

## IMPACT OF AN EPIDEMIC ON THE MEDICAL AND ECONOMIC SYSTEMS --- THE CASE OF SARS OUTBREAK IN TAIWAN

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### ABSTRACT

At the peak of the worldwide SARS epidemic, apprehension arisen out of partially disclosed, if not concealed, information on the current status has driven many foreign-based companies to withdraw their business in Taiwan or move their bases elsewhere. Normal trading, investment and travel have been suspended or even come to a standstill. This paper traces the spread of SARS in Taiwan and the corresponding measures undertaken. Proposals on emergency action in crisis management are also made, which can serve as references for investors in risk control assessment.

### INTRODUCTION

The 21<sup>st</sup> century saw the emergence of a new highly contagious disease, Severe Acute Respiratory Syndrome (SARS). In this age of the global village where the world is closely interconnected and highly mobile, this readily transmissible disease has become a worldwide health threat. Within a short span of time, there were outbreaks in many countries around the world with Taiwan being no exception.

Indeed SARS is a cause of alarm and a particularly serious threat. In the first place, its primary causative agent is the extremely dangerous RNA coronavirus. This family of virus is known to undergo frequent mutations, adding unpredictability to future evolutions of outbreak. There is no vaccine, assay, or treatment yet for this newly emerging disease. Health officials can only resort to isolation and quarantine for controlling the spread. Diagnosis is also difficult because the initial symptoms are non-specific and common. At its onset, SARS is often mistaken as a common cold or flu, thus the infected may be delayed in seeking medical care. Early symptoms include fever, sore throat, headache, dry cough, shortness of breath, stiffness, loss of appetite, malaise, confusion, rash and diarrhea. Little is known about the epidemiology and pathogenesis of SARS. Its incubation period, estimated at a maximum of 10 days, allows spread via air travel, leading to outbreaks around the world. SARS poses great challenges to the international public health and calls for collaboration among nations in combating this unknown but rampant disease.

The multi-country outbreak has aroused widespread public anxiety. Fear of SARS has led to social unease, economic losses and even political changes. Its repercussions and wide-ranging impacts are worth attention and offer lessons for the future. This paper aims to supplement the world scene of SARS outbreak with the report of Taiwan. Actions taken and measures introduced by the Taiwan government can also serve as references for future pandemic control.

## CHRONOLOGY OF SARS

The emergence of the first cases of SARS dated back to mid-November 2002 in Guangdong Province, China, where an outbreak of atypical pneumonia occurred, affecting 305 persons and claiming five lives. While the World Health Organization (WHO) was alerted, SARS was quietly exported from China to Hong Kong, Singapore, Toronto and Hanoi. The disease was first identified in Vietnam in February by an epidemiologist from the WHO. In March, a global alert was issued drawing public attention to this severe atypical pneumonia with unknown etiology. Reports of infected cases came from around the world showing that the disease had moved out of its initial focus in Asia and had spread to North America and Europe. In view of the rapid spread of the disease by international travel, WHO issued a rare emergency travel advisory as a heightened warning to international travelers, health-care professionals and medical authorities.

### SARS IN TAIWAN

According to the Ministry of the Interior, there were a total of 150,628 people subject to mandatory quarantine between April 28 and July 3, 2003. Among them, 69,815 had history of close and possible contact with SARS patients and 80,813 entered Taiwan from infected areas. There were 664 suspect cases with 346 on the probable list. As of September 18, the Department of Health in Taiwan announced that only 273 SARS cases survived. There were 37 deaths directly due to SARS and 36 SARS-related casualties, amounting to a mortality rate of 10.7%. Another 107 died because of other diseases complicated by SARS infection. Taiwan was the last country that fell under the attack of SARS and also the last to be taken off the SARS-affected area list. The three-month SARS epidemic has caused havoc to the economy and significant impact on the life of the people.

The outbreak of the SARS crisis traced its origin to the first SARS infected in Foshan, China on March 12, 2003. Since then, SARS spread at an alarming rate around the world (Donnelly et al., 2003). In Taiwan, the infected cases were either imported or related to the hospital setting. The epidemic started with a woman riding a bus to her home in Ilan on March 15. Among the passengers sharing the same bus were Mr. and Mrs. Ching who just returned from China via Hong Kong on March 14. Both were carriers of the virus (Wonacott et al., 2003). This woman got infected and sought medical care from a local hospital, which then unleashed the spread of this deadly disease in Taiwan.

At its initial stage, the SARS spread was slow and sporadic with only 23 probable cases detected in the first month. Most of these cases could be attributed to close contacts with SARS patients or a history of recent travel to affected areas. Only four of the early cases resulted from secondary transmission within Taiwan. The outbreak began to escalate in mid-April when the lapse in infection control procedures led to in-hospital infection. With increasing infected cases of medical staff in hospitals attending SARS patients, the Taipei City Government was forced to shut down Taipei Municipal Heping Hospital for collective quarantine and treatment. Nevertheless, owing to inadequate staff support and poor quarantine facilities, the number of suspected cases stemming from the hospital continued to climb. The situation further deteriorated when SARS spread from within hospital to community setting and from the north to the south. Two department stores even suspended their business to carry out disinfection.

In the midst of the mass panic for fear of infection, the government rapidly introduced a series of sweeping measures to fend off the insecurities of the general public. At the same time, steps have been taken to control SARS. First, instead of having the infected collectively quarantined for treatment in the infected hospitals, the SARS patients were relocated to regional hospitals for intensive treatment and quarantine. Allocation of medical resources islandwide was centralized and better coordinated, while medical institutions offer mutual support to find cause of SARS, treat the infected and control its spread.

Despite the emergency measures, the rapid growth in reported cases had led to the Center for Disease Control (CDC), U.S.A. to issue warnings against travel to Taiwan and the WHO to list Taiwan as the Level C SARS-infected area( note1) . In two months after the first confirmed case, Taiwan had become the third largest infected area in the world next to Beijing and Guangzhou, China.

To cope with the worsening situation, new directors had been appointed to head the Department of Health (DOH), Center for Disease Control (CDC), and Taipei Health Bureau for implementing more effective infection control measures. These measures included (1) upgrading the surveillance system, (2) timely delivery of information needed for prompt and targeted action, (3) tightening hospital procedures for infection control, (4)

improving logistics for effective delivery of protective equipment and other supplies, (5) seeking advice and assistance from foreign infection control experts and medical consultants. Forces from the police, fire services and the military were mobilized to engage in surveillance, assist emergent transportation, and carry out disinfection of the environment.

Mass education campaigns were launched to persuade the population to check frequently for fever and report promptly at fever clinics. This greatly reduced the exposure to in-hospital infection and shortened the time between onset of symptoms and isolation of patients.

All the efforts bear fruits when genuine new cases began to decline in mid June. The welcome development finally led to WHO removing Taiwan from its list of areas with recent local transmission of SARS on July 5. David Heymann, the WHO Executive Director for communicable disease, credited the authorities for reacting quickly and appropriately, and attributed the key to Taiwan's success in combating the SARS outbreak to the establishment of a mechanism for coordinating the response of all relevant sectors. As Heymann said, "With the last known chain of transmission interrupted in Taiwan, the whole world can breathe an initial sign of relief."

## **THE IMPACT OF SARS**

The sudden and dramatic SARS outbreak around the world has taught us valuable lessons. First, the spread of a major epidemic is closely related to trade and transportation as evidenced in the chronology above. The SARS outbreak originating from Guangzhou plunged the whole Mainland to become the most seriously affected area. It then found its way into Hong Kong, a hub of world trade and commerce, where it spread globally along the routes of international travel within days. Thus, the multi-country involvement in this health disaster can be attributed to high mobility of the world population, frequent international trade and travel, and the rapid means of transportation.

The impacts of SARS are wide-ranging. Not only did it bring havoc to the medical and health systems, it also caused social and economic disruption. During the outbreak, the society of Taiwan was overcast by the shadow of threatening high mortality, mysterious and alarming path of transmission, and mass panic and fear of the infection. In less than a month, over 100 lives were taken and Taiwan plummeted from the pride of "zero death, zero exportation and zero community transmission" into the abyss of shock and anxiety when the reported cases kept climbing.

The toll exacted on the economy was also heavy. All consumer sales dropped with the exception of the hot and much demanded items such as surgical mask, protective clothing, thermometer, sterilization equipment, medical supplies, video devices and anti-SARS edibles. Servicing and tourism industries bore the hardest hit. Thousands of people were placed in voluntary or supervised quarantine; hospitals, schools and some borders were closed; and many preferred to stay home or avoid travel for fear of infection. Many overseas tour groups canceled their trips. Influence on international trade and investment activities was also evident with foreign investors, securities investment trust companies and securities firms all recorded a net selling. With China severely affected by the epidemic, cross-strait economic development would certainly be undermined. Taiwan's exports to China declined, thus widening the trade deficit. This is particularly serious for traditional manufacturing and high-tech electronic industries. The impact of SARS was estimated to slash billions of dollars in production and shave global economic growth by 0.1 to 0.5%. The Taiwan Economic Research Institute also forecast a reduction in economic growth by 0.15% - 0.48% following the effective containment of SARS by mid July. Among the various sectors, hotel, travel and air transportation in service industry suffered a decline in business of 9.24%, 8.44% and 7.62%, respectively, while that of manufacturing was approximately of 0.76%. The impact or extent of loss bore by different sectors as a result of the SARS epidemic are detailed in Table 2.

**Table 2: Impacts/Extent of Loss Suffered by Agriculture, Industry & Service Industries in Taiwan due to SARS epidemic**

Affected Industry	Impacts
Agriculture	Prices of edibles that can prevent SARS infection according to folk prescriptions soared 2-10 folds compared with that in 2002. These products include green lentils, pineapples, carrots, and Chinese herbals.
Manufacturing	Production was affected or suspended due to infection and quarantine of employees. Foreign orders were postponed or cancelled. Fewer orders led to reduced deliveries. Business trips to Asia and participation in trade fairs were canceled. Reduction in orders placed in China affected Taiwan exports of related equipment and machinery, and upper streams products to China.
Hotel	Occupancy dropped below 40% due to cancelled visits by tourists, businessmen and participants of large international conventions.
Air Transportation	Six domestic airline companies reported a reduction in business of more than USD 60M in Q2 of 2003. Measures to cope with the financial crisis include pay cut, compulsory no-pay leave and layoff.
Land Transportation	Tourist bus companies suffered 20% loss in sales. Other means of land transport including greyhound, city bus, railway and MRT suffered 50% drop in business. Number of commuters driving and riding motorcycles increased significantly.
Food & Catering	Great decrease in business for food and catering sector. Entertainment venues, especially those operating in enclosed space saw a great reduction in patrons.
Travel	More than 90% of tourists groups cancelled their trips to HK, Macao, and China. 85% cancelled their trips to SE Asia. Domestic travel sales dropped by approximately 50% compared with that in 2002.
Door to Door Courier Service	Increase in demand for door-to-door courier service. Growth of 20-30% monthly sales reported by two leading courier service provider at the peak of the SARS epidemic.
Department Store, and Retail Industry	20% sales reduction for the three leading department stores with infected employees. Marked decrease in customers on festive occasions including Mother's Day and Dragon Boat Festival A drop of 30% in sales revenues for the entire traditional retail market.
Medical sector	Financial condition of National Health Insurance Bureau further deteriorated due to inadequate medical and hospital resources and expensive new assays Deficit in national budget increased due to emergency fund set aside

	<p>for SARS prevention and control.</p> <p>Poor coordination between the central government and local health authorities affected the provision of medical care.</p> <p>Intense mass panic due to excess coverage and exaggerated reports.</p> <p>Lack of confidence in infection control measures further strained medical resources.</p> <p>Hoarding of medical necessities such as surgical masks and thermometers resulting in great variations in market price and inadequate supplies for health-care workers in execution of their duties.</p>
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Source: Economic Research Institute of Taiwan, May 14, 2003.

The three-month SARS epidemic has taught Taiwan and the world a hard but valuable lesson. Its repercussions on the social, economical, political and medical care systems aroused much attention. SARS is not the first, and certainly will not be the last contagious disease. History has seen repeated episodes of plagues and diseases, from the Black Death in 1519 claiming millions of life to the cholera rampant in India in the 19<sup>th</sup> century; from the smallpox and yellow fever crises in New York, U.S.A. in 1947 to the more recent outbreaks of enteroviruses, Dengue fever, AIDS and avian flu. Like migrating birds, these seasonal diseases have been keeping people around the world on the alert. All the nations are doing everything to prevent the importation of infectious diseases by taking disease control actions (Lague & Saywell, 2003). Taiwan has succeeded in eradicating and containing infectious diseases like malaria, poliomyelitis, and Japanese Encephalitis. However, increase in national income has resulted in frequent international travel for pleasure as well as business, thus exposing Taiwan to the importation of contagious diseases. The potential recurrence of SARS during the fall or winter season necessitated the strengthening of infection control measures.

### **IMPROVING MEDICAL SYSTEM FOR SARS CONTROL**

Preparedness and planning are keys to combating possible SARS re-emergence. Nations have united their efforts to identify and characterize the causative agent, to develop diagnostic test and treatment protocols, and to implement control measures. Despite its devastating impacts, the SARS crisis offered new opportunities for rectification of past errors, reformation of the current system and renewal for a better future. The following measures are suggested for enhancing the efficiency and effectiveness of the medical system and disease control strategies.

1. Create and maintain a pre-alarm system and fast response mechanism, simplify the clearance formalities upon departure, and improve the quarantine and inspection of commodities for export (Ho, 2003).
2. Urge the general public to measure body temperature three times a day.
3. Mandatory temperature check for anyone entering public venues (Ren, 2003).
4. Mandatory temperature check for anyone entering hospitals and clinics who are also required to wear masks.
5. Only one family member is allowed to accompany the sick in hospital.
6. Mandatory temperature check for MRT, train, bus and airplane passengers who are also required to wear masks.
7. Conduct epidemiological monitoring and surveillance with fever screening posts set up at each hospital and local public health clinics.
8. Establish SARS-designated hospitals. All transport of possible SARS patients handled by 119-ambulance.

9. Increase training programs to cultivate talents in epidemiology and infection control.
10. Restructure and reorganize the Center for Disease Control.
11. Set up Outbreak Emergency Operation Centers in all local governments for better coordination and response for infection control.
12. Strengthen support and collaboration between the central and local medical systems.

To achieve better coordination and enhanced efficiency, it is important for standard operation procedures (SOP) to be laid down for references by institutions involved in infection control. Taking into consideration the current knowledge of SARS, the WHO guidelines, and prior experience in Hong Kong, Vietnam, Toronto and Singapore, the Chang Gung Memorial Hospital (CGMH) presented an integrated framework for crisis management as shown in Figure 1 (Wu et al., 2003).

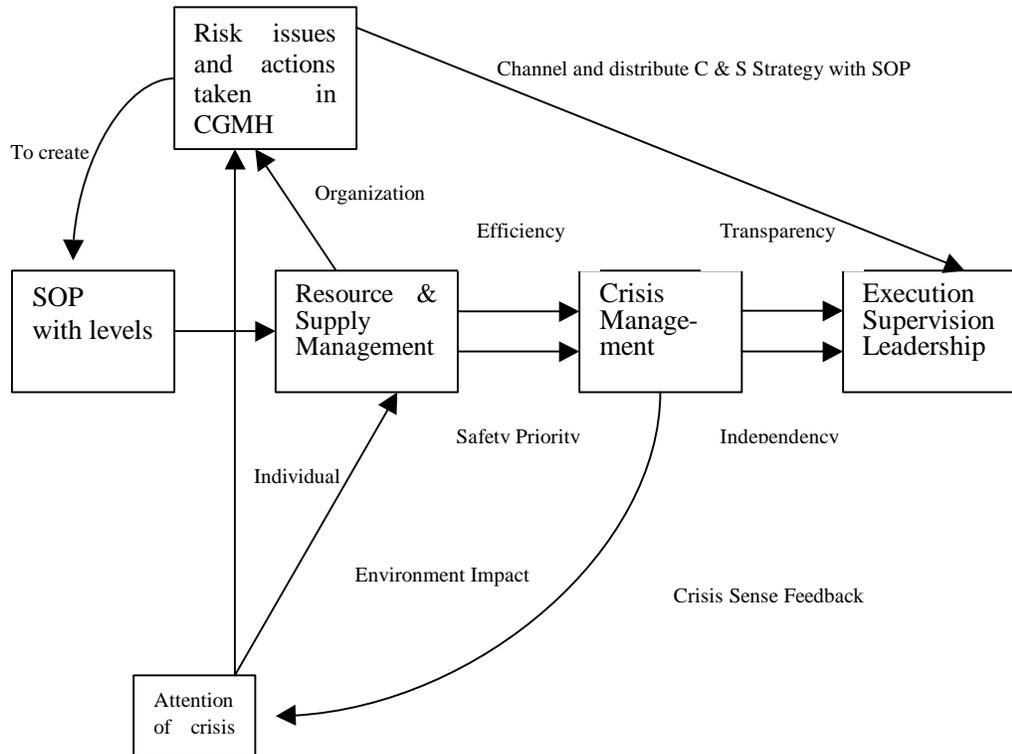
## **ECONOMIC RECONSTRUCTION AFTER SARS EPIDEMIC**

With the containment of the disease, all governments look forward to social and economic activities returning to normal. While health systems at every major outbreak site were strained to the limits of their capacity, the total loss in tourism, trade and investment incurred by SARS was also enormous. The economy is so dampened that more constructive steps are needed to revive it.

Possible measures for boosting post-SARS economic development are as follows.

1. Explore new consumer highlights to stimulate economic growth.
2. Provide financial subsidy in form of tax reduction or exemption to businesses and industries seriously affected by SARS.
3. Offer tax exemption and extend deadline for personal income tax payment for front-line health-care workers involved in infection control.
4. No import duties imposed on foreign donations of personal protective gears, equipment for diagnosis and treatment, monitoring devices, ambulances, as well as vehicles for disease control and disinfection.
5. Tax deduction on donations from local individuals or domestic enterprises to institutions involved in SARS control.
6. Minimize the risk of interruption or suspension of production due to epidemic by decentralizing overseas manufacturing bases and establishing cooperation between domestic and foreign manufacturers engaged in similar production through the power of trade unions.
7. Reduce loss in orders due to cancellation or postponement of trade fairs by assisting manufacturers to organize large-scale virtual audio-visual trade shows to attract customers online through creative and interesting marketing strategies.
8. Encourage the general public to install broadband network to gain access to online services and updates of current epidemic development.
9. Help servicing industry to enhance their competitiveness through providing online services.
10. Assist manufacturers to maintain their competitive advantage by exploring alternatives of production base relocation and other feasible options in case of worsening epidemic situation in other countries.
11. Promote domestic travel and put forward alternative options of indoor activities for health, interests and leisure.

Figure One: Model of managerial behavior and crisis management attention



12. Implement effective infection control and quarantine at borders( Greet, 2003) .
13. Follow through supportive measures for isolation and home quarantine.
14. Establish a system for stabilizing supply of primary consumer products to prevent undue fluctuations in prices.
15. Formulate policy for regulating medical supplies to ensure ample supply for disease prevention and control.
16. Keep the public well informed by providing a platform for different sectors including the government, medical, education, mass media, leisure and entertainment, manufacturing and service for joint coverage of the recent development and latest updates.
17. Provide financial assistance to airlines by lowering the landing and take-off charges and airport rental, as well as offering tax reduction and exemption.
18. Encourage airline staff on unpaid leave to take trips or undergo training.
19. Cut airport rental for idled aircraft.
20. Solicit other international airlines for short-term lease of idled aircraft.

## CONCLUSION

SARS dramatically illustrated the wide-ranging impact that a new disease can have in a closely interconnected and highly mobile world. The public anxiety it incited has spread faster than the virus, causing social unease and economic losses. The sudden outbreak of SARS not only put medical systems and infection control policies to test, but also challenged a nation's disease response and crisis management abilities. No doubt human lives are at stake in such disaster while the economy is thrown into jeopardy. It is thus important to learn from experience and enhance preparedness for future. The multitude of diverse infectious diseases strain the medical system and put health-care workers under great stress. To prevent further calamity in case of epidemic, it is of utmost importance to strengthen infection control measures, and enhance the quantity and quality of medical professionals.

Prevention is the key to containment of highly contagious diseases. Effective preventive strategies include collecting information before the outbreak, formulating coping measures, getting equipped for the combat and providing education for disease control. During the epidemic, crisis management would involve rapid case detection, prompt delivery of medical treatment, immediate isolation and infection control. Isolation and quarantine measures, environmental disinfection, eliminating pollution sources, better personal hygiene and effective protection measures can all help to prevent further spread.

From the global perspective, a worldwide surveillance and response capacity to address health threats and international collaboration would be the key to disease control and prevention. From the national perspective, strong political leadership for mobilizing the country's resources, speed of action, efficient coordination between different tiers of administration and effective implementation of surveillance, isolation and quarantine measures would ensure success in combating disease, thus avoiding devastating impacts on the society and economy.

Note1: China News, May 21, 2003

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