

# The battle against SARS: a Chinese story

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## Abstract

*SARS is the first major new infectious disease in the 21st century (Rodier, 2003) and is described as a “serious disaster” in mainland China where it caused unprecedented panic and social and economic consequences. A total of 5,327 SARS cases were reported, with 348 deaths (Ministry of Health, 2003a). Although the Chinese government was criticised by the international community for underreporting at the early stages of the SARS epidemic (Editor CMAJ, 2003a), China eventually achieved remarkable success in combating SARS.*

*This paper documents some aspects of the Chinese experience in fighting against SARS, based on interviews with my Chinese colleagues, analysed with reference to government policy documents and published articles. My interviewees included health officials at the central, provincial and municipal levels and hospital managers who had been working in the frontline of the battle against SARS.*

## Overview of SARS epidemic in mainland China

The first case of SARS is believed to have occurred in November 2002 in the Fushan municipality of Guangdong province. At the end of November and early December 2002, there was public panic in Guangdong province. Despite the limited media report about the outbreak of SARS and the lack of official response to the early warnings of an emerging atypical pneumonia and its serious consequences among healthcare workers, the message of “a rapid spread of a deadly flu-like disease” was widely transmitted among the public. About 58% of Guangdong citizens (41% nationally) obtained SARS-associated information from channels other than the public media (Xinhua Agency, 2003a). Many Guangdong residents at that period rushed to shopping centres and pharmacies to purchase white vinegar and “Ban Lan Geng” (a traditional Chinese herb) which are believed to be effective in preventing and curing viral diseases.

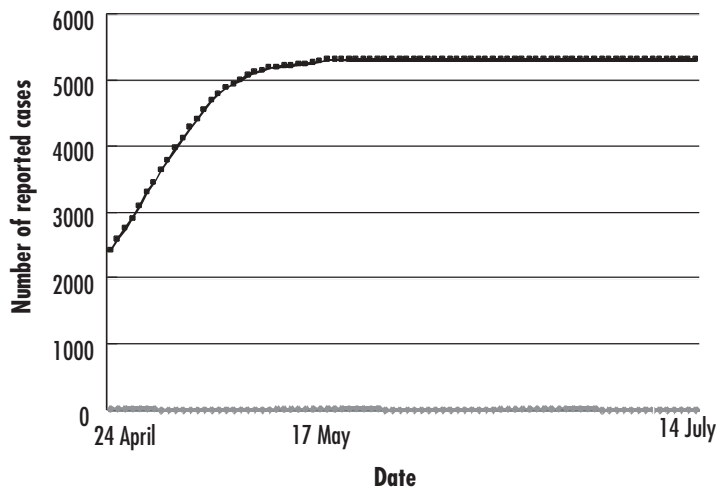
Unfortunately, this was seen by most government officials and healthcare workers as an over-response to a “common infectious disease”, and no health emergency was declared. By 11 February 2003, China reported 305 cases of SARS (with 5 deaths) officially with most of the cases identified in Guangdong province (Editor CMAJ, 2003b). Meanwhile, Dr. Zhang Wen Kang, the Chinese Health Minister, declared that Beijing was a safe city for tourists, with low risk of SARS infection (Ministry of Health, 2003b).

By 15 April 2003, Beijing had reported only 37 cases of SARS officially (Ministry of Health, 2003b). Both the World Health Organisation (WHO) and many local medical practitioners believed this was under-reporting and Dr Jiang, a retired physician of a military hospital wrote a passionate open letter, uncovering the truth of the SARS outbreak in Beijing. The WHO estimated that there were as many as 200 likely cases in Beijing at that period. This caused a big shock among politicians and Chinese citizens (especially Beijing residents). On 20 April the Health Minister and the Mayor of Beijing were sacked. On the same day, Beijing reported 339 cases of SARS (with 18 deaths) officially, representing a dramatic change within a few days. This changed the national total to 1,807 cases, with 79 deaths.

Since 20 April 2003, SARS has been considered as a top priority issue in the government's agenda. However, because of the failure at the early stage in effective control of the spread of SARS, the prevalence of SARS had been increasing linearly until 15 May, ending up with 5,327 cases (Figure 1).

**Figure 1: Official report of accumulated cases of SARS during the period of 24 April to 14 July, 2003**

Data source: MOH (<http://168.160.224.167/sarsmap/>)



## Failure to contain SARS in the early stages

The failure of the immediate response to the outbreak of SARS highlighted the vulnerability of the Chinese health system in an emerging crisis, due to inadequacies in the surveillance and reporting systems, which are addressed below.

### *Multi-sectoral hierarchical administrative structure*

The multi-sectoral and strongly hierarchical administrative structure creates a major obstacle for the Chinese public health system in collecting accurate and timely data and developing consistent strategies to deal with an emerging crisis across sectors. There are several hierarchical systems engaged in health service delivery, including the government funded public service system, the private system, the military health system, and enterprise-owned health systems. Medical facilities sponsored and administered by economic enterprises (railways, coal industry, telecommunications industry, etc) comprise about half of the medical resources (44% and 72% for hospitals and public outpatient clinics respectively) (MOH, 2000). For example, the railway system has developed a complex health delivery system, including public hospitals, epidemic prevention stations and even medical universities (although the government has moved in recent years to bring all universities under the control of the Ministry of Education). Communication is rare across these sectors, and between these sectors and local health authorities. Although there has been a strong call in recent years for the development of unified governing bodies to plan and manage health services based on geographic catchments, the separation remains largely unchanged.

In recent decades, the vulnerability of China's public health information system has not been apparent, largely because of the success of the reporting system for notifiable diseases, which legally defines the roles of various sectors. All health organisations are required to report notifiable diseases (3 categories and 29 infectious diseases) to the local epidemic prevention stations (Ministry of Health, 1991). However, when a new crisis emerges (such

as SARS), not on the list of notifiable diseases, the health authorities lack an effective approach to collecting relevant data from the various hierarchies, and therefore are not in a position to judge the extent of the outbreak. On 15 April 2003 when the Ministry of Health claimed that there were only 37 cases of SARS, one military hospital in Beijing was understood to have admitted that number of SARS patients.

There are also problems with information flow within a single hierarchy. Data are usually reported layer by layer from bottom to top, which contributes at least in part to the slow response to emerging crisis. This reporting arrangement also increases the chance of errors, since many steps are involved in data collection and manipulation, each providing a risk that the information is distorted. According to the legislation for the control of communicable diseases (Ministry of Health, 1991), category one diseases have to be reported to local epidemic prevention stations within 6 hours (12 hours in rural areas) of diagnosis. The deadlines for category two and three diseases are 12 hours (24 hours in rural areas) and 24 hours respectively. Once provincial governments have been informed of the occurrence of category one diseases and outbreak of other notifiable diseases, they are required to report to the Ministry of Health. However, the reporting requirements between the local epidemic prevention station and the provincial government (that is, through the county and municipal levels) are not defined. Moreover, the military health system is required to report directly to the central government while the enterprise-owned health organisations are required to report to the local epidemic prevention stations “periodically” (Ministry of Health, 1991). Given this situation, neither the central government nor the local governments can be reliably informed of the outbreak of disease in a timely and accurate manner.

The multi-sectoral hierarchical structure also creates obstacles for mobilising community resources and increases difficulties in developing collective and collaborative efforts towards an agreed goal. For example, when local health authorities were trying to re-allocate health resources and re-orient health services to focus on SARS, other industries were not prevented from ignoring those strategies and developing their own initiatives and services. This could be vital in dealing with an emerging crisis that needs immediate and unified collective efforts such as SARS.

### *Household registration and registration-based public health service arrangements*

One of the major concerns in China's SARS campaign was the risk of SARS spreading to rural areas through “floating populations”, which lack financial resources and good access to health care. (Wang Longde, 2003). Preventing the spread of SARS to rural areas was critical, given that more than 60% of Chinese citizens are rural residents.

The household registration system formed a great obstacle for the implementation of public health measures among floating populations. China still maintains a residential permit system, but it no longer prevents people from moving around. Traditionally public health projects and planned community activities are arranged in line with the household registration and residential permit system. As a consequence, such programs rarely cover those who live in the communities but are registered as residents of different districts, particularly rural migrant workers (who are registered in rural areas). Because public health funding is allocated in accordance with the number of registered residents, floating populations are commonly excluded from the public health service benefits enjoyed by the registered residents.

A large number of the floating population are living in very poor conditions and are exposed to higher health risks than registered urban residents (Wong and Chiu, 1998; Dong, 2001; Zhang, 2001). The fifth national census showed that more than 121 million people were on the move at the time of the census. About 74% of the total floating population were moving from rural to urban areas (China Statistics Bureau, 2002).

In fact, the community governing bodies (residential committees) rarely see floating populations as their responsibility, although many may have been temporarily registered. Meanwhile, the floating populations are commonly seen as a potential source of SARS transmission (and other communicable diseases). Some residential committees instructed their temporary residents to move out of their communities, ignoring the fact that this could have exacerbated the spread of SARS to other communities.

### *Poor preparation of public health system in responding to emerging crisis*

In the early 1980s, the Chinese government initiated market-oriented economic reform (Hindle, 2000). With respect to the health sector, the most salient changes included the devolution of public sector finance to various levels of government and the decentralisation of administrative responsibilities to individual cost centres (Aldis, 1989; Bloom, 1997, p12; Pei, 1998, p. 36; CMA, 2003). Health organisations carry more financial responsibilities than ever before (Pei, 1998, p. 45; Liu, X. and Mills, 2002; Bloom and Gu, 1997).

China has established an independent public health hierarchy in parallel with the medical and hospital hierarchy. Public health institutions are no longer seen as pure welfare entities (Liu and Mills, 2002) and the share of the total health budget allocated to public health services has decreased. In all government-funded health sectors, the gap between government budgets and actual expenditure is covered by user charges (Bloom, 1997, p.11) and staff income (through the bonus system) is increasingly determined by the revenue generated (Liu and Mills, 2002). This situation encouraged health organisations to focus on the delivery of services that could generate more revenue, with unintended consequences, such as the decline of accessibility of health care, the widening inequality between poor and rich (Pei, 1998, p. 46; AusAID, 2000, p. 7; Hindle, 2000) and reduced demand for preventive services.

At the same time, infrastructure and workforce development needs for the public health system have not been properly addressed, and the capacity of public health institutions to organise community action (as in the patriotic health movements) in combating emerging health crises has been greatly weakened. In fact, some of these adverse consequences had been evident long before the SARS crisis, for example, in increasing incidence of vaccine-preventable diseases; in delay and failure of diagnosis and treatment of communicable diseases; and in increases in infant mortality (Liu and Mills, 2002).

### *Hospital-dominated primary care system fuelled the spread of SARS*

Primary care in China is overwhelmingly provided by hospitals (as first point of contact), especially in urban areas. Patients with different illnesses (including infectious diseases) from various communities gather in a very crowded environment in a few hospitals to seek medical help. Hospitals became one of the biggest sources of SARS infection.

Poor preparation in infection control of public hospitals fuelled the transmission of nosocomial infection. Even very simple measures such as frequent handwashing and surgical masks could be helpful in reducing transmission (Abdullah et al., 2003; Seto et al., 2003) but unfortunately, healthcare workers were apparently poorly prepared. In China, about 20% (90% at the beginning of the outbreak) of SARS patients were healthcare workers. In turn, they became a potential source of infection for their colleagues and patients particularly when there were no respiratory precautions in place at the beginning of the outbreak. Some existing medical practices, such as the use of ventilators may also have played a role in fuelling the transmission of SARS (Abdullah et al., 2003).

Some of my interviewees believed that the specialised hospitals in communicable diseases were not well prepared either. Although they might perform well in infection control, the quality of facilities and workforce of these hospitals fell far behind many of the comprehensive hospitals, especially the tertiary hospitals. This is at least partly due to the emphasis on the importance of non-communicable diseases in the past decade. One of my interviewees expressed deep sorrow for the loss of some healthcare workers, who might have survived if better quality services were provided. "Some of my colleagues died of SARS in the communicable diseases hospital. By contrast, many more severe patients with SARS survived in our own hospital. Why? Because they were too frail to be transferred to other organisations. As a consequence, they stayed in our own hospital and received better treatment because of the better equipment and better quality of medical workforce. I am so sorry. You know, those who died in the communicable diseases hospital walked to that hospital by themselves. It is hard to imagine."

### *Poor response of public media*

The role of public media in disseminating information about SARS was criticised by many Chinese people. The dramatic change from under-reporting before 20 April to over-reporting after that date was believed to have resulted in public panic and lack of confidence of the public to combat SARS (Xinghua Agency, 2003a).

## **Successful control of SARS**

The basic instruments in combating SARS remain largely the same all over the world, which universally includes reporting and isolating probable and suspect cases; contact tracing and quarantine; public education, screening and self-protection, and travel restrictions (CDC, 2003; Donnelly et al., 2003; Editorial, 2003a; b; Maunder et al., 2003; Rodier, 2003; Schabas, 2003; VanDenKerkhof, Goldstein and Rimmer, 2003). However, the strategies adopted in each country to implement the above instruments varied considerably.

China adopted a centralised top down and very aggressive approach in accordance with the specific Chinese cultural and political environment (Maunder et al., 2003; VanDenKerkhof et al., 2003). In general, China's experience was less technology-dependent. China adopted a strategy that is analogous to the traditional "patriotic health movements", which has proved to be effective in controlling many types of communicable diseases.

### *Government commitment and coordination in the SARS crisis*

Although SARS is not the only public health concern that spread across national boundaries, the speed with which it happened is unique (Mariani, 2003). This led to very quick responses from international organisations, including WHO's release of travel advisories to several SARS affected countries. China, as a country believed to be the origin of SARS, confronted the greatest pressure from both political and economic perspectives.

Mrs Wu Yi, the vice premier, was appointed as the new health minister to lead the SARS campaign. This indicated the strong commitment of the central government to dealing with SARS. Since then, governments at all levels have begun to see SARS as a top priority in the government agenda. This is widely believed to have been critical in achieving the success of SARS campaign (China Daily, 2003; Wu Yi, 2003).

Wu Yi is the first health minister in China's history who has no health science background and who had been a very senior government official (vice premier) when taking the position of health minister. Many of my interviewees believed that this arrangement has benefit not only in establishing a powerful leadership in the SARS campaign, but also will benefit the health system in the long term.

"I have never seen such an awareness of our governments in health issues. Because Wu Yi remains vice premier, so many provincial governors attended the national health conference. It is amazing. It is unprecedented." (a health official)

A right structure in place to enable adequate leadership and multi-sectoral coordination is critical in the SARS campaign. The commitment of central government led to multi-sectoral involvement and mass movement. All health resources were quickly integrated under consistent guidelines of the government. At each level of government, a leadership command team was developed. Non-governmental organisations, residential committees and enterprises also established leadership teams to protect their own communities from SARS. Recommendations from public health professionals have never been so greatly appreciated by government officials and the public.

To overcome the barrier caused by the household registration system in combating SARS, the Chinese government has had to define clearly the role and functions of local governments in the locations where SARS was identified. All probable and suspect cases of SARS are required to be isolated and managed immediately at the place where diagnosis was made, including provision of free medical care for isolated patients.

Mass quarantine inspection was arranged in all important transport stations (particularly inter-municipality and inter-provincial transports). Once SARS-related symptoms were identified, the tourists would be isolated and treated promptly. Those people who had close contacts with SARS patients would also be quarantined locally. Others would be allowed to continue their trips, and notice would be given to the local (township) governments at the destinations of these tourists so that medical observations could be arranged (Wang Longde, 2003). On 15 May 2003, the Ministry of Railways promulgated a quarantine policy that required all railway passengers to fill out a health statement so that contact tracing could be arranged if necessary (Xinghua Agency, 2003e). In Beijing, the requirement for health statements even applied to taxi services.

Having witnessed the success of the SARS campaign, Chinese people have regained their confidence and trust. About 72% of Chinese residents surveyed believed that the Chinese government has a strong capacity to deal with emerging crises. More than 80% of those surveyed were satisfied with the strategies adopted by government authorities in combating SARS. About 90% believed that China would re-gain its rapid economic development after the SARS crisis (Xinghua Agency, 2003a).

### *Ministry of Health response to SARS*

The healthcare delivery system was re-organised by the Ministry of Health according to consistent guidelines. The first response of the health authorities was to require all hospitals to admit SARS patient to avoid possible refusal of such patients and subsequent community transmission of SARS. The health authorities soon realised that the poor preparedness of many hospitals (and healthcare workers) might fuel the spread of SARS. The policy changed to concentrated management of SARS patients in designated hospitals for reasons of both infection control and quality care (Wang Longde, 2003). Meanwhile, fever clinics were established to screen and identify SARS cases. Tight timelines for reporting SARS cases to health authorities were set (two hours for urban medical organisations and six hours for rural medical organisations from the time of diagnosis) (Reuters, 2003).

Later, designating SARS hospitals was also a strategy for restoring normal hospital services for other patients. The list of designated SARS hospitals was shortened to a few specialised hospitals for communicable diseases at the final stages of the SARS campaign (Beijing Newspaper For Youth, 2003).

The SARS hospital in Xiao Tang Shan is an example of great success. While 680 SARS patients were admitted to this hospital, only 8 died (Xinghua Agency, 2003c), and there was no nosocomial infection in this hospital. All of the 1,383 hospital staff members had rich experience in dealing with SARS, with most coming from Beijing and Guangzhou where the most serious SARS outbreaks occurred.

Within the Ministry of Health, staff members were arranged to work in two groups in separate locations to ensure that leadership for health authorities was always available. Public academics in some municipalities (such as Beijing) were seconded to the front-line group to reinforce the public health workforce.

### *Effective community mobilisation*

Community mobilisation and participation played a crucial role in combating SARS (China Daily, 2003; Wu Yi, 2003). The roles played by residential / village committees (a group of residents elected by community members and approved by the local governments, with responsibilities of ensuring the security and environmental safety of communities; providing support to disadvantaged community members; and organising community activities required by the governments), in combating SARS were remarkable. Their roles usually included: identifying, recording, and reporting patients with fever; disinfecting the community environment; assisting in the implementation of quarantine for community residents (including daily living support to residents under quarantine); and public education. It is particularly important for the residential / village committees to find and identify suspect cases of SARS, especially for those who are unlikely to seek medical help for various reasons (including financial barriers, fear of exposure to SARS, or distrust of medical practitioners). Many volunteers (generally retired residents) were organised to report suspected cases of SARS. Some communities asked their residents to check body temperature daily. More aggressive measures could also be adopted by the residential / village committees. For example, cross-contacts between communities were strictly restricted in some communities (this is possible because Chinese residential communities usually have walls).

“During the SARS period, I was even not allowed to buy my breakfast in another residential community nearby where I used to have my breakfast” (Beijing resident).

Similar strategies were adopted in working environments, such as daily disinfection of facilities and check of body temperature. In some organisations, staff members were encouraged to work at home (or simply remain at home) to reduce contacts. Instructions on how to prevent SARS were available at all residential committees. Respiratory precautions (wearing face masks) were widely accepted in all working and living environments.

Village committees also contributed to the success of containing SARS in urban areas. Without government instructions, many villages set up quarantine inspection voluntarily. All visitors were examined. Unnecessary visiting would be refused. For the floating populations (and others) coming from SARS affected cities, some villages organised voluntary quarantine. For example in one village, a quarantine camp was set up at the foot of a mountain. Family members provided food everyday for those under quarantine.

Several surveys revealed that more than 90% of community residents had been aware of the SARS outbreak and knew the symptoms and transmission mechanism of SARS (Shi et al., 2003; Zhan et al., 2003). More than 98% of surveyed community residents supported the strategies of isolation, quarantine, health statements, and body temperature screening (Shi et al., 2003). About 60% of residents took protective strategies as recommended by the public health institutions including respiratory precautions, hand washing, and environmental disinfection (Zhan et al., 2003). Even in rural communities, more than 94% of surveyed residents were aware that SARS is a communicable disease with fever as an early symptom and 73% of rural residents knew that it could be transmitted through respiratory droplets (Wang et al., 2003). Most residents reported that they got their knowledge from TV programs.

### *‘Inspiration plus punishment’*

‘Inspiration plus punishment’ was used as a main instrument to mobilise community resources. Using the model of previous mass health movements in China, the SARS campaign was also titled as a “patriotic movement”. Hu Jintao, president of China, pointed out in a national SARS workshop, “national spirit provided us with a drive to achieve success in fighting against SARS”. As usual, communist party members were encouraged to act as role models in this campaign. Recently, 100 health organisations and 500 individuals were awarded by the Ministry of Health for being national role models in fighting against SARS (Wu Yi, 2003). Similar motivational mechanisms were also developed at provincial, municipality and local district levels.

Meanwhile, incentives were established to encourage more people to participate in the frontline battle against SARS. For example, financial subsidies were offered for the healthcare workers in SARS clinics and wards, and university entrance criteria for students with parents working in SARS clinics were lowered.

Preferential policies (such as reduced tax rates and exemption of some fees) were offered to enterprises that employed a large number of rural migrant workers to encourage them to provide appropriate arrangements for the rural migrant workers locally (and thereby prevent them from fleeing back to their home towns (Xinghua Agency, 2003g). Some enterprises offered free long distance calls (for example, ten minutes per week) for their employees to ease the stress on employees and their families and encourage their employees to stay in the worksite.

To ensure effective implementation of public health measures all over China, strict governmental regulations and rules were promulgated. For example, SARS patients were not allowed to be transferred to other places or organisations without arrangement by government authorities (Deng, 2003). Government employees were also subject to stringent disciplines, according to a policy document promulgated in May 2003 by the Ministry of Human Resources (and discipline department of the party) (Xinghua Agency, 2003b).

### *Transparency in public media*

The transparency of transmission of SARS information by the public media is unprecedented in China. For example, people could access the Internet to look at daily reports on the SARS outbreak in each municipality



and to search for details of potential contamination of SARS in public transport. A Geographic Information System (GIS) has been developed by the Ministry of Health to be used in monitoring the SARS epidemic (Institute of Geographic Resource, 2003). In some health organisations, direct access to a national SARS reporting system via Internet has been achieved (Ministry of Health, 2003d). The openness and transparency also facilitated international communication and collaboration (Wu Yi, 2003).

### *Other important factors*

Strong financial support was vital to ensure the provision of all goods that were needed in this campaign (including daily life consumables), particularly during the panic buying period when people stored consumables in order to avoid contacts with others (People's Daily, 2003). The Chinese governments allocated 10 billion for the anti-SARS campaign, which equals to about one fifth of the annual public health budget of recent years (Ministry of Health, 2001). As part of this funding, 4.3 billion was distributed to rural areas to strengthen the medical capacity of rural health organisations and ensure the availability of free medical services for rural residents infected by SARS (Xinghua Agency, 2003f; g).

Furthermore, government authorities made great efforts to provide daily life support for people living in SARS affected areas. For example, from 24 April to 1 May of 2003, 19,717 tons of rice, 1,010 tons of flour, 3,576 tons of salt, 1,343 million face masks, 2.616 million pieces of disinfectant soap, and 225 tons of disinfectants were added to the Beijing market (People's Daily, 2003).

Finally, the change of seasons contributed to ending the 2003 SARS epidemic. Variances in the distribution of SARS in Guangzhou, Hong Kong, Tai Yuan and Beijing demonstrated that the SARS virus is more likely to be active in temperatures of between 17 and 28 degrees centigrade, with about 95.8% of SARS cases occurring in these conditions (Tan, 2003). This study indicates that the change of season and climate could contribute at least partly to the reduction and disappearance of SARS.

## **Conclusion**

Wen Jia Bao, premier, summarised in a SARS workshop that five steps are necessary for institutionalising a sustainable public health system for emerging crises, including appropriate response mechanisms (such as timely information support, comprehensive disease prevention and control system, and emergency service system); legislation for emerging public health alerts; medical and social security systems that ensure the accessibility of medical care; strong capacity in scientific research; and public education to improve public hygiene (Xinghua Agency, 2003d).

China's experience indicates that attention to the privacy of individuals is needed. The first case of SARS was widely reported in the public media, and many of this patient's personal details were revealed, with the result that he had to leave his home and work to evade the great pressure and stigma from the community. Other people who had recovered from SARS also faced discrimination from their communities, which further intensified their feelings of guilt.

The aggressive strategies adopted in this campaign also raise ethical issues. Many patients were reluctant to seek medical help out of fear of being cared for with SARS patients, and many patients who were suffering from fever chose to stay home. Many of my interviewees believed that during the SARS outbreak, more patients died from other illness than SARS because of their refusal to seek medical help.

## **References**

- Abdullah, A. S. M., Tomlinson, B., Cockram, C. S., et al. (2003). 'Lessons from the severe acute respiratory syndrome outbreak in Hong Kong.' *Emerging Infectious Disease* 9(9): 1042-5.
- Aldis, W. L. (1989). 'Privatisation of care in China.' *Lancet* 2(8677): 1456-7.



AusAid (2000). 'China health sector strategy - strategic framework and potential program of assistance'. <[www.ausaid.gov.au/publications/pdf/China\\_Health\\_Sector\\_Strategy.pdf](http://www.ausaid.gov.au/publications/pdf/China_Health_Sector_Strategy.pdf)> (Accessed 18 Feb 2003).

Beijing Newspaper For Youth (2003). 'SARS patients will go to Ditan hospital; other Beijing hospitals will not admit SARS patients anymore'. <[www.moh.gov.cn/zhgl/zt/fdgzdt/1200306240012.htm](http://www.moh.gov.cn/zhgl/zt/fdgzdt/1200306240012.htm)> (Accessed 17 October 2003).

Bloom, G. (1997). *Primary health care meets the market: lessons from China and Vietnam*. Brighton: Institute of Development Studies. <<http://www.ids.ac.uk/ids/bookshop/wp/wp53.pdf>> (Accessed 15 May 2003).

CDC (2003). 'Use of quarantine to prevent transmission of severe acute respiratory disease - Taiwan, 2003.' *Morbidity and Mortality Weekly Report* 52(29): 680-3.

China Daily (2003). 'Summarising the experience in fighting against SARS and encouraging a steady economic development'. <[www.moh.gov.cn/zhgl/zt/fdgzdt/1200307310013.htm](http://www.moh.gov.cn/zhgl/zt/fdgzdt/1200307310013.htm)> (Accessed 17 October 2003).

China Statistics Bureau (2002). 'Statistics report on floating population (in Chinese)'. <[www.china.org.cn/chinese/2002/Sep/201983](http://www.china.org.cn/chinese/2002/Sep/201983)> (Accessed 13 Sep 2002).

CMA (2003). 'Health care system in China'. <[www.chinamed.org.cn/healthcare5.htm](http://www.chinamed.org.cn/healthcare5.htm)> (Accessed 14, April 2003).

Deng, Z. Z. (2003). 'Governmental employees who refuse to follow governmental arrangements in SARS control will be sacked'. <[www.moh.gov.cn/was40/detail?record=105&channelid=27615](http://www.moh.gov.cn/was40/detail?record=105&channelid=27615)> (Accessed 17 October 2003).

Dong, W. Z. (2001). 'Health care reform in urban China'. <[www.utoronto.ca/cphs/WORKINGPAPERS/CPHS2001\\_Weizhen\\_Dong.pdf](http://www.utoronto.ca/cphs/WORKINGPAPERS/CPHS2001_Weizhen_Dong.pdf)> (Accessed 10 April 2003).

Donnelly, C. A., Ghani, A. C., Leung, G. M., et al. (2003). 'Epidemiological determinants of spread of causal agent of severe acute respiratory syndrome in Hong Kong.' *The Lancet* Published online (7 May), <http://image.thelancet.com/extras/03art4453web.pdf>.

Editor (2003a). 'SARS: the struggle for containment.' *CMAJ* 168(10): 1229.

Editor (2003b). 'Lessons from SARS.' *CMAJ* 168(11): 1381.

Hindle, D. (2000). 'China in transition: the new health insurance scheme for the urban employed.' *Australian Health Review* 23(3): 122-31.

Institute of Geographic Resource (2003). 'National geographic information system for SARS control and alert'. <[www.sars.ac.cn](http://www.sars.ac.cn)> (Accessed 8 October 2003).

Liu, X. and Mills, A. (2002). 'Financing reforms of public health services in China: lessons for other nations.' *Social Science & Medicine* 54: 1691-8.

Mariani, S. (2003). 'April 2003: globalization, public health, and SARS - a way of life.' *Medscape Molecular Medicine* 5(1). Available at: [www.medscape.com/viewarticle/452371](http://www.medscape.com/viewarticle/452371) (Accessed 30 October 2003).

Maunder, R., Hunter, J., Vincent, L., et al. (2003). 'The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital.' *CMAJ* 168(10): 1245-51.

Ministry of Health (1991). 'Implementation of the law for infectious disease control'. <<http://www.moh.gov.cn/was40/detail?record=24&channelid=8085&searchword=%B4%AB%C8%BE%B2%A1%B1%A8%B8%E6>> (Accessed 17 October 2003).

Ministry of Health (2001). Chinese health statistical digest. Beijing: Ministry of Health: 129.

- Ministry of Health (2003a). 'SARS update'. <<http://168.160.224.167/sarsmap/>> (Accessed 17 October 2003).
- Ministry of Health (2003b). 'Key events of SARS in China'. <[www.moh.gov.cn](http://www.moh.gov.cn)> (Accessed 17 October 2003).
- Ministry of Health (2003c). 'Implementation of SARS report system'. <[www.moh.gov.cn/jbkz/zcxs/faya/1200309020007.htm](http://www.moh.gov.cn/jbkz/zcxs/faya/1200309020007.htm)> (Accessed 17 October 2003).
- MOH (2000). Chinese health statistical digest (in Chinese). Beijing: Ministry of Health: 71. <<http://www.moh.gov.cn/statistics/digest00/index.htm>> (Accessed 9 May 2003).
- Pei, L. (1998). *Hospital management in a time of change: the need for management training (and policy reform) in three teaching hospitals in Yunnan*. (PhD Degree) Melbourne: School of Public Health, La Trobe University.
- People's Daily (2003). 'Powerful financial support in anti-SARS campaign'. <[www.moh.gov.cn/was40/detail?record=95&channelid=27615](http://www.moh.gov.cn/was40/detail?record=95&channelid=27615)> (Accessed 17 October 2003).
- Reuters (2003). 'China still in dark over SARS origins'. <[www.medscape.com/viewarticle/463207](http://www.medscape.com/viewarticle/463207)> (Accessed 29 October 2003).
- Rodier, G. (2003). 'Why was Toronto included in the World Health Organisation's SARS-related travel advisory?' *CMAJ* 168(11): 1434.
- Schabas, R. (2003). 'SARS: prudence, not panic.' *CMAJ* 168(11): 1432-3.
- Seto, W. H., Tsang, D., Yung, R. W. H., et al. (2003). 'Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS).' *Lancet* 361: 1519-20.
- Shi, R., Cai, B., Zeng, B., et al. (2003). 'A KAP survey to the severe acute respiratory syndrome in Shanghai residents.' *Chinese General Practice* 6(6): 481-2,5.
- Tan, J. G. (2003). 'Climate could be related with SARS epidemic'. <[www.sars.ac.cn](http://www.sars.ac.cn)> (Accessed 8 October 2003).
- VanDenKerkhof, E., Goldstein, D. and Rimmer, M. (2003). 'Containing a new infection with new technology: a Web-based response to SARS.' *CMAJ* 168(10): 1259-62.
- Wang Longde (2003). 'Key elements in SARS control'. <[www.moh.gov.cn/was40/detail?record=92&channelid=27615](http://www.moh.gov.cn/was40/detail?record=92&channelid=27615)> (Accessed 17 October 2003).
- Wang, X. L., Zhang, J. X., Zhang, Y., et al. (2003). 'A knowledge, attitude and practice survey on SARS in a rural area.' *Medical Journal of Peking University* 35(z1).
- Wong, V. C. and Chiu, S. W. (1998). 'Health-care reforms in the People's Republic of China--strategies and social implications.' *Journal of Management in Medicine*. 12(4-5): 270-86, 197.
- Wu Yi (2003). 'Trying to develop a new public health system'. <[www.moh.gov.cn/zghl/zt/fdgzdt/1200307310011.htm](http://www.moh.gov.cn/zghl/zt/fdgzdt/1200307310011.htm)> (Accessed 17 October 2003).
- Xinhua Agency (2003a). 'Confidence of Chinese people increased after SARS attach'. <[www.moh.gov.cn/was40/detail?record=34&channelid=27615](http://www.moh.gov.cn/was40/detail?record=34&channelid=27615)> (Accessed 17 October 2003).
- Xinhua Agency (2003b). 'Governmental employees who do not make efforts in fighting against SARS could be sacked'. <[www.moh.gov.cn/was40/detail?record=43&channelid=27615](http://www.moh.gov.cn/was40/detail?record=43&channelid=27615)> (Accessed 17 October 2003).
- Xinhua Agency (2003c). 'Recovery rate for SARS in Xiao Tang Shan has reached 98.8%, no hospital staff are infected by SARS'. <[www.moh.gov.cn/zghl/zt/fdgzdt/1200306220025.htm](http://www.moh.gov.cn/zghl/zt/fdgzdt/1200306220025.htm)> (Accessed 17 October 2003).

Xinhua Agency (2003d). 'Five strategies in promoting the development of public health system'. <[www.moh.gov.cn/was40/detail?record=34&channelid=27615](http://www.moh.gov.cn/was40/detail?record=34&channelid=27615)> (Accessed 17 October 2003).

Xinhua Agency (2003e). 'All railway passengers must fill out a health statement from 18 May 2003'. <[www.moh.gov.cn/was40/detail?record=132&channelid=27615](http://www.moh.gov.cn/was40/detail?record=132&channelid=27615)> (Accessed 17 October 2003).

Xinhua Agency (2003f). 'The government has arranged 4.3 billion in rural areas for fighting against SARS'. <[www.moh.gov.cn/was40/detail?record=123&channelid=27615](http://www.moh.gov.cn/was40/detail?record=123&channelid=27615)> (Accessed 17 October 2003).

Xinhua Agency (2003g). 'Six strategies in preventing the spread of SARS in rural China'. <[www.moh.gov.cn/was40/detail?record=126&channelid=27615](http://www.moh.gov.cn/was40/detail?record=126&channelid=27615)> (Accessed 17 October 2003).

Zhan, S. Y., Wu, T., Ren, T., et al. (2003). 'The cross-sectional study of awareness and practice of SARS epidemic in community residents in Beijing.' *Medical Journal of Peking University* 35(z1).

Zhang, H. Q. (2001). 'Health service delivery models for floating populations (in Chinese)'. In S. G. Jin and Y. Bao (Eds.). *Collection of literature about community health services*. Beijing: Ministry of Health, pp. 76-8.