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Chapter 4

# Tourism and SARS

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## Introduction

The Severe Acute Respiratory Syndrome (SARS) was responsible for the first pandemic of the 21st century. Within months after its emergence in Guangdong Province, mainland China, it had affected more than 8000 persons and caused 774 deaths in 26 countries on five continents. SARS illustrated dramatically the potential of air travel and globalization for the dissemination of an emerging infectious disease (Peiris, Yuen, Osterhaus, & Stohr, 2003). The history and epidemiology of the year 2003 SARS outbreak, its impact on travel and tourism and strategies to contain the international spread are discussed in this chapter.

## History and Epidemiology

An unusual atypical pneumonia emerged in Foshan, Guangdong Province, mainland China, in November 2002 (Zhong et al., 2003). In February and March 2003, the disease spread to Hong Kong and then to Vietnam, Singapore, Canada and elsewhere. It was a traveller who became the vector that turned a newly emergent local virus into a global outbreak. An American businessman travelling from China via Hong Kong exported the disease to Vietnam on 23 February 2003. The resulting outbreak of this 'mysterious disease' in a Vietnamese hospital led the World Health Organization (WHO) to issue a global alert on 12 March 2003. Besides this business traveller, at least 10 other travellers to Hong Kong had stayed on the same hotel floor as the index case of SARS, a physician from Guangdong who had treated SARS patients. Together, they unmasked the problem in Southern China. From then on, SARS spread to multiple countries, always in the respiratory tract of a traveller. On 15 March, the new disease was named the Severe Acute Respiratory Syndrome, and a preliminary case definition was established. The instantaneous communication and information exchange that supported every aspect of dealing with this epidemic led to a speed of scientific discovery that has set a new standard for disease response.

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A new coronavirus was identified as the causative agent and its entire genome sequenced and made publicly accessible within weeks. Coronaviruses are a family of enveloped, single-stranded RNA viruses, with SARS CoV being a new group within this family. Since seroepidemiologic data suggested that SARS CoV had not previously been endemic in humans, it seemed likely that this was a virus of animals that had crossed the species barrier to humans in the recent past. This hypothesis was further supported by anecdotal reports that some patients who had SARS in Guangdong Province in November and December 2002 reported a history of occupational exposure to live, caged animals that are used as exotic "game food", a culinary delicacy in southern China (Peiris et al., 2003). SARS-like coronaviruses were isolated from Himalayan palm civets and from raccoon dogs in one market in Guangdong Province where wild game animals are sold. In addition, persons involved in the wild animal trade in Guangdong had a higher seroprevalence of SARS CoV than unrelated controls (Guan et al., 2003). These findings support (but do not prove) that live game animals may be potential sites of interspecies transmission.

Intense shoe leather epidemiology has clearly proven transmission to be almost exclusively person to person, through direct respiratory droplets, hand contamination, and fomites (Seto et al., 2003). In some instances, fecal–oral modes of transmission may have been implicated, such as in the one well-publicized community outbreak in an apartment complex in Hong Kong. The leading hypothesis is that small virus-containing droplets from the contaminated sewage entered the bathrooms. However, other modes of transmission are the exception, although the SARS virus is hardy enough to last in the environment for several days under experimental conditions.

The spread of SARS was initially exponential, with hospital settings serving as amplifiers. SARS was transmitted primarily, but not exclusively, in healthcare settings, generally 5 or more days after the onset of disease and from patients who were severely ill (Donnelly et al., 2003). Transmission to casual and social contacts is uncommon, but has been described. Asymptomatic or mild infections are rare, and do not appear to contribute to the chain of infection.

Mathematical models have shown that SARS coronavirus, if uncontrolled, would infect the majority of people wherever it was introduced (Dye, 2003). An even more worrying phenomenon is the heterogeneity in transmission. In extreme instances of SARS, the so-called superspreading events occurred where single individuals apparently infected as many as 300 others (Dye, 2003). All the countries with major outbreaks were those that imported SARS before the disease was known and before appropriate infection control measures were instituted. With extraordinary efforts, but without a vaccine or a specific vaccine, these outbreaks were controlled once the mode of transmission was established and measures taken.

The experience of the year 2003 has taught us that although this new coronavirus is sufficiently transmissible to cause a very large epidemic, it is not so contagious as to be uncontrollable with good, basic public health measures. The basic public health measures were early identification and isolation, quarantining of contacts and a strict infection control programme based on personal protective measures, as well as travel restrictions. The WHO declared 5 July 2003 to be the date of the end of the SARS epidemic. Since then, several isolated SARS cases have been reported; none were fatal, and none resulted in a new SARS epidemic.

## Travel, Tourism and SARS

SARS and travel are intricately interlinked. Travellers were among those primarily affected in the early stages of the outbreak, and they became vectors of the disease, and finally, travel and tourism themselves became the victims. The outbreak of SARS created international anxiety because of its novelty, its ease of transmission in certain settings, and the speed of its spread through jet travel, combined with extensive media coverage. By 15 March 2003, the WHO had begun to issue an unprecedented series of travel advisories (e.g. advice to postpone non-essential travel to a SARS-affected area). The purpose was to limit the spread of infection by international travel.

## Impact of SARS on Tourism

Air travel to areas affected by the advisories decreased dramatically during the epidemic, although the impact of advisories compared with other sources of information to travellers, such as news media, is difficult to assess.

International tourism arrivals fell 1.2% to 694 million in 2003, according to World Tourism Organization (WTO) figures. Growth of the broader travel and tourism economy, which measures visitor spending around the world as well as capital investment, slowed to 2.9% from about 5% in previous years (http://news.bbc.co.uk/2/hi/business/3024015.stm). In East Asia, tourist arrivals dropped by 41% between April 1st and 21st compared to the same period in 2002, with the following Asian destinations suffering in particular — China, Hong Kong, Vietnam and Singapore. Over the months of the outbreak, there was a drop of 12 million arrivals in Asia and the Pacific, constituting a 9% drop compared to the previous year. According to Rick Miller, vice president of research and economics at the World Travel & Tourism Council (WTTC), the impact of SARS on these countries has been four or five times the impact of 11 September in the United States. In the first 5 months of 2003, overseas and domestic tourist arrivals in Beijing dropped by 480,000 and 8.7 million, respectively, generating losses as high as 11 billion Yuan (US$1.3 billion). The hotel occupancy rates in Beijing fell down to 10%. Four lakh foreign tourists cancelled their tours to Vietnam in 2003. The Toronto crisis cost the province of Ontario's leisure industry around Canadian $2 billion in lost revenues and 28,000 jobs, according to Ontario Ministry of Tourism figures.

SARS had major political and economic impact. The FIFA Women's World Cup, originally scheduled for China, was moved to the United States. On 30 March 2003, the International Ice Hockey Federation (IIHF) cancelled the 2003 IIHF Women's World Championship tournament, which was to take place in Beijing. On 1 April, a European airline retrenched a group of employees owing to a drop in travellers. Severe decline in customer numbers occurred for Chinese cuisine restaurants in Guangdong, Hong Kong and Chinatowns in North America; a 90% decrease in some cases. Businesses recovered considerably in some cities after promotion campaigns. Hong Kong merchants withdrew from an international jewelry and timepiece exhibition in Switzerland. Swiss officials enforced a full body check of the 1000 Hong Kong participants, which resulted in diplomatic tensions between the two countries. An estimated several hundred million HK dollars in contracts

were said to be lost as a result. Some conferences and conventions scheduled for Toronto were cancelled, and the production of at least one movie was moved out of the city. The findings of the Canadian study, "Economic impact of SARS on tourism in seven selected member economies in the APEC region" can be found at www.apecsec.org.sg. WTTC estimates of the economic impacts of SARS are at www.wttc.org.

## Measures at International Borders

Passive and active methods were used to provide information and screen entering and exiting travellers. These methods included signs, videos, public address announcements, distributing health alert notices, administering questionnaires to assess symptoms and possible exposure, visual inspection to detect symptoms and thermal scanning. Combined data from Canada, China, Hong Kong, Taiwan, France, Singapore, Switzerland, Thailand and the US indicate that approximately 31 million travellers entering these countries received health alert notices (Bell, 2004). Of these, approximately 1.8 million were reported as arriving from affected areas; this estimate is likely to be low given the difficulties in tracking travellers and the fact that many airline passengers change planes en route. Inadequate data exist to evaluate the effect of distribution of these notices. Mainland China reported distributing 450,000 notices and detecting four SARS cases that may have been linked to the notices. Thailand printed 1 million notices; as a result 113 cases of illness (respiratory symptoms) were detected; 24 cases were suspected or probable SARS.

### *Entry Screening*

Entry screening was deemed necessary in response to the fact that the outbreaks in Vietnam, Singapore and Canada were due to importation of SARS via international arrivals. Visual inspections, soon replaced by temperature checks (infrared scanning), were introduced at many airports around the world. Data from a worldwide survey indicate that among 72 patients with imported probable or confirmed SARS cases, 30 (42%) had onset of symptoms before or on the same day as their entry into the country and symptoms developed in 42 patients (58%) after entry (Bell, 2004). In Singapore, there were six imported cases of SARS, of which only the first case led to secondary transmission and eventually to the large outbreak there (Wilder-Smith, Paton, & Goh, 2003a). After implementation of screening methods at the Singapore airport, no further importation of patients with SARS occurred. In total, 442,973 passengers were screened between 31 March and 31 May 2003, and of those, 136 were sent for further SARS screening and observation, but none was diagnosed as having SARS (Wilder-Smith et al., 2003a). Of 349,754 passengers arriving in Toronto, 1264 were referred for further screening, none had SARS (St John et al., 2005).

Temperature screening of 13,839,500 travellers entering or leaving Beijing by air, train or automobile identified 5907 patients with fever, of whom 12 had probable SARS (Bell, 2004). None of 275,600 international travellers who underwent temperature screening had SARS. In China–Taiwan, incoming travellers from affected areas were quarantined; probable or suspected SARS was diagnosed in 21 (0.03%) of 80,813. None of these 21 was detected by thermal scanning. Results combined from Canada, China (including the

mainland and Hong Kong SAR) and Singapore indicate that no cases of SARS were detected by thermal scanning among more than 35 million international travellers scanned at entry during the SARS epidemic.

The low yield in detecting SARS is most likely due to a combination of factors, such as travel advisories, which resulted in reduced travel to and from SARS-affected areas, implementation of effective pre-departure screening at airports in SARS-hit countries, and a rapid decline in new cases at the time when screening was finally introduced (Wilder-Smith, Paton, & Goh, 2003b). An estimated Canadian $7.55 million was invested in airport screening measures in Canada (St John et al., 2005). SARS has an extremely low prevalence, and the positive predictive value of screening is essentially zero (St John et al., 2005). Screening at entry points is costly, has a low yield and is not sufficient by itself. However, one may argue that entry screening is justified in light of the major economic, social and international impact that even a single imported SARS case may have. However, new imported SARS cases need not lead to major outbreaks if systems are in place to identify and isolate them efficiently. Rather than investing in airport screening measures to detect rare infectious diseases, investments should be used to strengthen screening and infection control capacities at points of entry into the healthcare system (St John et al., 2005).

Barring the entry of travellers from SARS-affected countries is politically incorrect and scientifically unjustifiable. Saudi Arabia was one of the few countries that actually banned the entry of people who had visited or resided in China, Hong Kong, Taiwan, Singapore, Vietnam and Canada; but this measure may have been understandable given that the SARS outbreak coincided with the Hajj (Memish & Wilder-Smith, 2004). This pilgrimage attracts more than 2 million Moslems from all over the world for a month-long event that is characterized by conditions of overcrowding (Wilder-Smith & Memish, 2003). Infectious diseases that require person-to-person transmission are known to be amplified during this pilgrimage (Wilder-Smith & Memish, 2003); and it could have been conceivable that SARS could have rapidly spread under such conditions and subsequently disseminated worldwide via pilgrims returning to their countries of origin.

### *Exit Screening*

After WHO recommended exit screening on 27 March 2003, no additional cases from airline travel were documented from countries with screening. Combined data from China (including Hong Kong SAR and Taiwan) indicate that among 1.8 million people who completed health questionnaires at exit, one probable case of SARS was detected. Combined data from Canada, China and Singapore indicate that no cases of SARS were detected among more than 7 million people who underwent thermal scanning at exit (Bell, 2004). However, exit screening may have helped dissuade ill persons from travelling by air but may have been more successful in dissuading local residents from traveling abroad than in dissuading ill travellers from attempting to return home.

Exit and entry screening may enhance the travellers' perception of security, but an unwanted side-effect may be to discourage travel for those unwilling to risk travel for the chance of being quarantined and business/holiday schedules being disrupted at a heavy cost on the presentation of fairly vague symptoms.

### *Passenger Contact Tracing*

The Infectious Disease Act in various countries legalized quarantining of passengers who had been in contact with a SARS patient (i.e. fellow passenger). Because of the lack of internationally accepted standards for developing and retaining passenger manifests, excessive delays in obtaining the manifests from various airlines occurred (St John et al., 2005). Therefore, in addition to completing health declaration cards about symptoms, the information required also included address and flight seats, to facilitate contact tracing. According to the Canadian experience, traveller contact information forms reduced the time for securing the manifest from weeks to 2 days.

## Transmission of SARS on Airplanes

Five commercial international flights were associated with the transmission of SARS from patients with symptomatic SARS to passengers and crew (Bell, 2004). Notification of exposed passengers and studies of transmission risk were greatly hampered by difficulties in identifying and tracing passenger contacts. In the most comprehensive investigation, involving three flights with extensive passenger tracing and laboratory confirmation of index and secondary cases, a wide range of risk was noted. In one extensively investigated flight, in which the secondary attack rate was 18.3%, the risk of infection was increased for persons seated close to the index patient, but most passengers who became infected were seated farther away, even though their individual risk was lower (Olsen et al., 2003; Lim et al., 2004).

On nine flights arriving in Singapore, the incidence of transmission from passengers with SARS was estimated at 1 in 156 persons (Wilder-Smith et al., 2003b). In conclusion, the overall risk to airline passengers is quite low. Aircraft ventilation systems are believed to be highly efficient at keeping the air free of pathogens, which they do by exchanging the air in passenger cabins every 3–4 min and passing the circulated air through high-efficiency particulate-arresting (HEPA) filters designed to filter out all particles larger than $0.3 \times 1$ μm (Olsen et al., 2003). The risk of aircraft transmission may have been further reduced, thanks to the implementation of safety measures and exit screening. The WHO reports that no transmission on an airline was identified after 23 March 2003. The Centers for Disease Control (CDC) have published guidelines on how to deal with airline passengers with symptoms suggestive of SARS and how to protect flight crew members and other passengers (www.cdc.gov/ncid/sars/flight_crew_guidelines.htm).

## SARS Information for Travellers

Pre-travel advice for travellers should include information about symptoms and mode of transmission of SARS, and advice for early health seeking if any of these symptoms arise. Droplet precautions include frequent hand washing. A thermometer, gloves and hand sanitizers or antimicrobial hand wipes, possibly face masks should be taken along. The routine use of masks is controversial. With the exception of the Amoy Gardens cluster in Hong Kong, SARS transmission in the community from aerosols or in social settings appears to

be very rare. However, isolated cases of transmission in taxis or in a large mass gathering (religious meeting in Toronto) have been reported. To minimize the possibility of infection, close contact with large number of people should be avoided, and visiting hospitals with an ongoing SARS epidemic should be strongly discouraged. Travellers are strongly recommended to be vaccinated against influenza and the rationale for this needs to be explained to them: although the influenza vaccine does not protect against SARS, it will minimize episodes of febrile illness and therefore reduce the number of misdiagnoses and lower the overall incidence of diseases that mimic SARS (Wilder-Smith & Ang, 2003). Moreover, it will reduce the risk of a febrile episode, which may be picked up at airport screening and lead to delays at the airport or even quarantining.

Travellers should regularly monitor the WHO website along with the CDC website. These institutions regularly update their websites to reflect changes in what is known about SARS, about outbreaks, and provide the latest travel guidance. Medical evacuation of SARS patients remains problematic and costly. Securing transport and locating a destination willing to accept such patients can be very difficult. Travelers should obtain information about evacuation and insurance policies with regard to SARS before departure.

Persons returning from one of the affected areas should monitor their health for 10 days. No one who has had contact with a known SARS case, whether in a SARS-affected area or elsewhere, should cross an international border for 10 days after the last contact, assuming they remain asymptomatic.

## SARS and Travel Medicine

Travel medicine practitioners often constitute the first point of medical contact for ill returning travellers, and nonspecific symptoms such as fever and cough are common in them. In the pre-SARS era from January 1997 to December 2002, an estimated 5% of ill travellers worldwide who sought post-travel care from one of the 25 worldwide GeoSentinel travel clinics had pneumonia (International Society of Tropical Medicine, unpublished data, 2003). These data emphasize two things: first, it is a diagnostic challenge for clinicians trying to diagnose SARS on a background of multiple other causes of common upper respiratory infections; second, travellers are susceptible to infectious respiratory pathogens (Wilder-Smith & Freedman, 2003). This facilitates not only the spread of SARS, but also the spread of influenza and novel respiratory pathogens yet to emerge. Individual clinicians must be vigilant in detecting suspicious circumstances and reporting to appropriate authorities, especially as the heightened awareness of SARS begins to wane.

## Outlook

The international spread of disease underscores the need for strong global public health systems, excellent international reporting mechanisms, robust health service infrastructures and expertise that can be mobilized quickly across national boundaries to mirror disease movements. The International Health Regulations (IHR) have not been revised since 1977 (http://www.who.int/csr/ihr/en/). SARS gave a new sense of urgency to the revision,

which is (at the time of writing), now close to its completion. Revised IHR should give some teeth to a framework that will facilitate three main public health measures for the containment of SARS and other potential new respiratory pathogens: prevention of subsequent community transmission via early identification and isolation of cases, and provision of technical expertise to allow for the prevention of hospital transmission via effective infection control.

The psychological impacts of SARS, coupled with travel restrictions imposed by various national and international authorities, have diminished international travel in 2003, far beyond the limitations to truly SARS-hit areas. Governments and press, especially in non-SARS-affected areas, have been slow to strike the right balance between timely and frequent risk communication and placing risk in the proper context. Communicating clearly the content and meaning of changing travel alerts, advisories and bulletins from the WHO and national authorities is a primary task. Many countries issue alerts or bulletins to provide accurate information about the status of SARS at a destination, and these need to be distinguished from outright travel advisories against non-essential travel to the area.

The appearance and spread of SARS on a global level also raised vital legal and ethical issues. Containment strategies had three important ethical values: privacy, liberty and the duty to protect the public's health. In the context of travel this became particularly obvious for international travellers who were detained or quarantined at international airports either because of detection on airport screening (febrile illness) or because one of their fellow passengers on the aircraft was found to be a SARS patient. Development of a set of legal and ethical recommendations becomes even more essential when, as was true with SARS and will undoubtedly be the case with future epidemics, scientific uncertainty is pervasive and urgent public health action is required.

Entry screening of travellers through health declarations or thermal scanning at international borders had little documented effect on detecting SARS cases; exit screening appeared slightly more effective. The value of border screening in deterring travel by ill persons and in building public confidence remains unquantified. Interventions to control global epidemics should be based on expert advice from the WHO and national authorities. In the case of SARS, interventions at a country's border should not detract from efforts to identify and isolate infected persons within the country, monitor or quarantine their contacts, and strengthen infection control in healthcare settings. The international public health community under the direction of the WHO will need to determine when and how best to scale up or scale down screening measures at the airports.

More countries should participate in WHO networks of global surveillance in order to identify emerging pathogens of international importance. Travel medicine practitioners who want to do more can consider participation in a global provider-based surveillance network such as GeoSentinel (www.istm.org), which is an initiative of the International Society of Travel Medicine. Such networks allow for the aggregation of clinical experiences via formal data collection for analysis of trends in diagnoses and linked travel histories. In addition, official reporting systems may be constrained or delayed by national or local political considerations that can sometimes be bypassed by the informal and rapid electronic communication engendered by such professional networks.

Our hope is that, if SARS reoccurs, the subsequent outbreak will be smaller and more easily contained if the lessons learnt from the recent epidemic are applied.

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