

A DEFICIENT PUBLIC HEALTH SYSTEM AS A CONTRIBUTING CAUSE OF SEVERE ACUTE RESPIRATORY SYNDROME (SARS) EPIDEMIC IN MAINLAND CHINA

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Abstract. SARS (Severe Acute Respiratory Syndrome) is a newly emerging infectious disease which spread over 32 countries and areas, infected more than 8,000 people and causing more than 900 deaths from November 2002 to August 2003. More than 90% of the SARS cases and death were reported from China. Nevertheless, we still know little about this disease, particularly in etiology. SARS, as an emergency of Public Health System (PHS), alarmed health workers throughout the world proving there is still the potential for an epidemic of an emerging infection both in developed and developing areas. Many reports indicated that the insufficiency of the PHS of China was one of the critical factors contributing to the outbreak of SARS. In this study, we attempt to demonstrate some of the categories of PHS that contributed to the SARS epidemic. Two of the categories studied were the living environment and health resources. In the living environment area, the population and population density were examined. Health resources include the medical facilities, health workers, and per capita public health expenditures. An understanding of these areas is important to prevent future epidemic.

INTRODUCTION

The first Severe Acute Respiratory Syndrome (SARS) cases emerged in mid-November 2002 in Guangdong Province, China (Peiris *et al*, 2003; WHO, 2003a). The epidemic rapidly spread within Mainland China and to a number of other countries throughout the world. By June 16, 2003, global accumulated cases totaled 8,461 in reports from 30 countries and six continents. As a result, 804 infected people died (WHO, 2003b). Among the cases, 25 provinces in Mainland China reported 5,326 probable cases and 346 deaths (WHO, 2003b). Mainland China bore the heaviest burden of the SARS outbreak. After failing to acknowledge the extent of the threat to public health and to take corrective measures, Mainland China finally put in place effective control mechanisms to stem

the spread and transmission of SARS. However, the threat of another outbreak, especially during the winter months remains high.

The Public Health System (PHS) is an international concept concerned with the protection and promotion of health. It has major sectors, such as education in the methods of preventing and controlling prevailing health problems; the promotion and proper nutrition; providing adequate safe water supply and basic sanitation; maternal and child health, including family planning; vaccination; prevention and control of local endemic diseases; appropriate treatment of common diseases and injuries; and the provision of essential drugs. The PHS involves universal, community-based, preventive and curative services, with substantial community involvement.

There is little public information available to describe the PHS of Mainland China and its association with the spread of SARS. The objective of this study was to identify some categories of PHS that contributed to the SARS epidemic on Mainland China.

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METHODS

Study location and parameters

The PHS status in the city of Beijing and in the Guangdong Province during the year 2001 was examined, because these two locations were the most seriously affected by the SARS epidemic. Two of the categories of the PHS studied were the living environment and health resources.

Data sources

Data were collected from government databases posted on the Internet and the 2002 Annual Statistics of China. The government databases come from the China Center for Disease Control (CCDC), Ministry of Health, the Ministry of Environmental Protection, the Ministry of Education, and the National Bureau of Statistics of China.

RESULTS

Table 1 tabulates living environment and health resources in both the city of Beijing and the Guangdong Province in the year 2001. There were about 18.3 million and 77.83 million people, living the City of Beijing and Guangdong Prov-

ince, respectively. The population density of the urban district was 3,189/km² in Beijing and 1,411/km² in Guangdong. The population densities in both locations were much higher than the average of the whole country, with a 588/km² population density.

Six basic parameters were covered to describe the status of health resources. The number of medical facilities in Beijing and Guangdong Province numbered 5,969 and 4,998, respectively. A total of 158,185 and 143,915 health personnel were practicing in Beijing and Guangdong, respectively. Per 1,000 residents, there were 6.28 beds and 4.62 doctors in Beijing and 6.31 beds and 4.13 doctors in Guangdong Province. These two parameters were close to those of developed countries (Fig 1). The total expenditure on public health in Mainland China in 2001 was 515,030 million Yuan. The per capita health expenditure was 403.6 Yuan. The average per capita health expenditure during 1995-1998 was US\$400, little less than 10% of US\$4,271 spent in the US. The GDP for health expenditures (HE) in Mainland China during 1995-1998 was 5.1%, less than half the 12.9% for the US during the same period (Fig 1). In 2000, Mainland China central government expen-

Table 1
The present situation of PHC in Mainland China.

	Beijing		Guangdong		National total	
	2001	2002	2001	2002	2001	2002
Living environment						
Total population (10,000 people) and National growth rate (%)	1,383 (0.80)	* ^a	7,783(8.83)	*	127,627(6.95)	*
Population density of urban districts (Person/km ²)	3,189	*	1,411	*	588	*
Health resource						
Number of health institutes	5,969	4,998	14,167	15,501	330,348	306,038
Number of health personnel in hospital & health center	158,185	143,915	330,418	323,416	5,583,932	5,238,079
Beds per 1000 population	6.28	6.31	2.14	2.15	2.39	2.32
Doctors per 1000 population	4.62	4.13	1.5	1.35	1.69	1.47
Total expenditure for public health (Year 2001) (100 million Yuan)	*	*	*	*	5,150.3	*
Per capita health expenditure (Year 2001) (Yuan)	*	*	*	*	403.6	*

^aData are not available.

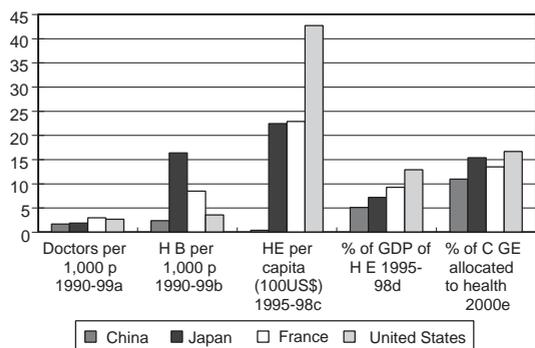


Fig 1–The comparison of health resource between four countries.

a=Doctor per 1,000 persons 1990-1999. b=Hospital beds per 1,000 persons 1990-1999. c=Health expenditure per capita (US\$100) 1995-1998. d=(%) of GDP of health expenditure 1995-1998. e=% of Central government expenditure allocated to health 2000.

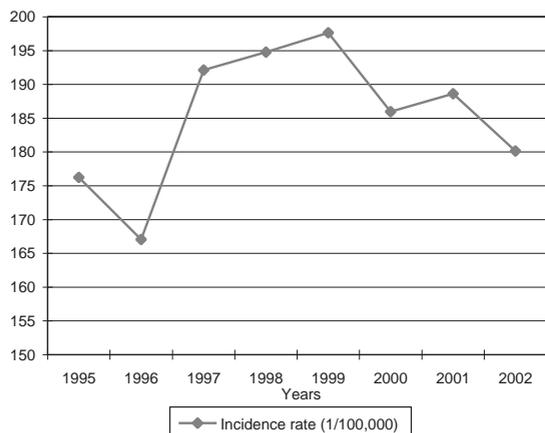


Fig 2–Reported incidence rate of infectious diseases (1/100,000).

diture on health was 11%, which was lower than in developed countries (Fig 1).

In percentage terms, the numbers for TB and other infectious diseases were decreasing from 1978 to 2000; likewise the beds for TB and other infectious diseases diminished. Nevertheless, the incidence of the infectious diseases kept moving upward from 1996 to a peak in 1999, and then gradually decreased from 1999 to 2002. However, the rate of infectious diseases in 2002 was still higher than in 1995 (Fig 2). The reported death rate (1 per 100,000) and deaths per 100 patients (%) with infectious diseases gradually decreased from 1995 to

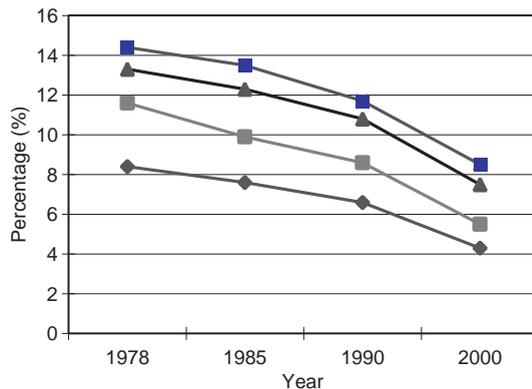


Fig 3–The transition of percentage of doctors and beds for infectious diseases and TB.

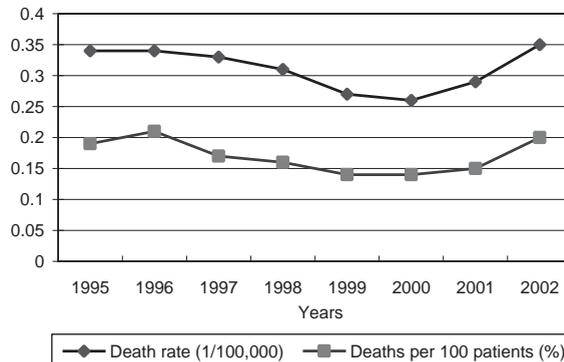


Fig 4–Reported death rate and deaths per 100 patients with infectious diseases (%).

2000 and moved upward to the 1995 rates again in 2002 (Fig 3).

DISCUSSION

SARS, a new emerging infectious disease, has become the first pandemic of the 21st century. Epidemiological evaluation suggests that the SARS pandemic began with just a few index cases clustered mainly around families and hospital health-care workers in cities around Guangzhou, China on January and February, 2003 (Zhong *et al*, 2003). The SARS virus is primarily transmitted by droplets and by direct

contact (Seto *et al*, 2003). This finding implies that effective human-to-human transmission is firmly established and suggests that SARS virus has become well adapted to human beings (Holland *et al*, 1991). Living environments with a high population density such as found in the City of Beijing and in the Guangdong Province are more likely to contribute to the spreading of SARS.

Since 1999, infectious diseases, including TB in the City of Beijing and Guangdong Province, have decreased. As a result, the bed and the treatment of medical facilities for the treatment of infectious diseases has declined, along with trained doctors specializing in this field (Fig 4). In 2003, the medical facilities and medical staff did not contain the outbreak of SARS. The lack of an effective national reporting system represents another critical cause that contributed to the difficulty in controlling the SARS epidemic in Mainland China. Learning from the last lesson, health officials in the capital of Guangdong have designated 158 hospitals and a total of 532 beds for infectious diseases to cope with any recurrence of SARS (Watts, 2003).

As the SARS epidemic spread, it severely tested the capacity of public health systems to respond rapidly and decisively. It tested each country's integrity in reporting data as well as the emergency response of local medical facilities. Local public health departments and hospitals had to reevaluate and strengthen their measures for handling infectious emergencies, quarantining patients, and ensuring the safety of other hospitalized patients.

Lessons from the SARS epidemic have been of incalculable value. The importance of the public health infrastructure, the necessity of improving health and living conditions, and the urgent need to implement measures that minimize risks to health care workers are critical.

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