the disease. These include condom

TABLE 3.2 HIV/AIDS Burden for Selected Countries

<i>Country</i>	<i>Estimated total population, 2009</i>	<i>Estimated number of people living with HIV49/AIDS, 2009</i>	<i>HIV prevalence in adults, 2009 (%)</i>
Cambodia	14,805,000	63,000	0.5
China	1,354,751,000	740,000	0.1
DPR Korea	23,906,000	...	<0.2
Indonesia	229,965,000	310,000	0.2
Japan	127,156,000	8100	<0.1
Laos	6,320,000	8500	0.1
Malaysia	27,468,000	100,000	0.5
Mongolia	2,671,000	<500	<0.1
Myanmar	50,020,000	240,000	0.6
Philippines	91,983,000	8700	<0.1
RO Korea	48,333,000	9500	<0.1
Singapore	4,737,000	3400	0.1
Thailand	67,766,000	530,000	1.3
Timor-Leste	1,134,000	...	<0.1
Vietnam	88,069,000	280,000	0.4

SOURCES: For estimated population in 2009—UNDESP, 2009; for HIV estimates—UNAIDS, 2010.

promotion among sex workers and their clients, and among men who have sex with men, as well as needle and syringe programs and methadone treatment for drug users. As a result of intensive interventions among high-risk groups, Cambodia, Myanmar, and Thailand have enjoyed steady declines in HIV prevalence in adults age 15–49. In Thailand, a successful program to prevent mother-to-child transmission (figure 3.1) has also yielded exemplary results (WHO, 2010a).

New strains of HIV threaten to continue to emerge as the virus develops resistance to the antiretroviral drugs used to control its replication. In recent years, government-supported programs to provide these drugs freely have been established in most of Asia. As the number of people gaining access to treatment increases, so too does the risk that some will develop resistant viruses and that they may transmit these viruses to their partners. This phenomenon has already been noted in China and Thailand, where first-line treatments are failing and they have begun introducing second-line treatments. Unfortunately, because the HIV virus is able to

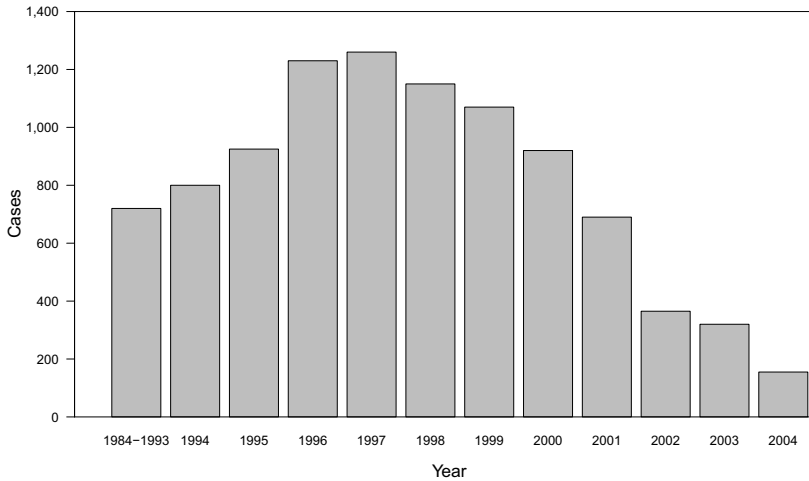


Figure 3.1. Gradual reduction in reported AIDS cases in Thai children, 1998–2004. In the mid-1990s, Thailand had the highest rate of HIV in Asia, largely due to transmission between sex workers and their clients and from the clients to their wives and girlfriends. A nationwide campaign to promote condom use in brothels and other establishments where sex was sold significantly reduced the rate of new infections, particularly among sex workers. This in part explains the drop in infections after 1997. However, having a pool of infected women of childbearing age meant that around 10,000 children were born each year at risk of HIV infection; in the absence of any intervention, HIV will be passed to around 30% of children of infected mothers during the intrauterine period, perinatally, or through breast-feeding. In 2000 the government launched a nationwide campaign to reduce mother-to-child transmission of HIV. The program included counseling and HIV testing for all pregnant women, a short course of zidovudine (ZDV, an antiretroviral drug that reduces HIV replication) for all HIV-positive women and their children, and a supply of infant formula so breast-feeding could be avoided. After a year, the HIV prevalence among newborns was 1.1% for those receiving antenatal care and 5.9% for those receiving no care. Nationally, this translated into a reduction in the overall number of children born with HIV, and the program was scaled up. The success of the program has made it a model for other countries in the region (Amornwichee et al., 2002). Source: WHO, 2010a.

mutate rapidly and resist these drugs, this problem will increase for the foreseeable future.

### *Tuberculosis*

Tuberculosis (TB) continues to be one of the biggest killers of young adults in Asia. It is reemerging as a threat in the region for at least two reasons: the rise in HIV infections and resistance to treatment.

TABLE 3.3 Estimated Prevalence of HIV in New Tuberculosis Cases in Selected Countries, 2009

<i>Country</i>	<i>Prevalence of HIV in new TB cases (2009)</i>	<i>Prevalence of HIV, 2009</i>
Cambodia	6.4	0.5
China	1.5	0.1
Indonesia	2.8	0.2
Myanmar	11	0.6
Thailand	17	1.3
Vietnam	4.2	0.4

SOURCES: For TB estimates—WHO, 2010d; for HIV estimates—UNAIDS, 2010.

NOTE: Many healthy people live asymptotically with TB. However, in the presence of HIV infection, the body's ability to defend itself against infections becomes compromised and many diseases, including TB, are able to manifest. As the prevalence of HIV has risen around the world, so too has the prevalence of TB. In some cases, TB is newly acquired, while in others latent TB is reactivated. Here, it can be seen that in countries with higher rates of HIV there is a higher proportion of TB patients presenting who are coinfecting with HIV.

TB is the most common opportunistic coinfection among immunologically compromised individuals infected with HIV, and it is believed to be the leading cause of death among persons with AIDS. With the likelihood of finding a higher prevalence of HIV among people infected with TB, and because of the need to coordinate treatment for HIV and TB in coinfecting individuals, special attention has been directed to HIV testing among TB patients. HIV surveillance among TB patients in many countries of the region has shown a moderate to high prevalence of HIV coinfection and incident cases (table 3.3).

The standard treatment for TB in most developing countries comprises simultaneous use of three to four drugs for periods varying from 6 to 9 months. To ensure compliance, the drugs are administered under the direct observation of an attendant—directly observed treatment, short course (DOTS). The clinical symptoms of the disease ameliorate within a few weeks of treatment, giving a false feeling of well-being to the patients, who in many instances stop the treatment. Inconsistent or partial treatment (i.e., not completing a course of treatment) has led to drug-resistant strains of TB. Strains resistant to one drug may still be treatable with other drugs. A particularly dangerous form of drug-resistant TB is multi-drug-resistant TB (MDR-TB), which is defined as the disease caused by TB

bacilli resistant to at least isoniazid and rifampicin, the two most powerful anti-TB drugs (WHO, 2010b). MDR-TB cannot be treated with first-line drugs (e.g., isoniazid and rifampicin), making it at least a hundred times more expensive to cure. Extensively drug-resistant TB (XDR-TB) is resistant to both first- and second-line treatments, making it even more expensive to treat. MDR-TB and XDR-TB have added new dimensions and complexities to treatment and control of TB.

Fortunately, although MDR-TB has been reported by some Asian countries, for example, Thailand, the prevalence is quite low because of the effective implementation of the DOTS program. However, it has been argued that the region could yet prove to be the decisive battleground in the international war against TB (Brill, 2008). More than 300,000 TB cases in Asia are estimated to be multi-drug resistant, yet only 1% are currently being treated. Several countries (e.g., Indonesia, Philippines, Thailand, Vietnam) have established or are gradually expanding treatment programs to include treatment for multi-drug resistance. At the same time, the emphasis is on using the window of opportunity provided by currently low rates of multi-drug resistance, to put in cost-effective interventions to prevent the further emergence of resistant strains. How current efforts to control TB in Asia will affect the long-term global spread of the disease remains to be seen.

### *Nipah Virus*

The beginning of the millennium saw the appearance of Nipah virus in Malaysia; it caused the deaths of 100 people in the country, as well as significant economic losses due to the slaughter of more than a million pigs (Chua, 2003). Subsequently, Nipah virus outbreaks have been identified in India and Bangladesh. The disease is characterized usually by influenza-like symptoms, with high fever and muscle pains (myalgia). It may progress to inflammation of the brain, with drowsiness, disorientation, convulsions, and coma. More than 50% of the clinically apparent cases die. By 2011, the Nipah virus had infected a total of 276 people and killed 106 in Southeast Asia (WHO, 2009c).

The virus is naturally carried by fruit bats, which do not show any symptoms of disease. During the first outbreak in Malaysia, it was thought that the bats infected pigs, which subsequently infected farmers and others who came into direct contact with respiratory droplets and nasal secretions of infected animals or their contaminated tissues. An alarming development seen in Nipah outbreaks in Bangladesh (in 2001 and 2006) and India (2001) was the evidence of person-to-person transmission of the virus and the high case fatality rate of 60–70% (Gurley et al., 2007). Nipah virus has

also been categorized as a food-borne disease (Luby et al., 2006), for example from eating dates contaminated with the urine or saliva of infected bats.

There is no vaccine, cure, or treatment for Nipah virus disease. Prevention of further outbreaks may be achievable by noting early signs of illness in pigs, wearing protective clothing when around infected animals or people, washing fruit and boiling fruit juices before consuming them, and regular hand washing. Culling infected livestock may also be necessary, pointing to the significant economic losses this disease could present in future outbreaks.

### *Severe Acute Respiratory Syndrome (SARS)*

In 2003, severe acute respiratory syndrome (SARS) inflicted a major toll on health, tourism, and travel in many countries. SARS was the first newly emerging and readily transmissible disease of the twenty-first century.

In late February 2003, an atypical pneumonia outbreak of unknown cause with a total of 305 cases (including five deaths) in Guangdong Province of China was reported by health authorities. The outbreak was caused by a new, emerging disease later named SARS. The causative virus of this new clinical entity is a novel coronavirus (Drosten et al., 2003). It is strongly believed that the virus jumped from civet cats to human beings in southern China, where the cats are eaten. This theory is supported by genetic evidence that suggests the viruses found in these cats and patients with SARS are related (WHO, 2003).

SARS spread with astonishing speed from Guangdong to the rest of the world, largely aided by air travel. Retrospective investigation indicated that the initial SARS case might have occurred in mid-November 2002 in Guangdong. By March 2003, SARS had spread to several other countries, notably Hong Kong, Taiwan, Singapore, and Canada. According to final data compiled by WHO, there were 8,096 probable SARS cases in 29 countries and areas, with 774 fatalities. Although the outbreak affected individuals in many countries, the greatest impact by far was felt in the Asia-Pacific region, which had more than 95% of the cases (WHO, 2008c). With a small number of notable exceptions, SARS was largely transmitted through hospitals and medical facilities. The containment of the epidemic involved the classical public health measures of isolation of suspected cases, tracing and quarantining of contacts, restrictions on air travel, and adoption of stringent infection control measures in medical facilities.

However, since the 2002–2003 outbreak, only four cases of SARS have been reported in Guangzhou, Guangdong Province, in China, occurring between December 2003 and January 2004. In addition, SARS cases



acquired in a laboratory setting have been reported in Beijing, Singapore, and Taipei. In Beijing, the incident was associated with transmission beyond the index case, with three “generations” of infection resulting in a further nine cases. These cases have raised the profile of laboratory biosafety as a regional issue that should be addressed.

SARS has had considerable economic impact in many countries in Asia and around the world. Estimates of losses based largely on canceled travel and decreased investment in service industries in Asia ranged from US\$30 billion to US\$140 billion (WHO, 2008c). The extent of the economic impact from outbreaks largely depended on how swiftly governments implemented effective public health actions that restricted the spread of infection, especially actions in which the communities actively participated. These actions included enormous public health campaigns to educate people about coughing/sneezing etiquettes, avoiding spitting, and increasing hand washing, and in the extreme, travel within cities was restricted (e.g., in Beijing).

### *Influenza*

Influenza pandemics have occurred regularly throughout human history. Of the three occurring in the twentieth century, the so-called Spanish flu pandemic of 1918 was the deadliest, with an estimated 20 to 40 million deaths. The other two pandemics were of the Asian flu (1957) and Hong Kong flu (1968), both of which resulted in the death of 1 to 4 million people worldwide. These pandemics were all caused by viral strains of influenza A related to avian influenza viruses, which is why the recent outbreak of avian influenza A (H5N1) was believed to be a large threat.

### *H5N1*

The first documented occurrence of H5N1 infection in humans occurred in Hong Kong in 1997 with 18 cases, 6 of which were fatal. The cases coincided with outbreaks of highly pathogenic H5N1 infection in poultry on farms and in livestock markets. Within 3 days, Hong Kong culled its entire poultry population of 1.5 million birds in an effort to avert a pandemic threat by preventing further human exposure. This strategy was subsequently vindicated by evidence that the virus had begun to mutate in a dangerous way.

From December 2003 to July 2009, outbreaks of H5N1 resulted in 433 cases, with 262 deaths in 15 countries (WHO, 2009a). Of these, 324 cases and 210 deaths occurred in 7 countries of East and Southeast Asia. More than 250 million birds either have died from the disease or were culled in efforts to contain the outbreaks. The world continues to live under the

threat of a pandemic of influenza. WHO estimates that a global pandemic could infect at least a billion people and cause the deaths of between 2 and 7 million people.

### H<sub>1</sub>N<sub>1</sub>

While the world was grappling with H<sub>5</sub>N<sub>1</sub> avian flu and preparing for a pandemic that could emerge, a novel influenza A H<sub>1</sub>N<sub>1</sub> subtype appeared suddenly in Mexico in March 2009.

An H<sub>1</sub>N<sub>1</sub> virus was responsible for the Spanish influenza pandemic of 1918, and the causative agent of the current epidemic seems to have evolved in part from the same H<sub>1</sub>N<sub>1</sub> strain. Its genetic structure is actually a reassortment of genes from four influenza viruses: North American swine influenza, Asian/European swine influenza, human influenza, and non-H<sub>5</sub> avian influenza. The virus has a unique genetic composition that has never been seen before.

During the 2009–2010 H<sub>1</sub>N<sub>1</sub> pandemic (figure 3.2), there were more than 300,000 laboratory-confirmed cases and 18,366 deaths reported from 214 countries/territories (WHO, 2010c). The virus crowded out other influenza viruses to become the dominant virus. In the postpandemic phase, many countries are reporting a mix of influenza viruses, again as is typically seen during seasonal epidemics (WHO, 2010c).

Fortunately, the global community was in a better state of preparedness in 2009 than at any time in the past. Since their experiences with SARS and H<sub>5</sub>N<sub>1</sub>, national authorities have been engaged in strengthening their response capabilities, with assistance from the WHO, the US Centers for Disease Control and Prevention, and other developmental partners. Thus, within a short time, the H<sub>1</sub>N<sub>1</sub> virus was sequenced, a diagnostic test was developed, and the susceptibility of the virus to currently available influenza drugs was determined. Fortunately, the virus continued to remain susceptible to oseltamivir and zanamivir, although access to these drugs and their rational use are critical in mitigating disease, as well as in prolonging the utility of the drugs by obviating emergence of resistance. Moreover, a vaccine was rapidly developed, was tested, and was mass-produced for distribution to governments. However, production takes time and the vaccine was not easily accessible to the vast majority of people living in developing countries, including Asia. In the meantime, many of Asia's nations employed the same kinds of public education campaigns they used to fight SARS, namely repeated hand washing and following proper cough/sneeze etiquette, as well as isolating infected individuals and their contacts.

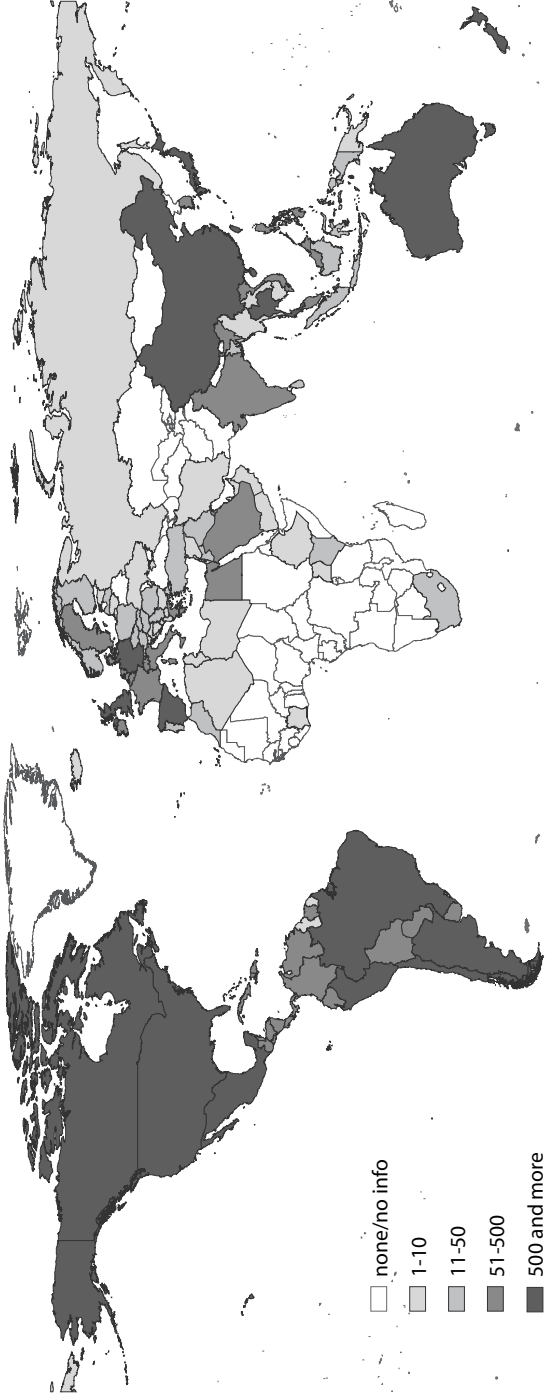


Figure 3.2. Distribution of influenza A (H1N1) during the first 2 months of the H1N1 pandemic. Total number of laboratory confirmed cases, as reported to WHO by 6 July 2009, was 94,512, with 429 deaths. Source: WHO, 2009b.

Based upon its assessment of the global situation, as well as reports from several countries, the WHO declared on 10 August 2010 that the world was no longer in phase 6 of influenza pandemic alert. The new H1N1 virus had largely run its course, and hence the world was to move into a postpandemic phase. This does not mean that the H1N1 virus has gone away. Based on experience with past pandemics, H1N1 virus is expected to take on the behavior of a seasonal influenza virus and continue to circulate for some years to come.

During the past 6 years, the world has been strengthening its preparedness capacity while trying to understand influenza viruses and their mode of spread. These advances will help to reformulate policy and strategies for combating this new threat to public health in the region. Experience with previous influenza pandemics shows occurrence of pandemics in several waves with increasing severity of disease. The current pandemic is considered “mild,” but there is an urgent need to be vigilant for subsequent waves of infection with increasing virulence.

### *Dengue Fever*

Dengue fever is a febrile illness that affects infants, young children, and to a lesser extent, adults in tropical and subtropical areas of the world. The virus likely originated in Asia, since the first record of dengue fever can be found in a Chinese medical encyclopedia dating to the third century (Gubler, 1998). Although the fever has been known in Asia for centuries, it is considered an emerging infectious disease because of recent outbreaks of increasing frequency and severity (figure 3.3).

Dengue fever is transmitted by the bite of an *Aedes* mosquito infected with any one of the four dengue virus strains. Symptoms appear 3–14 days after the infective bite and range from a mild fever to incapacitating high fever with severe headache, pain behind the eyes, muscle and joint pain, and rash. Dengue hemorrhagic fever (DHF), which mainly affects children, is a potentially lethal complication comprising fever, abdominal pain, vomiting, and bleeding. Early clinical diagnosis and careful clinical management by experienced physicians and nurses increase survival of patients. There are no specific antiviral medicines for dengue. Patients who have experienced the fever once usually do not develop it again—exposure provides immunity to that serotype, although it is possible to be infected by any of the other serotypes. Because exposure to dengue viruses usually happens during childhood, thereby conferring immunity against future infections, dengue fever is generally considered a childhood illness in endemic countries.

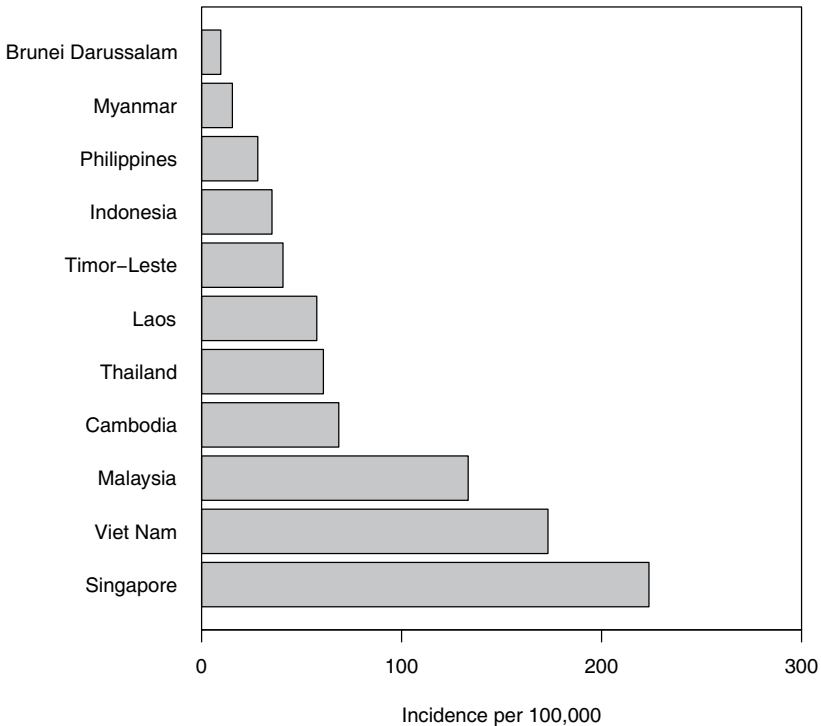


Figure 3.3. Incidence of dengue fever per 100,000 in the Asia-Pacific region, 1991–2004. Case numbers varied from a low of 247 in China to a high of around 80,000 in Indonesia. These numbers translate to very high rates in countries reporting focal outbreaks for the first time, especially smaller countries with smaller populations. Source: WHO, 2008c.

Dengue fever is now the most common arboviral disease in the world, with an estimated annual 100 million cases in over 100 countries, 250,000 cases of DHF, and 25,000 deaths per year (Gubler, 2002; Gubler, 2011). In just the past five decades, there has been a thousandfold increase in the number of reported cases (Kroeger & Nathan, 2006). Over 50 million infections, with about 500,000 cases of DHF and at least 12,000 deaths, occur annually, with dengue being a significant cause of childhood mortality in several Asian countries, including Indonesia, Singapore (see figure 3.4), and Thailand (WHO, 2008a). The *Aedes* mosquito that carries the dengue virus thrives in cities, breeding in stagnant water that may collect in discarded plastic, bottles, tires, or any other receptacle. With increased urbanization, its breeding grounds have expanded exponentially, and the overcrowding that co-occurs with urbanization means the disease is more

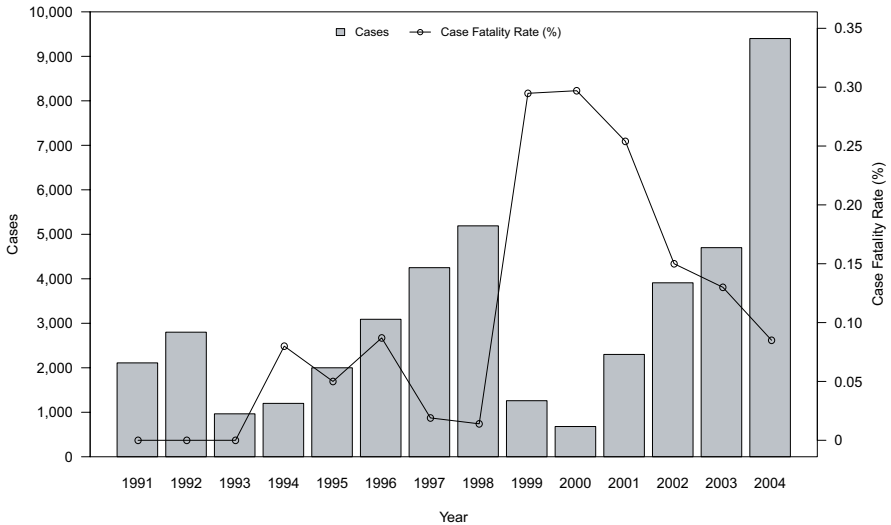


Figure 3.4. Dengue fever cases and deaths in Singapore, where larger outbreaks tend to occur every 5 to 6 years. Since the early 1990s, dengue incidence during major outbreaks has risen steadily in the country. In 2004, there were 8 deaths and 9,459 cases reported. This is the most cases reported during the last 15 years and is almost twice as many as in the 1998 epidemic. This has occurred in spite of Singapore's sophisticated control and monitoring system and strict legislative measures, and it demonstrates the vulnerability of even wealthy nations to infectious disease.

easily spread from person to person. Increased travel and trade and the lack of effective mosquito control are also thought to have contributed to the reemergence of this disease (Kroeger & Nathan, 2006).

Control of dengue fever is achievable through mosquito control, use of bed nets, and public education regarding removal of water receptacles that can allow stagnant water to collect and promote breeding of *Aedes* mosquitoes. Vaccines are in development. However, even with the comprehensive controls employed in developed countries, outbreaks still occur (figure 3.4).

### *Chikungunya*

Chikungunya is another viral disease spread by mosquitoes that has re-emerged with a series of outbreaks this century, affecting Indonesia, Thailand, and Malaysia (Bhatia & Narain, 2009). It causes fever and severe joint pain. Other symptoms include muscle pain, headache, nausea, fatigue, and

rash. The disease shares some clinical signs with dengue fever and can be misdiagnosed in areas where dengue is common. There is no cure for chikungunya. Treatment is focused on relieving the symptoms. The proximity of mosquito breeding sites to human habitation is a significant risk factor. The disease originated in Africa, and in recent decades mosquito vectors of chikungunya have spread to East and South Asia, Europe, and the Americas.

### *Malaria*

Although malaria has a long history in Asia, antimalarial-resistant strains of the parasite continue to emerge in this region, making it a reemerging problem. Antimalarial-drug-resistant strains have spread slowly but steadily. Resistance to chloroquine, which is used in both the prophylaxis and the treatment of malaria, was reported first in 1962 on the Thai-Cambodian border (figure 3.5) and then in 1969 on the Thai-Myanmar border. These two areas are now identified as the primary foci for multi-drug-resistant falciparum malaria. Resistance to the 4-aminoquinolines and sulfadoxine-pyrimethamine monotherapy is widespread in almost all Asian countries, with varying levels of severity (Bloland, 2001). Mefloquine has reduced potency for treatment in Cambodia and Thailand, where it was used as monotherapy from the mid-1980s to the early 1990s, and it is now also ineffective for prophylaxis. Combination therapies are preferred over monotherapy, since they minimize the emergence of resistance. Although quinine is still effective in the treatment of severe malaria, it is generally combined with tetracycline to improve efficacy. With progression from single-drug to multi-drug resistance, the problem is becoming acute, prompting most countries to shift to highly effective artemisinin-based combination therapy. During the last 4 years, however, data have started to show increasing treatment failures with the mefloquine and artesunate combination along the Thai-Cambodian border (Samarasekera, 2009). As yet, doxycycline, atovaquone/proguanil, and primaquine remain effective malaria preventives, but these drugs cannot be used in treatment.

Chloroquine resistance in *Plasmodium vivax* was recently reported in Indonesia, Myanmar, Timor-Leste, and Vietnam, while primaquine tolerance (e.g., in the *P. vivax* Chesson strain) was already well documented in the 1950s and 1960s. The current vivax malaria treatment recommendations—3-day chloroquine and 14-day primaquine—are inadequate in these areas, and a higher dose of primaquine is required to achieve a radical cure of infections (Bloland, 2001).

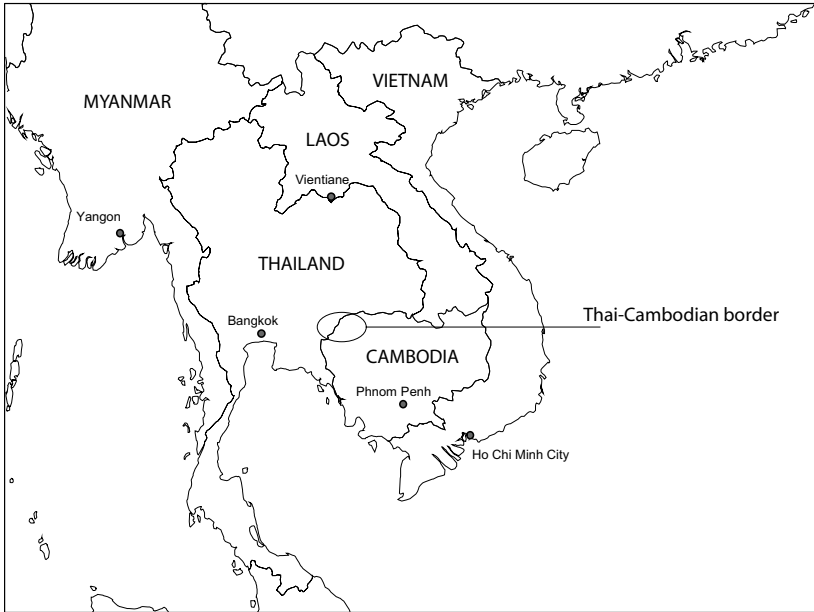


Figure 3.5. Drug-resistant malaria at the Thai-Cambodia border, a region with a long history with *Plasmodium falciparum* that has an uncanny ability to develop resistance to antimalarial drugs. In the 1970s, the parasite became resistant to the first-line drugs chloroquine and sulfadoxine-pyrimethamine. Now resistance to artemisinin derivatives has been reported. These are fast-acting antimalarials with few side effects. Importantly, they are the last option available in this and other regions where *falciparum* has become tolerant for alternative treatments. Drug resistance means higher rates of treatment failure and longer treatment durations.

While it is possible that the parasites in this region have an exceptional ability to develop resistance to pharmaceuticals, the more probable reasons for the emerging resistance are human factors. Many Cambodians self-medicate using over-the-counter antimalarials that may be substandard or even counterfeit medicines. These drugs may contain small amounts of the active ingredient, in this case artemisinin; this exposes the parasites to small doses, which in turn facilitates tolerance for the drug and subsequent treatment failure. The solution, then, is to educate the population about the disease and its correct treatment and, more importantly, to regulate the distribution of pharmaceuticals in Cambodia and other developing countries—a daunting and extremely challenging task. See Samarasekera, 2009, for more information.



### *Antimicrobial Resistance*

Malaria is not the only disease to have reemerged because of antimicrobial resistance. Control of STIs, TB, HIV, pneumonia, and other diseases is also threatened by resistance to the drugs that have been developed to treat them. Diseases due to resistant organisms take longer to heal and require expensive and at times toxic drugs for longer periods, often making the disease untreatable. The resistant organisms can also move across countries through travel and trade. Thus, antimicrobial resistance is a global challenge requiring concerted efforts at national and international levels to preserve the available antimicrobial agents (Bhatia & Narain, 2010).

While the appearance of resistance is a continuous phenomenon in microorganisms, its amplification and spread are caused by an array of practices conducted by human beings. Improper utilization of antimicrobial agents, especially in high-disease-burden settings and for nontherapeutic use, as in the veterinary sector, result in strong selection pressure that allows the resistant strains to grow and rapidly replace susceptible isolates. Asian countries are particularly vulnerable because most countries have a deregulated or poorly regulated pharmaceutical industry with easy availability of treatment without sound medical advice. Those dispensing medications—whether health workers, pharmacists, or even doctors—may not fully understand the indications for the treatments they are providing. The problem is not limited to the developing countries of Asia; Singapore, for example, has one of the highest rates of antimicrobial resistance in the world, largely because of inappropriate antibiotic prescribing (Hsu et al., 2008). In the event of antimicrobial resistance, combination antibiotic therapy may be used. But there are caveats with the use of combination therapy, such as increased risk of drug toxicity, increased cost, and potential superinfection with even-more-resistant bacteria or fungi. The WHO has been promoting rational use of antimicrobial agents, and recently the World Health Assembly has endorsed a resolution (WHA 60.16) that requires development of national programs to ensure rational use of medicines to prevent emergence of resistance.

The magnitude of the antimicrobial-resistance crisis is unknown because of the absence of systematic monitoring in developing countries. Data available from selected institutes indicate the enormity of the spectrum and extent of resistance of other pathogens to available treatments. Chloramphenicol is no longer the drug of choice against typhoid fever; most hospital-associated infections are due to multiresistant strains of commonly encountered bacteria, and in some instances even the ultimate

weapon against bacteria—vancomycin—does not work (WHO, 2011a). Vancomycin resistance in *Staphylococcus aureus* and enterococci is a reality in hospitals, leaving health workers with no way to treat patients who become infected with these organisms.

#### ECONOMIC LOSSES DUE TO EIDS

EIDs not only represent a serious public health threat, they exert an enormous socioeconomic impact and are a cause for global concern. These diseases have the potential to spread across borders, thereby threatening global health security and necessitating cooperation between countries. The global community is acutely aware of the impact of health on the economy: Nipah virus outbreaks are estimated to have caused losses of US\$500 million (Marsh Inc, 2010); SARS cost the Chinese and Canadian economies over US\$50 billion in medical treatment, disease control, and lost revenue due to the abrupt halt of their tourism industries (WHO, 2008c). The World Bank (2008) estimates a severe avian flu pandemic among humans could cost the global economy about 3.1% of the world's gross domestic product—around US\$1.25 trillion on a world GDP of US\$40 trillion. Some of the estimated losses due to EID outbreaks in one year are shown in table 3.4.

HIV/AIDS, malaria, and tuberculosis are three of the world's most devastating diseases. Developing countries are especially vulnerable to these diseases because of poverty, lack of basic health and education services, poor nutrition, and inadequate living conditions. The impact of these diseases drives communities deeper into poverty as primary caregivers and income earners become too ill to support their families. HIV/AIDS destroys lives, families, and entire communities. The disease threatens to reverse years of development and puts at risk the political stability and economic security of developing countries. Though several communicable diseases have huge impacts on communities, perhaps the most dreadful are from HIV/AIDS, along with malaria and TB.

The association between poverty, malnutrition, and communicable diseases is well established. These collectively create a vicious cycle with far-reaching implications. Children in poor families are often grossly malnourished and become susceptible to a variety of communicable diseases. Inability of the families to provide appropriate and timely treatment every time a child falls sick leads to weakened physical and mental capabilities of the child. Illness among the poor adults leads to higher absenteeism, low productivity, and low levels of skill—all of which are detrimental to the capacity of the individuals to improve their economic condition. The pre-

TABLE 3.4 Economic Loss Due to Selected Emerging Infectious Diseases

<i>Outbreak</i>	<i>Region</i>	<i>Year</i>	<i>Loss in US\$ billion</i>
SARS	Asia	2003	50
Nipah virus	Malaysia	2003	0.5
Avian influenza	Asia	2004	110

SOURCE: World Bank, 2008.

NOTE: The costs of contagious diseases such as SARS, Nipah virus, and avian influenza encompass many factors, including reduced productivity of the workforce; loss of income during illness, convalescence, or care for ill family members; medical care and treatment of patients; provision of vaccines (if available); establishment of screening procedures, e.g., thermosensors in airports; losses to the tourism industry due to restricted travel and tourism; and loss of livestock.

ponderance of communicable diseases and rampant malnutrition in poor countries are two important causes of those countries' lesser development.

#### VULNERABILITY OF ASIAN COUNTRIES TO EIDS

Infectious diseases have always been closely interwoven with the history of developing countries, which are ideal sites for emergence and propagation of infectious diseases. Poverty, overpopulation, deforestation, urbanization, global warming, ignorance, and weak health structures are characteristics of any developing country and ideal settings for emergence of infectious diseases (box 3.2). The end result of the impact of these factors is borne by the health of human beings.

##### *Demographic Factors*

Population pressure is an overarching determinant. A net addition of 77 million people per year occurs in the world. The East and Southeast Asian countries have an estimated population of around 2 billion, with population density of about 130 persons per square kilometer—far higher than the global average of 45 persons per square kilometer (Brennan, 1999). Increased population density carries increased potential for person-to-person contact and spread of disease, greater likelihood of global warming, larger numbers of travelers, and increased hunger and malnutrition. More people virtually guarantees extensive urbanization. By 2015, there will be 23 megacities with populations exceeding 10 million each, of which 15

### BOX 3.2 Factors in Disease Emergence

There are many factors that contribute to the emergence of new infectious diseases or the reemergence of old diseases. The key factors are increased international travel and trade, population growth, changes in physical and social environments, and antimicrobial resistance in disease-causing organisms. Some specific factors follow:

Environment: deforestation or reforestation, floods, water

Human behavior: sex, drug use, travel, diet, play

Food supply: globalization and processing

Public health infrastructure: lack of surveillance, training, laboratory support

Microbial adaptation: evolution, drug resistance

Social change: crowding, poverty, migration

Health care: immunosuppression, medical devices, antibiotic misuse

will be in Asia. Indeed, Asia already has 7 megacities. Most governments and civic authorities have not planned for this population explosion in the cities and are thus ill prepared to provide the necessary basic amenities such as water, sanitation, electricity, garbage disposal, communication, transport, and health care.

A worldwide increase in poverty and rapid urbanization are forcing millions of people to live in overcrowded and unhygienic conditions where lack of clean water and inadequate sanitation provide breeding grounds for infectious diseases. High population density raises the risk of respiratory infections and of infections transmitted through contact with pathogens in food and water. In addition, almost one-third of children today are undernourished, and half the world's people lack regular access to essential drugs (see chapter 2).

Changes in human behavior and lifestyles bring higher risk from infectious diseases to certain age groups—for example, young children clustered in day-care centers, and the growing numbers of older persons in nursing homes in Japan, RO Korea, and Thailand. While these factors are pervasive all over the world, the developing countries with multiple political, social, economic challenges and a weak health infrastructure bear

the brunt of these diseases. The situation gets further compounded by the emergence of new pathogens at regular intervals.

### *International Travel*

International travel and trade also facilitate movement of infections. SARS has been documented to be one of the fastest-moving microorganisms in the history of humankind. The Spanish influenza traveled around the world in less than 12 months, the Hong Kong (1968–1969) influenza took only 6 months, and a future pandemic is likely to spread even more rapidly because of the speed and frequency of human travel. SARS was carried to at least 29 countries in a matter of months, through international air travel by infected people. With world air travel likely to increase at about 5% every year for at least the next 20 years, the problem of EIDs will continue to grow (Cunningham, 2005).

### *Environmental Factors*

Safe water and good hygiene are prerequisites for individual health as well as public health, especially in developing countries (also see chapter 8). Globally, it is estimated, over 1 billion people are without access to a clean water supply and about 2.5 billion people live without adequate sanitation. In Asia, although it is claimed that more than 80% of the population have access to an improved water supply, the quality and safety of the water is often questioned. Waterborne illnesses continue to be a major problem. Outbreaks of hepatitis E in Vietnam and Myanmar have been traced to the piped water that got contaminated by sewage from leaky sewer pipes (Corwin et al., 1996; Sinlaparatsamee et al., 1995). Basic sanitation facilities are weak, and millions of people in Asia lack access to sewage facilities.

### *Economic Factors*

As mentioned above, poverty breeds ill health, and ill health in turn breeds poverty. Poverty remains the number one killer. Today, poverty amid plenty is the world's greatest challenge. Poor children are particularly affected, with the greater burden being borne by the female child. Not only are children more heavily and frequently exposed to threats to their health, but they are more vulnerable to the effects of ill health. Most of the countries in Asia belong to the low- or lower-middle-income category, highlighting the importance of economic factors in the control of infectious disease. Indeed, three of the eight Millennium Development Goals are health related, and three others (hunger, environment, and education) significantly influence health.

### BOX 3.3 Examples of Zoonoses of Public Health Importance

Endemic: rabies, brucellosis, salmonellosis, rickettsiosis, hydatid disease

Endemic and expanding: Japanese encephalitis,\* leptospirosis, Kyasanur forest disease\*

Potentially epidemic: Japanese encephalitis,\* leptospirosis, Chandipura virus,\* plague

New and emerging: SARS,\* Nipah virus,\* avian influenza\*

Potentially pandemic: influenza

\*thought to have originated in Asia

### *Animals and Human Health*

Human beings have lived closely with animals since time immemorial. But nowhere is this coexistence as intense, continuous, and close as in Asian countries. The close continuous contact provides frequent exchange of microorganisms between animals and human beings, as well as opportunities for some of the genetically altered organisms to adapt to humans and initiate a new cycle of human-to-human transmission (box 3.3). SARS exemplifies this phenomenon: the virus jumped from civet cats in southern China to human beings, resulting in the first pandemic of the new millennium (WHO, 2003).

A large proportion of human pathogens—about 60%—are zoonotic, and to date, over 800 pathogens have been identified as causing zoonoses (Woolhouse & Gowtage-Sequiera, 2005). New organisms are being added to this list. Over 30 new human pathogens have been detected in the past three decades; 75% of these are of zoonotic origin (WHO, 2008a). SARS and avian influenza are just two examples. Zoonoses involve all types of agents: bacteria (which cause salmonellosis, plague, anthrax, leptospirosis), parasites (taeniasis, hydatidosis, toxoplasmosis), viruses (rabies, Japanese encephalitis, avian influenza, Nipah virus, SARS), and unconventional agents (bovine spongiform encephalopathy).

Other factors associated with the emergence and spread of zoonoses in Asia include diversification of farming systems (intensive farming or intensified animal husbandry practices) without considering biosecurity measures; extensive antimicrobial use, causing development of resistance;

rapid urbanization and industrialization; changing food habits and lifestyles; deforestation; increased international travel, tourism, and trade, including illegal trafficking of wildlife; and climate change, which disturbs the natural habitats of animals (Weiss & McMichael, 2004).

Globalization of the food trade has resulted in more shipment of livestock; changed food production, storage, and marketing; and altered eating habits. All of these provide new opportunities for infections to flourish. For example, an outbreak of multi-drug-resistant salmonella that occurred in Singapore was linked to consumption of imported dried anchovy (Ling et al., 2002; see chapter 10 for more on globalization).

### *Human-Induced Ecological Changes*

Unmindful degradation of the environment is especially common in developing countries. Ecosystems all over the world are being destroyed in the name of development. Deforestation is altering flora and fauna, bringing deterioration of the environment and providing greater contact with hitherto restricted pathogens. Human encroachment on tropical forests and rapid deforestation have brought people with little or no immunity into close proximity with insects that carry infectious diseases. For example, clearance of forest to build an international airport in Malaysia in the 1990s led to a devastating outbreak of Nipah virus, carried by displaced forest bats that fled to agricultural lands. Malaria, dengue fever, and schistosomiasis have increased in areas wherever artificial water bodies have been created (WHO, 2005b).

### *Climate Change*

Increasingly, scientists and others are convinced that our planet is warming. It now appears quite likely that Earth will be 1°C to 4°C warmer in the twenty-first century than it was in the twentieth. This will change the distribution of vectors and enable them to thrive in areas that were previously inhospitable (Kumaresan & Sathiakumar, 2010). The warmer temperatures may cause the following effects on parasites:

- a shortened viral incubation period in mosquitoes
- a shortened breeding cycle of mosquitoes
- increased frequency of mosquito feeding
- more efficient transmission of vector-borne diseases, including malaria, dengue, and chikungunya

Consequently, there will be an increase in the incidence of vector-borne infections like malaria and dengue fever. Even if effective measures are

instituted, it will take many years to negate the effects of climate change due to global warming.

### *Inadequate Public Health Infrastructure*

Having a well-functioning public health infrastructure can prevent many infections, particularly those that are food-borne or waterborne. Inefficient functioning of health systems can result in massive epidemics, and the occurrence of epidemics is an indicator of the weakness of public health systems. An efficient public health system not only quickly detects and responds to an epidemic during its initial phase but also is sensitive and sophisticated enough to spot a new or hitherto unidentified infection. Achieving an effectively functioning public health infrastructure is thwarted by inadequate funding and the low priority assigned to it by governments, and this is a persistent problem in much of Asia. For example, much of the region is without essential medicines. These are medicines that satisfy the priority health care needs of the population, selected with due regard to public health relevance, evidence of efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times and in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford. The concept of essential medicines is intended to include flexible implementation that is adaptable to many different situations; exactly which medicines are regarded as essential remains a national responsibility. Problems with public health infrastructure are discussed in greater detail in the next section and in chapter 11.

## COMBATING EIDS: CHALLENGES AND OPPORTUNITIES

The emerging infectious diseases are associated with high mortality, widespread panic, and staggering economic loss as well as loss of credibility of the health system and national authorities. These diseases require the utmost attention of national health authorities. Emerging infectious diseases are important, evolving, and complex public health problems (box 3.4).

Prevention and control of EIDs will increasingly require the application of sophisticated epidemiologic and molecular biologic technologies, changes in human behavior, and a national perspective. The fight against these diseases requires a comprehensive vision and an efficient road map that stimulates action at all levels of the health machinery. EIDs will continue to challenge public health infrastructure, test credibility of health



**BOX 3.4** Importance of Emerging Infectious Diseases

Why are emerging infections so important? They can have a significant impact on

Trade and tourism

International spread of drug-resistant organisms

Migration of infected people

Military readiness

Calls for humanitarian assistance

Potential for biological warfare and terrorism

Destabilization of nations or regions and increased international tensions

services, and threaten to devastate health and economic development unless a strategic vision and an effective plan of action are developed to combat them. In view of this, the WHO (2005a) has made several recommendations for national strategies:

- advocacy for political commitment and partnership building
- epidemic preparedness and rapid response
- public health infrastructure
- risk communication
- research and its utilization

*Advocacy for Political Commitment and Partnership Building*

The prevention and control of EIDs are the responsibility of national governments, and they necessarily require strong political will, financial commitment, human resources, and multisectoral collaboration. Experience with the SARS epidemic has clearly shown that effective prevention and control of diseases in the human population depend on multisectoral and multidisciplinary collaboration using multidimensional and integrated approaches, with the WHO coordinating the global efforts. However, it does appear that diseases that strike rapidly have garnered rapid response from governments, while diseases with a long latency between infection and symptoms, such as HIV, have received much slower responses.

In most countries of Asia the public health system is fragmented and in need of national policy to prepare for potential outbreaks. An outstanding exception, however, is country preparedness for influenza outbreaks. In the wake of earlier avian influenza outbreaks, national influenza pandemic preparedness plans have been developed by Indonesia, Myanmar, Thailand, and Timor-Leste. These plans, with minor modifications, are being activated to launch an effective response to the current influenza A (H1N1) pandemic. Countries also need to cooperate with one another and develop synergistic plans, as was clearly demonstrated with the SARS and avian influenza epidemics, which could be contained only through global efforts.

In several Asian countries, partnerships with the private health sector, NGOs, business and industry, medical schools, the media, and communities and development partners are making a significant contribution to TB control as well as prevention and control of the influenza pandemic and HIV. There are outstanding examples of successful collaboration between governments and NGOs at the grassroots level in Cambodia, Indonesia (WHO, 2011b), Myanmar, and the Philippines, where NGOs provide DOTS at the community level. In some areas and countries, public-private-mix DOTS programs have moved from the pilot stage to being integrated into national programs. China, Indonesia, and Myanmar have recently experienced a substantial increase in case-detection rates as a result of a strong political commitment at all levels, together with countrywide implementation of a partnership linking private practitioners, large public and general hospitals, and TB dispensaries. Other countries are in the process of building and scaling up these very successful partnerships. Employees in the public and private sectors are beginning to benefit from DOTS at their workplaces. DOTS has also been included in teaching, practice, and research agendas of medical schools in Indonesia, Myanmar, the Philippines, and Thailand.

### *Epidemic Preparedness and Rapid Response*

In order to be able to detect the emergence of a new disease or an outbreak, countries require a disease surveillance system (see also chapter 11). Surveillance in its simplest form is collection by health care workers of information that is reported to the public health authority for interpretation and action. The conceptual framework for the surveillance and response system for EIDs is essentially the same as for any other communicable disease. However, in many developing countries, implementation of this framework is hampered by several deficiencies. Prominent among these are inadequacies in data collection and in capacity for its analysis by

health care workers, weak feedback mechanisms, and an inadequate public health laboratory support system. Integration of individual data collection systems is important for government preparedness; in some cases, there may be several data collection systems for one disease! Many countries are beginning to integrate the data collection systems of different parts of the health sector and/or develop monitoring and evaluation systems to consolidate the data and plan for the future. For example, China has integrated HIV data collection by a number of different bodies and has a single system for monitoring and evaluation of the HIV epidemic (Wu et al., 2011).

An increasing use of information technology in health management information systems is a step in the right direction to improve data management. As demonstrated by China, real-time information collection, analysis, and dissemination of data are now feasible and can be accomplished by low-cost technology that is becoming more widely available (Mao et al., 2010).

### *Public Health Infrastructure*

Public health infrastructure is the backbone of any efficient public health activity. It consists of people who work in the field of public health, epidemiology, entomology, environmental hygiene, infection control, and laboratories as well as information and communication specialists at local, provincial, state, national, and international levels (figure 3.6).

There is a significant shortage of well-trained personnel who can perform these duties, in part because of low salaries and relatively low status, and this severely hinders the health services in many countries. The cost of establishing this infrastructure, particularly the installation of laboratory support, is a significant barrier for many of the poorer countries of Asia. Moreover, unstable power supplies and the occurrence of EIDs in remote areas further deter laboratory infrastructure and point out the need to develop field-friendly, heat-stable, and economically priced rapid diagnostic kits. Fortunately, several kits are now available for HIV, hepatitis B, dengue, and malaria, but still more are needed to support public health actions.

### *Risk Communication*

Risk communication is an interactive process of exchanging information and opinions among individuals, groups, and institutions, with the overarching aim of rapidly containing a crisis with as little social, economic, and political disruption as possible. It has two aims: (1) to ease public concern by

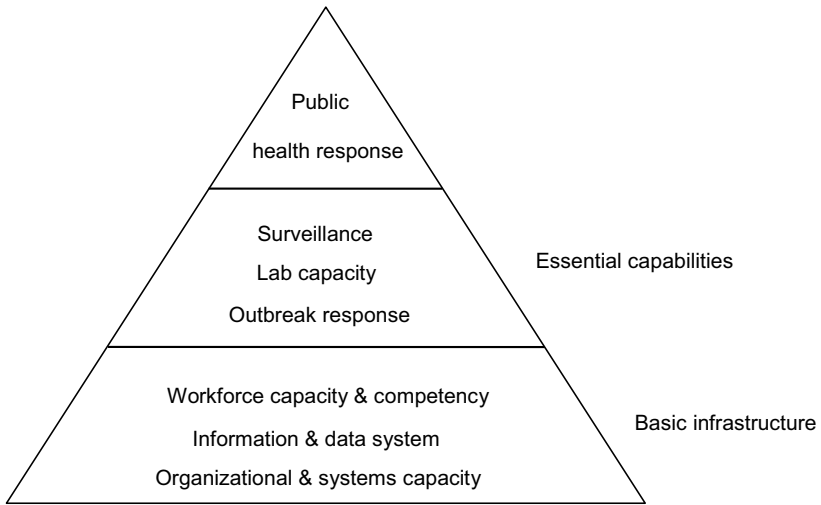


Figure 3.6. Public health infrastructure. An effective health system requires trained and competent personnel, adequate physical infrastructure of its health facilities, and good information and data management in order to prevent and control EIDs. These basic requirements facilitate surveillance, which is confirmed and improved by laboratory support. Fruitful collaboration between various units leads to more effective actions to improve public health. Source: WHO, 2005a.

providing information about the risk, treatment, transmission dynamics, and clinical features of disease outbreaks and (2) to educate the public about the actions they can take to reduce the risk of infection / transmission. Risk communication targets the general public and is crucially dependent on the mass media. For example, during the SARS epidemic, China was able to recruit the media to inform its population about the ongoing epidemic and to educate people about ways to prevent infection.

#### *Research and Its Utilization*

Research can play an important role during an outbreak, in identifying the etiological agent and in developing diagnostic tools, case management modules, and preventive strategies. Moreover, knowledge needs to be generated through research and interpreted, evaluated, built upon, and transferred in order to improve practices for prevention and control of EIDs. For example, during the Nipah virus epidemic in Malaysia, laboratory research was able to discern that although the initial laboratory diagnoses indicated Japanese encephalitis, the strain appeared sufficiently different to warrant further investigation. This eventually led to identification of

this new form of paramyxovirus, which requires quite different treatment strategies (Chua, 2003). Moreover, epidemiological research was able to identify the probable cause of infection once it was noted that a disproportionate number of those affected were pig farmers. Thus, these research investigations were able to inform clinical treatment as well as prevention among the uninfected.

### *International Health Regulations*

In response to the exponential increase in international travel and trade and the emergence and reemergence of international disease threats and other health risks, 194 countries and territories across the globe have agreed to implement the 2005 International Health Regulations. This binding instrument of international law entered into force on 15 June 2007. The stated purpose and scope of the regulations are “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade” (WHO 2008e). Because they are not limited to specific diseases but are applicable to health risks, irrespective of their origin or source, the regulations will follow the evolution of diseases and the factors affecting their emergence and transmission. They also require states to strengthen core surveillance and response capacities at the primary, intermediate, and national levels, as well as at designated international ports, airports, and ground crossings. They further introduce a series of health documents, including ship sanitation certificates and an international certificate of vaccination or prophylaxis for travelers. There is a need for core capacity development for implementation of the International Health Regulations in Asia. This includes control of zoonoses and multisectoral cooperation for international public health security. These core capacities cover surveillance and laboratory support, epidemic alert and response, reporting mechanisms and communication flow, and border health issues. In this scenario, closer collaboration, effective coordination, and timely information sharing among all relevant sectors become critical. The 2005 International Health Regulations provide a legal framework for accomplishing these goals.

### CONCLUSIONS

Events that have occurred during the past three decades reinforce the fact that newer microbes will continue to appear and infectious diseases will

continue to emerge. Unless controlled effectively, these will take a heavy toll on human life regardless of age, gender, lifestyle, ethnic background, and socioeconomic status. These will not only cause suffering and death but will also impose an enormous financial burden on society.

Some of these microbes may carry pandemic potential. Influenza is the most likely candidate, and the recent occurrence of avian influenza demands that national authorities pay greater attention and immediately strengthen the recognition and response mechanism, infrastructure, and expertise in all countries. We do not know what new diseases will arise tomorrow, but if we are to protect our populations, we need to stay one step ahead of the microbes by creating and sustaining a strong and vigilant public health system. The prevalence of several environmental and socioeconomic factors in Asia indeed increase our vulnerability, but this can be reduced effectively by a national commitment by each country, strengthened public health infrastructure, skilled and competent human resources, intersectoral collaboration, and intercountry cooperation. Tested strategies and tools are available, and the international community is willing to work together. The needs of the day are continuous vigilance and the harnessing of national and international resources to protect humankind from the continuing onslaught of emerging infectious diseases.

Microbes are never idle bystanders. They possess remarkable genetic versatility that enables them, under favorable circumstances, to develop new pathogenic vigor, to overcome population immunity by acquiring new antigens, and to develop antimicrobial resistance by rapidly mutating. The vulnerability of the human race to emerging infections is paramount; the versatility of the microbes unfathomable. Challenges are enormous, options limited. Though there have been significant achievements on several fronts, much more must be done to combat emerging infectious diseases.

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## 4 Nutrition

Pattanee Winichagoon and Kraissid Tontisirin

Undernutrition among children and women is still prevalent in several countries in East and Southeast Asia, despite substantial improvements since the 1980s. The rapid transition in most of these countries from an agricultural economy to one based on industry and service has had a significant impact on the health and nutrition of people in these subregions. Malnutrition is shifting from high rates of undernutrition (evidenced by stunting, wasting, and micronutrient deficiencies) among children and women to overnutrition resulting in overweight/obesity and related chronic diseases (diabetes, hypertension, dyslipidemia, cardiovascular diseases, and metabolic disease). The most challenging nutritional issue in the region is how to prevent and control the double burden of malnutrition: the coexistence of under- and overnutrition. While efforts have been made to develop integrated strategies (e.g., diet, physical activity, nutrition education) to prevent overweight and obesity, they have not been properly evaluated. It is essential to address the two extremes of malnutrition together and recognize that malnutrition during reproductive years can have intergenerational impacts on health.

### INTRODUCTION

East and Southeast Asia have been rapidly industrializing since the 1970s, although some countries, such as Japan, made headway much earlier. The countries in these regions are at widely different stages of economic progress and of development of health and nutrition programs. Despite two severe economic downturns, the 1997 Asian financial crises and the current global economic recession, the economies of East and Southeast Asia continue to grow and change and are unlikely to shift back from industrialization to the previous labor-intensive agriculture-based models (RAPA/FAO, 2006).

Undernutrition is a major health problem in several Asian countries, including those known as the rice bowl of Asia. Protein-energy malnutrition and micronutrient deficiencies have an adverse impact on growth, development, and functionalities of human capital in these countries. Alleviating malnutrition has been given high priority, and promotive policies and programs have been actively implemented, with impressive successes in China, Indonesia, Thailand, and Vietnam. At the same time, rapid urbanization and industrialization have brought with them changing lifestyles, and malnutrition has transitioned from under- to over-nutrition owing to the unbalanced dietary practices and lower physical activity levels common to urban dwellers. However, poverty remains the root cause of undernutrition and continues to be an important underlying problem in rural and some congested urban areas. The rising epidemic of overnutrition and related health problems is now well recognized in many countries. This chapter presents the trends and changing picture of malnutrition, the so-called nutrition transition, and efforts to alleviate malnutrition of all forms in East and Southeast Asia.

#### UNDERNUTRITION: A DECREASING CONCERN BUT A REMAINING CHALLENGE

Undernutrition in mothers and children has been one of the most important health problems in developing countries. This is due to its serious consequences on child development and well-being, particularly during the early years of life. By the turn of the twenty-first century, antenatal services in many countries in East and Southeast Asia had markedly improved. The proportion of women receiving at least one antenatal care visit was close to or above 70% in most countries, except Laos, where it was 35%. The WHO's recommendation for prenatal care (at least four antenatal visits during pregnancy) has been achieved in only a few countries, including Thailand, the Philippines, and Indonesia. However, births attended by skilled workers have become more common. Malnutrition in utero and low birth weight are important risk factors for diet-related chronic diseases in later life (Barker et al., 2008). Improvements in the quality and availability of diets and health services as well as environmental hygiene and sanitation are still needed and will contribute to reductions in infections and maternal and child mortality.

Figure 4.1 presents the current situation for underweight, stunting, and wasting in selected Asian countries. The prevalence of underweight in China, Thailand, and Mongolia is notably lower than in the other

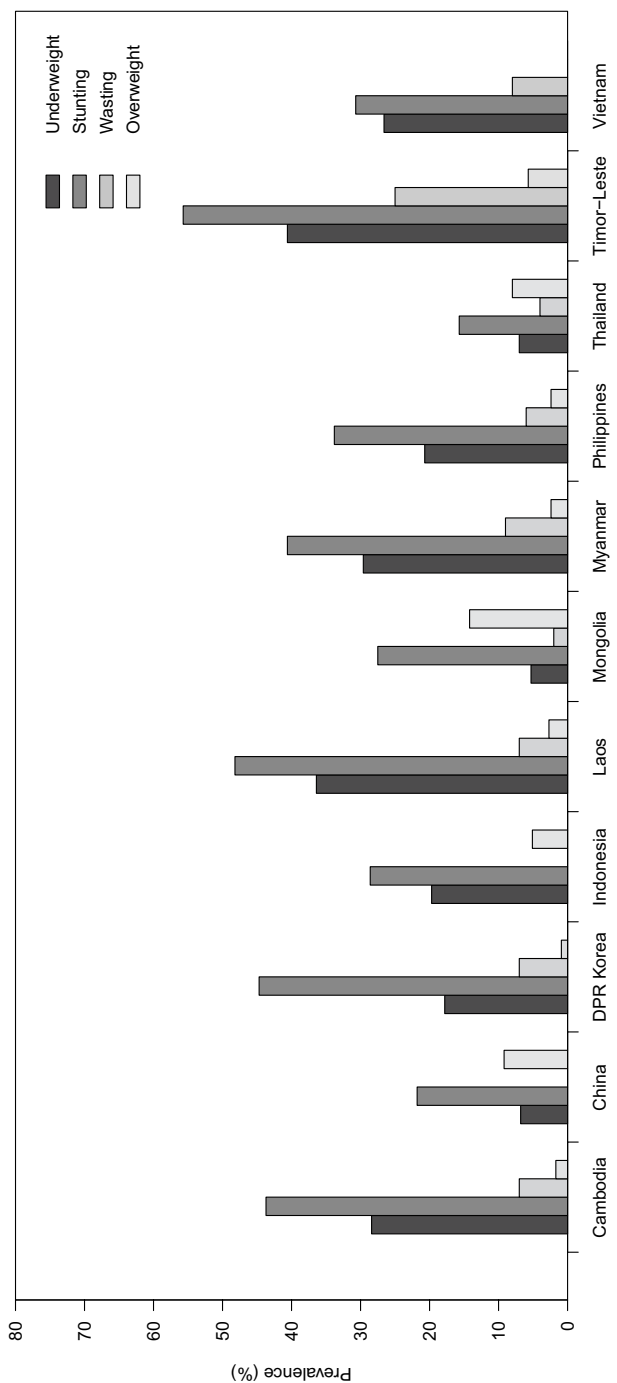


Figure 4.1. Prevalence of underweight, stunting, and overweight/obesity in selected countries. Sources: For underweight, stunting, and overweight—WHO, 2009 and, for Vietnam, Khan et al. 2007; for wasting (based on the NCHS/WHO reference population)—UNICEF, 2008. No data are available for China or Indonesia.

#### BOX 4.1 Thailand's Experience in Alleviating Undernutrition in Children and Women

Malnutrition in Thailand was first reported in the early 1960s but not recognized by the government until the 1970s. It was considered a problem of the nation's development, associated with social disparity, and addressed in the first National Economic Development Plan. A comprehensive survey in the 1960s identified protein-energy malnutrition as the worst problem, especially in pregnant or lactating women, infants, and preschoolers. A growing number of local researchers, public health workers, and scholars had begun working in the area of nutrition, and their experience together with the survey data made it clear that nutrition could be addressed only by addressing development, which required efforts beyond the health sector. However, the existing top-down structure limited coordinated efforts among different sectors of government. In 1973 a landmark inter-ministerial workshop was held where working groups examined each ministry's potential role in combating undernutrition and discussed ways to coordinate efforts. This ultimately culminated in the 1977 National Food and Nutrition Plan (NFNP) targeting protein-energy malnutrition. Support continued with a second plan integrated into a poverty alleviation plan. Concurrently, a primary health care plan was introduced that emphasized community self-reliance for realizing and solving health problems. For nutrition, this involved a growth-monitoring program led by village-health volunteers, local production and consumption of food, supplementary food to severely malnourished children, subsidized school lunches, education campaigns, and research and training. By the end of the second NFNP (1986), marked improvements in child nutrition were seen. The third NFNP (1987–1991) continued to use the primary health care approach and introduced improved quality of life as a measure of performance. Success of these programs is due not only to government commitment but, importantly, to local governments' joint efforts with the community.

SOURCES: Tontisirin, Attig, Winichagoon, 1995; Tontisirin, Winichagoon, 1999.

countries shown in the figure. Although there have been improvements, stunting rates remain rather high in many countries. In Indonesia, the Philippines, Laos, and Vietnam, the prevalence of stunting was 30–50%. Only Thailand reported a low stunting rate (<20%) in the early 2000s (FAO, 2006). Wasting,<sup>1</sup> an acute form of undernutrition, has also declined and was less than 5% in China, Thailand, and the Philippines. It remains highest in Timor-Leste (>20%) and is relatively high (5–10%) in the Democratic People’s Republic of Korea (DPR Korea), Laos, Myanmar, and Vietnam (Atmarita, 2005; Pedro et al., 2007; UNICEF 2006; Khan et al., 2007).

Thanks to primary health care delivery and other community-based approaches, these countries have achieved significant declines in malnutrition and poor health in children and women (Thailand is one example; see box 4.1). Infant and young child mortality has decreased significantly in many countries, largely as a result of innovative primary health care models that emphasize community participation. Undernutrition among children under 5 years and women has declined since the 1980s. For example, China enjoyed a more than 20% reduction in the prevalence of stunting between 1989 and 2000. The Philippines also reported reduced rates of stunting, albeit to a lesser extent. However, the prevalence of wasting changed little during this period. Overall, chronic undernutrition as reflected by high prevalence of stunting in most countries will likely remain a major challenge for the region.

#### MICRONUTRIENT DEFICIENCIES: THE REMAINING “HIDDEN HUNGER”

Micronutrient deficiencies exist even in situations where food deficits are not obvious, so they are often referred to as a hidden hunger. Among micronutrients, vitamin A, iron, iodine, and possibly zinc deficiencies are global public health problems. While there have been dramatic improvements in maternal and child undernutrition, micronutrient deficiencies remain a problem in most developing countries (table 4.1). Micronutrient deficiencies result in overt clinical signs such as blindness associated with vitamin A deficiency, severe mental retardation and stillbirth associated with maternal iodine deficiency, and neural tube defects due to folate deficiency. Importantly, there are several functional consequences of micronutrient deficiencies, including impairment of growth and development, reduced cognitive and learning ability, reduced physical performance, and increased morbidity (FFI/GAIN/MI/USAID/WB/UNICEF/WHO, 2009).

TABLE 4.1 Micronutrient Deficiencies in Children and Women

	<i>Under-five anemia (%)</i>	<i>Pregnancy anemia (%)</i>	<i>Nonpregnancy anemia (%)</i>	<i>Under-five vitamin A deficiency (%)</i>
Cambodia	63.4	50.9	44.3	38.8
China	20	28.9	19.9	9.3
DPR Korea	31.7	34.7	34.7	27.5
Indonesia	44.5	44.3	33.1	19.6
Laos	48.2	56.4	46.1	44.7
Malaysia	32.4	38.3	30.1	3.5
Mongolia	21.4	37.3	13.6	19.8
Myanmar	63.2 <sup>c</sup>	49.6 <sup>c</sup>	44.9	36.7
Philippines	36.3	43.9	42.1	40.1
Thailand	25.2	22.3	17.8	15.7
Timor-Leste	31.5	22.9	31.5	45.8
Vietnam	34.1	32.2	24.3	12
Brunei	24.2	38.9	20.4	0 <sup>d</sup>
Japan	10.6	14.8	21.3	0 <sup>d</sup>
RO Korea	16.5	22.6	14	0 <sup>d</sup>
Singapore	18.9	23.8	18.4	0 <sup>d</sup>

SOURCES: For under-five, pregnancy, and nonpregnancy anemia—WHO, CDC, 2008; for under-five vitamin A deficiency and pregnancy night blindness—WHO, 2008b; for vitamin A supplementation—UNICEF, 2008; for school-age children UIE—WHO, 2007; for household adequate USI—UNICEF, 2008; for zinc deficiency—IZiNCG, 2004.

<i>Vitamin A supplementation (% coverage)</i>	<i>Pregnancy night blindness (%)</i>	<i>School-age children UIE<sup>a</sup> ≤ 100 µ g/L (%)</i>	<i>Household adequate USI<sup>b</sup> (%)</i>	<i>Zinc deficiency (% at risk of inadequate Zn intake)</i>
...	6.0	91.7	49	27.7
...	4.2	15.7	94	14.1
95	5.3	...	40	39.8
87	1.7	16.3	73	34.4
69	11.9	26.9	84	35.7
...	4.4	57	...	14.1
94	3.4	52.8	83	1.6
93	1.1	22.3	60	34.6
83	7.9	23.8	45	31.9
...	3.7	34.9	47	41.6
64	13.4	...	60	...
95	4.1	84	93	27.8
...	0 <sup>d</sup>	...	...	12.8
...	0 <sup>d</sup>	...	...	23.5
...	0 <sup>d</sup>	...	...	19.4
...	0 <sup>d</sup>	...	...	...

<sup>a</sup>UIE = urinary iodine excretion

<sup>b</sup>USI = universal salt iodization

<sup>c</sup>These are regression-based estimates.

<sup>d</sup>Countries with GDP > US\$15,000 are assumed to have no vitamin A deficiency.



### *Iron Deficiency and Anemia*

Anemia among under-fives and reproductive-age women, especially during pregnancy, is widely prevalent in both developed and developing countries. Most of the wealthier Asian nations enjoy relatively low rates of anemia (15–20% in Japan, RO Korea, and Singapore). An exception is Brunei, where the rate remains similar to that of less wealthy countries (e.g., China and Thailand, with rates of 20–30%). Other countries face very high prevalences of anemia (above 40%) (see table 4.1). The low prevalence rate in Timor-Leste could be due to limited data availability. Diets low in iron or iron bioavailability are significant contributors to anemia in populations habitually eating plant-based diets.

During mid to late pregnancy, iron requirements become very high, and iron supplementation through antenatal services has been the key intervention for preventing anemia during pregnancy. Programmatically, success is limited by interruptions or inefficiency of the health service system and poor compliance with iron supplementation (USAID/WB, n.d.). Forgetfulness, fear of a large fetus, and not knowing the benefits of iron supplementation are reasons for low compliance (Winichagoon, 2002). Poor maternal iron status and anemia put women at risk of death during childbirth. Globally, 20% of maternal mortality related to childbirth is associated with anemia (FFI/GAIN/MI/USAID/WB/UNICEF/WHO, 2009), and in Asia it is 13% (UNICEF, 2008).

Anemia in early infancy is likely related to maternal anemia during pregnancy that results in low endowment of iron stores. Healthy infants during the first 6 months of life meet their iron demand from their iron stores and from breast milk. During the second half of infancy (6–12 months of age), when appropriate provision of complementary foods (quality, quantity, and timing) is crucial, iron intake from plant-based diets is often inadequate. Iron deficiency anemia during this period could result in irreversibly compromised cognitive ability (Lozoff, 2007). In-home fortification of complementary food has been tested and scaled up in some countries. Promoting addition of small amounts of animal food sources to traditional diets may also improve diet quality and, consequently, iron status. Increased intakes of animal food sources have been observed in some countries (figure 4.2), but whether this trend is associated with nutritional improvements (including iron and other micronutrient status) in the population has not been examined. Currently, iron fortification of foods such as wheat flour and condiments is also promoted in national programs in Indonesia,<sup>2</sup> China, and Vietnam.<sup>3</sup>

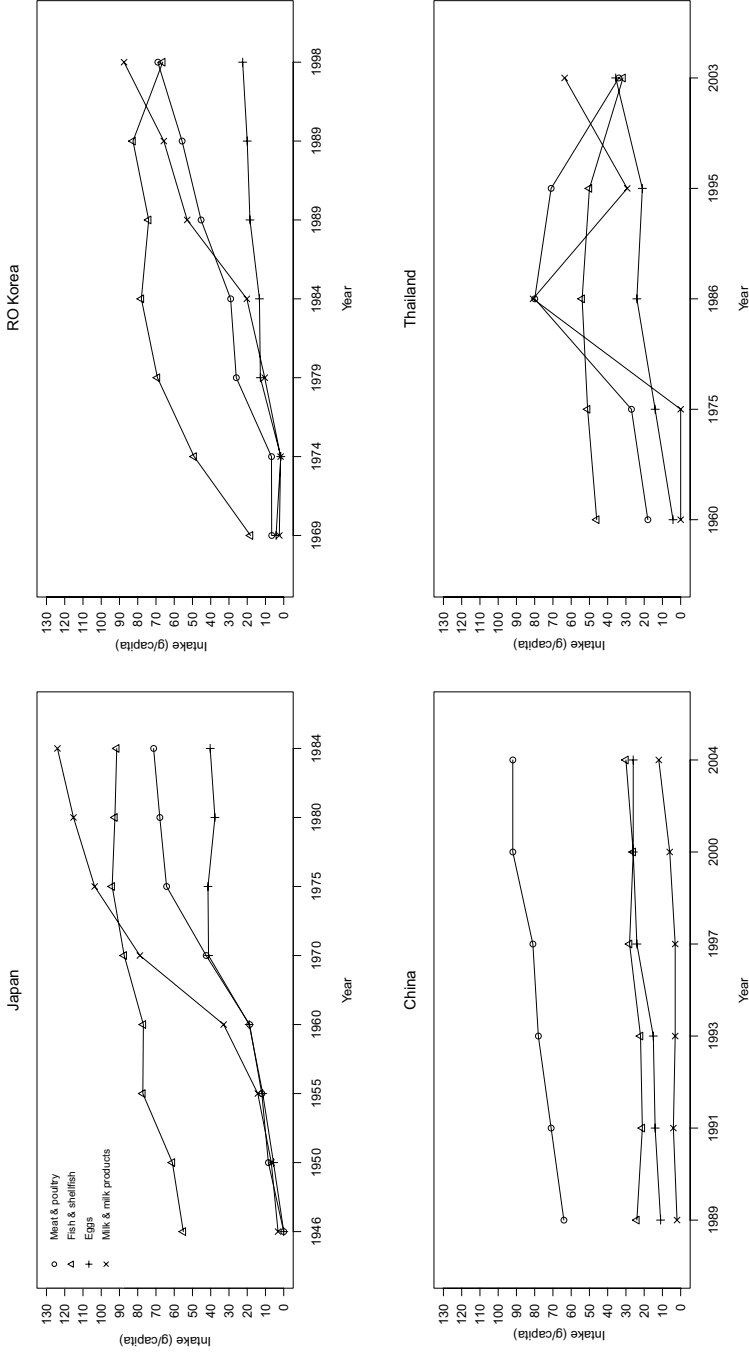


Figure 4.2. Trend in intakes of animal food sources (grams per capita) in selected countries. Sources: For Japan—Matsumura, 2001; for RO Korea—Son, 2003; for China—Zhai et al., 2002; for Thailand—MOPH, 1986, 1997, 2006a (per capita intakes for all surveys, except that 2003 are intakes of adults age 15–59).

Although iron deficiency has been recognized as the most important cause of anemia, it is not the sole cause of anemia in children and women. Studies in rural Thailand and Vietnam showed that the prevalence of anemia among school-age children was 25–30%, but iron deficiency contributed to only 10–25% of anemia (Thurlow et al., 2005; Nga et al., 2009). Other nutritional factors (e.g., vitamin A, B vitamins) and nonnutritional factors also contribute to anemia. Important among nonnutritional factors are the genetic abnormalities in hemoglobin synthesis (hemoglobinopathies), which are highly prevalent in subpopulations in the region. Parasitic infestations, including those of hookworm, trichuris, and ascaris, can also cause anemia.

### *Vitamin A Deficiency*

Vitamin A deficiency causes damage to epithelial cells, resulting in a range of ocular and nonocular changes. Clinical signs of ocular changes depend on the extent of deficiencies and are collectively called xerophthalmia. Its earliest sign is night blindness (difficulty seeing in dim light), which then progresses to conjunctival xerosis, Bitot's spots, corneal xerosis, and corneal ulceration (or keratomalacia; Sommer, 1995). The profile of vitamin A deficiency is less clear because data are limited. Vitamin A deficiency (based on serum retinol) among under-fives is not present in the wealthier countries, but it remains a significant public health problem in most developing countries, for example, Laos, Cambodia, and Indonesia (see table 4.1). Night blindness is often reported during pregnancy in populations in which vitamin A deficiency among children is common.

Vitamin A supplementation for under-fives has been implemented as a national program in countries where prevalence is high. Most of the programs provide supplementation every 6 months, on either a national immunization day or in child day campaigns. Coverage has been used as a measure of the vitamin A situation; program success has been achieved in several countries (see table 4.1). Since high-dose vitamin A supplementation during pregnancy can cause birth defects, it is safer to supplement only during lactation. During the first 6 months of breast-feeding, mothers need to consume enough vitamin A to both replace the vitamin A lost in breast milk and maintain high enough levels to supply adequate vitamin A from breast milk to their babies. Recommendations for doses and periodicity of vitamin A supplementation have been provided (WHO, 1998). In addition, food fortification with vitamin A (e.g., in cooking oil in the Philippines) and dietary diversification coupled with effective nutrition education (e.g., Smitasiri et al., 1992) have also been implemented successfully in some countries in the region.

### *Iodine Deficiency Disorders*

Medical conditions related to iodine deficiency are collectively termed iodine deficiency disorders. In their extreme, these disorders include an enlargement of the thyroid gland (goiter) and cretinism, a congenital condition characterized by poor growth and mental retardation. In less extreme cases, iodine deficiency results in delayed cognitive and physical development. Traditionally, the prevalence of goiter among school children was used as an indicator of iodine deficiency in a community, primarily because it is relatively easy for trained health workers or teachers to examine and to collect data. However, goiter may not be observable when the deficiency is less severe or in its early stages. Measuring iodine concentration in urine samples, reported as urinary iodine excretion (UIE) is currently recommended. In a population, a median UIE among school-age children of  $< 100 \mu\text{g/L}$  indicates iodine deficiency. Despite the increasing household use of iodized salt, median UIE suggests that iodine deficiency continues to be a public health problem in Cambodia, Mongolia, Myanmar, the Philippines, and Thailand (table 4.1). Discrepancies in the adequacy of iodine intakes between pregnant women and school-age children in the same households has been reported in Thailand (Gowachirapant et al., 2009). Pregnancy is a critical period during which insufficient iodine may cause permanent damage to the fetus. This suggests that monitoring UIE of school-age children may not be adequate for tracking iodine deficiency in a population.

Universal salt iodization has been recommended and promoted globally. Despite efforts to implement legislation and enforce salt iodization, the percentage of households using iodized salt remains low in some countries. Low quality of iodized salt is also a major impediment. In Thailand, Indonesia, and the Philippines, there are many small salt producers, which makes it difficult to monitor quality of iodization. Moreover, in many countries in Southeast Asia, fish sauce and soy sauce are commonly used condiments. Therefore, in areas where iodine has been leached from the soil or several salty condiments are used, iodization of the other condiments as well as salt may be the only way to effectively combat iodine deficiency. Where deficiencies are severe and universal salt iodization is still a problem, it may be necessary to provide iodine supplement as iodized oil, especially for pregnant women (Zimmermann, 2009).

### *Zinc Deficiency*

Zinc is involved in several enzymes for gene expression, cell division, growth, and immune and reproductive system functioning. Zinc defi-

ciency is believed to have adverse effects on growth, morbidity, and development, especially in young children. Soil zinc and zinc intake in the population have been used to define the risk of zinc deficiency in populations, with several countries of East and Southeast Asia identified as being at medium risk (e.g., China, RO Korea, Thailand, Malaysia) or high risk (e.g., the Philippines, Vietnam, Indonesia, Myanmar; IZiNCG et al., 2004). Serum zinc has been recommended as the way to estimate zinc deficiency in a population; greater than 20% prevalence of low serum zinc indicates population risk, which requires public health interventions (Hess et al., 2009).

### *Multiple Micronutrient Deficiencies*

Coexistence of several micronutrient deficiencies is not uncommon in developing countries. In rural northeast Thailand almost 60% of school children had at least two micronutrient deficiencies (Thurlow et al., 2006). Several studies on multiple-micronutrient supplementation have shown sprinkles and food fortification to be efficacious in improving micronutrient status and some functional outcomes (e.g., Smuts et al., 2005; Zlotkin et al., 2005; Winichagoon et al., 2006). Some micronutrients interact either synergistically or antagonistically. Iron and zinc have been found to reduce each other's efficacy when given in combination (Wieringa et al., 2007). In contrast, goitrous, iron-deficient children need iron supplementation to improve their response to iodized salt. New evidence of possible impairment of micronutrient metabolism in overweight and obese populations has recently been reported. Iron absorption and iron status were found to be inversely related to BMI in women of reproductive age in Thailand and in school children in Morocco (Zimmermann et al., 2008). Developing countries in East and Southeast Asia will need to keep abreast of these challenges for some time.

### *Burden of Disease Associated with Micronutrient Deficiencies*

The burden of disease is expressed as disability-adjusted life years (DALYs). In East Asia and the Pacific, the estimated DALYs lost in association with micronutrient deficiencies among young children were substantial (Caufield et al., 2006). Cost-effective intervention strategies for alleviating these problems are currently available. For example, the cost of vitamin A supplementation per DALY gained is US\$6–12. Food fortification using different food vehicles for each of the micronutrients costs US\$30–75 per DALY gained. It is important to integrate these interventions into health, social, and development policy.

## CHANGING ENVIRONMENTS ASSOCIATED WITH INDUSTRIAL DEVELOPMENT IN ASIA

After World War II, Japan experienced a period of rapid economic growth associated with agriculture development, a trend which was later followed by RO Korea, China, Thailand, and Vietnam and resulted in poverty reduction in rural areas in these countries. However, increasing development of non-agriculture-related industry followed, and agriculture GDP declined, resulting in rural-to-urban migration and widening income disparities between rural and urban dwellers (RAPA/FAO, 2006). Japan presents itself as a very interesting country case, demonstrating the changing form of malnutrition as a result of the availability of food and changing food habits associated with industrialization (see box 4.2).

### *Urbanization and Changes in Dietary and Physical Activity Patterns*

Rapid industrial development in East and Southeast Asia and opportunities for cash earnings have attracted rural poor migrants to urban areas (see chapter 2). Urbanization has been identified as a key factor in the changing diets of Asian populations. Urban dwellers tend to consume high amounts of refined cereal grains, high-fat foods, meat, and foods containing sugar and salt. Patterns of physical activities have changed because of the availability of transport and the reduction in heavy physical work and daily chores, resulting in a reduction of as many as 300 kcal/day of energy expenditure among adults. This amount of energy, if not expended, can be translated to 1kg of added body weight per month, or 10–12 kg per year. Similarly, children's energy expenditure has decreased by around 200 kcal/day (James, 2008).

Income levels have been shown to affect food and nutrient intakes in Asia. Comparison of food balance sheets and GNP for 21 Asian countries indicated a downward trend in energy intake derived from complex carbohydrates, but an increase in fats, between the mid-1970s and mid-1990s for all income levels (Drewnowski & Popkin, 1997). In China, a larger proportion of those in the low-income tertiles consumed traditional low-fat diets, compared with the higher-income tertiles. In 1989, the proportion of people consuming high-fat diets (>30% of total energy) was drastically increased among the highest-income tertile. Increased local production and importation of oil seeds resulted in increased availability of fats. Data from national nutrition surveys in Thailand, RO Korea, and Vietnam also indicate increasing energy intakes derived from fats in the diets (Kosulwat,

#### BOX 4.2 Changing Dietary and Obesity Patterns in Japan

Japan has gone through a rapid dietary transition since World War II, influenced by the country's socioeconomic and political contexts (Murata, 2000). Post-World War II there was a food shortage, which the country did not fully recover from until around 1955. During this period, Japanese continued eating a traditional diet, with a very low fat intake of 7–9% of total adult energy intake. Since 1970, the country has undergone rapid industrialization and westernization. Westernized diets and the habit of frequently eating “delicious food” are part of the new affluent lifestyle and have been increasingly adopted, despite early recognition of their adverse health effects.

As the food supply recovered, fat intake increased. This was particularly noticeable in Tokyo's children, for whom fat intake rose from 12.6% in 1952 to 20.9% in 1960, when the food supply had recovered, and to over 30% by the 1980s, when food was in surplus. Among adults, red meat intake tripled (from 4 g to 12 g per capita per week) and egg consumption increased from 3.8 to 5.9 eggs per capita per week between 1964 and 1990, and these phenomena were associated with a shift in the main source of protein from plant-based foods to animal-based foods.

Accompanying these changing dietary patterns has been an observable increase in childhood obesity from 3–4% in 1970 to around 10% by the mid-1990s. Interestingly, the lipid profiles (serum cholesterol) of 5–9-year-old children were already higher than those of children in the United States in the 1980s (Couch et al., 2000). Total cholesterol among boys younger than 10 was about 4.2 mmol/L in 1960, 4.5 in 1980, and slightly lower in the 1990s; in girls it was around 4.5 from the 1960s through the 1980s.

*(continued)*

BOX 4.2 (continued)

Time period	Food supply situation	Diet & living characteristics	Fat intake of adults as % of total energy intake (year)	Adult protein sources as animal:plant (year)	Fat intake of boys age 5 as % of total energy intake, Tokyo city (year)	% obesity in children age 10 (year) <sup>a</sup>	
						Boys	Girls
1945–1950	Shortage	Low-fat traditional	7.0 (1946)	...	12.6 (1952)	...	...
1950–1955	Recovery	Low-fat traditional	8.7 (1955)	0.66 (1952)	...	...	...
1955–1970	Rapid SES development, westernization, industrialization	...	14.8 (1965)	1.0 (1960)	20.9 (1960), 28.4 (1970)	3.5 (1970)	4.0 (1970)
1970–1980	Sufficient/excessive supply	Westernized diets, "delicious food," affluent living	22.3 (1985)	...	...	7.0 (1980)	7.0 (1980)
1980–present	Sufficient/excessive supply	Affluent living and diet with adverse health effects	33.2 (1994)	1.37 (1982), 1.2 (1987), 1.53 (1994)	33.8 (1982), 32.0 (1988), 33.2 (1994)	9.0 (1990), 10.0 (1996)	7.5 (1990), 9.0 (1996)

SOURCES: Murata, 2000; Couch et al. (2000).

<sup>a</sup>Obesity is defined as weight for height >120% age- and sex-specific reference median.



2002; Kim et al., 2001; Hop et al., 2003). On the other hand, dietary diversity improved as income increased. New foods, namely, meat, fish, milk, eggs, and cheese, were increasingly included in the diet as income rose.

### *Increased Consumption of Processed and Ready-to-Eat Foods*

Preparation of traditional foods and snacks can be time-consuming and labor-intensive. The food industry has taken over this demanding task and has made food more readily available through modern market systems, including supermarket chains. Processed foods and foods from ready-to-eat food stalls have become very common in Asia. These are driving the increase in consumption of energy-dense, high-salt, and high-sugar processed foods (Traill, 2006). In addition to convenience and availability, the low prices of packaged foods, made possible by bulk production and distribution to supermarkets, are attractive to consumers. Fresh fruits and vegetables, on the other hand, may be available at lower prices at local markets near farms but may become quite expensive in urban food stores because of their perishability. There has been a dramatic reduction in the consumption of fresh fruits and vegetables, even in countries such as Thailand where they are in surplus during the harvesting season (MOPH, 2006a; MOPH, 2006b).

There has been a rapid expansion of fast-food outlets throughout Asia. For example, there was an eightfold increase in the number of McDonald's restaurants in Asia and the Pacific between 1987 and 2002 (Pingali, 2004). The rapid growth of the soft-drink industry in Southeast Asia has also been reported (Traill, 2006). Although the per capita consumption is still far less than that reported in developed countries and in developing countries in other regions, continued expansion and increase in demand is anticipated. Aggressive marketing and advertising of these foods and drinks through mass media, especially targeted toward children, will be influential in shaping the diets of the next generation. Government policy and self-regulation or voluntary initiatives by industry and partnerships with civil society groups will be an important strategy to ensure the supply of healthier foods and more balanced diets (Hawkes, 2008).

## THE RISING TREND OF OVERNUTRITION

Industrialization, urbanization, and their concomitant changes in both dietary and physical activity patterns have contributed to a burgeoning epidemic of overweight and obesity in Asia. In the Philippines, for example, the prevalence of overweight among adults, as measured by BMI,<sup>4</sup> increased from 16.8% in 1993 to 24% in 2003, with the prevalence in females higher

than in males and a doubling in prevalence among people over 40 years of age. Lipid profiles (i.e., high total cholesterol, LDL cholesterol) and impaired blood glucose and diabetes increased with age, doubling for all parameters by age 40 (Pedro et al., 2007). Although the prevalence of overweight/obesity among Vietnamese adults is low compared with adults in other countries, it doubled between 1992 and 2002 and was higher among females and urban residents (Tuan et al., 2008).

Differential prevalence of overweight and obesity have been observed by gender and ethnic background. A survey of 27 cities in Indonesia showed that the prevalence of overweight among adults (age  $\geq 18$  years) was higher in women (38%) than men (23%). Alarming, the prevalence of overweight among women in urban slum and rural areas was also high, and it increased with age (Atmarita, 2005). The prevalence among young adults was  $<10\%$  and increased to over 25% among women age 30 years or above. In Malaysia, adults of Indian ethnicity had a higher prevalence of overweight and obesity, but there was no clear pattern by gender within each ethnic group (Tee, 2002). In Singapore, the prevalence of obesity was found to be much lower among Chinese (3%) than Malays (23.1%) or Indians (18.3%) (Deurenberg-Yap et al., 2001).

Increases in the prevalence of overweight and obesity have also been observed in children. In Singapore, for example, the prevalence of overweight in children age 8–16 years was only 2% in 1976 but rose to 15% in 1991 and 1992 (MOH, 2005). In China, there was a trend of increasing overweight and obesity among children age 7–17 years, from 1.3% in 1982 to 4.4% in 1992 and 5.2% in 2002. The increase in prevalence may be greater in adults than in children, as is the case in Indonesia (Popkin et al., 2006) and Thailand (MOPH, 2006b) but not in China or Vietnam (table 4.2).

### *Metabolic Syndrome*

Metabolic syndrome is a group of metabolic disorders related to the occurrence of obesity, characterized by the presence of diabetes, hypertension, and dyslipidemia, all of which are important risk factors for cardiovascular diseases. Metabolic syndrome is a condition, not a disease, and it is defined differently by different organizations, such as the WHO, the US National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III), the European Group for the Study of Insulin Resistance, and the International Diabetes Federation (Cornier et al., 2008). These definitions differ in criteria and cutoff values to define metabolic syndrome for both adults and children; hence prevalence across studies cannot be easily compared.

TABLE 4.2 Annual Relative Increase in Overweight/Obesity in Children and Adults in China, Indonesia, and Vietnam

	<i>Initial year</i>	<i>Final year</i>	<i>Annual relative increase (%)</i>
China: 1991, 2004			
Children 10–17.9 y	4.8	11.4	10.4
Adults	12.9	27.3	8.6
Indonesia: 1993, 2000			
Children 10–17.9 y	3.4	4.0	2.7
Adults	12.0	17.0	6.0
Vietnam: 1992, 2002			
Children 10–17.9 y	0.2	1.4	46.3
Adults	1.6	5.5	24.5

SOURCE: Popkin, et al., 2006.

NOTES: Criterion for adult overweight/obesity is BMI  $\geq 25$  for all countries. For children, the criteria differ: For China, Indonesia, and Vietnam, the criterion is BMI for age equivalent to 25 kg/m<sup>2</sup> at 18 y. For the Philippines, it is BMI for age >85th percentile.

The prevalence of metabolic syndrome (based on NCEP-ATP III criteria) in China, Taiwan, Hong Kong, and Thailand has been reported to be 10–15% but was as high as 25% among Koreans (Pan et al., 2008). Taiwanese, at the same BMI, had a higher rate of metabolic syndrome than a US population. It has been speculated that this discrepancy may be explained by differences in genetics, early childhood development, and environmental factors (Pan et al., 2008). Compared with Caucasians, Asians have higher body fat and abdominal obesity for the same BMI. Asians also tend to have a higher prevalence of type 2 diabetes at a much lower BMI and at an earlier onset than Caucasians. Marked increases in the prevalence of type 2 diabetes among adults age 40 and above compared with those age 30–40 were observed in both males and females in Thailand, Taiwan, China, and Vietnam. There is a clear rural-urban difference in the prevalence of type 2 diabetes in many countries (Yoon et al., 2006). Which dietary factors and how they contribute to metabolic syndrome among Asians need to be elucidated. Because of a lack of consensus on the definition of metabolic syndrome among children, the situation in children is still unclear. Nonetheless, obesity was the major determinant of insulin resistance and a risk factor for diabetes and cardiovascular disease in later life.

The high prevalence of dyslipidemia in Asians has been observed from quite early in adulthood, as seen in figure 4.3. In the Philippines, the prevalence of low HDL (high-density lipoprotein) was consistently high across age groups. At least one-third of the adult population in both Thailand and the Philippines had high LDL (low-density lipoprotein), which continued to rise to 40–50% by age 60 and above. Overall, dyslipidemia is very common among adults and markedly increases with age.

The rising prevalence of overweight and obesity and the associated risks of metabolic syndrome and eventual chronic, noncommunicable diseases have important implications for health care costs. Because of the chronic nature of these conditions, long-term care of patients is inevitable, and at times hospitalization is required for treatment of complications. Both hospitalization and outpatient care of patients with such problems are imposing an increasing burden on health care systems. Studies in China (Zhao et al., 2008), Hong Kong (Ko, 2008), Taiwan (Fu et al., 2008), and Japan (Furukawa, 2008) have estimated the economic burden of obesity and metabolic syndromes on the health and medical care systems of those countries. Using the population attributable risk of overweight/obesity for various chronic diseases and expenses on health care, overweight and obesity accounted for 25% of total medical costs for four chronic diseases in China. This was 3.7% of total medical costs in that year (almost US\$3 billion) and could increase by 75% in the worst-case scenario. The population attributable risk for overweight/obesity was slightly less in Hong Kong than in mainland China, at 10–20%, but this is equivalent to 8–10% of total public expenditure on health, amounting to US\$430 million in 2002. In Taiwan, 4–9% of total costs for treatment of related diseases, or 2.9% of total national health care expenditures (roughly US\$44,000) in 2000–2002, was due to overweight and obesity. Furukawa (2008) estimated that medical costs for hyperlipidemia were over 40 billion yen (22% of overall costs) for middle-aged persons, but this decreased for older age groups. Prevention of obesity and its consequences is obviously an important strategy for preventing or reducing the size of potential hikes in health care costs in East and Southeast Asia.

#### COEXISTENCE OF UNDER- AND OVERNUTRITION: THE DOUBLE BURDEN OF MALNUTRITION IN EAST AND SOUTHEAST ASIA

Several countries in East and Southeast Asia are currently in a state of transition of malnutrition, from undernutrition (evidenced by stunting,

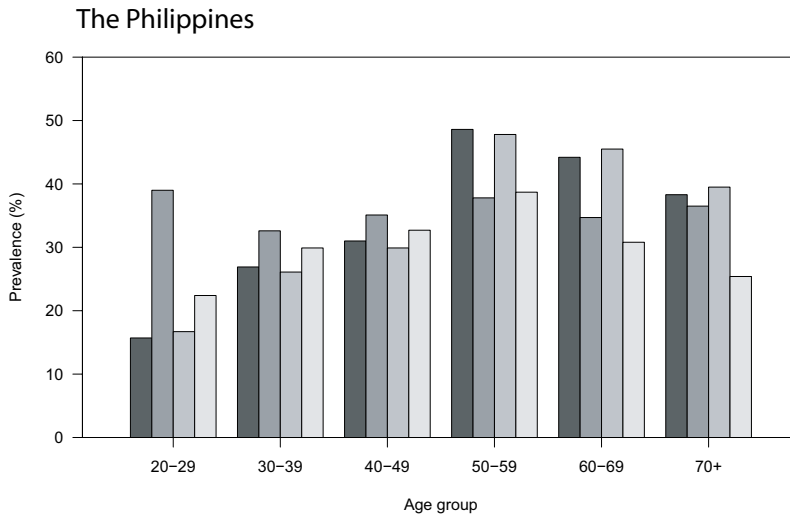
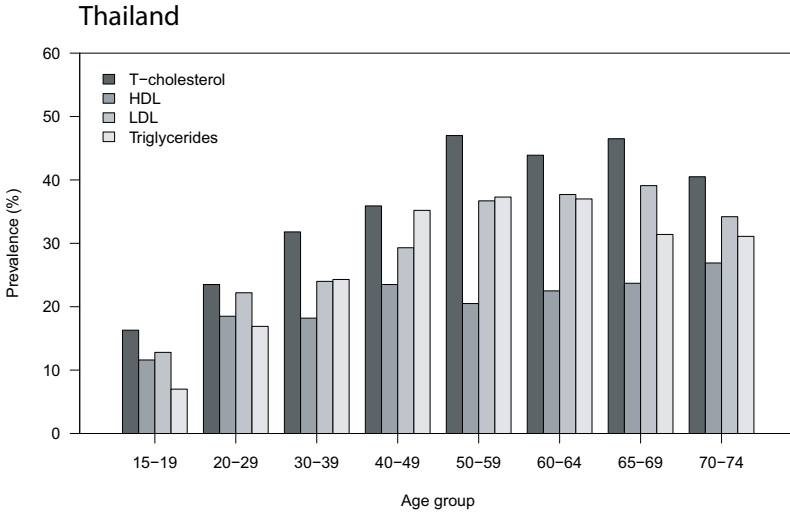


Figure 4.3. Prevalence of dyslipidemia in Thailand and the Philippines, based on national nutrition surveys. Criteria for defining prevalence of dyslipidemia: total (T) cholesterol  $\geq 200$  mg/dL; HDL  $< 35$  mg/dL in males and  $< 45$  mg/dL in females in Thailand,  $< 40$  mg/dL in the Philippines; LDL  $\geq 130$  mg/dL; triglycerides  $\geq 150$  mg/dL. Sources: MOPH, 2006b; FNRI-DOST, 2008.

underweight, and wasting) toward overnutrition (evidenced by overweight and obesity), and during this transition both states coexist. For example, a national survey of 2–5-year-old children in China showed an impressive decline of stunting from 33% to roughly 10% (17% to 3% in urban vs. 30% to 14% in rural areas) between 1992 and 2000 (FAO, 2006). However, during this same period, obesity rose drastically from 2.6% to 8.2%, with the most profound increase after 1997. The proportion of overweight and obese children who were also stunted decreased from 1992 to 2002 (Li et al., 2008), indicating that stunted obesity might be becoming less of a problem in this population. By contrast, the situation in the Philippines shows a less dramatic change, with a 10% reduction in the prevalence of stunting and only a slight increase in the prevalence of overweight (Pedro et al., 2007).

In Indonesia, while the prevalence of underweight among children 6–8 years old remained as high as 25% in 2004, the prevalence of overweight and obesity combined rose to 12.3%, including a 3.7% increase in obesity (Atmarita, 2005). A 5-year longitudinal study of children age 6–8 years revealed an interesting pattern (Julia et al., 2004). Among children who were underweight at age 6–8 years, about 40% became overweight or obese by 11–13 years. In contrast, almost all children who were overweight/obese at 6–8 years remained so at 11–13 years. These findings suggest that there is a tendency for children to become overweight or obese as they approach puberty. Obese children were of high socioeconomic status. In addition, stunted children had lower BMI and weight-for-height ratios compared with nonstunted children. These study findings agreed with those for China (mentioned above) that stunted obesity may not be a major public health problem in these subregions of Asia.

As previously mentioned, Thailand has shown an impressive improvement in nutrition, with a significant reduction of undernutrition since the 1980s (see box 4.1). Stunting and wasting among under-fives was reported to be around 5% in 2003 (MOPH, 2006b) and roughly 10% among school-age children, whereas overweight and obesity was about 5%. In Vietnam, undernutrition (using BMI for age) remains high among children younger than 18 years: 32.1% in 1992 and 33.5% in 2002 (Khan et al., 2007). Although the prevalence of overweight/obesity in children changed very slightly, the rural-urban disparity was notable.

#### *Dual Form of Malnutrition in the Same Households*

While it may not seem surprising to find underweight and overweight coexisting in the same country, Doak and colleagues (2000) reported on

the coexistence of underweight and overweight in the same household. In China, they found that 8.7% of households had both over- and underweight members. In the Philippines, underweight children of overweight mothers had lower energy and protein intakes compared with normal-weight children (Angeles-Agdeppa et al., 2003). The trend was less clear in similar studies conducted in Malaysia (Khor & Sharif, 2003) and Thailand (Yamborisut et al., 2006). Caballero (2005) speculated that the coexistence of underweight children and overweight/obese mothers may be associated with rapid industrialization and high rural-to-urban migration. Mothers may purchase poor-quality foods because of poor education and low earnings. Diets may be high in sugar and fat contents while lacking balance with other nutrients, especially micronutrients. Poor nutritional status during early childhood can also put children at risk of developing obesity when diets become energy dense, such as those of urban dwellers.

#### BURDEN OF DISEASE ASSOCIATED WITH VARIOUS FORMS OF MALNUTRITION

Globally, communicable diseases are contributing less to the global burden of disease (39% of total global DALYs) than are the noncommunicable diseases (48% of total global DALYs; WHO, 2008). Undernutrition accounted for 6.41% of DALYs associated with communicable diseases, comparable to the percentage associated with maternal conditions (6.45%). However, diarrhea, respiratory infections, and prematurity/low birth weight, which are likely underscored by poor maternal and child nutrition, accounted for another 36% of DALYs due to communicable diseases. In essence, undernutrition and related illnesses accounted for almost half of the DALYs lost to communicable diseases. Among the noncommunicable diseases, diabetes and cardiovascular diseases accounted for about 12% of total DALYs. Unfortunately, because of the differential grouping of countries by the WHO, it is not possible to present exact DALYs contributions of different diseases in the subregions of interest.

#### TACKLING THE GROWING OBESITY EPIDEMIC IN ASIA

The rising trends of childhood obesity and diet-related chronic degenerative diseases among children and adults have been alarming, and many countries have reacted with public health policies or campaigns to mitigate the epidemic. Although the effectiveness of these national efforts is still to

be seen, some examples are presented below. Best practice will need to be further developed to address these complex nutritional situations in East and Southeast Asia.

Health Japan 21 was an outstanding effort to address the problem of overnutrition and related diseases for Japanese in the twenty-first century (Udagawa et al., 2008). The campaign included four basic policies: (1) emphasizing primary prevention, (2) creating supportive environments, (3) establishing and assessing goals, and (4) promoting effective coordinated activities. Seventy specific goals within nine focus areas were established. A health promotion law was enacted in 2002 to fortify existing legislation, and national health and nutrition surveys have been conducted since 2003 to monitor progress. The Health Frontier Strategy, a 10-year strategy focusing on promotion of measures to reduce lifestyle-related diseases and the need for nursing care, was established in 2005. A food-based dietary guideline—Japanese Food Guide Spinning Top (figure 4.4a)—and *Shokuiku* (food and nutrition education) were developed. A high-risk approach was added in 2008, focusing on control of metabolic syndrome. Midterm evaluation showed a slowing of the rising trend of obesity, as well as increased awareness and efforts to control weight.

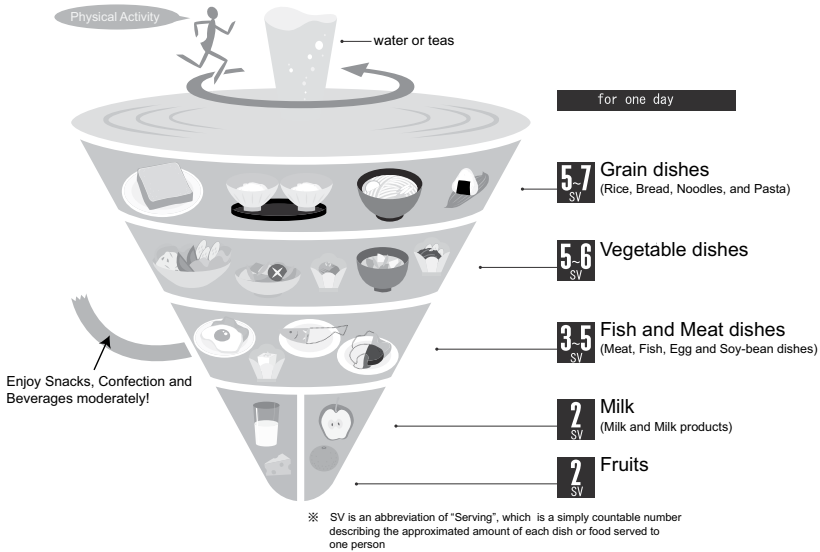
There has been a strong movement in Singapore for effective programs in schools and workplaces to prevent obesity and related diseases (Soon et al., 2008). The Model School Tuck-Shop Program, access to healthy foods, and the Trim and Fit Program, focusing on both nutrition and physical activities, were successfully implemented in 74% of schools and reached 80% of students. A decrease in prevalence of overweight in school children was observed, from 11.7% in 1993 to 9.5% in 2006. Two countrywide programs, the Healthier Dining Program and Healthier Hawker Program, were launched in 2003 and 2006, respectively. Both aim to provide healthier food choices and supply for the population.

China was one of the first countries in the region to report the emergence of the double burden of malnutrition. A national plan of action implemented in 1997 set out goals for reducing undernutrition as well as preventing diet-related chronic noncommunicable diseases (Zhai et al., 2002). Intersectoral efforts were perceived to be crucial in implementing effective programs to address nutrition-related problems. The agricultural production structure was modified to increase production of healthy foods, such as fish, poultry, fruits, vegetables, and soybeans. Dietary guidelines for Chinese and the Food Guide Pagoda were developed as guiding principles for nutrition education and awareness. Capacity building in nutrition planning and action pro-



# Japanese Food Guide Spinning Top

Do you have a well-balanced diet?



Decided by Ministry of Health, Labour and Welfare and Ministry of Agriculture, Forestry and Fisheries.

Figure 4.4a. Food-based dietary guidelines for Japan.

grams was conducted at several levels of government and involved leaders from various sectors. National guidelines and a program for prevention and control of hypertension, diabetes, and cardiovascular disease were implemented. Non-nutrition programs such as smoking control and increased physical exercise, particularly in school children, were also promoted. A health-promotion demonstration project conducted in Tianjin resulted in significant reductions in hypertension and mortality due to stroke.

In Thailand, a Sweet Enough campaign led by a network of civil society groups has focused on young children (Ungchusak, 2008). The campaign was initiated to address the problem of dental caries and hygiene among children and rapidly gained widespread interest and participation at the national level. The extension of the network involved other groups such as pediatricians and nutritionists, and the scope of prevention was expanded to include childhood obesity. Obesogenic environmental factors in pre-school and school children were identified, and guidelines and standards

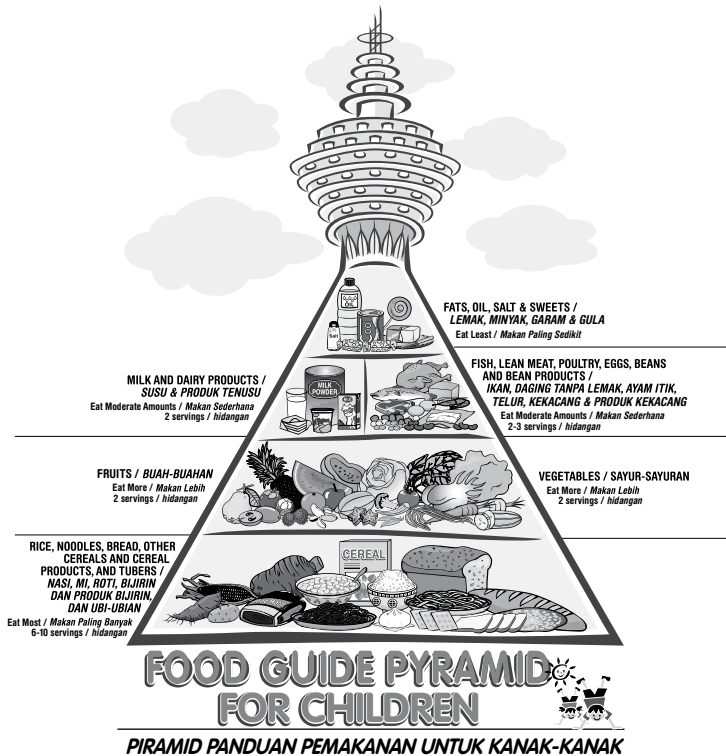


Figure 4.4b. Food-based dietary guidelines for Malaysia.

on child feeding and physical activities were developed. Legislation and regulation were promulgated to limit the use of sugar in children's foods, such as formula milk and complementary food for infants, prohibiting soft-drink sales in Bangkok metropolitan schools and expanding nationwide. Partnership with local government was important and provided a good avenue for promoting nutrition and physical activities in the community.

An important regional effort to develop a food-based dietary guideline is an attempt to translate the nutrient-based recommendations or dietary guidelines to foods and food groups, making it more practical for people to eat healthily (WHO/FAO, 1996). The guidelines consider the cultural context, as well as social, economic, and environmental aspects of foods and eating patterns of the population. Several countries in the region have developed a food-based dietary guideline and used it as one of the key strategies to address the problems of obesity and its related consequences. In Malaysia and Korea, additional efforts were made to develop guidelines

for specific different age groups (see the Malaysian food pyramid for children in figure 4.4b). Further testing of the usefulness of these guidelines may be needed to verify their practicality and effectiveness.

#### ASIA AT THE CROSSROADS

Countries in East and Southeast Asia differ widely in their economic development and rates of malnutrition. While countries that are rapidly industrializing are moving away from undernutrition, there are rising trends in overweight and obesity and the consequent diet-related chronic noncommunicable diseases. Those countries that lag behind in economic development still encounter the challenges of undernutrition (especially stunting and micronutrient deficiencies). Prevention and control of maternal and young child undernutrition will be important to prevent both short- and long-term consequences on health and function, and across the life span.

Several interventions to alleviate protein-energy and micronutrient deficits are now available and have proven cost-effective (Morris et al., 2008; Horton et al., 2010). The challenge for the poorer countries in the region is how to scale up programs, given their relatively limited resources. Success in combating undernutrition in countries such as China, Thailand, and Vietnam provides examples for other nations. However, the transition from under- to overnutrition means that even those countries that have been successful at improving the nutrition of their population may need to reexamine their policies and strategies to address newly emerging problems. It is well recognized that the contexts, that is, socioeconomic, demographic, and epidemiologic profiles, are changing. Nutrient deficiencies during the rapid growth period have negative consequences on health and compromise a person's full potential. Overnutrition is rising at alarming rates and in some countries has overtaken undernutrition as a more significant problem among vulnerable populations, specifically pregnant mothers and young children. The rising health care costs related to obesity and chronic diseases, as well as the permanent damage to health and human functions related to micronutrient deficiencies, call for preventive and promotive measures. Although the health care systems in many countries in East and Southeast Asia have been well developed since the 1990s, the health sector cannot be solely responsible for tackling the double burden of malnutrition. Past experiences in Japan, China, Thailand, and Vietnam using integrated multisectoral approaches provide useful models for other countries. Elements for successful national programs have

been identified in these countries and include political will and commitment, effective policy and program management, and community-based approaches. The difficult challenge facing countries undergoing development transition is how to implement policy and strategic programming that can address the problems at both ends of the malnutrition spectrum. Of course, a one-size-fits-all approach will not work, and each country has to tailor these programs based on its own political, social, demographic, cultural, and economic environment. While priorities may need to be focused, preventing and promoting good nutrition across all stages of life is essential. The ultimate goal is optimal nutrition for all and throughout the human life cycle.

#### NOTES

1. The same indicators (weight for height or BMI for age) can be used to define both wasting (acute undernutrition) and overweight/obesity (overnutrition).

2. Flour Fortification Initiative, *Indonesia Reinstates National Fortification Standard*, [http://www.sph.emory.edu/wheatflour/EastAsiaPortal/Indonesia\\_reinstates.doc](http://www.sph.emory.edu/wheatflour/EastAsiaPortal/Indonesia_reinstates.doc), 2011

3. Global Alliance for Improved Nutrition, *GAIN National Food Fortification Program*, <http://www.gainhealth.org/programs/gain-national-food-fortification-program>, 2011

4. BMI = weight in kilograms divided by height in meters squared. International recommended BMI classification for adults: <18.5 = chronic energy deficit, 18.5–24.9 = normal, 25–29.9 = overweight, and  $\geq 30$  = obesity (WHO, 2004). Unfortunately, at the same BMI, Asian populations have been found to have much more body fat compared with Caucasians (Pan et al., 2008). The WHO recommends that these cutoffs be retained as the international classification but advises an additional set of cutoffs for public health action in Asia ([http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html)).

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## 5 Tobacco

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Tobacco use imposes a high cost on Asian countries in terms of poor health outcomes and economic impacts. Since the tobacco-related disease epidemic is relatively new in Asia, these costs will continue to rise for many years, even if action is taken very soon. Legislation is needed to control tobacco promotion and smoking in public places and worksites, along with higher tobacco taxes and better enforcement of the laws that do exist. However, there are many obstacles, including the multiplicity of tobacco products; lack of good local evidence on the health effects of tobacco products; and links between local tobacco production, transnational industry lobbying, and government departments. The WHO's Framework Convention on Tobacco Control and the training of Asian tobacco-control workers are essential supports in the war against tobacco-related disease in Asia, but the battles have hardly begun in some countries in the region and are far from won in the remainder.

### INTRODUCTION

Tobacco use is still a major cause of death and serious disease in many countries, and if the current trends in its use continue, it could kill a billion people around the world this century. At present, about half of tobacco-related deaths occur in developing countries (Mackay et al., 2006). The annual death toll is predicted to be 7–10 million by 2030, based on an estimated decline in tobacco use of about 9% in high-income countries but a doubling in use in low- and middle-income countries (Mathers & Loncar, 2006). Even if the rate of starting to smoke stayed the same, an increase in population numbers would increase the number of smokers. The risk of being killed by smoking could be as high as 2 out of 3 in those who

start young (Doll et al., 2004), and half of the premature deaths will occur in middle age. Therefore tobacco's position as a major cause of death will continue well into the future in spite of attempts to control it.

Although tobacco control measures have had some success in reducing smoking rates, the impact has been greatest in high-income countries; lower-income countries have lagged behind in regulation or enforcement of controls, such as smoke-free laws. Most tobacco-related deaths are due to chronic diseases that have long incubation periods. In countries with long histories of tobacco use, such as the United States, there is a time lag of two to three decades between the peak of tobacco consumption and the peak of tobacco-related deaths. This means that in countries where tobacco consumption is currently rising, we see increasing numbers of smokers but few tobacco-related deaths. Awareness of the looming public health problem is therefore low, and there is no sense of urgency in implementing strict tobacco-control measures, as compared with the perceived importance of controlling acute communicable diseases such as influenza.

For these reasons, the burden of tobacco-related disease is shifting relatively quickly from developed to developing countries, many of which are in Asia. Compared with the mature epidemic in the West, the tobacco disease epidemic in Asia is still relatively immature, with most countries at the early stages of increasing smoking prevalence among males, followed by increasing prevalence among females. Of the countries with the most cigarette smokers, three out of the top six are in Asia, with China first, Indonesia third, and Japan sixth (WHO, 2008). China was by far the largest consumer in 2000, accounting for 35% of the world's tobacco consumption. The nearest competitor was India, which consumed just 6%. The consumption of tobacco in China is predicted to increase concurrent with increasing population, although the rate of increase may be slowing (UN-FAO, 2003).

In spite of high rates of smoking among men, most Asian countries have currently low, but increasing, rates of smoking among women. There is enormous marketing potential for local and international tobacco industries, but the public health consequences of this will be catastrophic.

#### CONSUMPTION OF TOBACCO IN ASIA

In terms of WHO regions, the Western Pacific region, which covers much of East Asia, has the highest rate of male tobacco smoking. Within Western Pacific countries, male daily smoking rates vary from 26% in Singapore to 57% in China and Laos (WHO, 2009). In the South-East Asia region,

Indonesia leads, with a male daily smoking rate of 54%. In all Asian countries, patterns of consumption can be characterized as higher rates among men and low rates among women. This can be seen in China, where in 1998 smoking rates among city-dwelling men age 35–64 were 75% while just 6% of women in this group smoked (Sung et al., 2006). In contrast, smoking rates among women followed a different age distribution, with 15% of older women smoking.

There are also lower rates of cigarette smoking among girls than boys in most Asian countries. For example, the rate of smoking among teenage girls in Malaysia in 2003 was 4% compared with 36% among boys, while in the Philippines 12% of girls smoked in 2007 compared with 23% of boys (WHO, 2009). In Malaysia, the smoking rate among adult men reported in 2006 (46%) was not very much higher than the rate among teenage boys, confirming that most male smokers began fairly young.

Rates of smoking are higher in rural than urban residents in Asia. In Cambodia, up to 86% of men in rural areas smoke. A further concern, and one that hinders attempts to deal with the problem, is the high smoking rate among health professionals and influential persons. In the early 1990s, almost 70% of male physicians in China and over 40% in Japan smoked, as did over 65% of Chinese teachers and a high proportion of Cambodian monks (WHO, 2002a).

However, there has been some success in reducing smoking rates. In the early 1970s, Singapore instituted legislative and other measures to stem what had been a growing prevalence of smoking. Rates of 26% in adults in the mid-70s (49% in men and 8% in women; Lee, 1989) declined to 18.3% in 1992, to 15.2% in 1998, and to 13.6% in 2007 (23.7% in men and 3.7% in women; Singapore Ministry of Health, 2007).

Hong Kong is the most westernized city of China, and in the early 1970s it was about 20 years behind the United States in smoking behavior, while the rest of China was about 20 years behind Hong Kong (Lam et al., 2001). Like Singapore, after about three decades of tobacco control, Hong Kong is also now at a relatively advanced stage of the tobacco epidemic; male smoking prevalence is decreasing and there are subsequent declines in the rate of tobacco-related deaths (figure 5.1). However, smoking in younger women in Hong Kong is now rising in spite of current tobacco-control measures.

Japan, too, has experienced increases in the rates of smoking among women and by 2006 had probably the highest female smoking rate in Asia, at 14% (Mackay et al., 2006). The diminishing gender divide is particularly evident in younger age groups; in 2003, the smoking prevalence

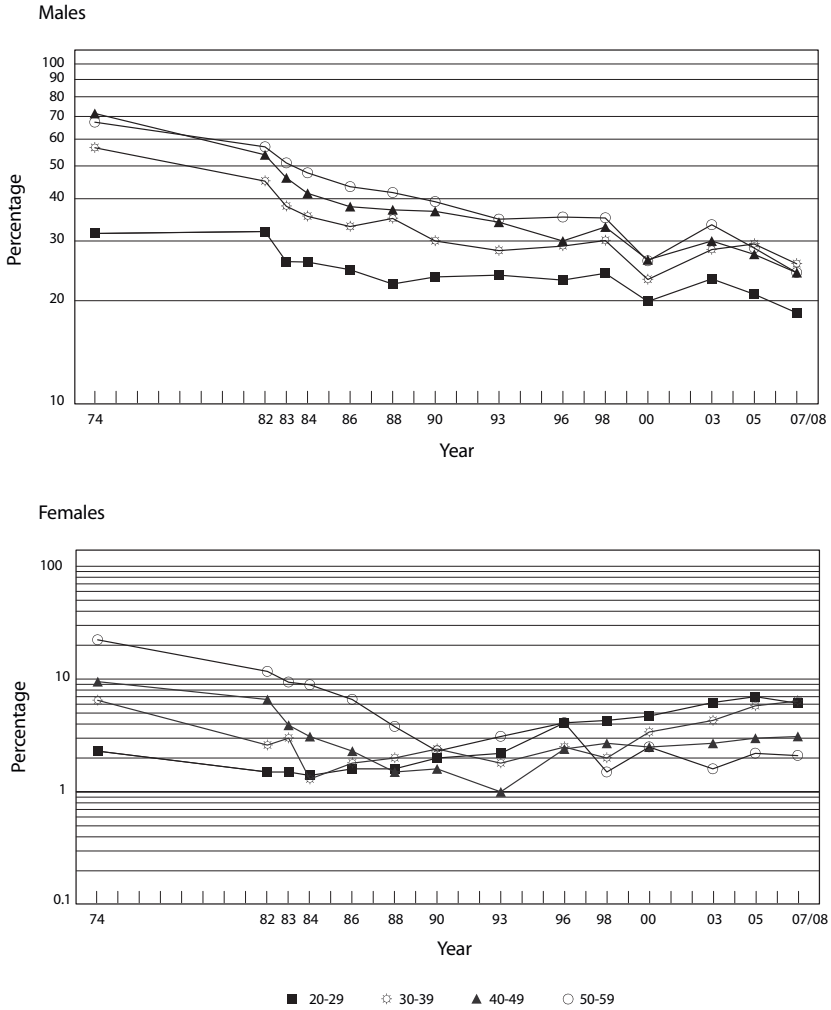


Figure 5.1. Trends in prevalence of male and female daily smoking in Hong Kong, 1974–2005. Sources: Social Surveys Section, Census and Statistics Department, 2011; Millar, 1979.

(smoking in the last 6 months) among Japanese girls age 12–15 years was only slightly lower than in boys of the same age, at 5.1% and 7.9%, respectively (Ando et al., 2007).

The same trend is mirrored throughout Southeast Asia; the prevalence of smoking among adult males was about 10 times that among adult females (Guindon & Boisclair, 2003), but more recent data show a preva-

lence among 13–15 year old males in Southeast Asia that is only 2.5 times that of females of the same age (CDC, 2010). Since females who smoke appear to have at least the same risk of disease as male smokers (Liu et al., 1998), the impact of tobacco-related disease on female death rates in Asia is likely to increase sharply in the coming years. This rise in smoking among women also has major implications for children's health if mothers smoke during pregnancy or around their young children.

### *Secondhand Smoke Exposure*

High rates of smoking are associated with high levels of exposure to secondhand smoke, particularly where awareness of the harm is low and regulation poor. Thailand has relatively good tobacco-control policies; nonetheless, exposure to secondhand smoke among young people in 2008 was estimated at around 70% in public places and almost 50% at home (Sirichotiratana et al., 2008). Secondhand smoke exposure of schoolchildren in Indonesia was even higher, at 81% in 2006, while exposure at home was around 65% (WHO, 2009).

While secondhand smoke exposure in the home is an important threat to health everywhere, exposure in the workplace is being tackled more quickly in other parts of the world than in Asia. The delay in making workplaces in Asia smoke-free will exact a toll on large numbers of Asian workers, many of whom are nonsmokers. A study of nonsmoking catering workers in Hong Kong showed that those who worked in premises with unrestricted smoking had higher cotinine levels in their urine than did their colleagues working in smoke-free premises (figure 5.2). However, the survey indicated that virtually all subjects, including the selected low-risk controls, showed contamination of body fluids by tobacco chemicals.

Local data like these are important, since opponents of tobacco control often try to argue that Western data have limited application in Asia. This study was relatively cheap, the main expense being the cotinine tests, and the results were widely reported by the mass media, which helped to increase social awareness and pressure. In Hong Kong, these findings supported the ban on smoking in restaurants for occupational health reasons, that is, for the protection of all workers, smokers and nonsmokers alike.

### TYPES OF TOBACCO CONSUMED IN ASIA

While many in Asia smoke cigarettes, there are other types of tobacco products available. For example, kreteks contain tobacco mixed with clove, which imparts a distinctive flavor, and they dominate the market

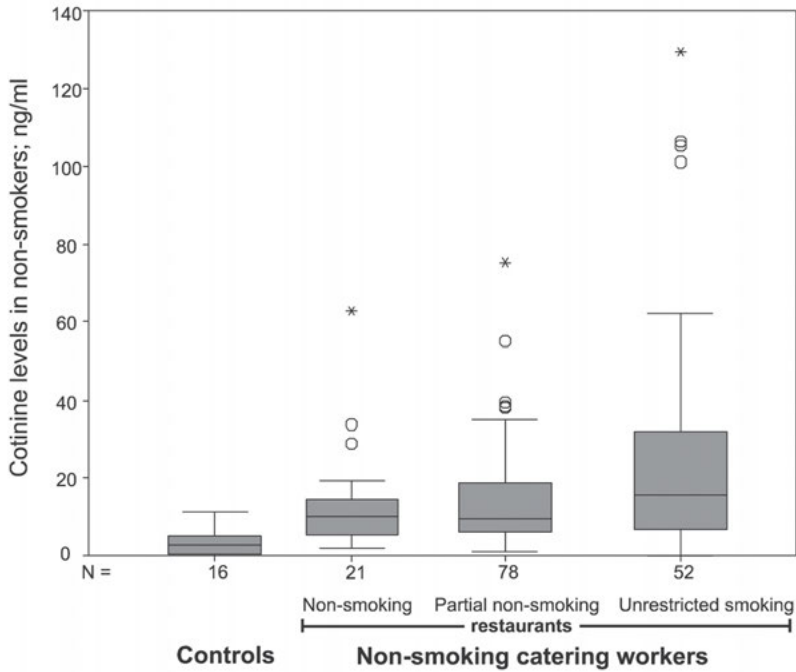


Figure 5.2. Urine cotinine levels (ng/mL) in nonsmoking controls and catering workers by type of restaurant. Source: Hedley et al., 2006.

in Indonesia; almost 90% of the sticks smoked in Indonesia are kreteks (Lawrence & Collin, 2004). The transnational tobacco companies have tried hard to compete, even developing their own clove-based products, but they have not been successful so far. There is, as yet, a lack of information on the specific impact of kretek smoking on health, but there is no evidence that they are less harmful than cigarettes (WHO, 2006). Indeed, the limited research available indicates that all forms of smoked tobacco are harmful. Research is most comprehensive for bidis, a form of cigarettes native to India, which are also smoked in Cambodia, Myanmar, and other Asian countries. Bidis contain tobacco and flavorings wrapped in a leaf and are often made by women based at home. Although they contain far fewer added chemicals than factory-made cigarettes, bidis deliver higher levels of nicotine, carbon monoxide, and tar and are associated with substantial harm.

All of the alternative forms of smoked tobacco create secondhand smoke and are hazards for passive smokers. Smokeless tobacco, however, does not create secondhand smoke. It comes in various forms and is chewed or held

in the mouth against the buccal mucosa. Smokeless tobacco is popular in several Southeast Asian countries and is often chewed with areca nut and slaked lime, which themselves can cause cancers. Despite being highly addictive and harmful to health, chewing tobacco is often perceived and marketed as safer than smoking (WHO, 2006).

#### THE IMPACT OF TOBACCO ON HEALTH IN ASIA

Tobacco use is associated with a wide spectrum of diseases, including cancer and heart and cerebrovascular diseases, and overall increased mortality rates. While there have been numerous studies in the West, the scarcity of Asian studies can lead to false beliefs among governments and the public that Western evidence of harm does not apply to Asians. Local studies of health impacts can therefore be very effective in promoting tobacco control and motivating health care professionals. One Asian study on upper aerodigestive tract cancers (of the lip, oral cavity, pharynx, esophagus, and larynx), which followed 455,409 subjects over about 6 years, found the risk for smokers was 136% higher than for nonsmokers (Ansary-Moghaddam et al., 2009). This is, however, a relatively lower excess risk than seen in other studies, mainly from the West.

The relatively lower current rates of tobacco-related disease in Asian countries are also illustrated by comparing the risk of lung cancer among smokers with the risk for nonsmokers. In the United Kingdom the ratio is about 15:1 (Doll et al., 2004), but in Hong Kong, ever-smokers were only about five times more likely as never-smokers to die from lung cancer (Lam et al., 2001) (table 5.1), and data from 24 urban and 74 rural areas of China suggested that smokers were only three times more likely than nonsmokers to die from lung cancer (Liu et al., 1998).

The lower risk ratios observed in Asian studies could be due to the relatively late rise in the prevalence of smoking compared with the West (Lam et al., 2001), where it peaked some years ago, coupled with the long latent period before the impact of smoking is reflected in health outcomes. There may also have been a lower cumulative exposure to tobacco smoke among Asians to date, but this implies that risks will increase as people initiate smoking at younger ages and increase their daily consumption. These trends are already being seen as a result of economic development and the low cost of cigarettes. There are also increased risks of respiratory cancers in Asia due to other hazards, such as indoor air pollution from wood fires, secondhand smoke, radon emissions from building materials, and outdoor air pollution, and these could modify the fraction of morbidity



TABLE 5.1 Adjusted Risk Ratios for Mortality from Selected Causes in Middle-Aged and Elderly Chinese Male Smokers in Hong Kong, 1998

	36–69 years	>69 years
Lung cancer	4.99 (4.00–6.22) <sup>a</sup>	4.90 (3.93–6.10) <sup>a</sup>
Esophageal cancer	7.89 (4.49–13.88) <sup>a</sup>	2.17 (1.28–3.66) <sup>a</sup>
Stomach cancer	1.72 (1.24–2.38) <sup>a</sup>	1.14 (0.83–1.56)
Liver cancer	1.56 (1.26–1.92) <sup>a</sup>	1.17 (0.91–1.52)
5 minor sites <sup>b</sup>	1.94 (1.52–2.48) <sup>a</sup>	1.68 (1.28–2.20) <sup>a</sup>
Other malignancies	1.25 (1.04–1.51) <sup>a</sup>	1.19 (1.01–1.40) <sup>a</sup>
Colorectal cancer	0.84 (0.64–1.09)	1.16 (0.91–1.48)
Chronic obstructive pulmonary disease	3.68 (2.58–5.26) <sup>a</sup>	3.81 (3.08–4.71) <sup>a</sup>
Respiratory tuberculosis	2.54 (1.24–5.22) <sup>a</sup>	1.63 (1.01–2.64) <sup>a</sup>
Other respiratory	2.15 (1.66–2.79) <sup>a</sup>	1.28 (1.11–1.48) <sup>a</sup>
Stroke	1.75 (1.39–2.20) <sup>a</sup>	1.04 (0.89–1.23)
Ischemic heart disease	1.58 (1.27–1.97) <sup>a</sup>	1.02 (0.87–1.20)
Other vascular	1.78 (1.36–2.33) <sup>a</sup>	1.16 (0.96–1.42)
Other medical	1.29 (1.07–1.55) <sup>a</sup>	0.94 (0.81–1.10)
Injury and poisoning	1.23 (0.93–1.63)	0.82 (0.59–1.13)
Controls	1.00	1.00

SOURCE: Lam et al., 2001.

<sup>a</sup>Statistically significant<sup>b</sup>Cancer of the mouth, pharynx, larynx, pancreas, bladder

and mortality attributable to smoking. Overall, therefore, the contribution of smoking to mortality and ill health in Asian populations is likely to increase over coming years.

There is, however, already some evidence in Singapore that tobacco control can result in lower disease rates. Lung cancers in Singaporean men, which are mostly tobacco-related, have declined from 63.0 per 100,000 in 1978–1982 to 45.0 in 1998–2002 and 40.8 in 2003–2007 (Singapore National Registry of Diseases, 2004, 2009).

There are many occupational exposures to respiratory hazards in Asian workplaces, and occupational health professionals concerned about chemicals and dusts do not always consider the smoking habits of workers as an occupational health issue. In one longitudinal study on Chinese factory

workers, the survival curves for males clearly showed lower survival among smokers than among never-smokers in the workforce (Ho et al., 2002). The curves for females also showed increased mortality for smokers, albeit to a lesser extent. While these workers were exposed to many hazards in the workplace, tobacco use stood out as having a larger effect on mortality, with 12% of deaths attributable to smoking compared with 3% attributable to occupational exposures. Such local evidence that smoking can be more harmful to workers than exposures to other occupational hazards, and that it can even have a synergistic effect with these other hazards, has resulted in smoking and passive smoking being included in national standards for occupational health surveillance in China (Jiang et al., 2009).

While the same dominant tobacco-associated diseases seen in the West are seen in Asia, some other diseases have been associated with smoking in Asia. For example, liver cancer has been strongly associated with smoking in Japan (Tanaka et al., 2006). In Thailand, pulmonary tuberculosis has been roughly three times more likely in smokers than nonsmokers (Ariyothai et al., 2004). The far lower prevalence of liver cancer and tuberculosis in the West may have made it more difficult to establish a clear association with smoking.

The alternative methods of tobacco smoking in Asia, such as kreteks, and chewed tobacco products appear to cause the same spectrum of disease as cigarettes, although the evidence is not yet as great as for cigarette smoking (WHO, 2006). Moreover, the composition of these products varies in different countries, making it difficult to generalize the findings of research studies.

Exposure to secondhand smoke can also cause lung cancer, and the first evidence of this came from a large Japanese cohort study in 1981 (Hirayama, 1981). This finding was subsequently confirmed by studies from many countries and regions, including Hong Kong (table 5.2) and mainland China, along with further evidence that passive smoking can cause respiratory illnesses, heart disease, and stroke (McGhee et al., 2005).

It should also be noted that although the relative risk of lung cancer and heart disease due to passive smoking (about 1.3) may be smaller than the relative risk due to active smoking (between about 2 and 10), the proportion of the population exposed is much larger, and thus the impact of passive smoking on any population can be enormous. The risk may even be greatly underestimated in most studies because of the ubiquitous exposure of the population, which means that we should ideally use chemical biomarkers to define adequate control groups against which to measure the risk.

TABLE 5.2 Adjusted Odds Ratios for Mortality from Selected and All Causes in Nonsmokers over Age 60 Exposed to Secondhand Smoke at Home

	<i>Men</i> OR <sup>a</sup> (95% CI <sup>b</sup> )	<i>Women</i> OR <sup>a</sup> (95% CI <sup>b</sup> )
Lung cancer	1.34 (0.82–2.17)	1.38 (0.94–2.04)
All cancers	1.16 (0.85–1.60)	1.35 (1.03–1.76)*
COPD <sup>c</sup>	1.67 (0.95–2.94)	2.90 (1.34–6.29)**
All respiratory	1.29 (0.87–1.92)	1.52 (1.01–2.27)*
Stroke	1.31 (0.87–1.99)	1.57 (1.11–2.34)*
IHD <sup>d</sup>	1.30 (0.88–1.93)	1.39 (0.95–2.04)
All CVD <sup>e</sup>	1.29 (0.93–1.79)	1.36 (1.02–1.81)*
Injury & poisoning	1.02 (0.53–1.51)	0.81 (0.43–1.52)
All deaths	1.25 (0.94–1.66)	1.41 (1.11–1.79)**

SOURCE: McGhee et al, 2005.

NOTE: Exposure to passive smoking at home was shown in Hong Kong to be associated with increased mortality due to cancer and cerebrovascular disease. The estimated number of deaths due to passive smoking (about 1,300 per year) has been used in Hong Kong in public education campaigns and by the government and legislators to promote public awareness, concern, and demand for totally smoke-free public places. These data, among others, have also helped with the passing of more stringent legislative measures to ban smoking in most indoor workplaces, including restaurants and bars, and in many outdoor places, including parks, beaches, and public housing estates. Model is adjusted for age and education level.

<sup>a</sup>OR = odds ratio

<sup>b</sup>CI = confidence interval

<sup>c</sup>COPD = chronic obstructive pulmonary disease

<sup>d</sup>IHD = ischemic heart disease

<sup>e</sup>CVD = cardiovascular disease

\* $p < 0.05$

\*\* $p < 0.01$

With major authoritative reviews confirming that passive smoking increases the risk of serious health problems, public health concern in the West has shifted to the protection of nonsmokers, especially children. Nonsmokers' rights movements and the need to protect people from involuntary exposure have been driving forces for implementing total bans on smoking in public places and workplaces in the West. Such concerns and advocacy for a smoke-free environment are still uncommon in Asia, where secondhand smoke exposure remains a common public health problem.

## INTERACTION BETWEEN RISK FACTORS IN ASIA

A variety of factors may interact to affect the health of populations, and therefore public health must take a comprehensive, multifactorial and multisector approach. This need is illustrated by the interaction between the harm from smoking and that from high levels of air pollution, which is also a serious hazard in most cities in Asia. The increased industrial development and use of motorized transport have pushed up concentrations of fine particulates and gases all over Asia to levels that cause illness and premature death (see chapter 8). The impacts of air pollution, like the impacts of smoking, include increased rates of respiratory and circulatory diseases. Air pollution affects everyone but there is growing evidence that it harms smokers even more than nonsmokers. A study in Hong Kong showed that mortality associated with particulate air pollution was about twice as high for male smokers as for male never-smokers (Wong et al., 2007).

Diabetes is on the increase in Asia, along with the rise in obesity and more globalized living habits (see chapter 4). One study among Chinese subjects with diabetes in Hong Kong showed a poorer metabolic profile among smokers than nonsmokers (Thomas et al., 2006). We must expect that increases in any of the risk factors associated with environment and lifestyle will have at least an additive effect and perhaps even a multiplicative interaction with tobacco use.

## ECONOMIC IMPACT OF TOBACCO CONSUMPTION

Premature deaths due to tobacco consumption have a large negative impact on the economy, as does treatment of tobacco-related disease. For example, in Vietnam the cost of inpatient care for the three most important tobacco-related diseases—lung cancer, chronic obstructive pulmonary disease, and ischemic heart disease—amounted to around 0.22% of the gross domestic product and 4.3% of the total health care costs (Ross et al., 2007). These figures underestimate tobacco's economic impact because they do not include other tobacco-associated diseases or the costs falling on other health care sectors, such as primary care. However, they do show that treating tobacco users consumes precious resources that are needed by other areas of the health care system.

From National Health Insurance data for 2001 in Taiwan, the smoking-attributable fraction of the lifetime medical costs of treating 10 diseases was estimated to be about 25% (Chung et al., 2007). Around 40% of this smoking-attributable cost was for the treatment of chronic respiratory

disease, and about 20% was for the treatment of stroke, both of which lead to long-term disability. Therefore, to these monetary costs should be added the immense burden in loss of quality of life. The Global Burden of Disease study estimated in 2002 that about 4.1% of the total disability-adjusted life years (DALYs) lost around the world were associated with smoking and that 16% of this global burden fell within the Western Pacific region and 20% within the South East Asian Region (WHO, 2002b). In the costing of tobacco-related disease in Hong Kong, the value of US\$688 million annually for direct costs and productivity loss was swamped by the US\$9.4 billion value of the premature deaths and suffering of smokers and their families (McGhee et al., 2006).

The costs of tobacco use have a disproportionate impact on the poor in Asia, who spend relatively more on its purchase. In Indonesia, one study estimated that the lowest income group spent 15% of their total household expenditure on tobacco (de Beyer et al., 2001), while another found an expenditure of 22% of household income on tobacco and a clear association with malnutrition in children in 1999–2003 (Semba et al., 2006). Economic studies like these are important to support tobacco-control policy and may motivate some policy makers to take it more seriously.

Of the tobacco-related disease cost in Hong Kong, about 23% was due to secondhand smoke (McGhee et al., 2006). Most other estimates of the costs of tobacco-related disease to date have not been able to include the costs of secondhand smoke, but they must be substantial in Asia, given the high prevalence of smoking and few restrictions on smoking in homes, workplaces, and other public areas.

## PRODUCTION OF TOBACCO IN ASIA

Tobacco-control measures aimed at reducing rates of smoking are made more difficult by the perceived contributions of tobacco to some economies in Asia. For example, in Japan, the government owns a 50% share in Japan Tobacco. China alone produces about 35% of the world's tobacco, mainly for consumption within China. In 2003, the government's State Tobacco Monopoly Administration generated around US\$2 billion from profits and taxes on tobacco, amounting to over 7% of the central government's revenue (Hu et al., 2006). The administration exerts close control over the production and sale of tobacco in China and has successfully resisted efforts by international companies to move into the market. This may have protected the Chinese population to some extent from the marketing strategies used in other Asian countries, such as advertising and packaging

designed to appeal to women, but this may change as the Chinese tobacco producers attempt to tap this market.

The perceived economic dependencies on the income from tobacco production and sales are a major obstacle for the implementation of tobacco-control policies for all affected Asian countries. Tobacco taxation is known to be one of the most successful means of reducing smoking rates in a population (Ross & Chaloupka, 2006). Increases in tobacco duty could, on the one hand, increase government taxation income but, on the other hand, deter smoking and thus reduce tobacco profits. There can be conflicts of interest between ministries responsible for finance and those responsible for health, creating an apparent dilemma for governments that perceive tobacco-related income as important. A study in RO Korea found that these conflicts also exist at the local level: the higher the local government's tax revenue was from tobacco-consumption tax, the lower their participation was in the national antismoking program (Do & Park, 2009). Perhaps, with increasing information on the substantial premature mortality, burden of health care, productivity losses, and other social problems caused by tobacco use, the revenues gained by governments through tobacco production and tax might not seem so attractive. The public health perspective on tobacco duty is that high tobacco duty reduces the incidence of disease, health care needs, demands on family income, and deprivation of food, clothing, and education for children.

## TOBACCO CONTROL

Tobacco is the only risk factor that has so far prompted the WHO to develop and implement a worldwide legally binding treaty, the Framework Convention on Tobacco Control (FCTC), which entered into force in 2005 (WHO, 2005) and which all Western Pacific and most South East Asian Region countries have ratified. The FCTC aims to reduce demand for tobacco products by price and tax measures, smoke-free policies, regulation of tobacco products and their packaging, control of advertising, education, and smoking cessation. It also aims to reduce supply by prohibiting illegal trade of tobacco and sales to minors and by encouraging the development of alternative industries.

The FCTC holds each country responsible for enacting the necessary measures to control tobacco advertising and availability as well as second-hand smoke exposure. There has been some degree of success in the implementation of tobacco-control measures around the world, although only 5.4% of the world's population was covered by comprehensive smoke-free

laws in 2009 (WHO, 2009). A number of countries now have smoke-free workplaces and other public places, including restaurants and bars, but these are mostly in the West, although some jurisdictions in Asia have taken steps toward creating a smoke-free society. For example, Singapore and Thailand introduced smoking restrictions in public places in the 1970s and have added to these measures over the years. More recently, Taiwan required all public places for more than three people, such as restaurants, and waiting areas like bus stops to be smoke-free. Hong Kong implemented a smoke-free law in 2007 covering all workplaces, including restaurants, but allowed some exemptions for bars until July 2009. The importance of a prompt, comprehensive, and enforceable smoke-free policy is highlighted by Hong Kong's experience. The concession by government in exempting licensed premises such as bars led to high levels of exposure of many catering workers to secondhand smoke for over 2 years longer than other workers, leading to objective clinical evidence of impaired lung function in those exposed (Hedley et al., 2009).

Another important policy promoted by the FCTC is tobacco taxation, because of its effect in making cigarettes more expensive and thus reducing smoking rates (Ross & Chaloupka, 2006). In Thailand the tax on a pack of cigarettes is 79% of the purchase price; China's tax is up to 35%, Indonesia's is 22%, but Cambodia is at the bottom with tax amounting to only 9% of the purchase price (WHO, 2008). Using a comparison that allowed for differences in purchasing power in each country, the WHO estimated in 2008 that cigarettes in Cambodia cost the equivalent of US\$1.18, while they cost US\$1.93 in the Philippines, US\$2.35 in Indonesia, US\$2.46 in Japan, US\$2.63 in Vietnam, US\$3.25 in Thailand, US\$4.51 in Malaysia, and up to US\$6.99 in Singapore (WHO, 2008). In a 2009 survey in China, 85% of respondents and 81% of smokers supported an increase in tobacco taxes (*China Daily*, 2009), but the subsequent 5% rise in consumption tax did not immediately increase the retail price and seemed to have been absorbed by the manufacturers and retailers. Cheap cigarettes in countries throughout Asia continue to feed the addiction of the population and to promote smoking among young people.

In 1998, Thailand introduced cigarette-pack warnings that tobacco use causes impotence, and in 2005 graphic health warnings covered half the pack. Now cigarette packs cannot even be displayed at the point of sale. Graphic warnings on packs were also introduced in Singapore in 2004 and more recently in Hong Kong and Taiwan, but warning labels in other Asian countries are smaller and less effective as a deterrent. Many juris-

dictions in Asia have reasonably comprehensive bans on advertising of cigarettes, but this is variable. For example, at the time this was written, advertising on the mass media was banned in Vietnam, partially banned in Laos, but not restricted at all in Cambodia.

However, nonspecific wording in the regulations allows loopholes, while blatant disregard of the meaning of the law allows images that portray smoking in a positive way to get through to the populations in many countries. Widespread in Asia is brand extension, in which the tobacco product is associated with nontobacco services or products, such as clothing, footwear, or watches, that carry the names, logos, and colors of the cigarette brand. With such a large potential market, especially among women, the tobacco industry will continue to use every available means to increase its products' visibility in Asia.

Smoking-cessation services are a complement to smoke-free policies and increases in tax, assisting those smokers who take the opportunity to give up smoking altogether. While some smokers manage to quit without any professional assistance, many benefit from counseling and pharmacological support such as nicotine replacement therapy or other medication. RO Korea, with smoking rates of around 50% among men, offers smoking-cessation services free of charge in public clinics (ITC, 2010). Smoking-cessation clinics can also be used as training sites for medical and nursing students and as focal points for tobacco-control campaigns. Taiwan considered quit-smoking booths where smokers could be exposed to health-promotion material, since the smoke-free laws had driven many smokers onto the pavements (*Taipei Times*, 2009). Most Asian countries, however, still have a long way to go in developing their smoking-cessation services, especially in rural areas, where clinics and even pharmacies may be hard to come by.

In Asia, health workers do not always show leadership in quitting smoking, partly because many are smokers themselves. However, other traditional leaders such as monks may be key players in smoking-cessation interventions, especially in rural areas. Religious factors were found to encourage quitting attempts by both Malaysian Muslims and Thai Buddhists, although they did not guarantee success (Yong et al., 2009).

Because of the numerous types of tobacco products consumed in Asia, such as bidis, kreteks, and smokeless tobacco, regulation can be problematic. These products are harmful to health but often are not taxed or required to carry the same warnings as cigarettes and cigars and so are not easily covered by existing regulations (WHO, 2008). Smokeless tobacco presents



further challenges, and whether it facilitates or complicates tobacco control is a contentious issue (Hedley & McGhee, 2009). Each jurisdiction in Asia will have to consider, if they have not done so already, whether to allow these products to be sold. Hong Kong, for instance, made a decision in the 1980s to ban the import of smokeless tobacco.

#### HEALTH PROMOTION AND PROTECTION OF YOUNG PEOPLE IN ASIA

While raising awareness of the dangers of active and passive smoking is essential, we should be aware that other endeavors sometimes masquerade as health education. In the United States in the 1980s, the tobacco industry sponsored programs that were apparently aimed at preventing youth smoking but were actually an attempt to forestall legislation restricting the tobacco industry (Landman et al., 2002). These programs portrayed smoking as an adult choice, and after evaluating their impact, the WHO stated that “at best, these campaigns have no effect to reduce or prevent youth smoking. In some cases, they may actually encourage young people to smoke” (WHO, 2002c). While these industry-sponsored youth smoking prevention programs have now been stopped in many countries, they are still active in Asia. They have been fairly successful in distracting attention away from comprehensive tobacco-control programs and toward a narrow focus on youth smoking prevention and in promoting the image of the tobacco industry as “socially responsible.” Evidence from internal tobacco industry documents has revealed their activities in Malaysia in the 1990s to dilute tobacco-control legislation (Assunta & Chapman, 2004). Tobacco-control advocates and governments, or in fact anyone, should not accept funding from the tobacco industry for youth smoking prevention or other programs.

Most Asian countries do not, in theory, allow cigarette purchases by those under 18, but enforcement is highly variable. According to the Global Youth Tobacco Survey only 30% of 13–15-year-old schoolchildren in Indonesia in 2006 were refused cigarettes by vendors on account of their age, compared with over 70% in Thailand (CDC, 2010). A study of schoolchildren in Japan found a decrease in current smoking among male junior high school students, from 11% in 1996 to 5% in 2004, but the decrease among girls was less, from 4.9% to 3.6% (Osaki et al., 2008). The authors attributed some of the decrease to a reduction in smoking by fathers and brothers and some to tightening of sales to minors. However, they acknowledged that a large number of students still bought cigarettes in stores and most students bought their cigarettes from vending machines, which are

very difficult to control. Clearly, there is still a long way to go in ensuring that young people in Asia cannot buy cigarettes.

#### POLITICS OF TOBACCO CONTROL IN ASIA

Asia presents a huge potential market to the global tobacco industry. This means that the political dimension is very important in the control of this important threat to public health. The detailed political situations differ among the many countries of Asia, but there are some common factors that can be illustrated by examples. The Hong Kong 2001 proposal to extend smoke-free legislation to all workplaces was delayed and even derailed at several points in the process by opposition from tobacco alliances and government uncertainty about how to deal with this opposition. The tobacco industry funded campaigns to oppose public health measures, and surveys based on flawed designs provided misleading information on the economic impact of legislation (McGhee et al., 2003). In Hong Kong, it required high-profile champions, analysis of successful overseas experience in implementing smoke-free regulations, evidence of the harm to health from local studies, and a great deal of patience before the bill was finally passed in 2006 after about nine years of deliberation. Even then, exemptions were introduced for two and a half years, and when they were due to expire, there was vigorous opposition from affected sectors of the catering industry. Exemptions led not only to delay and detriment to workers' health but also to new opportunities for opponents to fight to repeal the law or to campaign for even longer extensions.

Hong Kong's experience contrasts with that of the United Kingdom, where no exemptions were allowed when the smoke-free law was enacted. The UK government initially wanted to exempt some licensed premises, but this proposal was voted down by a cross party alliance of democratically elected members of parliament. The political system that exists in any jurisdiction is an important factor in determining whether rigorous legislation is enacted.

Clearly the battle against tobacco-related disease in Asia will have to be fought for many years to come, and it is therefore important to train new generations of leaders in this field. Fortunately the experience and expertise gained in tobacco control in the West is being exploited with impetus from the FCTC, utilizing funding and experts from many agencies and governments. For example, one project has prepared trainees from Cambodia and Laos to lead evidence-based tobacco control in their own countries (Ferry et al., 2006).

## SUMMARY AND RECOMMENDATIONS

The toll of tobacco-related disease, premature death, and economic costs will continue to increase for many years in Asia. The rise in smoking by young women is a major concern, for both their own health and their families' health. Urgent action is needed by governments to protect the population, especially young people and nonsmokers, including strict enforcement of legislation, control of tobacco promotion, smoke-free work and public places, and fiscal measures to maintain tobacco prices. There are many obstacles to the prevention of the tobacco epidemic in Asian countries, including governments' perceived dependence on tobacco revenues and a generally low awareness of the impending epidemic of tobacco-related disease, even among health professionals. However, there are good examples of effective action in Asia, notably in Singapore, Thailand, Taiwan, and Hong Kong, including local health and economic studies and moves by many countries to formulate new policies. This is supported by the FCTC and training of tobacco-control workers from Asia. However, we must acknowledge that, coupled with the epidemiological transition of increasing overweight, diabetes, and health impacts of air pollution, tobacco use will continue to kill and disable many Asians for years to come.

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## 6 Chronic Disease

### Introduction

*Thomas Tsang*

*Chronic disease* usually refers to a group of diseases that are not transmissible but are potentially preventable. These diseases, which include cardiovascular diseases, cancer, diabetes mellitus, chronic respiratory conditions, and mental disorders, are literally reaching epidemic proportions and becoming dominant sources of morbidity and mortality in most countries of the world, including in Asia.

In 2005, chronic noncommunicable diseases (NCDs) took the lives of over 35 million people—60% of all deaths globally. Eighty percent occurred in low- and middle-income countries, and approximately 16 million deaths were of people younger than 70. Without actions to address the cause, the tolls will increase by 17% over the next 10 years (WHO, 2005a). In Asia, depending on the level of epidemiological and developmental transition, NCDs exhibit different profiles, and the associated health burdens vary among countries and areas. In Asia, NCDs represent 92% of the burden of disease in disability-adjusted life years among the high-income countries and approximately 63% in middle- or low-income countries. More importantly, chronic disease risks are increasing rapidly, particularly in middle- and low-income countries and areas. Consequently, the health burden attributed to NCDs is expected to increase over the coming decades.

This chapter provides an overview of three priority NCD groups that have placed a significant disease burden on Asia, namely, cardiovascular

diseases, cancer, and mental disorders (diabetes mellitus and chronic respiratory diseases are discussed in chapters 4 and 8, respectively).

While cardiovascular diseases and cancer are commonly perceived to be health threats in high-income countries only, they are now imposing a considerable burden in middle- and low-income countries. Asia is on the cusp of a major epidemic, with unprecedented proportions of populations suffering from or at risk of developing these diseases. The best public health strategies for combating cardiovascular diseases and cancer are, primarily, eliminating shared major lifestyle factors (including smoking, poor nutrition, physical inactivity, and alcohol misuse for reducing the risks for ischemic heart disease, stroke, and certain cancers) and vaccinations (such as against hepatitis B virus and human papillomavirus for prevention of liver cancer and cervical cancer). Secondary strategies include appropriate screening methods, such as for early detection of breast cancer and colorectal cancer.

Mental health is becoming a greater concern in many countries of Asia and can be adversely affected by other NCDs, resulting in more disability than other known public health problems. Many Asian countries do not have a comprehensive data collection system for mental disorders. Very often, they go undiagnosed because of immense stigma associated with them. However, mental disorders are not uncommon in East and Southeast Asia. Cultural and religious differences between Asian countries lead to mental disorders being expressed in markedly different ways. Similarly, there are marked differences in provision for mental health services and care among countries. Treatment for mental disorders can be varied, from conventional modules with pharmacotherapy and psychotherapy to traditional remedies like prayers and rituals. Nevertheless, access to treatment remains inadequate. Many Asian countries are still ill equipped to provide the specialist care needed to rehabilitate those who are suffering from mental disorders.

Addressing NCDs is not something that Asian countries can leave to the future. Middle- and low-income countries and areas that are undergoing upsurges in chronic disease risk need to have supportive public policies in place to reduce the risk before NCDs take hold. In countries and areas with established chronic disease problems, more effective health interventions are required not only to curb the epidemics but also to manage illness and disability. In fact, NCD prevention and control has been identified as a priority at global and regional levels by the WHO. Member States are urged to work collaboratively and intensify action against NCDs and their related risk factors. In the Western Pacific and Southeast Asia, regional



networks have been established for strengthening and sustaining regional efforts in NCD prevention and control, such as the Mobilization of Allies in Noncommunicable Disease (MOANA) and South-East Asia Network for NCD Prevention and Control (SEANET-NCD). There are regional strategies and action plans for prevention and control of NCDs and related risk factors. For example, the Regional Strategy for Health Promotion for South-East Asia (WHO, 2008b) has provided a framework for countries of the region to build capacity for addressing social determinants of health and risk factors associated with premature death and ill health. The Western Pacific Regional Action Plan for Noncommunicable Diseases (WHO, 2009a) is a collaborative effort by WHO and Member States to establish a shared vision and strategic actions to reduce the NCD burden. Regardless of the level of resources, every Asian country has the potential to take steps toward and make significant improvements in chronic disease prevention and control. Inaction will ultimately sweep away the health gains achieved in reducing the burden of communicable diseases and will cost millions of premature deaths in Asia.

## Cardiovascular Diseases

*Ting Hung Leung and Lilian W. C. Wan*

Cardiovascular diseases (CVDs) comprise all diseases of the heart and blood vessels. Major types of CVDs include hypertension (high blood pressure), ischemic heart disease, cerebrovascular disease (stroke), peripheral vascular disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism. As they are in other regions of the world, CVDs are major public health issues in East and Southeast Asia.

### BURDEN OF CVDS

Globally, CVDs are the number one cause of death, causing an estimated 17.5 million deaths in 2005—mainly from ischemic heart disease and stroke. While CVDs are often incorrectly regarded as “diseases of affluence,” low- and middle-income countries account for 80% of all CVD-related deaths (WHO, 2007a). In high-income countries, CVDs have a disproportionate impact on the more economically deprived and least educated population groups (WHO-WPRO, 2006).

In East and Southeast Asia, most CVD deaths are from ischemic heart

TABLE 6.1 Age-Standardized Rates for Ischemic Heart Disease and Stroke in Males and Females in Selected Countries, 2005

Country	Ischemic heart disease		Stroke	
	Males	Females	Males	Females
East Asia				
China	49	63	134	140
DPR Korea	176	131	87	76
Japan	175	21	136	35
Mongolia	193	58	137	189
RO Korea	260	28	166	95
Southeast Asia				
Brunei Darussalam	247	43	176	59
Cambodia	79	118	66	105
Indonesia	194	144	99	99
Laos	176	194	136	146
Malaysia	246	83	175	78
Myanmar	238	168	126	107
Philippines	127	97	47	55
Singapore	172	76	135	42
Thailand	74	56	53	72
Viet Nam	186	107	140	108

SOURCE: WHO-SEARO & WHO-WPRO, 2008.

NOTE: Rates are per 100,000 standard population.

disease and stroke. As shown in table 6.1, the age-standardized mortality rates of ischemic heart disease and stroke vary markedly by sex and country after taking into account the different age compositions of the selected countries (WHO-SEARO, WHO-WPRO, 2008). In addition to causing death, CVDs and their sequelae absorb health care resources and are costly to treat. Studies on estimating the direct health care costs of CVDs and their risk factors in industrialized countries have found them to be a profound economic burden and a major driver of rising health care costs. In Singapore, hospital care for acute stroke in 1996 was about US\$5,000, with a mean length of stay of 17 days (Venketasubramanian & Yin, 2000). In Japan, the mean hospital cost of acute ischemic stroke per patient amounted to over US\$6,800 in 2001 (Yoneda et al., 2003). For other Asian countries, the health costs of CVDs are likewise enormous.

In China, the direct medical costs in 2002 of high blood pressure, ischemic heart disease, and stroke were about US\$2.4, US\$1.9, and US\$2.9 billion, respectively (Zhai et al., 2006). Between 2002 and 2005, the Philippines Health Insurance Corporation (PhilHealth, a government corporation) reimbursed US\$56 million to hospitals for care related to high blood pressure (Wagner et al., 2008). Although these costs may already seem high, the health care costs for CVD are likely to rise in most Asian countries as the prevalence rises. Even if the prevalence of CVD flattens, costs will become increasingly heavy as new technological options advance to extend and prolong survival (Leeder et al., 2004).

### RISK FACTORS OF CVD

A number of modifiable and nonmodifiable risk factors for CVDs have been recognized (box 6.1). These risk factors can act independently, or they can act in combination to produce additive or synergistic effects on the risk for cardiovascular events. In East and Southeast Asia, the most potent modifiable risk factors for CVDs include high blood pressure, smoking, diabetes, and high serum cholesterol (Ueshima et al., 2008). Increasing body mass index (BMI) is also an important risk factor for CVD (Ni Mhurchu et al., 2004). Table 6.2 shows the estimated measurements or prevalences of these cardiovascular risk factors among selected countries in East and Southeast Asia.

#### *High Blood Pressure*

In adults, high blood pressure is generally defined as a systolic blood pressure (SBP) above 140 mmHg and/or a diastolic blood pressure (DBP) above 90 mmHg. The risk of CVD doubles with every 20-point increase in SBP or 10-point increase in DBP (Mackay & Mensah, 2004). For East Asian populations, it is the most common cardiovascular risk factor, particularly for hemorrhagic stroke (Eastern Stroke and Coronary Heart Disease Collaborative Research Group, 1998).

The Asia-Pacific Cohort Studies Collaboration (APCSC) found that the age-standardized prevalence of high blood pressure among men varied from 25–30% in Thailand, Indonesia, Japan, RO Korea, and China to 47% in Mongolia. The corresponding prevalence among women ranged from 18% in Japan to 37% in Indonesia and 41% in Mongolia (Martiniuk et al., 2007). Estimates for the population-attributable fraction<sup>1</sup> of CVDs suggest that up to 66% of some subtypes could be attributed to high blood pressure in the region. The fractions of fatal ischemic heart disease attributable to high

**BOX 6.1 Major Risk Factors for CVD***Modifiable Risk Factors*

Smoking

Physical inactivity

Unhealthy dietary practices

Alcohol misuse

Hypertension

Adverse blood lipids

Elevated blood sugar and diabetes

Overweight and obesity

Negative feelings (including anger, anxiety, and depression)

Use of certain medications (e.g., certain oral contraceptives and hormones)

*Nonmodifiable Risk Factors*

Advancing age

Gender

Heredity or family history

Ethnicity or race

blood pressure ranged from less than 15% in Japan to 28% in Mongolia for men and from less than 15% in Indonesia to 39% in Japan for women. For fatal hemorrhagic stroke, the corresponding fractions for men ranged from just less than 50% in Thailand to over 60% in Indonesia and Mongolia; for women they ranged from just over 20% in Japan to over 40% in Indonesia, China, and Mongolia. The proportions of fatal ischemic stroke attributable to high blood pressure in men ranged from less than 30% in Thailand to about 40% in China and Mongolia; for women, they varied from about 20% in Indonesia to over 40% in Mongolia (Martiniuk et al., 2007).

The prevalence of high blood pressure is forecast to rise in the Asia-Pacific region, especially in China. In fact, the prevalence in the Chinese adult population quadrupled from 5% in 1959 to 19% in 2002 (Wu et al., 2008). Having over 160 million adults with high blood pressure cur-

TABLE 6.2 Blood Pressure, Blood Cholesterol, Overweight and Obesity, Smoking, and Diabetes in Selected Countries

<i>Country</i>	<i>Mean systolic blood pressure (mmHg)<sup>a</sup></i>		<i>Mean blood cholesterol (mmol/L total cholesterol)<sup>a</sup></i>	
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>
<b>East Asia</b>				
China	121.5	119.1	5.5	5.4
DPR Korea	124.0	120.2	5.0	5.0
Japan	126.0	117.6	5.2	5.1
Mongolia	129.0	125.5	5.0	5.0
RO Korea	126.1	120.8	4.8	4.9
<b>Southeast Asia</b>				
Brunei Darussalam	120.0	118.3	5.3	5.3
Cambodia	119.7	112.5	5.0	5.0
Indonesia	123.3	123.3	4.5	4.5
Laos	119.7	112.5	5.0	5.0
Malaysia	118.1	117.0	5.1	5.1
Myanmar	120.6	114.3	4.9	4.9
Philippines	121.9	116.8	4.4	4.4
Singapore	124.3	119.1	5.3	5.2
Thailand	119.3	117.3	5.1	5.3
Vietnam	119.6	116.7	5.4	5.2

SOURCES: For mean systolic blood pressure, mean blood cholesterol, and prevalence estimates of overweight and obesity—WHO Global Infobase, <https://apps.who.int/infobase/report.aspx>; for prevalence estimates of current smoking—WHO, 2008; for prevalence estimates of diabetes and impaired glucose tolerance—International Diabetes Federation, 2006.

<sup>a</sup>The estimates were for people age 15 and above for the year 2005.

<i>Prevalence estimates of overweight and obesity (%)<sup>b</sup></i>		<i>Prevalence estimates of current smoking (%)<sup>c</sup></i>		<i>Prevalence estimates of diabetes and impaired glucose tolerance (IGT) (%)<sup>d</sup></i>	
<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>Diabetes</i>	<i>IGT</i>
33.7	30.1	59.5	3.7	4.1	6.9
42.9	55.2	58.6	...	5.2	8.2
34.4	25.2	44.3	14.3	4.9	10.9
56.0	69.9	45.8	6.5	1.9	10.3
45.1	53.8	53.3	5.7	7.8	8.2
64.7	68.9	...	...	12.2	17.6
15.8	11.7	40.5	6.5	5.0	10.4
12.1	27.8	65.9	4.5	2.3	10.6
42.2	54.7	65.0	15.6	3.1	2.5
28.6	45.7	54.4	2.8	10.7	14.9
39.2	52.6	46.5	13.6	3.2	2.5
23.3	33.5	42.0	9.8	7.6	10.7
25.3	25.4	...	...	10.1	18.7
34.1	46.5	39.8	3.4	6.9	4.2
5.2	13.0	45.7	2.5	2.9	2.5

<sup>b</sup>Overweight and obesity was defined as having a BMI  $\geq 25$  kg/m<sup>2</sup>. The prevalence estimates were for adults age 30 and above for the year 2005.

<sup>c</sup>Current smoking referred to daily and nondaily smoking of any tobacco products, including cigarettes, cigars, pipes, bidis, and kreteks. The prevalence estimates were for people age 15 and above.

<sup>d</sup>The prevalence estimates were for people age 20–79 for the year 2007.

rently living in China alone underscores the importance of prevention and increased control of high blood pressure to reduce the incidence of ischemic heart disease and stroke in Asia.

### *Smoking*

Cigarette smokers are more than 10 times as likely as nonsmokers to develop peripheral vascular disease, and 2 to 4 times more likely to have ischemic heart disease and stroke (Centers for Disease Control and Prevention, 2008). The risk is especially high if the person started smoking when young or smokes heavily. Passive smoking is also a risk factor for CVD. Nonsmokers exposed to secondhand smoke have a 25% increased risk of heart disease (Mackay et al., 2006).

In East and Southeast Asia, up to 29% of some CVD deaths were attributed to smoking. For men, the fractions of CVDs attributable to smoking were highest in Indonesia, RO Korea, and Cambodia, at 28–29% for ischemic heart disease, 23% for ischemic stroke, and 10% for hemorrhagic stroke, but they were lower in Singapore and Hong Kong, with fractions of 12–13% for ischemic heart disease, 10% for ischemic stroke, and 4% for hemorrhagic stroke. For females, the corresponding fractions were highest in Mongolia (10%, 8%, and 3%) and lowest in Thailand (1%, 0.9%, and 0.3%; Martiniuk et al., 2006).

As smoking is common among men (table 6.2; WHO, 2008a) and not smoking might prevent 29% of cardiovascular deaths in the region, efforts to prevent smoking initiation and promoting smoking cessation would yield great public health benefits (see chapter 5 for more discussion on smoking).

### *Diabetes*

Compared with nondiabetics, individuals with diabetes have a two- to threefold higher risk of ischemic heart disease and other atherosclerotic conditions (Stamler et al., 1993; Asia Pacific Cohort Studies Collaboration et al., 2007). While Asian people have a stronger genetic susceptibility than others to type 2 diabetes, characterized by insulin secretory defects along with an increasing BMI and prominent central obesity (Yoon et al., 2006; Ueshima et al., 2008), diabetes is a serious and independent risk factor for CVD in most Asian countries (see also chapter 4).

The APCSC has estimated that the fractions of ischemic heart disease or ischemic stroke attributable to diabetes varied from less than 4% in China, Mongolia, and Philippines, to 4–7% in Taiwan and Malaysia and more than 8% in Thailand, Hong Kong, and RO Korea. For hemorrhagic

stroke, the corresponding fractions ranged from less than 2% in China, Mongolia, and the Philippines to 4% or more in Hong Kong, Thailand, and RO Korea (Lee et al., 2007). However, cohort studies involving populations of Asian origin have shown that cardiovascular risk starts well below the usual “diabetic threshold” (Nakagami & DECODA Study Group, 2004). As shown in table 6.2, many of these countries have higher prevalence of impaired glucose tolerance than of diabetes.

Throughout Asia, the prevalence of impaired glucose tolerance and diabetes has been increasing, and the speed of increase is much faster than in Western countries (International Diabetes Federation, 2006). Regardless of diabetes status, another analysis of cohorts from the Asia-Pacific region found that each 1 mmol/L decrease in usual fasting glucose was associated with a 23% lower risk of total ischemic heart disease and 21% lower risk of total stroke (Lawes et al., 2004). Management of glucose intolerance and diabetes should be an important component of a regional strategy to reduce the burden of CVD in Asia.

### *High Serum Cholesterol*

Although serum cholesterol levels in Asian countries are generally lower than in the United States and other Western countries, cholesterol levels are rising in many regions in East and Southeast Asia. Such an increase is compatible with the increase in intake of total saturated fats resultant from economic growth and associated changes in lifestyle (Zhang et al., 2003; Ueshima et al., 2008). For example, dietary supply of fats in China increased from 24 to 79 grams per capita per day between 1967–1969 and 1997–1999 (WHO, 2003). In Guangzhou, one of the regions with fast economic growth, the total serum cholesterol level for men and women, respectively, increased by 14% and 22% in urban areas and by 19% and 25% in rural areas between 1984 and 1994 (Li et al., 2002).

Based on the conventional threshold for elevated total cholesterol at 6.2 mmol/L or more, the APCSC reported that the prevalence of elevated total cholesterol in East and Southeast Asia varied, from less than 5% in the Philippines and Malaysia to 6–10% in China, Indonesia, and RO Korea, 11–16% in Hong Kong, Taiwan, and Thailand, and over 17% in Singapore. The contribution of serum cholesterol to both ischemic heart disease and ischemic stroke deaths for men, as expressed in population-attributable fractions, ranged from 0% in Indonesia to 9% in Singapore. For women, the fractions varied from 0% in Indonesia to 8–9% in Thailand and Singapore (Woodward et al., 2008). However, the above figures most prob-



ably underestimated the true burden by using a conventional threshold for defining elevated total cholesterol. Studies have demonstrated that the relationship between total cholesterol and cardiovascular risk is continuous, with no apparent threshold at low levels of total cholesterol. For each 1 mmol/L increase above usual total cholesterol level, the risk of fatal ischemic heart disease was approximately 35% greater. For fatal or non-fatal ischemic stroke, the corresponding risk was 25% greater (Zhang et al., 2003). Once the continuous effect of total cholesterol was accounted for, the fraction of fatal ischemic heart disease and ischemic stroke attributable to “nonoptimal” total cholesterol would be at least twice as high as what was attributable to “high” total cholesterol. For ischemic heart disease death, the fractions would range from 0–37% for men and 0–35% for women. Regarding ischemic stroke death, the fractions would be 0–28% for men and 0–35% for women (Woodward et al., 2008).

Because increases in the levels of serum cholesterol are likely to result in a substantial increase in the occurrence of CVDs, it is necessary to address and control blood cholesterol in the population.

### *Overweight and Obesity*

Obese persons are two to three times more likely to suffer from ischemic heart disease or high blood pressure than their nonobese counterparts (WHO, 2000). Risk for CVD is particularly high when central obesity is present. For Asians, a one-standard-deviation increase in waist circumference index was associated with 27% increased risk of developing ischemic heart disease (Asia Pacific Cohort Studies Collaboration, 2006).

In East and Southeast Asia, up to 10% of fatal CVD could be attributed to overweight and obesity. Across countries, these proportions ranged from less than 3% in Indonesia to about 8% in Mongolia for fatal ischemic heart disease, less than 4% in Indonesia and China to about 9% in Mongolia for fatal ischemic stroke, and less than 1% in Indonesia and China to 2.5% in Mongolia for fatal hemorrhagic stroke (Asia Pacific Cohort Studies Collaboration, 2007).

Secular trends indicate that mean BMI levels are increasing rapidly throughout Asia, probably as a result of increased availability of processed foods and reduced physical activity. For example, the prevalence of adult overweight in China increased by nearly 40%, and that of obesity doubled between 1992 and 2002 (Wu et al., 2009). In Thailand, the percentage of overweight and obese adults increased from 16.7% and 4.0% in 1991 to 28.3% and 6.8% in 1997, respectively (Kantachuvessiri, 2005). The APCSC reported that each 2 kg/m<sup>2</sup> lower BMI was associated with an 11% lower risk

of ischemic heart disease, 12% lower risk of ischemic stroke, and 8% lower risk of hemorrhagic stroke (Ni Mhurchu et al., 2004). Such results indicate potential for CVD reduction through promotion of healthy weight and the prevention of overweight and obesity (see chapter 4 for other examples).

## PREVENTION AND CONTROL OF CVD

The focus of public health intervention is to prevent rather than treat a disease. CVDs are characterized by complex causality with multiple risk factors; a long latency period between risk factor exposure and the occurrence of disease; a prolonged course of illness, functional impairment, or disability; and in most cases, the low likelihood of achieving complete cure. However, CVDs and associated complications are largely preventable through efforts focusing on generalized health promotion and control of the risk factors (primary prevention), stopping the progression of the disease after its occurrence by early detection and prompt interventions (secondary prevention), and restoration and rehabilitation of patients with the disease to minimize residual disabilities (tertiary prevention).

For prevention and control of CVDs, the best public health strategy is to lower their incidence through primary prevention, by addressing the confluence of cardiovascular risk factors among a majority of the population, and to use intra- and intersectoral partnerships to marshal the required resources and link health promotion with the total environment.

### *Addressing Modifiable Risk Factors*

Available evidence and experience clearly demonstrate that countries can significantly halt and even reverse the advance of CVD and associated problems if strong and integrated public actions are strategically focused on a cluster of major lifestyle factors. According to WHO estimates, up to 80% of premature heart disease, stroke, and diabetes mellitus could be prevented by eliminating shared risk factors, mainly tobacco use, poor diet, physical inactivity, and harmful use of alcohol (WHO, 2005a). In the absence of these risk factors, CVD is rarely a cause of premature death (Stamler et al., 1999).

In Asia, clustering of CVD risk is common. For example, a study found that over four-fifths of Chinese adults had at least one of the investigated cardiovascular risk factors (including smoking, elevated blood lipids, high blood pressure, diabetes, and overweight). Among those people, 28.7% had two risk factors and 17.2% had three or more (Gu et al., 2005). As illustrated in figure 6.1, intervening upstream on a cluster of behavioral risk

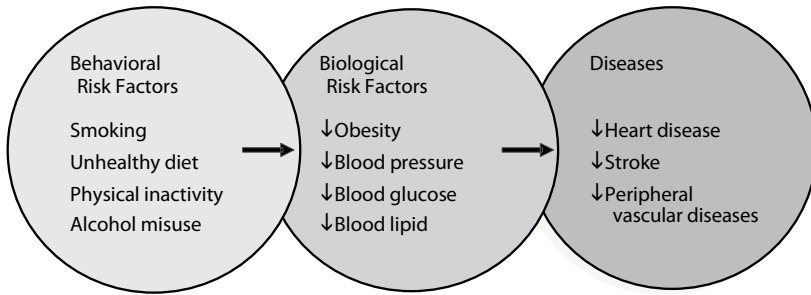


Figure 6.1. Intervene upstream to reduce cardiovascular disease risk.

### BOX 6.2 Regional Snapshot 1

Primary prevention, such as lifestyle modification programs related to tobacco, diet, and exercise, is designed to prevent the onset of illness. In 1992, the Singapore government launched the National Healthy Lifestyle Program, aimed at improving the social and physical environments to promote healthy living. The program focused on four lifestyle pillars: not smoking, being physically active, eating right, and stress management. It involved government ministries, health professionals, employers, unions, and community organizations. It engaged the mass media and legislative measures along with widespread school, workplace, and community health promotion packages to discourage smoking and promote healthy eating and regular physical exercise. After 6 years, the smoking rate in men decreased from 34% to 27%; the proportion of adults who exercised regularly increased from 14% to 17%; and the prevalences of obesity and diabetes were stabilized. Although the prevalences of high total blood cholesterol and hypertension increased, the age-standardized incidence (per 100,000 residents) of myocardial infarction declined from 98.2 in 1991 to 83.0 in 1999 (Cutter et al., 2001; Mak et al., 2003).

factors (and environmental determinants such as socioeconomic status and physical milieu) can induce parallel changes in those biomedical risk factors, thereby reducing the risk of developing CVD. To reduce the burden of CVD, risk factor modifications should constitute a crucial component of any efforts.

### *Placing Emphasis on the Whole Population for Collective Health Benefits*

When cardiovascular risk factors are prevalent in the community, the most effective intervention by which to reduce the incidence of CVD is to shift the population distribution curve as a whole toward lower risk.

Most CVD events arise in persons with modest elevations of risk, and these people far outnumber high-risk individuals (e.g., hypertensive, diabetic, or hyperlipidemic patients). Therefore, interventions targeting only those people with high risk will have a limited impact on the total CVD burden at the population level. Instead, a modest reduction in the risk factor levels in the entire population can translate into substantial gains in CVD events prevented. For example, the Eastern Stroke and Coronary Heart Disease Collaborative Research Group estimated that a population-wide reduction of 3 mmHg in DBP would avert about one-third of all strokes in East Asia. The effect would amount to the prevention of about 370,000 deaths from stroke in China alone. Had similar benefits been achieved throughout the Asia-Pacific region by 2010, about 1 million stroke deaths and 10 million lost healthy-life years would have been averted (Eastern Stroke and Coronary Heart Disease Collaborative Research Group, 1998). Having said that, a comprehensive CVD prevention and control program should also acknowledge the inherent benefits of screening among high-risk individuals to prevent secondary events, as well as clinical management of symptomatic CVD (WHO, 2005b). A key challenge is to achieve an affordable and appropriate mix of both “costly” high-risk and “relatively cheaper” population-wide approaches in CVD prevention and control according to the disease profile, population characteristics, and capacity of each country.

### *Striving for a Healthy Start*

CVD prevention must aim at risk reduction across the life span; in particular it should emphasize the importance of early life factors. Chronic disease epidemiology recognizes that factors acting early in life accumulate and interact with factors acting later in life to produce adult diseases (Ben-Shlomo & Kuh, 2002). CVD events typically occur in middle age or later. However, the incidence usually reflects a cumulative lifetime exposure to detrimental environments and the resulting unhealthy behaviors adopted early in life (figure 6.2; Aboderin et al., 2002). For example, more rapid infant growth is associated with a higher childhood BMI; higher BMI during childhood is then associated with cardiovascular risk in adult life (Baird et al., 2005; Baker et al., 2007). While successful interventions

**BOX 6.3** Regional Snapshot 2

The efficacy of reducing salt intake to lower blood pressure, thereby decreasing cardiovascular risk, is well established. The WHO recommends a salt intake of no more than 5 grams/day (WHO, 2003). In Asia, salt is used predominantly for preserving meat, fish, and vegetables and in seasoning or sauces used during cooking and at the table. Very few countries have nutritional policies to reduce salt intake. Nutritional recommendations were found for four Asian countries, and they ranged from less than 5 grams/day of salt in Singapore to less than 10 grams/day of salt in Japan (WHO, 2007b). From a public health perspective, a population-targeted salt reduction strategy should be viewed as one significant component of a comprehensive blood pressure control program.

Japan has a high average salt consumption. Deaths from stroke were among the highest in the world in the 1960s (Ueshima, 2007). Acknowledging this phenomenon, the Japanese government led health education campaigns to reduce salt intake and successfully reduced the average daily intake of salt in adults from 13.5 grams to 11.2 grams. The most significant decreasing trend was observed in males age 50–59 who had high risks of lifestyle-related disease (Udagawa et al., 2008). Together with better management of hypertension, the incidence of stroke significantly declined, by 56% for men and by 40% for women over the past 40 years (Kubo et al., 2008).

in middle and older age will reap major short-term benefits, more health gains can be achieved through promoting a healthy start early in life and reducing the cumulative risk at every stage of the life course.

*Promoting a Heart-Healthy Environment*

Ensuring an environment conducive to the adoption of healthy lifestyles is vitally important for CVD prevention and control. An important determinant of population health is the physical and social environment in which people live, learn, and work. While individual health choices and personal behaviors are important factors for disease susceptibility, CVDs cannot be averted without broad social and environmental supports to promote healthy living. As such, the “setting approach” is better able to integrate policy support, intersectoral collaboration, and community actions in cre-

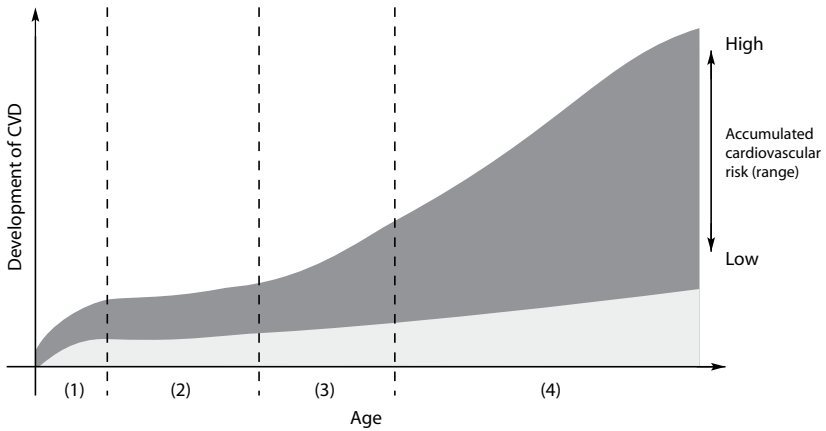


Figure 6.2. The life-course perspective on cardiovascular disease (CVD) risk. Examples of key risk factors at different stages of life: fetal life (1) fetal growth, maternal nutritional status, socioeconomic position at birth; infancy and childhood (2) growth rate, breast-feeding, unhealthy diet, lack of physical activity, obesity, socioeconomic position; adolescence (3) unhealthy diet, lack of physical activity, tobacco, alcohol use, obesity; adult life (4) behavioral and biological risk factors. Source: Aboderin et al., 2002.

ating an environment that enables people to make heart-healthy choices. Examples of healthy settings include healthy schools, restaurants, markets, workplaces, villages, and cities (WHO, 2009b).

## CONCLUSIONS ABOUT CARDIOVASCULAR DISEASES

The CVD burden in Asia is expected to increase further over the coming decades. This increase will result from rapidly aging populations, continuing changes in people's lifestyles due to urbanization, food market globalization and trade liberation, and the associated escalating prevalence of cardiovascular risk factors in the region. The issue is particularly complicated in those Asian countries with a massive population and heterogeneous pace of development (such as China and Indonesia), ethnically diverse populations (such as Malaysia and Singapore), and other health priorities and social problems (such as control of various infectious diseases and poverty). During an economic downturn, it would be a great challenge for some Asian countries to deploy adequate resources and secure sustainable financing for CVD prevention and care. Nevertheless, the imperatives of CVD prevention are clear and urgent.

### BOX 6.4 Regional Snapshot 3

Hong Kong is renowned as one of the culinary capitals of Asia, with cuisines from all over the world. As such, eating out is a common practice among the local community.

Building on contemporary health promotion strategies and principles, the department of health launched the “EatSmart@restaurant.hk” campaign. The campaign aims to promote healthy eating habits among Hong Kong residents by raising their awareness and encouraging restaurants to provide more healthy dishes. To become an EatSmart restaurant, the establishment must pass an assessment after the personnel undergo training. The restaurant is also required to follow campaign guidelines by making available at least five EatSmart dishes (i.e., options with more fruits or vegetables and less oil, salt, and sugar) every day during selected business hours. Furthermore, all enrolled food premises have to place the EatSmart decal in a prominent location and highlight the EatSmart dishes by means of point-of-purchase information. In 2008, about 480 food premises had enrolled in the campaign (Leung & Ching, 2009).



Medical strategies to identify and treat those with CVDs are useful but have very limited impact on reducing the number of people getting the diseases. The best policy for combating CVD is primary prevention that not only has the potential to decrease CVD incidence but also is likely to use far fewer resources than treating the diseases and managing their complications. Assessing the potential benefit of primary prevention in reducing the burden of CVD involves consideration of both the prevalence of various risk factors in the populations and their importance in contributing to the population burden. In Asia, the importance of different risk factors varies between populations, but the proximal causes of the CVD epidemics are qualitatively similar. Control of high blood pressure and smoking are the highest priorities, with respective population-attributable fractions as high as 66% and 30% for some CVD subtypes. However, high blood cholesterol, rising levels of type 2 diabetes, and suboptimal weight contribute significantly to the occurrence of CVD in the region. More importantly, the prevalence of these cardiovascular risk factors remains high throughout Asia, and it continues to increase in many countries. Unless this situation is changed, the future is bleak.

Regional commitment to and local actions for CVD prevention and control are necessary. There is ample evidence that many cardiovascular risks are modifiable and cardiovascular events are preventable. Generic preventive strategies can be adapted and framed in accordance with each country's risk factor and disease profile, considering the population, cultural practices, capability, and availability of resources. In general, the key component for CVD prevention and control should focus on risk modification and promotion of healthy lifestyles in the entire population. With population-based strategies as a cornerstone for programming, appropriate prevention delivered in multiple settings, public-private alliance, and adequate infrastructure for the public good, the vision of a heart-healthy and stroke-free region could become a reality.

## Cancer

*Binh Y. Goldstein, Donald Maxwell Parkin, and Zuo-Feng Zhang*

### INTRODUCTION

As control of infectious diseases is achieved in Asian countries, noncommunicable diseases, such as cancer, and their prevention have become a



growing public health issue. In this section, we will describe the current burden of cancer in Asia (based on 2002 estimates), using incidence (new cases), mortality (new deaths), and 5-year prevalence (existing cases) (Ferlay et al., 2004). We will focus on the major cancers in the area, describing their burden (past, current, and future projection through 2050) and prospects for cancer prevention and control.

Data in this section are presented separately for East and Southeast Asia, with Japan and China presented individually because of their higher income status and overwhelming population, respectively. Data quality varies between and within regions, because of the limited availability of high-quality tumor registries, though the number is gradually increasing (Parkin, 2006a). Past trends are based on registry data from China (Shanghai), Japan (Miyagi), Singapore, and Thailand (Chiang Mai) (Waterhouse et al., 1982; Muir et al., 1987; Parkin et al., 1992; Parkin et al., 1997; Parkin et al., 2002; Curado et al., 2007).

#### CURRENT CANCER BURDEN

In 2002, nearly a third of the world's population lived in East and Southeast Asia, where roughly the same proportion of the world's new cancers and cancer deaths occurred. Based on 2002 data, Asia is estimated to have 3.4 million new cancer cases annually, 2.4 million deaths annually, and 6 million people living with cancer (based on 5-year prevalence; table 6.3). The incidence is highest for stomach cancer (16.6% of all sites), lung cancer (16.3%), and liver cancer (13.4%); mortality is highest for lung cancer (20.2%), liver cancer (17.8%), and stomach cancer (17.0%); and cancers of the stomach (16.4%), colon / rectum (14.2%), and female breast (13.5%) are the most prevalent cancers.

The rankings of these cancers differ between males and females. In males, lung, stomach, and liver cancers are most common, while breast, stomach, and lung cancers are most common in females. Lung, liver, and stomach cancers are the top cancer killers among males as well as among females, but the order differs (lung, stomach, and liver among females). In terms of the most prevalent cancers, stomach, colon / rectum, and lung are the most prevalent in males, while breast, colon / rectum, and cervix are the most prevalent in females.

Table 6.4 shows age-standardized incidence and mortality rates, using the world standard population (Waterhouse et al., 1982), in order to account for the different age distributions within the Asian regions. Among males, the rates are comparable with the average rates seen in the world's male

population, while rates for females are slightly lower (table 6.4). The overall Asian incidence rate is 202 per 100,000 males and 134 per 100,000 females, and the overall cancer mortality rate is 151 per 100,000 males and 85 per 100,000 females. East Asia (RO Korea and Mongolia) has the highest incidence and mortality rates for cancer among males (285 and 180 per 100,000 males, respectively). Japan has the highest incidence rate among Asian females (167 per 100,000 females), while China has the highest mortality rate among females (87 per 100,000 females).

## THE MAJOR CANCERS: BURDEN AND PREVENTION

### *Stomach Cancer Burden*

As previously mentioned, stomach cancer (denoted by ICD-10 C16 in the WHO's International Classification of Diseases) is the most common cancer in Asia, with 563,000 new cases in 2002. It is also the third most common cause of cancer deaths, responsible for 403,000 deaths each year, and the most prevalent cancer, with a 5-year prevalence of 983,000. Asia accounts for roughly 60% of the world's new stomach cancer cases and deaths. Relative to the rest of the world, Asia is a high-risk area with rates over 1.5 times that of the world average (table 6.5). Stomach cancer is more common among men than women, with 67% of new cases occurring in males and rates among males being generally twice those of females. Incidence rates among males are highest in Japan (62 per 100,000 males) and highest among females in East Asia (RO Korea and Mongolia) and Japan (respectively 27 and 26 per 100,000 females). Mortality rates are also highest in East Asia (RO Korea and Mongolia) for males (37 per 100,000 males) and highest in East Asia and China for females (15 per 100,000 females). Over time, the incidence of stomach cancer has been on the decline throughout Asia, and the decline was more dramatic among males than females.

### *Stomach Cancer Prevention*

The identification of environmental risk or protective factors for stomach cancer suggests potential strategies for prevention and control. Over 60% of stomach cancers are attributed to *Helicobacter pylori* infection, a bacterial infection that is highly prevalent in Asia, particularly in developing countries (Parkin, 2006b). In Japan, the prevalence of *H. pylori* was found to be highest among those born during wartime (1940s and 1950s), and a decreased prevalence was found among individuals born in the 1960s (Replogle et al., 1996). Improvements in hygiene and living conditions, leading to lower prevalence of *H. pylori* infection, as well as treatment of

TABLE 6.3 Estimated New Cancer Cases, Deaths, and 5-Year Prevalence by Site or Type, by Gender, and as Percentage of Total, 2002

<i>Site or Type</i>	<i>New cases</i>		
	<i>Males</i>	<i>Females</i>	<i>%</i>
Oral cavity	18,423	13,500	0.9
Nasopharynx	39,171	16,740	1.6
Other pharynx	9,660	2,317	0.4
Esophagus	194,150	84,936	8.2
Stomach	377,447	185,448	16.6
Colon and rectum	177,880	128,012	9.0
Liver	330,731	124,672	13.4
Pancreas	42,480	31,819	2.2
Larynx	22,302	3,240	0.8
Lung	384,082	169,914	16.3
Melanoma of skin	2,989	2,827	0.2
Breast	...	224,935	6.6
Cervix uteri	...	103,268	3.0
Corpus uteri	...	29,255	0.9
Ovary, etc.	...	47,302	1.4
Prostate	41,102	...	1.2
Testis	6,084	...	0.2
Kidney, etc.	25,303	13,733	1.1
Bladder	44,058	14,940	1.7
Brain, nervous system	33,305	23,807	1.7
Thyroid	10,299	30,250	1.2
Non-Hodgkin lymphoma	40,416	23,748	1.9
Hodgkin lymphoma	3,650	1,894	0.2
Multiple myeloma	8,396	5,811	0.4
Leukemia	54,276	39,412	2.8
All sites but skin	1,980,713	1,415,610	100

SOURCE: Ferlay et al., 2004.

<i>Deaths</i>			<i>5-year prevalence</i>		
<i>Males</i>	<i>Females</i>	<i>%</i>	<i>Males</i>	<i>Females</i>	<i>%</i>
9,195	6,264	0.7	54,497	39,503	1.6
24,393	10,615	1.5	103,003	44,547	2.5
5,890	1,692	0.3	22,422	5,106	0.5
152,009	68,787	9.3	181,566	74,396	4.3
267,814	135,526	17.0	659,084	323,868	16.4
89,833	69,249	6.7	495,301	356,331	14.2
304,476	115,602	17.8	200,471	74,682	4.6
37,705	29,573	2.8	29,309	23,158	0.9
11,763	2,035	0.6	64,427	8,924	1.2
332,394	146,247	20.2	361,649	164,653	8.8
1,549	1,582	0.1	9,371	8,844	0.3
...	74,376	3.1	...	805,191	13.5
...	53,702	2.3	...	325,875	5.5
...	7,947	0.3	...	112,105	1.9
...	24,183	1.0	...	132,445	2.2
22,096	...	0.9	118,938	...	2.0
1,379	...	0.1	20,956	...	0.4
11,541	6,643	0.8	66,955	35,697	1.7
20,116	6,991	1.1	133,036	42,521	2.9
21,711	16,493	1.6	48,367	34,849	1.4
2,612	5,749	0.4	40,064	119,642	2.7
25,347	16,055	1.7	78,145	47,252	2.1
1,347	710	0.1	11,066	6,070	0.3
6,485	4,764	0.5	14,884	11,392	0.4
41,538	30,162	3.0	72,915	52,325	2.1
1,465,465	901,036	100	2,980,043	2,998,611	100

TABLE 6.4 Age-Standardized Incidence and Mortality Rates for All Cancer Sites Combined, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	261.4	167.4	154.3	82.2
China	204.9	129.5	159.8	86.7
RO Korea & Mongolia	284.6	155.3	180.1	75.0
Southeast Asia	130.4	120.9	102.5	76.2
Asia	202.2	134.0	150.6	84.8
World average	209.6	161.5	137.7	92.2

SOURCE: Ferlay et al., 2004.

NOTES: Rates are per 100,000. Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

TABLE 6.5 Age-Standardized Incidence and Mortality Rates for Stomach Cancer, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	62.1	26.1	28.7	12.7
China	41.4	19.2	32.7	15.1
RO Korea & Mongolia	69.0	26.7	37.1	15.1
Southeast Asia	8.5	4.5	7.4	3.9
Asia	38.9	17.4	27.8	12.6
World average	22.0	10.3	16.3	7.9

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

infection, especially among younger people who have not yet developed atrophic gastritis or intestinal metaplasia (stomach cancer precursors), may explain the decreases in stomach cancer incidence. Diets high in fruits and vegetables and low in salt may protect against stomach cancer; the use of refrigerators for storage of fresh food may reduce the consumption of salt-preserved foods and protect against stomach cancer. Cigarette smoking may also cause stomach cancer (IARC Working Group, 2004).

Screening for stomach cancer could decrease mortality. Since the prognoses of most cancers are closely tied to the stage at diagnosis, screening programs that allow for earlier detection of cancer will improve survival, if there is an effective treatment. Potential screening methods for stomach cancer include testing for the presence of *H. pylori* antibodies, testing for pepsinogen levels in serum (used as a marker for atrophic gastritis), testing for gastrin-17 levels (also used as a marker for atrophic gastritis), photo-fluorography, and endoscopy. Only radiological screening (photo-fluorography) has been widely implemented (in Japan). Although endoscopy has the highest detection rate, it is more invasive and resource intensive than the other methods and therefore may be beyond the resource capabilities of many of the public health systems in Asia. A multistage screening program that involves a combination of screening methods, therefore, is likely to be most cost-effective.

### *Lung Cancer Burden*

Lung cancer (ICD-10 C33 and C34) is the second leading new cancer (554,000 new cases in 2002) and the top cancer killer in Asia, causing 479,000 deaths each year. The mortality-to-incidence ratio is often used as an indicator of fatality, where ratios close to 1 indicate high fatality. With a ratio of 0.86, lung cancer's high fatality explains its relatively low prevalence (5-year prevalence of 526,000). Among certain groups in Asia, including Chinese and Southeast Asian males, lung cancer is not only the top cancer killer but also the most common newly diagnosed cancer. The age-standardized incidence and mortality rates for lung cancer are given in table 6.6. Rates among males are 2.5 times that of females in Asia. The highest incidence and mortality rates among males can be found in East Asia (RO Korea and Mongolia; respectively 53 and 43 per 100,000 males), while China has the highest rates among females (respectively 19 and 16 per 100,000 females).

Although 40% of the world's new lung cancer cases and deaths occur in Asia, the region has only moderate-level incidence and mortality rates, which is somewhat unexpected considering the high prevalence of ciga-

TABLE 6.6 Age-Standardized Incidence and Mortality Rates for Lung Cancer, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	38.1	12.3	32.4	9.6
China	42.4	19.0	36.7	16.3
RO Korea & Mongolia	52.9	12.7	42.7	10.3
Southeast Asia	27.1	8.9	25.3	8.3
Asia	39.7	16.0	34.5	13.7
World average	35.5	12.1	31.2	10.3

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

rette smoking in Asian men, the main risk factor for lung cancer (IARC Working Group, 2004). The relatively low incidence and mortality rates are surely related to the long time lag (decades) between exposure to tobacco smoke and the development of lung cancer. Since Asian populations began smoking much later than North American and West European populations, the relationship between tobacco smoking and lung cancer in Asia may not have matured yet, and rates in Asia are likely to increase in the coming decades. Rates in Asia, however, may never attain the very high levels observed in Western countries, since tobacco control has been implemented in some Asian countries and the composition of cigarettes has changed over time.

With respect to past trends in incidence, rates are increasing in some areas while decreasing in others. Among males, lung cancer rates appear to be increasing in Japan, Singapore (Malay), and more recently China. Time will tell whether this recent upswing in China will continue as predicted. Other populations, like Singapore (Chinese) and Thailand, have consistently decreasing rates among males. Among females, increases in incidence are found in many parts, with the exception of decreases in Singapore (Chinese) and Thailand.

### *Lung Cancer Prevention*

Worldwide, up to 90% of lung cancers in males and 50% in females are attributable to tobacco smoking (Parkin et al., 2001). Prevention strategies against smoking are likely to be the most cost-effective means to reduce

lung cancer incidence. These strategies include promoting smoking cessation among smokers, raising taxes, and preventing initiation among adolescents. Antismoking strategies involving social pressure, stigma, legislation, and taxation have achieved a fair amount of success in the United States. This strategy can also reduce passive exposure to tobacco smoke (secondhand smoke; see chapter 5).

Controlling occupational exposure to lung carcinogens, such as asbestos and rubber, and residential exposure to radon may also help prevent lung cancers. Although serial chest radiographs and sputum cytology were found to be ineffective screening methods for reducing mortality rates, additional screening strategies for lung cancer (spiral computerized topography, biomolecular markers in exhaled breath condensation or blood, and proteomics) are gaining interest. These methods, however, are still being researched and tested for efficacy.

While prevalence of cigarette smoking is very low in Chinese women (4–8%), the incidence and mortality of lung cancer is disproportionately higher. Studies of lung cancer among nonsmoking women are needed to evaluate the association between passive smoking, indoor air pollution, cooking-fume exposure, and other potential risk or genetic factors to improve prevention of lung cancer among nonsmoking women.

### *Liver Cancer Burden*

In 2002, 455,000 new cases of liver cancer (ICD-10 C22) were estimated to have occurred in Asia, making liver cancer the third most common new cancer in the area. Liver cancer is characterized by a high case fatality (420,000 deaths per year, or a mortality-to-incidence ratio of 0.92), low survival rates (5-year survival rates generally below 10% in Asia; Sankaranarayanan et al., 1998), and consequently low 5-year prevalence (275,000 cases) (see table 6.3). Asia is a high-risk area for liver cancer, with incidence and mortality rates roughly twice the world averages (table 6.7). Some 70% of the world's new liver cancer cases and deaths occur in Asia, which is largely because of the high prevalence of chronic infection with hepatitis B and hepatitis C viruses. China alone accounts for 55% of the world's new cases and deaths. In addition, males are three times more likely than females to develop or die from liver cancer (33 and 31 per 100,000 males, respectively, vs. 12 and 11 per 100,000 females). Although China has the largest number of new cases by far, East Asian males actually have higher liver cancer incidence and mortality rates (48 and 37 per 100,000 males, respectively).

Incidence rates in Singapore, Thailand, and China have generally been



TABLE 6.7 Age-Standardized Incidence and Mortality Rates for Liver Cancer, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	23.1	7.6	21.0	6.7
China	37.9	14.2	35.3	13.3
RO Korea & Mongolia	48.1	12.2	37.0	9.3
Southeast Asia	18.3	5.7	17.2	5.4
Asia	33.1	11.8	30.6	10.9
World average	15.7	5.8	14.9	5.7

SOURCE: Curado et al., 2007.

NOTE: Rates are per 100,000.

decreasing over time, with a possible upswing in recent years in China. Rates in Japan, on the other hand, have been rising, reaching a plateau in recent years. This trend has been ascribed to increases in alcohol consumption among men and prevalence of hepatitis C viral infection, which is responsible for 80% of liver cancer cases in Japan (Tanaka et al., 1991). Infection with hepatitis C was at a maximum shortly after World War II, because of the spread of infection from intravenous drug users and paid blood donors to the general population through blood transfusions and use of contaminated medical equipment (Yoshizawa, 2002). Hepatitis C prevalence has decreased since then.

### *Liver Cancer Prevention*

While hepatitis C is the dominant cause of liver cancer in Japan, over half of the world's liver cancer cases are attributable to the hepatitis B virus (Parkin, 2006b). Vaccination against hepatitis B is a very promising prospect for liver cancer prevention in Asia, especially in China and Southeast Asia, where the chronic carrier prevalence is 10–15% (Parkin et al., 2001). The hepatitis B vaccination is part of the National Infant Immunization program in 162 countries worldwide. RO Korea, China, Thailand, Singapore, and Taiwan adopted infant vaccinations very early on, and their universal vaccination programs have been in place since the early 1990s. The Philippines and Cambodia, however, have not adopted universal infant immunization (Lim et al., 2009). The vaccine has been shown to be effective in both controlling infection, especially when given in conjunc-

tion with hepatitis B immune globulin to infants of high-risk mothers, and lowering liver cancer incidence among children (Chang et al., 1997).

Improvements in food storage may prevent contamination by aflatoxin B<sub>1</sub> (the hepatotoxin found in mildewed grains and nuts that increases risk for liver cancer), and avoidance of drinking water contaminated with microcystin (a peptide produced by cyanobacteria in water that may increase risk for liver cancer) is another potential liver cancer prevention strategy. Since excessive alcohol consumption is a risk factor for liver cancer (IARC Working Group, 2007), reduced alcohol consumption could prevent some liver cancers, especially among those with decreased aldehyde dehydrogenase-2 activity; this inactivity, which is more prevalent among Asian populations than among other ethnicities, decreases the body's ability to process and break down the carcinogenic component of alcohol, acetaldehyde. Tobacco smoking is another preventable cause of liver cancer (IARC Working Group, 2004).

### *Colorectal Cancer Burden*

Colorectal cancer (ICD-10 C18–C20) is the fourth most common new cancer in Asia (306,000 new cases in 2002) and fifth most common cause of cancer deaths (159,000 deaths annually). Because of its relatively good survival and low case fatality rates (mortality-to-incidence ratio of 0.5), colorectal cancer is the second most prevalent cancer in the area (5-year prevalence of 852,000). Thirty percent of the world's new colorectal cancers occur in Asia. Although Asia's rates are slightly lower than the world's average rates, Japan is a high-risk area, with age-standardized incidence rates that are roughly two times that of the world average (table 6.8). Incidence is increasing in Asia, especially Japan, which has experienced diet and lifestyle changes conducive to developing colorectal cancer.

### *Colorectal Cancer Prevention*

Lifestyle changes and screening are two major prevention prospects for colorectal cancer. Diets rich in fruits, vegetables, fiber, and garlic are potentially protective, while diets rich in red and processed meat increase risk. Alcohol drinking has also been defined as a carcinogen for colorectal cancer (IARC Working Group, 2007; World Cancer Research Fund/American Institute for Cancer Research, 2007). Regular exercise decreases risk, while overweight and obesity increase risk. Therefore, a lifestyle change that includes regular exercise, weight control, alcohol reduction, and a diet rich in fruits, vegetables, and fiber but moderate in red and processed meat may help prevent colorectal cancer (Parkin et al., 2009).

TABLE 6.8 Age-Standardized Incidence and Mortality Rates for Colorectal Cancer, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	49.3	26.5	17.3	11.1
China	13.6	9.2	7.9	5.3
RO Korea & Mongolia	24.3	15.6	10.8	6.6
Southeast Asia	12.5	9.9	7.9	6.2
Asia	18.2	12.0	9.3	6.4
World average	20.1	14.6	10.2	7.6

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

The three major screening modalities for colorectal cancer are fecal occult blood test (detection of blood in the feces), flexible sigmoidoscopy (which allows for visualization of the rectum through the sigmoid, the distal part of the colon), and colonoscopy. All these methods can be used to detect both adenomatous polyps (colon cancer precursors) and localized cancers. Although colonoscopy allows for visualization of the whole colon and has the greatest single-test accuracy, it is expensive and may have serious complications, such as bowel perforation. Barium enemas (with X-ray) and, more recently, CT colonography are used for colorectal cancer detection in Japan. These methods, however, may result in exposure to high radiation doses and are being refined to minimize the radiation exposure while maximizing sensitivity (ability to accurately identify those with polyps) and specificity (ability to accurately identify those with no polyps). More recently, fecal DNA analysis has gained interest, but this novel method's effectiveness is still being researched.

### *Esophageal Cancer Burden*

In Asia, esophageal cancer (ICD-10 C15) is the fifth most common new cancer and fourth largest cause of cancer deaths. In 2002, there were 279,000 new esophageal cancer cases and 221,000 deaths from esophageal cancer in the area, which account for roughly 60% of the world's new esophageal cancer cases and deaths. Seventy percent of cases are males. China

TABLE 6.9 Age-Standardized Incidence and Mortality Rates for Esophageal Cancer, by Gender and Region, 2002

	<i>Incidence</i>		<i>Mortality</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Japan	10.0	1.3	7.5	1.1
China	27.4	12.0	21.6	9.6
RO Korea & Mongolia	9.2	1.2	7.0	0.8
Southeast Asia	3.1	1.2	2.8	1.1
Asia	20.0	8.0	15.8	6.4
World average	11.5	4.7	9.6	3.9

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

has the highest rates for esophageal cancer by far, with age-standardized incidence rates over twice the world average (table 6.9). Past trends of incidence rates show a consistent decline throughout Asia in both males and females, most dramatically in China, with a possible slight increase among Japanese males. Although incidence rates of adenocarcinoma of the esophagus have been slowly increasing in Japan, the increase is not nearly as dramatic as that seen in other developed countries, and squamous cell carcinoma remains the dominant carcinoma subtype in Japan as well as in the rest of Asia (Shibata et al., 2008).

#### *Esophageal Cancer Prevention*

Tobacco smoking, alcohol consumption, eating pickled vegetables, and consuming food and drinks at very high temperatures may increase risk for esophageal cancer, while fresh fruits (especially citrus fruits) and vegetables (especially green leafy vegetables) may be protective. Modification of these risk and protective factors may help prevent esophageal cancer. Those with Barrett's esophagus, which is a precursor to adenocarcinoma, and potentially those with gastroesophageal reflux disease, which is a predisposition for Barrett's esophagus, are at high risk for adenocarcinoma.

Screening high-risk individuals for precursors and early cancers using endoscopy (with iodine staining) or balloon cytology is another potential strategy to decrease burden. Endoscopy, however, is resource intensive,

and its cost-effectiveness is unclear. Screening with balloon cytology has been used in high-incidence areas of China since the late 1950s and has shown promise in detecting early squamous cell carcinoma and precancerous lesions. Some researchers have suggested developing screening criteria based on inactivity of aldehyde dehydrogenase-2, alcohol flushing, alcohol consumption, tobacco smoking, and diet (Yokoyama et al., 2009).

### *Female Breast Cancer Burden*

Female breast cancer (ICD-10 C50) is the most common new cancer among females and sixth overall. In 2002, there were 225,000 new breast cancers and 74,000 deaths from breast cancer among Asian females. With such high incidence and good relative survival (5-year survival rates in the area can reach 65–80%) (Sankaranarayanan et al., 1998), breast cancer is also the most prevalent cancer among females by far (805,000 prevalent cases). In general, Asia has fairly low risk, with incidence and mortality rates nearly half the world averages (table 6.10). However, the incidence-to-mortality ratio in Southeast Asia is relatively high (0.5), which might be associated with barriers to accessing breast screening and medical care for proper treatment at an earlier stage of the disease.

Over time, incidence rates for female breast cancer have been steadily increasing, with the most dramatic increases found among Chinese and Malay females in Singapore. These increases may be explained by factors associated with estrogen levels (decreasing age at menarche, increasing age at menopause, decreasing fertility, increasing age at first birth) as well as dietary changes and increases in height and/or weight. Mutations of the *BRCA1* and *BRCA2* genes have been associated with increased risk of breast cancer.

### *Female Breast Cancer Prevention*

Early detection through screening is the most effective prevention strategy for breast cancer mortality. Three screening methods are currently in use: breast self-examination, clinical breast examination, and mammography. Although mammography has been shown to decrease mortality by up to 30% (Duffy et al., 2002), it is resource intensive and may not be available in government clinics or rural areas. A study done in Thailand in 2002, for example, revealed that 60% of health facilities with mammogram equipment were in the private sector, most of them concentrated in major cities (Putthasri W et al., 2004). Self-examination requires few resources, but

TABLE 6.10 Age-Standardized Incidence and Mortality Rates for Female Breast Cancer, by region, 2002

	<i>Incidence</i>	<i>Mortality</i>
Japan	32.7	8.3
China	18.7	5.5
RO Korea & Mongolia	20.0	4.3
Southeast Asia	25.5	11.8
Asia	21.5	7.1
World average	37.5	13.2

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

whether it actually has any effect on mortality is questionable. Clinical examination requires few resources relative to mammography and may also decrease mortality, especially when done regularly (Kuroishi et al., 2000). Given that most of Asia has low risk for breast cancer, a combination of clinical breast examination and mammography, if available, may be the most cost-effective modality for breast cancer screening, although this has not been demonstrated in practice.

Several lifestyle factors are known to increase the risk of breast cancer, including alcohol consumption, overweight and obesity, and lack of physical exercise (IARC Working Group, 2007; World Cancer Research Fund/American Institute for Cancer Research, 2007). Their avoidance could prevent some new cases.

### *Cervical Cancer Burden*

Cervical cancer (ICD-10 C53) is the sixth most common new cancer among Asian females. Based on 2002 data, there are 103,000 new cervical cancer cases and 54,000 deaths from cervical cancer in Asia each year. It has a relatively good prognosis (5-year survival rates in Asia up to 60–70%; Sankaranarayanan et al., 1998) and subsequent high prevalence (326,000 prevalent cases). Age-standardized incidence and mortality rates in Asia are roughly half the world averages (table 6.11). However, as with breast cancer, Southeast Asia has rates that are higher than in other parts of Asia, as well as the world. Fortunately, incidence rates have been declining, most notably among Chinese and Indian women in Singapore.

TABLE 6.11 Age-Standardized Incidence and Mortality Rates for Cervical Cancer, by Region, 2002

	<i>Incidence</i>	<i>Mortality</i>
Japan	8.0	2.8
China	6.8	3.8
RO Korea & Mongolia	17.9	4.8
Southeast Asia	18.7	10.2
Asia	9.9	5.1
World average	16.2	9.0

SOURCE: Ferlay et al., 2004.

NOTE: Rates are per 100,000.

### *Cervical Cancer Prevention*

All cervical cancers are attributed to infection with human papillomavirus (HPV), which is transmitted sexually (Parkin, 2006b). Vaccines against the high-risk HPV types 16 and 18 are currently available and provide a promising prevention strategy for cervical cancer. This vaccine is most effective when given before sexual debut. It is highly effective in preventing infection (and the cellular changes associated with early cancer) for at least several years (although long-term efficacy is still under study). Smoking is also a clear risk factor, and smoking cessation is another strategy in cervical cancer prevention (IARC Working Group, 2004).

Screening for cervical cancer relies greatly upon detection and treatment of precursor lesions. Recent studies have shown that Pap smears significantly reduce mortality from cervical cancer and could reduce the incidence of cervical cancer to less than 5 per 100,000 population in some countries of Europe and North America. Both cytological tests (Pap smears) and aided visual inspections (with diluted acetic acid or Lugol's iodine) have high sensitivities (ability to detect true positives), but the cytological tests have higher specificity (ability to detect true negatives). On the other hand, cytological tests require more resources, which makes aided visual inspections a realistic alternative in low-resource settings. Furthermore, results for visual inspections are available immediately and allow for treatment (with either cryotherapy or electrosurgical excision) in the same visit. More recently, HPV DNA testing has gained attention as a screening modality, and in a recent trial in India it was found to be more

effective in reducing cervical cancer mortality than a single cytological test or visual inspection (Sankaranarayanan et al., 2009).

## FUTURE PROJECTIONS

Three major factors require consideration when making future projections of new cancer cases and cancer deaths: (1) changes in the size of the population at risk, (2) aging of the population, and (3) changes in the age-specific rates. Future changes in age-specific rates are often predicted based on trends in the past. Improvements in prevention, early detection, and treatment, however, may result in drastically inaccurate rate projections, especially long-term projections. Furthermore, past trend data for Asian countries are limited, adding another layer of inaccuracy. Thus, projection data presented in this section incorporate only the demographic changes in population size and aging, while holding the age-specific rates constant over the projection period.

### *Population Projections*

Over the next 48 years, Asian population projections predict an overall decline in fertility and increased life expectancy, producing a population distribution with fewer children and more elderly people (age 65 years and older). The Asian population is expected to grow 15% from 2 billion in 2002 to 2.3 billion in 2050, while the elderly proportion is expected to triple from 7% to 22% (table 6.12). Only Japan will experience negative growth, but the proportion of elderly Japanese will increase from 18% to 30% by 2050 (UNDESA, 2004).

### *Cancer Burden Projections*

With greater numbers of elderly people, the burden of cancer will increase (table 6.12). Purely based on demographic changes, the number of cancers in Asia will double by 2050 to 7.4 million cases per year. New cancers of the stomach, lung, liver, colon/rectum, esophagus, and cervix will increase twofold or greater by 2050, while the number of new female breast cancers will increase by nearly 70%. The change in the population distribution will also change the ranking of the top cancers. By 2020, lung cancer will overtake stomach cancer as the top cancer in terms of new cases, and by 2050 esophageal cancer will have a higher number of new cases than colorectal cancer, making it the fourth highest for new cancers.

The number of deaths from all cancers will also increase 2.4-fold to reach 5.6 million. The number of deaths from liver and breast cancer will roughly double by 2050, while the deaths from cervical cancer will



TABLE 6.12 Projected Demographic Effects on New Cancer Cases and Deaths by Site, 2002–2050

Cancer site	New cancer cases (in 1,000s)				Cancer-related deaths (in 1,000s)			
	2002	2010	2020	2050	2002	2010	2020	2050
All sites combined	3,396.30	4,137.00	5,293.60	7,390.60	2,366.50	2,912.40	3,818.40	5,630.10
Stomach	562.9	692.7	897.2	1,243.70	403.3	500.6	665.4	978.7
Lung	554	688.3	915.6	1,374.00	478.6	596	800.1	1,230.50
Liver	455.4	556.5	711.3	925.9	420.1	514.5	660.9	898.8
Colon/rectum	305.9	370.7	470.3	667.8	159.1	195.1	255.3	390.6
Esophagus	279.1	348.2	467.3	677	220.8	275.7	376.9	575.3
Breast	224.9	266.5	320.6	377.8	74.4	90.5	113.3	151.5
Cervix	103.3	125.1	156.2	204.7	53.7	66.4	86.2	125.1

SOURCE: Ferlay et al., 2004.

NOTE: Total population and percentage of people who are elderly are expected to increase over time. Estimates are 2,025.8 million total (7.2% elderly) in 2002; 2,162.3 million (8.3% elderly) in 2010; 2,292.4 million (11.2% elderly) in 2020; and 2,347.3 million (21.5% elderly) in 2050 (UNDESA, 2004).

increase 2.3-fold and deaths from cancers of the lung, stomach, esophagus, and colon/rectum will increase roughly 2.5-fold. The ranking of cancer deaths will also be slightly altered by the demographic shift. By 2020, stomach cancer will cause more deaths than liver cancer, making it the second-largest cause of cancer deaths in Asia.

While these projections do not account for changes in rates, past rate trends and current prevention efforts may help indicate possible over- or underestimations. The projections for stomach cancer are likely to be overestimates, based on its consistently decreasing past trends; assuming a 1% annual decrease in incidence, which has been consistently seen in past trends, stomach cancer is projected to have 798,000 new cases in 2050 (36% less than previously projected). Lung cancer projections may be underestimated, based on the high prevalence of smoking among Chinese men, as previously mentioned. If hepatitis B vaccination is successfully scaled up, the projections for liver cancer are likely to be overestimates. Because rates for colorectal cancer have been rising, future colorectal cancer burden may have been underestimated; if a 2% annual increase in incidence is incorporated, based on past trends, colorectal cancer is projected to have 1.9 million new cases in 2050 (2.8-fold higher than the previous projection). On the other hand, rates for esophageal cancer have generally declined, so its projections may be overestimates. Breast cancer is probably underestimated, since past trends show a consistent increase in rates; with a 3% annual increase in incidence, which is a conservative estimate for this area, breast cancer is projected to have 1.6 million new cases in 2050 (fourfold higher than the previous projection). Cervical cancer projections are likely to be overestimates, based on already decreasing past trends, an available vaccine for HPV, and effective screening modalities.

## CONCLUSIONS ABOUT CANCER

With 3.4 million new cancer cases and 2.4 million deaths occurring in Asia each year, the burden of cancer in Asia is a substantial public health issue. The top seven cancers account for nearly 75% of all new cancers in the area.

The public health system's ability to prevent and control cancer in Asia is well developed in some Asian countries but poorly developed in others. Roughly 30 tumor registries were available in 2007, some of which were based on only a sample of the population. Improvements in surveillance are needed to glean a more accurate picture of the burden of cancer. While research from Asia itself is limited, the study of cancer in migrant populations has shown that modifications in environmental factors affect risk for

most of the top Asian cancers. The rapid lifestyle changes currently taking place in Asia (see chapter 2) are therefore likely to increase people's risk of cancer. As yet, cancer prevention programs are generally absent, although programs that target cardiovascular and nutritional diseases could have a positive impact on cancer rates (see chapters 4 and 11 and earlier in this chapter). Behavioral interventions that encourage tobacco smoking cessation, diets with adequate nutrition, alcohol reduction, physical activity, and body weight reduction could have a major impact in reducing cancer incidence, and they need to be expanded in the region.

Many of Asia's countries have also yet to establish national cancer screening programs. Screening identifies cancer at an earlier stage, permitting more effective and cheaper treatment and reduced mortality. Fortunately, implementation of screening programs is not necessarily dependent upon adequacy of health care systems, making cancer screening a potentially feasible strategy in Asia, where many countries have less advanced health care systems. However, introduction of screening programs is only efficacious if appropriate treatment can be obtained, which in Asia's least developed countries may not be the case. In the absence of treatment and given the poor survival expected with the major cancers of Asian populations (lung, liver, stomach), palliation (to improve the quality of life of patients and their families by offering support for physical, psychosocial, and spiritual aspects of the illness) is considered an important part of cancer care. However, palliative care has probably been undervalued in Asia, possibly because of local family values and culture structure.

With growth and aging of the Asian population, cancer will become an even greater problem in the future. Adoption of some of the strategies for prevention and early detection discussed in this chapter will hopefully help to decrease the anticipated future burden of cancer morbidity and mortality in the region.

Note: during publication, cancer burden data were updated and are available at: <http://globocan.iarc.fr/>.

## Mental Health Care

*Ee Heok Kua and Sunbaunat Ka*

### INTRODUCTION

In recent years, policy makers have become more aware of the importance of mental health, especially in low- and middle-income countries. This

increased awareness is demonstrated by the publication of the World Health Report 2001 on mental health (WHO, 2001). In many Asian countries, psychiatry is no longer sequestered in the mental asylum and has made inroads into the general hospital, underlining the totality of health as not merely the absence of physical illness but also the presence of mental well-being. Although there is a sense of optimism in the wake of neuroscience research and development of new services, for example, community care, there is still a scarcity of resources compounded by inequity in their distribution in Asia (Tasman et al., 2009). For example, Japan has improved services, legislation, and policies, whereas in Laos there has been limited development of mental health programs (Courtenay & Choulamany, 2007). Compared with what is available in the rest of the world, mental health services in East and Southeast Asia fall short of the average (table 6.13).

The recent global economic crisis has serious implications in low- and middle- income countries. In most rich countries, unemployed people are protected from absolute deprivation by social security nets, but in developing countries the family is the usual social safety net. The crisis will have a detrimental effect on mental health as people struggle to cope with unemployment and poverty. There is already evidence of an increase in the number of people with depression and anxiety, and many in distress may rely more heavily on alcohol and drugs (Phua & Kua, 2009).

#### CULTURE AND HEALTH-SEEKING BEHAVIOR

In many Asian communities, theories of health and illness are embedded in customs and religions. Religious beliefs and spirituality are important issues that determine illness behavior and health-seeking tendency. The traditional healers in Asian communities are popular not only because of the accessibility of their service but also because they share the same socio-cultural beliefs about illness and health (Kua, 2004). In some societies, such as in Cambodia (see box 6.5), Laos, and the Philippines, mental illness is thought to be possession by angry spirits, due to transgressions of good conduct or to displeasing the ancestors (Courtenay & Choulamany, 2007). Thus these illnesses need a spiritual healer, rather than Western medicine. Indeed, many of the less educated are not aware of modern treatments. In addition, traditional healers are readily available, particularly in rural areas, whereas mental health facilities are scarce. Where people are better educated, it is not uncommon for patients to consult both the traditional healer and the psychiatrist. For example, 36 of 100 patients referred to a psychiatric clinic in Singapore had also consulted traditional healers (Kua et al., 1993).

Mental health problems often go undiagnosed in Asia because of

TABLE 6.13 Mental Health Infrastructure and Specialist Care, by WHO Region

WHO region	Mental health policies (%)	Community mental health care (%)	Psychiatrists (per 100,000)	Psychiatric nurses (per 100,000)	Psychologists (per 100,000)
Africa	50.0	56.5	0.04	0.20	0.05
Americas	72.7	75.0	2.00	2.60	2.80
Eastern Mediterranean	72.7	68.2	0.95	1.25	0.60
Europe	70.6	79.2	9.80	24.8	3.10
South-East Asia	54.5	50.0	0.20	0.10	0.03
Western Pacific	58.1	66.7	0.32	0.50	0.03
World	62.1	68.1	1.20	2.00	0.60

SOURCE: WHO, 2005.

NOTE: The countries of East and Southeast Asia fall into the WHO's South-East Asia and Western Pacific regions.

immense stigma surrounding mental illness that acts as a major deterrent to patients seeking help. Physical disability, on the other hand, is less stigmatized, and as a result mental illness may manifest as somatic complaints such as weakness, dizziness, or headaches. Pervasive negative attitudes toward people with mental illness lead to increased self-stigma and shame, which may reduce treatment compliance, particularly utilization of outpatient clinics where others may see them using the service (Yang, 2007). There may be less stigma associated with seeking help from traditional healers. For example, the possession-trance is a common culture-related phenomenon in Asia in which a person in a semiconscious state often mimics the behavior of a deity, commonly the Monkey God, and behaves as if possessed by the deity (Kua et al., 1986). Because the possession trance is not deemed an illness, the traditional healer is often consulted, and the person avoids the stigma associated with referral to the mental hospital.

It is generally not culturally acceptable to discuss family or personal problems with friends. In Cambodia, for example, there is an idiom, "*Kom Hek Puos Oy Khaek Si*" (don't open the stomach for the black bird to eat), warning wives not to complain about their married life. In Japan and RO Korea, there is a recognized condition known as *Taijin-Kyofu-Sho*, which is characterized by fear that a person will behave in an embarrassing or offensive manner (e.g., blushing, emitting odors, staring inappropriately, improper facial expressions) and results in social withdrawal (Rosen, 2001).

## EPIDEMIOLOGY

It is difficult to compare countries, because of differences in diagnostic criteria, methodologies, and sample size (Chiu, 2004). Research on the prevalence of an illness, such as dementia, provides important data for health service planning, preventive measures, and possible interventional strategies. It is difficult to use a research questionnaire from the West if its validity and reliability have not been confirmed in Asia. For example, many hospitals in Asia use the Mini-Mental State Examination (Folstein et al., 1975) for the assessment of dementia, although it is biased against people who are less educated. Diagnostic criteria also vary. Although most Asian countries use the WHO's International Classification of Diseases (ICD), there is a growing dominance of the American Psychiatric Association's Diagnostic and Statistical Manual (DSM), despite known problems with its use (e.g., it ignores neurasthenia, which is a common disorder in many Asian countries; Kua & Ho, 2008).

**BOX 6.5 Country Snapshot: Mental Health Care in Cambodia**

Cambodia is one of the poorest countries in Asia and, recently, one of the most tumultuous. Under the Khmer Rouge, Cambodians experienced extreme starvation, chronic forced labor, verbal and physical abuse, torture, and separation from family members, and many survivors developed depression, anxiety, behavioral personality and posttraumatic stress disorders. After 1979, at the end of the Khmer Rouge regime, the health infrastructure was gradually reestablished after having been completely destroyed under the regime. However, there were no remaining human resources for mental health. Awareness, even among health workers, was very limited, and strong societal stigma and discrimination against those suffering from mental illness precluded care. Persons attempting suicide or self-harm were referred to the general hospital's emergency ward but were usually discharged without any referral to psychiatric care.

It was not until 1994 that mental health services began to receive acknowledgement, and specialist education in psychiatry began with support from the Norwegian government (NORAD, Norwegian Agency for Development Cooperation), the University of Oslo, and the Norwegian Council for Mental Health. Mental health services have been developed step-by-step, and currently there is a national mental health program focusing on basic mental health care and

*(continued)*

*Depression and Affective Disorders*

There are few epidemiological studies of mental disorders in East and Southeast Asia. The most commonly reported conditions are depression and anxiety, but rates vary considerably among countries. A review by Chiu (2004) reported a lifetime prevalence of depression from 1.1% in Taiwan to 19.9% in Thailand. In RO Korea the lifetime prevalence of anxiety disorders was 12.7% in women and 5.3% in men, while affective disorders were reported by 6.6% and 4.3%, respectively (Lee et al., 1990). In Japan, the lifetime prevalence of major depression was 8.5% in women and 7.3% in men (Kitamura, 1998). In Singapore, the prevalence of minor psychiatric morbidity (depression and anxiety) in a community survey of 3,020 adults was 15.1% in Malays, 17.4% in Chinese, and 17.8% in Indians (Fones et al., 1998).

community-based mental health services, especially family-based care. So far, 40 psychiatrists, 40 psychiatric nurses, and about 170 general practitioners and 170 registered nurses have been trained in basic mental health care. In addition, 64 psychiatric units in general hospitals and health centers have been established across Cambodia.

Depression is the most common of mental disorders in Cambodia. Among 4,329 adult psychiatric patients seen at the Khmer-Soviet Friendship Hospital, 24% were diagnosed with depression. Typically, people with depression first visit traditional healers or visit monks or fortune-tellers. Nonmedical treatment is preferred for several reasons. First, people may not realize mental illnesses can be treated with modern medicine, which is thought to be inappropriate because depression and other mental illnesses are caused by spirits and should be treated using spiritual or magical procedures. Traditional healers are readily available in the community, particularly in rural areas, while formal mental health services are centralized in cities. Thus, these services may not be easily accessible. Moreover, they may be too expensive for the rural poor. Even in cities, few people are aware that services and professionals for mental health care exist. Finally, stigma against mental illness still prevents people from seeking help.

### *Posttraumatic Stress*

In many parts of Asia, people's mental health has been adversely affected by wars, famine, and natural disasters, which can result in posttraumatic stress disorder (PTSD). Risk factors for PTSD include conflict-related trauma after age 12, psychiatric history, youth domestic stress, death or separation in the family, and alcohol abuse in parents (De Jong et al., 2001). Among Cambodian refugees living in the United States, the prevalence of depression and PTSD have both been reported to be as high as 60% (Marshal et al., 2005), although in Cambodia the prevalence of PTSD was reported to be lower, at 28.4% (De Jong et al., 2001). Howard and colleagues (1999) evaluated 351 Filipino victims 6 years after they were displaced by a volcanic eruption and found the prevalence of PTSD was 27.6%.

### *Suicide and Self-Harm*

Suicide in Asia varies among countries, but even within the same country there are differences according to gender, ethnicity, and age. For example,



in Singapore, attempted suicide is more common among Indian than Chinese teenagers (Ho et al., 1999), but Chinese men have higher completion rates (Kua et al., 2003).

In general, suicide is more common among men than women, often two- or threefold (Hendin et al., 2008). However, one of the most striking features of suicide in Asia is the extremely high rates among mainland Chinese women, a trend that is not mirrored in other Chinese societies (e.g., Taiwan, Hong Kong, Singapore). China is the only country that reports higher rates of completed suicide among women than men—25% higher between 1995 and 1999 (Phillips et al., 2002a). The majority of suicides are among young rural women, and they are often apparently spontaneous rather than premeditated, with many women using pesticides or other agricultural poisons readily available in rural areas (Phillips, 2009). The high completion rates are, to some extent, due to the use of these poisons, which are quite effective, because many rural health services do not have stomach pumps to remove the poisons.

Historically, suicide was a culturally acceptable response to a variety of situations and was, in some circumstances, considered morally appropriate; an example is the use of seppuku among Samurai in Japan (Fusé, 1980). Often, it is perceived not as an outcome of mental illness but as a response to social circumstances. Psychological autopsies from China, however, have suggested that more than 60% of the people had a psychiatric illness at the time of suicide (Phillips et al., 2002b). Still, social reasons do exist; suicide is used as a means of protest by otherwise powerless individuals or as a means of escape from unbearable lives, particularly by young women.

### *Mental Health among Children*

A neglected area of research in psychiatric epidemiology in Asia is child mental health. In most Asian countries, mental health services for children are not well developed, mainly because of a lack of trained mental health personnel such as child psychiatrists and psychologists.

A major survey in Thailand on child mental health that assessed 1,698 children (8–11 years old) reported high prevalence rates for mental disorders: 10.8% for anxiety, 9.7% for phobia, 7.1% for depression, 5.5% for conduct disorder, and 5.1% for attention deficit hyperactivity disorder (Wacharasindhu & Panyyayong, 2002). School examination is a recurrent stressor in many Asian countries, including Japan, RO Korea, Hong Kong, Taiwan, and Singapore. It is often a cause of attempted suicide in children or adolescents.

Eating disorders, especially anorexia nervosa, were initially thought to

be uncommon in Asia, but there are now more reports, especially among Chinese girls. Early detection and referral for treatment lead to better outcomes (Lim et al., 2007).

### *Mental Health among Elderly People*

East and Southeast Asia have some of the most rapidly aging populations in the world, and mental health conditions associated with aging, such as dementia, are becoming increasingly common. For example, a review in China reported an increased prevalence of dementia, from 2.1% to 4% between 1980 and 2004 (Dong et al., 2007). Other studies in Hong Kong, Taiwan, RO Korea, and Singapore showed similar prevalence rates (Chiu & Zhang, 2000).

The most common mental disorder in late life is depression, and the prevalence in elderly Asians varies between 5% and 9% (Chiu, 2004; Kua, 1992). Many elderly people with early depression do not complain of mood problems, but they see their doctors for physical symptoms such as headache or chest pain. It is this somatization that makes it especially difficult for the primary care doctor to make a diagnosis and start appropriate treatment. Case identification is also difficult because many depressed elderly people in Asia prefer to visit traditional healers.

### *Substance Abuse*

The extent of alcohol abuse varies among countries in Asia, and a significant factor is religion. It is relatively uncommon in Muslim countries like Indonesia and Brunei. In Singapore, alcohol dependence is a more common problem among Indians and Chinese than Malays, and a follow-up study showed that about 60% of alcohol dependents remained abstinent for a year after treatment in a general hospital (Kua, 1990). Successful abstinence could be attributed to the patients being referred early for treatment by their doctors, and all of them returned home to their families after treatment. However, there are few reports of alcohol treatment outcomes from Asia.

Less common but of growing importance is drug abuse. Although Asia has a long and well-known history of drug use, particularly opium in South-east Asia and China, many countries have recently seen rapid increases in substance use and increased use of heroin and amphetamine-type stimulants (UNODC, 2008). There are few psychosocial support services for drug users. Treatment for substance use is usually limited to detoxification, though some countries (e.g., Hong Kong, and recently China and Vietnam) have introduced methadone substitution for opiate users (see also chapter 2).

## MENTAL HEALTH SERVICES

### *Diagnosis*

The rates of mental illness reported from Asia are likely to greatly underrepresent reality, especially when researchers use more restrictive criteria like the DSM. Moreover, Asian families may try to hide mental illnesses, leading to underenumeration.

In most primary care clinics in Asia, doctors have just 10 to 15 minutes per patient—insufficient time to make a comprehensive assessment of each patient. Many mental health screening tools take too long to administer in such a setting or are culturally or educationally biased. Thus, many cases of depression and dementia are undetected or misdiagnosed. Based on WHO research, a short 10-item Elderly Cognitive Assessment Questionnaire that can be administered by a nurse or social worker has been constructed and is more appropriate for those who are less educated (Kua & Ko, 1992). There are other screening instruments for depression, anxiety, and addiction that can be used by the primary care doctors for quick assessment.

### *Treatment*

A century ago when mental health services were introduced into Asia, the model essentially followed the European model of the day, with large mental institutions in the countryside. This led to stigmatization, lack of family contact, anxiety about abandonment, and the development of “institutional neurosis” (Kua, 2009). General hospital psychiatry started in Japan, Hong Kong, Taiwan, Thailand, Malaysia, and Indonesia three decades ago, but the focus today is on community mental health care. Few countries—even those most developed, such as Japan—are able to provide primary care for severe mental disorders (WHO, 2005c).

Because of a paucity of mental health services, the care of mentally ill people in Asia rests heavily on the family. It is interesting to note that in the WHO International Study of Schizophrenia, the treatment outcome of patients from developing countries was slightly better than of those from the developed countries (Sartorius et al., 1996). One important factor is that in all Asian countries, most patients discharged from hospitals will return to their families and not to hostels or sheltered accommodations. The families will take care of them, remind them about their medications, and even accompany them in the follow-up appointments (Kua et al., 2003).

In recent years, early psychosis intervention programs have become an important part of a new strategy for severe mental disorders. The detec-

tion of patients early in the course of their psychotic conditions enables expeditious diagnosis and therapy, leading to better clinical and social outcomes. While becoming well established in developed places such as the United Kingdom, the United States, Australia, and Scandinavia, early psychosis intervention programs have also been set up in Singapore, Taiwan, RO Korea, Malaysia, and Hong Kong. In Asia, where cultural factors and norms can lead to long delays before the diagnosis of psychosis, early intervention programs could be expected to produce a greater positive impact, if successfully implemented.

In an ideal program, a day hospital or center in the community is the nucleus of the mental health service, with psychiatrists, nurses, psychologists, social workers, and other mental health therapists working in a multidisciplinary team. Its location in the community and near the people encourages early referrals from family or primary care doctors. The patients go to the center during the day and return home in the evening—there is no dislocation from family life. With referrals from the general hospital, the day hospital or center can provide step-down care, and this will reduce the burden of bed shortages in the acute hospitals. Galvanizing community support is critical, especially in destigmatization campaigns, to ensure the success of the mental health service (Kua, 2010).

Models of psychological therapy reflect the cultural and religious milieu in which they are developed. In Western psychotherapy, the focus is on the individual struggling with biological urges and social constraints. In Asian culture, the emphasis is on the individual as a member of a family. In traditional Chinese medicine, “talking therapy” is part of holistic care, which includes herbs and acupuncture. A powerful therapeutic factor is the rapport between the healer and the patient. The healer understands the ethos and explains the symptoms using the belief systems with which the patient is familiar.

There is much to learn from the psychotherapeutic techniques of traditional healers in the management of mental disorders—a good rapport also ensures medication compliance. A sine qua non in the therapeutic relationship is trust and an understanding of the cultural belief system. In the provision of psychiatric care in Asia, the role of the traditional healer is gradually being acknowledged. In Indonesia, psychiatrists work closely with traditional healers and organize training programs to help them identify patients with psychoses to ensure early referral to the hospital for treatment (Kua, 2009).

Traditional treatments vary widely. In Cambodia, for example, patients may perform prayers and rituals, often with a fortune-teller or monk

to intercede and determine the cause, as well as to make food offerings, restore peace, and request the spirit to leave.

Japanese Morita therapy is influenced by Buddhism (Alloy et al., 1999). During treatment, there is a phase of disengagement from the precipitating factor (e.g., leaving an intolerable relationship or situation), introspection (rethinking the issues and planning different strategies in problem solving), conflict resolution with suggestions by the healer to overcome the impasse, and finally the phase of acceptance of reality and solutions. The transference onto the healer is likened to the master-student relationship in martial arts training. The healer's suggestions help the patients to accept themselves and to internalize the healer's wisdom. In the recovery process, a healthy diet with herbal supplements and regular exercise or martial arts training are integral in the treatment.

In traditional Chinese medicine, there is an emphasis on exercise as a part of healthy lifestyle to restore the yin-yang equilibrium. Tai-chi or kung fu exercise is encouraged during the recuperation phase of physical or mental illness. Acupuncture has been used to relieve headache, insomnia, depression, and chronic pain, but further research is needed to determine its true efficacy over the use of pharmacotherapy.

Freudian psychoanalysis and theory of the mind may be well accepted in the West but not in Asia. As an alternative, brief integrative psychological therapy (Kua, 2008) is an approach that integrates different techniques of psychological therapy that mental health professionals can practice in a setting with which they are familiar. The therapy incorporates healthy lifestyle and cultural practices of the community—for example, the use of meditation for people with anxiety and sleep disorders.

In Asia, most patients with mental illness are cared for by their families at home, and there is a growing concern about an increasing number of elderly people and a diminishing number of caregivers. Traditionally, caregivers have been women, but because of the social transformation of the Asian family, young couples today prefer to live away from their parents and women prefer to work outside the home. A study of 50 family caregivers of patients with dementia in Singapore showed that 56% of the caregivers had symptoms of anxiety and depression (Kua & Tan, 1997). Family caregivers need to seek help outside the home. Support networks typically have the family as the core but should also include friends, neighbors, and home helpers. Community and governmental supports are necessary to alleviate the burden on the family. Families are reluctant to use community services, because to send a relative to one of these centers implies a failure of responsibility. However, with the change in the

family structure, many caregivers may have to rely on these community services.

Most countries of Asia have pharmacotherapies for mental illness, such as diazepam, but lack others, such as lithium (e.g., Laos, Cambodia; WHO, 2005c). In recent years there has been research collaboration among countries in this region in pharmacoepidemiology. A successful collaborative effort is the Research on East Asia Psychotropic Prescriptions studies with participation from Japan, Singapore, RO Korea, China, and Taiwan (Sim et al., 2009). Their research has indicated that the treatment of psychotic disorders, such as schizophrenia and bipolar illness, vary among countries in terms of dosage and the range of antipsychotics used. Consequently, there are plans to organize training programs in the future to improve and standardize psychopharmacotherapy.

The introduction of pharmaceutical treatments may be a double-edged sword in Asia. Pharmaceutical companies' desires to increase their market share can have an enormous effect on the way a condition is understood within a culture, as was the case in Japan where GlaxoSmithKline re-described depression in order to sell more antidepressants (Watters, 2010).

### *Prevention*

Prevention is pivotal in public health. Primary prevention at the prenatal level, an adequate diet, and advice on drug or alcohol abuse that may affect the fetus are important. It may be necessary to help parents who have problems in child rearing to learn parenting skills and to anticipate the normal crises of childhood and adolescence. Such preparation is important when the child is at periods of heightened susceptibility to stress, such as the first day at school. A powerful tool in primary prevention is health education; for example, to prevent alcohol abuse, it is vital to educate young people about the hazards of excessive drinking through the mass media or programs in schools.

Secondary prevention aims to shorten the course of the illness by early identification and rapid intervention. The prompt treatment of depression with antidepressants and psychotherapy to decrease the acute phase and minimize risk of suicide is one example of secondary prevention. Telephone hotline counseling that provides immediate help to people in acute distress is another.

In tertiary prevention the goal is to reduce chronicity through the prevention of complications and through active rehabilitation, which is directed toward achieving the maximum functioning level for the patient. Pharmacotherapy with lithium provides prophylaxis to prevent relapses in

depression or mania, and behavioral modification in social skills training improves interpersonal relationship, but counseling is necessary to help the patient cope with stress. Rehabilitation also includes other community services, such as day care, hostels, and sheltered workshops. Successful work placement will enhance the patient's self-esteem and sense of self-worth.

Collaboration among the mental health services, voluntary organizations, and family caregivers can have a significant, positive impact on mental health treatment. For example, in Singapore such collaboration has resulted in a gradual decline in elderly suicides (Kua et al., 2003). In 1995, the suicide rate of elderly Chinese in Singapore was at an all-time high of about 52 per 100,000. Those at risk—especially elderly people who were disabled and living alone—were identified, and primary care doctors were informed where they could refer these people for social service assistance or treatment. Prevention programs were run by nongovernmental organizations like the Gerontological Society, and a telephone help line started by a voluntary group called the Singapore Action Group of Elders. The Department of Psychological Medicine in the National University of Singapore provided training for retirees who could be peer counselors. There were discussions with the health authorities, requesting more day centers—some of which were managed by religious organizations—and more training opportunities in geriatric psychiatry for doctors, nurses, social workers, psychologists, and other therapists. Since 1995 the number of elderly suicides has dropped gradually, and the present rate is about 17 per 100,000.

Most Asian countries have begun suicide prevention programs, since suicide is a severe outcome of mental illness. For example, RO Korea has undertaken national public awareness programs sponsored by the ministry of health and welfare and the Korean Association for Suicide Prevention. Supported by private companies, these initiatives have included community service announcements, aired on television and radio and displayed in subways, and an educational program on depression and suicide prevention that was televised, placed on the Internet, and distributed in CD form. The program was evaluated by conducting annual random surveys to monitor the general population's views on depression and suicide (Nam et al., 2008). Programs to prevent severe depression (tertiary prevention) have also been conducted. For example, Malaysia's ministry of health together with the Malaysian Psychiatric Association have attempted to improve community understanding of depression via posters, radio and television broadcasts, and public forums.

Traditional prevention measures also exist. For example, for many centuries, elderly people in East Asia have known that *Ginkgo biloba* extract, which is sold over the counter in pharmacies, can be used for the prevention of cognitive impairment in later life (Kua & Tan, 2005). Other traditional methods include *chi-gong* exercise and mind games like Chinese chess and mahjong.

#### MENTAL HEALTH CARE RECOMMENDATIONS

There is a perennial shortage of trained psychiatrists and other mental health professionals in many Asian countries. Future psychiatric education should focus on primary care doctors and health workers like nurses who can be trained to identify and treat early or mild disorders and to refer more complex problems to specialists. There is also a need for a paradigm reorientation in the teaching of psychiatry in medical schools, with emphasis on the common psychiatric problems in primary care. More people overwhelmed by the problems of modern living seek help from general practitioners. Doctors will need to treat common psychiatric disorders not just with judicious prescription of medication but also with counseling. To ensure detection of early or mild disorders, training of medical students should be at the primary care clinics.

Modern psychiatry is derived from Europe and the United States. Most psychiatrists in the East are schooled in Western ideas of psychiatric practice. In some cases, Western psychiatry ignores conditions peculiar to the East, so Asian psychiatrists need to be aware of both schools of thought to be effective. A recent research paper on training psychiatrists explored the attributes of Asian psychiatrists and observed that personal values and professional qualities were ranked much higher than research skills (Tor et al., 2009). Mental health professionals working in Asia will have to multi-task because of staff shortages, and their skills must reach beyond clinical competence. Psychiatrists working in the front line in disaster areas (e.g., after earthquakes or floods) would benefit from training in administrative and organizational skills.

The stigma of mental illness still remains a barrier to early treatment and affects both patients and their therapists (Lai et al., 2000). It also contributes to the shortage of mental health care staff in Asia. Antistigma campaigns can show participants how to recognize and respond to a person having a mental health crisis and where to seek help (Kua, 2009). There should be regular training workshops for staff and educational programs for the public to promote preventive psychiatry, to identify early symp-



toms, and to destigmatize mental illness. In the absence of prejudice, preventive and treatment services will be more effective. However, combating these deeply embedded beliefs about mental illness remains the most significant challenge for Asia's mental health system.

#### NOTE

1. An epidemiological measure that provides an estimate of the amount of disease attributed to that particular risk factor or, conversely, that could theoretically be prevented if the risk factor were eliminated (Last, 2001).

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# 7 Accidents and Injuries

Wen-Ta Chiu, Lu Pai, and Shin-Han Tsai

While injury is viewed as one of the major public health problems of the twenty-first century, many developing countries in Asia have paid little attention to it. Generally, injuries are among the top 10 leading causes of death for every nation in East and Southeast Asia, with traffic injuries the leading group, followed by home injuries. Trends in injury epidemiology vary enormously across Asia and are closely linked with each country's economic development, as is the level of emergency care. Physical treatment of injuries is poor, and access to psychological support is worse, as is long-term care, which usually is the burden of families. Preventive measures, such as compulsory laws for motorized vehicular traffic, have been implemented and enforced to varying degrees in the region. For injuries related to war or terrorism, international alliances are needed to mitigate the impacts.

## INTRODUCTION

One effect of industrialization and changes in lifestyle is that injuries and chronic diseases have overtaken infectious diseases as major causes of death. Asia consists of a vast territory covering multiple countries that have different types of injuries based on their distinct economic, geographical, and cultural features (see figure 7.1). The nations in East Asia are economically more advanced. The major causes of injury in these countries, based on epidemiological studies, are motor vehicle accidents and injuries of children and elderly people. In most low-income nations in Southeast Asia, data collection systems are not well established, and thus injury problems remain underreported. Furthermore, injury mortality and morbidity data are not available in some countries, such as Brunei,

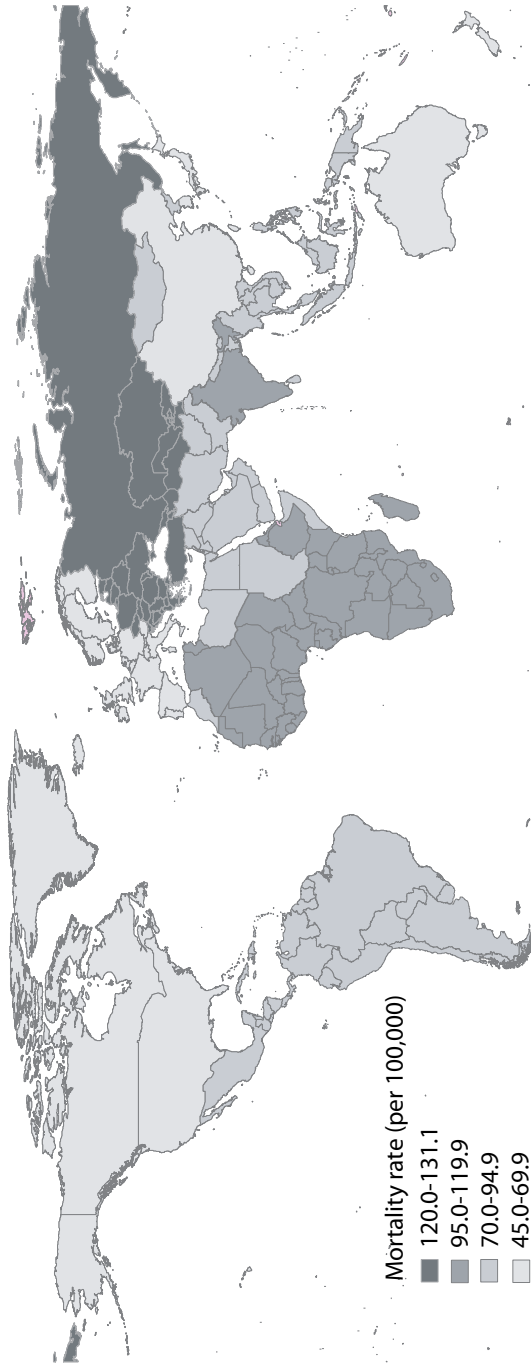


Figure 7.1. Distribution of global injury-related mortality. Source: Wananukul et al., 2007.

Myanmar, Cambodia, and Laos. Many of these countries are currently experiencing or did recently experience war and social unrest, and with the recent rise of terrorism, many countries that depend economically on tourism, such as Indonesia, the Philippines, Thailand, and Malaysia, tend to be the targets of terrorist attacks. Therefore, in these areas, war- and weapon-related incidents are speculated to be additional causes of injuries.

Generally speaking, injuries are among the top 10 leading causes of death for every nation in East and Southeast Asia (Hwang et al., 2007; Nakahara et al., 2008; WHO, 2004), and they account for an average of 75 deaths per 100,000 population (figure 7.2). However, data from different countries consistently indicate that injury is the leading cause of deaths for children and teenagers (Nakahara et al., 2008; WHO, 2004).

#### TRENDS ACROSS THE REGION

Trends in injury epidemiology vary enormously across Asia and are closely linked with each country's economic development. In more developed countries and regions, such as Japan, Singapore, and Taiwan, the number of injuries has declined annually and the injury mortality rate has reached just 16–30 deaths per 100,000 population (Ministry of Health, PRC, 2000; Wang et al., 2008). In these countries, the number of injuries does not markedly differ between urban and rural areas. On the other hand, in economically disadvantaged countries such as China, Thailand, Vietnam, Cambodia, Laos, Indonesia, and Malaysia, injury mortality is increasing yearly and has reached 50–84 deaths per 100,000 population. In addition, rural-urban differences in injury mortality rates can be as high as threefold.

As a high-income country, Japan enjoys the lowest burden of injuries in East Asia. Official records indicate that between 2004 and 2005, 7,983 people suffered injuries, and there were 1,135 injury-related deaths (Nakahara et al., 2008). Traffic accidents are the major cause of injuries, followed by falls. With its aging population, Japan is more likely to focus injury-related studies on fall prevention. In contrast, injury mortality in RO Korea, another high-income country in East Asia, is much higher than in Britain, the United States, or Japan (Tanaka et al., 2003). A national survey conducted in RO Korea in 2006 indicated that the incidence of unintentional injury was 17,606 per 100,000.

Until 1988, overall injury mortality followed an upward trend in Taiwan. According to official statistics, the injury mortality rate increased from 70.5 per 100,000 in 1986 to 76.6 per 100,000 in 1988. This trend has gradually declined in the past 20 some years. The injury mortality rate

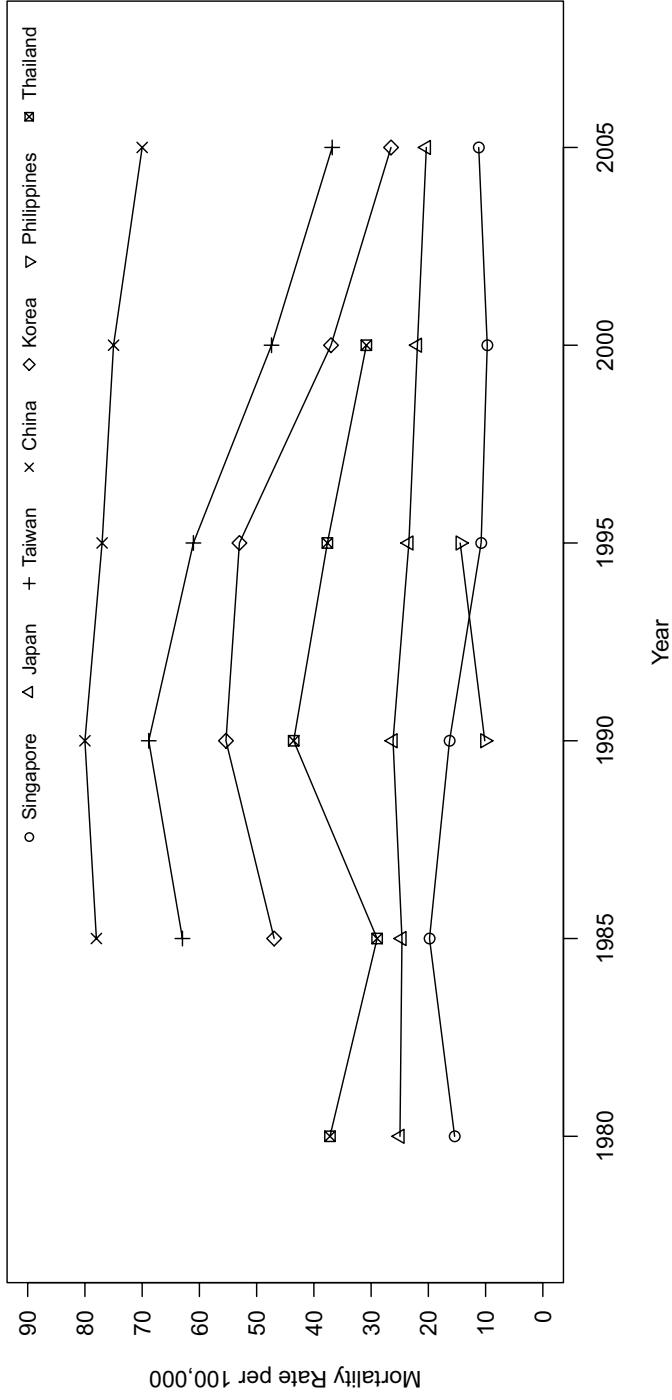


Figure 7.2. Injury-related mortality in selected countries, 1985–2005. Source: WHOSIS, n.d.

was reduced to 27.9 per 100,000 by 2007, a 63.6% reduction since 1988. The injury mortality rate for males is 2.5 times higher than for females. Suicides continue to increase, while traffic accidents have been reduced substantially (figures 7.3, 7.4; Department of Health, ROC, 2007).

Statistics provided by China's department of health of in 1999 showed that injury was the main cause of death for Chinese age 1 to 44 years. Injuries kill 750,000 people and place 3.5 million people in hospitals every year (Ministry of Health, PRC, 2000). Self-inflicted injury mortality among females is higher than for males, being the seventh and the tenth leading causes of death, respectively (see chapter 6 for further discussion of this issue). Males, on the other hand, tend to die from traffic accidents, the eighth leading cause of male deaths. In urban areas, injuries and poisons are ranked fifth among causes of death, with an annual mortality rate of 43.45 per 100,000. In 2002, 9.13% of patients were hospitalized because of injuries and poisons in the cities of China, and injuries and poisons are the fourth leading cause of hospitalization. Because of the lack of systematic data collection, injury mortality and other injury-related information for rural areas of China are limited (Wang et al., 2008), though mortality in rural areas (69.2/100,000) is roughly twice that in the cities (38.7/100,000; Zhao & Svanstrom, 2003). Overall injury mortality in China was reduced by over 17% between 1997 and 2006. By comparison, the mortality rate for traffic accidents increased by 81%, but the suicide rate declined by 57% for the same period.

With the constant threat of infectious diseases and political instability, the developing countries of Southeast Asia paid little attention to injuries until international organizations, such as the UN, began to promote injury prevention vigorously in the 1990s. The Cambodian government, for example, has gradually recognized that deaths and injuries caused by land mines or unexploded ordnance are just as serious as infectious diseases (WHO, 2011). According to the WHO, most amputation cases in the world have been caused by land mines in Cambodia (about 40,000 people, or 0.3% of the Cambodian population). The overall injury mortality in rural areas is 287 per 100,000, while in urban areas it is 386 per 100,000. In addition, the rapid increase in the use of motor vehicles in recent years—an increase of roughly 18% per year since 1979—has been associated with higher numbers of traffic accidents, which have become the leading cause of injury deaths. According to national statistics in Cambodia for 2003, the road accidents fatality rate is about 18.42 per 10,000 vehicles (WHO, 2011).

Laos is one of the poorest nations in Southeast Asia. Serious infectious diseases and land mines and unexploded ordnances are major public health

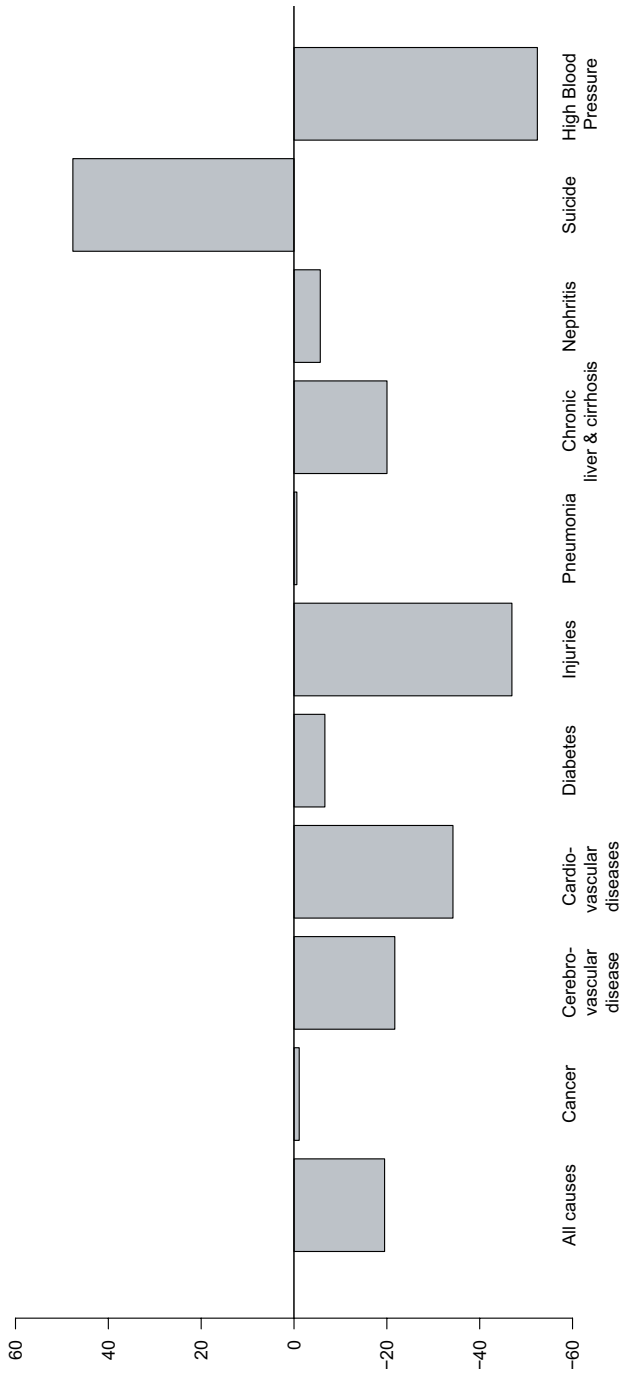


Figure 7.3. Changes in standardized mortality rates for the leading causes of death in Taiwan, 1997–2007. Source: Department of Health, ROC, 2007.

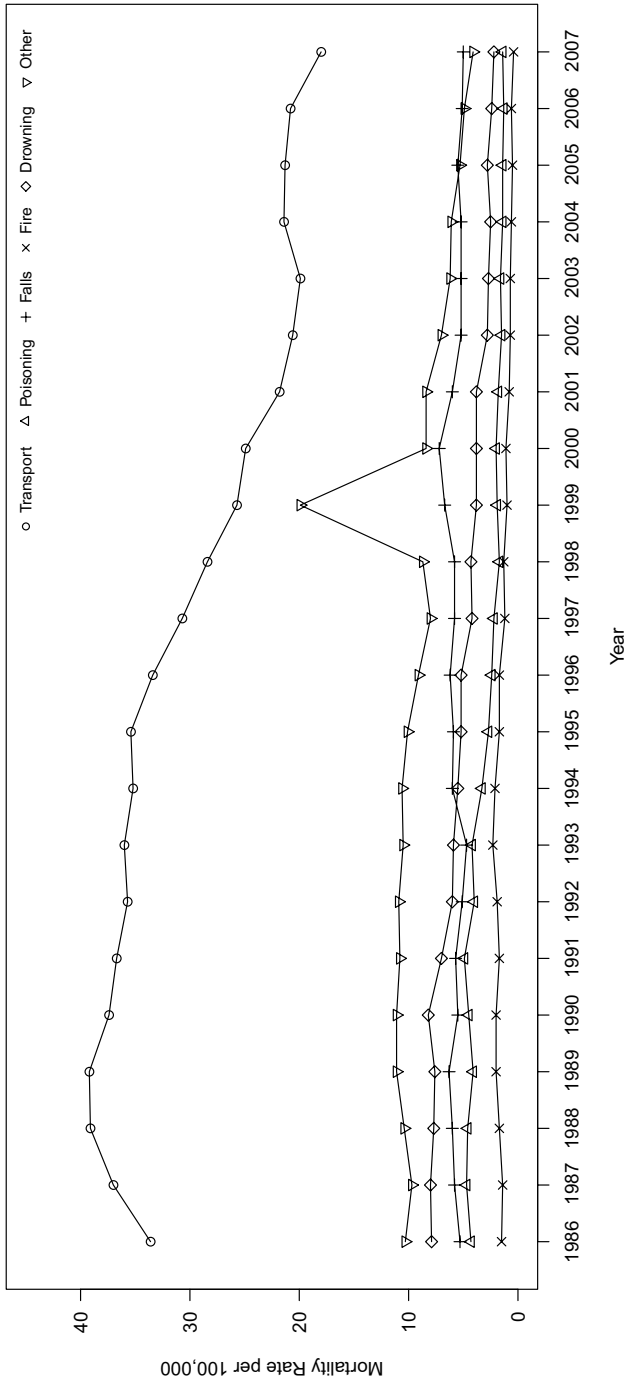


Figure 7.4. Mortality due to different causes of injury in Taiwan, 1986–2007. Source: Department of Health, ROC, 2007.

threats in the country. Land mines and unexploded ordnances are the leading cause of injury deaths in rural areas. Farmers often risk explosion during their farming and household practices (Durham et al., 2005). Recently, because of rapid urbanization and increasing use of motorized vehicles, road traffic accidents in urban areas have increased. Traffic accidents increased from 1,090 cases in 1990 to 4,051 cases in 2001 (WHO, 2011).

After decades of mismanagement and isolation, Myanmar still suffers from serious infectious diseases, famine, malnutrition, and injuries with very little health care. Because of political instability, it is difficult to obtain reliable health statistics, but land mines may cause high injury and mortality rates (Mullany et al., 2007).

In other parts of Southeast Asia, the injury mortality rates vary. According to a report in 2002, the age-standardized injury mortality rate is 23 per 100,000 in Singapore, 50 per 100,000 in Malaysia, and 87 per 100,000 in Indonesia (WHO, 2008a), a trend that clearly follows the level of economic development and health care infrastructure of the three neighboring countries. Thailand and Vietnam are similar, both geographically and economically, and have similar injury mortality rates, at 61.5–74 per 100,000 (WHO, 2008a) and 72 per 100,000 (Nakahara et al., 2008; WHO, 2008a), respectively. In the past 20 years, injury mortality in Thailand increased rapidly, and injury has become the second leading cause of death, after heart disease (Donald, 2008).

### *Trauma Care*

Generally speaking, in East and Southeast Asia, the level of emergency care is aligned with the level of development of the nation; the more developed nations (such as Singapore, Japan, Taiwan, and Hong Kong) have better emergency care systems. In middle-income countries, such as China, Malaysia, Indonesia, Thailand, and Vietnam, the emergency care systems need to improve in the content and quality of care provided and in the balance of resource allocation between urban and rural areas. In poorer nations, the resources and density of emergency care facilities are much higher in cities than in rural areas.

Complete systems that can provide good services for prehospital and in-hospital emergency care have been established in both Japan and RO Korea, with injured persons sent to hospitals of different levels according to their injury severity (Choi et al., 2007; Hwang et al., 2007; Tanaka et al., 2003). Singapore also has a well-developed system where patients can get immediate and effective medical services when needed. The emergency care system in Taiwan is quite complete, and the quality of its services



differs little between urban and rural areas. In Taipei City, 9–16% of cases demand advanced life support (Lu et al., 2006; Hu et al., 1996), and the average wait for an ambulance is 4.1–4.9 minutes. In rural areas like Hualien County, the average wait for an ambulance is 6.6 minutes—just 2 minutes longer than in urban areas. Ambulance vans are the major transport for emergency care in Taiwan. Air emergency medical transport is also available, but only for serious injuries occurring in remote areas or on offshore islands (Chiang et al., 2009).

In other countries in the region, the quality of services in rural areas is far worse than in urban areas, and even in urban areas services may be weak. In Thailand, 24-hour emergency services have been established in most of the main provincial hospitals, but prehospital care is still inadequate. Most prehospital services consist of only transportation for the injured to a hospital. Because of a lack of life-support facilities, delays, and mishandling by untrained volunteers, persons with severe injuries may not survive the journey to the hospital. The situation is even worse in rural areas where medical manpower and resources are insufficient (Department of Health, 2008; Donald, 2008). Likewise, in Vietnam, emergency service centers can be found in only a few major cities and have very limited prehospital care (Nguyen et al., 2008). These centers can respond to only 10% of the “115” emergency calls received. Although Vietnam has a national primary health care system that is intended to serve all citizens, an explosion of private medical services in recent years has made the health care system less accessible and affordable for the poor, especially for those residing in remote areas. Because of geographic and financial limitations, the injured usually resort to self-treatment instead of seeking professional medical care. In an investigation undertaken in northern Vietnam, Hang and colleagues found that 51.7% of local residents would choose self-treatment even for severe injuries, and only 23.2% would utilize health services (Hang et al., 2009).

Adapting the standards introduced by other nations, China constructed an emergency care system to fit its own situation in the 1980s, although it has limited reach in rural areas (Thomas & Crem, 1999). A special “120” telephone line for emergency calls has been established, but it cannot be accessed by more than half of the population. Communication and emergency care devices are insufficient even in urban areas. However, it is expected that with the rapidly growing economy, emergency care in China, especially in rural areas, will improve (Donald, 2008).

Other problems exist with the provision of care. In Malaysia, for example, although good trauma care services are available at large university

hospitals, the injured are often not sent to them. The lack of prehospital care cohesiveness has brought about a waste of medical resources and reduction of usability, particularly in rural areas (Donald, 2008).

Indonesia is prone to natural disasters, owing to its multiple-island topography and location on a volcanic tectonic plate boundary. In recent years, the country has also become a target for terrorist attacks. Thus, the provision of good emergency care has become essential. International organizations and foreign governments have been trying to assist the nation to establish a complete emergency care system that includes a "118" emergency ambulance service and prehospital emergency medical services. However, because of the lack of medical resources in Indonesia, even in urban areas, the system is still in a very early stage of its development (Donald, 2008).

In the poorest nations in the region, such as Myanmar, Laos, Cambodia, and Timor-Leste, emergency services are extremely limited, if available at all.

Although emergency care can save many lives, long-term physical and mental health rehabilitation for people with disabilities as a result of injuries is also needed. Few of these countries (including the developed nations) have integrated trauma care with mental health services, leaving patients with few resources to cope with the long-term aftereffects of their traumas. While physical treatment of injuries is poor, access to psychological support is even worse, as is long-term care, which usually is the burden of families in most countries. Mental health services are important not only for therapeutic care but also for preventive purposes. For example, it is extremely important to identify individuals at risk of self-inflicted harm and/or suicide after a natural disaster. However, such efforts should be fostered in Asian countries with some caveats (see chapter 6 for more discussion on mental health care). In resource-poor countries, where mental health and other relevant services are meager, identifying such high-risk individuals may only serve to increase frustration over the lack of services (Yip et al., 2008).

## ROAD TRAFFIC INJURIES

According to a WHO report, road traffic injuries kill over 1.2 million people per year, mostly in low-income and middle-income countries (Zarocostas, 2007). Roadways are often shared by "vulnerable road users"—pedestrians, cyclists, and drivers of motorized two- and three-wheeled vehicles—along with automobiles. Fast-moving automobiles are related to higher fatality

rates in road traffic injuries (WHO, 2004). Most of the nations in East and Southeast Asia have either a high percentage of motorized two- and three-wheeled vehicles on their roads or a greater variety and intensity of traffic components. The volume of traffic on Asian roads has increased considerably in recent years. In China, for example, car ownership increased 9-fold between 1985 and 2005, and there was a 54-fold increase in ownership of other types of vehicles. In Vietnam, the use of motorized vehicles increased from 105 per 1,000 population in 2001 to 193 by 2005, and 95% of motorized vehicles are motorcycles (Hoang et al., 2008; Hung et al., 2008a). Not surprisingly, road traffic deaths more than doubled in the 10 years between 1998 and 2007, from 6,000 to more than 12,000 (WHO, 2009), and nonfatal road traffic injuries were high, at 734 per 100,000 population in 2001. Over half of the nonfatal road traffic injuries were among motorcycles users (Hoang et al., 2008).

The high proportion of motorcycles in Asia makes road users particularly vulnerable. In Thailand, for example, motorcycle accidents are the major type of domestic traffic injuries, with roughly 80% of those injured being motorcyclists, half of whom receive head injuries (Ichikawa et al., 2003). Even in Singapore, where motorcycle use is quite low (at 19%), 36% of road accidents involve motorcycles, and roughly half of deaths and injuries on the roads involve motorcycle users.

As countries develop, vehicle ownership increases. As wealth continues to increase, vehicle ownership turns toward cars rather than motorcycles, and thus the profile of traffic injuries changes. Brunei, for example, is a wealthy Asian nation and has a very low rate of motorcycle ownership, with just 4% of vehicles being motorcycles. A major exception has been Taiwan, which has the highest motorcycle density in Asia: 14 million motorcycles for 23 million people. Not surprisingly, most transport accidents are motor vehicle accidents, and roughly 60% involve motorcycles (Department of Health, ROC, 2007).

Concurrent with development and the increase in vehicle ownership, the rates of road traffic accidents and related injuries increase. Thus, in the Philippines, for example, deaths due to motor vehicle crashes increased from 0.2% of all deaths in 1960 to 1.4% in 1999. During the same period, rates of motor vehicle ownership increased by 460%, and motor vehicle injury mortality increased from 4.5% to 15.4% of total mortality in 1995. Half of road deaths in Manila involve pedestrians (Consunji & Hyder, 2004).

Conversely, some countries have enjoyed a decline in the rate of traffic injuries in recent decades, largely owing to the introduction of relevant

laws (discussed in the next section). Japan and RO Korea, for instance, both enjoyed a continuous decline in the rate of road traffic injuries in the 1990s. Even Thailand and Malaysia, two of Asia's transition countries, are now enjoying declines in the rate of traffic accidents. Other trends in road traffic mortality and its victims are summarized in table 7.1.

Motorized vehicular traffic accidents not only result in serious deaths and psychological injuries but also lead to financial burdens. Statistics from Vietnam suggest that, on average, the direct costs of traumatic brain injuries caused by motorized vehicular traffic accidents total US\$2,364.7 for a severe case, US\$1,390.7 for a moderate case, and US\$849 for a minor case (Hoang et al., 2008).

### *Preventive Laws in Different Countries*

Motorized vehicular traffic injuries are generally caused by drivers' behavior, such as drunk driving, speeding, not wearing seat belts, and motorcycle riding without helmets. The importance of laws pertaining to these injuries has gradually increased in Asian countries. High-income nations, such as Singapore and Japan, were the first to enact relevant laws, in the early 1970s. Southeast Asian nations have lagged, somewhat, in terms of law enactment. For example, Vietnam did not introduce a motorcycle helmet use law until 2000, at first only on regulated roads and important highways. Helmets were not required on all roads until 2007. Understanding of the laws is limited, however, with one survey showing that 95% of respondents thought that helmets reduce the risk of head injury, yet most believed helmets were not necessary for short trips (Hung et al., 2008a).

Among the more serious of these laws is the regulation of driving under the influence of alcohol. In Japan in the 1990s, about 14–16% of drivers involved in fatal traffic accidents tested positive on blood-alcohol tests. New traffic laws were enacted in June 2002 that reduced the legal blood-alcohol concentration from 0.25 to 0.15 mg/L and the breath-alcohol concentration from 0.05% to 0.03%. Furthermore, fines for drunk driving were increased (Nagata et al., 2007). By 2004, alcohol use was implicated in 10% of deaths, less than 3% of serious injuries, and 1.9% of all injuries (Nagata et al., 2007).

Many countries have enacted motorcycle helmet use laws. For example, in Taiwan, which has the highest head injury incidence and mortality in Asia, head injury mortality is 21 per 100,000. This compares with 6.6 per 100,000 in Japan and 5.2 per 100,000 in Singapore, where motorcycle use is far less (Ministry of Transportation and Communications, ROC, 2005). Thus, Taiwan introduced compulsory helmet use in 1997, after which

TABLE 7.1 Trends in Road Traffic Mortality and Main Victims in Selected Countries

<i>Country (year)</i>	<i>Road traffic deaths</i>	<i>Main victims</i>
Brunei Darussalam (2007)	14 deaths per 100,000 and increasing	76% were passengers or drivers of 4-wheeled vehicles.
Cambodia (2007)	8-fold increase between 1999 and 2007 and rapidly increasing	63% were riders of 2- or 3-wheeled vehicles.
China (2006)	3-fold increase between 1992 and 2002, but now decreasing	>60% were vulnerable road users, including motorcyclists (28%), pedestrians (26%), and cyclists (9%).
Indonesia (2007)	<7 deaths per 100,000 and increasing	61% were riders of 2- or 3-wheeled vehicles.
Japan (2007)	5 deaths per 100,000 and decreasing	37% were users of 4-wheeled vehicles.
Malaysia (2007)	24 deaths per 100,000 but slightly decreasing	58% were riders of motorized 2- or 3-wheeled vehicles.
Mongolia (2007)	24 deaths per 100,000 and steady	65% were users of 4-wheeled vehicles.
Myanmar (2007)	3.6 deaths per 100,000 and slightly increasing	47% were users of 4-wheeled vehicles.
Philippines (2004, 2006)	0.2% in 1960 increasing to 1.4% in 1999	51% were pedestrians in metro Manila.
RO Korea (2007)	13 deaths per 100,000 and decreasing	37% were pedestrians, and 37% were users of 4-wheeled vehicles.
Singapore (2007)	<5 deaths per 100,000 and slightly decreasing	50.2% were motorcyclists, and 53.1% of all road traffic injuries were to motorcyclists.
Taiwan (2007)	31.1 deaths per 100,000 and decreasing	~60% were motorcyclists.
Thailand (2007)	20 deaths per 100,000 and slightly decreasing	70% were riders of motorized 2- or 3-wheeled vehicles.

SOURCES: For Philippines road traffic deaths—Consunji & Hyder, 2004; for Taiwan—Department of Health, ROC, 2007; for all others—WHO, 2009.  
 NOTE: Other middle- and low-income nations in Southeast Asia were not included because of insufficient data.

TABLE 7.2 Time of Enactment of Motor Vehicle Accident Prevention Laws in Taiwan

<i>Law</i>	<i>Time of enactment</i>
Helmet use law	June 1997
Drunk driving law	June 1999
Seat belt law	September 2001
Cellular phone prohibition	September 2001
Child car seat enforcement	September 2001

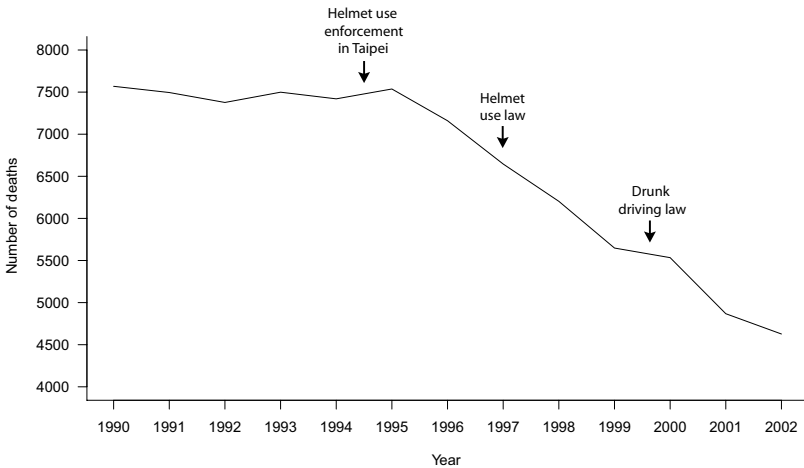


Figure 7.5. Traffic-injury deaths before enforcement of laws for helmet use and drunk driving in Taiwan. Source: Chiu et al., 2007.

related deaths were significantly reduced from 7,160 people in 1996 to 4,868 people in 2001 (Department of Health, ROC, 2002) (table 7.2; figure 7.5). Similarly, in Thailand, helmet use was made compulsory in December 1994, and within 2 years helmet use increased fivefold, head injuries decreased by 41.4%, head injury deaths were reduced by 20.8%, and the number of motorcyclist injuries was reduced by 33.5% (Ichikawa et al., 2003).

In many countries, the problem is not the absence of road traffic laws but rather their nonenforcement. In RO Korea, the impetus for stricter

enforcement of road traffic laws came from Fédération Internationale de Football Association (FIFA) prior to the 2002 World Cup. Estimates suggest that nearly 2,000 traffic accident deaths were avoided in 2001 because of these measures, and seat belt usage increased from 23% at the end of 2000 to 98% in August 2001 (Yang & Kim, 2003).

### *The Injury Epidemiology Transition in Southeast Asia*

The Global Road Safety Partnership, established in response to the growing importance of road crashes as a cause of death, has reported that traffic injury fatality rates are lower in highly motorized countries (i.e., Australia, New Zealand, and Japan and countries in North America and Western Europe) than they are in countries in Asia (Jacobs et al., 2000). Unlike the highly motorized countries, Asia has fatality rates that are expected to continue to increase (WHO, 2008b). This geographic discrepancy can most easily be explained by inadequate traffic injury prevention strategies, as discussed above.

Abdel Omran (2001) first used the concept of an epidemiologic transition to define the shifting pattern occurring in disease mortality. Infectious diseases, for example, had two points of transition globally. During the early 1900s, mortality due to infectious disease increased sharply. However, in the 1960s, mortality due to infectious disease declined because of improvements in hygiene, immunization programs, and widespread use of antibiotics. At the same time, because of rapid industrialization and motorization, there was an increase in injury deaths, resulting in a transition to traumatic injury as a major health problem. Following implementation of injury prevention strategies in the 1990s, there was a decrease in injury-related deaths.

Infectious diseases and traumatic injuries differ in etiology, but both describe a similar transition pattern. The first transition point for traffic injuries in Asian countries was in the 1980s, about 20 years later than in highly motorized countries. If no effective preventive strategies are implemented, the injury mortality rate will continue to increase. Taiwan provides an example of how preventive strategies can reduce fatality rates. Five strategies have been implemented in Taiwan in the past 10 years: a compulsory helmet use law (1997; Chiu et al., 2007), a drunk-driving law (2000), a seat belt law (2000), prohibition of cellular phone use while driving (2005), and a child car-seat law (2007). Enactment of these laws is the likely reason for Taiwan's substantial reduction in traffic injury deaths, from 7,313 before 1997 (annual average for 1987–1996) to 4,007 in 2007 (Department of Health, Executive Yuan, ROC, 2008). Motorcycle-related

injuries in particular were significantly reduced, by 33% between 1996 and 1998—the years before and after implementation of the helmet use law (Chiu et al., 2007).

Based on extrapolations by the WHO (2008b), global injury mortality will increase by 28% by 2030, predominantly because of increases in traffic accident fatalities. Asia is predicted to suffer the greatest proportions of global deaths and specifically traffic accident deaths. Using the evidence of injury prevention through legislation in Taiwan, we would like to highlight the importance of implementing strategies for injury prevention. This is especially crucial in Asia, where the burden of traffic-related fatalities is destined to increase significantly. Improved efforts at injury prevention are needed to bring about reductions in injury-related mortality.

### HOME INJURIES

Home injuries refer to all kinds of injuries that occur in a domestic environment, including falls, burns, poisonings, suffocation/choking, and drowning (CDC, 2008). Home injury victims are mainly elderly people and preschoolers—people who spend most of their time at home (Ministry of Transportation and Communications ROC, 2004). Among all injury deaths, home injury is the second leading cause, after traffic accidents (CDC, 2008; Department of Health, ROC, 2007; Forjuoh & Li, 1996).

Home injuries are common in East and Southeast Asia; however, they do not receive equal attention across countries. In high-income nations like Japan, Singapore, Taiwan, Hong Kong, and RO Korea, there are better public health programs, and there are therefore better safeguards for those at risk (people >65 years old and preschool children). In contrast, in some Southeast Asian nations where people have suffered from wars, famine, and serious infectious diseases (e.g., Laos, Myanmar, and Cambodia), falls and burns at home are neglected. In China, public health issues, including home injuries, have gradually attracted greater attention in accordance with rapid economic development in recent decades.

Children and the elderly are the most affected by home injuries. Studies in Thailand have indicated that 65–72% of children's injuries occurred at home. Animal bites, puncture wounds, burns, near drownings, and falls were the leading causes of nonfatal injuries in Thai school-age children (Junnanond et al., 1993; Kozik et al., 1999). In China, a high proportion of hospitalized patients with burn injuries were children; in particular, males age 3 years or less who spend most of their time indoors are most susceptible (Lv et al., 2008).



For the elderly, falls are an important cause of injury. In Taiwan, the department of health in 2007 identified falls as the second leading cause of injury deaths (mortality is 5 per 100,000 population), with people over 65 years most at risk (Department of Health, ROC, 2007). Moreover, injuries and deaths from falls increase with age (Lin & Wang, 2004; Liu et al., 2009), a trend that was also observed in Japan, where the overall prevalence of falls was 21.1% (Morita et al., 2005). Falls are more common among those living in aged-care facilities (20–35%) than among those living in the community (10–25%) and are more common in women than in men (Yasumura & Kanari, 2003). These trends have also been observed in Thailand. Besides physical conditions, walking in the house and lack of electricity in the house were important factors independently associated with falls among the elderly (Jitapunkul et al., 1998).

Poisonings should draw more attention in agricultural countries such as Thailand, Vietnam, and the Philippines, where farmers are frequently exposed to pesticides without adequate protection (Palis et al., 2006). Children are also at high risk of poisoning in these environments. A report from Thailand for 2001–2004 suggested that pesticides, household products, and pharmaceutical products were the most common poisons, and children age 0–6 had the highest rate of exposure, at 33 per 100,000, followed by teenagers (24.5 per 100,000) and adults (10.5 per 100,000). An investigation conducted by the Poison Control Center in Hanoi, Vietnam, indicated that from 1999 to 2003, there were 1,836 emergency cases of poisoning admitted to the center (Wananukul et al., 2007). Most were in young people, age 15–24 years, and the vast majority of poison exposures (74.1%) occurred at home. Intentional poisonings accounted for one-third of all poisoning emergency cases (Hung et al., 2008b). While most exposures in young people were unintentional, intended suicide was the major reason for poison exposure in adults (Wananukul et al., 2007). According to 1995–1999 suicide estimates in China, the suicide rate was higher among women (25.6 per 100,000) than among men (20.7 per 100,000) and highest in rural areas (Phillips, Li & Zhang, 2002), where pesticides were readily available and were used in more than 60% of cases (Phillips, Zhang et al., 2002). Countries are slowly introducing laws governing the sale of certain poisons. Owing to cultural influences, stigmatization of the mentally ill, socioeconomic factors, and competing priorities, suicide has received relatively little attention and suicide prevention efforts have been limited in Asian countries (Yip et al., 2008; see chapter 6 for more discussion on suicide in Asia).

## WAR / CIVIL UNREST AND POSTCONFLICT INJURIES

*Unexploded Ordnance and Increased Access to Weapons*

Many nations in Southeast Asia have suffered from war and civil unrest in recent decades. In northeastern Laos, northern Thailand / eastern Myanmar, northwest Cambodia, Vietnam, and Timor-Leste, war continued until recently. Long-term military tension has resulted in a crisis of land mines and unexploded ordnance (UXO). Mortality due to land mines or UXO has ranged from 0.5 to 3.1 per 100,000 (Andersson et al., 1995; Durham et al., 2005; Zarocostas, 2007). The UN and many international organizations are committed to preventing injuries from land mines or UXO and casualties from terrorist attacks.

An investigation in the west of Myanmar and the border of Thailand indicated that land mines and UXO were major causes of injuries among local residents (Mullany et al., 2007; Richard et al., 2009). According to an investigation in 2006, land mines or other remains of wars have resulted in 1,367 deaths and 4,296 injuries in 68 nations around the world. Three quarters of the victims have been civilians, with up to one-third children. Children constitute a relatively high percentage of the victims of war injuries in Southeast Asia: 44% of people injured by UXO in Vietnam and 41% in Laos (Zarocostas, 2007). A report on land mine victims in 2007 indicated that there were 450 cases in Cambodia and 243 in Myanmar (Zarocostas, 2007). In Laos, even 22 years after the end of the war, there is still, on average, one injury or death caused by UXO every other day (Morikawa et al., 1998).

Land mine and UXO injuries tend to result in long-term medical and physical burdens (Zarocostas, 2007). Moreover, the subsequent financial burden seriously affects the social and daily lives of the victims and their families (Durham et al., 2005). Land mines and unexploded ordnance are also environmental pollutants in these agricultural regions. The chemicals pollute the soil and subsequently the water table and indirectly result in infectious diseases by compromising immunity and nutrition (Durham et al., 2005).

Foreign governments and international organizations have supported prevention programs in affected countries. The main strategies include elimination of the land mines and UXO in the conflict or polluted regions and health education for the residents in these regions. With regard to the first strategy, many international organizations, such as the UN and NGOs, have provided resources and manpower to execute the plan, and

many researchers have worked to develop technology for land mine elimination. The UN has published guidelines for education on land mines and UXO. These include information on how to recognize explosive ordnance and areas likely to be contaminated, recommendations for safe behavior in contaminated environments, and emergency procedures to follow in the event of finding oneself in a minefield or in case of an explosion (UNMAS, 2009). However, despite these efforts, reaching the farmers can be challenging. In Laos, for example, although the government followed guidelines to set up the national mine risk education program, farmers in communities with high levels of contamination continued to place themselves at risk during farming and household practices. Safer farming practices were often perceived as impractical and too time-consuming. Those who had not yet experienced negative outcomes did not perceive themselves to be at risk. In addition, food insecurity, increased cash needs, and access to the scrap metal market drove them to take the chance to dismantle the ordnance, despite the risks. Therefore, cultural, political, and economic barriers need to be considered when designing effective risk-reduction education programs. Community involvement is vital in the development of education for prevention of land mine or UXO injuries, and the role and function of community liaison in mine action should be further developed and strengthened (Durham et al., 2005). Some scholars have suggested that in order to maximize the effect of preventive actions, educational programs should target news reporters, local celebrities, and tourists in addition to the army and local residents (GICHD, 2003).

### *Terrorism*

Some of the islands of the Philippines and Indonesia, as well as Timor-Leste, southern Thailand / northern Malaysia, and western China, have experienced civil unrest and terrorist activity in recent years. The south of Thailand and Indonesia are among the regions most at risk of terrorist attacks in Southeast Asia. In recent years, serious terrorist attacks have occurred in several locales, including Bali, Jakarta, and Phuket. Between 1997 and 2002, Indonesia experienced roughly 90 terrorist attacks. On 13 of these occasions (14.4%) the bombs did not explode. The attacks targeted either capital cities, such as Jakarta, or tourist spots, like Bali, where there were likely to be crowds. Therefore, the government of Indonesia has developed prehospital emergency medical services and has implemented these services in 18 cities to be able to provide proper medical care to the casualties of large-scale disasters, riots, or terrorist attacks (Pusponegoro,

2003). On the alert for terrorist attack, Indonesia's neighbors Malaysia, Singapore, and Thailand have also constructed an antiterrorism alliance with the UN and the United States to enhance local defense and patient transportation (Abul Aziz, 2003).

## CONCLUSIONS

Injuries are a major public health problem to which Asian countries, whether low-income or economically more advanced nations, should pay more attention. Motor vehicle accidents, especially those involving two- or three-wheel motor vehicles, are among the leading causes of injury deaths. Preventive measures, including compulsory laws, should be expanded to cope with increases in motorized vehicular traffic. While people of all ages can be the victims of traffic accidents, elderly and very young people are more vulnerable to injuries in the home. Because hazards are often hidden and because of their reduced ability to protect themselves, the elderly and young children need multiple strategies to prevent home injuries. Poisons are a particular danger to children, who may be accidentally exposed. Exposure to poison in adults, on the other hand, is often related to intended suicide, and suicide prevention should be strengthened in Asian countries.

Some injury prevention strategies cannot rely on national efforts alone. They require the help of international agencies like the UN as well as foreign government assistance. UXO and increased access to weapons in Southeast Asia have led to the loss of numerous innocent lives and to permanent disabilities. Terrorism threats and natural disasters have also traumatized Asian countries. There is a need for neighboring countries to construct alliances and to seek assistance from international organizations and other governments to reduce these kinds of casualties.

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# 8 Environmental Issues in East and Southeast Asia

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Environmental factors are important determinants of human health. There have been significant improvements in access to safe water, the coverage of piped water, and sanitation facilities in East and Southeast Asia in recent decades, leading to reductions in waterborne diseases. However, significant urban-rural disparities exist, particularly in developing countries. Furthermore, severe contamination of drinking water and pollution of rivers, seas, and oceans has had detrimental effects on food chain safety and public health. Rapid economic and population growth and industrialization have coincided with striking increases in total energy use and with consequent outdoor air pollution and respiratory illnesses. In addition, the use of solid fuel contributes to serious indoor air pollution. The countries in this region need to address the health impact of their development policies, to strength public awareness and education, and to enforce relevant regulations.

## INTRODUCTION

The term *environment* can be broadly defined as “all that which is external to the human host” (Last, 2001). According to this epidemiological definition, all nongenetic aspects, including physical, biological, natural, social, and behavioral, can be included in the environment as a whole. However, in this chapter we use the more practical definition given by the WHO: “The environment is all the physical, chemical and biological factors external to a person, and all related behaviors” (WHO, n.d.). Genetics, behavior not related to the environment, and behavior related to social and cultural environments are not included (Prüss-Üstün & Corvalán, 2006). According to this definition, the components of the environment that may



## BOX 8.1 Modifiable Components of the Environment

### *Chemical*

- Heavy metals
- Organic solvents
- Agricultural chemicals
- Industrial emissions
- Chlorinated organic compounds

### *Biological*

- Viruses
- Bacteria
- Fungi
- Parasites
- Arthropods
- Animal and plant toxins

### *Physical*

- UV and ionizing radiation
- Noise, microwave, and electromagnetic fields

### *Behavior related to availability of safe water and sanitation facilities*

- Hand washing

### *Social aspects*

- Housing
- Water supply systems
- Sewage and waste disposal
- Agricultural methods and irrigation schemes
- Occupational risk

cause disease include the pollution of air, water, and soil with chemical or biological agents; human schemes including housing, water supply, land usage, agricultural methods, irrigation, or sewage and waste disposal; UV and ionizing radiation; electromagnetic fields; noise and vibration; and occupational risks or behavior related to the availability of safe water and sanitation facilities (box 8.1). These factors are modifiable and readily amenable to change by intervention.

Approximately 25% of all deaths in developing countries and 17% of all deaths in developed regions have been attributed to environmental factors. The disease burden can also be estimated in terms of disability-adjusted life years (DALYs), a weighted measure of death, illness, and disability. Nearly one-fourth of the disease burden estimated using DALYs can be attributed to the environment. Among children under 14 years, 36% of premature deaths could be prevented by making the environment healthier. Globally, more than 10% of deaths are due to two environmental factors: unsafe water, including poor sanitation and hygiene, and air pollution. Related diseases, such as pneumonia and diarrhea, account for up to 70% of deaths in children under 5 years in the developing countries of East and Southeast Asia.

To improve understanding of the current environmental problems in East and Southeast Asia and to offer suitable strategies for environmental improvement, this chapter reviews the updated estimation of the amount of disease attributable to the environment, the current levels of exposure, the management of risk factors, and the goals for disease control and exposure reduction in East and Southeast Asia.

#### ACCESS TO SAFE WATER

Slightly more than 90% of all waterborne diseases are attributable to unsafe drinking water and poor water resource management. The diseases are caused by diarrhea-causing agents, malnutrition related to unsafe water, and vector-borne diseases, such as malaria, dengue, and Japanese encephalitis. Better management of water resources to reduce vector-borne diseases can save many lives and has extensive economic benefits. For example, the WHO estimated that a safe water supply could prevent 1.4 million child deaths worldwide from diarrhea alone. Table 8.1 shows waterborne diseases, their endemic areas, and the estimated numbers of affected people worldwide. As seen in the table, diarrhea-causing agents, hepatitis A virus, and several contaminants such as arsenic and fluoride are causes of waterborne diseases in East and Southeast Asia. According to the WHO,

TABLE 8.1 Waterborne Diseases and Numbers of People Affected

<i>Disease</i>	<i>Estimated numbers of people affected</i>	<i>Endemic area</i>	<i>Major environmental cause</i>	<i>Environmental fraction (%)</i>
Diarrhea	1.8 million cases, 90% in children <5	Most developing countries	Unsafe water supply, inadequate sanitation and hygiene	94
Malnutrition	860,000 deaths related to unsafe water and poor hygiene	Most developing countries	Unsafe water supply, inadequate sanitation and hygiene associated with diarrhea and nematode infection	...
Malaria	1.3 million malaria deaths each year, 90% in children <5	Sub-Saharan Africa, Asia, South America	Intensified irrigation, dam projects	40
Intestinal nematode infection	2 billion infections	Sub-Saharan Africa	Feces-contaminated soil, inadequate sanitation and hygiene	100
Schistosomiasis	160 million	Sub-Saharan Africa	Man-made reservoirs, poorly designed irrigation schemes	100
Trachoma	500 million affected, 146 million at risk for blindness	...	Unsafe water supply, lack of face washing	100
Japanese encephalitis	...	South, Southeast, and East Asia	Poorly designed irrigation schemes	95
Dengue	...	Southeast and East Asia	Poorly designed irrigation schemes	95
Hepatitis A	1.5 million clinical cases	Most developing countries	Unsafe water supply	...
Arsenic-caused illnesses	>35 million	Argentina, Bangladesh, Chile, China, India, Mexico, Taiwan, Thailand, and USA	Usage of arsenic-containing well water	...
Fluorosis	>26 million in China	China	Use of fluoride-containing well water	...

SOURCES: WHO/UNICEF, 2008; WHO, 2011.

in 2004 there were about 147,724 deaths caused by diarrhea, 8,926 deaths by malnutrition, 5,826 deaths by malaria, and 4,401 deaths by dengue, Japanese encephalitis, and parasitic infections, including schistosomiasis, lymphatic filariasis, trachoma, and intestinal nematode infections, among children under 5. Figure 8.1 shows the numbers of deaths from waterborne diseases in the region (WHO, 2009a). Clearly, the mortality rates of these waterborne diseases are much greater in Southeast Asia than in East Asia.

The Millennium Development Goal (MDG) targeting water safety aims to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (UN, 2005). The WHO classifies drinking water supplies according to a three-category ladder: “unimproved,” “other improved,” and “piped into dwelling, plot or yard” (figure 8.2) (WHO/UNICEF, 2008). Improved drinking water sources include sources that, by nature of their construction or through active intervention, are protected from outside contamination, particularly fecal matter. Unimproved drinking water sources include unprotected dug wells or springs, carts with small tanks/drums, tanker trucks, surface water, and bottled water. “Other improved” drinking water sources include public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection. The WHO estimated in 2006 that 87% of the world’s population uses drinking water from improved sources: 54% uses piped water and 33% uses other improved water sources. More than half of the world’s households have a piped water system in the home or nearby. The total population without improved drinking water sources is about 884 million (13%), half of whom live in Asia. In East Asia (excluding Japan), 88% of the population uses improved drinking water, including 73% who use piped water (see figure 8.2). However, 162 million people cannot access safe drinking water. In Southeast Asia, 86% of the population uses improved drinking water, including 32% who use piped water. The coverage of piped water sources in this area is lower than the average coverage level of developing regions (46%; only sub-Saharan Africa and Southern Asia have poorer coverage). However, in absolute numbers, about 78 million people cannot access improved drinking water, which is fewer than in East Asia. Progress has been made, however, and as can be seen in figure 8.2, between 1990 and 2006 the proportion of people with piped water increased by 22% and 16% in East and Southeast Asia, respectively. Access to other improved drinking water sources also improved.

The urban-rural disparities of safe water coverage are also great challenges for the developing countries in East and Southeast Asia. Table 8.2 summarizes the country-specific coverage of safe water in East and Southeast

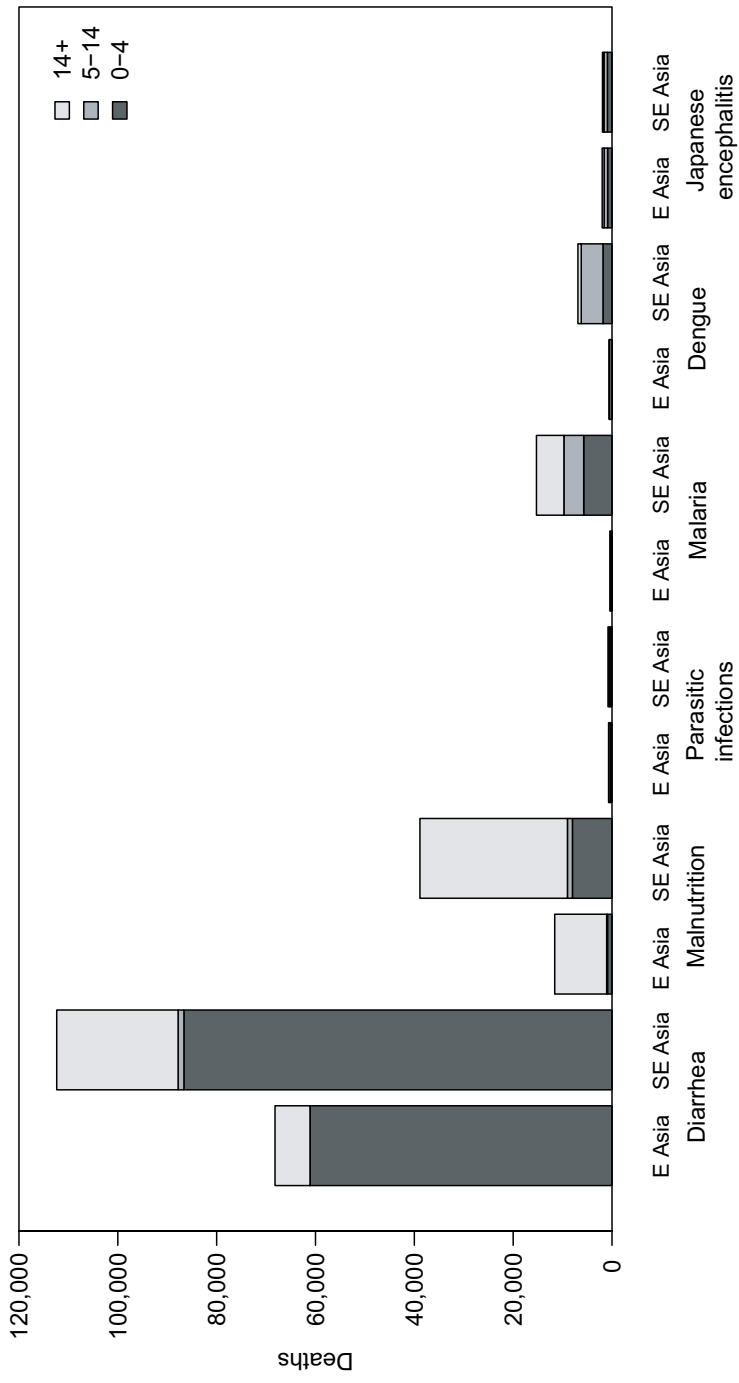


Figure 8.1. Numbers of deaths from waterborne diseases in East (E) Asia and Southeast (SE) Asia, by age group. Parasitic infections include intestinal nematode infection, trachoma, schistosomiasis, and lymphatic filariasis. Source: WHO, 2009a.

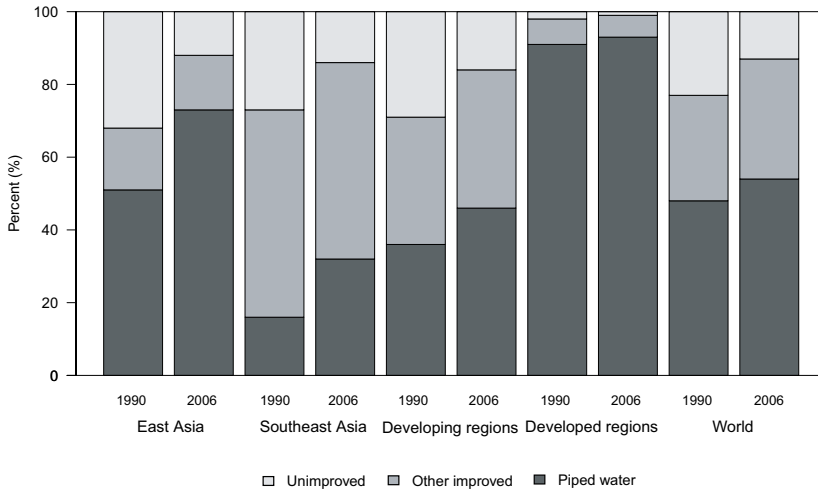


Figure 8.2. Drinking-water coverage by a three-step ladder in East Asia, Southeast Asia, developing regions, developed regions, and the world. The MDGs refer to the following regions: East Asia (China, Hong Kong, Macao, DPR Korea, RO Korea, Mongolia); Southeast Asia (Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Vietnam); developing regions (eastern, southern, southeastern, and western Asia; Latin America; Caribbean; northern and sub-Saharan Africa; Oceania). Source: WHO/UNICEF, 2008.

Asia (WHO, 2010). In both East and Southeast Asia, urban residents are more likely than rural residents to have improved drinking water sources, and these disparities are greater in Southeast Asia. However, between 1990 and 2008, impressive improvements in the percentage of people without safe drinking water were made in rural Asia. Overall, there was a 16% reduction in the number of people in rural areas without safe drinking water, translating into an increase of more than 131 million people who can now access improved drinking water. Vietnam has made the most impressive progress, increasing coverage in rural areas by more than 40% since 1990. Although coverage has increased in Mongolia, Laos, and Cambodia, these countries are able to provide improved water to only half their rural populations.

In urban areas, the coverage of safe drinking water is struggling to keep pace with the population growth. Since 1990, the urban population in East and Southeast Asia has risen by 345 million people, and 335 million urban inhabitants gained access to improved drinking water. However, in some cases the percent coverage actually decreased between 1990 and 2008 (e.g., Indonesia, Myanmar).

TABLE 8.2 Rural and Urban Improved Water Supply and Sanitation Coverage

	<i>Total population (1,000s)</i>		<i>Urban population %</i>	
	1990	2008	1990	2008
<b>East Asia</b>				
China	1,149,069	1,344,920	28	43
DPR Korea	20,143	23,819	58	63
RO Korea	42,869	48,152	74	81
Japan	123,537	127,293.0	63	66
Mongolia	2,216	2,641	50	70
<b>Southeast Asia</b>				
Brunei Darussalam	257	392	66	75
Cambodia	9,698	14,562	13	22
Indonesia	182,847	227,345	31	52
Laos	4,076	6,205	63	66
Malaysia	18,103	27,014	15	31
Myanmar	40,147	49,563	57	57
Philippines	61,226	90,348	49	65
Singapore	3,016	4,615	100	100
Thailand	54,291	67,38	29	33
Timor-Leste	740	1,098	21	27
Vietnam	66,173	87,096	20	28

SOURCE: WHO/UNICEF, 2008; WHO, 2010

<i>Population using improved drinking water sources (%)</i>						<i>Population using improved sanitation (%)</i>					
<i>Urban</i>			<i>Rural</i>			<i>Urban</i>			<i>Rural</i>		
1990	2008	% change	1990	2008	% change	1990	2008	% change	1990	2008	% change
97	98	1	56	82	26	48	58	10	38	52	14
100	100	0	100	100	0	...	...	...	...	...	...
97	100	3	...	88	...	100	100	0	100	100	0
100	100	0	100	100	0	100	100	0	100	100	0
81	97	16	27	49	22	...	64	...	...	32	...
...	...	...	...	...	...	...	...	...	...	...	...
52	81	29	33	56	23	38	67	29	5	18	13
92	89	-3	62	71	9	58	67	9	22	36	14
...	72	...	...	51	...	...	86	...	...	38	...
94	100	6	82	99	17	88	96	8	81	95	14
87	75	-12	47	69	22	...	86	...	...	79	...
93	93	0	76	87	11	70	80	10	46	69	23
100	100	0	...	...	...	99	100	1	...	...	...
97	99	2	89	98	9	93	95	2	74	96	22
...	86	...	...	63	...	...	76	...	...	40	...
88	99	11	51	92	41	61	94	33	29	67	38



According to the WHO drinking water report, all countries in East Asia and Southeast Asia were on track to meet the MDG target in 2006.

### *Sanitation*

Sanitation is also an important environmental issue and a main indicator of a healthy environment. The quality of sanitation can be represented by four main categories: open defecation, unimproved sanitation facilities, shared sanitation facilities, and improved sanitation facilities. Improved sanitation facilities are defined as facilities that ensure a hygienic separation of human excreta from human contact. These facilities include flush or pour-flush toilets/latrines connected to piped sewer systems, septic tanks, or pit latrines; ventilated improved pit latrines; pit latrines with slab; and composting toilets. In 2006, more than 2.5 billion people worldwide did not have access to improved sanitation facilities (WHO/UNICEF, 2008). More than 70% of these, almost 1.8 billion people, are in Asia. More specifically, there are about 485 million people in East Asia and 187 million people in Southeast Asia without access to improved sanitation (WHO/UNICEF, 2008). Figure 8.3 shows trends in sanitation coverage, according to a four-step ladder, in East Asia, Southeast Asia, developing regions, and the world. Globally, the proportion of people with improved sanitation increased from 54% in 1990 to 62% in 2006. In Southeast Asia, the proportion of people with improved sanitation increased by roughly 10%, and there were declines in open defecation and unimproved sanitation of 9% and 10%, respectively. In East Asia, the proportion of people with improved sanitation increased from 48% in 1990 to 65% in 2006, while unimproved sanitation decreased by 19%. The rate of improvements in sanitation in Asia is higher than the average for developing regions (12%).

Japan, RO Korea, and Singapore reached 100% coverage by improved sanitation before 1990 (table 8.2) (WHO, 2010). By 2008, improvements in sanitation coverage were seen in both rural and urban areas in all other countries, with an additional 350 million urban dwellers and 82 million rural dwellers having access to improved sanitation. Vietnam experienced the greatest improvements in sanitation coverage (40% overall). Sanitation coverage was lowest in China, Mongolia, Cambodia, Indonesia, Laos, and Timor-Leste, and for most of these countries substantial rural-urban disparities exist. In these countries, urban sanitation coverage has risen to as high as 86% (in Laos), while rural coverage is as low as 18% (in Cambodia).

According to the WHO sanitation report, most countries in East and Southeast Asia were on track to meet the MDG sanitation target in 2006. In the developing regions, Myanmar, the Philippines, and Vietnam had

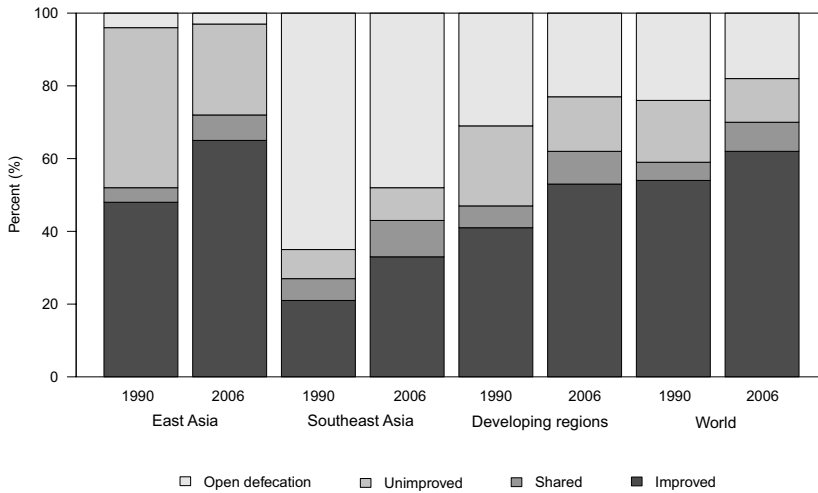


Figure 8.3. Sanitation coverage by a four-step ladder in East Asia, Southeast Asia, developing regions, and the world (see figure 8.2 for definition of regions). Source: WHO/UNICEF, 2008.

the largest proportions of population gaining access to improved sanitation between 1990 and 2006. Mongolia, Indonesia, and Timor-Leste fell short of the expected MDG target by 10%.

### *Contamination of the Food Chain*

In addition to severely contaminating drinking water, pollution has contaminated rivers, seas, and oceans, and this has detrimental indirect effects on the health of people living in Southeast and, particularly, East Asia. The Yellow Sea, for example, has been listed by Worldwatch as one of the world's most polluted seas since 1995. Rapid economic growth and coastal development in China, DPR Korea, and RO Korea, as well as increased marine traffic in the region, have contributed to a drastic increase in pollutants, with subsequent reduction in marine diversity and increase in the frequency and severity of red tides—harmful algal blooms that contain toxic or otherwise harmful plankton and that lead to massive mortality of marine life and contamination of the food chain (UNDP/GEF, 2008). The chief pollutants are nutrients, such as inorganic nitrogen and active phosphate, which may cause algal blooms; organic compounds (mainly oils); and heavy metals, such as mercury, lead, cadmium, and arsenic, which can cause a range of health conditions in humans, including developmental disabilities in children, poisoning, skin lesions, and various cancers. A range

of persistent organic pollutants, many of which are carcinogenic, are also found in the Yellow Sea's fish and shellfish. In addition, overfishing has led to a depletion of fish stocks, which could ultimately affect food security.

Freshwater supplies are also heavily polluted with organic pollutants and heavy metals in Asia. The Pasig River in Manila, for example, is considered unfit for *any* purpose, and it may take 15 years to get the river back to a condition in which it would be able to sustain life (AusAID, 2009). Not only is such severely polluted water directly harmful to the people who come into contact with it, but it threatens the food supply by reducing the availability of water for irrigation as well as by depleting fish stocks.

Governments in the region have been working together to contain pollution in their shared waterways. RO Korea, DPR Korea, and China, for example, have recently agreed on efforts to reduce fishing activities and pollution in the Yellow Sea as part of the Large Marine Ecosystem project. The Mekong River Commission also endeavors to monitor water quality in the countries bordering that river. However, further efforts and government enforcement of these kinds of treaties is urgently needed.

## AIR POLLUTION

Rapid economic growth and industrialization has occurred in the developing countries in Asia in recent years, bringing many people from rural areas to the cities (see chapter 2). As a result, the number of urban inhabitants in East and Southeast Asia increased from 572 million to 933 million between 1990 and 2006 and is still increasing by an average of 4% per year. As the population and economy grows, there has been increased demand for energy, housing, employment, resources, and transport. With increasing industrialization and urbanization, air pollution has become a more serious problem in developing Asia. During the period 1980–2007, a four- to sevenfold growth in total energy use occurred in most countries in East and Southeast Asia, except Japan (EIA, 2009). Rapidly growing coal use is also occurring in the developing countries in Asia. China is ranked as the highest consumer of coal in the world, with an annual consumption of 2.8 million tons in 2007. Motor vehicle use has also increased. In developing countries the number of motor vehicles grew two- to threefold between the mid 1990s and the mid 2000s. In China alone, more than 18 million motor vehicles were registered in 2009, up from 8 million in 2007 (China Automotive Review, 2011). The rapid rate of motorization is expected to continue into the next few decades in these countries.

Table 8.3 shows the major sources of air pollutants and their impact on health. In addition to these health hazards, air pollution causes poor visibility, transport disruption, climate change and global warming, vegetation degradation, damage to wildlife habitats, reduced biodiversity, and overall ecological retrogression. The main source of outdoor air pollution in most Asian cities is vehicle emissions that include sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), and particulate matter (PM). Power stations, major industries, waste incineration, and the combustion of coal, kerosene, and biofuels are also among the sources of outdoor air pollution.

In Southeast Asia, seasonal forest fires also cause severe outdoor air pollution, producing large quantities of particulates, smoke, and haze and hundreds of millions of tons of carbon dioxide (CO<sub>2</sub>). The forest fires in Indonesia from 1997 to 1998 were started in order to clear the land for agriculture, but their mismanagement led to more than 70 million people in Indonesia, Malaysia, Brunei, the Philippines, and Singapore being affected by air pollution that moved into their countries. During this period, more than 40,000 persons were hospitalized for respiratory and haze-related ailments (Qudri, 2001). In Indonesia, health officials estimated that 20 million people suffered from health problems because of the fires. In Singapore, there was a 30% increase in outpatient attendance owing to increased incidence of upper respiratory tract illness, asthma, and rhinitis. The regional Haze Action Plan was developed in Southeast Asia to respond to the many hazards of forest fires.

Asian dust, also called yellow wind, yellow sand, or China dust, is a natural phenomenon that occurs in East Asia sporadically during the springtime. The dust originates from the deserts as a result of high-speed surface winds in Mongolia, Kazakhstan, and northern China. The intense dust storms with fine soil particles also contain sulfur, soot, ash, CO, viruses, bacteria, microorganisms, heavy metals, and other toxic pollutants that are then carried eastward, affecting China, DPR Korea, RO Korea, Japan, and Taiwan. The storms, especially those containing sulfur emissions, can reduce visibility and are harmful to agricultural crops, wildlife, and their natural habitats. Rapid population growth and unsustainable human activities, such as land overuse and deforestation due to overlogging or overgrazing, have intensified and will continue to intensify the rate of desertification and will increase the frequency and severity of these Asian dust storms. According to a NASA report, before 1949 a sand storm occurred once every 31 years in northwestern China. After 1990, the frequency increased significantly, with an average of one storm occurring

TABLE 8.3 Major Sources of Air Pollutants and Health Impacts

<i>Pollutant</i>	<i>Major sources</i>
<i>Outdoor air pollutants</i>	
Particulate matter (PM)	Motor vehicles
PM <sub>10</sub> (< 10 µm in aerodynamic diameter)	Power plants
TSP (total suspended PM)	Fossil fuel combustion
Sulfur dioxide (SO <sub>2</sub> )	Waste incineration
Nitrogen dioxide (NO <sub>2</sub> )	Forest fires
Carbon monoxide (CO)	Sandstorms
Ozone (O <sub>3</sub> )	Reactions of NO <sub>x</sub> and other volatile organic compounds in the atmosphere
<i>Indoor air pollutants</i>	
Fine particles	Fuel or tobacco combustion
Carbon monoxide (CO)	Remodeling or demolition of construction materials
Polycyclic aromatic hydrocarbons (PAHs)	Consumer products
Nitrates (NO <sub>x</sub> )	Cleaning
Sulfates (SO <sub>x</sub> )	Cooking
Arsenic and fluoride	Furnishings
Volatile & semivolatile organic compounds	
Aldehydes	
Pesticides	
Asbestos	
Lead	
Biological pollutants	
Radon	

## *Health impacts*

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### Effects related to short-term exposure

- Lung inflammatory reactions
- Adverse effects on the cardiovascular system
- Bronchoconstriction in asthma patients
- Increased daily mortality and hospital admissions from respiratory and cardiovascular disease

### Effects related to long-term exposure

- Asthma exacerbation
  - Increase in lower respiratory symptoms
  - Reduction in lung function
  - Increase in chronic obstructive pulmonary disease
  - Reduction in life expectancy, owing mainly to cardiopulmonary mortality and probably lung cancer
- 

### With evidence from 10–20 studies

- Acute lower respiratory infections (children < 5 yrs)
- Chronic obstructive pulmonary disease (adults)
- Lung cancer (coal)

### With evidence from several consistent studies

- Tuberculosis
- Cataracts
- Upper airway cancer
- Asthma

### With evidence from very few studies

- Low birth weight
  - Perinatal mortality
  - Otitis media
-

each year, but more recently this has jumped to four to five storms per year (NASA, 2006).

Four major criteria are used to measure and estimate urban air quality: particulate matter smaller than  $10\mu\text{m}$  in aerodynamic diameter ( $\text{PM}_{10}$ ), total suspended particulates (TSP),  $\text{SO}_2$ , and  $\text{NO}_2$ .  $\text{PM}_{10}$  can be inhaled to deep within the respiratory system and has more adverse health effects than larger particles. WHO has set  $\text{PM}_{10}$  guidelines at  $20\mu\text{g}/\text{m}^3$ , since several epidemiological studies have shown that the all-cause mortality due to cardiopulmonary or lung cancer is substantially increased at levels above  $20\mu\text{g}/\text{m}^3$ . WHO guidelines for TSP,  $\text{SO}_2$ , and  $\text{NO}_2$  are 90, 50, and  $40\mu\text{g}/\text{m}^3$ , respectively (CAI, 2008a). In recent years, the trends of aggregate levels of these four categories of pollutants have declined slowly but steadily in Asian cities. The level of TSP declined from  $340\mu\text{g}/\text{m}^3$  in 1993 to  $200\mu\text{g}/\text{m}^3$  in 2006.  $\text{SO}_2$  declined from  $100\mu\text{g}/\text{m}^3$  to  $45\mu\text{g}/\text{m}^3$  during the same period, showing that this problem has been well controlled in most Asian cities.  $\text{NO}_2$  levels changed little during this period and remained just above the WHO's recommended maximum (CAI, 2007).  $\text{PM}_{10}$  levels also remained steady but are far above recommended levels. High levels of  $\text{PM}_{10}$  are a major concern in Asian cities (CAI, 2008a; CAI, 2008b). As seen in figure 8.4, high levels of TSP have been observed in Hanoi, Jakarta, Ulaanbaatar, Manila, and Shanghai. The  $\text{PM}_{10}$  levels of almost all cities do not meet WHO recommended levels. The highest levels of  $\text{PM}_{10}$  occur in China, DPR Korea, Indonesia, and Thailand (WHO, 2009b). On the other hand, the levels of  $\text{SO}_2$  and  $\text{NO}_2$  in almost all cities are well controlled and comply with the WHO guidelines.

Although there is no direct health effect of  $\text{CO}_2$ , concerns have grown in recent years because of its effect on global warming. Compared with North America and Europe,  $\text{CO}_2$  per capita is relatively low in East and Southeast Asia. However, the growth rate of  $\text{CO}_2$  emissions in developing Asia is substantially higher. The growth rate in China and Vietnam is about 10%, much higher than the 2% observed in Europe and North America during the 6-year period from 2000 to 2005. Because of its large population and rapid economic growth, China now ranks highest in the world for total  $\text{CO}_2$  emissions, with recordings as high as 6,018 million metric tons in 2006, accounting for 20% of global emissions. The amount of emissions is expected to continue to increase until 2030. Better control of  $\text{CO}_2$  emissions in East Asia, especially in China, will be a significant challenge, especially as global warming becomes an increasingly important issue worldwide.

Several hundred epidemiological studies have been conducted in Asia to

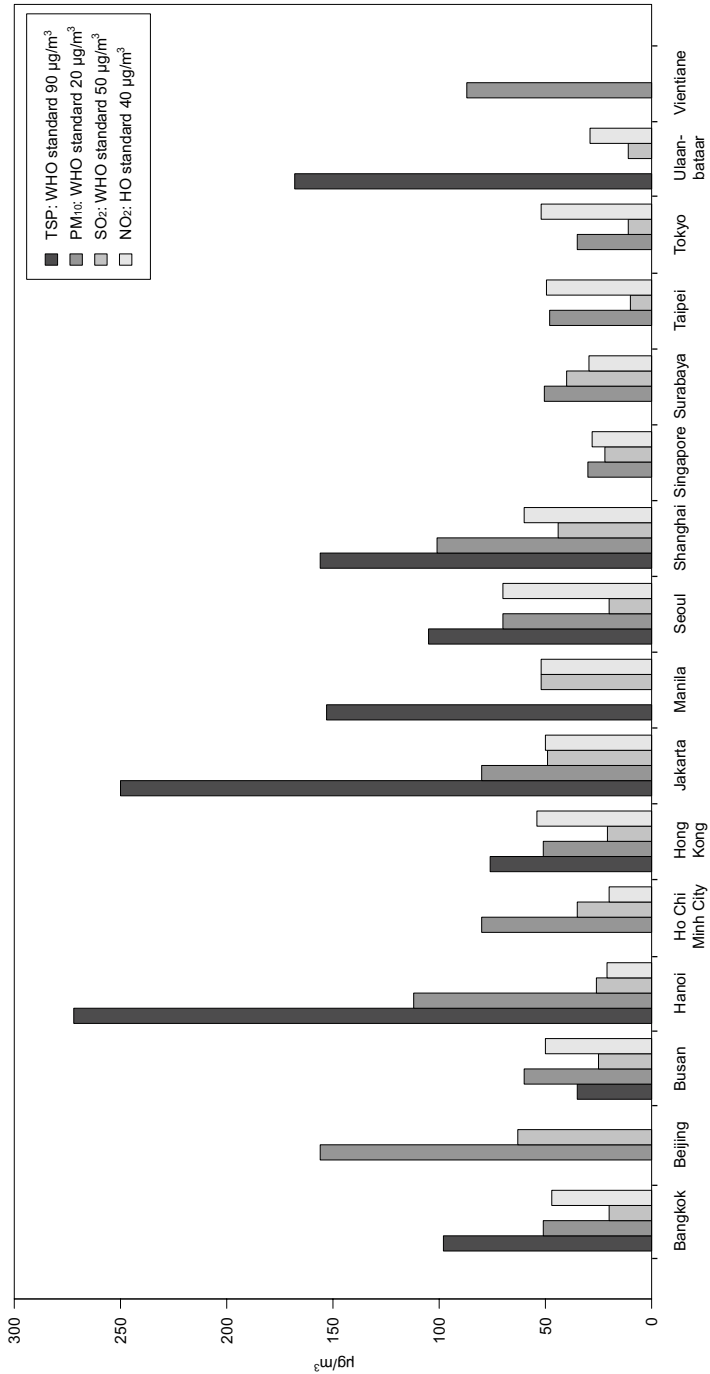


Figure 8.4. Average annual air pollution concentrations (2000–2004) in selected cities. Source: ADB & CAI, 2006.



estimate the health effects of outdoor air pollution. Most of these studies have been conducted in East Asia, including China, Hong Kong, Japan, RO Korea, and Taiwan. Data have been collected on all-cause mortality; hospital admissions; lung function; respiratory symptoms, including acute lower respiratory infection (ALRI), asthma, lung cancer, and chronic obstructive pulmonary disease (COPD); and reproductive outcomes. The Public Health and Air Pollution in Asia program, which is part of the Clean Air Initiative for Asian Cities, undertook a systematic review of the epidemiological studies on air pollution and adverse health effects. A meta-analysis was also conducted to estimate the percentage change in the mean number of daily events associated with a  $10\mu\text{g}/\text{m}^3$  increase in ambient pollutant concentration, based on 28 time-series studies (HEI, 2004). The summary estimates for TSP,  $\text{PM}_{10}$ , and  $\text{SO}_2$  show 0.2%, 0.5%, and 0.5% increases in all-cause mortality for every  $10\mu\text{g}/\text{m}^3$  of exposure. The results closely reflect the estimates from Europe and North America.

Aware of the impact of air pollution on health and the environment, governments have made efforts to improve air quality by issuing more stringent ambient air quality standards, introducing more efficient technical devices or clean fuels, managing mobile and stationary sources, and increasing public awareness and participation. In recent years, the main achievements in improving air quality in the region have included successful control of  $\text{SO}_2$  emissions and reduction of the sulfur content in fuel oil. In Thailand, the dramatic decrease of  $\text{SO}_2$  emissions from 150 tons/hr to less than 7 tons/hr was brought about by the installation of the flue gas desulfurization system in the Mae Moh Basin. The air quality of almost all of the countries in the region met the WHO guideline for  $\text{SO}_2$  levels in recent years. Air quality monitoring stations have been established in the main Asian cities. Strict standards for motor vehicle exhaust and ambient air quality have also been issued (CAI, 2008b). Leaded gasoline has been phased out in Indonesia, Vietnam, and Thailand, and the concentrations of lead have dramatically decreased in these countries. However, several challenges remain. For example, although leaded gasoline is completely banned in most countries in Southeast Asia, fuel quality remains a major problem in low-income countries. People in Southeast Asia are more likely to use low-cost diesel fuel that contains high levels of sulfur and worsens particulate pollution. These countries are also struggling to manage worsening traffic situations and increasing pollutant emission due to urbanization and the rapid increase in motor vehicle use. Furthermore, the time it takes to upgrade to energy-efficient, low-emission vehicles is relatively long in these countries because of prohibitively high costs and taxes.

### *Indoor Air Pollution*

The main sources of indoor air pollution include fuel and tobacco combustion, cleaning, cooking, remodeling, and construction materials (see table 8.3). Indoor air contains a variety of health-damaging pollutants, including fine particles, CO, polycyclic aromatic hydrocarbons (PAHs), nitrous oxides (NO<sub>x</sub>), sulfur oxides, formaldehyde, and carcinogens such as benzo(a)pyrene, benzene, arsenic, and fluoride. Solid fuels burned indoors include coal and biomass such as wood, dung, and agricultural residues. Indoor air pollution is a serious concern in the developing countries of Asia because solid fuel is frequently used in day-to-day life. In China and most countries in Southeast Asia except Malaysia and Singapore, more than 70% of households use solid fuel for cooking and heating. Studies from Asia, Africa, and South America have shown that levels of air pollution in households reliant on solid fuel are extremely high. For example, typical 24-hour mean levels for PM<sub>10</sub> in homes using biomass fuels are 300–3,000µg/m<sup>3</sup>. Peaks during cooking may be as high as 10,000µg/m<sup>3</sup>, which is 500 times higher than the WHO standard of 20µg/m<sup>3</sup> (Rehfuess, 2006).

Globally, more than 3 billion people depend on solid fuels, and this “killer in the kitchen” was responsible for 1.5 million deaths and 2.7% of the global burden of disease (as DALYs) in 2002. Solid fuel use is the second most important environmental cause of disease, just after unsafe water and poor sanitation. More than two-thirds of the disease burden from solid fuels occurs in sub-Saharan Africa and South Asia, and about 18% occurs in East Asia and the Pacific. In 2002, solid fuel usage caused 381,000 deaths in East Asia, with 90% due to COPD, 5.4% caused by ALRI, and 4.6% due to lung cancer. In Southeast Asia, solid fuel usage caused 56,200 deaths; most were due to COPD and ALRI (WHO, 2007). In East Asia, more than 99% of indoor smoke-induced deaths occur in China. In Southeast Asia, mortality due to ALRI among children under 5 was relatively high; 28,000 deaths could be prevented if cleaner household energy were used. Women are most at risk of indoor air pollution because they spend 3–7 hours a day in the house and are in charge of cooking. Young children carried on their mothers’ backs are also exposed to indoor pollutants for many hours a day from early infancy.

The health impact of indoor air pollution has been reviewed (see table 8.4; Smith, 2004). Children under five years of age have a 130% increased risk of acute infections of the lower respiratory system when exposed to indoor smoke. Women over 30 with long-term indoor smoke inhalation may have a 220% increased risk of COPD compared with those who cook

TABLE 8.4 Adverse Health Impacts of Indoor Air Pollution

<i>Health outcome</i>	<i>Evidence<sup>a</sup></i>	<i>Population</i>	<i>Relative risk</i>	<i>95% CI<sup>b</sup></i>
Acute infection of the lower respiratory tract	Strong	Children <5 years	2.3	1.9–2.7
Chronic obstructive pulmonary disease	Strong	Women ≥ 30	3.2	2.3–4.8
	Moderate	Men ≥ 30	1.8	1.0–3.2
Lung cancer (from coal)	Strong	Women ≥ 30	1.9	1.1–3.5
	Moderate	Men ≥ 30	1.5	1.0–2.5
Lung cancer (from biomass)	Moderate	Women ≥ 30	1.5	1.0–2.1
Asthma	Moderate	Children age 5–14	1.6	1.0–2.5
	Moderate	Adults ≥ 15	1.2	1.0–1.5
Cataracts	Moderate	Adults ≥ 15	1.3	1.0–1.7
Tuberculosis	Moderate	Adults ≥ 15	1.5	1.0–2.4

SOURCE: Prüss-Üstün & Corvalán, 2006.

<sup>a</sup>Strong evidence is based on 15–20 studies of solid fuel use in developing countries. Moderate evidence is based on at least 3 studies of solid fuel use in developing countries.

<sup>b</sup>CI = confidence interval.

with cleaner energy, such as electricity or gas. Coal exposure among adult women also doubles the risk of lung cancer. The association between indoor smoke exposure and an increased risk of COPD and lung cancer is seen in adult men also, but the magnitude of the association is not as strong as for women. Solid fuel exposure is also associated with 20–60% increased risk of several other health outcomes, such as tuberculosis, cataracts, upper airway cancer, asthma, low birth weight, perinatal mortality, otitis media, and ischemic heart disease. The disease burden of such health outcomes that is related to solid fuel usage needs to be further examined. In China, exposure to arsenic-rich or fluoride-rich coal is also linked with increased risk of lung cancer and skeletal fluorosis (Ando et al., 1998; Finkelman et al., 1999).

### *Respiratory Disease*

The environment contributes to more than 40% of respiratory diseases in developing countries (Prüss-Üstün & Corvalán, 2006). These include COPD, ALRI, and asthma.

COPD is a life-threatening lung condition that is characterized by a persistent blockage of airflow to and from the lungs. COPD is not one single disease; at least chronic bronchitis and emphysema are included within the COPD diagnosis. The most common symptoms of COPD are breathlessness, excessive sputum production, and chronic cough. Globally, 210 million people are estimated to have COPD, and in 2004 more than 3 million people died of COPD, which contributed to about 5% of all deaths that year (Speizer, 2006). Total deaths from COPD are projected to increase in the next two decades. It is expected to become the third leading cause of death worldwide by 2030. Almost 90% of COPD deaths occur in low- and middle-income countries. In East and Southeast Asia, COPD is the most serious respiratory disease; it contributed to 11% of all-cause deaths in 2004. COPD is nearly twice as common among women as men, most likely because of the use of solid fuels for cooking indoors (Prüss-Üstün & Corvalán, 2006). There may be 16.7 million cases of COPD in East Asia and 3.9 million in Southeast Asia. A total of 1.6 million COPD deaths were reported from the region in 2004, 87% of which were in China. The age-adjusted mortality of COPD is as high as 124.6 per 100,000 in China, which has the highest mortality rate in Asia. This suggests that China faces a great challenge to reduce or control the main risk factors of COPD, including cigarette smoking and solid fuel combustion.

Lower respiratory tract infections, lung cancer, and tuberculosis, which are either caused or exacerbated by air pollution, also contribute to 12% of all deaths in Asia. The prevalence and incidence of tuberculosis in Asia have been significantly reduced since 1990, and much of the reduction can be attributed to a healthier environment and better treatment, such as directly observed treatment (see DOTS in chapter 3). Although the environment is not the most important cause of tuberculosis, with an estimated involvement of 19%, exposure to indoor smoke from solid fuel is associated with increased incidence (Lin et al., 2008; Smith & Mehta, 2003). Management of the environmental component could significantly reduce the disease burden of tuberculosis.

ALRI, including pneumonia and bronchitis, was the leading cause of deaths from infectious diseases and accounted for 4.2 million deaths worldwide and 7.1% of all deaths in 2004. ALRI was also the chief cause of death in children under 5, killing an estimated 1.8 million per year worldwide in 2004. In East and Southeast Asia, ALRI contributed to 5% of all-cause deaths, with a total of 690,000 people dying of ALRI in 2004. The number of deaths in children under 5 due to ALRI was 320,000 in East Asia and 76,000 in Southeast Asia. The proportion of all deaths caused by ALRI

was estimated at 76% and 69% among children younger than 5 in these two regions. Over 40% of ALRI was attributable to the environment in developing countries, while it was responsible for only around half that in developed regions.

Asthma is also largely attributable to the environment. Important asthma triggers include environmental tobacco, dust mite or cockroach allergens, mold, and outdoor pollutants such as ozone, particulate matter, SO<sub>2</sub>, and NO<sub>x</sub>. Rising temperatures, which can cause increases in allergens in the air, can also bring on asthma. Asthma causes breathing problems due to a narrowing of the airways, causing the lungs to get less air. Attacks are characterized by a tight feeling in the chest, coughing, and wheezing. The WHO (2006) estimated that 300 million people suffered from asthma and that 255,000 people died from it worldwide. Asthma does not kill on the scale of COPD; an estimated 90,000 died from asthma in 2004, but it is the most common chronic disease among children.

The historical influence of air pollution and its impact on health can be seen as far back as ancient Rome (Capasso, 2000). Pleurisy and anthracosis were regularly found in Romans, who were living in an environment with a high degree of particulate pollution. The mechanism by which exposure causes those diseases remains unclear and needs to be further explored. The pollution may cause a reduction in the function of the ciliated respiratory epithelium or cause inflammation of the lung airways and alveoli and impair the immune response. Based on surveys of the impact of air pollution on health, policy makers can set practical goals to reduce the national or regional burden of respiratory disease by controlling the modifiable factors of these diseases. In developing countries, household energy is an important issue directly related to indoor smoke. The MDGs include a 50% reduction in the number of people (485,000 people) without access to clean fuels. Several interventions are currently under way to reduce indoor smoke by improving cooking devices, using cleaner fuel, improving ventilation and placement of the stove, modifying user behavior, and reducing children's exposure. The Chinese government, for example, implemented a National Improved Stove Program that produced an estimated 200 million stoves in the 1980s and 1990s (Rehfuss, 2006). Poverty affects household energy use because cleaner fuel and modern devices usually cost more. The control of industrial emissions and the growth in the number of motor vehicles is also an important concern. Quick government intervention, policy change, and improvements in technical implementation can improve the lives of those suffering from life-threatening or debilitating respiratory problems.

## CONCLUSIONS AND RECOMMENDATIONS

Environmental factors are important determinants of human health. Among them, the pollution of air and water with chemical or biological agents, the condition of water supply systems, and the disposal of sewage and waste have the most significant impacts on public health. There have been substantial improvements in access to safe water, coverage with piped water, and sanitation facilities in East and Southeast Asia in recent decades. However, there is a significant urban-rural disparity in safe water coverage and access to sanitation facilities for the developing countries in the region. Rapid economic and population growth, coastal development, and increased marine traffic have contributed to a drastic increase in pollution of seas and oceans in this region. Freshwater supplies are also heavily polluted, which leads to the use of underground water contaminated with arsenic. Severe contamination of drinking water and pollution of rivers, seas, and oceans have detrimental effects on food chain safety and public health in East and Southeast Asia. Countries in this region should try their best to mitigate the pollution of rivers and seas, to prevent further freshwater contamination, to monitor drinking water quality, and to deliver adequate safe water to their people.

The rapid economic and population growth and industrialization in developing countries in East and Southeast Asia have resulted in striking increases in total energy use in most countries in the last three decades. The major sources of outdoor air pollution in the region include vehicles; power stations; industries; waste incineration; combustion of coal, kerosene, and biofuels; forest fires; and dust storms. Despite the recent efforts to decrease the four major air pollutants ( $PM_{10}$ , TSP,  $SO_2$ , and  $NO_2$ ) in East and Southeast Asia, the levels are far above the WHO's recommended maximums. Indoor air pollution, resulting from coal or other fuel combustion, cigarette smoking, cleaning-solvent evaporation, and cooking, as well as construction and remodeling, is the most important environmental cause of disease after unsafe water and poor sanitation. Cigarette smoking and air pollution have resulted in increases in morbidity and mortality from acute lower respiratory infections, asthma, lung cancer, and chronic obstructive pulmonary disease. Countries in this region have to improve air quality by issuing more stringent ambient air quality standards, introducing more efficient technical devices and clean fuels, managing mobile and stationary sources of pollution, reducing tobacco consumption, increasing public awareness of and participation in air pollution control, and most importantly, enforcing air quality regulations.

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# 9 Occupational Health

Judy Sng and David Koh

In recent years, Asian countries experienced rapid economic growth leading to great diversity in occupational health issues and challenges. Less developed nations tend to face diseases associated with traditional occupations, for example, pesticide poisoning in agriculture. As a country develops, work-related disorders, for example, musculoskeletal pain, gain prominence while traditional occupational diseases decline. Countries undergoing rapid industrialization and economic growth face a triple burden of traditional occupational diseases, increasing incidence of work-related disorders, and novel hazards from emerging industries, for example, nanotechnology and biotechnology. Several factors contribute to the occupational health challenges faced in Asia. First, there is economic dependence on small to medium enterprises, where workplace health and safety awareness is generally low. Second, many workers in the informal economy face poor working conditions and lack access to basic occupational health services. Third, large numbers of Asians migrate to seek work; many go to more developed countries, where they are often involved in high-risk work. Internationally, the WHO, the International Labour Organization (ILO), and others are working toward ensuring basic occupational health services for all.

## INTRODUCTION

In the past few decades, Asian countries experienced some of the most rapid economic growth in the world. An important factor for economic development is a productive workforce, which is in turn influenced by the health of each worker. Occupational health is an important discipline that aims to protect workers' well-being and reduce the incidence of ill health at work so that they can continue to contribute positively to their nations.

TABLE 9.1 Differences between Work-Related and Occupational Diseases

<i>Work-related diseases</i>	<i>Occupational diseases</i>
Occur largely in the community	Occur mainly among the working population
Are multifactorial in origin	Have specific causes
May be related to exposure at the workplace	Definitely result from exposure at the workplace
May be notifiable and compensable	Are notifiable and compensable
Examples:	Examples:
Coronary heart disease, lower back pain	Silicosis, asbestosis, lead poisoning

Occupational health issues and challenges faced by each country in Asia depend on their unique blends of geographic, cultural, socioeconomic, and political characteristics. However, there appears to be a common thread that can help us understand and improve the occupational health and safety situation in Asia.

In Asia, there are nations in all stages of development, beginning from the least developed to developing, and finally to the developed or industrialized nations. The distribution of industries and occupations is influenced by the stage of development of a country. This determines the types of work-related hazards that people are exposed to and the occupational health issues seen in that particular country.

For instance, the main industries found in the less developed nations are typically of a more traditional nature, such as agriculture and mining. Health issues arising from such work are occupational diseases that occur as a direct result of harmful exposures at the workplace. Some examples of the classical occupational diseases are pneumoconiosis<sup>1</sup> and poisoning by heavy metals (e.g., lead, mercury) or pesticides (usually organophosphates).

As the occupations found in less developed countries tend to be of a more hazardous nature—such as mining or shipbreaking—workplace accidents, injuries, and fatalities are also not uncommon. In contrast, work-related health disorders, rather than accidents/injuries, are encountered in developed countries with more employed in the service and finance sectors.

Work-related illnesses are differentiated from occupational diseases in that both work and nonwork factors may be associated with their occurrence or exacerbation, as in the case of hypertension or lower back pain (table 9.1). Although work-related illnesses are generally less devastating

TABLE 9.2 Stages of Economic Development and Occupational Transitions

<i>Stage of economic development</i>	<i>Major occupations<sup>a</sup></i>	<i>Associated occupational/ work-related health issues</i>
Least developed	Farmer, miner, fisherman	Pesticide poisoning, mining accidents, pneumoconiosis, diving-related accidents, barotrauma
↓	↓	↓
Developing/ newly industrializing	Construction worker, factory / assembly-line worker, shipyard worker (ship repair, ship-breaking)	Accidents, e.g., falls from height, electrocution; welding-related problems, e.g., "arc eye," toxic pneumonitis
↓	↓	↓
Developed	Banker, clean-room worker, researcher, service sector worker (e.g., hotelier, retailer), creative industry designer	Ergonomic problems leading to musculoskeletal disorders, work-related stress, clean-room dermatitis

NOTE: Least developed countries in Asia include Timor-Leste, Cambodia, Myanmar, Laos. Developing/ newly industrializing countries in Asia include China, Thailand, Philippines, Malaysia, Vietnam. Developed countries in Asia include Japan, RO Korea, Singapore, Hong Kong, Taiwan.

<sup>a</sup>There will be overlap between stages.

than occupational accidents and the classical occupational diseases, they can be disabling and significant causes of morbidity.

The changes in the types of occupations found and the associated health issues as a country develops economically are summarized in table 9.2. There is considerable overlap between stages, especially in the newly industrializing countries (NICs). This will be discussed further in the next section.

Globalization has had a great impact on Asian countries. This has led to development of manufacturing industries to serve more developed markets, an influx of multinational companies to countries with lower wage costs, and outsourcing of a variety of jobs to Asian countries. This has been accompanied, in some instances, by the transfer of hazardous work

processes. The global financial meltdown that began in 2008 reminds us how closely countries are interlinked. The impact of this crisis will likely extend beyond the financial sphere to affect social and occupational health adversely (see chapter 10 for further discussion).

#### EPIDEMIOLOGY OF OCCUPATIONAL / WORK-RELATED INJURIES AND DISEASES

Complete and accurate statistics on occupational disease, injuries, and work-related diseases in Asia are not available. Public domain data are often underestimates, because of underrecognition and underreporting, especially in the developing countries or NICs. Nevertheless, we can infer from available information the likely types of occupational issues a country is experiencing based on its economic growth stage and the major industries it engages in.

##### *Workplace Accidents and Injuries*

The number of workplace accidents in Vietnam increased by 42.8% between 2000 and 2007, while work-related deaths rose by 34.6% and serious injuries by 59%. Construction, mining, and the manufacture of construction materials were the industrial sectors associated with the highest work fatality rates. By geographical area, the highest incidences of fatal work accidents occurred in the large cities or provinces where industrial zones were located, such as Ho Chi Minh City, Quang Ninh, Hanoi, and Da Nang (Nguyen & Luong, 2008). Road traffic accidents also tend to have higher incidences in more densely populated areas and are in some instances considered work related (see chapter 7).

The ILO and WHO reported in an April 2005 joint press release that the estimated number of fatal accidents in China had risen from 73,500 in 1998 to 90,500 in 2001 (the most recent year for which figures were available at the time of the analysis), while accidents causing 3 or more days absence from work increased from 56 million to 69 million.

One important cause for the growing rates of workplace accidents and fatalities in NICs is the fact that many people are migrating from rural areas to work in the urbanized areas. Many of these migrant workers have few skills and minimal training in safe work practices. A large proportion have no experience working with heavy machinery and little understanding of common industrial hazards such as electricity. Yet these are elements and exposures in the kinds of jobs that are available for low-skilled workers in rapidly industrializing countries (ILO, 2005).

Once a country becomes more developed, there is a gradual transition to less hazardous occupations, resulting in a decline in injury and fatality rates. For example, in Japan the number of fatal industrial accidents declined steadily from 5,269 cases in 1973 to 1,357 in 2007 (Ministry of Health, Labour and Welfare Japan, 2008). Similarly, in Singapore the number of workplace fatalities has been decreasing since 1997, mainly because of reduction in fatal accidents occurring in the construction industry.

### *Occupational Diseases*

While data underestimate occupational accidents, injuries, and deaths, the statistics for occupational diseases are usually even more severe underestimates. In some Asian countries, such data can be nonexistent. For example, 13,218 cases of occupational diseases were reported to the Ministry of Health, China, in 2001. About 80% of these cases were pneumoconioses (Liang & Xiang, 2004). The other reportable diseases in the list do not include work-related disorders. An official from the ministry stated that “due to incomplete reports, this is only the tip of a huge iceberg of health hazards at the workplace in China. The actual statistics are far worse” (Su et al., 2001). Bearing in mind that the working population in China during that period was approximately 700 million, the crude incidence rate of reported occupational diseases would be 2 per 100,000 persons.

In contrast, 4,396 occupational diseases were reported in RO Korea in 2001. With a working population of 11.7 million, the crude reported occupational disease incidence rate would be 40 per 100,000 persons (KOSHA, 2001). The occupational safety and health agency of RO Korea has a comprehensive occupational disease and injury reporting system in place. Thus the higher occupational disease incidence rates in RO Korea are most likely due to more comprehensive statistics rather than poorer working conditions.

## OCCUPATIONAL HEALTH ISSUES PROMINENT IN ASIA

Developing Asian nations often depend heavily on agriculture, mining, and some aspects of manufacturing. The occupational issues faced will often be the occurrence of “classical” occupational diseases, such as poisoning by chemicals, heavy metals, and pesticides and pneumoconiosis from exposure to silica, coal, or other dusts from mining work. Also, less developed Asian countries tend to have a large informal employment sector as well as substantial proportions of persons working in small to medium enterprises. In such enterprises, there is often little or no attention paid to occupational health and safety issues.



Figure 9.1. Oil palm plantation worker in Malaysia.

On the other hand, the more developed nations have gradually phased out most of the traditional land- and labor-intensive industries such as agriculture and mining. As a result, they have fewer of the associated occupational accidents and diseases with which to grapple. However, they face rising numbers of emerging and work-related diseases from modern industries such as high-tech manufacturing, research and development, and new technologies.



Figure 9.2. Semiconductor manufacturing facility in Singapore.

Developed nations also experience and report more work-related illnesses such as stress and musculoskeletal disorders, often (but not exclusively) related to work in the service industries and financial sector. Such health problems are often ill defined and difficult to diagnose and establish as work induced. For example, some studies have suggested an increase in cancer incidence among semiconductor workers, but conclusive evidence is still lacking. Another challenging area is in the growing number of industries using emerging cutting-edge technologies such as nanotechnology and biotechnology, where the occupational hazards are still not well characterized but potentially harmful.

#### NEWLY INDUSTRIALIZING COUNTRIES (NICs)

In the middle of the spectrum are less developed countries that have undergone rapid industrialization and growth of their economies. These nations have been described as newly industrializing countries (NICs). The first NICs were Hong Kong, RO Korea, Singapore, and Taiwan. Other Asian countries have since been added to the list, including China, Malaysia, Thailand, and the Philippines. In fact, a large proportion of countries in

the world that are considered NICs are in Asia. As occupational health issues in developing and developed countries have already been extensively covered in many occupational health texts, the rest of this section will be dedicated to discussion of the issues faced by the NICs in the area of worker protection and health promotion.

Several factors contribute to the unique combination of occupational health challenges faced by NICs. The NICs are defined by a shortened time frame in which the industrialization process takes place. This often leads to the coexistence of industries typical of both developing and developed countries. As a result, occupational health issues in these countries can range from traditional health concerns of small-scale industries, agriculture, mining, and manufacturing industries to emerging health concerns related to the service, finance, and knowledge industries, cutting-edge technologies, and materials utilized in semiconductor, engineered nanoparticle, and pharmaceutical production.

For instance, half of China's 700 million economically active persons in the year 2000 were employed in agriculture, forestry, and fishing; a quarter were employed in mining and manufacturing, and the remaining quarter were in the service industry and government. The growing manufacturing sector in China was estimated to produce 70% of the world's toys, 70% of photocopiers, 40% of microwave ovens and sports shoes, and increasing proportions of the world's videotape and digital video disc equipment, mobile phones, electric lighting, semiconductors, and circuit boards. China has been described as the rising star in the global electronics industry. In the first 7 months of 2002, export of electronics goods from China to the United States rose by 47%, reaching US\$1.2 billion in June 2002 alone. Many of the world's principal electronics companies have capitalized on China's low labor and land costs and its well-developed transport and telecommunications infrastructure for cost-effective manufacturing operations. However, there have been extensive complaints by electronics workers over low wages and withheld payments, long working hours, poor safety and health conditions, and living conditions in dormitories. China does have relatively strong labor laws prohibiting such treatment of workers but lacks enforcement of these laws on the ground (Luthje, 2003). In addition, China is actively working to boost its service industry. According to ministry of commerce statistics, the service trade in China totaled US\$4.6 billion in 1982 and increased to US\$128.6 billion in 2004, ranking ninth worldwide (Xinhua News Agency, 2005). While generally less hazardous compared with jobs such as construction and mining, service industry work has been associated with health issues such as stress and musculoskeletal disorders.



Additionally, there is a tendency to leapfrog from traditional to newly emerging industries. Most NICs have limited occupational health and safety manpower, and those available are under pressure to expand their knowledge base and adjust their worker protection strategies, which some NICs may not have sufficient resources or political will to do. This leapfrogging phenomenon can be seen in the case of Thailand, where large investments have been made in nanotechnology—an emerging group of industries that are involved in the manipulation of matter at the nanometer scale to design and manufacture a wide range of products. This is occurring against a backdrop of an economy that is still heavily dependent on agriculture and tourism. About half of the labor force of Thailand is involved in agriculture, while extensive plans are being made and implemented with the purpose of using nanotechnology to boost the country's economy. However, as is often the case with emerging high-tech industries, the health effects of exposures are still poorly understood because of lack of scientific data. Occupational health and safety professionals in NICs thus have to grapple with health issues arising from traditional industries as well as the uncertain health risks from the newly emerging industries.

Furthermore, changes are expected in the NICs that will affect occupational health issues in Asia. The ILO predicts that rapid technological advances, trade in commodities, and competitive pressures are expected to lead to greater decline in agriculture and heavier emphasis on services and emerging industries. Total employment in agriculture is projected to diminish by 6.6 million from 2005 to 2015, while employment in manufacturing and services is expected to expand by around 24 million and 35 million, respectively. The service sector is projected to become the main source of job creation and to eventually develop into the largest employment sector, accounting for about 40% of total employment in ASEAN countries<sup>2</sup> by the year 2015 (ILO, 2007).

### *Competing Priorities and Occupational Health Priorities in NICs*

There are always competing priorities for decision makers in the NICs. Unfortunately, occupational health and safety is frequently accorded low priority and is often subordinated to economic pressures.

Singapore was one of the earliest NICs, but its occupational health and safety legislation lagged behind significantly. Prior to 2006, Singapore with its colonial heritage relied on a Factories Act that covered only workplaces fitting the definition of *factory* and excluded nonindustrial sectors such as health care and the service sector. Singapore only implemented

TABLE 9.3 Occupational Health Priorities in Developing and Industrialized Countries

<i>Developing country priorities</i>	<i>Industrialized country priorities</i>
Agricultural work, accounting for 2/3 of manpower and work-related problems	Stress, overload and pace of work, psychological factors, workplace relations and management
Other hazardous sectors, such as mining, construction, fishery, logging, and other dangerous occupations	Problems caused by aging workforce, maintaining ability to work Right to know, right to be informed, hazard communication
Major industrial accidents and fires	Chemical substances, carcinogens, asbestos
Traditional accident and safety problems, housekeeping	Ergonomics, repetitive work and musculoskeletal problems
Occupational diseases, Global Programme for the Elimination of Silicosis	Organizational issues and safety and health (quality) management issues
Vulnerable groups, in particular, child labor	Preventive occupational health services, health promotion
Transfer of technology	New technologies

SOURCE: Rantanen et al., 2001.

a Workplace Safety and Health Act in 2006. Even then, the coverage of workers in different sectors was only gradually extended over subsequent years. For example, health care workers were not covered until 2008. Thus, during the 2003 outbreak of severe acute respiratory syndrome (SARS), an occupational disease that affected health care workers, such workers in Singapore were not covered by its Factories Act.

With other contending issues such as economic growth and sometimes political instability to deal with, many NICs tend to divert resources away from occupational health service provision. Some NICs lack even basic occupational health services for their workers. Occupational health priorities for developing and industrialized countries were defined and listed by Rantanen and colleagues in 2001 (table 9.3). The priorities for NICs overlap parts of the two lists. Another challenge for decision makers in each NIC is to decide in which areas of occupational health to focus their limited resources.

### SMALL TO MEDIUM ENTERPRISES

Small to medium enterprises (SMEs) account for a large proportion of employment in many Asian countries. In Singapore, 62% of workers were employed in SMEs in the year 2007 (Spring Singapore, 2008). Vietnam has 160,000 enterprises, of which more than 95% are SMEs (Nguyen & Luong, 2008). The distribution of industries in Thailand is also similar, with SMEs contributing a growing proportion of employment.

What exactly constitutes a SME varies among countries. One definition of SMEs (adopted in Singapore) is “companies that have at least 30% local equity, fixed productive assets (defined as net book value of factory building, machinery and equipment) not exceeding S\$15 million and fewer than 200 workers for non-manufacturing companies.” As SMEs tend to have limited human as well as financial resources, usually little priority is given to health and safety measures, such as adequate ventilation to reduce exposure to hazardous vapors or provision of appropriate personal protective equipment. Workers in SMEs usually have limited or no access to occupational health services.

### PERSISTENCE OF THE INFORMAL SECTOR

*Informal sector* refers to economic activity that is not subject to taxes or monitoring by the government and therefore not included in a country's GNP. The lack of governmental monitoring and control implies that implementing and enforcing occupational health and safety laws is fraught with difficulty in a country with a large informal employment sector. Moreover, most informal employment establishments pay little or no attention to worker health protection because of limited knowledge and resources.

In 2006, an estimated 156 million people were involved in informal employment in ASEAN countries, forming nearly 60% of the total workforce. However, there is again considerable intercountry variation. The estimated proportion of informal employment as a component of total employment ranges from around 80% in Cambodia, Laos, and Vietnam to 53% in Thailand and 8.8% in Singapore. About 530,000 people in Mongolia work in the informal or nonorganized sector, forming some 61% of total employment in 2002–2003. The gender ratio tends to be female dominated; more women tend to work in the informal sector, implying that women tend to have poorer opportunities for formal employment—and therefore access to health care—than do men (ILO, 2006a, 2007).

In the informal sector, poor occupational health and safety aware-



Figure 9.3. Example of a small to medium enterprise—a cake-making factory employing women in Malaysia.

ness and practices in animal husbandry and handling can be important contributors to the risk of emerging infectious disease outbreaks. For example, Nipah virus first emerged as an occupational disease of pig farmers in Malaysia, and more recently there is concern about possible avian influenza infection of workers exposed to chickens and ducks. Another example is SARS; up to one-third of the SARS cases prior to February



Figure 9.4. Elderly woman selling handmade crafts in Kunming, China. Note her bound feet.

2003 occurred in food handlers in South China. The food handlers were involved in the preparation of infected exotic animals (such as civet cat) for dining. (See also chapter 3.)

#### MIGRANT WORKERS

Every year, over 2 million Asians leave their home countries to seek work. Currently, there are about 25 million Asian workers who work outside their home countries, and this figure is expected to grow. Many of these migrant workers perform “dirty, dangerous and degrading” jobs that native workers are unwilling to do, such as construction, domestic, and cleaning work. For instance, over 90% of construction site workers in Singapore are from other Asian countries. On the other hand, large numbers of skilled and professional workers are moving within and outside Asia, for instance, Indian information technology engineers going to the United States to work. In fact, the ILO has deemed Asia the “world’s largest supplier of professional and skilled migrant workers” (ILO 2006b, 2009). Other issues pertaining to migration are further discussed in chapters 2 and 10.

## CHILD LABOR

In Asia, there are many youths (age 15–24) struggling to find employment. Yet it is not uncommon that their jobs are done by children (age 14 or less), who should not be working. This, in the words of the ILO, is a “cruel irony.” For example, in 2005 the Philippines had roughly 0.8 million working children between 5 and 14 years of age, while close to 1.3 million youths were unemployed (ILO, 2007).

The ILO has stipulated minimum legal ages for employment under various working conditions, the youngest age being 13 years for light work that will not interfere with education or impair healthy growth and development. Young people in the working population need to be protected from exploitation. There are approximately 51.9 million persons worldwide age 15–17 years working under hazardous conditions, most of them in Asia and the Pacific. A study by the ILO in 2006 in Indonesia, the Philippines, and Vietnam found that young people age 15–17 years who work often have to drop out of school. They were also more likely to work for lower wages and be exposed to more hazards than working adults.

## ACCESS TO CARE:

### BASIC OCCUPATIONAL HEALTH SERVICES

Access to worker health protection and promotion services is a fundamental right of every employed person. Yet, more than 80% of the world's 3 billion workers do not have access to occupational health services. It is not unreasonable to presume that many of these unprotected workers are living and working in Asia, where many of the developing countries and NICs are found.

Based on the premise that every worker is entitled to a safe and healthy workplace, the concept of basic occupational health services was developed by the ILO in conjunction with the WHO. The objective is to work toward ensuring the provision of services for all workplaces in the world, to meet the occupational health needs of the workers. Focus is primarily on the underserved populations within specific nations or industries, especially in the SMEs and informal sector, which lack resources to set up their own occupational health services.

Basic occupational health services should be organized by employers for their workers in such a way that they are affordable, available to every working person, and adapted to be relevant to local needs. Provision of these services by the public health care sector should be arranged to cover

individuals who work in the informal sector or who are self-employed. Links with the intermediate health care sectors are also important so that there is adequate support for service delivery personnel. The ILO's proposed cycle for implementation begins with needs identification, moves forward to assessment of problems, management actions, and evaluation of effect followed by program revision, and returns again to needs assessment and identification (Rantanen, 2007).

Initiatives have been taken by some Asian countries to introduce basic occupational health services as a first step toward making occupational health services available to all workers in all occupations. Specific efforts are being made by the WHO and ILO to develop these services in China. The ministry of public health in Thailand recently conducted a pilot project to explore the integration of basic occupational health services into the country's public health systems. An occupational and environmental health services model was developed and implemented using the existing health service infrastructure provided by primary care units within selected provinces. The model included training courses on occupational health services for the primary care unit staff, focusing on developing their skills in recognizing and dealing with common occupational health issues such as pesticide exposure in their provinces. Workplace evaluations including general health screens as well as specific testing for occupational diseases such as pesticide poisoning were conducted. Specific strategies to overcome common problems faced by the workers were developed with active input from the workers themselves. In some instances, the solutions were proposed by the workers themselves, resulting in greater buy-in from the involved workers as well as their peers. Plans are under way for continued capacity building in the primary care units involved in the pilot project and for the eventual introduction of basic occupational health services to all primary care units throughout Thailand (Siriruttanapruk, 2006).

### *Countrywide Initiatives to Improve Occupational Health*

In the face of increasing occupational health and safety problems due to rapid economic development, countries such as China have begun to take steps to overcome these challenges. Following China's acceptance into the World Trade Organization, enterprises there were required to abide by international trade rules, which include occupational health and safety regulations. China passed an occupational disease law and a work safety law in 2002. The first annual safety and health management summit was held in 2002 with the participation of the International Commission on Occupational Health, in which occupational health personnel from China

and other countries gathered to explore possible ways of addressing China's occupational health problems.

In Vietnam, a national program on labor protection, occupational safety, and health was launched in 2006 and targeted for completion in 2010. Models were developed to deal with four of the common local occupational health problems, namely pneumoconiosis, hepatitis B, noise-induced hearing loss, and melanosis. Plans are also in place for the development of adequate basic occupational services as well as strengthened legislation to reduce workplace asbestos exposure. Importantly, political support for worker health protection is now even more forthcoming—the Vietnamese government has ratified the national target program on labor protection, which includes the specific objective of reducing the incidence of workplace fatalities in high-risk sectors such as construction and mining.

### *International-Level Occupational Health Initiatives*

In addition to the efforts of individual countries, there are some international collaborative efforts to promote occupational health in Asia. A network of Collaborating Centres in Occupational Health was set up by the WHO to enhance the implementation of worker health improvement strategies at the ground level. These centers make important contributions toward fulfilling the goal of “occupational health for all” through their own areas of expertise in research, capacity building, and information sharing. Asian countries such as China, RO Korea, Singapore, Thailand, and Vietnam are members of this network and actively work on priority areas identified by the WHO, such as extending the coverage of occupational health services.

The Asian Association for Occupational Health (AAOH) was formed in 1956 with the aim of improving the health, safety, and welfare of the working population in Asia as well as Australasia through collaborative efforts in training, promotion, education, and research. Current AAOH members include China, Japan, RO Korea, Thailand, Vietnam, the Philippines, Malaysia, Indonesia, Taiwan, Hong Kong, and Singapore. The AAOH hosts triennial conferences to facilitate the sharing of research findings and ideas on best practices for occupational health and safety.

Another important international occupational health initiative in Asia is the Asian Asbestos Initiative (AAI), which is spearheaded by Japan, with funding from the Japan Society for the Promotion of Science and endorsed by the WHO and the ILO. This initiative was launched in response to the sharp predicted rise in the burden of asbestos-related diseases in Asia in the coming decades. The AAI brings together international organizations,



academia, and nongovernmental organizations in a collaborative effort to eliminate asbestos-related diseases in Asia. Countries such as Vietnam, Thailand, Mongolia, China, Malaysia, RO Korea, and Singapore are involved in this initiative. The goal of the project is to promote asbestos-free environments through the sharing of knowledge and skills, as well as interim measures to alleviate suffering brought on by asbestos-related disease. For example, one session in the inaugural AAI conference held in September 2008 brought clinicians from Japan and Singapore together to share information on mesothelioma diagnosis and management, and discussions were held on issues related to compensation of workers and their families for asbestos-related diseases (Takahashi, 2008).

In June 2008, a group of key leaders and decision makers gathered in Seoul for a safety and health summit that culminated in the adoption of the Seoul Declaration on Safety and Health at Work as a pledge to give priority to occupational safety and health in their national and international agendas. Among those present were representatives from many countries, ranging from Laos to Japan, as well as many decision makers and stakeholders from RO Korea. The summit and declaration had the strong support of the ILO, which recognized the declaration to be an important milestone for improving workplace safety and health. The ILO also considered the declaration useful in gaining the political backing necessary to put occupational health policies and programs into actual practice (ILO, 2008).

## CONCLUSIONS

Countries in Asia demonstrate a wide variation in economic development and, attendant to this, face heterogeneous occupational health issues and challenges. The countries collectively face a triple burden of occupational health diseases—a unique combination of (1) classical occupational diseases in traditional industries, (2) novel occupational diseases related to new technologies in emerging industries, and (3) work-related diseases found in service, financial, and knowledge sector workers.

Challenges include poor data collection for occupational health and safety statistics, a lack of adequately trained occupational health and safety manpower, a lack of basic occupational health services, and competing national priorities that often relegate occupational health to a matter of low concern.

We can observe varying degrees of success in meeting occupational health challenges in different countries. A heartening observation is that, in general, occupational health tends to improve with the development of the country.

As developing countries in Asia progress, it would be to their advantage to learn from the experiences of their neighbors who developed earlier, to avoid the mistakes and pitfalls already made. The impact of such mistakes can be much more widespread than on just the workplace and workers, as the following tale of two Asian NIC cities demonstrates.

POSTSCRIPT: ENVIRONMENTAL HEALTH—  
A TALE OF TWO ASIAN NIC CITIES

Environmental health issues are managed differently in different NICs. While often neglected initially, they are usually addressed at a later stage of development. A positive and recent trend is the questioning of the assumption that a clean, attractive environment comes at the cost of economic performance—a belief still widely held even in some advanced Asian cities. A comparison of personal observations of two individuals in two of the original four East Asian tiger NIC cities shows a stark contrast in environmental health (box 9.1).

Hong Kong suffers high concentrations of air pollution, caused partly by huge numbers of factories over the border in southern China. There has been concern that the problem could compromise Hong Kong's position as an international finance center. On 2 January 2009, AFP News reported that in Hong Kong, air pollution in 2008 was the worst since records began. The number of hours for which street-level pollution exceeded the danger level in the city's busiest districts rose by 14% in 2008, according to environmental protection department data. For more than 2,000 hours that year, air pollution levels in the two main shopping areas (Causeway Bay and Mongkok) and one business district (Central) were considered dangerous: >100 on the Air Pollution Index, a level that can pose immediate health risks, especially to people with respiratory or heart problems. This was the highest figure since 2000, when roadside recordings began. Hong Kong's Chief Executive Donald Tsang has called improving air quality a "matter of life and death" for Hong Kong. The AFP News also quoted a report released in 2008 by the Hong Kong-based think tank Civic Exchange, which stated that at least 10,000 deaths every year in Hong Kong, Macau, and China are caused by the area's worsening air pollution (AFP, 2009).

In RO Korea's capital city, Seoul, Lee Myung Bak (box 9.1) adopted the restoration of the once-polluted Cheonggyecheon (which means "clear valley stream") in the heart of Seoul as a mayoral campaign promise in 2002. The restoration project commenced in 2003 and was completed on 1 October 2005. The restored 5.8 km sparkling stream is now widely enjoyed

## BOX 9.1 Environmental Health: A Tale of Two NIC Cities

SEOUL, SOUTH KOREA

"If we don't place an emphasis on environmental friendliness, not only will citizens leave the city, but foreign investors won't choose Seoul. . . . I believe that over the long term, choosing the environment serves a dual purpose."

—MAYOR LEE MYUNG BAK, quoted in *Time* magazine, Monday, 8 May 2006

HONG KONG

"Todd Prado blames Hong Kong's air pollution for his decision to move to Singapore at the end of this year. He keeps his job as head of Asian trading for Janus Capital Management, and his children, ages 9 months and 3 years, keep their health."

—BLOOMBERG NEWS, 22 May 2006

by residents as well as tourists. In addition, over 3 million trees have been planted in the city since 1998, and a development undertaken from 2003 to 2005 resulted in Seoul Forest, a US\$224 million urban woodland. A director at the Korea Research Institute for Human Settlements, Kim Won Bae, traces the change back to disasters like the 1995 collapse of the poorly constructed Sampoong department store, which killed 501 people, and the 1997 economic crisis. "Those events made a lot of people think again about what economic growth was all about," he said. "Now people in Seoul want to enjoy life and be proud of themselves and their city" (Walsh, 2006).

As the WHO noted in 1992, the challenge we face in Asia and throughout the world is "to keep to a minimum the adverse health and environmental effects while promoting and sustaining economic development" (WHO, 1992).

## NOTES

1. Pneumoconioses are interstitial lung diseases caused by the inhalation of certain dusts and the lung tissue's reaction to the dust. They are principally caused by workplace, rather than environmental, exposures (NIOSH, 2009).

2. ASEAN is the Association of Southeast Asian Nations comprising Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Singapore, the Philippines, Thailand, and Vietnam.

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# 10 Economic Globalization and Public Health in Asia

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As national economies in Asia have integrated into the larger world system, resultant movements of capital, technology, information, and labor both directly and indirectly affect the health of populations throughout the region. To date, health improvements in Asia have been the result of decades-long work to improve sanitation, nutrition, access to primary health care, and routine vaccination as well as the treatment of infectious diseases. The extent to which these impressive health gains, as evidenced by increased life expectancies and dramatic reductions in infant, child, and maternal mortality throughout the region, are aided or threatened by globalization is a central focus of this chapter.

## INTRODUCTION

Economic globalization, which is broadly defined as the shrinkage of economic distances (i.e., costs of doing business) between nations, is more accurately seen as a set of processes pertaining to *international trade and production finance* and *international capital flows*.<sup>1</sup> Both aspects of globalization have been aided and abetted by three factors. First are the spectacular innovations and advances in transportation, information, and communications technologies, such as the Internet, which have dramatically lowered the costs of doing business across borders (Baldwin & Martin, 1999; World Bank, 2002b). Second is the push by the various international institutions toward global economic liberalization (i.e., reduced policy barriers to trade and investment). These include the General Agreement on Tariffs and Trade (GATT) and its successor the World Trade Organization (WTO) in the case of world trade in goods and services and, to a lesser extent, in movement of persons, as well as the International Monetary

Fund (IMF) in the case of global finance and international capital flows. Third is the shift in perceptions about the appropriate role of government and near-global consensus on the need for extensive, albeit judicious, use of market incentives for economic success.<sup>2</sup>

With respect to international trade and production, major strides over the decades in transportation, coordination, and communication technologies have afforded firms vastly increased opportunities to fragment previously integrated goods and activities into their constituent parts, components, and accessories.<sup>3</sup> These in turn are spread across countries on the basis of comparative advantage. The importance of such production fragmentation is that economic globalization will benefit all parties involved by expanding opportunities for international specialization and trade. Thus, in the longer term, globalization and free trade ought to be an unambiguously positive-sum game. Of course, this presupposes that the necessary institutional structures are in place to allow for a country to exploit the opportunities that are available in the global marketplace.

This said, the world economy is no more integrated, and in some ways is actually less integrated, than it was back in 1913 when cross border transactions costs had been significantly reduced by the advent of the railroad, steamships, and the telegraph in the nineteenth century and by the automobile and airplane in the early twentieth century. However, while technological progress continued unabated, the triple whammy of World War I (1914–1918), the Great Depression (1929–mid 1930s), and World War II (1939–1945) effectively halted the trend toward economic globalization. An index of the intensity of globalization over the last century suggests a U-shaped curve, with a lengthy trough spanning the period between 1914 and 1960. Thus, the World Bank (2002b) identifies three broad periods of globalization: “the first wave of globalization” (1870–1914), “the second wave” (1945–MID 1980), and the “third wave” or “new wave” (1981 to the present).

Just how far have the second and third waves of globalization (of trade and production) progressed in the contemporary era? *Intra*-country trade between regions still far exceeds *inter*-country trade, even where much smaller physical distances exist between two countries than between two regions in the same country. For example, after controlling for factors such as geographical distance and relative size, during the period 1982 to 1994 a typical OECD country was on average about two and a half times more likely to buy goods and services from itself than from a trading partner (Wei, 1996). Although this “home bias” in trade is tending to decline gradually, with tests of absolute and relative price differentials across countries

suggesting real-sector integration (Knetter & Slaughter, 2000), the process has not yet reached full maturity; there is still a long way to go.

This said, there are some important differences in the characteristics of historical (first-wave) and contemporary (second- and third-wave) globalization (Baldwin & Martin, 1999; World Bank, 2002b). In the case of the globalization of production and trade, the first wave largely involved *extensive growth*, a general increase in the tradability of goods and services. Contemporary globalization, on the other hand, reflects in large part *intensive growth*, that is, intraproduct specialization and trade in parts, components, and accessories discussed above. Another important dynamic of international trade in the current epoch of globalization is the growing role played by services. Despite the vague statistical description of services, it is noteworthy that international trade in services has outpaced that of merchandise trade over the last decade. There has been a rapid rise in the offshore outsourcing of and trade in many service activities that may have been considered nontradable in the recent past (e.g., call centers). The often-repeated mantra nowadays is “anything that one can send over the wire is up for grabs”! Many US, British, and other multinationals, as well as smaller enterprises, routinely outsource a number of their services activities. They have come to appreciate that if they do not outsource to reduce costs, while their competitors continue to do so aggressively, they stand to lose global and local market shares to their foreign rivals. The resultant stagnant corporate profit growth will limit the creation of new capital and reinvestment in domestic technology.<sup>4</sup> Echoing the view of many informed observers, Primo Braga (1996) has declared that the “internationalization of services is viewed as being at the core of economic globalization” (p. 34), while the World Bank (2002a) has proclaimed that “in virtually every country, the performance of the service sectors can make the difference between rapid and sluggish growth” (p. 69).

Contemporary globalization of production and trade has been facilitated by multinational corporations. Indeed, a large part of trade in parts, components, and accessories and services is of the intrafirm variety (i.e., involving international affiliates of the same company).<sup>5</sup> Notably, there has been much greater involvement of developing countries in world trade in the current (third) wave of globalization.

East and Southeast Asia have been among the first developing regions to embrace globalization of trade and production and benefit significantly thereof. Indeed, until the mid-1990s, emerging East Asian economies were among the most dynamic in the world. In addition to the sustained growth of the newly industrializing countries (NICs)—Hong Kong, Korea, Sin-



gapore, and Taiwan—and the near-NICs in Southeast Asia (Malaysia, Indonesia, and Thailand), the Asian giants (China and later India) were rapidly integrating into the global economy. The Asian crisis of 1997–1998 brought the growth in the NICs and Southeast Asia to a screeching halt. The region experienced a period of painful but much-needed de-leveraging and corporate and financial restructuring (including consolidation, loan loss recognition, and restructuring of bad loans) as well as some institutional reforms. They faced setbacks with a series of negative shocks in 2000–2003, including the collapse of the NASDAQ (National Association of Securities Dealers Automated Quotations) bubble, the spread of severe acute respiratory syndrome (SARS), avian influenza, and some natural disasters, all of which helped delay full-fledged recovery in both growth and asset prices. Although some doubts were expressed about whether the region would ever regain its luster, Asia reemerged quite strongly, with growth returning to precrisis levels and asset prices and in most cases even surpassing their precrisis levels. However, by mid to late 2008 Asia was badly hit again by the financial tsunami that emanated from the US housing and financial system.

Despite the fact that the region has been hit by a series of negative shocks, countries in the region have, by and large, remained among the world's fastest growing. This is due in no small part to their openness to international trade and investment. Merchandise trade as a percentage of GDP is higher in the East Asia and Pacific region than in any other region (figure 10.1). Trade-to-GDP ratios are as high as 180% for Malaysia, 150% for Vietnam, and almost 120% for Thailand (figure 10.1). The ratios are even higher for Hong Kong and Singapore. However, the World Bank data excludes these higher-income economies in Asia, as well as Japan and South Korea.

#### IMPACT OF GLOBALIZATION ON HEALTH

Much has been said about the contribution of globalization and the deregulation of trade and investment to East Asia's stellar economic performance. We turn now to the issue of how this growth, and the processes that drive it, potentially influence the health of the people living in this region. Globalization has been described as a mixed blessing for health (McMichael & Beaglehole, 2000), and both its proponents and those who decry what they see as neoliberalism or neocolonialism have been active and vocal in their response (Feachem, 2001). The remainder of this chapter focuses on several key areas for which the incorporation of national econo-

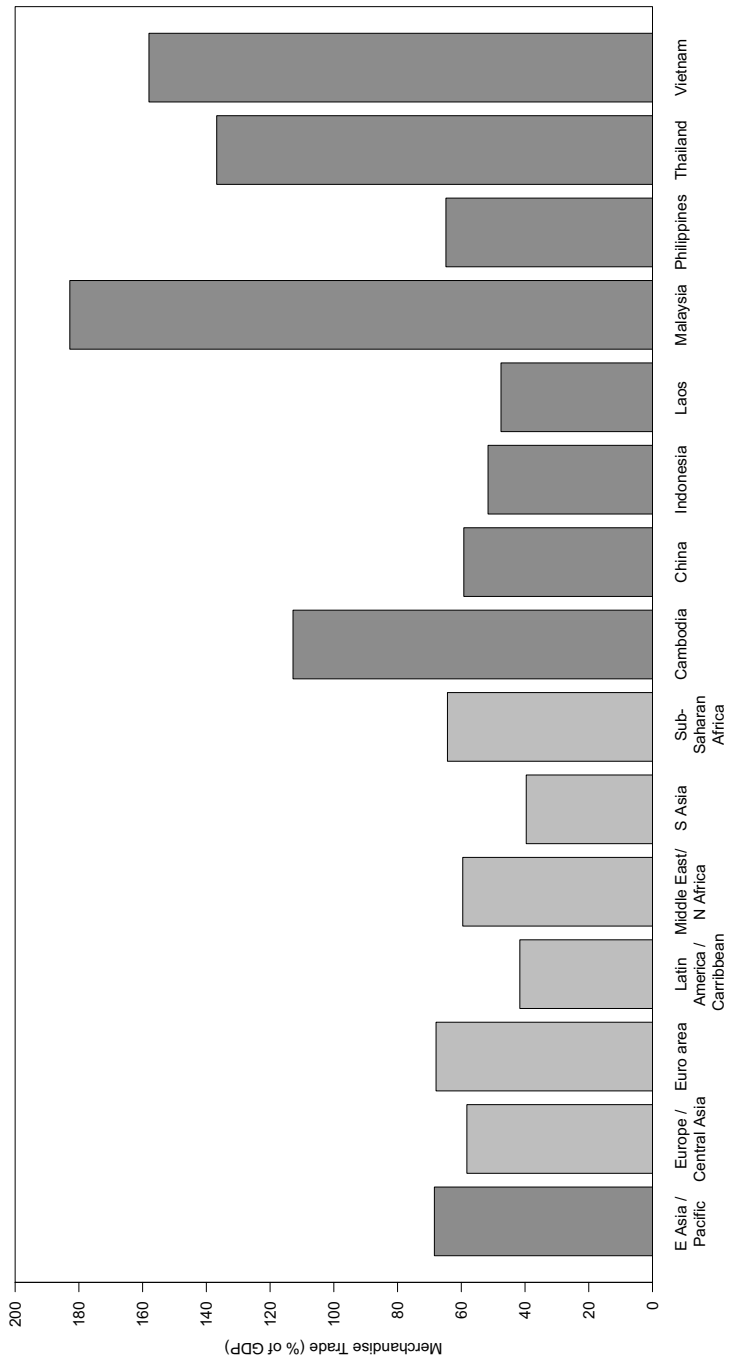


Figure 10.1. Trade volume as a percentage of GDP in 2007. Source: World Bank, 2008.

mies in Asia into the larger world system and the resulting movement of capital, technology, information, and labor have both direct and indirect effects on health of the nations' populations. In the concluding section, we offer a broader discussion of the health system response and the role of national and international governments.

*Background: Global Indicators of Health in East Asia*

In terms of human development indicator scores,<sup>6</sup> the Asian region ranks fourth, after the OECD, Europe and Central Asia, and Latin America and the Caribbean. The human development index gives an average score of three basic items: income, health, and education. In terms of life expectancy at birth, the region gained more than 20 years during the second half of the twentieth century. Currently, life expectancies in East Asia are similar to those in Latin America and, in some cases, higher than in some European countries, indicating that for Asia the scores on the consolidated health indicators are favorable relative to their corresponding scores in income and education (see chapter 2).

Indeed significant improvements in health have been achieved in middle-income southeast Asian countries like Indonesia, the Philippines, Thailand, and Vietnam. Between 1990 and 2004 the overall infant mortality rate in East Asia improved, from 37 to 26 deaths per 1,000 live births, while in Southeast Asia the same indicator decreased from 53 deaths to 32 deaths per 1,000 live births (UNESCAP, 2007). More detailed examination shows that this is a mixed bag: Vietnam has made the greatest progress by reducing its under-five mortality rate by half, and Indonesia, Laos, and China are all on track to meet their goals for child health. Cambodia, however, is making insufficient progress and will require an annual average rate of reduction of 8.3% to meet its child health target by 2015 (table 10.1).

The Millennium Development Goals (MDGs) created a global partnership of development promoting human, social, and economic progress. There are eight broader goals comprising 21 targets for developmental progress, of which more than 50% are dedicated to sustainable health and environment concerns. While considerable heterogeneity exists, the Asian nations as a whole have also shown good progress in achieving these targets (see table 10.1). The region is on track to reduce extreme poverty (based on the US\$1/day measure) by half. However, in countries such as Laos, the proportion of the population living on less than US\$1/day has increased from 18.6% in 1992 to 27% in 2002 (UNESCAP, ADB, UNDP, 2007). Net primary school enrollment rates are also quite high, with a regional average of 94%. However, within Southeast Asia, little progress has been made

since the early 1990s, and in some cases rates are regressing (UNESCAP, ADB, UNDP, 2007).

### *Globalization and Social Inequalities*

While growth in investment, production, and trade in East Asia has led to economic gains for many countries in the region, it has been argued that this process is inherently “disequalizing” and is leading to widening social disparities and inequities in health within countries (Schrecker, 2008). Regional averages mask differences between countries throughout the region: faster-growing economies, such as China, have experienced larger increases in inequality compared with slower-growing economies, such as Thailand, which have seen falls in overall inequality (UNDP, 2006). Income disparities, for example, those evident between China’s eastern seaboard and the more rural interior and western provinces, are reflected in infant mortality rates twice as high in rural than in urban areas (Drummer & Cook, 2008). These gaps are replicated within large cities, where the large influx of migrants creates pockets of poverty. The hazards to health that arise in these situations have been well documented: abuse of drugs and alcohol, high-risk sexual behavior, mental illness, and violence, in addition to overcrowding, which exacerbates the spread of infectious diseases (see chapter 2).

Furthermore, inequitable access to both health care and health information is significant not only for in-country, rural-to-urban migration but also for refugees as well as those living in border communities. Straddling a main border crossing with Myanmar, the Thai border town of Mae Sot illustrates issues of access and care often encountered by border communities. Along with the daily traffic across the border, Myanmar citizens and members of the Karen ethnic group (many of whom are stateless, with neither Thai nor Myanmar citizenship) travel to Mae Sot for health care, placing pressure on a system funded and designed to address the needs of Thai citizens (Irving & Mosca, 2010). Within the context of infectious disease, this cross border patient phenomenon poses complex challenges in relation to the management, treatment, and prevention of illnesses like tuberculosis and HIV (Hemhongsai et al., 2008).

The global labor market increases the worth of highly skilled and mobile workers at the top of the income scale, while encouraging employers to lower wages for those in production, in an effort to remain competitive. There is growing evidence that unskilled workers have been left behind in the market economy (ADB, 2007). Worsening income inequality has acted as a “push” factor, compelling migration both within and between

TABLE 10.1 Countries On and Off Track for the Millennium Development Goals

	1		2		3		
	<i>\$1/day</i>	<i>Underweight children</i>	<i>Primary school enrollment<sup>a</sup></i>	<i>Primary school completion rate<sup>b</sup></i>	<i>Gender primary<sup>c</sup></i>	<i>Gender secondary</i>	<i>Gender tertiary</i>
East Asia							
China	●	●	...	...	●	●	▲
DPR Korea	...	▲	...	...	...	...	...
Hong Kong	...	...	●	●	▽	●	...
Mongolia	▲	●	▽	●	●	●	●
RO Korea	...	...	●	●	●	●	□
Southeast Asia							
Brunei Darussalam	...	...	●	●	●	●	●
Cambodia	...	▽	●	□	▲	□	□
Indonesia	●	▽	●	●	●	●	□
Laos	▽	□	▲	□	▲	□	▲
Malaysia	●	●	●	□	●	●	●
Myanmar	...	□	▽	▲	●	●	...
Philippines	□	□	▽	●	●	●	●
Singapore	...	...	...	...	●	●	...
Thailand	●	...	▲	...	●	●	●
Timor-Leste	...	...	...	...	...	...	...
Vietnam	...	●	▽	▽	□	●	▽

SOURCE: UNESCAP, ADB & UNDP, 2007.

NOTE: ▽ = no progress/regressing; ▲ = on track; □ = slow; ● = early achiever.

	4		6		7			
	<i>Under-5 mortality</i>	<i>Infant mortality</i>	<i>HIV prevalence</i>	<i>TB prevalence</i>	<i>Water urban</i>	<i>Water rural</i>	<i>Sanitation urban</i>	<i>Sanitation rural</i>
	●	▲	▲	●	▽	□	□	□
	▽	▽	...	●	●	●	...	...
	...	...	...	●	...	...	...	...
	▲	▲	▲	●	▽	▽	...	...
	●	●	▲	▽	●	...	...	...
	●	●	▲	●	...	...	...	...
	▽	▽	●	●	...	...	...	...
	▲	▲	▲	●	▽	□	□	□
	▲	▲	▲	●	...	...	...	...
	●	●	▽	●	●	●	●	...
	□	□	●	●	▽	●	●	●
	▲	▲	▲	●	▽	□	▲	□
	●	●	▲	●	●	...	●	...
	●	●	▲	●	●	●	●	●
	●	▲	...	●	...	...	...	...
	●	●	▽	●	●	●	●	▲

<sup>a</sup>Primary school enrollment, or the net enrollment ratio in primary education, is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in primary school to the total population of children of official school age.

<sup>b</sup>Primary school completion rate is the proportion of pupils starting grade 1 who complete the last grade of primary school.

<sup>c</sup>Gender primary, secondary, and tertiary are ratios of girls to boys in primary, secondary and tertiary education.

countries. The global stock of international migrants increased fivefold, from 76 million in 1960 to 175 million in 2000, with most international migrants concentrated in a relatively small number of developed countries (UNDESA, 2004). Over the last two decades, the NICs provided attractive destinations for migrants from traditional “sending” countries, such as China, the Philippines, Indonesia, and Thailand (UNDP, 2004). Political and social pressures in host countries may not accurately reflect the economic realities of growing markets, such as the demand for cheap, low-skilled labor. As such, undocumented or illegal migration can often meet this demand, with smugglers and traffickers ready to take advantage of this potentially lucrative trade.

### *Trade Agreements, Foreign Aid, and Implications for Health*

Another potentially disequalizing factor is that the infrastructure for the global marketplace, in the form of binding trade agreements and other processes (e.g., TRIPS, discussed below), may affect the viability of specific industries in developing countries, and this again has the greatest impact on livelihoods of the poor and consequently on their health.

In the international arena, frameworks and agreements that are binding upon member nations of the WTO or that set the stage for bilateral free-trade agreements may also have important consequences for public health. Pharmaceuticals account for 55% of all health-related trade, valued at US\$650 billion in 2006, of which the high-value patented products account for almost 90%. The WTO agreement on Trade-Related Aspects of Intellectual Property Rights, or TRIPS, was established in January 1995 and set global minimum standards for the protection of intellectual property, including 20-year patent protection on pharmaceuticals and protection of test data on effectiveness and safety of drugs. While such agreements serve an important role in promoting research and development, and they address the complexities of dealing with varying levels of intellectual property between countries, it could be argued that TRIPS has served to further polarize the pharmaceutical market and widen the gap between developed countries, which produce and export high-value patented drugs, and developing countries, which must import these products or are involved in the production of low-price generics (Smith, Correa, Oh, 2009). These inequalities raise issues regarding the affordability of medicines in these countries, including new-generation antibiotics and anticancer and antiretroviral drugs. For example, prices of drugs in Malaysia rose by 28% between 1995 and 2005 (Babar et al., 2007). In 2001, the Doha Declaration provided for member countries’ rights to “adopt measures necessary to protect public

health and nutrition" (Correa, 2002) by introducing flexibilities within TRIPS. These include the granting of compulsory licenses for third parties to produce or sell drugs that are in short supply and allowing access to patented drugs sold at a lower price in another country. However, reservations remain as to how effectively developing countries will be able to apply these flexibilities to safeguard access to essential medicines. As Williams (2001) points out:

First, it is piecemeal, ambiguous and it is difficult to administer public safeguards and exceptions. . . . Developing countries do not always have the infrastructure to examine patents and resolve issues of questionable patent ownership, this and other factors are resulting in a chilling effect on developing countries implementing the safeguard measures in these provisions. Many countries do not act because they fear legal challenges by multinational corporations and trade sanctions that may result from an adverse ruling by the WTO dispute panels. (p. 5–6)

In the meantime, however, patients in need lack access to life-saving drugs, and this increases the health disparities between wealthy and poor nations.

Other examples exist in which conditionalities imposed, in relation to either trade agreements or foreign aid, can affect the health of disadvantaged groups in developed countries. Since 1990, development assistance for health has quadrupled, from US\$5.6 billion to US\$21.8 billion (Ravishankar et al., 2009).<sup>7</sup> In some instances, restrictions placed upon foreign aid effectively export domestic debates on certain issues to the international community. For example, the Mexico City Policy, first instituted by the Reagan administration in 1984, made NGOs operating outside of the United States ineligible for family-planning funding through the US Agency for International Development (USAID) or the State Department if, using non-USAID funds, they engaged in abortion-related services. These services could include performing abortions in cases other than rape, incest, or a threat to the life of the woman; providing counseling and referral for abortion; or lobbying to make abortion legal or more available in the foreign country (Crane & Dusenberry, 2004). The International Planned Parenthood Federation refused to sign onto the policy and lost US\$21 million of its core funding—approximately 9% of its income—while smaller organizations had to close clinics and restrict services because of funding cuts (Senanayake & Hamm, 2004).

### *Impact on the Environment*

Environmental health risks have been fueled by rapid industrialization that is accompanied by inadequate environmental safeguards, together with spi-



raling population growth. The pace at which development is occurring is outstripping the capacity for replenishment, leading to large-scale losses in terms of arable land, clean waterways, air quality, and biodiversity. This in turn has implications for food security and food safety, and the potential for contamination of the general environment by hazardous and often carcinogenic materials (such as 1,3-butadiene, formaldehyde, polychlorinated biphenyls, and heavy metals) may increase a population's risk of cancer (Vineis & Xun, 2009). Another consequence of rapid industrialization in developing countries that rely on coal and oil as sources of energy is the rise in air pollution. Particulate air pollution causes a range of respiratory diseases as well as premature mortality by exacerbating heart disease (see chapter 8).

In occupational settings, the "race to the bottom" encourages employers to cut costs by being less stringent about health and safety standards at the workplace. There is also little incentive for small enterprises to meet environmental standards unless effective regulatory and monitoring systems are in place. In China, township and village enterprises (TVEs) established over the last three decades account for 50% of total production and 40% of national exports, and they employed more than 120 million rural workers (or 20% of all rural laborers) in 1999. A ministry of health survey found that TVEs had very low compliance rates with national occupational health standards for workplaces, including standards governing exposure to silica, coal dust, and asbestos. TVEs had very limited access to health and safety services—only 1.4% conducted preventive inspections, and 2.7% provided regular physical examination for their workers. Sixty percent of employers did not provide medical insurance, and no compensation was paid for work-related diseases in the majority of these entities (Zhi, 2002).

### *Travel and Communications*

A global labor market is contingent on human mobility—the exponential rise in the volume of air traffic reflects burgeoning international business travel, on the one hand, and the effects of low-cost airlines on the tourism industry, on another. With more than 2,000 airlines servicing over 3,700 airports, growth of world air travel has averaged approximately 5% per year over the past 30 years (MIT, 2008), and it is estimated that 1 billion persons travel per year (Mangili & Gendreau, 2005). Apart from rural-to-urban migration of workers within countries, there is also a tremendous movement across borders as foreign workers fill the labor needs of several East Asian countries, including Hong Kong, Malaysia, and Singapore (Martin, 2008). The impact of all these movements on how rapidly a new

or emerging infection can traverse the globe was demonstrated first by the SARS epidemic in 2002–2003, which spread to 30 countries over a period of 6 months (Fleck, 2003), and more recently by the H1N1 virus (see chapter 3). Interestingly, economic globalization is linked with the geographical spread of emerging infectious diseases in other forms: the introduction of the *Aedes* mosquito, vector for the dengue fever virus, to the Americas is postulated to have occurred in shipments of used rubber tires exported from Asia (Hawley, 1987).

Reduction in the “effective distance” between countries and business partners is also facilitated by information and communications technology. Shrinking costs have extended the reach of computers and the Internet, even to remote communities that struggle with basic needs. While this has the capacity to bring about tangible benefits to health, (e.g., telemedicine), it is also a conduit for transnational advertising and marketing. The influence of health on changes in consumer preferences, diet, and lifestyles to those that are less traditional and are associated with risk of chronic disease is one consequence of this. In many cases, countries do not regulate advertising in such a way that these harms are made known to the public.

#### *Lifestyle and Risk of Chronic Degenerative Diseases*

Over the past several decades, rapid changes in standards of living, population structure (primarily due to declining fertility rates and improved infant survival), and income growth have accelerated the epidemiological transition within many Asian countries (see chapter 2). The resultant increases in rates of chronic disease, including diabetes, heart disease, cancer, and mental illness, are discussed in chapters 4 and 6. The effects on migrant populations are less clear.

Asian markets are highly attractive to foreign investors selling health-harming products. Tobacco usage, for example, is growing fastest in low-income countries; in China, smoking prevalence among men increased from 43% in the 1950s to 63% in 1996, and imports of tobacco and manufactured tobacco substitutes doubled between 2002 and 2007. Nearly two-thirds of all smokers live in just 10 countries, including China, Indonesia, and Japan (WHO, 2008). Globally, tobacco use causes more than 5 million deaths per year and is the single most preventable cause of death in the world today (WHO, 2008), but with an estimated annual value of US\$22 billion, international tobacco trade is big business (World Lung Foundation, 2010) and tobacco is aggressively marketed in the region. Through WTO multilateral trade agreements, sizable reductions in tariff and nontariff barriers

expanded global trade in tobacco. The Framework Convention on Tobacco Control (FCTC) was adopted by WHO member countries in 2003 to initiate cost-effective interventions to reduce death and disease caused by tobacco use. Indeed, many countries in the region do provide health warnings on cigarette packets, and some (e.g., Thailand and Singapore) prohibit smoking in public and indoor venues; elsewhere (e.g., China) there are fewer and poorly enforced restrictions (see chapter 5).

Much like tobacco, alcohol is no ordinary commodity (Babor et al., 2003); however, unlike tobacco, alcohol lacks a framework for concerted global action. The acceleration of free trade at the regional, national, and global levels has created unprecedented opportunity for the expansion of alcohol corporations into emerging markets, thus increasing the availability, affordability, and marketing of alcohol in developing countries (Casswell & Thamarangsi, 2009). This aggressive expansion, coupled with the strong link between purchasing power and per capita consumption, suggests that alcohol consumption and its associated harms are likely to increase in most societies in the future (Beaglehole & Bonita, 2009). An important risk factor for chronic disease and injury, alcohol consumption accounts for approximately 4% of global mortality and between 4% and 5% of disability-adjusted life years (DALYs), making it one of the largest avoidable risk factors (Rehm et al., 2009). Increased alcohol consumption among countries in Southeast Asia previously associated with a culture of abstinence presents a growing public health problem.

That international trade agreements often fail to recognize alcohol as a health-damaging commodity is apparent in the degree to which regulation of alcohol pricing, marketing, and distribution is relaxed (or, in some cases, removed) at both national and regional levels, as well as the lack of a formal mechanism in which public health interests are represented in the development of trade agreements (Gould, 2005). Regulation may be of particular importance in East Asia, where populations may be genetically more predisposed to risk of liver disease and esophageal cancer because of lower activity of the enzyme that digests alcohol (see chapter 6).

### *Trade in Health-Related Services*

The scope of contemporary globalization encompasses the trade and production of both goods and services. Although international trade in health services is relatively new, advances in communication technology, increased mobilization of patients and providers, growing private-sector participation, and systemization of services trade within the WTO under

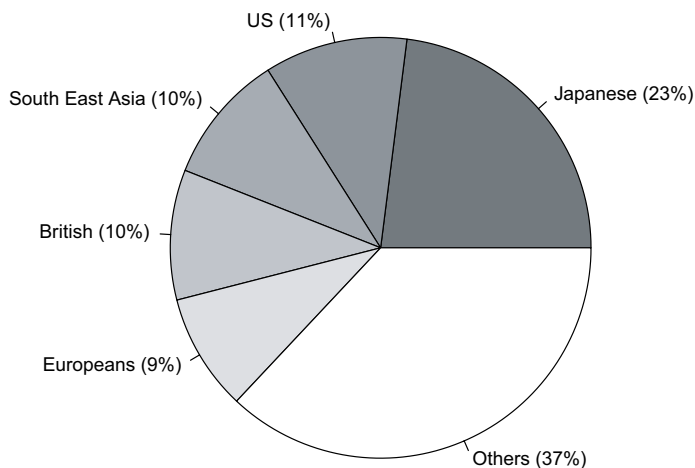


Figure 10.2. Medical tourists to Thailand, by area of origin, 2005. There were 1.1 million medical tourists in total. Source: Clearstate, 2007.

the General Agreement on Trade in Services (GATS) have prompted governments throughout the region to examine their position on this matter (Smith, Chanda, Tangcharoensathien, 2009). Unlike the GATT, which deals primarily with merchandise trade, the GATS deals solely with trade in services such as water, communication, health, and education. The GATS extends the concept of cross border trade by defining four modes of supply services, discussed next.

*Cross border supply* refers to the remote provision of services from a health provider in one country to an overseas patient or client. Examples include teleradiology, laboratory testing, remote surgery, and teleconsultation as well as administrative functions such as claims processing and medical transcriptions (Smith, Chanda, Tangcharoensathien, 2009). As an example, the Philippines, with a large pool of educated, English-speaking workers, is a major exporter of medical transcriptions to the United States. The Philippine government offers special incentives for foreign direct investment in the sector and the majority of the 25 companies exporting these services in 2004 were owned by US investors (Arunanondchai & Fink, 2007).

*Consumption abroad* refers to medical or health tourism and is typically characterized by patients of one country traveling to another for medical services. In 2007, medical tourism generated US\$1.3 billion in revenue,

with projected growth to US\$4.4 billion in 2012 (Clearstate, 2007). Lower costs, higher quality, and the availability of specialized or niche services (Arunanondchai & Fink, 2007) attract more than 1 million patients annually to Thailand (see figure 10.2), with Singapore and Malaysia expected to reach this number by 2012 (Smith, Chanda, Tangcharoensathien, 2009).

*Commercial presence* refers to the movement of capital across national borders, typically in the form of foreign direct investment. Within the health sector of developing countries, foreign direct investment can be an important source of capital investment and infrastructure development; however, foreign, for-profit firms with better pay, equipment, and services may lure health professionals away from the public health sector, thus creating an internal brain drain and creating a two-tier health system—high-quality care for the rich and low-quality care for the poor (Smith, 2004). In the ASEAN region, Singapore and Thailand have considerable commercial presence abroad. Parkway Group Healthcare, the largest investment group in the health care sector in Singapore, has set up joint ventures with hospitals in India, Indonesia, Malaysia, Sri Lanka, and the United Kingdom. Additionally, Thailand's Bumrungrad Hospital has entered into management contracts with hospitals in Bangladesh and Myanmar and has formed a joint venture with a hospital in the Philippines (Arunanondchai & Fink, 2007). As shown in table 10.2, in 2001 there were 24 private hospitals with part-foreign ownership in Thailand, with foreign investment originating from the following countries and regions: Japan (25%), Singapore (19.4%), China (11.1%), Europe (11.1%), and the United States (5.6%; Wibulpolprasert et al., 2004).

*Movement of individual service providers* refers to the temporary movement of health professionals from one country to another. Historically, the Philippines has been, and continues to be, a major exporter of health professionals, particularly nurses. From 1992 to 2005, more than 100,000 Philippine nursing professionals were deployed to work abroad (POEA, 2006). Top receiving countries included Saudi Arabia, the United Arab Emirates, Kuwait, the United States, the United Kingdom, and Ireland (Arunanondchai & Fink, 2007). Furthermore, of the total number of work permits issued for nurses in the United Kingdom during 2002, approximately 50% were for nurses who originated from the Philippines and India. Within the ASEAN region, the major receiving countries are Malaysia and Singapore, with Malaysia in the unique position as both recipient and exporter of health care workers (Arunanondchai & Fink, 2007).

Given the demographic profile of many receiving countries (e.g., rapidly

TABLE 10.2 Foreign Investment in Private Hospitals in Thailand, by Location, 2001

	Number without foreign investment (%)	Number with foreign investment (by hospital size)			
		<50 beds	51–100 beds	101–200 beds	>200 beds
Bangkok	48 (77%)	1	5	3	5
Central	117 (96%)	0	2	1	2
Northeast	42 (93%)	0	3	0	0
North	59 (97%)	0	0	1	1
South	36 (100%)	0	0	0	0
Total	302 (93%)	1	10	5	8

SOURCE: Wibulpolprasert et al., 2004.

aging populations), one can expect the migration of health professionals to increase over the coming decade. Within the next 5 years, developed countries in the region can expect an acute shortage of nursing staff (see table 10.3). Many countries in the region are trying to preempt the expected shortfall in supply through economic agreements and government policy. In September 2007, Japan signed an Economic Partnership Agreement with eight countries, including the Philippines and Indonesia, in order to meet the expected demand for nurses and care workers by 2010 (Amante, 2007; Stott, 2008). Sending countries face the dual problem of aging populations combined with increased outflows of nurses, physicians, and other health care workers (who themselves are often young). Moreover, developing countries are paying the cost of educating the nurses (and other health professionals), while the developed/rich countries reap the benefit. To combat this problem, some sending countries, like Malaysia, are actively recruiting foreign nurses. The Malaysian ministry of health has agreements with India, Pakistan, Bangladesh, Indonesia, the Philippines, and Albania that allow their nurses to practice in Malaysia (Matsuno, 2007). Within traditional sending countries, the implications of domestic shortages upon the national health system are not well understood, as few studies have examined the magnitude and impact of brain drain upon national health systems in developing countries (Pang & Guindon, 2004).

TABLE 10.3 Projected Nurse Supply in Selected Countries

	<i>Hong Kong</i>	<i>Japan</i>	<i>Korea</i>	<i>Macau</i>	<i>Singapore</i>	<i>Taiwan</i>	<i>Thailand</i>
In 1 year	↓	↓	↓	↓	↓	↑	↓
In 5 years	↔		↓		↓	↑	↓
In 10 years	↓		↔	↔	↔	↑	↓

SOURCE: International Council of Nurses, 2008.

### GLOBALIZATION AND THE RESPONSE OF HEALTH SYSTEMS

While fundamentally an economic process, contemporary globalization, unlike the forces of colonization and expansion of trade in the nineteenth century and early twentieth century, is multidimensional. It is also taking place at a pace and depth that is unprecedented.

It is important to recognize that improvements in health status in Asia have taken place over several decades, primarily as a result of broad-based improvements in sanitation, literacy, family spacing, nutrition, access to primary health care, and the implementation of public health measures such as vaccination, as well as treatment of infectious diseases (McMichael, 2000). The sustainability of these health gains, in light of the forces of globalization, is contingent on the public health community adopting an ecological and systems-based view of health and disease prevention that takes into account the complex and multifactorial issues involved.

How can we act to make globalization work *for* health? The new and rapidly evolving needs of the population call for both a global and a local response.

On a global scale, containing the spread of contagious diseases such as SARS and influenza is a concern that requires concerted, collaborative efforts by international organizations and their member states. It also requires a substantial commitment of resources by governments nationally, regionally, and internationally. International health diplomacy is also essential so that countries can work together to address concerns relating to equity and to redress possible imbalances, as illustrated by both the TRIPS-plus agreements and the WHO initiative on tobacco.

As we have seen, the social and political institutions within each coun-

try play an important role in determining the impact of globalization on the health of its population. The degree to which the poorest sections of society are able to benefit from economic growth depends on the economic and social policies that are in place at the national level to safeguard the equitable distribution of benefits. Even on an informal level, this social capital (e.g., civic institutions, social networks) can be a critical safeguard against urban decay and the weakened support systems that are encountered in many major cities in Asia.

A salient example of the need for appropriate social policies at the national level is the structure and financing of health care. The effect of financial reforms introduced in China in support of a decentralized, market-based health care system has provided important lessons for the region. Beginning in 1978, health institutions were regarded no longer as welfare entities fully supported by the state but as economic entities. The proportion of national health spending by the central government fell from 32% in 1978 to 14% in 2000, and out-of-pocket payments rose from 20% in 1978 to 60% in 2000 (Blumenthal & Hsiao, 2005). The health care system fundamentally evolved from public-funded state clinics and hospitals to a fee-for-service system. On the one hand, this led to an oversupply of profitable services, such as drug prescriptions (which can lead to drug-resistant disease; see chapter 3) and expensive investigations, while on the other hand, it denied access to a large proportion of the population, who could not afford health care. In 1978, 85% of the rural population was covered by the Cooperative Medical Scheme, a health security program; this had fallen to 9.5% in 2003. The Third National Health Services Survey in 2003 found that 40% of ill persons do not seek medical attention and that 70% of those refusing hospitalization after being referred cited cost as their main reason (Ho & Gostin 2009). Additionally, the reduction in government health budget allocated to public health and preventive services was particularly marked: from 15–18% in the 1970s, to 10.6% in 1995 (Liu & Mills, 2002). Disease prevention, public education, and surveillance of disease, being unprofitable, lacked the resources to be effective, which led to failures in containing the incidence and spread of communicable diseases. The widening of health inequalities caused by all these changes has led the Chinese government to consider comprehensive reforms that would provide universal health coverage and enhanced public health functions (Blumenthal & Hsiao, 2005; Ho & Gostin, 2009). The lessons learned in health care provision and financing will be important for other rapidly transitioning economies.



## GLOBALIZATION AND PUBLIC HEALTH RECONSIDERED

It is clear that the openness and porosity that characterize economic globalization can and do have a complex influence on the overall health status of populations in East and Southeast Asia. While some of the influence is positive, it will take a sustained effort by both the international community and national governments to mitigate the potential hazards, particularly to the most vulnerable groups of society. What this clearly implies is the need for a strong state to conduct essential public functions and for the appropriate social and economic policies to be in place.

If anything, the Asian experience has emphasized the need for a mixed-economy approach to development, a pointillistic rather than a broad-brush strategy. As Rodrik (2000) has noted:

The idea of a mixed economy is possibly the most valuable heritage that the twentieth century bequeaths to the twenty-first in the realm of economic policy. . . . We enter the twenty-first century with a better understanding of the complementarity between markets and the state—a greater appreciation of the virtues of the mixed economy. That is the good news. The bad news is that the operational implications of this for the design of development strategy are not that clear. There remains plenty of opportunity for renewed mischief on the policy front. . . . The state and the market can be combined in different ways. There are many different models of a mixed economy. The major challenge facing developing nations in the first decades of the next century is to fashion their own particular brands of the mixed economy. (pp. 1, 3)

As the effects of globalization become increasingly apparent in the region, it is the social capital, evident in the quality of domestic policies and the strength of regulatory institutions, that will play an increasingly important role in determining whether the fruits of globalization will realistically translate to the betterment of all societies.

## NOTES

1. There is, of course, another aspect of economic globalization, namely globalization of labor, which has lagged the other components of globalization quite significantly (Streeten, 2001; World Bank, 2002b). See Rajan and Srivastava (2007a) for an overview of cross border labor flows and worker remittances.

2. Note that the use of markets does not, by any means, imply complete *laissez faire*.

3. The term *production sharing* is used by Yeats (1998), while the term *pro-*

*duction fragmentation* is used by Jones and Kierzkowski (2000). Other terms sometimes used in the literature to describe this phenomenon include *disintegration of production* (Feenstra, 1998) and *slicing the value chain* (Krugman, 1995). See Rajan (2003) for a discussion of globalization of capital flows.

4. Rajan & Srivastava (2007b) offer an overview on services outsourcing with reference to Asia.

5. See Kleinert (2001) for a discussion on the role of multinational corporations in international trade.

6. While discussions of the impact of globalization on public health have traditionally focused on movement of infectious diseases, the reach of globalization moves beyond communicable diseases and extends into risk factors, health products, and health services. For further reading on the impact of globalization and trade liberalization on health risks and health care, please see WHO, 2000.

7. Ravishankar et al. define development assistance for health as “financial and in-kind contributions from channels of assistance to improve health in low-income and middle-income countries.”

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# 11 Health Services

U Than Sein and Kumnuan Ungchusak

Health services are all services dealing with prevention and treatment of diseases and disabilities, rehabilitation and restoration of health, and promotion and maintenance of health. This chapter covers how health systems work to prevent and control the major communicable and noncommunicable diseases, how both financial and human resources are managed, and how the health systems in many Asian countries are structured. Despite the diversity of countries in Asia, all have gained higher levels of health status in recent decades because of improvements in their health care systems. These successful efforts are a welcome movement, but they tend to mask persistent social and health inequalities not only between the high- and low-income countries but within countries. Sizable rural populations in many developing countries still lack access to basic health services. Some countries are not able to adequately finance their own health systems, and so they rely heavily on external assistance, which is sometimes diverted to limited or inappropriate programs. While immunization programs have controlled many communicable diseases, there is a continuous threat of new and emerging diseases, as well as a growing incidence of chronic conditions. Disease surveillance and response systems should be ready for early detection and response to disease outbreaks and public health events.

## INTRODUCTION

A wide range of health problems and issues exists in the different countries in Asia, a diversity that is reflected in the region's health systems and health outcomes. Life expectancy at birth for both genders in 2008 ranged from 54 years in Myanmar to 83 years in Japan. Similarly, the under-five mortality rate (probability of dying by age 5) per 1,000 live births in 2008

for both genders was as high as 122 for Myanmar and as low as 3 for Japan (WHO, 2010). The evolution of health systems in these countries has influenced these wide variations in health outcomes, which in part mirror political, socioeconomic, and infrastructure development.

Inputs for health services—financing, human resources, facilities and equipment, technologies, and mechanisms—determine how to best provide health services. Similarly, the access, coverage, and quality of health services reflect how health systems are organized and managed. This chapter provides an overview of health care systems, how financial and human resources are managed, and how the major communicable and noncommunicable diseases are prevented and controlled.

## HEALTH SYSTEMS

All national health systems have evolved from initially providing local personal health care at simple hospitals and clinic-based facilities, along with minimal preventive public health services, through tropical-disease control programs and active hygiene/health campaigns. Health programs gradually developed toward a comprehensive system implementing integrated public health programs and medical care interventions. In Asia, health systems development can be traced to the traditional systems of medicine, including Ayurvedic and Chinese herbal medicines as well as other traditional practices for the prevention and cure of illnesses. Such treatments are still widely used. Modern health systems arose only recently, and most are still in a stage of continuous development. A 2005 review of the development of health systems in Japan presents the most documented model. There, the system evolved in successive stages, beginning with an era of acute medical care incorporating both traditional and allopathic medicine and achieving control of communicable diseases through mass public health campaigns. Later, services were restructured and expanded to include social welfare, culminating in recent reforms for addressing the challenges of an aging society (JICA, 2005; Wagstaff, 2005). This process of evolution through a series of epidemiological and economic stages is reflected in many Asian countries.

Today, the quality of health care varies considerably in Asia, with many countries still in the transition stages experienced earlier by Japan. In developed countries, such as Singapore and RO Korea, health services are provided to their citizens through public hospitals, private clinics, and private hospitals, staffed by qualified medical practitioners in both urban and rural areas. Health care in these countries is usually supported by

the latest diagnostic technology, and patients are provided with the latest available medicines. In the least developed countries, such as Myanmar, Laos, and Cambodia, people rely on small rural health facilities staffed with middle-level community-based health workers able to provide basic prevention and first aid. These health facilities are supported by different tiers of hospitals (township, district, provincial, and central levels). The simplest are able to provide basic care such as simple surgery, internal medicine, obstetrics and gynecology, and pediatrics, while tertiary hospitals, usually located in cities, can provide specialty services such as cardiology; eye, ear, nose, and throat specialties; and advanced respiratory and gastrointestinal medicine. While the majority of these facilities are public and managed by central, provincial, or local governments, an increasing number of higher-level facilities staffed with private practitioners are becoming available. This situation is more often seen in middle-income countries, such as Thailand, Malaysia, or the Philippines. Although referral systems have been established with a hierarchy of health facilities, the gatekeeper mechanism works only where there is a social health insurance (SHI) system, as in Japan, RO Korea, and Thailand. In countries with less SHI coverage, such as Cambodia or Myanmar, patients tend to bypass local health facilities and go directly to specialists. This leads to an unnecessary overload at specialist hospitals and increases the use of private medical practitioners. The growing private sector needs to be regulated, since out-of-pocket expenditure is becoming uncontrollably high.

Many countries have initiated reforms in recent decades. These have included the devolution of authority to local bodies on health matters, as well as changes in sources or methods of health care financing, as important strategies. The approach has varied among countries, depending on the extent of devolution and decentralization, division of responsibility and resources, and management capacity at each level of the health system. Most nationwide health development programs promote community awareness and the creation of active and effective mechanisms for community involvement. The conventional approach of merely expanding basic health services (e.g., hospitals and health centers) and employing community-based basic health workers was often inadequate; the costs of expanding basic health care services in the face of existing resource constraints were unrealistic. Thus, many countries, including Myanmar, Indonesia, Thailand, and the Philippines, opted to deploy large numbers of community-level health volunteers, trained for short periods, as additional human resources. This approach has proven successful for expanding essential health care coverage in many countries. With volunteers' involvement in



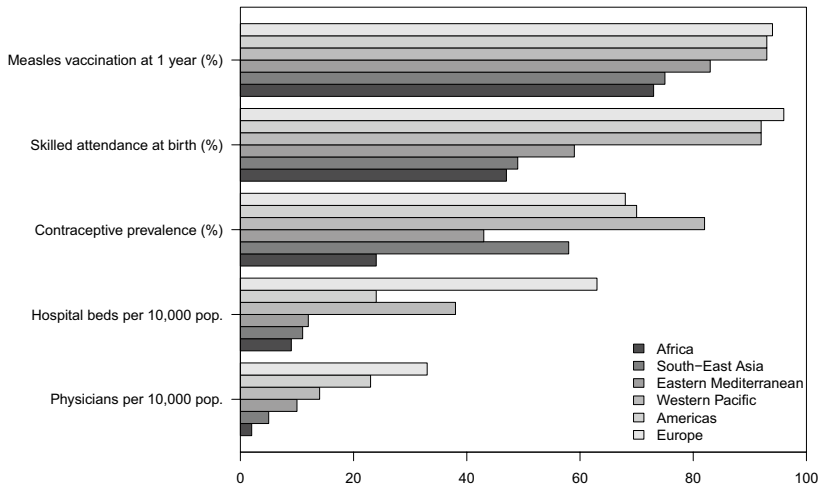


Figure 11.1. Access to health care by regions of the WHO, 2008. Source: WHO, 2010, tables 4, 6.

health activities, many essential public health interventions were further developed and improved. This was especially true for epidemic control and immunization, health promotion, maternal and child health care (including nutrition promotion), information gathering and surveillance, treatment of minor ailments, and environmental health promotion.

Almost all Asian nations have implemented a series of so-called third-generation health reforms either by improving the content of essential packages for health care and public health or by improving the way in which these packages are financed. Many models of health financing at either the national or local level were developed, including expanding SHI and increasing the role of the private sector both for profit and not for profit. The issue of an appropriate public and private mix in health systems has been extensively debated; because governments were unable to increase health expenditure, an increasing proportion of health care expenditure became out-of-pocket. Some new nonprofit international and national agencies have emerged to assist expansion of public health development and medical care to the underserved populations, as seen in Cambodia and Laos. Governments have needed to seek a balanced mix of both private and public funding that would fit within the existing socioeconomic, political, and health context of their countries, while also considering the extent to which national health plans could address gaps in health care and create a pro-poor health system. Figure 11.1 shows the situation of access to health care across WHO regions.

Many countries still face challenges in health services development. While all countries have attained higher levels of life expectancy and declines in infant and child mortality, there remain large differences in mortality and other health outcomes between countries. Disparities also exist within countries; the poor, less educated, marginalized, and rural populations have higher child mortality rates and poorer health outcomes than the nonpoor. This can be explained, in part, by inadequate coverage of quality health services. Many countries have attempted to provide universal health care by expanding health staff and facilities, but ensuring appropriate quality of health services, including patient safety, is a major challenge, especially for the least developed countries of Asia.

#### HEALTH FINANCING

A large proportion of Asians live below the poverty level; for them even small health events may have catastrophic financial consequences. Development of health systems to shoulder these financial burdens does not necessarily involve substantial resource inputs, as long as the resources available are used in the most cost-effective way. Financing health systems depends not only on the share of disposable income that each household spends on health but also on the methods of public and private financing, such as general taxation, SHI, and/or out-of-pocket payments. The reform of health financing depends on how health systems protect people financially in the fairest way possible and on how appropriate incentives are given to health care providers to motivate them to improve the health of their people.

##### *Level of Health Expenditure*

The low investment in health in most of Asia has changed little in recent decades. Per capita total health expenditures range from US\$7 in Myanmar and US\$27 in Laos to US\$2,751 in Japan (WHO, 2010). Publicly financed health expenditure as a percentage of the total health expenditure varies from under 20% to over 80% (table 11.1).

It has been estimated that to achieve the relevant UN Millennium Development Goals, a minimum government expenditure on health of US\$34 per capita per year is required to provide an essential package of public health interventions (WHO, 2001). In poor countries, roughly one-third of the disease burden in 1990 might have been averted at a total cost per person of only US\$12 (WHO, 2000). Thus, efficient health spending could be achieved if countries adopted an essential set of interventions with an average cost of US\$30–40 per person. However, health systems

TABLE 11.1 Health Expenditure Patterns in Selected Countries, 2007

	<i>Total expenditure on health (THE) as % of GDP</i>	<i>General government expenditure on health as % of THE</i>	<i>Private expenditure on health as % of THE</i>	<i>External resources for health as % of THE</i>	<i>Social security expenditure on health as % of general government expenditure</i>	<i>Out-of-pocket expenditure as % of private expenditure</i>	<i>Per capita THE at average exchange rate (US\$)</i>
Cambodia	5.9	29	71	16.4	0	84.7	36
China	4.3	44.7	55.3	0.2	55.3	92	108
Indonesia	2.2	54.5	45.5	1.7	16	66.2	42
Japan	8	81.3	18.7	0	78.7	80.8	2,751
Laos	4	18.9	81.1	14.5	12.1	76.1	27
Malaysia	4.4	44.4	55.6	0	0.8	73.2	307
Mongolia	4.3	81.7	18.3	2.6	33	84.4	64
Philippines	3.9	34.7	65.3	1.3	22.3	83.7	63
Republic of Korea	6.3	54.9	45.1	0	77.7	79.2	1,362
Singapore	3.1	32.6	67.4	0	15.3	93.9	1,148
Thailand	3.7	73.2	26.8	0.3	9.7	71.7	136
Timor-Leste	13.6	84.6	15.4	35	0	37.2	58
Vietnam	7.1	39.3	60.7	1.6	32.3	90.2	58

SOURCE: WHO, 2010.

that spend less than US\$60 per capita may find it difficult to deliver a reasonable minimum range of services (WHO, 2000).

Countries generally finance part of their health care resources through tax revenues. Health policy makers often question the optimal level of health investment, whether public or private, or in economic terms, how much of a nation's gross national product (GNP) or gross domestic product (GDP) should be devoted to health care. Total health expenditures as percentage of GDP in 2007 in Asia were 1.9% in Myanmar, 2.2% in Indonesia, 3.7% in Thailand, 3.9% in the Philippines, 7.1% in Vietnam, and 8.0% in

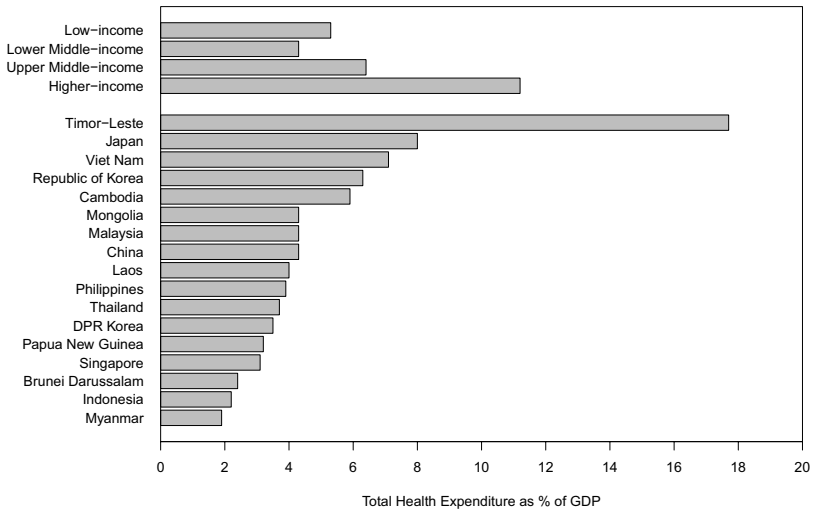


FIGURE 11.2. Total health expenditure as percentage of GDP in Asia, 2007.  
Source: WHO, 2010, table 7.

RO Korea (figure 11. 2; WHO, 2010). Japan has one of the highest health expenditures, spending 8.0% of GDP. In accordance with the global health-for-all goals, countries agreed in the 1980s that the target should be that each state would invest at least 5% of its GDP on health. However, there was no clear explanation as to how this target was being set (van Herten & van de Water, 1999). A study undertaken by the International Monetary Fund (IMF) in 2001 suggested that effective health services coverage would require around 12% of GNP in low-income countries in order to meet the UN Millennium Development Goal of reduced infant mortality (Gupta et al., 2001). An appropriate benchmark for health expenditure, either as a percentage of GDP or proportionate to per capita income, is extremely difficult to establish (Saviedoff, 2007). Research is under way to better define the minimum amounts of financing that each country should invest in order to optimally develop its health system. The WHO has recommended that low-income countries should increase their budgetary outlays on health by 1% of GNP by 2007 and by 2% of GNP by 2015, in view of existing and expected trends of economic growth (WHO, 2001).

Health care financing by general taxation, as well as social health insurance, demands an excellent taxation collection system, which is absent in most countries. General taxation revenue usually accounts for around 14–20% of the total public revenue in low- and middle-income countries

around the world. Poorer countries actually mobilize a smaller share of GNP in tax revenues: an average of 14% of GNP in low-income compared with 31% of GNP in high-income countries. These poorer countries have relied heavily on taxation of international trade (exports and imports). Thus, these countries need to make overall financial reforms in order to improve revenue earnings from domestic taxation. While health spending has a high correlation with per capita national income, there are still some limitations in predicting how much more any particular country should spend on health as its income rises.

### *Earmarked Funds*

Indirect taxation of harmful products such as tobacco and alcohol has been earmarked to fund health promotion and disease prevention in some countries. For example, RO Korea, under the National Health Promotion Act in 1995, established a National Health Promotion Fund from excise taxes on tobacco products. The ministry of health and welfare collected 150 won (US\$0.15) for every pack of 20 cigarettes sold in 2000, which was later increased to 500 won in 2004. Ninety-seven percent of the US\$640 million collected annually from this tax is used to fund national health insurance, and the balance is used for health promotion and tobacco control, including actions for limiting advertisement of cigarettes and alcohol. Similarly, the Thai Health Promotion Foundation (ThaiHealth) funds tobacco and alcohol control, injury prevention, health promotion for elderly persons, and community capacity strengthening by using a 2% dedicated tax on tobacco and alcohol under the Health Promotion Foundation Act of 2001 (Prakongsai et al., 2007).

Such dedicated tax or earmarked taxation is imposed with the understanding that excessive consumption of harmful products not only is detrimental to oneself but also incurs additional budgetary expenses for families, the government, and society as a whole. One could argue that dedicated taxes place an extra burden on the poor. There is also some disagreement on whether tax revenue collected on harmful products such as tobacco or alcohol should be used exclusively for health purposes. Some countries instead use state-run lotteries or other special revenue collection strategies to raise revenue for health. In many cases, ministries of finance are reluctant to earmark taxes for health promotion.

### *Social Health Insurance*

Social health insurance (SHI) is a mechanism for financing and managing health care by pooling the health risks of its members, on the one

hand, and the financial contributions of enterprises, households, and government, on the other (Carrin et al., 2001). It is usually formed as part of a broader social security framework, covering all contingencies that need financial protection and risk sharing. SHI programs typically have mandatory membership; are initially limited to people (and their dependents) formally employed in commercial, semicommercial, industrial, and agricultural establishments; and are later expanded to the informal sector. For example, in RO Korea, national mandatory health insurance that began in 1963 initially covered employees of the formal sector (i.e., establishments with more than 500 workers). In the 1980s, the program expanded to cover government employees and teachers and firms with fewer than 300 employees. This was further extended to small firms of less than 16 employees and then to the self-employed in all urban and rural areas. Since 1989, almost 96% of the 47-million population of RO Korea have been covered under the mandatory SHI system. The remaining 4% of the population are covered by a medical aid program for the poor that is fully subsidized by the general revenue of the government. Like RO Korea, other high- and middle-income countries in Asia, including Japan, Singapore, Thailand, and the Philippines, have greater SHI coverage, while poorer nations such as Myanmar, Laos, and Cambodia provide less coverage. Vietnam, for example, which started its SHI system in 1992, presently covers only employees and retirees from the formal sector, their family members, and school children; coverage for people working in the informal sector, especially in rural areas, is still underdeveloped.

All parties in an SHI system have the responsibility for paying contributions and allocating them to health promotion and health care. Payment is made through an organizational arrangement to collect the regular income-related prepayment contributions from individuals (earmarked deductions from regular payroll). For example, in Indonesia civil servants pay a premium of around 2% of their basic monthly salary, and since 2003 the central government has contributed 0.5% of the basic salary. For other employees, the PT Jamsostek system, managed by a for-profit public company, requires employers to make monthly insurance contributions that are 3% of their single employees' salaries and 6% of married employees' salaries.

The changing needs for health care over the course of life imply that health care may be funded at least in part by savings. This approach is best developed in SHI systems that include medical savings accounts, an approach pioneered by Singapore's 3M framework, which includes the Medisave, Medishield, and Medifund financing systems. Singapore's Medi-

save system generally excludes coverage of outpatient services, so Medisave balances are reserved to pay for infrequent but high-cost inpatient care. As the system depends on intertemporal pooling over the individual's life cycle, it is not actuarially feasible for Medisave balances to insure against truly catastrophic contingencies. To solve this problem, Singapore introduced Medishield, a backup health insurance program based on cross-sectional risk pooling, designed to finance extreme catastrophic illnesses. In 1993, the Singapore Government created an endowment fund, Medifund, to assist persons who are in poverty and cannot pay their hospital bills. The interest income from this endowment fund is used to cover poor patients who are hospitalized.

### *Direct Payments*

Although some countries, including China and Myanmar, ostensibly provide free health services at government facilities for their citizens, they and other countries have introduced user charges at public and private health care facilities, with the expectation of relieving the burden on public expenditure on hospitals and health centers. Even where SHI is in place, some of the costs have been levied to patients in the form of co-payments or deductibles as out-of-pocket payments at the time of use. Private out-of-pocket payments or direct payments now form a major part (more than 80%) of health expenditure in both rich and poor countries, including Japan, RO Korea, Singapore, Indonesia, Myanmar, Cambodia, and Laos. Various systems of user charges at public establishments have been introduced, but they are typically fees for ordering expensive medical or diagnostic tests or charges for pharmaceuticals. Sometimes under-the-table payments have to be made for conducting surgical operations or treating catastrophic medical illnesses. Most countries have allowed local health institutions to retain a larger proportion of the fees collected and to use these funds for pharmaceuticals, services, and maintenance. User fee problems might improve following effective civil service reform, budgetary reform, decentralization, or introduction of market mechanisms in the public sector. Experience from Laos has shown that a user charge for drugs has played a significant role in ensuring availability of essential drugs at the primary care level (UNESCAP, 2009).

There are many adverse consequences of introducing user charges for health care, in terms of equity, efficiency, and consumer satisfaction as well as providing an excuse for government to cut the health budget (van Doorslaer et al., 2005, 2007). Experience with the introduction of user fees has been unsatisfactory in many Asian countries (O'Donnell et al.,

**BOX 11.1 Country Snapshot:**  
**Thailand's Health Insurance System**

Thailand introduced the national social welfare scheme for low-income households in 1975, originally giving free medical care to poor workers from the formal sector and later extending it to people over 60 years, children under 12 years, secondary school students, disabled people, veterans, and monks. By 2000, around 20 million people were covered under this system.

In 1978, with a royal decree, Thailand introduced the Civil Servant's Medical Benefit Scheme (CSMBS) to cover all government employees (including staff of state enterprises), pensioners, and their dependents (parents, spouses, and children). It now covers around 6 million civil servants and their dependents. It was initially a fee-for-service reimbursement plan. After the economic crisis in the late 1990s, the government reformed the CSMBS to include capitation for ambulatory care, a global budget, and diagnosis-related groups for inpatient care.

Following the enactment of the Social Security Act 1990, the government introduced national mandatory health insurance for all private enterprises with more than 20 employees, using a capitation, low-cost contract model. In 1994, the coverage extended to private or commercial establishments with more than 10 employees, and by 2002 it included small enterprises with 2 or more employees. The scheme covered around 4 million employees. The financial contribution was progressive, with a fivefold gap between the contribution of the highest wage earners and that of the lowest.

The Voluntary Health Card (VHC) project introduced in 1983 initially covered MCH care. It has expanded to include village health volunteers and local leaders, with a 100% government subsidy. The Universal Coverage (UC) Scheme, often called the 30 baht scheme, was introduced in October 2001, with the idea that it would replace the social welfare scheme and the VHC system. It aimed at incorporating the uninsured 30% of the population into a single system. The UC scheme includes plans to provide comprehensive health care coverage with virtually no co-payment by users, apart from a nominal fee of just 30 baht (which was later dropped) per each health visit or hospital admission. The scheme is mainly subsidized through funds from general taxation.



BOX 11.2 Country Snapshot:  
Social Health in the Philippines

In the Philippines, health spending patterns have remained unchanged for the last few decades, with around 3% of GDP as total health expenditure. More than half of this has been out-of-pocket private expenditure. The voluntary social health insurance (SHI) scheme for employees in the formal sector and their dependents started in 1972. The medical benefits included reimbursement of inpatient and outpatient care provided by both public and private health facilities. The premium was a mandatory payroll reduction of 2.5% of monthly wages, up to a ceiling of 3,000 pesos, with employers and employees contributing equally. The scheme was operated by a government agency, the Philippines medicare commission, almost self-financed with limited public subsidies.

By the early 1990s, the SHI system covered around 40% of the population. In 1995, with the enactment of the National Health Insurance Act, the national SHI scheme expanded to cover around 75% of the total population. Efforts are being made to reach universal coverage as soon as possible, by making SHI coverage mandatory for all employees and their family members, in both the formal and informal sectors.

The government provided the financing for SHI through the payroll taxes and general taxation. A positive factor was the strong involvement of local governments and their commitment to the subsidized program for the poorest families. Payment was based on the conventional fee-for-service reimbursement model, resulting in some negative factors: cost escalation, overcharging, excessive admissions, and irrational use of drugs and investigations. In addition, there was a limited package for inpatient care. Co-payment was high, with average support ranging from 30–70% of billing. Awareness of the system, and thus its utilization rate, was low, resulting in a surplus of funds. Unfortunately, there has been an enormous workload of claim reviews, resulting in high administration costs (12% of total spending) and ineffective filtering of fraudulent claims.

2008). It creates barriers to essential health services with public health implications. For example, user fees might be responsible for a resurgence of tuberculosis in China, failure to raise significant revenue, and failure to protect the poor through exemptions. In addition, although there are ostensibly various mechanisms of exemptions for the poor, providers may still charge. Absent any government assistance, out-of-pocket expense can push households into poverty, if they must borrow money or sell assets, or it can preclude access to needed care. Analysis of information from 89 countries yielded a strong correlation between out-of-pocket payments and incidence of catastrophic health expenditure (Xu et al., 2007). An increase of 1% in the out-of-pocket portion of total health expenditures was associated with an average 2.2% increase in the proportion of households experiencing catastrophic consequences; about 10.5% of households in Vietnam and 5% in Cambodia experienced catastrophic health care events. User fees can also lead to unethical practices in health care, as discussed later in this chapter.

### *Community-Based Health Financing*

Recently, voluntary pooling of resources for health, especially at the community level, has emerged as another health-financing mechanism in low-income and lower-middle-income countries. These community-based health-financing strategies, including voluntary risk-sharing systems (both for formal and informal employment sectors), highlight the importance for national or subnational governments to ensure that financial risk sharing covers the entire population. Presently, these risk-sharing systems have limited coverage, in terms of both population and the range of health care services provided. Continuous and sustained support and incentives from national and local governments are required to improve managerial skills and to provide opportunities for pooling of funds to generate greater financial viability and sustainability. Large financial pools are better than small ones, as they can provide for a better sharing of health risks and raise more revenue. A larger pool can also take advantage of economies of scale in administration and reduce the level of contributions required to protect uncertain needs, while ensuring that sufficient funds are available to pay for services. Experience has shown that pooling risks to cover both health problems and financial burdens has increased the efficiency of health systems, creating better health outcomes.

Developing countries such as the Philippines, Indonesia, Cambodia, Laos, and Myanmar have developed different forms of community health financing systems, through non-formal-sector health insurance initiatives

to cover certain targeted groups, such as poor women, low-wage workers, and the semi-employed, in both rural and urban settings. The major policy challenge is how to accelerate the development of these community-based systems to facilitate the broader coverage of all people. Social capital is a prerequisite to implement such systems, and since social capital varies among states and even among localities, the design of programs is very location specific. This condition makes it difficult to replicate the systems in other areas. There needs to be strong stewardship from the government to enhance such community-based systems and, if possible, provide additional funding. For various reasons, involvement of nongovernmental organizations in SHI development at local levels is relatively marginal, compared with other development areas. The experience already gained by implementing various models of community-based financing systems, especially in ensuring consensus on solidarity and contribution and in community management of collecting and allocating funds, could play a useful role in expanding such systems into national universal health protection programs.

#### *External Funding for Health Care*

It is very difficult to estimate how much of public health spending is funded through donations and loans, from either bilateral or multilateral agencies and financial institutions or internal resource collection through grants/donations. Many governments do not show these grants and loans in their public budget estimates or expenditure statements. While some countries show the value of expected and actual external loans and grants, some report only the actual amount received in previous years. The least developed countries, such as Cambodia or Laos, received donor assistance of nearly US\$52 per person for health per year (on average for 1997–1999), while the total outlay of donor assistance for health in these countries was around US\$1.4 billion (WHO, 2001). The degree of dependence on donor resources as a percentage of total resources for the health sector varies from country to country. In 2007 it ranged from 0.1% in China and 1.4% in Indonesia and the Philippines to 7.6% in Myanmar and Bangladesh, 16.4% in Cambodia, and 35% in Timor-Leste (WHO, 2010). It is generally perceived that total dependence on external financial sources makes a country's health system vulnerable. External aid in health, especially through large international health partnerships, can create imbalance in the overall allocation of health resources and lead to loss of a country's autonomy in making health decisions.

Much support for health sector development comes from bilateral gov-

ernment programs and multilateral financial institutions such as the World Bank, the International Monetary Fund, and regional development banks. However, national and international civil society organizations, including foundations, also play an important role in financing health, especially for prevention and health promotion. Several multinational pharmaceutical corporations, such as Novartis (for leprosy), SmithKline Beecham and Merck & Co. (for river blindness and filariasis), and Pfizer (for trachoma), contribute their products to assist with the elimination of major diseases (in what is known as public-private partnerships). The recent entry of foundations set up by private philanthropists to support health and other social causes, with multibillion-dollar contributions in specified funds and programs for health development, is most welcome. These include foundations in the names of Helen Keller and entrepreneurs Bill and Melinda Gates, M. Bloomberg, W. Buffett, and George Soros as well as multinational corporations such as Kellogg and Hilton. Another new big player, with nearly US\$15 billion, has been the Global Fund to Fight AIDS, Tuberculosis and Malaria (the Global Fund). Established in 2000, it is primarily funded by the United States, the United Kingdom, Japan, and Nordic countries as well as the Bill and Melinda Gates Foundation and a group of private corporations. It has disbursed large grants to China (US\$400 million), Thailand (US\$190 million), and Indonesia (US\$222 million; Global Fund, 2010). However, inputs from all the above funding sources have benefited programs that primarily target specific diseases, such as HIV/AIDS, tuberculosis, and malaria, which may affect only a certain segment of people in a minority of developing countries. Usually, these funds and programs come with hidden costs and political pressure, and sometimes national priorities become distorted (see chapter 10 for further discussion).

External financing of health generates the potential for weakening health systems, rather than strengthening them, allowing countries to avoid finding sustainable solutions. The sector-wide approach in health development planning is one method of improving external aid coordination, harmonization, and alignment through a wider consultative process involving civil society groups. A shared policy framework using sector-wide approaches and a common or pooled program budget reduces duplication and ensures better coordination for resource allocation and more opportunity for working with partners. There has been growing willingness to employ sector-wide approaches for health systems development in some low-income countries, such as Cambodia and Papua New Guinea, which suggests these approaches can be an effective investment in health systems capacity and

government ownership. The evidence also suggests that success depends on the degree to which specific and high-priority objectives target the poor (Hutton & Tanner, 2004).

## HEALTH HUMAN RESOURCES

A key factor for health development, and one greatly affected by health financing, is having competent human resources for health, that is, the right numbers and mix of health professionals with the right knowledge, skills, and attitude. The development of human resources for health is crucial for improving health services coverage and for scaling up public health interventions. Because human health resources consume as much as 35–45% of public health expenditure, it is essential that they are fully developed and optimally utilized (WHO, 2006). Major reasons for the health workforce shortage vary greatly between and within countries but include insufficient numbers, due to underinvestment in education and training; loss of existing workforce, due to emigration to other countries or to international agencies (see chapter 10); inadequate governance, management, and coordination (i.e., career structure and staff supervision); and inefficient planning.

Physicians are the backbones of delivering essential health care. Increased production of physicians has to be accomplished through the rapid expansion of medical schools, health care facilities, clinics, and hospitals in both the public and private sectors. For example, Myanmar has increased medical and nursing universities threefold in the last two decades. The country had around 10,000 doctors in 1986, increasing to 23,000 by 2008. While there has been a modest increase in the number of doctors in the public sector, there has been a threefold increase from 5,000 in 1986 to 15,000 in 2008 in the private sector. Realizing the shortage of physicians, especially in rural areas, many Asian countries such as Thailand, Indonesia, and Myanmar have established new universities throughout the country to reduce the rural-urban imbalance of physicians. Most medical faculties offer postgraduate specialty training or residency for at least 3 years.

While most countries have graduate and postgraduate institutes for public health workforce training and education, they have been unable to meet the challenge of the changing demands of rapidly evolving public health needs. It is also common to see public health education under the umbrella of medical education. Weaknesses that impede the development of a relevant and sufficient public health workforce include the lack of

incentives and career structure for public health professionals (especially for nonphysicians), the view that public health training is an extension of the biomedical model of clinical training, and the inclusion of many training courses and core curricula that are either obsolete or irrelevant to the public health needs of the countries. Several networks, both formal and informal, among public health education institutions such as the South-East Asia Public Health Education Institutions Network and the Asia-Pacific Academic Consortium for Public Health have been established in order to collaborate and support exchange programs for faculty members and students, share curriculum and training materials, and organize joint research studies. Some of the networks have full participation with institutions from Europe and the United States.

Nursing and midwifery personnel include a wide variety of professional and semiprofessional health workers. They usually have at least a high school education and 3 years or more of basic professional nursing and midwifery education. Opportunities are also given for post-basic specialty training and for postgraduate master and doctorate programs. There are also semiprofessional nurses / nurse-midwives who receive education in nursing and midwifery for 1 to 2 years and can provide basic nursing and midwifery care, normally under the supervision of professional nurses / midwives. The shortage of nurses and midwives in Asia has been a chronic human resource issue for decades, and many countries have attempted expansion of nurse training institutions to match the need. While attempts have been made to have a global standard for nursing and midwifery practices, the nursing education sector still needs to improve and upgrade its curricula, teaching methods, clinical practice, clinical sites including community-based institutions, student assessment, evaluation methods, quality assurance, and accreditation. The production of nurses is two to three times more than it was in the 1980s, but there is still a shortage, and the physician-to-nurse ratio has remained unchanged at around 2:1 in most countries.

Very often, health workers find it difficult to keep pace with new knowledge and skills, especially when language barriers preclude access to the vast medical literature, much of which is only in English. In some languages, such as Khmer, the medical language is not well developed and the medical curriculum is taught in a foreign language, such as French in Cambodia. Hence, preservice, in-service, or continuing education and training of health personnel is required—to equip them with the requisite knowledge, skills, and attitude; to effectively keep up with the rapid advancements in health and other technologies; and to prepare them to

respond to changes in their population's health needs. Each country is striving toward ensuring the quality and relevance of health personnel education. In the area of medical education, countries have established useful linkages for conducting collaborative training programs among different institutions. For example, the US CDC has established HIV medical training programs in China and Thailand to help these countries deal with an increasing number of AIDS patients—training that has not yet been integrated into the regular medical curriculum.

### *Imbalance and Maldistribution*

Another critical issue faced by many nations of Asia is maldistribution, such as imbalances in the geographical distribution of the health workforce, both professionals and technical staff. While 70–85% of the people in developing countries live in rural areas, less than 20% of government health workers service these areas. Even in developed countries such as Japan, maldistribution of physicians is a problem (Toyabe, 2009). For a variety of reasons, health professionals choose to work only in urban areas. The private sector also absorbs or siphons off qualified health professionals from the public sector, and unplanned health worker migration exacerbates this situation. The Philippines has become one of the world's largest exporters of nurses, and, worryingly, many doctors are retraining as nurses so they may join the exodus. Thailand, Indonesia, and China suffer from a shortage of medical doctors and other health professionals willing to work in rural areas. In China, nearly a million rural doctors—improved and upgraded versions of barefoot doctors, many of them being employed through national rural cooperative systems—are still working in rural areas and providing primary health care (Zhang & Unschuld, 2008). Other strategies have been developed and introduced, such as compulsory public service for the first 3 years after training (e.g., in Thailand, Indonesia, and Myanmar), additional remuneration (salary and other bonuses; e.g., in Thailand, Philippines, and Vietnam), rural recruitment and hometown assignment (in most countries), qualification for postgraduate degree programs (e.g., conditional scholarships in Indonesia, Myanmar, and Thailand), and on-site continuing education (e.g., in Thailand). Thailand and Indonesia have evaluated some of these strategies with a view to improving the imbalanced distribution of health professionals (Wibulpolprasert & Pengpaibon, 2003; World Bank, 2009).

Other problems include the lack of clear national policies for health personnel development; inadequate norms and standards for health professionals, resulting in an inappropriate mix of health personnel; lack of

mechanisms for the exchange of information and continuing education; lack of common standards for health professionals' education and training; and absence of quality control mechanisms in health professionals' practices. Numerous strategies have been identified to strengthen the health workforce's services and education. These include, among other things, development of comprehensive human resources for health; ensuring that curricula meet changing service needs and technology and that they result in evidence-based and cost-effective care; creating uniformity in education quality and products; establishing/strengthening national and regional centers of excellence; and implementing twinning arrangements that would address health workers' changing needs.

### *Health Volunteers*

Volunteerism or voluntary action provides social, mental, and spiritual satisfaction and self-esteem. It has rapidly expanded in recent decades in all parts of the world, as shown by the proliferation of individuals and groups of volunteers and philanthropists and the innumerable local, national, and international nongovernmental organizations working in social, health, and development programs. There are nearly 800,000 village health volunteers and nearly 2 million health cadres trained in Thailand, and there are over 1.8 million health cadres in Indonesia. Myanmar has three different types of health volunteers, including community health workers (42,500), auxiliary midwives (30,000), and 10-household health workers (45,000). Around 42,000 barangay health workers (one in every village) provide services in the Philippines.

These health volunteers are individuals, often female, who willingly provide their services to the community where they live or work. They are usually selected and rewarded by the community to whom they are answerable, and they are not considered part of the national health structure, although they are closely linked with it. Experiences during the 1990s indicated that many countries could achieve higher levels of health by deploying thousands of community health volunteers as the front-line workforce (Than Sein, 2006). Now, the extensive deployment of the health volunteers for development forms part of the essential strategy for achieving the universal health-for-all goal. However, appropriate national strategies are still needed to provide effective and efficient support to the health volunteers within the broader framework of community action for health and to enhance partnerships targeted particularly toward improving the health and well-being of the people, especially in disadvantaged communities.



### *Ethics in Health Care*

A recent trend across Asia is the shift of expenditure toward tertiary care at the cost of primary health care. The increasing reliance on high-cost procedures and tests has created a resource problem in several countries, including developed ones. This increase is sometimes justified by improved application of modern diagnostic technology and use of second-generation medicines, but supplier-induced demand for economic gain also plays a role. Developed and newly industrialized countries such as RO Korea, Singapore, Thailand, Indonesia, and China have experienced rapidly escalating health costs in recent decades, since their health systems rely heavily on modern medical technology.

Irrational use of medicines by health care providers and consumers is common in Asia. Excessive sales promotion and misinformation, lack of knowledge and information about medicines among consumers, and inadequate monitoring of distribution and use of medicines are the main causes. In an extreme example, in 2005 a Chinese man hospitalized for 67 days managed to accrue a 1.39-million-yuan (US\$172,600) bill, in addition to 5.5 million yuan (US\$680,000) for imported medicines recommended by the doctors. The bills indicated that he had been administered 1,180 diagnoses and, on one day, 94 blood transfusions (*China Daily*, 2005). The situation calls for continuing monitoring for corruption and education of medical professionals as well as pharmacists, including keeping their registrations updated as a priority for human resources development. Consumer education and empowerment are required for promoting rational use of medicines. Full use of regulatory measures, especially the use of generic names in labeling and packaging, are necessary. Ideally medicines should be available on the basis of need rather than ability to pay. Using essential medicines for their rational uses makes medicines more affordable (see discussion of generic medicines in chapter 10).

## CONTROL AND PREVENTION OF MAJOR DISEASES

### *Vaccine-Preventable Diseases*

Nationwide vaccination programs have been a key element in the control of communicable diseases and have directly contributed to increased life expectancy in populations. The most spectacular public health achievement of the twentieth century was the elimination of smallpox through worldwide vaccination efforts. Although a smallpox vaccine had been available for nearly a century, in the 1960s cases were still being reported

because of issues related to accessibility, variability in the purity and potency of the vaccine, incorrect storage and transportation, poor vaccination strategies, technical and human resource limitations, and lack of confidence in vaccination by the local populace. Worldwide eradication campaigns started in the early 1960s through mass vaccination, quarantine of cases, and control of contacts, which led to successful containment of the disease. The last naturally acquired human smallpox case in the world was reported in Somalia in October 1977, and in May 1980 the world was declared smallpox-free.

Following this success and with the development of new and more effective vaccines, as well as improved cold-chain processes and storage facilities, many countries started implementing campaigns for other major vaccine-preventable diseases, such as measles, poliomyelitis, diphtheria, tetanus, and pertussis. The Expanded Program on Immunization (EPI) was launched globally in the mid-1970s, with support from bilateral and multilateral donors, regional financial institutions, and UN agencies. Initially, under the national EPI program, vaccines against six childhood diseases—poliomyelitis, tuberculosis, diphtheria, pertussis (whooping cough), tetanus, and measles—were introduced as part of routine immunizations for all children under 1 year. Tetanus vaccine was also provided to pregnant mothers. Hepatitis B vaccine was later added, as were vaccines against measles (booster), mumps and rubella, and meningitis, as part of the national immunization schedules for older children, especially in developed countries of Asia. Within 10 years, nearly 80% of all children age 2 years were immunized, thus averting death and disability for millions of infants and young children.

Disease-specific campaigns have also been launched, though with varying success. In 1988, the world community resolved to achieve global eradication of poliomyelitis by the year 2000 through polio immunization to all newborn babies within the existing global EPI initiative. This provided many developing countries with a much-needed incentive to improve their health infrastructures and was supported by an unprecedented level of financial support from the international community. The campaign introduced the concept of a National Immunization Day (NID), which was piloted in the Philippines and China in the early 1990s. China, after two rounds of NID in 1993 and 1994, reported a reduced incidence of poliomyelitis, from 5,000 cases in 1990 to almost zero in 1995. Based on China's success, NID was introduced to other polio-endemic countries in the mid-1990s. By the end of 1997, more than 450 million children under 5 (almost half of the world's children) in at least 80 developing countries had been

immunized with oral polio vaccine through NID campaigns, in addition to over 500 million children immunized through routine EPI programs. All countries in East and Southeast Asia have been polio-free since 2000; however, sporadic cases of vaccine-derived (not wild-type) polioviruses occurred in Myanmar, Indonesia, China, and Laos in 2004–2005.

Neonatal tetanus is a major cause of death among newborns that is easily averted by vaccinating the mother. In 1989, the global community called for the elimination of neonatal tetanus by 2005, with a target of less than one neonatal tetanus case per 1,000 live births in every district. Although the target was met, small numbers of neonatal tetanus cases have been reported from China (1,786 cases), Cambodia (32 cases), Indonesia (183 cases), the Philippines (132 cases), Myanmar (25 cases), and Thailand (5 cases). Poor access to good antenatal care and the lack of clean and safe delivery by trained personnel hinder complete immunization coverage.

Other vaccination campaigns have enjoyed less success in the region. For example, a Global Measles Initiative was launched in 2005 calling for countries to reduce global measles deaths by 90% between 2000 and 2010. However, measles vaccine coverage in Cambodia, China, Laos, Myanmar, or Indonesia at 70–75% falls well below the elimination target of 90% coverage among children age 1 year (WHO, 2008a). Indeed, of all countries in Asia, only Timor-Leste reported no cases in 2008 (WHO, 2010). While polio vaccine is administered at birth, measles is administered later, and it can be harder for health systems to reach older children.

In the early 1990s, many Asian countries began immunizing their populations against other vaccine-preventable diseases, such as mumps, meningitis, rubella, hepatitis B, rotavirus, and *haemophilus influenzae*. There have been disturbing declining trends in routine immunization during the last few years among developing countries in Asia. The donor-driven EPI programs organized solely for the purpose of improved immunization coverage in the 1990s were short-lived and collapsed after the withdrawal of external inputs and pressure. Acknowledging the decreasing trends of routine immunization coverage and the dearth of available vaccines, the Global Alliance for Vaccines and Immunization (GAVI) was launched in 1999 with an initial start-up fund of US\$750 million from the Bill and Melinda Gates Foundation. It is a public-private partnership representing developing world and donor governments, the financial community, developed and developing country vaccine manufacturers, research and technical institutes, civil society organizations, and multilateral organizations such as the WHO, the United Nations Children's Fund (UNICEF), and the World Bank. The GAVI has provided 74 low-income countries, includ-

ing Cambodia, China, DPR Korea, Indonesia, Laos, Mongolia, Myanmar, Timor-Leste, and Vietnam, with new vaccines and related equipment and technical and financial support to strengthen immunization services.

### *Control of Communicable Disease without Vaccines*

Many communicable diseases cannot be prevented by vaccines alone, and health systems need to implement complementary clinical and/or behavioral interventions. An example is tuberculosis (TB). Fifty percent of cases reported from high-burden countries are reported from seven countries of Asia: China (466,000 cases), Indonesia (161,000), the Philippines (86,500), Vietnam (54,500), Myanmar (42,600), Thailand (28,500), and Cambodia (19,400; WHO, 2009b). The *Bacillus Calmette-Guérin* (BCG) vaccine for prevention of TB has existed for 80 years and is one of the most widely used of all current vaccines, reaching >80% of infants in countries where it is part of the national childhood immunization program. The BCG vaccine protects against meningitis and disseminated TB in infants and young children but does not prevent primary infection or reactivation of latent pulmonary infection, which is the principal source of bacillary spread in the community. Prevention of TB transmission is aided by improving socioeconomic conditions, providing access to good housing, reducing indoor and outdoor pollution, and good personal hygienic practices (see chapter 2). A major component of TB control is treatment, especially the directly observed treatment, short course (DOTS) strategy (see WHO, 2009a for further information). However, successful control of TB through prevention and treatment programs has not been achieved in Asian countries, because of increased susceptibility to the disease among people with HIV, the increasing prevalence of drug-resistant strains, and failures of health systems to adequately control and treat the disease (see chapter 3).

In contrast, successful control by treatment was achieved for leprosy. In the early 1980s multidrug therapy involving a combination of rifampicin, dapsone, and clofazimine was introduced to cure leprosy, reducing the number of cases as well as the resultant disability and social stigma (Than Sein & Kyaw Lwin, 2003). In the endemic countries of Southeast Asia, the total leprosy case load was significantly reduced from 2 million cases in 1985 to less than 1 million cases in 1990. Many endemic countries resolved to eliminate leprosy by extending coverage of multidrug therapy. By the end of 2006, Asia had, for the most part, reached the global elimination goal, although Timor-Leste is yet to achieve elimination.

For diseases carried by vectors, prevention and control have been aided by environmental controls. Campaigns to eradicate malaria in the 1950–1960s

involved spraying insecticide in areas where malaria-carrying mosquitoes breed, antimalarial drug treatment, and surveillance. The malaria case load in Asia was reduced from over 100 million cases in 1950 to 230,000 in 1965, but these actions failed to achieve eradication; approximately a million people in Asia remain at risk, and more than 200,000 people are infected each year. Control has failed because of inadequate supplies of insecticide and spraying equipment, lack of personnel and transport facilities for large-scale operations, an insufficient supply of antimalarial medicines, and development of malaria strains resistant to prophylaxis or treatment drugs (see chapter 3). Many national and multinational programs have enhanced their malaria prevention and control activities by improving access to multidrug therapy, increasing indoor residual spraying, distributing effective insecticide-treated bed nets, increasing availability of rapid diagnostic tests, revamping surveillance, improving monitoring and evaluation, and organizing advocacy and launching malaria campaign weeks (WHO, 2008b).

The prevention and control of dengue relies largely on vector control similar to that used for malaria control. In the absence of a vaccine or treatment, effective public health interventions to reduce mortality include early detection, prompt diagnosis, and standardized case management. These depend on having an active surveillance system, since dengue is seasonal and cyclical in nature, and rapid response. Surveillance systems have been established in most endemic ASEAN countries.

For most communicable diseases, prevention, treatment, and management interventions are not impeded by moral values. Major exceptions are HIV and other sexually transmitted infections. The illegality and perceived immorality associated with risk behaviors, including sex outside marriage, sex between men, and drug use, has hindered the implementation and effectiveness of prevention programs. The stigma of people with HIV, and to a lesser extent other sexually transmitted infections, especially when it is perceived by health workers, is a major barrier to prevention efforts and deters people from seeking testing, care, and treatment. Legal discrimination may preclude access to drug treatment or needle-exchange programs and may deter sex workers from carrying condoms. Education about the modes of transmission and prevention is generally mandated, but cultural shyness about openly discussing sex (even among health workers) prevents many of these programs from having a significant impact, and ignorance about the ways people can and cannot contract the disease remains high. Prevention programs require significant coordination with other government sectors, such as police, education, and civil affairs, but clashes in ideology between sectors further reduce the

effectiveness of prevention programs. Effective HIV control has mainly succeeded where those affected are not blamed for infection, such as in strategies to prevent mother-to-child transmission and to ensure that the blood supply is free of HIV (as well as other blood-borne diseases such as hepatitis B and C). However, HIV has been instrumental in forcing health departments to work with other government departments to deal with major social issues that were previously being ignored. It has also been a highly funded disease, which on the one hand has taken staff away from other disease programs, but on the other it has provided an incentive and resources to improve health systems in general.

### *Control of Chronic Diseases*

While infectious diseases continue to be a major priority in many Asian countries, chronic noncommunicable diseases have become increasingly prevalent. Estimates from 2001 of the global burden of disease indicated that almost 53% of all deaths in low-income countries (over 26 million people) were due to noncommunicable disease, including cardiovascular diseases (CVDs), diabetes, cancer, mental disorders, injuries, and other disabling diseases and conditions (WHO, 2005a).

The investment in the health system required to control chronic diseases varies. Health systems in most countries of Asia (both low- and middle-income countries) have focused on the development of more sophisticated diagnostic and treatment facilities (in part because they can generate revenue from these facilities), whereas people-centered health promotion and legislative measures such as control of tobacco and use of low-cholesterol fat in food preparation could be done without much investment in health facilities.

Low-income countries are increasingly adopting the lifestyle characteristic of high-income countries. As a result, these populations are being increasingly exposed to disease risk factors such as increased use of tobacco and alcohol, physical inactivity, and unhealthy diets with too much saturated fat, leading to elevated serum cholesterol levels and obesity (see chapter 2). Since human behavior occurs in a specific milieu, reducing the noncommunicable disease burden and improving health have been accomplished more effectively through comprehensive policy interventions that improve the physical, social, and economic environments and modify the social norms of the population than through focus on behavior change at the individual level. This approach has worked in Hong Kong for reducing CVD mortality and morbidity (see chapter 6). Any intervention that affects CVDs is also likely to have positive impacts on cancer and nutri-

tional disorders, including diabetes, since they share common risk factors (e.g., smoking, lack of exercise, and poor diet).

Many public health systems have not been able to deal with the increasing case load from noncommunicable diseases, and access to treatment to mitigate the burden of such diseases may be limited. For example, many people who suffer from insulin-dependent diabetes in low- and middle-income Asian countries such as China, Indonesia, Myanmar, and Laos do not yet have adequate access to medicines and diagnostic services and must buy their own, resulting in unnecessary complications due to delayed diagnosis and mismanagement. Diabetic patients in countries that have universal SHI coverage, such as Japan, RO Korea, Thailand, and the Philippines, enjoy better and continuous access to care (see chapter 4). Cancer treatments are also unavailable in many developing countries, as is palliation. Specialists and radiotherapy facilities are few and tend to be located in the metropolitan areas. Out-of-pocket payment for the diagnosis and treatment of cancer can devastate affected families and individuals. There is a need to provide equitable radiotherapy services in most of the low- and middle-income countries of Asia.

Many of these countries also lack facilities to detect chronic diseases early through screening (see chapter 6). With early diagnosis, the complications of many noncommunicable diseases can be controlled without the need to engage more expensive options. For example, a combination of screening individuals at relatively high risk of CVD (e.g., people with high blood pressure and cholesterol), intervening early, and fostering population-wide preventive activities is an effective and appropriate approach for many countries in Asia (Lenfant, 2001).

Communicable disease control also plays a role in preventing chronic disease. At least 15% of malignancies are thought to be caused by infections. Effective control of these infections could significantly reduce the rates of some cancers in Asia. For example, liver cancer (hepatocellular cancer), which affects approximately 300,000 people in Asia, is predominantly caused by hepatitis B virus infection. Immunization against hepatitis B has now been introduced as part of the national routine immunization program in many endemic developing countries. Stomach cancer is another cancer common in Asia, especially Japan, which has the highest incidence worldwide. It can be caused by infection with *Helicobacter pylori* but is also associated with high consumption of salt as well as salted, smoked, and pickled foods. Introduction of refrigerators and adoption of better methods for food preservation as well as treatment for *H. pylori* have considerably reduced the incidence of stomach cancer in many coun-

tries (see chapter 6). Cancer of the uterine cervix is caused the human papillomavirus (HPV). This virus can also cause other genital and anal cancers, as well as some oral cancers. A vaccine has been developed and is being introduced in some of the wealthier Asian countries (e.g., Singapore, Japan) but is yet to be provided in other countries. Broad implementation of either HPV vaccination or cervical Papanicolaou (Pap) screening to detect precancerous lesions is hindered in many developing Asian countries by financial constraints, poor health infrastructure, and the demand of service fees by providers.

A major component of noncommunicable disease control is tobacco control. In recent decades, there has been a major increase in tobacco-related illnesses and deaths worldwide, with 4 million people dying every year (see chapter 5). Multisectoral and multinational actions are needed to mitigate tobacco-related harms. The WHO's Framework Convention on Tobacco Control (FCTC), adopted in 2003, stresses the importance of national policies and strategies for reducing demand and addressing supply issues for tobacco use. The main provisions of the FCTC include the regulation of the contents, packaging, and labeling of tobacco products; prohibition of sales to and by minors; control of illicit trade in tobacco products; and reduction of smoking in work and public places. It also calls for reducing consumer demand by introducing price and tax measures; a comprehensive ban on tobacco advertising, promotion, and sponsorship; education; training; raising awareness and assistance with quitting; and protection of the environment and the health of tobacco workers. Many of these provisions are well beyond the health system's jurisdiction, but health workers have been key proponents of tobacco control. All countries in Asia now have comprehensive national tobacco control legislation, conforming to the provisions of the FCTC (see chapters 5, 10).

In addition to poor diet, lack of exercise, and smoking, alcohol consumption contributes to a multitude of health conditions that are not limited to the consumer. The health care costs of treating people with alcohol-related conditions and illnesses are huge for individuals, families, and governments. Harmful alcohol use is associated with roughly 60 physical and mental disorders, including cancer, diabetes, and CVD as well as violence, intentional and unintentional injury, road traffic injuries, family problems, and unemployment. In addition, in low-socioeconomic areas, a disproportionate amount of family income is spent on alcohol (and tobacco), leaving very little money for food, education, housing, and health and leading to or perpetuating poverty and adversely affecting the health of not just the alcohol user. Loss of productivity and future earnings, due to premature



death of the wage earner, also places a burden on society. One of several policy options for controlling alcohol is to allocate part of the taxes generated from the sales of alcohol to support health promotion, including community education, sports, and recreational activities. Others include limiting availability of alcohol, setting minimum age limits, restricting sale outlets, and imposing other restrictions on sales. Community-level efforts to control harmful use of alcohol in Thailand, the Philippines, Myanmar, and a few other countries have been successful through enhanced partnerships involving public agencies and nongovernmental organizations.

Many Asian countries have started paying attention to promoting the health of elderly people (age 60 years or above) by promoting social welfare and health care at home and in the community, promoting and strengthening traditional family ties and values, making optimal use of existing health care delivery systems, and establishing aged-care facilities. The economic, social, and health status of the fast-growing elderly population poses a great challenge to all sectors. In Japan, for example, people above age 60 years comprised 12% of the population in 1975, which sharply increased to 27% by 2005 and will reach 36% by 2025 and 44% by 2050. The major difficulties in developing appropriate health care for elderly persons include the lack of reliable data for program planning, a virtual absence of national policies and strategies for elderly care, and an inadequate infrastructure to cope with their rapidly increasing health needs. Addressing the health needs of elderly persons has become an unbearable burden in some countries, especially those with weak public policy and health system infrastructures. A national health survey in RO Korea in 2002 revealed that almost 90% of elderly persons suffered from at least one chronic disease and that elderly care may soon overwhelm health systems in Asia. The need to provide health and social care to elderly people is increasing daily, especially in Japan, China, and other countries with a low birth rate. Knowledge among health workers of the specific needs of elderly people is also minimal.

Similarly, few resources exist to care for people with mental health conditions or disabilities. Mental and neurological disorders contribute to an estimated 12.3% of all disability-adjusted life years (DALYs)<sup>1</sup> (WHO, 2000). Mental health promotion programs, national policies, and legislation are often based on outdated knowledge, concepts, and approaches. Treatment gaps for mental disorders are a major issue for health systems to tackle because of the lack of essential medicines and/or inadequately trained human resources. Of the limited health care resources available, most are currently spent on the specialized treatment and care of mentally

ill patients and, to a lesser extent, an integrated mental health care system. The emphasis is on placing these patients in large psychiatric hospitals, rather than integrating mental health into primary health care, general hospitals, and community-based mental health services (see chapter 6).

For people with intellectual disabilities (a range of conditions characterized by low IQ and poor adaptive behaviors), health system resources are perhaps the most limited. Moreover, failures in the health care system can in fact cause these conditions. Major causes are problems occurring during pregnancy or childbirth; poor nutrition (notably, iodine deficiency); vaccine-preventable communicable diseases, such as measles, whooping cough, or meningitis; injuries; and genetic conditions, such as Down syndrome. These conditions occur most frequently in the least developed nations where the health systems infrastructure is weak and health services are inadequate, leading to low immunization coverage, insufficient prenatal and antenatal care, and inadequate health services to deal with injuries. Only a handful of countries in Asia have established education centers for children with intellectual disabilities, most of them privately run centers managed by nongovernmental organizations. For the majority, the burden of care is on the family, who may not have the resources to provide appropriate care.

#### HEALTH INFORMATION SYSTEMS

An essential component of disease control and management is the establishment of health information systems, including disease surveillance systems. Their development depends on the development of health systems, the extensiveness and coverage of the health infrastructure, healthy public policy commitment, and human and financial resources to operate and sustain them. Health information provides a basis for evidence-based management of health systems as a whole. Traditionally, health information systems are oriented toward collection and dissemination of information on diseases and health services outputs (known as vital and health statistics), which provide information on the morbidity, mortality, and disability of diseases and utilization of health services.

Health information and surveillance systems provide specific information for management of health services and disease control. While all countries in Asia have health information systems, some countries, especially those least developed, such as Cambodia, Laos, and Myanmar, have simple systems of collection and dissemination of information and usually depend heavily on small sample surveys and onetime studies. Developed

countries such as Japan and middle-income countries such as Thailand and the Philippines have comprehensive health information systems with sophisticated information technology support and extensive collection and generation of information. These countries have also established special research units/centers to do analysis for policy support.

Socioeconomic and demographic data characterize the contextual environments in which the health systems and disease control programs of each country operate. Much of this information comes from other sectors or is derived from surveys and studies and rarely comes from a national census or from representative routine data collection. Health systems infrastructure and resources vary depending upon whether the authority of the ministry of health is decentralized or centralized. Japan, RO Korea, Indonesia, the Philippines, and China have decentralized government structures, where the majority of staff and budget are put under the direction of local governments. This makes coordination of a systematic health information and disease surveillance system quite challenging. In contrast, centralized systems such as those in Thailand or Myanmar face different problems. The district and provincial health offices in centralized systems shoulder the burden of supplying (sometimes too much and duplicated) information to different central authorities. The central government has to coordinate and ask for only crucial health information, while encouraging the district- and provincial-level offices to take ownership of collection and utilization of these data.

Health information systems should inform efforts to improve health service availability and quality. Some indicators, such as coverage of antenatal care or safe delivery by trained personnel, can act as good proxies for service coverage. Health information systems in all countries include information on mortality, morbidity, and disability, as well as related risk behaviors and well-being. In general, countries with good health infrastructures, strong policies, and adequate human and financial resources are more likely to have good health information systems. However, even the best systems have flaws: Japan has state-of-the-art technology supporting its information system and well-developed research, but its disease surveillance system has weaknesses, which was exemplified when it faced the largest recorded outbreak of *E. coli* O157:H7, which numbered 6,000 cases, in June–July 1996.

### *Disease Surveillance Systems*

An important component of any health information system is disease surveillance. Surveillance is the systematic ongoing collection, collation, and

analysis of data for public health purposes and the timely dissemination of public health information for assessment and public health response as necessary. Local community and basic health services need to be strengthened for core surveillance capacities. These include detection of events involving disease or death above expected levels for the particular time and place and prompt implementation of appropriate initial control measures. Local capacity to undertake a risk assessment, based on preliminary findings, of the potential for spread of an infectious disease is of paramount importance in containing and controlling an outbreak and for communicating risk.

Timely surveillance data are needed to identify, track, and manage threats to public health and to support evidence-based public health decisions. Information management should include systems to support alert-and-verification processes, archive incoming communications, and record important decisions and actions taken.

For effective health protection, surveillance activities must be matched by the ability to respond rapidly and effectively to public health threats. Key elements of the public health response include verifying and characterizing outbreaks or health events of public health concern; identifying the key epidemiological parameters to guide public health prevention and control measures; mobilizing technical, financial, and material resources to support field operations; and communicating risk. The triggers for a rapid response will vary, depending on a country's baseline surveillance capacity.

Although health information systems are in place in most Asian countries, there is room for improvement and strengthening. When the WHO launched the Health Metrics Network in 2005 to help countries and other partners generate health-related information, China, Indonesia, the Philippines, Laos, Cambodia, Vietnam, and Myanmar participated and received financial and technical support from it. They are in the process of assessing their health information systems according to the standard guidelines put forth in the Health Metrics Network. The results of the preliminary assessment for China, Laos, and Cambodia are available online from the Health Metrics Network at <http://www.who.int/healthmetrics/en/>.

Recent outbreaks of emerging and reemerging infectious diseases have had severe economic impacts (see chapter 3). As a result of these outbreaks, particularly SARS and avian influenza H<sub>5</sub>N<sub>1</sub>, the ability and transparency of disease surveillance systems have been questioned. Efforts have been made to restructure and improve disease surveillance systems in many countries in Asia. After the SARS epidemic, China established a new

Center for Disease Control to provide technical and research advice to the Ministry of Health. Selected diseases are subject to notification by law and must be reported by the provinces to the national level, using a real-time Internet-based system. Similarly, the Hong Kong Special Administrative Region established the Centre for Health Protection, which is responsible for disseminating outbreak news about cases of notifiable diseases through the department websites on an almost daily basis.

Rapid response teams are now established in every district and province to detect and contain outbreaks or other unusual events in Thailand, Cambodia, Myanmar, and Brunei. Rapid response team members include field epidemiologists and disease control staff trained for epidemic control, and each team is provided with the necessary equipment for outbreak containment. During disasters, such as the 2004 tsunami in Indonesia, Thailand, and Myanmar and the 2008 Cyclone Nargis in Myanmar, rapid response teams were assigned for daily surveillance to contain possible outbreaks that might follow these disasters.

In order to strengthen surveillance systems, special health professionals known as field epidemiologists are needed, and many countries have established national field epidemiology training programs, adapting the training model of the US Centers for Disease Control and Prevention's Epidemic Intelligence Service. Thailand, the Philippines, and Indonesia established such training programs in the mid 1980s. Malaysia established its epidemic intelligence service after the Nipah virus outbreak in the late 1990s. Japan, China, and RO Korea established national training programs in the aftermath of the *E. coli* O157:H7 and SARS outbreaks in the mid-1990s and 2003, respectively.

The Mekong Basin Disease Surveillance was established in 1999, as a collaborative effort among the six countries of the Mekong subregion, to strengthen their disease surveillance systems. Cross-border activities to share disease surveillance information and control endemic diseases along border areas are expanding in these countries. The outbreak investigation of the first human H5N1 case in Laos was performed jointly by Thai and Laos rapid response teams. The ASEAN+3 Emerging Infectious Diseases Program was initiated by the leaders of the 10 ASEAN nations plus China, Japan, and RO Korea after the SARS epidemic in 2003. This regional collaborative program provided a forum for disease control authorities to discuss and learn good practices and reach agreements on improving country and regional capacities. The ASEAN+3 meeting of senior health officials and ministers of health in May 2009 in Bangkok in response to the pandemic alert by WHO of the new influenza A (H1N1) is another example

of solidarity to improve disease surveillance and information exchange in Asia. Many efforts have been initiated to improve health information and disease surveillance systems in Asia. International organizations and donors have played and continue to play an important role by providing technical and financial resources. The remaining challenge for each country is to maintain, expand, and improve its systems.

### *Laboratory Systems*

Laboratory diagnosis is an essential component of disease surveillance, since it is essential for the routine confirmation of diseases, as well as for rapid identification of the etiological agents. Public health laboratory functions also assess food safety, water quality, and other environmental specimens. Under the 2005 International Health Regulations, the public health functions of laboratories are to provide support in routine surveillance, early warning, emergency response, quality assurance, training, networking, and partnerships through specialized staff, laboratory analysis of samples (domestically or through collaborating centers), and logistical assistance. In addition, laboratory support available on-site to supplement local outbreak investigation has proven very useful in emerging infections. Except for the wealthiest nations, most Asian countries lack sufficient human and financial resources, equipment, and supplies to support public health functions, including the capacity for surge demand and appropriate levels of biocontainment to support diagnostic activities for known and unknown pathogens. This is true even for reference laboratories.

### *Research*

Research is an important component of developing disease control strategies. While much research is done in Western nations, Asian nations sometimes argue that the results are not applicable to their populations. This has been a problem for tobacco control (see chapter 5) and was a barrier for early implementation of HIV control strategies in China (Wu et al., 2007). Locally driven research is important for identifying control strategies for endemic diseases of little interest to developed or Western nations, including the so-called neglected tropical diseases (e.g., dengue, schistosomiasis, lymphatic filariasis, and yaws).

Health research creates knowledge and gathers evidence for policy making and for improving health systems. Recent international forums and conferences on health research development have taken a system approach. This ensures that the health research system is the brain of overall national health systems development. A national health research system is

a strategic tool to revitalize health research. The development of national health research systems varies between countries, and while some are well advanced, some have yet to be fully established.

Research infrastructures in Asian nations vary considerably. Funding to support research and improve research capacity is becoming increasingly available, with the Global Fund expanding its mandate to include neglected diseases (Molyneux et al., 2009). This adds to existing funding from the Wellcome Trust and the Fogarty International Center, among others.

### HEALTH EMERGENCIES

The relationship between health and security was integrated into the preamble to the Constitution of the World Health Organization when it was established in 1948. The statement in the constitution clearly indicates that the health of all peoples is fundamental to the attainment of peace and security. Terrorist and military attacks against civilian populations in recent decades are themselves threats to the health and security of the people. Communal violence and armed conflicts of long duration existing in many parts of the world have also caused severe psychosocial and other illnesses to the people and have been compounded by needlessly prolonged destruction of their health services (see chapter 7).

More than 2,000 disasters (both man-made and natural) have occurred in Asia in the last decade, causing an estimated 500,000 deaths and making millions homeless. The most devastating recent disaster was the Asian tsunami in December 2004, which affected several million people and took over 220,000 lives. Other natural disasters in recent years include landslides in the Philippines in 2006, which killed over 240 schoolchildren, and an earthquake at Yogyakarta in Indonesia in the same year, which killed more than 6,000, injured almost 100,000, and displaced between 200,000 and 650,000 people. More recently, in May 2008, Cyclone Nargis devastated delta areas of Myanmar, killing over 100,000 people and leaving millions displaced. Weeks later, an earthquake of 8.0 on the Richter scale struck in Sichuan Province, China, killing more than 60,000 people and making millions more homeless and displaced (WHO, 2008c).

How countries are able to deal with large-scale human emergencies depends on their disaster preparedness and risk management. Most countries regularly update their national disaster preparedness and emergency management plans. This includes provisions for the health sector. Standard operating procedures, including emergency directory and coordinating focal

points, have been updated, especially after the Asian tsunami. Through improved local capacity for emergency provision of essential services and supplies, such as temporary and permanent shelters, safe water, basic food, and communication facilities, excessive loss of lives can be avoided. Potential communicable disease outbreaks can also be prevented, through rapid response and control by basic health workers. While early warning systems need to be in place and communities at risk need to be educated about the potential natural disasters, it is the community resilience and community-based response and preparedness capacity that ensures quick response and recovery from disasters, as seen in examples of national responses to the Asian tsunami and Sichuan earthquake (WHO, 2005b; Thanawood et al., 2006; Potangaroa et al., 2008).

Another important component is the ability of the hospitals and lower tiers of the health care system to deal with trauma. In some countries, including Indonesia, Myanmar, and Malaysia, injury prevention and control started with improving medical care services by establishing accident and trauma centers, strengthening emergency ambulance services, and promoting training in injury care and management (see chapter 7).

A major challenge for disaster preparedness and management is how best to plan and coordinate among relevant agencies at every level of administration. Many actors at local, intercountry, and international levels are needed to ensure a rapid response, in case the health infrastructure collapses, as it did in many of the above-mentioned disasters. All health facilities, whether primary health centers or district hospitals, are on the front line during an emergency, and it is important that they can withstand such hazards so that they continue to provide the needed services to the injured. There are three aspects of preparedness: structural, non-structural, and functional. Modern engineering and architectural science and design are available with low-cost solutions for ensuring structural integrity so that health facilities do not collapse during natural disasters. In some cases, although a health facility remains intact, it is rendered nonfunctional. Lifelines such as water and electricity require backup, equipment must be well secured, and access and escape routes must be protected. Organizational aspects also play a role. A safe health facility performs drills, has contingency plans in place, and has a well-trained health workforce that is ready and able to deal with the health consequences of emergencies.

Priority actions during emergencies include (1) ensuring access to essential health care for vulnerable people; (2) strengthening coordination among health partners; (3) establishing and strengthening disease sur-



veillance, early warning, and response systems; (4) supporting systems to reduce mortality and morbidity among mothers, infants, and under-fives; and (5) strengthening health and psychosocial support to victims. Greater investment by all the countries of Asia is required to strengthen national and local capacity for human emergencies for effective preparedness and response, which encompass a wide range of public health actions, from creating community awareness to reinforcing health infrastructures. Adequate international and national preparedness and risk reduction measures can greatly reduce the burden of disasters.

## CONCLUSIONS

Asian countries encompass different types of organization and management of health infrastructure, as well as differences in political, social, and cultural organization. All have gained higher health status because of recent concerted efforts to prevent and control communicable diseases. Commensurate with infectious disease control, interventions to promote risk reduction have started. These successful efforts are a welcome movement, but they tend to mask persistent social and health inequalities, not only between the high- and low-income countries but also among regions within countries. Large rural populations in many developing countries still lack access to basic health services. Some countries are not able to adequately finance their own health systems and so rely heavily on external assistance, which is sometimes diverted to limited or inappropriate programs. While there has been a significant reduction of the burden of major communicable diseases, there is a continuous threat of new and emerging diseases and a growing incidence of chronic conditions. The health systems of Asia need to be strengthened and fully responsive. The disease surveillance and response systems should be ready for early detection and response to emerging disease outbreaks and public health events.

## NOTE

1. A time-based measure of overall disease burden that combines years of life lost because of premature mortality and years of life lost because of morbidity, i.e., time lived in states of less than full health

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## 12 Opportunities and Challenges

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East and Southeast Asia is one of the fastest growing and most diverse regions of the world, encompassing wealthy nations, middle-income nations, and three countries that are among the poorest in the world. The future for all the nations of Asia holds great promise and many opportunities for the improvement of the health of the people and the environment of the region. However, the extent to which this future is realized and the opportunities are turned into achievements depends on overcoming many challenges and picking the right alternatives. In this concluding chapter we outline the key challenges and make various recommendations for the actions needed to achieve the goal of health for all in the region.

### MAJOR PROBLEMS AFFECTING ALL COUNTRIES IN THE REGION

In the last decades of the twentieth century and the first of the twenty-first century, nearly all of the countries of Asia have experienced tremendous economic growth through industrialization and globalization. However, with these advancements have come many problems. As has occurred around the world, increasing wealth has allowed the adoption of diets high in fats and sugars and more sedentary lifestyles. As a result, developing countries are now responsible for the majority of the global burden of chronic diseases such as heart disease and cancer. Thus, the epidemic of obesity and diabetes is not confined to the wealthy countries of the region (e.g., Japan, Taiwan, RO Korea, and Singapore) but is also affecting the poorer countries, which will experience an increase in these problems as their economies grow and some of the national prosperity trickles down to the poor.

The most effective strategy to combat the epidemic of noncommunicable diseases in the region is the promotion of healthy lifestyles. Thus, campaigns need to be implemented and existing programs continued to promote balanced nutrition, routine exercise, and abstinence from products detrimental to health, such as tobacco and excessive alcohol. Education is a key component of the campaign against unhealthy lifestyles. The school system is an ideal closed setting in which to promote healthful lifestyles that prevent disease. Health education should begin even in the earliest grades, when lifestyles are being established, and because in many of the countries of the region, a significant proportion of students do not go beyond 6 years of education. An essential component of health education is to train children in simple infection control, such as by hand washing. But it should also train children in how to make life choices, resist peer pressure, and protect themselves against sexually transmitted diseases and drug use before they are challenged. Teachers need to be taught to overcome their own prejudices and fears so that they can teach behaviors that can protect people from harmful behaviors, regardless of morality. The mass media, especially television, is another important, underutilized venue for spreading health information to the population. It can be used to promote healthy behaviors, such as seat belt use or exercise, and deter unhealthy behavior, for example, by detailing the detrimental effects of smoking. Governments should introduce regulations that require media outlets to run at least a minimum amount of positive health-related social marketing during peak airtimes and should disallow or restrict advertising of harmful products, such as alcohol and tobacco, as is being done in Malaysia, Singapore, and Hong Kong.

Structural interventions to complement these campaigns are needed for success. Highest among these is the provision of safe drinking water and acceptable levels of sanitation. Encouraging hand washing through provision of running water and soap in public toilets can also reduce disease transmission. It is essential that individuals have access to healthy foods and nutritional information on food packages, enabling them to make healthy food choices. The creation of safe public spaces is also important, to facilitate exercising and provide opportunities for constructive social interaction. Similarly, prohibiting unhealthy behaviors in public spaces, such as cigarette smoking and alcohol consumption, reduces the ease with which these behaviors can be practiced. Taxation on harmful products can deter their use and provides an avenue for raising revenue for health programs. Heavier penalties and automated systems to enforce traffic laws can also raise revenue while reducing motor vehicle injuries. As described

by the authors in this book, many of these strategies have already been introduced by countries, but advocacy for further structural barriers to unhealthy behaviors and enforcement of relevant regulations is needed.

Concurrent with the recent rise in chronic diseases has been the persistence of infectious diseases, especially among the poor. Immunizations are highly effective in reducing the burden of infectious disease and vaccine-preventable deaths. Yet, the coverage of vaccination programs in many parts of Asia remains too low. For example, in 2004, diphtheria-pertussis-tetanus coverage in Southeast Asia was only 69%—far lower than the coverage reached by the European, Western Pacific, and American regions, where it exceeded 90%. Inadequate vaccination coverage is reflected in the high morbidity and mortality from vaccine-preventable diseases in Southeast Asia among children less than 5 years of age. There is a great opportunity to make a substantial public health impact by increasing the coverage of current vaccination programs as well as extending programs to include control of pneumococcal and rotaviral infections in the future. Although great achievements in disease control through vaccination have been realized in the past, further control will require renewed strong and concerted international will and effort to overcome the barriers to effective control, such as limited local capacity and resources. Success in this area will yield large and enduring improvements in public health outcomes both in the region and beyond.

Infectious diseases do not respect boundaries. As the SARS epidemic of 2003 demonstrated, outbreaks of infectious diseases occurring in one part of the world can rapidly spread to other countries through air travel. Control of these diseases cannot therefore be confined to individual countries but must be regionally coordinated, with the wealthier countries of the region assisting the poorer countries with basic elements of control, including surveillance and laboratory support. The Association of Southeast Asian Nations (ASEAN), founded in 1967, has been active in strengthening regional cooperation in epidemic preparedness since the SARS outbreak of 2003 and the threat of pandemic H5N1 avian influenza in 2004. The emergence of several regional groups to combat influenza and other emerging diseases in the last quarter of the twentieth century is also a good beginning. These cooperative, coordinated efforts need to be expanded and sustained in order to control the continuing threat of newly emerging, persisting, and resistant organisms plaguing the region. An important component of the improved surveillance will be the development of more competent laboratories in the region that have the capacity to identify new disease agents.

Among the major infectious diseases burgeoning in the region are the sexually transmitted infections (STIs), including HIV/AIDS, that persist in many counties and are increasing at an epidemic rate in China. Traditional strategies for control of STIs have clearly failed for a number of reasons. Recognizing these problems, we recommend that rather than criminalizing the sex industry, public health officials control the transmission of STIs by facilitating implementation of regulations requiring condom use and regular health checks and treatment of sex workers, as has been done in Thailand and Cambodia. Further, treatment should be made available in nonstigmatizing venues, such as women's clinics and pharmacies, and should be provided at minimal or no cost.

While globalization has greatly aided the growing prosperity of many Asian nations, it has also facilitated the spread of infectious diseases, especially STIs, and brought about lifestyle changes that can have negative effects on public health. Globalization has created other health problems, too, through increased impetus to engage in industrial and economic activities that lead to destruction of the environment, pollution of the air and waterways, and creation of large migrant populations living in squalid conditions with limited access to health care, safe water, and basic sanitation. It should be considered a basic right of people living in Asia (as well as globally) to have access to safe water and a clean environment. Although it is clearly in the best interest of the countries of the region to continue progress through globalization, it is also important that these continuing efforts do not continue to contribute to the destruction of the environment and the deterioration of cities and the health of their inhabitants. Although initially it will be more costly, the countries of Asia need to reduce the use of fossil fuels and adopt alternative energy sources that are also non-polluting, such as solar and wind energy. China is a world leader in the use of alternative energies and can help its neighbors invest in renewable and sustainable sources of energy. Further, the damage that has already been done, including massive destruction of forests, needs to be remedied, through reforestation and the restoration of wetlands as well as other measures. Governments need to abide by the environmental protection laws that they have agreed to follow, both internationally and locally, and hold accountable those persons and corporations responsible for breaking these laws. Clearly, fines do not sufficiently deter such behavior, and stronger penalties should be adopted and enforced. The long-term consequences of short-term economic benefits need to be considered, as pollution of the air and waterways will ultimately damage the health of the populations and lead to increased health care costs. The emphasis on the production of



competitively priced (cheap) goods for the world market, a major component of globalization, must not come at the expense of the workers' health. Governments of the region must legislate occupational safety regulations applicable to both large and small businesses and industries. Workers need to be guaranteed access to basic health care and a decent standard of living. Economic development at the expense of the environment and health is aided by corruption and the ease with which businesspeople can buy their way out of illegal activities or drive legislation in their favor. Stronger anticorruption efforts will ultimately contribute to better health.

#### HEALTH CARE

Access to health care remains a problem in many countries of Asia, especially for the poor. For example, China recently implemented a fee-for-service approach to health that has resulted in limited or no access to health care for the rural poor and urban migrants. Ensuring health for persons in the rural areas continues to be a problem because the density of the population is low and health professionals are reluctant to work in these areas. Many of the countries of the region have trained community health workers and have established a system of tiered health centers providing different levels of care, at the top of which are the referral facilities usually covering many health districts. These systems are a good beginning but need to be improved and upgraded to ensure a basic level of health for the rural poor. At the same time, many urban dwellers lack adequate access to health care. The countries of the region, particularly the poorer countries, need to develop innovative ways to ensure that all their citizens have access to a minimum package of health care that includes important preventive strategies such as immunization.

In many of the countries in the region, physicians own pharmacies, creating a potential incentive to increase the number of prescriptions and treatments, whether necessary or not. Physicians may also benefit from ordering expensive tests and procedures, paid for by the patient or insurance company. These conflicts of interest need to be addressed so that physicians and pharmacies do not profit unreasonably at the expense of the public. The best models are not necessarily those that have been implemented in the developed countries of the world. However, observation of these models may help the countries of the region to avoid the pitfalls experienced by their systems.

Increasing stress has accompanied urbanization and industrialization. As Asian societies have become more complex and the central role of the fam-

ily has diminished, especially in the urban areas, coping with the stresses of life has become increasingly difficult. In the past, traditional approaches have met with some success, but with the increasing complexity of the world in which Asians live, these traditional methods have increasingly failed. Commensurate with the decline in the effectiveness of traditional approaches, there has been increasing stigmatization of those suffering from mental illness. Thus, there is a need to respond to the increasing problem of mental health in the region and to reduce the stigma associated with it, which is a major barrier to diagnosis and treatment.

Improvement of the health of the region will require building the capacity of health workers and public health facilities by training of more health professionals. Some of the poorer countries of the region (Cambodia, Vietnam, and Laos) have only recently established schools of public health. The number of schools needs to be expanded and the quality of the training upgraded, including opportunities for advanced training. Medical and nursing schools should offer courses in neglected specialties, especially psychiatry, and establish systems for accreditation that require staff to keep abreast of recent, relevant research and best practices. Greater regional cooperation that provides advanced training in developed countries would be an effective and timely approach. Government scholarships for both national and international education that require students to work in government health facilities for a period have worked in many countries and could be offered in the least developed areas, where these skills are needed most. Often public health workers in the region are not paid a salary sufficient to support a family. As a result they must take second jobs to generate income. This diverts their attention and efforts away from their public health duties and is a barrier to recruiting the best young minds to the field. Thus, a high priority has to be given to providing health workers with a living wage and recognizing their important role in improving the health of the nation. Extra incentives may need to be given to recruit qualified health workers to rural and other less desirable locations. However, these incentives should not be driven by profits from pharmaceutical sales and unnecessary medical procedures.

Most medical and public health research over the last century has focused primarily on diseases of major interest to the developed countries of the world. More research into the characteristics of diseases relevant to the peoples in this region needs to be conducted. The majority of chronic diseases are occurring in the developing countries of the world, aging of the population is creating an urgent problem in the region (especially in Japan, China, Taiwan, and Singapore), and infectious diseases continue to

cause significant morbidity and mortality in the region. The WHO and the Wellcome Trust encourage research on the world's "neglected" diseases and have established research collaborations in Asia. Efforts are needed to increase and improve the research capacity of the region through better universities, medical and public health schools, and the development of other research institutions. This will require a massive effort to train personnel who can conduct this research as well as funds to support the research. In view of this, collaborative research partnerships between institutions and universities in more developed and less developed parts of Asia would be a more cost-effective and realistic means of expanding relevant research in diseases of greatest importance for the region. Moreover, governments need to provide incentives to attract back researchers who emigrate, such as seed grants to establish research centers. Research skills are needed by governments to ensure effective monitoring and evaluation of the programs they implement and to pilot new interventions that can improve health.

A major portion of the public health budget in many of the poorest countries of the region comes from external sources. Frequently these external nongovernmental organizations (NGOs) have their own agendas, usually a focus on a particular disease or group of diseases that they target rather than investing in the overall improvement of health in the country. This creates two problems. First, their programs require trained personnel, and the external sources can pay better than the local governments. Thus, the NGOs divert qualified personnel from the country's programs to their own targeted programs. Second, they may inadvertently cause these countries to invest less of their own money in public health programs by encouraging them to depend on these external sources. External agencies and NGOs need to work with the local public health officials to invest their money in those projects that will provide the maximum impact in improving the country's public health system and the overall health of the country. In addition, the external sources must recognize the need to ensure sustainability of these improved public programs once their own attention is diverted to other problems.

Improvement in the health of East Asians and Southeast Asians cannot be achieved by ministries of public health alone. They must recruit and collaborate with the other segments of government to ensure health for all. For example, progress in addressing the epidemics of recreational drug use and commercial sex will only be possible with the cooperation of law enforcement agencies. Health departments are often weak, especially in comparison to those departments concerned with economic development

and the large corporations. Business, environmental, and labor agencies need to be made to recognize how their policies and decisions can have a major impact on the health and well-being of Asians. Thus, a major role of health officials is strong and persistent advocacy for healthful policies, in their own as well as other ministries. They must reach out to create multisectoral partnerships that will work together in a coordinated and aligned manner to promote health for all Asians.

The agenda that we have presented above is very ambitious, and it requires decision makers in the countries of the region to recognize the need to increase their countries' investments in health. The economies of the region can be expected to grow in the coming decade, resulting in an increase in wealth but also a widening of the rich-poor gap. A significant proportion of this increased wealth needs to be invested in reducing the economic and health disparities of the peoples of the region. Increasingly, Asia, particularly Southeast Asia, is recognizing that in order to control infectious disease and foster economic and social development, the region needs to develop coordinated approaches. An example of this is the many initiatives developed by ASEAN. In the future these regional organizations will increasingly contribute to better health. Thus optimism about improving health and public health approaches is warranted. We are confident that recognition of the challenges and opportunities that we have outlined above, plus those that we have failed to anticipate, will result in the improvement of health in the region and significant progress toward achievement of the Millennium Development Goals and health for all. The rapid rise of Asia in the twenty-first century should be a story not just of growing economic progress for the peoples of the region but also of greatly improved public health and health care outcomes.

#### ACKNOWLEDGMENTS

Thanks go to Manuel Dayrit, Ee Heok Kua, Tai Hing Lam, and David Koh for their input on this chapter.



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# Index

- abortion, 28, 269
- access to drugs, 55, 269
- access to healthcare, 14, 308, 318, 325, 326
- access to primary health care, 259, 276
- access to safe water, 44, 66, 213, 214, 215, 216, 217, 235, 317, 325. *See also* water safety
- access to treatment, 49, 306, 308; mental health, 133
- acute ischemic stroke, 135
- acute lower respiratory infection (ALRI), 227, 230, 231, 232, 233, 234, 235; air pollution, 235; mortality, 231; smoking, 235
- acute respiratory infections, 43
- advertising: alcohol, 32; foods and drinks, 24, 94; globalization, 271; harmful products, 323; tobacco, 34, 122, 123, 125, 309
- Aedes* mosquitoes, 59
- affordability of medicines, 268
- aging population, 19, 147, 165, 175, 192, 275, 284, 327
- aging workforce, 247
- agrarian societies, 12
- air pollution, 2, 215, 255, 305, 325; asthma, 225, 227, 230, 232, 234, 235; chronic obstructive pulmonary disease, 235; circulatory diseases, 121; lung cancer, 235; mortality, 121, 230, 270; respiratory diseases, 121, 270; smoking, 121. *See also* indoor air pollution/ outdoor air pollution
- air quality, 228, 255, 270
- alcohol, 2, 31, 133, 265, 309, 323; abuse, 31, 175, 179; advertising, 32; breast cancer, 163; cancer, 168, 309; cardiovascular disease, 144, 147, 309; colorectal cancer, 159; consumption rates, 31, 272; control, 310; dependence, 31, 32, 175; diabetes, 143, 309; driving, 32, 201; education level, 31; effect on family income, 309; esophageal cancer, 161, 162; excessive consumption, 32; health-care costs, 309; illicit drug use, 31; increased use, 307; injuries, 272, 309; liver cancer, 158, 159; mental health, 169, 173, 309; misuse, 32, 137; percent of global mortality, 272; pregnancy, 179; tax, 290, 310; trade, 272
- aldehyde dehydrogenase-2, 159, 162
- Aldehydes, 226
- Alliance for Vaccines and Immunization (GAVI), 304
- allopathic medicine, 284
- amphetamines, 29, 30, 175
- amphetamine-type stimulants. *See* amphetamines
- anemia, 84, 86, 88

- animal bites, 205  
 animal husbandry, 67, 249  
 antenatal care, 50, 80, 304, 311  
 anthrax, 67  
 antibiotics, 44, 47, 204, 268  
 anticorruption efforts, 326  
 antidepressants, 179  
 antimicrobial resistance, 62, 65, 75  
 antipsychotics, 179  
 antismoking: policies, 34; programs, 33, 123; strategies, 157  
 anxiety, 35, 137, 169, 172, 174, 176, 178  
 arsenic, 215, 216, 223, 226, 231, 235  
 arsenic-rich coal, 232  
 artemisinin, 60, 61  
 artesunate, 60  
 asbestos, 157, 226, 247, 253, 254, 270  
 asbestosis, 239  
 ASEAN, 246, 274, 306, 324  
 ASEAN+3 Emerging Infectious Diseases Program, 314  
 ash, 225  
 Asian dust, 225  
 asthma: air pollution, 225, 227, 230, 232, 234, 235; smoking, 235  
 attachment, 15  
 avian influenza, 45, 46, 54, 55, 64, 67, 71, 75, 249, 262, 313, 324  
 Ayurvedic medicine, 284
- Babesiosis hemolytic disease, 46  
 bacillary angiomatosis, 46  
 Bacillus Calmette-Guérin (BCG) vaccine, 305. *See also* tuberculosis  
 ban on smoking in public places, 115, 120, 272, 323  
 Bangkok, 29, 47, 61, 103, 229, 275, 314  
*Bartonella henselae*, 46  
 basic occupational health services, 238, 247, 251, 252, 253, 254  
 benzene, 231  
 benzo(a)pyrene, 231  
 bidis, 116, 125, 139  
 biofuels, 225, 235  
 biotechnology, 238, 244  
 bipolar, 179  
 blood cholesterol, 138, 142, 144, 149.  
*See also* serum cholesterol  
 body mass index (BMI), 23, 90, 94, 96, 99, 105, 136, 139, 140, 142, 145  
*Borrelia burgdorferi*, 46  
 bovine spongiform encephalopathy, 67  
 brain drain, 274, 275  
 breast cancer, 23, 133, 150, 162–167; alcohol, 163; clinical breast examination, 163; mammography, 162, 163  
 breast-feeding, 50, 88, 147  
 brucellosis, 67  
 Brunei, 4, 29, 31, 37, 58, 84, 86, 135, 138, 154, 175, 190, 200, 202, 219, 220, 225, 256, 266, 289, 314
- Cambodia, 4, 6–13, 17, 28, 29, 30, 31, 35, 37, 48, 49, 51, 58, 60, 61, 71, 81, 84, 88, 89, 113, 116, 124, 125, 127, 135, 138, 140, 154, 158, 169–173, 177, 179, 192, 194, 199, 202, 205, 207, 219, 220, 222, 240, 248, 256, 263, 264, 266, 285, 286, 288, 289, 291, 295–297, 299, 304, 305, 311, 313, 314, 325, 327  
*Campylobacter jejuni*, 46  
 cancer, 2, 46, 117–121, 132, 133, 149–168, 231, 232, 233, 244, 271, 307, 308, 322; 5-year prevalence, 150, 152, 153; alcohol, 159, 161–163, 168; anal, 309; Barrett's esophagus, 161; breast, 23, 133, 150, 162–167; burden, 150, 165, 167, 168; cardiovascular diseases, 307; cervical, 133, 150, 163–167; colorectal, 23, 133, 150, 159, 160, 165–167; diet, 161, 162, 168; endoscopy, 155, 161; esophageal, 160, 161, 165–167, 272; exercise, 159; fatality, 155; gastroesophageal reflux, 161; genital, 309; human papillomavirus, 167; incidence, 149–168; indoor air pollution, 117, 157; infectious diseases and, 151, 164; liver, 46, 47, 119, 133, 150, 157–159, 165–168, 308; lung,

- 117, 150, 155–157, 165, 167, 168, 227, 228, 230, 232; migrants, 167; morbidity, 168; mortality, 149–168; mortality-to-incidence ratio, 155; national screening programs, 168; new, 150, 152, 153, 157, 166; nutrition, 168; obesity, 159, 163; outdoor air pollution, 117; overweight, 159, 163, 168; palliative care, 168; passive smoking, 119; prevalence, 150, 151; prevention, 167, 168; prevention and control, 150; respiratory, 117; salt-preserved foods, 155; screening, 155, 162, 168; sexually transmitted infections, 164; smoking, 155, 157, 161, 164, 167, 168; smoking and air pollution, 157; stomach, 150, 151, 155, 165, 166–168; survival, 168; tobacco, 117, 159, 162; tobacco control, 309; upper airway, 227, 232; uterine, 309; vaccine preventable, 158, 167
- carbon dioxide (CO<sub>2</sub>), 225, 228
- carbon monoxide (CO), 225, 226, 231
- carcinogens, 32, 157, 159, 224, 231, 247, 270
- cardiopulmonary mortality, 227
- cardiovascular diseases, 79, 120, 132–149, 307; alcohol, 309; cancer, 307; cholesterol, 142; healthcare costs, 135, 136, 147; interventions, 144, 145; mortality, 135, 195, 307; obesity, 143; overweight, 143; passive smoking, 140; prevention, 149; risk factors, 136, 137, 140, 146; smoking, 143, 149; survival, 136; tobacco, 143
- cardiovascular risk factors, 23, 136, 141–143, 145, 147, 149
- casual sex, 26, 27
- cataracts, 227, 232
- cerebrovascular disease, 23, 117, 120, 134, 195
- cervical cancer, 133, 163–165; human papillomavirus, 164, 309; Pap smears, 164, 309; smoking, 164; vaccine preventable, 164
- Chandipura virus, 67
- changes in behavior, 69
- chewed tobacco products, 117, 119
- chikungunya, 45, 59, 60, 68
- child health care, 286
- child labor, 247, 251
- child mortality, 15, 43, 80, 83, 259, 287; dengue, 58; survival, 14. *See also* under-5 mortality, infant mortality
- child nutrition, 100
- child undernutrition, 83, 104
- childbirth, 86, 311
- childhood obesity, 102
- China, 2, 4–13, 16–22, 24–37, 45, 47–49, 51, 53, 58, 67, 71–73, 80–87, 90, 91, 95–97, 99, 100, 101, 104, 112, 113, 117, 119, 122, 124, 135–138, 140–142, 145, 147, 150, 151, 154–158, 160–164, 174, 175, 179, 192–194, 197, 198, 200, 202, 205, 206, 208, 216, 219, 220, 222–225, 228, 230–233, 240–242, 244, 245, 250, 252–255, 262–266, 268, 270–272, 274, 277, 288, 289, 291, 295–297, 300, 302–305, 308, 310, 312–316, 325–327; Beijing, 12, 13, 24, 29, 54, 229; Shanghai, 12, 13, 26, 150, 228, 229
- China dust, 225
- Chinese, 12, 13, 20, 24, 30, 33, 35, 36, 57, 63, 95, 101, 113, 118, 121, 122, 123, 137, 143, 155, 156, 157, 162, 163, 167, 172, 174, 175, 180, 181, 194, 234, 277, 302
- chloroquine, 60, 61
- choking, 205
- cholera, 46
- cholesterol, 22, 92, 98, 307. *See also* total cholesterol, serum cholesterol, LDL cholesterol
- chronic disease, 2, 23, 79, 112, 132, 190, 234, 271, 307, 308, 322, 324
- chronic obstructive pulmonary disease, 118, 120, 121, 227, 230–235; air pollution, 235; mortality, 233; smoking, 233, 235
- circulatory diseases: air pollution and

- circulatory diseases (*continued*)  
   smoking, 121. *See also* cardio-vascular diseases  
 cirrhosis, 47, 195  
 clean waterways, 270  
 coal exposure, 232  
 coexistence of under- and overnutrition, 23, 79, 97, 99, 100  
 coexistence of underweight children and overweight/obese mothers, 100  
 colonoscopy, 160  
 colorectal cancer, 23, 133, 159, 160, 165, 167; colonoscopy, 160; fecal occult blood test, 160  
 combination therapy, 60, 62  
 combustion of coal, 225, 235  
 commercial sex, 25, 27, 28, 325, 328; criminalization, 325; HIV, 48. *See also* sex work  
 communicable diseases, 63, 100, 311; burden, 100; control, 63, 64, 71, 112, 134, 283, 284, 302, 306, 308, 318; endemic, 44; globalization, 279; mortality, 43; outbreaks, 317; spread, 277; undernutrition, 100; vaccines, 305. *See also* infectious diseases  
 communist, 5, 6, 25, 29  
 community health workers, 301  
 compulsory licenses, 269  
 Confucian culture, 19, 25, 35  
 consumer education, 302  
 consumer preferences, changes in, 271  
 consumerism, 5, 35  
 contaminated food, 44  
 Cooperative Medical Scheme, 277  
 coresidence, 19, 20, 22  
 coronavirus, 46, 53  
 corruption, 302, 326  
 cost-effectiveness, 69, 162  
 cotinine, 115  
 counseling, 32, 36, 50, 125, 179, 180, 181, 269  
 cross border trade, 260, 273  
 crowding, 13, 58, 65, 265  
 Cryptosporidiosis, 46  
*Cryptosporidium parvum*, 46  
 cultural change, 12, 13  
 cultural inflation of morbidity, 15  
*Cyclospora cayetanensis*, 46  
 DALYs. *See* disability-adjusted life years  
 deliberately emerging infections, 45  
 demand for pediatric care, 15  
 dementia, 36, 171, 175, 176, 178  
 demographic projections, 36  
 demographic transformation, 9  
 demographic transition, 6, 12, 14, 16, 21  
 dengue, 57, 68, 72, 215, 216, 217, 218, 271, 306, 315; reemergence, 59  
 dental caries, 102  
 depression, 35, 36, 137, 169, 172, 173, 175, 176, 178, 179, 180  
 diabetes, 2, 23, 32, 79, 95, 96, 100, 102, 121, 132, 133, 136, 137, 138, 139, 140, 141, 143, 144, 149, 271, 307, 308; alcohol, 309; blood pressure, 138; cholesterol, 138; insulin dependent, 308; mortality, 195; obesity, 322; overweight, 128, 138  
 diarrhea, 43, 44, 46, 100, 215, 216; mortality, 217; diarrhea-causing agents, 43, 46, 215; diarrheal infections, 43, 44, 45  
 diazepam, 179  
 diet and lifestyle, 2; traditional diets, 86, 91, 92, 93, 94; traditional lifestyles, 271  
 dietary change, 23, 37, 94, 162, 271  
 dietary guidelines, 101, 102, 103  
 diphtheria, 13, 303; vaccine, 303, 324  
 direct costs, 201  
 direct health care costs, 135  
 directly observed treatment, short course (DOTS), 51, 52, 71, 233, 305  
 disability, 122, 133, 143, 171, 215, 303, 305, 311, 312  
 disability-adjusted life years (DALYs), 43, 90, 100, 122, 132, 215, 231, 272, 310  
 disaster preparedness, 316, 317  
 diseases of affluence, 5, 37, 134

- double burden of malnutrition, 79, 97, 101, 104
- DPR Korea, 4, 6, 9, 17, 29, 37, 49, 81, 83, 84, 135, 138, 219, 220, 223, 224, 225, 228, 266, 289, 305
- drinking water, 213, 323
- drowning, 205
- drug patents, 269
- drug resistance, 43, 44, 45, 47, 65, 277; drug-resistant organisms, 43, 44, 62, 63, 65, 70, 324; gonorrhoea, 47; influenza, 55; malaria, 60-61, 306; salmonella, 68; *Staphylococcus aureus*, 63; TB, 50-52, 305
- drug safety, 268
- drug toxicity, 62
- drug trafficking, 30
- drug trafficking routes, 30
- drug use. *See* illicit drug use, injection drug use
- dysentery, 13
- dyslipidemia, 23, 79, 95, 97, 98
- early warning, 48
- early warning systems, 315, 317, 318
- Ebola, 46
- economic development, 1, 2, 25, 70, 104, 117, 190, 192, 197, 205, 238, 240, 252, 328
- economic gains, 265
- economic globalization, 259, 271, 278
- economic transition, 44
- education: alcohol, 310; continuing education, 299, 300, 301; depression, 180; GATS, 273; health workforce, 298, 300, 301, 302, 327; illicit drug use, 323; injuries, 208; intellectual disabilities, 311; land mine, 208; MDGs, 66; medical, 298, 300; nursing, 299; nutrition, 88, 101; occupational health, 253; overweight and obesity, 79; psychiatry, 172, 181; public health, 298, 299; school enrollment, 267; sexually transmitted diseases, 323; tobacco, 309; tobacco tax, 123; working children, 251
- education campaigns: nutrition, 82; smoking, 120. *See also* public education, health education
- education level, 14, 264; alcohol use, 31; attitudes towards sex, 26; health workers, 299; low levels among men, 21; nutrition, 14, 100; rising, 5, 18, 36; smoking, 33; vulnerability to disease, 63; women, 14, 37
- Ehrlichia chaffeensis*, 46
- elderly people, 19, 44, 165, 290, 310; cancer projections, 165, 166; elderly care, 310; falls, 206; injuries, 190, 205, 209; mental health, 175, 178, 181; suicide, 180
- emergence of infectious diseases, 2, 43, 45, 57, 64, 65, 66, 69, 70, 71, 74, 75, 249, 283, 324; economic impacts, 313; globalization, 271
- emergencies, 316, 317, 318
- emergency care, 32, 172, 190, 197, 198, 199, 206, 208
- emergency response, 315, 316, 317
- emerging communicable diseases, 2. *See also* emergence of infectious diseases
- emerging industries, 238, 246, 254
- emotional nucleation, 15
- Encephalitozoon hellem*, 46
- endocarditis, 46
- endoscopy, 155, 161
- Enterocytozoon bieneusi*, 46
- entomology, 72
- environmental: controls, 2, 305; hazards, 15; health, 255, 269; protection laws, 325; regulations, 213, 235; standards, 270
- epidemic disease, 5. *See also* infectious diseases
- epidemic preparedness and rapid response, 43, 70, 71, 324
- epidemiological transition, 2, 12, 14, 22, 35, 37, 69, 74, 104, 128, 132, 172, 182, 190, 204, 213, 228, 230, 271, 284, 313
- epidemiology, 72, 145, 174, 190, 314
- ergonomics, 240, 247
- Escherichia coli*, 46

- esophageal cancer, 160, 161, 165, 167, 272; alcohol, 161; alcohol flushing, 162; aldehyde dehydrogenase-2, 162; endoscopy, 161; smoking, 161, 162
- essential drugs, 65. *See also* essential medicines
- essential medicines, 269, 292, 310
- essential services, 317
- Ethics in Health Care, 302
- Expanded Program on Immunization (EPI), 303, 304
- falciparum, 60, 61
- families: changes in relations, 14; of one or two children, 15, 21
- famine, 22, 173, 197, 205
- fatalism, 13, 14
- female health advantage, 37
- fertility, 5, 6, 8, 9, 14, 16, 17, 18, 19, 21, 22, 36, 37, 165; age structure, 19; below replacement, 16; breast cancer, 162; contraception, 24, 28; declining, 19, 271; total fertility rate, 17
- fetal growth, 147
- field epidemiologists, 314
- fluoride, 215, 216, 226, 231
- fluoride-rich coal, 232
- food: guide, 101, 102; poisoning, 46; safety, 15, 270, 315; security, 224, 270
- food-borne disease, 53, 69
- foreign direct investment, 273, 274
- forest fires, 225, 226, 235
- formaldehyde, 231, 270
- Four Corners virus, 46
- Framework Convention on Tobacco Control (FCTC), 34, 111, 123, 124, 127, 128, 272, 309
- gastroenteritis, 46
- gender roles, 5, 32, 37
- General Agreement on Tariffs and Trade (GATT), 259, 273
- General Agreement on Trade in Services (GATS), 273
- Global Alliance for Improved Nutrition, 105
- Global Measles Initiative, 304
- global warming, 64, 225
- globalization, 1, 6, 22, 23, 24, 25, 38, 65, 68, 147, 240, 259, 260, 261, 262, 272, 276, 277, 279, 322, 325, 326; advertising, 271; alcohol, 272; chronic disease, 271; communications technologies, 6, 24; economic globalization, 259, 271, 278; emerging infectious diseases, 271; health-related trade, 268; international trade, 6, 252, 259, 260, 261, 262, 263, 272, 279; neocolonialism, 262; neoliberalism, 262; tobacco, 33, 271, 272; trade agreements, 269; waves of, 261
- glucose intolerance, 23, 141
- golden staph, 46
- greater equality for women, 36
- Guanarito virus, 46
- haemophilus influenzae (HIB), 304
- hand washing, 53, 323
- Hantavirus cardiopulmonary syndrome, 46
- harmful algal blooms, 223
- haze, 225
- Haze Action Plan, 225
- health and safety standards, 270
- health campaigns, 54, 284. *See also* health education, public education
- health care expenditures, 97
- health continuum, 15
- health disparities, 269, 329. *See also* health inequalities
- health education, 179, 323; injuries, 207; salt intake, 146; youth smoking, 126
- health emergencies, 316. *See also* public education, education campaigns
- Health Frontier Strategy, 101
- health inequalities, 265. *See also* health disparities
- health information, 265, 311–315, 323
- health information systems, 311–313
- health insurance, 136, 289, 291, 293, 295

- health of workers, 2
- health status, 37, 276, 278, 283, 310, 318
- health systems, 2, 43, 44, 69, 252, 275, 283–287, 295, 297, 302–312, 315, 318; financing, 287–290, 293, 294; research, 315, 316; resource capabilities, 155
- health tourism. *See* medical tourism
- health transition, 5, 6, 12, 14, 15
- health volunteers, 301
- health workers, 62, 63, 82, 89, 125, 172, 181, 285, 299, 300, 301, 309, 310, 326, 327; stigma, 306
- healthy food choices, 323
- hearing loss, 253
- heart disease, 2, 32, 119, 134, 140, 143, 197, 270, 271, 322; passive smoking, 119. *See also* cardiovascular disease
- heavy metals, 223, 225, 239, 242, 270
- Helicobacter pylori* (*H. pylori*), 46, 151, 308; cancer, 151; stomach cancer, 155, 308
- helminthiasis, 44
- hepatitis A, 215, 216
- hepatitis B, 30, 45, 47, 72, 253, 307; liver cancer, 133, 157, 158; stomach cancer, 167; vaccine, 47, 158, 303, 304, 308
- hepatitis C, 30, 158, 307; liver cancer, 46, 157
- Hepatitis E, 46
- hepatocellular carcinoma, 46, 47. *See also* liver cancer
- heroin, 29, 30, 48, 175
- hierarchy of health facilities, 285
- high blood pressure, 134, 136, 137, 140, 142, 143, 149, 308; mortality, 195
- HIV / AIDS, 28, 30, 45–50, 63, 70, 71, 72, 265, 297, 305–307, 325; access to treatment, 306; antiretroviral drugs, 50, 268; antiretroviral resistance, 49, 50; bisexual transmission, 48; control of, 306, 307, 315; education, 306; homosexual transmission, 48; injection drug use, 48; legal stigma, 306; medical training programs, 300; prevalence, 29, 49, 50, 62, 267; sex workers, 48, 50; sexual transmission, 48; stigma, 48, 306; surveillance, 51; testing, 50; transmission of antiretroviral resistant HIV, 49
- home injuries, 190, 205; animal bites, 205; burns, 205; children, 205; elderly and children, 205, 209; falls, 192, 196, 205, 206; poisoning, 205, 206, 209; suffocation, 205
- homeless, 316
- homosexuality, 25, 28, 29, 36, 306; HIV, 48; legality, 29; marriage, 29; stigma, 25, 28, 29. *See also* men who have sex with men
- Hong Kong, 4, 5, 6, 31, 32, 37, 47, 48, 53, 54, 66, 96, 97, 113, 115, 117–122, 124, 126–128, 140, 141, 148, 174–177, 197, 205, 219, 229, 230, 244, 253, 255, 256, 261, 262, 266, 270, 276, 307, 314, 323
- HTLV-II Lymphoma, 46
- human development index, 264
- human herpes virus 8, 46
- human monocytic ehrlichiosis, 46
- human papillomavirus: cervical cancer, 133, 164, 309; vaccine, 164, 309
- human resources, 32, 70, 75, 172, 283–285, 298, 301, 302, 310
- Human T-lymphotropic virus I (HTLV-I) T-cell leukemia, 46
- hydatidosis, 67
- hygiene, 44, 66, 72, 284, 305; campaigns, 102, 284; improved, 80, 151, 204; poor, 215, 216
- hypergamy, 18
- hyperinsulinemia, 23
- hyperlipidemia, 97
- hypertension, 23, 79, 95, 102, 134, 137, 144, 146, 239; stroke, 102
- ideology, 14, 306
- ignorance about health, 13, 64, 306
- illegal migration, 268
- illicit drug use, 2, 29, 30, 32, 65, 175, 265, 328; education, 323; heroin, 29;



- illicit drug use (*continued*)  
 history of within Asia, 175; HIV, 30; mental health, 169; pregnancy, 179; social problems, 31; stigma, 31; sexuality transmitted infections, 30, 306; treatment, 49, 175
- International Monetary Fund (IMF), 259–260, 289, 297
- immunity, 57, 68, 75, 207
- immunization, 286, 303, 304, 326;  
 campaigns, 303; programs, 47, 204, 283, 303
- impaired glucose tolerance, 138, 139
- improved sanitation, 221, 222, 223
- improved water, 66, 217, 219, 220
- inadequate monitoring of medicines, 302
- income disparities, 91, 265
- Indonesia, 4, 7–13, 16, 17, 18, 23, 25, 28–31, 37, 48, 49, 51, 52, 58, 59, 60, 71, 80–84, 86, 88–90, 95, 96, 99, 105, 112, 113, 115, 116, 122, 124, 126, 135–138, 140–142, 147, 154, 175–177, 192, 197, 199, 202, 208, 209, 219, 220, 222, 223, 225, 228, 230, 251, 253, 256, 262–264, 266, 268, 271, 274, 275, 285, 288, 289, 291, 295–298, 300–305, 308, 312–317
- indoor air pollution, 117, 213, 231, 232, 235; smoke exposure, 232; smoking and lung cancer, 157; women, 231. *See also* air pollution, outdoor air pollution
- industrialization, 5, 6, 21, 68, 79, 190, 213, 322
- infant mortality, 83, 259, 264, 265, 267, 287, 289; infant survival, 14, 271. *See also* child mortality
- infant mortality rate, 36, 37
- infection control, 53, 72, 323
- infectious agent, 44
- infectious diseases, 43, 59, 65, 68, 190, 194, 197, 205, 284, 307, 325; burden, 2, 324; control, 2, 3, 44, 66, 147, 149, 318, 324, 329; globalization, 279; malnutrition, 37; morbidity, 327, 328; mortality, 14, 204, 233, 327, 328; political instability, 194; pollution, 207; spread, 43, 265, 313, 324, 325; treatment, 259, 276. *See also* communicable diseases, emerging/reemerging infectious diseases
- inflammatory liver disease, 47
- influenza, 2, 13, 44, 45, 52–57, 66, 67, 71, 112, 276, 324; antivirals, 55; avian influenza, 45, 46, 54, 55, 64, 67, 71, 75, 249, 262, 313, 324; drug resistance, 55; H1N1, 2, 46, 55–57, 71, 271, 313, 314; H5N1, 2, 46, 54, 55, 314, 324; seasonal, 57; Spanish flu, 54, 55, 66
- informal economy, 238
- informal sector, 248, 251, 252, 291, 294
- information technology, 72, 250, 312
- injection drug use, 30, 31, 47, 158; HIV, 48
- injuries, 187–209, 307, 311, 323; children and elderly, 190; hospitalizations, 194; mental health, 199; morbidity, 190; mortality, 190–197, 200, 201, 205; motor vehicle related, 34. *See also* traffic injuries/accidents; self-inflicted, 194. *See also* suicide
- intellectual disabilities, 311
- international certificate of vaccination, 74
- International Health Regulations, 74, 315
- International Labour Organization (ILO), 238, 241, 246, 250, 251, 252, 253, 254
- international migrants, 9
- international organizations, 38, 194, 207, 209, 253, 276
- international tobacco trade, 271
- international trade, 290
- international travel, 65, 270
- internet, 9, 180, 259, 314
- intravenous drug use. *See* injection drug use
- iodine deficiency, 23, 83, 89, 311
- iodization, 85, 89
- iron deficiency, 86, 88

- irrational use of medicines, 294, 302  
 ischemic heart disease, 118, 120, 121,  
 133, 134, 136, 140, 141, 142, 143, 232;  
 mortality, 135  
 isoniazid, 52
- Jakarta, 208, 228, 229
- Japan, 4–13, 16–19, 28–31, 33, 34, 37,  
 47–49, 65, 79, 84, 86, 87, 91, 92, 97,  
 101, 102, 104, 112, 113, 119, 122,  
 124, 126, 135–138, 146, 150, 151,  
 154–156, 158–160, 161, 163–165,  
 169, 171, 172, 174, 176, 179, 192,  
 193, 197, 201, 202, 204–206, 217,  
 220, 222, 224, 225, 230, 240, 242,  
 253, 254, 262, 271, 274, 275, 276,  
 283–285, 287, 288, 289, 291, 297,  
 300, 308, 309, 310, 312, 314, 322,  
 327
- Japanese encephalitis, 67, 73, 215, 216,  
 217, 218
- Kaposi's sarcoma, 46
- Kazakhstan, 225
- kerosene, 225, 235
- Korean hemorrhagic fever, 46
- kreteks, 115, 116, 119, 125, 139
- Kyasanur forest disease, 67
- labor laws, 245
- laboratories, 72, 315, 324; biosafety,  
 54; functions, 315; support, 65, 72,  
 73, 74, 315, 324; testing, 273
- land mines, 194, 197, 207, 208
- Laos, 4, 6–13, 17, 23, 28, 29, 31, 37, 48,  
 49, 58, 80, 81, 83, 84, 88, 112, 125,  
 127, 135, 138, 169, 179, 192, 194,  
 199, 205, 207, 208, 219, 220, 222,  
 240, 248, 254, 256, 263, 264, 266,  
 285, 286, 287, 288, 289, 291, 292,  
 295, 296, 304, 305, 308, 311, 313,  
 314, 327
- LDL cholesterol, 95
- lead poisoning, 239
- Legionella pneumophila, 46
- Legionnaire's disease, 46
- leisure-time, 23
- leprosy, 297, 305; stigma, 305
- leptospirosis, 67
- life expectancy, 1, 5, 6, 7, 12, 13, 37,  
 165, 259, 264, 283, 287, 302; reduc-  
 tions in, 227; rising, 36; survival,  
 6, 14
- lifestyle, changes in, 2, 23, 45, 80, 141,  
 147, 190, 271
- lithium, 179
- liver cancer, 46, 47, 119, 133, 150, 157–  
 159, 167, 308; aflatoxin B<sub>1</sub>, 159;  
 alcohol acetaldehyde, 159; aldehyde  
 dehydrogenase-2, 159; hepatitis B,  
 157, 158, 159; hepatitis C, 157; smok-  
 ing, 119; tobacco, 159
- living standards, changes in, 271
- low birth weight, 80, 100, 232
- low-mortality urban-industrial envi-  
 ronments, 32
- lung cancer, 117, 150, 155–157, 165–  
 168, 227, 228, 230, 232; air pollution,  
 235; passive smoking, 119; smoking,  
 156, 235
- lung function, 124, 227
- Lyme disease, 46
- lymphatic filariasis, 217, 218, 315
- lymphoma, 46, 152
- Macau, 4, 255, 276
- macroeconomic, 9
- macroeconomic effects of aging, 19
- macrosocietal processes, 24
- magic, 14, 173
- malaria, 2, 13, 60, 61, 63, 68, 72,  
 215, 216, 217, 297, 305, 306; anti-  
 malarial drug, 61, 306; antimalarial  
 resistance, 60, 61, 306; multi-drug-  
 resistant malaria, 60; treatment  
 failure, 60, 61
- Malaysia, 4, 7–13, 16–18, 23, 25, 29–  
 32, 37, 49, 52, 58, 59, 64, 68, 73, 84,  
 90, 95, 100, 103, 113, 124, 126, 135,  
 138, 140, 141, 147, 154, 176, 177, 180,  
 192, 197, 198, 201, 202, 208, 209, 219,  
 220, 225, 231, 240, 243, 244, 249, 253,  
 254, 256, 262, 263, 266, 268, 270, 274,  
 275, 285, 288, 289, 314, 317, 323

- malnutrition, 5, 23, 37, 63, 64, 79, 80, 82, 83, 91, 97, 104, 105, 122, 197, 215–218; infectious diseases, 37; mortality, 217
- mandatory health insurance, 291
- mania, 180
- Manila, 200, 202, 224, 228, 229
- marketing, 24, 68, 94, 112, 271, 323
- marriage, 15, 21, 22, 27; declining rates, 5; delayed, 16–18, 24, 26; marriage squeeze, 18, 21; marriage-related problems, 31; obligations, 17; opportunity costs, 18; practices, 17; protective health effects, 36; same sex, 29; sex before, 25, 26, 28; sex outside of, 25, 28, 306; singlehood, 17, 18; without children, 18
- mass media, 323
- maternal education, 14
- maternal healthcare, 286
- maternal mortality, 80, 259; anemia, 86
- maternal nutrition, 100
- maternal nutritional status, 147
- maternal undernutrition, 83, 104
- McDonald's, 24, 94
- MDR-TB, 52
- measles, 13, 303, 304, 311; vaccine, 303, 304; vaccine (booster), 303
- media, 71, 94, 115, 144, 179
- medical insurance, 270
- medical tourism, 273–275
- mefloquine, 60
- Mekong Basin Disease Surveillance, 314
- melanosis, 253
- men who have sex with men, 26, 29; condom promotion, 49; HIV, 48; sexually transmitted infections, 29, 45. *See also* homosexuality
- meningitis, 13, 305, 311; vaccine, 303, 304
- mental health, 36, 37, 168–182, 327; mental disorders, 35, 36, 132, 133, 172, 173, 174, 176, 177, 307, 309, 310; mental illness, 35, 169, 171, 173, 174, 176, 178, 179, 265, 271; services, 2, 32, 35, 36, 133, 169–182, 199, 310, 311; stigma, 35, 36, 133, 171, 172, 173, 176, 177, 180, 181, 182, 206, 327
- mentality, 13, 14, 15, 38
- metabolic disease, 79
- Mexico City Policy, 269
- micronutrient deficiencies, 23, 79, 80, 83, 84, 90, 104; folate, 83; iodine, 23, 83, 89, 311; iron, 86, 88; multiple, 90; vitamin A, 23, 83, 84, 85, 88; zinc, 84, 85, 89, 90
- micronutrient status, 86
- micronutrients, 83, 90, 100
- microsporidiosis, 46
- midwives / midwifery, 299, 301
- migrants, 35, 91, 265, 268, 326
- migration, 25, 264, 270; international migrants, 268; international migration, 270; rural-to-urban migration, 270
- Millennium Development Goals (MDGs), 66, 217, 219, 222, 223, 234, 264, 266, 287, 289, 329
- mobility, 9
- modernization, 12, 14, 24, 26, 34
- Mongolia, 4, 13, 27, 37, 49, 80, 81, 84, 89, 135–138, 140–142, 151, 154–156, 158, 160, 161, 163, 164, 202, 219, 220, 222, 223, 225, 248, 254, 266, 288, 289, 305
- morality, 25, 323
- morbidity: cancer, 168; cardiovascular diseases, 307; chronic diseases, 132; DALYs, 318; decline, 14; emergencies, 318; health information systems, 311, 312; infectious diseases, 327, 328; injuries, 190; occupational health, 240; psychiatric, 172; rising, 15, 37, 83; smoking, 117; smoking and air pollution, 235; vaccine-preventable diseases, 324; zinc, 90
- mortality: age structure, 19; air pollution, 121, 230, 270; cancer, 150, 151, 228; cardiovascular diseases, 102, 135, 307; chronic diseases, 132; decline, 14, 37; dengue, 306; emer-

- gencies, 318; falls, 206; head injuries, 201; health information systems, 311, 312; infectious diseases, 14, 43, 69, 204, 327, 328; injuries, 190, 191, 192, 193, 194, 196, 197, 200, 205; land mines and UXO, 207; leading causes of death in Taiwan, 195; motor vehicle-related, 34; respiratory diseases, 227, 231, 233; smoking, 111, 118, 120; smoking and air pollution, 235; tobacco, 117, 119, 123; traffic, 34; traffic accidents, 34, 201, 202, 204; vaccine-preventable diseases, 324; waterborne diseases, 217
- mortality transition, 6, 14, 15, 38
- motor vehicle ownership, 2, 23, 34, 200
- motorization, 204, 224
- multi-generational households. *See* coresidence
- mumps: vaccine, 303, 304
- Myanmar, 4, 6–13, 17, 18, 27–31, 37, 45, 48, 49, 51, 58, 60, 66, 71, 81, 83, 84, 89, 90, 116, 135, 138, 154, 192, 197, 199, 202, 205, 207, 219, 220, 222, 240, 256, 265, 266, 274, 283, 284, 285, 287, 288, 289, 291, 295, 296, 298, 300, 301, 304, 305, 308, 310–314, 316, 317
- nanotechnology, 238, 244
- national health insurance, 290
- national health spending, 277
- National Immunization Day, 88, 303, 304
- natural disasters, 173, 199, 209, 262, 316, 317
- Navajo flu, 46
- needle exchange, 31
- neglected diseases, 315, 316
- nematode infection, 216, 217, 218
- Newly Industrializing Countries (NICs), 240, 241, 244, 245, 246, 247, 251, 255, 261, 262, 268
- Nipah virus, 45, 46, 52, 53, 63, 64, 67, 68, 73, 249, 314
- nitrates, 226
- nitrogen dioxide (NO<sub>2</sub>), 225, 226, 228, 229, 235
- nitrous oxides (NO<sub>x</sub>), 226, 231, 234
- noncommunicable diseases, 2, 22, 97, 100, 101, 104, 132, 149, 307, 308, 323; burden, 307; control, 283, 284, 309; prevention and control, 134
- nongovernmental organizations, 180, 254, 296, 301, 310, 311, 328
- nonpregnancy anemia, 84
- nurses, 57, 173, 274, 275, 299, 300
- nutrition, 22, 79–105, 207, 259, 269, 276; advertising, 24, 94; cancer, 168; cardiovascular disease, 102; development, 82; education, 88, 101; education level, 14; malnutrition, 5, 23, 37, 63, 64, 79, 80, 82, 83, 91, 97, 104, 105, 122, 197, 215–218; maternal, 147; nutrition transition, 22; overweight, 2, 23, 79, 81, 90, 94, 95, 96, 97, 99, 100, 101, 104, 105, 128, 137, 138, 139, 142, 143, 159, 163; overweight and obesity, 79; policies, 146; poor, 63, 100, 133, 311; programs, 79; promotion, 103, 105, 286, 323; undernutrition, 2, 22, 79, 80, 82, 83, 97, 99, 100, 101, 104, 105
- nutrition transition, 80, 104
- nutritional information, 323
- nutritional patterns, 22
- nutritionists, 102
- nutrition-related problems, 101
- obesity, 2, 22, 23, 37, 79, 81, 92–105, 121, 137–140, 142, 144, 147, 307; cancer, 163; cardiovascular diseases, 143; childhood, 102; diabetes, 322
- occupational diseases, 2, 238–242, 247, 249, 252, 254
- occupational exposures, 118, 119
- occupational health, 238; accidents, 239, 240, 241, 242, 243, 247; injuries, 239, 241, 242; occupational diseases, 2, 238–242, 247, 249, 252, 254; occupational health issues, 239, 242, 245, 246, 252, 254; respiratory hazards, 118; smoking, 118, 119; surveillance,

- occupational health (*continued*)  
 119; tobacco, 115; traditional occupational diseases, 238; workplace fatalities, 241; work-related diseases, 241, 243, 244, 270; work-related disorders, 238; work-related injuries, 241
- occupational safety regulations, 252, 326
- old-age dependency ratio, 36
- open defecation, 222
- open toilets, 13
- opiates, 29
- opioid substitution, 31
- opium smoking, 30
- otitis media, 227, 232
- outbreak investigation, 314
- outdoor air pollution, 117, 213, 225, 230, 235
- overcrowding, 58, 265
- overnutrition, 22, 23, 79, 80, 99, 101, 104, 105
- overprescription of antibiotics, 47
- overweight, 2, 23, 79, 81, 90, 94–101, 104, 105, 137–139, 142, 143; cancer, 159, 163; cardiovascular diseases, 143; diabetes, 128, 138
- ozone, 226, 234
- P. vivax*, 60
- parasites, 61, 67
- particulate matter (PM), 225; PM<sub>10</sub>, 226, 228, 229, 230, 231, 235; total suspended particulates (TSP), 226, 228, 229, 230, 235
- parvovirus, 46
- passive smoking, 120, 126; air pollution and lung cancer, 157; ban on smoking in workplaces, 120; cardiovascular disease, 140; harm to workers, 119; heart disease, 119; respiratory illness, 119
- patented drugs, 268, 269
- pediatricians, 102
- peliosis hepatis, 46
- penicillin-resistant gonorrhoea, 47
- people smugglers, 268
- perceptions of risk, 15
- perinatal mortality, 227, 232
- personal hygiene, 44
- pertussis, 303, 311; vaccine, 303, 324
- pesticides, 174, 206, 226, 238, 239, 240, 242
- pharmaceuticals, 61, 268, 291
- pharmacoepidemiology, 179
- philanthropists, 297
- Philippines, 4, 7–13, 17, 18, 19, 23, 26, 28, 29, 30, 31, 37, 47, 48, 49, 52, 58, 71, 80, 81, 83, 84, 88, 89, 90, 94, 96–100, 113, 124, 135, 136, 138, 140, 141, 154, 158, 169, 192, 193, 200, 202, 206, 208, 219, 220, 222, 225, 240, 244, 251, 253, 256, 263, 264, 266, 268, 273–275, 285, 288, 289, 291, 294, 295, 296, 300, 301, 303–305, 308, 310, 312–314, 316
- Phnom Penh, 29, 61
- physical activity, 91, 102, 103, 168; changes in, 94; education, 101; lack of, 147; lower, 80, 142; overweight and obesity, 79; promotion, 103
- physical environment, changes in, 65
- physical inactivity, 133, 143, 307
- piped water, 66, 213, 217, 219, 235
- plague, 45
- Plasmodium falciparum*, 61
- Plasmodium vivax*, 60
- pneumococcal, 324
- pneumoconiosis, 239, 240, 242, 253
- pneumonia, 43, 62, 215; mortality, 195
- poisoning, 118, 120, 196, 205, 206, 223, 238, 239, 240, 242, 252
- poisons, 174
- polio, 303, 304; eradication, 303; vaccine, 303, 304
- poliomyelitis, 303. *See also* polio
- political instability, 194, 197, 247
- pollution, 213, 255, 325; infectious diseases, 207
- polycyclic aromatic hydrocarbons (PAHs), 231
- pooling risks, 290, 291, 295
- (the) poor, 1, 63, 122, 198, 268, 287, 322

- poor sanitation, 44, 235  
 population: growth, 65, 213, 270; size, 165; structure, 271  
 pornography, 25, 26  
 postsocialist market transition, 24  
 posttraumatic stress disorder (PTSD), 173  
 poverty, 31, 63, 65, 80, 147, 169, 264, 265, 287  
 pregnancy anemia, 84  
 premature mortality, 270, 318  
 prematurity, 100  
 preschoolers, 23, 82  
 prescription drug abuse, 29  
 prescription drug use, 32  
 primaquine, 60  
 productivity losses, 122, 123  
 psychiatric: care, 36, 172, 177, 181; complications, 32; disorders, 31, 181; education, 181; epidemiology, 174; hospital, 173, 311; illness, 174; morbidity, 172; nurses, 170, 173, 177, 180, 181; problems, 181. *See also* mental health  
 psychiatrists, 35, 170, 173, 174, 177, 181  
 psychiatry, 169, 172, 176, 180, 181, 327  
 psychologists, 170, 174, 177, 180  
 psychopharmacotherapy, 179  
 public education, 213, 277; dengue, 59; influenza, 55; psychiatry, 181. *See also* education campaigns, health education  
 public-private alliances, 149  
 public-private partnerships, 297, 301, 304  
 puncture wounds, 205  
  
 quit-smoking booths, 125  
  
 rabies, 67  
 radio, 9, 32, 180  
 radiotherapy, 308  
 rapid aging, 19  
 rapid economic growth, 141  
 rapid industrialization, 1, 92, 100, 204, 238, 244, 269, 270  
 rapid response, 306  
 rapid response teams, 314  
 rational use of antimicrobial agents, 62  
 rational use of medicines, 55, 62, 302; drug resistance, 62  
 reemergence of infectious diseases, 2, 44, 45, 65, 74; economic impacts, 313  
 referral systems, 285  
 regional cooperation, 324  
 religious beliefs, 14  
 reproduction, 9  
 research, 43, 116, 169, 243, 268, 299, 312, 327  
 resistant organisms, 324  
 resource flows, 15  
 respiratory diseases, 118, 120, 121, 133, 213, 225, 232, 234, 255; air pollution and smoking, 121; mortality, 227; passive smoking, 119  
 respiratory infections, 65, 100  
 response systems, 283, 318  
 rhinitis, 225  
 rickettsiosis, 67  
 rifampicin, 52, 305  
 risk communication, 43  
 risk education, 208  
 risky sexual practices, 30  
 RO Korea, 4–13, 16–21, 23, 29, 33, 34, 37, 49, 65, 84, 86, 87, 90, 91, 123, 125, 135, 136, 138, 140, 141, 151, 154–156, 158, 160, 161, 163, 164, 172, 174, 175, 177, 179, 180, 192, 201–205, 219, 220, 222–224, 240, 242, 244, 253–255, 266, 284, 285, 289, 290, 291, 302, 308, 310, 312, 314, 322  
 rotavirus, 46, 324; vaccine, 304  
 rubella: vaccine, 303, 304  
 rural migrants, 9, 35  
 rural-to-urban migration, 27, 91, 265  
  
 Sabia virus, 46  
 salmonellosis, 67  
 sandstorms, 226  
 sanitation, 2, 5, 220, 231, 235, 267, 323; adequate, 66; basic, 66, 217, 325; improved, 80, 221, 222, 223, 259, 276;

- sanitation (*continued*)  
 inadequate, 65, 215, 216; quality, 222; unimproved, 222, 223
- sanitation facilities, 213, 214, 215, 217, 222, 235
- SARS, 2, 44, 45, 46, 53, 54, 55, 63, 64, 66, 67, 70, 71, 73, 247, 249, 262, 271, 276, 313, 314, 324; laboratory-acquired, 54
- schistosomiasis, 68, 216, 217, 218, 315
- schizophrenia, 179
- school enrollment, 264, 267
- seat belts, 201
- secondhand smoke, 115, 117, 119, 120, 122, 123, 124, 140, 157. *See also* passive smoking
- sedentary, 22, 322
- Seoul, 229, 254
- serum cholesterol, 136, 141, 142, 307.  
*See also* blood cholesterol
- sewage facilities, 66
- sex: behaviors, 65; education, 25, 306; extramarital, 25, 28, 306; industry, 26, 325; premarital, 25, 28; risk behaviors, 47, 265
- sexual mores, 25
- sex ratio, 18, 20, 21, 22
- sex selection, 18
- sex work. *See* commercial sex
- sex workers, 26, 27, 28, 36, 306, 325; condom promotion, 49; HIV, 50; sexually transmitted infections, 45.  
*See also* commercial sex
- sexual: conservatism, 25; liberalization, 26, 28; mores, 5; norms, 24, 37; permissiveness, 26; revolution, 24
- sexual transmission of HIV, 30
- sexually transmitted infections, 2, 21, 26, 27, 28, 30, 37, 43, 45, 62, 325; control of, 306; drug resistance, 47; education, 323; stigma, 306, 325
- shared sanitation facilities, 222
- ship sanitation certificates, 74
- shipyard worker, 240
- silicosis, 239, 247
- Singapore, 4–8, 10–13, 16–19, 23, 28–30, 32, 34, 37, 48, 49, 53, 54, 58, 59, 62, 68, 84, 86, 95, 101, 112, 113, 118, 124, 128, 135, 138, 140, 141, 144, 146, 147, 150, 154, 156–158, 162, 163, 169, 172, 174, 175, 177–180, 192, 193, 197, 200–202, 205, 209, 219, 220, 222, 225, 229, 231, 240, 242, 244, 246, 247, 248, 250, 253, 254, 256, 262, 266, 270, 272, 274, 276, 284, 288, 289, 291, 302, 309, 322, 323, 327
- skeletal fluorosis, 232
- small to medium enterprises, 248, 251
- smallpox, 302, 303
- smoke-free laws, 112, 123, 124, 125, 127
- smokeless tobacco, 116, 117, 125, 126
- smoking, 2, 32, 113, 114, 116, 117, 124, 125, 133, 137, 138, 139, 144, 235, 309; advertising, 125; air pollution, 121; antismoking legislation, 113; asthma, 235; ban on smoking in public places, 33, 34; cancer, 157, 168, 308; cardiovascular disease, 102, 136, 140, 143, 149; cervical cancer, 164; cessation, 125; chronic obstructive pulmonary disease, 233, 235; circulatory diseases, 121; control, 33, 111; costs, 122; cotinine, 115; DALYs, 122; deaths attributable to, 119; education level, 33; esophageal cancer, 161, 162; harm to workers, 119; health professionals, 113; health workers, 125; lifetime medical costs, 121; liver cancer, 119; lung cancer, 119, 156, 167, 235; mass media, 323; men, 32, 33, 112, 113, 271; mortality, 111, 118, 120; prevention programs, 140, 144, 156; rate, 112; rates, 33, 113; reducing, 122, 123, 124, 126; respiratory diseases, 121; rural, 113; socioeconomic status, 33; stigma, 157; stomach cancer, 155; tuberculosis, 119; urban, 113; versus chewing, 117; women, 32, 33, 112, 113, 115, 128, 157; workplace, 309; youth, 33, 113, 114, 124, 126. *See also* tobacco, passive smoking

- smoking-cessation services, 125  
 social change, 30, 65  
 social disparities, 265  
 social environment, changes in, 65  
 social health insurance (SHI), 285, 290, 294, 296, 308  
 social security, 37, 169, 288, 291, 293  
 social skills training, 180  
 solid fuel use, 213, 231, 232, 233  
 son preference, 20, 21, 22  
 soot, 225  
*Staphylococcus aureus*, 46, 63  
 stigma: health workers, 306; HIV, 48, 306; homosexuality, 25, 28, 29; illicit drug use, 31; legal, 306; mental illness, 35, 36, 133, 171, 172, 173, 176, 177, 180, 181, 182, 206, 327; sexually transmitted infections, 306, 325; smoking, 157  
 stomach cancer, 150, 151, 155, 165, 167; endoscopy, 155; *H. pylori*, 155, 308; smoking, 155  
 stroke, 119, 133–137, 140–146, 149; hypertension, 102; mortality, 102  
 stunting, 79, 80, 81, 83, 97, 99, 104  
 substance use. *See* illicit drug use  
 suffocation, 205  
 suicide, 32, 172, 174, 180, 194, 195  
 sulfadoxine-pyrimethamine, 60, 61  
 sulfates (SO<sub>x</sub>), 226  
 sulfur, 225, 230  
 sulfur dioxide (SO<sub>2</sub>), 225, 226, 228, 229, 230, 234, 235  
 sulfur oxides, 231  
 superinfection, 62  
 superstitious, 13  
 Surabaya, 229  
 surveillance, 65, 71, 73, 74, 277, 283, 286, 312, 313, 314, 315, 324; cancer, 167; dengue, 306; HIV/TB, 51; malaria, 306; occupational health, 119  
 surveillance systems, 311–318  
 survival, 6, 57, 157  
 taeniasis, 67  
 Taipei, 25, 54, 125, 198, 203, 229  
 Taiwan, 4–6, 12, 13, 18, 19, 20, 21, 25, 29, 31, 33, 34, 53, 96, 97, 121, 124, 125, 128, 140, 141, 158, 172, 174–177, 179, 192, 193, 195–198, 200–206, 216, 225, 230, 240, 244, 253, 262, 276, 322, 327  
 taxation on harmful products, 123, 124, 125, 157, 290, 309, 310, 323  
 telemedicine, 271  
 television, 9, 23, 24, 32, 180, 323  
 terrorism, 316  
 tetanus, 303; neonatal, 304; vaccine, 303, 324  
 Thai-Cambodia border, 61  
 Thailand, 4, 7–13, 17–19, 26–33, 37, 45, 47–52, 58–60, 65, 71, 80–84, 86–91, 94, 95–100, 102, 104, 115, 119, 124, 126, 128, 135–138, 140–142, 150, 154, 156–158, 162, 172, 174, 176, 192, 193, 197, 198, 200–209, 216, 219, 220, 228, 230, 240, 244, 246, 248, 252–254, 256, 262–266, 268, 272–276, 285, 288, 289, 291, 293, 297, 298, 300–305, 308, 310, 312, 314, 325  
 thermosensors, 64  
 Tibet, 12, 13  
 tiered health centers, 285, 317, 326  
 Timor-Leste, 4, 37, 47, 49, 60, 71, 83, 84, 86, 199, 207, 219, 220, 222, 223, 240, 266, 288, 296, 304, 305  
 tobacco, 111, 139, 226, 271, 323; advertising, 34, 122, 123, 125, 309; branding, 125; cancer, 117, 120, 309, 315; cardiovascular disease, 143; cerebrovascular disease, 117; control, 111, 112, 113, 115, 117, 118, 123, 126, 127, 128, 156, 290, 307, 309; costs, 121, 122; deaths, 271; economic contribution, 122; education, 123; Framework Convention on Tobacco Control, 34, 111, 123, 124, 127, 128, 272, 309; globalization, 33; government revenues, 123, 128; household expenditure, 122; impact on female death rates, 115; increased use, 307; liver cancer, 159; marketing, 271;



- tobacco (*continued*)  
 marketing toward women, 33; mortality, 117, 119, 120, 123; opponents to control, 115; premature deaths, 121; reducing consumption, 235; respiratory cancers, 117; substitutes, 271; survival, 119; taxation, 123–125, 157, 290, 309; tobacco-related deaths, 111, 112, 113; workplace, 119; world tobacco consumption, 112. *See also* smoking
- Tokyo, 92, 229
- total cholesterol, 92, 95, 138, 141, 142
- total suspended particulates (TSP), 226, 228, 229, 230, 235
- tourism, 27, 53, 192, 246, 270
- township and village enterprises, 270
- toxic pneumonitis, 240
- toxic pollutants, 225
- toxoplasmosis, 67
- trachoma, 216, 217, 218, 297
- trade, 65
- trade agreements, 33, 268
- Trade-Related Aspects of Intellectual Property Rights (TRIPS), 268, 269
- traditional medicine, 133, 181, 284; Ayurvedic medicine, 284; traditional Chinese medicine, 177, 178, 284; traditional healers, 169, 171, 173, 175, 177
- traffic accidents, 2, 190, 192, 194, 197, 200, 201, 205, 209, 241; mortality, 34, 194, 201; motorcycles, 200; psychological injuries, 201. *See also* traffic injuries
- traffic injuries, 2, 32, 34, 200; mortality, 202, 204
- traffic laws, 34, 190, 201–204, 209, 323; alcohol use, 32, 201, 203, 204; child car seat use, 204; helmet use, 34, 201, 203, 204, 205; seat belt use, 34, 203, 204
- transportation, 198, 259
- traumatic brain injuries, 201
- Trim and Fit Program, 101
- TRIPS. *See* Trade-Related Aspects of Intellectual Property Rights
- tropical-disease control programs, 284
- tuberculosis, 2, 13, 44, 50, 51, 62, 63, 118, 119, 227, 232, 233, 265, 267, 295, 297, 305; directly observed treatment, short course (DOTS), 51, 52, 71, 233, 305; drug-resistant tuberculosis, 51, 52; smoking, 119; surveillance, 51; treatment, 51, 52; vaccine, 303, 305
- two-tier health system, 274
- typhoid fever, 62
- Ulaanbataar, 229
- under-5 mortality, 233, 264, 267, 283; environment factors, 215. *See also* child mortality, infant mortality
- undernutrition, 2, 22, 79, 80, 82, 83, 97, 99, 100, 101, 104, 105; child, 83, 104; communicable diseases, 100; maternal, 83, 104
- unexploded ordnance (UXO), 194, 207, 208, 209; morality, 207
- unhealthy lifestyle, 2
- unimproved sanitation, 222, 223
- unimproved water, 217, 219
- universal salt iodization, 85, 89
- unsafe water, 215, 216, 231, 235
- unskilled workers, 265
- urban renewal and expansion, 35
- urban-industrial lifestyles, 23
- urban-industrial societies, 5, 12
- urbanization, 1, 2, 5, 6, 21, 22, 25, 58, 64, 65, 68, 80, 94, 147, 197, 224, 230, 326
- user charges for health care, 292, 295
- vaccination, 47, 259, 286, 324; cancer, 158, 164, 167; coverage, 324; liver cancer, 158
- vaccine, 45, 47, 48, 55, 59, 64, 303
- vaccine-preventable diseases, 47, 302, 303, 304, 311, 324
- Venezuelan hemorrhagic fever, 46
- Vibrio cholerae*, 46
- Vientiane, 61, 229
- Vietnam, 4–13, 17, 23, 25–29, 31, 35, 37, 48, 49, 51, 52, 60, 66, 80, 81, 83,

- 84, 86, 88, 90, 91, 95, 96, 99, 104, 121, 124, 125, 138, 154, 175, 192, 197, 198, 200, 201, 206, 207, 219, 220, 222, 228, 230, 240, 241, 248, 251, 253, 254, 256, 262–264, 266, 288, 291, 295, 300, 305, 313, 327
- village health volunteers, 293, 301
- violence, 32, 265, 309, 316
- vitamin A deficiency, 23, 83, 84, 85, 88
- volunteers, 301
- war, 12, 27, 35, 52, 111, 190, 192, 207, 316; genocide, 12; illicit drugs, 30
- waste incineration, 225, 235
- wasting, 79, 80, 81, 83, 99, 105
- water quality, 224, 315
- water safety, 2, 217. *See also* access to safe water
- waterborne diseases, 66, 69, 213, 215, 216, 217, 218
- West Nile, 45
- Western Pacific Regional Action Plan for Noncommunicable Diseases, 134
- westernization, 24, 92, 93
- WHO definition of health, 15
- whooping cough. *See* pertussis
- women in the labor force, 5, 24
- workplace accidents, 240
- work-related diseases, 239, 243, 244, 254, 270
- world drug market, 29
- World Trade Organization, 24, 252, 259
- Yangon, 61
- yellow sand, 225
- yellow wind, 225
- zinc deficiency, 84, 85, 89, 90
- zoonoses, 67, 74