

INTRODUCTION

4.1 The Committee has studied the chronology of events and examined a considerable amount of information and evidence presented through submissions and meetings with people from a wide variety of backgrounds. The story that has been pieced together is one of courage and dignity as Hong Kong struggled against this new disease. The Committee wishes to offer its condolences to the families of those who have died.

4.2 Overall, the epidemic in Hong Kong was handled well, although there were clearly significant shortcomings of system performance during the early days of the epidemic when little was known about the disease or its cause. The Committee has not found any individual deemed to be culpable of negligence, lack of diligence or maladministration. In reaching this judgement, full account has been taken of the hazards of retrospective judgement, and therefore efforts have been made in each instance to examine the subject matter in the context of what was known, and what could have been done, at the time.

4.3 Several shortcomings in the system were exposed, some of which were aggravated by key personnel becoming ill with SARS as the epidemic progressed. Many were rapidly put right, while others were compensated for by the extraordinary hard work of people at all levels of the system and in very difficult circumstances.

Tribute

Eight healthcare workers died of SARS during the epidemic –

- ◆ Dr CHENG Ha-yan, Kate, a *Medical Officer at Tai Po Hospital*
- ◆ Dr CHEUNG Sik-hin, Thomas, a *Specialist in Otorhinolaryngology in private practice*
- ◆ Ms LAU Kam-yung, a *Healthcare Assistant at United Christian Hospital*
- ◆ Dr LAU Tai-kwan, a *Specialist in Paediatric Surgery in private practice*
- ◆ Mr LAU Wing-kai, a *Registered Nurse at Tuen Mun Hospital*
- ◆ Ms TANG Heung-may, a *Healthcare Assistant at United Christian Hospital*
- ◆ Dr TSE Yuen-man, a *Medical Officer at Tuen Mun Hospital*
- ◆ Ms WONG Kang-tai, a *Ward Attendant at Prince of Wales Hospital.*

They have sacrificed their lives to save others in the epidemic, and will be remembered for their bravery, commitment and professionalism.

4.4 In the Committee's discussion with various parties, there were a few key issues that were prominent and about which concern or dissatisfaction was expressed. This chapter deals with each of these key issues in turn, together with the views and conclusions of the Committee. Thereafter, the focus turns to lessons learnt from the epidemic and a series of themes that have been identified.

EARLY EVENTS IN GUANGDONG PROVINCE AND HONG KONG

4.5 Even before the outbreak of SARS at Prince of Wales Hospital (PWH) in mid-March 2003, a series of unusual events occurred in Guangdong Province. A question often raised was whether the authorities in Hong Kong had reacted appropriately to these early signals.

4.6 In considering this question, the Committee makes the following observations –

- ◆ Following local media coverage of an outbreak of atypical pneumonia in Guangzhou on 10 February 2003, DH immediately tried to contact the Guangzhou and Guangdong authorities. In the absence of a response, DH took the matter up with the Ministry of Health in Beijing on the same day. On the following day, the Guangzhou Health Bureau conducted a press conference on the situation as regards atypical pneumonia in the province, and the public was urged not to panic.
- ◆ There was considerable speculation at the time that the Guangdong outbreak might be due to Avian Influenza. Unfortunately, this proved a false trail for many investigators, locally and internationally.
- ◆ The report produced for the Guangdong Health Bureau on 23 January 2003 concerning the epidemic of atypical pneumonia was circulated to a limited audience. At the time, the authorities in Hong Kong were not aware of the existence of the report.
- ◆ On 18 February 2003, the China Centre for Disease Control and Prevention in Beijing announced that the probable causative agent of the Guangdong epidemic was *Chlamydia*. DH noted that WHO had stationed a team of experts in Beijing since 23 February 2003. DH did not consider it appropriate to send a fact-finding team to the Mainland.
- ◆ DH noted that there were some academic exchanges between Hong Kong and the Mainland. No reports of any unusual findings were received from local academics.
- ◆ HA head office convened a working group on 11 February 2003 to establish a surveillance system for cases of atypical pneumonia in public hospitals. Given that as many as 1,400 cases of pneumonia are admitted each month to HA hospitals, the working group decided to focus on cases of severe community-acquired pneumonia. This was a sensible decision.
- ◆ DH was involved in HA's working group to strengthen the surveillance system, and on 13 February 2003 requested private hospitals to report on any cases of severe community-acquired pneumonia upon admission to hospital.
- ◆ Between mid-February and early March, a confirmed case of Avian Flu (H5N1) with a history of travel to Fujian, the case

of the professor from Guangzhou admitted to Kwong Wah Hospital, the case transferred from Union Hospital to PWH, and the case transferred from Hanoi to Hong Kong were all identified by the surveillance system for severe community-acquired pneumonia.

- ◆ Case investigation and contact tracing conducted by DH on 24 February 2003 on the case of the Guangzhou professor admitted to Kwong Wah Hospital revealed that he and his wife had stayed at *Hotel M* on 21-22 February 2003. DH did not conduct contact tracing at *Hotel M* at that time because DH had not received any other report of severe community-acquired pneumonia cases related to the hotel, and there was no indication of any environmental factors that would suggest the need for such action. The established practice was for contact tracing to be conducted on close contacts, not places. The fact that a number of the professor's contacts had fallen ill appeared to be due to intra-familial spread through close contact. Notwithstanding this, the Director of Health had discussions with one of the attending physicians and the consultant at the Government Virus Unit to review any further action that was required to help identify the causative agent.
- ◆ The Singapore Ministry of Health first discussed with DH on 8 March 2003, during a telephone conversation on another subject, three patients who had travelled to Hong Kong at the end of February and who had been admitted to hospital with pneumonia after returning to Singapore. The three patients had all stayed at *Hotel M* in Hong Kong and two were friends. Laboratory investigations were pending and the patients' condition had apparently improved with antibiotic treatment. As there was insufficient evidence to suggest that their illnesses had been related to *Hotel M*, DH asked the Singapore Ministry of Health to keep it informed of any positive laboratory findings.
- ◆ The index patient in the PWH outbreak was hospitalised on 4 March 2003. As indicated by retrospective analysis, the disease had already spread to several other persons at PWH by 8 March 2003 (when the three Singapore cases were reported to DH). Even if DH had initiated contact tracing at *Hotel M* on 8 March 2003, the Committee believes that this would not have had any effect on the course of events in the PWH outbreak. Neither could DH have identified the index patient for the PWH outbreak any earlier, since he was a visitor and not a guest at *Hotel M*. He was first suspected to be the index case on 13 March 2003, and was confirmed as such on the following day. It was only after he had been identified as the index patient, and upon repeated enquiries, that he revealed on 19 March 2003 that he had visited *Hotel M* around that period.
- ◆ Clinical presentation of the index patient in the PWH outbreak was rather different

from that of the professor from Guangzhou and the case transferred from Hanoi. While the latter two had clinical features of severe community-acquired pneumonia, the index patient had a much milder presentation. Hence, his admission to ward 8A did not trigger the usual infection control precautions, nor did he meet the case definition for reporting under the surveillance system.

- ◆ Little was known about the new disease when the PWH outbreak began, and WHO did not issue its first emergency travel advisory naming the illness as SARS until 15 March 2003.

4.7 Having regard to the above, the Committee considers that the authorities in Hong Kong acted reasonably on the information available, and pursued with due diligence a course of investigation commensurate with the evidence available at the time. The Committee notes that accurate information about the atypical pneumonia outbreak in Guangdong Province was not available to Hong Kong or the international community at the time, otherwise the epidemic in Hong Kong might have been ameliorated.

THE SARS OUTBREAK AT PWH

4.8 The handling of the outbreak in PWH is another matter about which there has been much criticism.

4.9 The outbreak in PWH first came to light on 10 March 2003, when hospital

management was notified that a group of 11 healthcare staff working in ward 8A had gone on sick leave at the same time. Ward 8A was closed to admissions and visitors the same day.

4.10 In addition to what was being done at the hospital level, considerable efforts were made by the authorities in Hong Kong, including HWFB, DH and HA, to deal with the outbreak. There were a lot of external activities going on around that time, including the local response by HWFB and DH to the WHO global alert on atypical pneumonia issued on 12 March 2003.

4.11 At the time of the outbreak, the term SARS had not been coined, the pattern of symptoms had not been clearly described, the degree of infectivity was unknown, and the causative organism had not yet been isolated.

4.12 The outbreak occurred in an environment that favoured the spread of the disease. The physical environment of the hospital was poor and infection control was inadequate. There were shortcomings in the relationships among HA, DH and the university, and with the media.

4.13 The level of anxiety and fear that gripped everyone at the start of the outbreak cast a very powerful shadow over the initial response.

4.14 **Decisions on hospital activity.** The Committee notes that decisions on hospital activity were made collectively at meetings (cluster meetings on atypical pneumonia) attended by senior members of the hospital cluster management, the chiefs of service (mostly professorial staff of the Chinese

University of Hong Kong (CUHK)), clinical heads, head of the infection control team and the Dean of the Faculty of Medicine, CUHK. Decisions on matters requiring coordination or approval at the head office level, such as diverting emergency cases to other hospitals and closure of the accident and emergency department, were made in consultation with HA head office. *The Committee considers that the absence of a pre-determined hospital outbreak control plan and the inadequate involvement of DH staff in critical decisions about outbreak control measures at PWH were not conducive to the management of the outbreak.*

4.15 **The question of hospital closure.**

The Committee notes that at the cluster meetings on atypical pneumonia, a number of issues relating to hospital closure were discussed. These ranged from whether medical patients should attend the hospital only to obtain medication without being seen by a doctor, whether medical emergencies should be diverted, whether the accident and emergency department should be closed, whether elective surgery that might require intensive care support should be stopped, whether the hospital should be closed to all admissions. The management of HA and PWH informed the Committee that their guiding principle regarding decisions on hospital activity was patient safety, both with respect to infection control and workforce availability. By contrast, the Taiwan experience of closing a municipal hospital for two weeks in order to prevent SARS spreading out of the hospital actually resulted in the unintended consequences of public panic and outcry. *The Committee considers that*

decisions made by HA and PWH management on the curtailment of services at the hospital were, on the whole, reasonable and justified.

4.16 **Restricted visiting policy.** The no-visiting policy to ward 8A was modified from 11 March 2003 to restrictions that required visitors to wear surgical masks, disposable gowns and gloves. Of the 42 secondary cases that were visitors, all had visited ward 8A on or before 10 March 2003. None of the tertiary cases was a ward 8A visitor. *The Committee considers the decision to modify the no-visiting policy to ward 8A from 11 March 2003 to a restricted visiting policy to be justified.*

4.17 **Closing and re-opening procedures for atypical pneumonia wards at PWH.** The criteria for re-opening wards at PWH followed the basic principle that there should not be mixing of patients suspected or confirmed to have atypical pneumonia with patients who had other diagnoses. Patients with similar diagnoses were cohorted. Ward 8A was closed between 10 and 12 March, and was re-opened on the evening of 13 March as a cohort ward for patients with atypical pneumonia. Together with ward 8B, it was used for patients with confirmed or suspected atypical pneumonia. Ward 8D was opened as a screening ward on 12 March 2003, and used to admit all patients with fever and respiratory symptoms for initial diagnostic screening. Patients were transferred to ward 8A (male) or ward 8B (female) for further treatment if they had symptoms of fever and lymphopenia together with chest x-ray changes and a contact history. *The Committee considers that*

converting ward 8A into a cohort ward for suspected atypical pneumonia patients on the evening of 13 March 2003 was reasonable given the prevailing circumstances at PWH and the lack of knowledge about the disease at that time.

4.18 Interface between DH and HA. It is noted that DH only became aware of the PWH outbreak from media reports on 11 March 2003. DH immediately contacted PWH management and offered to attend the special meeting that was convened by them later that morning to understand the outbreak situation. DH attended subsequent meetings on issues regarding the outbreak situation, and discussions on the epidemiological study, contact tracing and related matters. DH did not participate in discussions on hospital activity and hospital closure. *The Committee considers that there was a lack of common understanding from a population-based perspective between DH and HA on how to respond to a communicable disease outbreak of this scale. There was also a lack of full appreciation of the total implications for the wider community at this early stage.* The Committee also notes that there was much confusion in the flow of case information at the working level between DH and PWH in the early days because of the magnitude of the outbreak, the rapid build-up of cases, the non-specific nature of the symptoms, and the absence of a diagnostic test. The information management system that was in place at the time was unable to cope with the scale of the epidemic and was eventually overwhelmed. DH was criticised for delay in contact tracing. *The Committee*

considers that DH carried out a large amount of contact tracing in a short period of time, though this may not have been immediately evident even to those close at hand. The Committee concludes that DH did the best they could within the context in which they operated, the constraints of the information system, and the nature of working relationships at the time. However, the lack of clear leadership in this process at the early stage caused confusion and must be addressed for the future.

4.19 The interface between HA/DH and the university. The Committee notes that professorial staff from CUHK were present at the cluster meetings on atypical pneumonia and participated in decisions on hospital activity and hospital closure. CUHK staff had two main criticisms of the handling of the PWH outbreak by HA and DH, namely HA's communication with the media, and the adequacy and speed of contact tracing by DH. The Committee also notes that university staff initiated their own case investigation and contact tracing at PWH in the early period of the outbreak. *The Committee concludes that there was a lack of clarity of the role of university staff in a hospital outbreak situation and failures of communication between HA, DH and the university.*

4.20 Communication with the media. The Committee observed that there was inadequate communication with the media about the PWH outbreak, which was dealt with by HA head office rather than PWH management. The chain of the communication with the media was too long and it was

confused. The hospital chief executive has reflected to the Committee that, in retrospect, he wished he had taken charge of this aspect of the outbreak. *The Committee sympathises with the problems experienced by PWH and HA as this was the start of a serious and unexplained outbreak, but concludes that the response was hampered by the lack of a pre-existing communication strategy.*

4.21 *The Committee commends all parties concerned for their hard work in the face of great stress and anxiety to cope with the overwhelming situation created by the PWH outbreak. The Committee, however, concludes that the response during the initial period of the outbreak was inadequate due to inadequate contingency planning and a number of system inadequacies in tackling an epidemic of this scale and nature. In particular, there were weaknesses in hospital infection control structures, inadequacies in staff training in infection control, deficiencies in the hospital environment (including ward design, spacing of beds and ventilation), scarcity of equipment, no pre-determined outbreak control plan or communication strategy, and a lack of clarity about the respective roles and responsibilities of HA, DH and the university.*

WAS THERE A ‘COMMUNITY OUTBREAK’ IN MID-MARCH 2003?

4.22 **Defining a community outbreak.** One question that has been repeatedly asked is whether the Government downplayed the

seriousness of the SARS epidemic during the early stages, and was slow in responding to it.

4.23 The Committee notes that, faced with an outbreak of a new and unknown disease at PWH, the authorities in Hong Kong adopted from the outset a transparent and open approach in the dissemination of information, even at a time when little was known about the disease. The really difficult challenge in such situations is how to convey messages in a way that is open, honest, clear and sympathetic, and at the same time not likely to be proved wrong. There is a delicate balance between keeping the public on the alert and trying to reassure the public and allay fear.

4.24 The Committee notes that there has been debate on whether there was a ‘community outbreak’ in mid-March 2003. SHWF made clear to the Committee that the Government had certainly not, at any point in time, tried to downplay the extent of the problem, but had endeavoured to give as much information as possible to the public. However, there were two main difficulties in the early stages of the epidemic: first, the time lag for information flow from hospitals to HWFB, and second, the lack of knowledge about the disease and that the term SARS was not coined at that time. SHWF indicated that on 14 March 2003, in response to a media question on whether there was an outbreak of atypical pneumonia in the community, he explained the background pneumonia cases in Hong Kong and put forward the observation that there had not been any unusual increase in the total number of pneumonia cases during that

time. He further tried to explain that the cases in PWH appeared to belong to a subset of atypical pneumonia. He reflected that he tended to be very technical in attempting to explain the issue and that, with hindsight, he should perhaps not have commented on whether there was an outbreak in the community, but should simply have described what was actually happening at the hospital. Reports in the press had given the impression that he was trying to downplay the seriousness of the outbreak and that he had been too reassuring. An apparently contradictory statement made by a university professor about the outbreak situation, and reported in the media on 17-18 March 2003, cast doubt on the credibility of the Government message.

4.25 The Committee notes that there was no evidence of active person-to-person spread of the disease outside the hospital when the statement was made by SHWF on 14 March 2003 about whether there was an outbreak of atypical pneumonia in the community. There was, however, public anxiety and fear of acquiring the infection. *The Committee considers that in order to avoid any confusion of SHWF's political role and his professional background, technical questions such as this would have been better dealt with by a senior member of the public health staff at DH. The Committee concludes that what SHWF said was technically correct, and was genuinely intended to allay public panic, but with hindsight, a more prudent phrase could have been used. There is no evidence to suggest that this debate in any way lowered public alertness to the public health threat of SARS.*

MAKING SARS A NOTIFIABLE DISEASE

4.26 Another contentious issue that has been raised with the Committee was whether there was any delay in obtaining statutory powers to deal with the SARS epidemic by seeking legislative amendment to make SARS a notifiable disease. The relevant law is the Quarantine and Prevention of Disease Ordinance (Chapter 141 of the Laws of Hong Kong), which provides the basis for statutory notification and powers of prevention and control of a list of infectious diseases included in its First Schedule. The powers are mostly vested in the Director of Health.

4.27 DH told the Committee that public health action was constrained by a number of factors during the initial stages of the epidemic, including the absence of a laboratory diagnostic test and imprecise case definition. Draconian measures such as compulsory quarantine were deliberately avoided at the outset because of concern about driving SARS patients into hiding. There were also concerns about issues of civil liberty and public acceptability, whether or not such control measures would be effective (or might aggravate the risk of spread of disease), and the feasibility of enforcement.

4.28 SARS was added to the list of notifiable diseases on 27 March 2003. Making SARS notifiable earlier might have helped to increase public awareness about SARS and ensured that legal powers were available, if necessary, to protect public health and safety.

In the event, DH introduced isolation and quarantine measures gradually as the infectious potential of SARS became apparent. Before SARS was made a notifiable disease, DH had introduced voluntary medical surveillance of close contacts without any major problems of refusal to cooperate. It is unclear whether making the disease notifiable earlier would have made any difference. However, in future it would be prudent to have the contingent authority to deal with any new or emerging disease available promptly, and this should be a priority on the checklist of a major outbreak control plan.

4.29 *Given that WHO had issued an emergency travel advisory about SARS on 15 March 2003, and in the light of how little was known about the disease, the Committee considers that it would have been a prudent precaution to add SARS to the list of notifiable diseases at the earliest possible time.*

THE OUTBREAK AT AMOY GARDENS

4.30 The handling of the outbreak at Amoy Gardens was also a target of much criticism. The main questions were whether the outbreak was preventable and had it been handled properly and adequately.

4.31 DH's investigation of the Amoy Gardens outbreak shows that it is probable that the index patient initially infected a relatively small group of residents within Block E, and

subsequently the rest of the residents in that block through the sewage system, person-to-person contact and the use of shared communal facilities. These residents subsequently transmitted the disease to others, both within and outside Block E, through person-to-person contact and environmental contamination. The WHO team that subsequently reviewed the circumstances of the Amoy Gardens outbreak reported the following on 16 May 2003 –

“It seems highly likely that an unfortunate sequence of environmental and health events happened simultaneously and contributed to the spread of the SARS-related coronavirus in the Hong Kong residential estate of Amoy Gardens.”

4.32 **Discharge from PWH of the index patient for the Amoy Gardens outbreak.** This patient is termed the index patient because he had the earliest onset date of symptoms of fever and diarrhoea in the Amoy Gardens outbreak. He stayed overnight in Amoy Gardens on 14 March 2003. According to HA, he was admitted to ward 8A at PWH on 15 March 2003 with chest x-ray changes, a history of possible contact in Shenzhen, and a clinical diagnosis of atypical pneumonia. An alternative diagnosis of influenza was made a few days later after the influenza A virus was cultured from nasopharyngeal aspirate and the patient responded to treatment with the anti-viral agent, Oseltamivir (Tamiflu). He was discharged on 19 March 2003 as his fever had settled and his chest x-ray had been almost clear. On 22 March 2003,

he was re-admitted to PWH after rapid deterioration in his clinical condition, and required intubation. In retrospect, he possibly had dual infections of both influenza A and SARS on his first admission. *Based on the initial clinical presentation and the fact that the causative agent for SARS was not identified until 22 March 2003 (hence the absence of a diagnostic test for SARS), the Committee considers the management of this patient and the decision by PWH staff to discharge him on 19 March to be reasonable.*

4.33 **Epidemiological investigation of the index patient for the Amoy Gardens outbreak.**

The patient was first referred by PWH to DH for contact tracing on the evening of 16 March 2003 (according to the master list of referrals). DH discussed with colleagues at PWH the latest clinical condition of persons referred, and commenced investigation of the previous evening's referrals on 17 March 2003, starting with the more serious cases. DH informed the Committee that it was likely that, by the time this patient was scheduled for interview, he had already been tested positive for influenza A, and hence no follow-up action was considered necessary. PWH also subsequently dropped the patient from the updated master list referred to DH. Staff from DH investigated the patient after his re-admission had been reported by PWH on 23 March 2003. *The Committee considers that the delay in epidemiological investigation of this case was unavoidable given the diagnostic ambiguity and the delay in clinical diagnosis.*

4.34 **Management of the Amoy Gardens outbreak.** An isolation order was served on Amoy Gardens Block E in the early morning of

31 March 2003 in view of the continued steep rise in the number of cases in that block. The purpose of the order was to prevent infected persons from Block E spreading the disease to the wider community. As soon as new information was obtained implicating the sewage system as a possible means of virus transmission, Block E residents were evacuated to a place of safety on 1 April 2003. The purpose of the evacuation was to protect the health of Block E residents themselves. A retrospective study shows that five residents of Block E developed SARS symptoms between 1 and 15 April 2003: four became symptomatic within the first three days in April, while one had an onset date of 15 April 2003.

4.35 The Committee notes that once the nature of the environmental hazard became clear, bold and decisive action was taken to evacuate, isolate and quarantine Block E residents, bearing in mind that such draconian control measures had not been used for decades. The urgent, but smooth, execution of the evacuation plan is an excellent illustration of the successful mobilisation of resources, and of the value of working closely with the community. The cooperation and understanding of the Amoy Gardens residents during the outbreak, particularly those from Block E, was most impressive. *The Committee considers that the outbreak was well handled overall.*

4.36 **Epidemiological investigation.** The initial epidemiological investigation only focused on individual SARS cases, and not on the entire population at risk at Amoy Gardens. There were considerable problems in terms of manpower

capacity and field epidemiology expertise. Consequently the objectives of the initial epidemiological investigation were ill defined and progress was slow. The findings of the investigation did not inform decisions on what public health control measures should be taken. There was a lack of capacity in the current system to be able to appreciate the full significance of unfolding events at Amoy Gardens, and the unique opportunity that they provided to learn more about the epidemiology of SARS. *Despite the satisfactory results of public health action, the Committee considers that the epidemiological investigation needed to be more complete and timely in order to fully capitalise on the unique opportunity to learn more about SARS. In particular, it is important to undertake epidemiological investigation on a population basis, not just concentrate on cases that have been infected. The analysis also leaves some degree of uncertainty about the precise nature of the hazard and, therefore, the completeness of the remedial measures taken.*

DESIGNATION OF PRINCESS MARGARET HOSPITAL (PMH) AS SARS HOSPITAL

4.37 The plan to designate PMH as the hospital to receive all new SARS patients referred from designated medical centres was recommended by DH at the HWFB Task Force meeting on 26 March 2003. After the meeting, internal discussions were held by senior executives at HA head office. At that time, around 100 SARS patients had already been treated in PMH, and no cases of SARS in healthcare

workers had occurred at the hospital. In view of the existence of dedicated infectious disease facilities at the hospital and the experience of staff in treating infectious diseases, a decision was made by HA to designate PMH to receive all SARS patients referred from designated medical centres and accident and emergency departments of other hospitals.

4.38 In the first week, PMH received an average of over 70 new SARS admissions per day, many of whom were ill and required intensive care. The unexpected upsurge in the number of SARS patients, mainly as a result of the Amoy Gardens outbreak, stretched the capacity of PMH to the limit, particularly with regard to workforce and expertise. The concentration of critically ill SARS patients posed substantial risks of infection to hospital staff. *The Committee considers that the decision to designate PMH as the SARS hospital was reasonable at the time it was made, but should have been reviewed and re-considered when the scale of the Amoy Gardens outbreak became apparent.*

COLLABORATION WITH THE PRIVATE SECTOR

4.39 The Committee heard several adverse comments about the lack of communication, cooperation, and collaboration between public and private sectors of the health system during the epidemic. The division of public and private sectors means that there is a certain amount of competition inherent in the system. This led to allegations that the public

sector alone could not adequately deal with SARS, yet HA was reluctant to transfer patients to private care for fear of losing patients to the private sector, that private practitioners were misled or misinformed about the infectiousness of SARS, and that private facilities had difficulties obtaining supplies of protection equipment because of having to compete with HA to purchase them. Conversely, there was general agreement that private hospitals could not have coped with SARS without assistance from HA.

4.40 During the epidemic, SARS patients were all referred for treatment in HA hospitals. Private doctors and private hospitals offered help to look after non-SARS cases, but it appears that this extra capacity was not fully utilised. Representatives from the private medical sector told the Committee that when former HA patients sought treatment from the private sector, private doctors had difficulty accessing patient records kept by HA. There also appear to have been problems in disseminating timely information and guidelines about SARS to community doctors, pharmacists and traditional Chinese medicine practitioners, a factor that may have hampered the coordination of prevention efforts. Private doctors said they felt that their dedication in maintaining services throughout the SARS epidemic had not been adequately recognised.

4.41 There were, however, examples of good practice, including a few joint initiatives between DH, HA and the private sector. Some private clinics act as sentinel surveillance points and regularly report infections such as

influenza-like illness to the DH surveillance network. In addition, private hospitals were invited from February onwards to report severe community-acquired pneumonia cases to DH, and the DH laboratory sought to involve private laboratories in surveillance. Both DH and HA also provided valuable support on aspects of infection control to homes for the elderly, and the Visiting Medical Officer or 'one home, one doctor' scheme was a success.

4.42 *The Committee considers that private hospitals and private doctors were not sufficiently engaged during the epidemic, and this is a clear example of a system problem associated with failings on all sides. It is very important, in order to improve the surveillance of communicable diseases, to raise standards of infection control and to ensure future preparedness, that strenuous efforts are made to develop better partnerships with the private sector to cope with future public health emergencies.*

THE CASE FATALITY RATE FOR SARS IN HONG KONG

4.43 The Committee has heard adverse comments that the case fatality rate appeared to be higher in Hong Kong than in other places.

4.44 On 15 August 2003, WHO released a summary of SARS cases in 32 countries and areas, as shown in Figure 4.1.

Figure 4.1 Summary Table of SARS Cases by Country/Area, 1 November 2002 - 7 August 2003

Areas	Cumulative number of cases			Median age (range)	Status				Number of imported cases (%)	Number of healthcare workers affected (%)	Date onset first probable case	Date onset last probable case
	Female	Male	Total		Number of cases currently hospitalised	Number of cases recovered	Number of deaths	CFR (%) ¹				
Australia	4	2	6	15 (1-45)	0	6	0	0	6 (100)	0 (0)	24-Mar-03	1-Apr-03
Brazil	1		1	4	0	1	0	0	1 (100)	0 (0)	3-Apr-03	3-Apr-03
Canada	151	100	251	49 (1-98)	10	200	41	17	5 (2)	108 (43)	23-Feb-03	12-Jun-03
China	Pending	Pending	5,327	Pending	29	4,949	349	7	NA	1,002 (19)	16-Nov-02	25-Jun-03
Hong Kong Special Administrative Region, China	977	778	1,755	40 (0-100)	7	1,448	300	17	NA	386 (22)	15-Feb-03	31-May-03
Macao Special Administrative Region, China	0	1	1	28	0	1	0	0	1 (100)	0 (0)	5-May-03	5-May-03
Taiwan, China	349 ³	319 ³	665	46 (2-79)	10	475	180	27	50 (8)	86 (13)	25-Feb-03	15-Jun-03
Colombia	1	0	1	28	0	1	0	0	1 (100)	0 (0)	2-Apr-03	2-Apr-03
Finland	0	1	1	24	0	1	0	0	1 (100)	0 (0)	30-Apr-03	30-Apr-03
France	1	6	7	49 (26-61)	0	6	1	14	7 (100)	2 ² (29)	21-Mar-03	3-May-03
Germany	4	5	9	44 (4-73)	0	9	0	0	9 (100)	1 (11)	9-Mar-03	6-May-03
India	0	3	3	25 (25-30)	0	3	0	0	3 (100)	0 (0)	25-Apr-03	6-May-03
Indonesia	0	2	2	56 (47-65)	0	2	0	0	2 (100)	0 (0)	6-Apr-03	17-Apr-03
Italy	1	3	4	30.5 (25-54)	0	4	0	0	4 (100)	0 (0)	12-Mar-03	20-Apr-03
Kuwait	1	0	1	50	0	1	0	0	1 (100)	0 (0)	9-Apr-03	9-Apr-03
Malaysia	1	4	5	30 (26-84)	0	3	2	40	5 (100)	0 (0)	14-Mar-03	22-Apr-03
Mongolia	8	1	9	32 (17-63)	0	9	0	0	8 (89)	1 (11)	31-Mar-03	6-May-03
New Zealand	1	0	1	67	0	1	0	0	1 (100)		20-Apr-03	20-Apr-03
Philippines	8	6	14	41 (29-73)	0	12	2	14	7 (50)	4 (29)	25-Feb-03	5-May-03
Republic of Ireland	0	1	1	56	0	1	0	0	1 (100)	0 (0)	27-Feb-03	27-Feb-03
Republic of Korea	0	3	3	40 (20-80)	0	3	0	0	3 (100)	0 (0)	25-Apr-03	10-May-03
Romania	0	1	1	52	0	1	0	0	1 (100)	0 (0)	19-Mar-03	19-Mar-03
Russian Federation	0	1	1	25	1	0	0		NA	0 (0)	5-May-03	5-May-03
Singapore	161	77	238	35 (1-90)	0	205	33	14	8 (3)	97 (41)	25-Feb-03	5-May-03
South Africa	0	1	1	62	0	0	1	100	1 (100)	0 (0)	3-Apr-03	3-Apr-03
Spain	0	1	1	33	0	1	0	0	1 (100)	0 (0)	26-Mar-03	26-Mar-03
Sweden	1	2	3	33	0	3	0	0	3 (100)	0 (0)		
Switzerland	0	1	1	35	0	1	0	0	1 (100)	0 (0)	9-Mar-03	9-Mar-03
Thailand	5	4	9	42 (2-79)	0	7	2	22	9 (100)	1 ² (11)	11-Mar-03	27-May-03
United Kingdom	2	2	4	59 (28-74)	0	4	0	0	4 (100)	0 (0)	1-Mar-03	1-Apr-03
United States	16	17	33	36 (0-83)	7	26	0	0	31 (94)	1 (3)	9-Jan-03	13-Jul-03
Vietnam	39	24	63	43 (20-76)	0	58	5	8	1 (2)	36 (57)	23-Feb-03	14-Apr-03
Total			8,422		64	7,442	916	11		1,725 (20)		

¹ Case fatality based on cases with known outcome and irrespective of immediate cause of death

² Includes imported cases in healthcare workers occupationally exposed

³ Following discarding of 3 cases, new breakdown by sex pending

4.45 Using the WHO data, a comparison has been made in terms of the crude case fatality rates in Hong Kong and countries/areas with more than 60 cases of SARS. The results, shown below, reveal that the case fatality rate for SARS in Hong Kong is 17.1%, significantly higher than that in Mainland China at 6.6%, but significantly lower than that in Taiwan at 27.1%. Compared with Hong Kong, the crude case fatality rate in Singapore (13.9%), Canada (16.3%) and Vietnam (7.9%) are not significantly different.

Figure 4.2 Comparison of Crude Case Fatality Rate (CFR)

Areas	Number of probable case	Median age (range)	Number of deaths	CFR (%)	p-value
Mainland China	5,327	NA	349	6.6	< 0.01*
Vietnam	63	43 (20 - 76)	5	7.9	0.06
Singapore	238	35 (1 - 90)	33	13.9	0.21
Hong Kong, China	1,755	40 (0 -100)	300	17.1	-
Canada	251	49 (1 - 98)	41	16.3	0.77
Taiwan, China	665	46 (2 - 79)	180	27.1	<0.01*

* The probability that the observed difference occurs by chance is less than 1/100, which means that the difference is statistically significant.

4.46 The likelihood of dying from SARS is influenced by a number of prognostic factors. Published studies report that increasing age, co-morbidities (eg diabetes, chronic hepatitis B infection, liver dysfunction), and certain biochemical and haematological indicators (high peak lactate dehydrogenase (LDH), increased absolute neutrophil count and lymphopenia) are associated with more severe SARS. Of these, age is the most consistent prognostic factor for death from SARS. A study carried out by HA also demonstrated that age and co-morbidity were the top two most important prognostic factors for SARS mortality, as shown below.

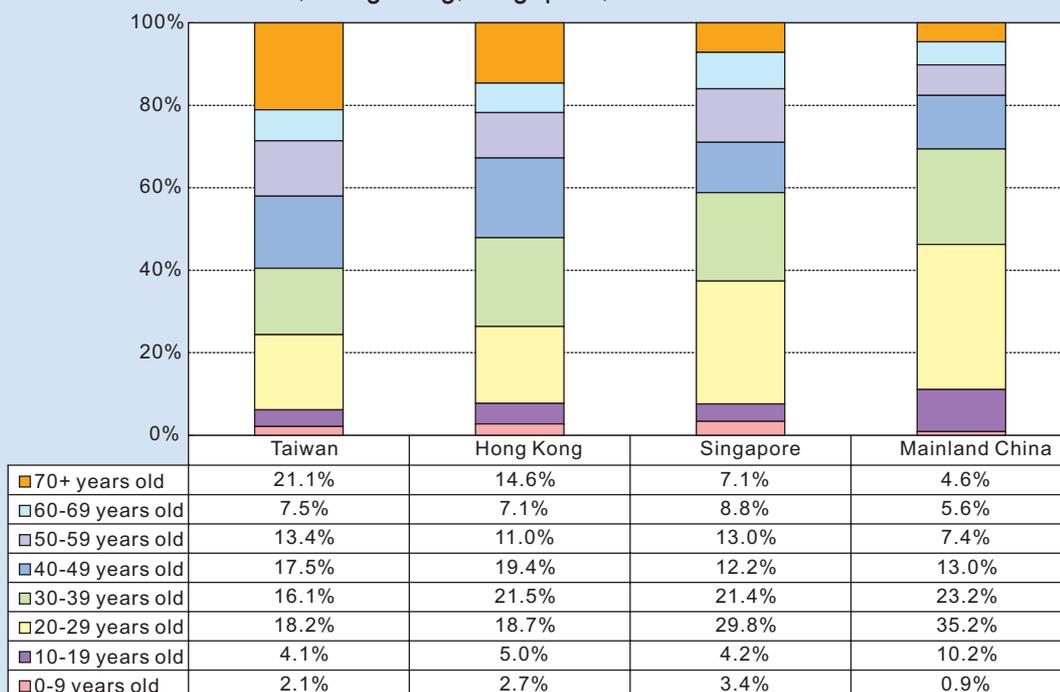
Figure 4.3 Prognostic Factors for 889 SARS Cases Aged 15 to 74

Factor	Adjusted odds ratio #	p-value
Age	1.98 (per 10 years ↑)	<0.0001
Co-morbidity	3.39 (vs without)	0.0002
Neutrophil count	1.12 (per 10 ⁹ /L ↑)	0.01
LDH - 1 st reading	1.02 (per 10 IU/L ↑)	<0.0001

Other factors being adjusted for include sex, lowest SaO₂ before intubation, use of steroid and ribavirin.

4.47 In order to analyse differences between countries/areas in case fatality rates for SARS, it is important to take account of the age profile of cases. A breakdown of SARS cases by age in Hong Kong, Mainland China, Singapore, Taiwan and Canada is shown below (Vietnam is not featured because the age breakdown of cases was not available).

Figure 4.4 Age Distribution of SARS Cases
Taiwan, Hong Kong, Singapore, and Mainland China



Sources:

Taiwan SARS website

sars.doh.gov.tw (data as at 4 September 2003)

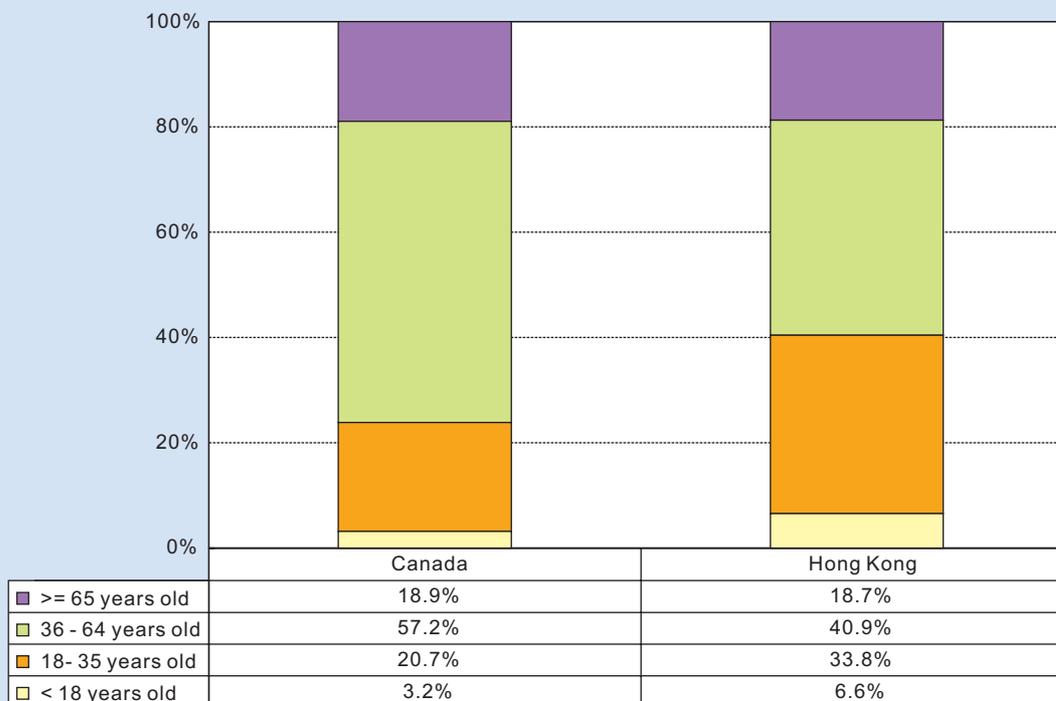
Singapore Ministry of Health website

www.moh.gov.sg/sars/media/age_sex.gif (data as at 16 July 2003)

Mainland China Ministry of Health SARS website

168.160.224.167/sarsmap/ (data as at 25 May 2003)

Figure 4.5 Age Distribution of SARS Cases
Canada and Hong Kong



Source: Health Canada. Presentation at WHO's SARS Clinical Management Workshop held in Hong Kong on 13-14 June 2003.

4.48 To take account of differences in the age distribution of SARS cases in different countries/ areas, a better and more accurate parameter to use instead of the case fatality rate is the standardised mortality ratio. This is calculated using the age-specific case-fatality rate for Hong Kong as the standard. The findings are summarised below –

Figure 4.6 Standardised Mortality Ratio (SMR) for SARS by Country

Areas	SMR	95% confidence interval
Mainland China	72	65 to 80
Canada	86	62 to 117
Hong Kong, China	100	-
Singapore	110	76 to 155
Taiwan, China	128	110 to 149

4.49 *The results show that after controlling for age, Hong Kong does indeed have a comparable standardised mortality ratio for SARS to Canada and Singapore, but it is significantly higher than that for Mainland China, and lower than that for Taiwan. The explanation for these differences is not known, but factors such as completeness of case ascertainment, accuracy of diagnosis, the effectiveness of the therapy used, the use of traditional Chinese medicine, and the way the elderly are cared for (eg home care or institutional care) should be further explored. This is beyond the scope of this Committee.*