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Transdisciplinary Approaches to Population Dynamics and Infectious Diseases in Asia

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Introduction

The population determinants and the outcomes of infectious diseases persisting or emerging in Asia are rarely considered together. Yet, both the causal factors and the outcomes are intricately intertwined with regional population dynamics. If better understanding and management of infectious diseases in Asia is the goal, then knowledge must be shared at many levels across multiple academic disciplines. This challenge is addressed here.

Exchange of information, concepts and analyses across disciplines is always difficult and has not been attempted for infectious diseases in Asia. Accordingly, the Asian MetaCentre for Population and Sustainable Development Analysis (National University of Singapore), together with the National Centre for Epidemiology and Population Health (Australian National University), invited over 40 scholars from Asia, Europe, Australia and North America to Singapore for an International Workshop on the *Population Dynamics of Infectious Disease in Asia* (October 27–29, 2004).

Papers presented covered diverse aspects of medicine, epidemiology, public health, history, demography, sociology, anthropology, geography,

economics, politics, journalism, engineering, and mathematical modeling — all in relation to various infectious disease problems in many parts of Asia. The dialogue among participants before and at the conference, and over the following year as we prepared this book, promoted our understanding of the many possible perspectives on the infectious disease problems.

We found ourselves developing new integrative thoughts that crossed the disciplines, and taking the first steps towards transdisciplinary understanding (Parkes *et al.*, 2005). We hope the readers of this book will also be drawn to such an analysis, an integrated approach that goes beyond a simple exchange of views across disciplines, as we present some of the complex issues arising from persistence, resurgence or emergence of infectious diseases in Asia.

Population Dynamics in Asia

Asia's 3.6 billion people account for about three fifths of the world's population (United Nations, 2005). China, the most populous nation in the world, has a current population of more than 1.2 billion people. Following closely behind is India, the world's second most populous country with a population that is slightly over a billion (United Nations, 2005; U.S. Census Bureau, 2002). Although world population growth is now generally declining, and in Asia it is likely to fall even further below the global rate, nonetheless, the developing countries of Asia will still be major contributors to world population growth for many decades to come (U.S. Census Bureau, 2005b).

Considering Asia as one geographical entity, however, belies the diversity in cultures and populations, as well as a wide range of economies and differences in demographic change. On the one hand, there is Japan with a developed economy and an aged population. There are also the rapidly growing economies of China and India, within each of which are found extensive variations, and which together with Pakistan, Bangladesh, Indonesia and Malaysia, have populations that are still relatively young. There are also places such as Hong Kong and Singapore, metropolitan centres with rapidly ageing populations, and finally, countries such as Cambodia, Laos, and Myanmar with developing economies and high fertility and mortality rates (UNESCAP, 2005; Population Reference Bureau, 2001).

Against this backdrop of wide variations, two distinct trends which have relevance to infectious diseases may be identified. They are increased

population mobility and large-scale migratory flows within and between countries, and a very rapid rate of urbanisation. These trends in urbanisation and migration have particularly profound implications for the ecology of infectious diseases, interacting in complex ways with other biological and social factors, and opening multiple pathways for the emergence of new infections and the resurgence of existing ones.

Migration and mobility

Asia has witnessed large movements of people both within and between countries in recent decades. The migration of labour in Asia, whether legal or illegal, is largely voluntary, essentially motivated by economic necessity or opportunity. However, there are also migrants who are refugees, driven out by political reasons or by conflict. And large numbers of Asian women are trafficked around the world, contributing to an increasing global problem. More recently, migration from Asia to other developed regions such as Europe, United States and Australia has also been growing.

Human mobility affects the population size and composition of both the host and receiving communities, and may also alter prevailing mortality and fertility trends (Lentzner *et al.*, 2002). Within Asia, Japan, Singapore and South Korea are predominantly the recipients of large numbers of migrants, while Malaysia and Thailand both send and receive significant numbers of migrants (see Table 1 for the number of migrants in the labour-importing countries). Malaysia and Thailand also have the highest number of unauthorised or illegal migrants in their countries, with numbers estimated to be about 500,000 (IOM, 2005). At the sending end, The Philippines, India, Bangladesh, Pakistan, Indonesia, China, Sri Lanka and Myanmar are among the largest exporters of migrants. Altogether, they contribute around one-half to two-thirds of all legal immigrants entering the international migration stream (IOM, 2005).

A large proportion of Asian migrants are unskilled workers, seeking employment in plantations, construction sites or in homes as domestic workers. Women made up about 47% of the total in 2001 (Zlotnik, 2003). However, Asian migration is becoming increasingly feminised, with women accounting for a growing proportion of labour migrants. For countries such as The Philippines, Indonesia, Thailand and Sri Lanka, women already constitute the majority — approximately 60% to 80% — of all labour

Table 1. Migrants in labour-importing countries in Asia, 2000.

	National labour force (thousands)	Foreign population (thousands)	Total migrant workers* (thousands)	Legal migrant workers* (thousands)	Migrant workers share of labour force (per cent)	Migrant workers with Legal Status (per cent)
Malaysia	9,600	1,500	1,239	789	13	64
Thailand	34,000	1,250	1,000	700	3	70
Singapore	2,190	1,000	960	940	44	98
Japan	68,000	1,700	670	420	1	63
Province of Taiwan	10,000	350	345	329	3	96
South Korea	22,000	350	310	95	1	31
Hong Kong, SAR	3,380	400	300	235	9	78
Total	149,170	6,550	4,824	3,508	3	73

*Note: Total migrant workers are legal migrants plus students and trainees and unauthorised workers. Legal migrant workers are foreign workers (1) with work permits and (2) considered to be workers under labour law.

Source: Martin and Widgren, 2002.

migrants (Asis, 2003). By the late 1990s, some one million Filipina, 500,000 Indonesian and 40,000 Thai female migrants had worked overseas (Wille and Passl, 2001). Approximately 250,000 of the foreign permanent residents in Japan are also women working in either skilled or unskilled jobs (IOM, 2005); most are second, third and fourth generation Koreans and Chinese.

Urbanisation

The second distinctive and significant trend in our consideration of infectious diseases is the increasing urbanisation in Asian countries, as larger proportions of the population shift from rural to urban settings. In 1975, only 25% of Asians lived in urban areas. However, the percentage has risen to 37% in 2000 and is expected to rise further to 53% by 2030 (Lentzner *et al.*, 2002). The changes in urban populations are reflected in Table 2. As part

Table 2. Percent urban: 1975, 2000 and 2030.

	1975	2000	2030
Asia	24.7	36.7	53.4
Republic of Korea	48.0	81.9	90.5
Japan	75.7	78.8	84.8
The Philippines	35.6	58.6	73.8
Malaysia	37.7	57.4	72.7
Indonesia	19.4	40.9	63.5
Pakistan	26.4	37.0	55.9
China	17.4	32.1	50.3
India	21.3	28.4	45.8
Bangladesh	9.8	24.5	43.8
Myanmar	23.9	27.7	46.6
Sri Lanka	22.0	27.5	39.3
Lao PDR	11.4	23.5	42.6
Thailand	15.1	21.6	39.1
Viet Nam	18.8	19.7	33.7
Cambodia	10.3	15.9	31.9

Source: United Nations Population Division, 2001.

of urbanisation, mega-cities have sprouted in Asia, with “12 of the world’s 20 largest urban agglomerations” being found there (Lentzner *et al.*, 2002: 11). In addition, secondary cities have also been growing in Asia. At least 170 urban areas with over 750,000 inhabitants can be found in India and China alone (United Nations Population Division, 2001).

Urbanisation impacts on many aspects of life, including living conditions, behaviours and values, and political, social and economic processes (Lentzner *et al.*, 2002: 11). It is thus expected to have a considerable impact on population dynamics, especially mortality. From the data gathered from both developed and developing nations, mortality rates are generally lower in cities due to their health advantage over rural areas. This has been reflected in many Asian countries, with cities generally having better overall health outcomes than rural areas (Lentzner *et al.*, 2002). However, this advantage may not last as mega-cities and urban populations continue to grow at an uncontrollable rate. Moreover, numerous hazards such as pollution exist

within urban areas. These hazards should not be ignored, as they may have critical influences on mortality in the near future (Mutatkar, 1995).

Urbanisation also affects fertility rates. Asians living in urban areas tend to marry later, with the mean marriage age increasing to >22 years for women and >25 years for men. This is true for all Asian countries except Nepal, India and Bangladesh (Lentzner *et al.*, 2005). Nonetheless, even India's mean age at marriage in both urban and rural areas has risen by 3.6 years during the period from 1961 to early 1990s (Das and Dey, 1998). The increasing age at marriage has resulted in dramatic declines in fertility. Changes in lifestyles, namely sexual activity outside of marriage, may also lead to unwanted and terminated pregnancies, as well as increasing the spread of sexually-transmitted diseases. Finally, it is interesting to note that most such demographic changes arise first in major cities before moving to smaller cities and rural areas.

Infectious Diseases in Asia

Infectious diseases are still important public health problems in Asia today. Previous optimism in the 1960s and 1970s that almost all serious infections would be controlled was misplaced (Morens *et al.*, 2004). Many old infections have persisted and several lethal new human infections like SARS, avian influenza and Nipah virus have emerged (from animal populations) in Asia in the last decade. In 2003, SARS spread around the world and paralysed trade, travel and some health systems for 6 months; it reappeared as dangerous laboratory outbreaks in Singapore, Taiwan and China in 2004. SARS could revisit at any time.

Avian influenza is now causing worldwide concern as it repeatedly appears in East Asia and spreads south and west, with the ever-present risk of becoming a lethal airborne human influenza pandemic. HIV had entered the region and spread exponentially for the last 20–30 years, currently infecting nearly 9 million people in Asia, 21% of the global total (UNAIDS, 2004). As more people are infected with HIV, the Asian population becomes more vulnerable to other infections, especially TB, because the HIV virus disables the natural ability to fight off infection. Other infections, including hookworm, other intestinal parasites, dengue, Japanese B encephalitis, sexual infections

and meningococcal meningitis, have persisted or re-emerged. Dengue has become more severe and spread to other continents, while still affecting most of Asia.

Age-old infections such as TB and malaria have become more resistant to control techniques that worked well in the past, while plague, human influenza and cholera still threaten the world with the possibility of escalating into global epidemics. Although large areas of Asia have been freed from previously endemic malaria and schistosomiasis that used to kill many people and debilitate surviving populations, transmission of these vector-borne diseases persists in less fortunate areas, usually intimately associated with ongoing poverty and rural subsistence occupations.

These worrisome infection trends occur in parallel with many other socio-economic and environmental developments which are themselves rapidly changing. We have already identified the two distinct trends i.e., migration and urbanisation that will have significant effects on infection risks. Furthermore, there are the ecological consequences of rapidly increasing trade, travel and transport of goods and animals, certain human behaviour linked to both transitional and traditional societies and their economies and cultures, intensified agriculture and animal food production and associated misuse of pesticides and antibiotics. We also cannot neglect the effects of progressive climate and ecological change. Microbial evolution, in dynamic interplay with these factors, and with the intrinsic properties of organisms transacting their existence in complex and changing environments, is also part of the causal web of infection trends in Asia. It is in the context of such a multitude of factors and players, and their complex inter-relationships, that we will have to understand the current unfolding situation of infectious diseases in Asia today.

Outline of Sections

The book is divided into six sections, starting with this *Introduction* (Chap. 1), highlighting our transdisciplinary approach and summarising the material presented. The next section sets up *Frameworks for Understanding Population Dynamics and Infectious Diseases in Asia* (Chaps. 2-6), overarching concepts or problems that are of general relevance to any analysis of

infectious disease patterns in Asia or beyond. We consider the forces driving infectious diseases, introduce novel approaches to analysis with special reference to unstable landscapes and migration, and consider the impact of large dams. We also explore the biomathematics of infection outbreaks and the implications for infection control, and analyse diverse health system responses manifested across Asia.

Section 3 considers *Development and Infectious Disease in Asia* (Chaps. 7–10). This section covers the extraordinary historical successes in Shanghai, the adverse impact of social change in mountain Vietnam, the tensions surrounding NGO services for mobile HIV-infected persons in Thailand, and the complex interactions of the state and civil society in relation to HIV/AIDS in Singapore. Section 4 covers *Population Mobility and Infectious Diseases in Asia* (Chaps. 11–14). This is where we examine a new road in Laos as a risk for sexually transmitted diseases (STD), rural work migration in China as a risk for TB, urban migration of females in Southwest China and the risk of STD, and the many infections associated with the largest annual human movement, the Hajj.

Section 5 deals with *Comparative Perspectives of SARS in Asia* (Chaps. 15–20). The SARS experience of Singapore is first noted in the context of the many infections that have been introduced to that central Asian city. This is followed by an analysis of the risks exposed by a notorious SARS outbreak in a high rise building in Hong Kong. Diverse reports followed from Taiwan (stigma and SARS), Malaysia (SARS and risk perception) and China (SARS and governance). In the final section, *Drawing Lessons from the Past to Respond to Future Challenges* (Chap. 21), the recent and ongoing problem of avian influenza is analysed and connected back to the many themes running through the book.

Outline of Following Chapters

Chapter 2 is Anthony J McMichael's account of *Ecological and Social Influences on Emergence and Resurgence of Infectious Disease*. He examines, broadly, the ways in which the emergence and resurgence of infectious diseases in the Asia-Pacific region reflect dynamic and rapid changes that have been brought about by the processes of 'globalisation'. Historic transitions include

the appearance of zoonotic diseases with the advent of agriculture and animal husbandry 10,000 years ago, subsequent east-west microbial exchange between the Chinese and Roman empires, then the spread of infections (smallpox, measles) to vulnerable populations by European navigators several hundred years ago, and now global warming and destabilisation of ecosystems and biophysical processes needed for the world's life-support system. McMichael notes three ongoing socio-ecological phenomena that promote emerging infections: (i) increasingly intense modification of natural environments; (ii) the disturbance of natural ecosystems; (iii) poverty, crowding, social disorder and political instability. He points out that we live non-negotiably in a microbially-dominated world. Thus, we must think more in ecological terms and less in military terms about our relations with microbes. Indeed, we should aim to improve at coexisting.

Chapter 3 is David Bradley's approach to transmissible diseases at several scales incorporating *Landscape Epidemiology and Migration*. He relates space-time to infection at ecological 'edges' or zones of change known as 'tones'. These include spatial 'ecotones' (such as the canopy-floor zone within a forest, or a forest fringe) and temporal 'chronotones' (unstable landscape interposed in time between two stable states, such as a recently dammed valley). Both ecotones and chronotones are rich sources of human infection and are often in flux due to human activity. He notes that the landscape is structured ecologically into patches, corridors and matrices which determine the existence and transmissibility of infection. People create and adapt to landscapes. Migrants entering landscapes contact new infections, especially when crossing ecotones or chronotones. They also carry cultural adaptations from their former landscapes, and these may become maladaptations and pose new risks in new landscapes.

Adrian Sleight (Chap. 4) analyses *Water, Dams and Infection*, an important and emerging feature of the Asian landscape with a direct impact on infectious diseases. Growing problems of water stress, food production, desertification and urbanisation are driving Asian countries to build large dams. These were a 2 trillion dollar investment in the 20th century, as the global inventory grew to 45,000 such dams, mostly in China and India. That investment was often imprudent and of exaggerated benefit. When located in Asia's heavily populated river valleys, the dams cause massive human displacement, much more so than in Western countries. As many as 50 million

people have been displaced by large dams in India and China since 1950. Infections result, notably schistosomiasis and malaria, but other endemic infections of poverty such as pneumonia and diarrhoea are also exacerbated due to the prolonged adverse socioeconomic effects of dams.

In Chap. 5, Niels Becker and Katie Glass consider the biomathematics underlying *The Impact of Imported Infection*. They use mathematical transmission models to assess the impact of imported infections in two settings, that of vaccine-preventable disease such as measles, and that of a newly-emerged infection such as SARS. The results indicate that the appropriate public health response is rather different in these settings. When controlling an infection by a routine vaccination schedule, there is no need for a response to an imported infection if the immunity coverage achieved is below the threshold required for sustained elimination. The number of extra cases resulting from importation is generally so small that more cases are prevented by focusing the effort on improving the immunity coverage. In contrast, to prevent a major outbreak from an emerged infection for which there is no vaccine, the public health response should focus on prompt traditional interventions; the models demonstrate that early isolation of new cases in the early days of such an outbreak can avert an epidemic.

Phua Kai Hong and Vernon Lee (Chap. 6) examine the role of Asian health systems in responding to newly emerging infectious diseases. The health systems now affected by emerging infections such as SARS and avian influenza are quite diverse in their capacity and finance. At issue is an accurate account of the costs of such infections and the determination of the appropriate threshold for public investment in national and regional preparedness and capacity to respond. The recent Asian fiscal crisis, as well as growing trends of privatisation and cost containment, provides many challenges to those responsible for planning health systems that are responsive to the infectious diseases of the future.

In Chap. 7, Zhongwei Zhao, Feng Zhou, Guixiang Song, Shengnian Zhang and Tingkui Zhou report on the *Control of Infectious Diseases and Rising Life Expectancy in Shanghai: 1950–2003*. Infectious diseases were the major killer in Shanghai before 1950. Since then, the Shanghai municipal government has taken effective measures to combat infectious diseases. They examine the huge impact of infectious diseases prior to the 1950s, the methods adopted for their control in the last half of the century, and the

great impact on life expectancy. They also note recent patterns of resurging or emerging infections (TB, gonorrhoea, HIV) and problems with re-appearance of old infections such as measles among poor migrant groups in Shanghai.

In Chap. 8, Nguyen Tran Lam reports on the *Social Change and Infectious Diseases in Northern Mountain Vietnam*. Changing social conditions affect the lives and livelihoods of particular minority people in ways that significantly influence the spread of infectious diseases and condition the shape of epidemics. Primary drivers are contextually varied, including among others, contaminated water, poor sanitation and hygiene awareness, under-nutrition and hunger, material and seasonal deprivation, poor housing conditions, migration, drug resistance, and uneven distribution of health services. Major health problems arising from the socio-political conditions in this area are diarrhoea, pneumonia, influenza, TB, AIDS, malaria, reproductive tract infections and hepatitis. There is a resurgence of TB, Japanese encephalitis and dengue fever.

In Chap. 9, Vincent Del Casino traces the rising tensions regarding questions of mobility and local development in the wake of the growing impact of HIV/AIDS in Northern Thailand. In so doing, he investigates the ways in which healthcare management and development programmes affect mobility patterns and how those mobility patterns impact NGO goals of sustaining local development initiatives. The dynamic relationship between mobility and local needs raises the question of how to provide economic opportunities for people living with HIV and AIDS (PLWHA), as well as those affected by HIV/AIDS locally, such as children and grandparents. Non-governmental organisations (NGOs) have intervened to provide both care programmes and community development support and organisation as a way of enhancing local development, in attempts to “keep people local” and focused on community development. Many of these projects have also found favour with the Thai government, which since the “1997 crash” has promoted “local development” more vigorously. The long-term goals of many NGO initiatives is to develop sustainable local economic development that will also enhance the growing drive to promote participation and local governance initiatives in Northern Thai communities. Yet, there is a tension between the growing interest of NGOs to promote local economic

development and the desire of PLWHA and others to participate in the growing globalised national economy.

Focusing on HIV/AIDS but in the context of the globalising city of Singapore, Shir Nee Ong and Brenda Yeoh in Chap. 10 consider the dominant state and socio-cultural discourses that surround HIV/AIDS and PLWHA in the city-state, and how these discourses attempt to discipline Singaporean bodies by encouraging 'safer sex' practices. Some discourses also (re)present HIV-positive bodies as 'deviant' bodies creating 'dis-ease' and therefore requiring regulation. The chapter also examines the extent of civil society activism and response through a consideration of how individuals and organisations help PLWHA in a number of ways, i.e., by providing 'space' for PLWHA to interact, by integrating them socio-spatially into the workplace, and through advocacy work in protecting their rights.

In Chap. 11, Chris Lyttleton explores the impact of *Cultivating the Market: Mobility, Labour and Sexual Exchange in Northwest Laos*. In the late 1990s, a million dollars from the World Bank upgraded a haphazard trail into an all-weather highway through Northwest Laos, linking China with the Mekong and Thailand. Although only 74 km long, Route 17B offers a microcosm of the multiple impacts that follow rapid social change for both itinerant and host communities in areas where infrastructure developments introduce transnational flows of ideas, people and goods. Numerous trucks now move through from China ferrying goods to and from the river connection with Thailand. The complex mix of ethnicity, economy, migration and politics has increased vulnerability to HIV and other sexually transmitted diseases in roadside communities in Northwest Laos. Rapid commoditisation of daily life for resettled Akha and other ethnic minority groups is fostering diverse sexual networks among internal and cross-border populations. Notions of ethnic customs and cultural difference are frequently cited by health professionals as a catalyst for the spread of sexually transmitted infections in this region, but simplistic ideas of ethnic difference pose a serious obstacle to effective health promotion.

In Chap. 12, Sukhan Jackson, Adrian Sleigh, Wang Guo-Jie and Liu Xi-Li consider *Household Poverty, Off-Farm Migration and Pulmonary Tuberculosis in Rural Henan, China*. They compare new TB cases and their controls for association with poverty (as measured by household economic status) and off-farm migration. They also calculated the economic costs of TB and its

huge impact on the household. In China's poverty reduction programme, it is critical that financial support be offered to TB sufferers impoverished by lost income and capital due to the economic burden of this disease. The poorest farmers migrate for work and these migrants are then at high risk for TB, impoverishing them further. Thus, in rural China today, poverty and TB form a vicious cycle, each inducing the other.

In Chap. 13, Xiushi Yang reports on *Migration, Gender, and STD Risk: A Case Study of Female Temporary Migrants in Southwestern China*. He examines the interplay of migration and gender power relations that render female migrants vulnerable to sexual infections. Rural female migrants in urban centres, particularly those in the personal service and entertainment industry, have disproportionate increases in dangerous sexual behavior and are at a high risk of STDs and HIV. Economic hardship and competition leave female migrants with little control of casual or commercial sex encounters and unable to resist the pressure for unprotected sex. Gendered moral and social values further subject them to a subordinate position, limiting their power in negotiating protective measures, and putting them at a high risk of acquiring and subsequently transmitting STDs/HIV which has dire implications. At any point in time in China there are several million female migrant workers in this industry, and the cumulative number could be many times larger since many typically work for only a few years, returning to home villages subsequently to get married. The possibility of them becoming the unwitting source in the spread of STDs/HIV in China is therefore real and serious.

Annelies Wilder-Smith (Chap. 14) then introduces another regional issue influencing infectious disease patterns in Asia and across the World, that of the annual Hajj pilgrimage. More than 2 million Moslems migrate for the Hajj every year, the largest mass movement of people on earth. The overcrowded conditions and convergence of populations carries a high risk of person-to-person infections such as influenza, tuberculosis and meningococcal disease, and worldwide spread of these diseases after the pilgrims return. She examines the information available on the many infections that result and reviews strategies that can reduce these risks.

Goh Kee Tai and Chew Suok Kai (Chap. 15) give a comprehensive account of the *Epidemiology of Emerging Infectious Diseases in Singapore, with Special Reference to SARS*. This chapter reveals the constant pressure placed

on Singapore to detect and control many food-borne infections, encephalitis and dengue, as well as unexpected intrusions. The stress reached new levels with the outbreak of SARS and they give us a detailed account of how it spread and of its severe impact on the Singapore health system. The final outcome was a laboratory incident with lessons for the whole region for the prevention and management of infection.

In Chap. 16, Yuguo Li, Hua Qian, Ignatius Yu and Tze Wai Wong examine the *Probable Roles of Bio-Aerosol Dispersion in the SARS Outbreak in Amoy Gardens, Hong Kong*. They use an engineering approach to evaluate and model the probable mode of transmission in this notorious community outbreak affecting 321 residents and causing 42 deaths in a high-rise apartment complex in that densely populated city. They conclude that the virus became externally airborne from a source case in one flat, enabling faeco-respiratory transmission between flats and buildings at different levels in the apartment complex, with transmission affected by prevailing weather conditions and the wind. This analysis raises the issue of high rise building safety, as urbanisation proceeds elsewhere in Asia and the need for better building design and more research on the topic.

In Chap. 17, Mei-Ling Hsu and Ching-I Liu examine how various groups have been stigmatised in the public discourse about SARS in Taiwan's society. Adopting a conceptual framework of stigma formation, they performed a textual analysis of the news content in three mainstream newspapers — namely, *China Times*, *United Daily News*, and *Min Seng Daily*, in Taiwan. The time frame of news selection ranges from the first reported local SARS case on 1 March 2003 to 5 July 2003, the date when Taiwan was removed from the World Health Organization's SARS list. They noted that 'others' were frequently constructed in the news texts informing the public about the epidemic and prevention of the infectious disease. The 'others' were distinguished from 'us' and were blamed and denigrated for putting the population at risk. Only healthcare workers had the power to escape from their initial 'other' status, but blue collar workers, the homeless and the foreigners were unable to do the same and bore the blame for SARS.

In Chap. 18, *Risk Perception and Coping Responses in a SARS Outbreak in Malaysia*, Chan Chee Khoo explores the theme of *risk perception* and what influences it may have had in the SARS outbreak which swept through East and Southeast Asia in 2003. He points out that while much credit has

been given to institutional responses such as isolation, contact tracing, and quarantines for rapidly bringing the epidemic under control, less mentioned were the individual-coping responses and risk avoidance behaviors (reduced travel, avoidance of crowded locations, avoidance of hospitals). In fact, because of the economic and financial stakes involved, official sources in Malaysia tried to avert “overreaction” in the risk avoidance responses to the outbreak (at the same time, and in obvious contradiction, urging caution upon those who contemplated travel to SARS-affected destinations such as China, Hong Kong, Taiwan, Singapore, and Toronto). In conclusion, he argues that the perception of risk associated with the SARS infectious outbreak was disproportionate to the threat it posed to global population health, and that this inflated perception of risk was driven more by economic rather than epidemiological considerations.

In Chap. 19, Liew Kai Khiun examines the response to the framing of the SARS epidemic in Singapore, looking at the role which the epidemic played in reinforcing government legitimacy and reifying themes which have been central to the nation-building project since independence. As such, his study demonstrates the ways in which public health and disease control efforts are nested within broader political and social concerns and may serve to either contravene or reinforce these other agendas.

In Chap. 20, David Kelly and Luo Xiaopeng examine the roots of a crisis in governance that were exposed by the SARS epidemic in 2003. Not only was the public health system extremely weak, particularly in the rural areas, but there was a large floating population of migrant labour that commuted between urban and rural areas, serving as a potential reservoir as well as a vector for the emergent infection. Kelly and Luo explain the characteristics of China’s economy and polity which gave rise to this large migrant pool, and point out that the difficulties in changing the system are essentially due to weaknesses in the governance structure of the country.

In the final chapter, we address the latest infectious disease threat to emerge from Asia. Not only is avian influenza considered a danger to the whole world, it has forced us to re-examine the often forgotten experience with previous influenza pandemics, especially the catastrophic 1918 and 1919 pandemic. The many lessons arising from the preceding chapters in the book are considered as we appraise the risks now posed by H5N1 infection. We may be better prepared for the next pandemic of influenza,

but must make decisions to share the risks and burdens of necessary investments regionally in our Asian health systems. Retreat to national solutions will make any prospects of control more difficult, and will not be in the best interests of anyone. This matter has now become a global concern, but Asia has a vital interest in the outcome of preparations for the next pandemic of influenza, as it will probably be the source and the first region to be affected.

Conclusion

This book covers an array of problems from many perspectives, but certain topics are of outstanding importance when considering population dynamics and infectious diseases in Asia. Firstly, the volume emphasises the importance of *place*, expressed through *landscape and culture*. Location determines the risk of infection and also modifies the response. Secondly, of significance too is the *alteration of the landscape* for economic development with local, national, regional and global effects. A third crucial element relates to *human mobility across the landscape*, driven by spiritual faith, involuntary displacement, and the forces of economic development, including both poverty and affluence. Fourthly, it is important to consider the *cumulated legacy of previous changes in place*, with human movement reflecting ties from the past, and resulting in infections being introduced. Finally, the all important effects of *poverty* cannot be ignored. This is driving millions of people to change where they reside, exposing them to risks they cannot resist and for which the local place- and culture-based health systems are currently inadequate.

As the chapters of this book unfold, it becomes apparent that understanding and responding to the challenges posed by infectious diseases takes us beyond a traditional epidemiological or biomedical framework towards a transdisciplinary analysis. We hope that this book will encourage readers to begin that intellectual journey on Asia.

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