CENTRAL INTELLIGENCE AGENCY

DIRECTORATE OF INTELLIGENCE

29 September 2003

SARS: Lessons From the First Epidemic of the 21st Century

A Collaborative Analysis With Outside Experts (U)

OTI IA 2003-069

29 September 2003

SARS: Lessons From the First Epidemic of the 21st Century

A Collaborative Analysis With Outside Experts (U)

This assessment was prepared by the Office of Transnational Issues. Comments and queries are welcome and may be directed to the Chief, Strategic Assessments Group, OTI, on (703) 874-0527 or 70549 secure. (U)

SARS: Lessons From the First Epidemic of the 21st Century
A Collaborative Analysis With Outside Experts (U)

Key Findings (U)

Had SARS (severe acute respiratory syndrome) been even moderately more contagious, it probably could not have been contained, according to a panel of prominent experts convened by the Office of Transnational Issues' Strategic Assessments Group. They attributed the successful control of SARS to basic public health measures such as early case detection, quarantine, isolation, and personal protective measures; a basically effective global health surveillance system; a high level of commitment from affected governments; preparedness training already in place for biological warfare; and luck. These experts noted that:

- SARS has served as a sobering warning about the serious worldwide consequences that can occur at every level—public health, economic, and political—when unanticipated epidemics arise in a highly connected, fast-paced world.

- The ability to contain the next pandemic or to achieve global eradication of SARS remains uncertain. The disease could reemerge in fall or winter or move from its animal hosts to humans again at any time. (U)

The next pandemic is likely to be a new strain of influenza that only a few countries can effectively respond to by mobilizing production of existing drugs and vaccines. According to the panel, non-medical procedures will also be critical to containing the next epidemic and its effects:

- Honesty and openness from governments and public health officials is especially important. Without understating the risks or dismissing people's fears, officials with relevant expert knowledge should advise the public on what measures to follow.

- Official announcements will need to be bolstered by ongoing public education programs to avoid panic and help motivate first responders to take reasonable risks in treating the sick. (U)

Moreover, the panel warned that the economic impact of an epidemic involving more deaths, plant closures, and population dislocations could be more significant than the modest SARS-related losses experienced mainly by China, Hong Kong, and the global transportation industry.

- Psychological intangibles—fear, risk avoidance, and resilience—are not currently represented in economic models use to gauge the impact of epidemics. (U)

The panelists stressed that the US defenses against infectious disease outbreaks depended on the expertise and competence of local public health officials worldwide. They urged enhanced global vigilance for infectious disease outbreaks—particularly in China—and improved surveillance along US borders, ports-of-entry, and major population centers. (U)

Scope Note (U)

In June 2003, the CIA's Strategic Assessments Group (SAG) sponsored an unclassified workshop with experts from various health-related disciplines titled "SARS: Lessons Learned," held at the National Science Foundation. The group included leading virologists, epidemiologists, public health experts from academia and government, senior officials from WHO and the Centers for Disease Control and Prevention (CDC), and authorities in global public health, health communications, and economics. The meeting's objective was to extract valuable lessons learned to help prepare for future epidemics of new and reemergent infectious diseases. The group reviewed the SARS experience from its medical-scientific, public health, psychosocial and risk communications, economic, and political dimensions. This report conveys the lessons participants found most important for the containment of SARS and for dealing with future epidemics. (U)

SARS: Lessons From the First Epidemic of the 21st Century

A Collaborative Analysis With Outside Experts (U)

SARS as Case History (U)

SARS, the first pandemic of the 21st century, has been a bellwether of the disruptive global effects of unanticipated epidemics. It provides a valuable opportunity to assess worldwide capabilities to rapidly detect, identify, respond to, and contain a worldwide epidemic. (U)

The CIA's Strategic Assessments Group assembled a multidisciplinary panel of world-class experts for a workshop on 4 June 2003 at the National Science Foundation. Representatives from virology, epidemiology, public health, health communications, economics, and global public health policy assessed SARS as a "case history" to arrive at key conclusions and a report card for overall SARS response. Discussions centered on the medical-scientific, public health, psychosocial, economic, and political aspects of the epidemic. (U)

Medicine and Science (U)

In evaluating the medical-scientific aspects of the global SARS response, the panel reiterated the conclusions of two recent reports, National Intelligence Estimate NIE 99-17D (UNCLASSIFIED), *The Global Infectious Disease Threat and Its Implications for the United States*, January 2000, and the March 2003 report from the Institute of Medicine (IOM) titled "Microbial Threats to Health: Emergence, Detection, and Response," by warning that the SARS outbreak is part of a recurring pattern of emergence of new infectious diseases.

- Indeed, SARS may presage far worse epidemics. Given the rapidity and ease with which today's intercontinental travel and trade help spread diseases and the poor public health infrastructure in many parts of the world, this should be a warning to all regions (see figure 1).
- Several panelists indicated they remain most concerned about another major worldwide influenza pandemic; previous patterns of such events suggest that the next serious outbreak is long overdue. (U)

"You've heard of the film, 'The Perfect Storm'. If SARS was a very, very bad microbial storm, the perfect microbial storm is yet to come; and it will come. have no doubt."

Both the NIE and IOM reports state that over 20 new or reemerging infectious diseases have been identified in the last 25 years, including HIV/AIDS, West Nile and Nipah viruses, and Hanta virus pulmonary syndrome, and that specific factors—all integral to "modern life"—are responsible for their emergence (see figure 2). These include:

- Microbial adaptation and change.
- Human susceptibility to infection.
- Population growth and changes in demographics.
- Inadequate and deteriorating public health infrastructure.
- Misuse of antibiotics and other antimicrobial agents.
- Urbanization and crowding, including juxtaposed human and animal habitats.
- Changing ecosystems.
- Fast-paced modern travel.
- Increased trade in and expanded markets for imported foods, animals, and plant products.
- Widespread existence of live animal markets. (U)

Figure 1
Forecast of World Inbound Tourism in 2020, by Region (U)

World tourist travel is predicted to increase by 2020, thus increasing the potential for the global spread of infectious disease.

International Tourism Arrivals by Tourist-Receiving Region

	Base Year *(million)*	Forecasts *(million)*		Average Annual Growth Rate *(percent)*	Market Share *(percent)*	
	1995	2010	2020	1995-2020	1995	2020
World	**565.4**	**1,006.4**	**1,561.1**	**4.1**	**100**	**100**
Africa	20.2	47.0	77.3	5.5	3.6	5.0
Americas	108.9	190.4	282.3	3.9	19.3	18.1
East Asia and the Pacific	81.4	195.2	397.2	6.5	14.4	25.4
Europe	338.4	527.3	717.0	3.0	59.8	45.9
Middle East	12.4	35.9	68.5	7.1	2.2	4.4
South Asia	4.2	10.6	18.8	6.2	0.7	1.2
Intraregional[a]	464.1	790.9	1,183.3	3.8	82.1	75.8
Long-Haul[b]	101.3	215.5	377.9	5.4	17.9	24.2

[a]Includes arrivals where country of origin is not specified.
[b]Everything except intraregional travel.

Source: World Tourism Organization; data as of July 2000.

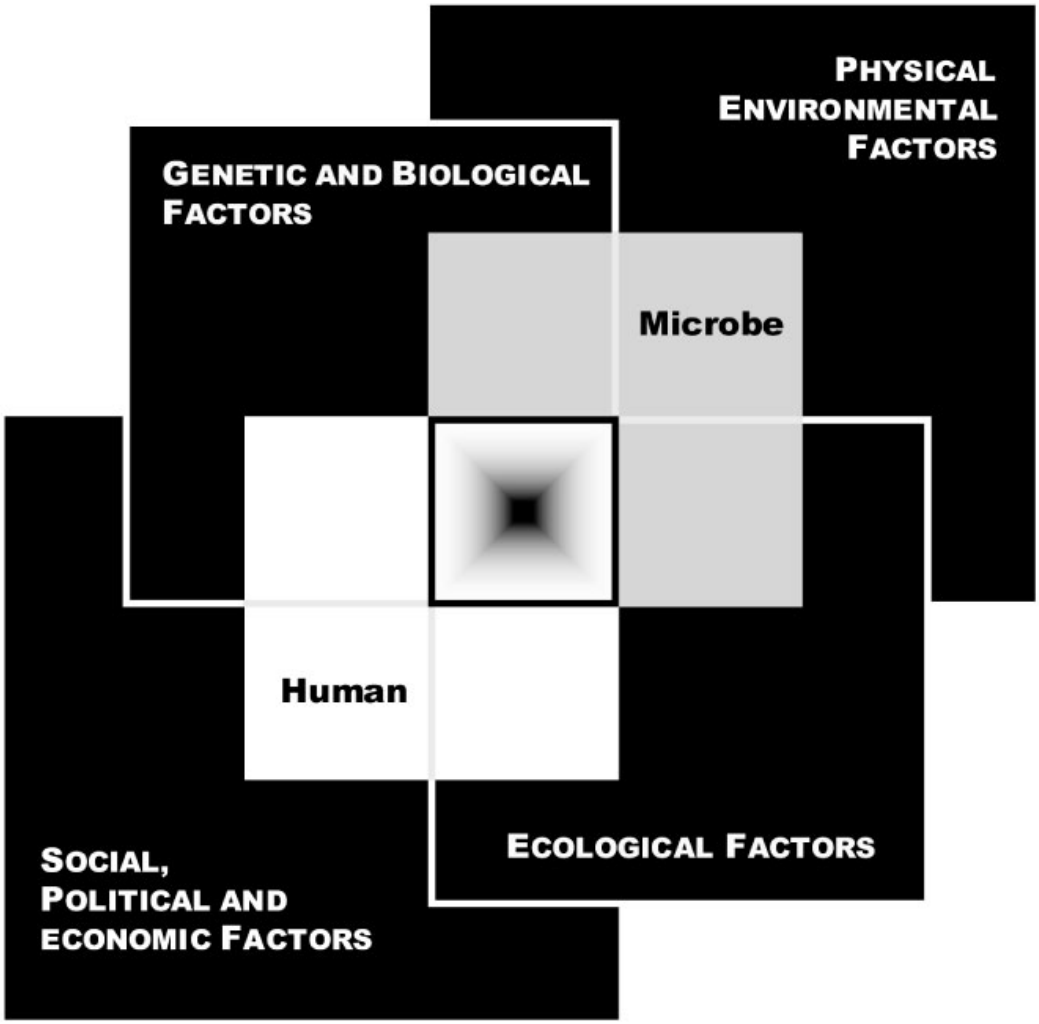
UNCLASSIFIED

OTI Production 102759AI 9-03

Control and influence over many of these factors lie outside the traditional public health domain, making it difficult to mitigate their impact and requiring a concerted, coordinated approach across various sectors to achieve greater control.

Researchers are starting to use sophisticated computer modeling and simulation capabilities to better understand the complex interdependencies among these factors. (U)

Figure 2
Emergence of an Infectious Disease: The Convergence Model (U)



At the center of the model is a box representing the convergence of factors leading to the emergence of an infectious disease. The white outer edges of the box represent what is known about the factors in emergence, and the black center represents what is not known. Interlocking with the center box are the two focal players in a microbial threat to health: the human and the microbe. The microbe-host interaction is influenced by the interlocking domains of the various factors in infectious disease emergence: genetic and biological factors; physical environmental factors; ecological factors; and social, political, and economic factors.

Reprinted with permission from "Microbial Threats to Health," by the National Academy of Sciences, 2003, courtesy of the National Academies Press, Washington, DC.

Panelists gave high marks to the following response efforts in the medical arena of SARS:

- WHO's network of 13 laboratories in 10 countries, which identified the SARS virus in two weeks and sequenced its entire genome in two more (compared with the two years it took to identify HIV as the cause of AIDS).

- Use of sophisticated information technology capabilities for communication, collaboration, and modeling to enhance international cooperation and better understand the phenomenology of the disease.

- An unprecedented level of information sharing among the world's scientific and medical communities. (U)

The panelists noted that data sharing by individual research groups is complicated by proprietary and publication concerns. Continued efforts to resolve these barriers will be necessary to sustain and improve response to future outbreaks. (U)

Weaknesses, or unresolved issues, according to panelists, included:

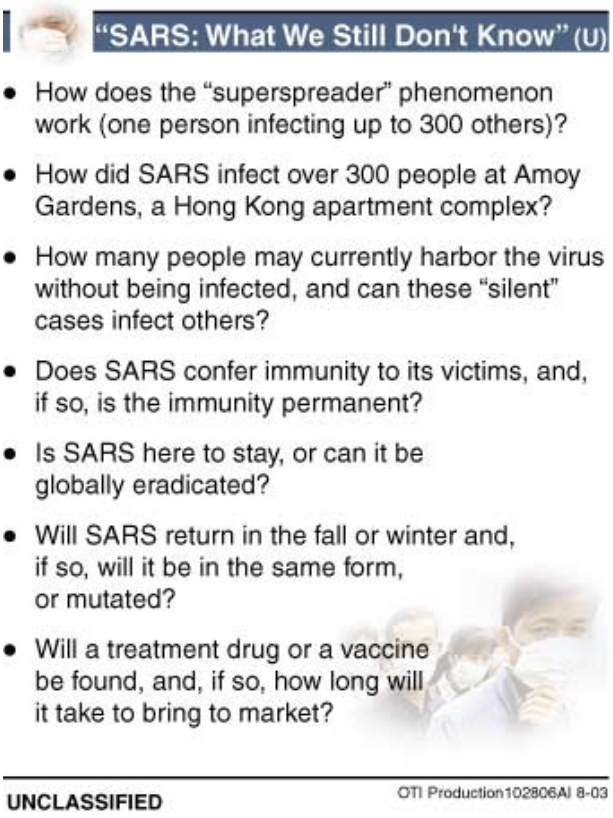
- Finding a rapid and accurate diagnostic test, especially to differentiate SARS symptoms from those of other respiratory illnesses like influenza.

- Developing successful treatment methods and a vaccine.

- Multiple factors—scientific, manufacturing, economic, and policy related—that complicate and prolong vaccine development.

- Difficulty in obtaining sera or viral samples from China.

- Understanding the SARS "superspreader" phenomenon, where a single infected individual can spread the virus to up to 300 others.



- Determining if SARS confers permanent immunity to those infected.

- Understanding the probability of mutation (SARS is an RNA virus, a type of virus that tends to mutate fairly frequently). (U)

Public Health Response: A Test of Readiness (U)

Our consultants noted the success of global surveillance in spotting this new illness and containing it in relatively rapid fashion. The WHO's Global Alert and Response Network and ProMed, a private reporting network, were instrumental in detecting the unusual outbreak of pneumonia which later was identified as SARS in Guangdong Province, China, in January 2003. In addition, the use of the

"I think that SARS will continue to persist in the world, which means we must remain vigilant, particularly in China."

Internet, e-mail, and teleconferencing greatly aided dissemination of information on patient treatment, control measures, and the course of the outbreak. (U)

Moreover, these experts observed that identification of a new or unusual disease depends on the astuteness of individual care providers and their willingness to accurately report findings to the appropriate public health authorities. This underscores the importance of public health training at the provider level, especially in developing countries where surveillance at the clinical level is weak. (U)

However, panelists claimed that tracking the spread of SARS was complicated by the inability to accurately and rapidly track travelers from affected areas because airlines do not routinely maintain flight manifests for more than 48 hours after completion of a flight. In addition, flight personnel had to be trained on the spot in how to screen passengers and detect possible SARS victims. The International Air Transport Association now plans to standardize these procedures to bring all carriers up to the same high standards for preventing the spread of epidemics. (U)

Panelists noted that early containment of SARS in the United States was greatly facilitated by existing bioterrorism preparedness measures, as officials from health, security, and public safety communicated with and, in many cases, trained together before the advent of the disease in the United States. One expert suggested that, given the inevitability of future epidemics, many of our bioterrorism preparedness efforts in the area of public health should be leveraged for application in times of naturally occurring epidemics. Such mutually reinforcing investments will bolster efforts to protect the nation from all forms of microbial threats. Should the next pandemic prove to be a strain of influenza, however, they warned that sufficient stockpiles of drugs or vaccine do not exist anywhere. (U)

The effective application and efficacy of quarantine and isolation proved a pleasant surprise to the public health community. Equally unexpected was the widespread acceptance of the need for these measures by the general public, panelists observed.

- Though 100 percent compliance with quarantine is not necessary to contain outbreaks, SARS-related compliance with quarantine orders was extremely high in most areas and almost always voluntary—a finding that bodes well for future outbreaks.

- However, people were more prone to comply with quarantine rules when there was no familial or financial hardship involved. Any future challenge to public health laws related to infectious disease outbreaks, such as those pertaining to quarantine or isolation, would be difficult to counter because of the antiquated nature of existing language and enforcement structures. (U)

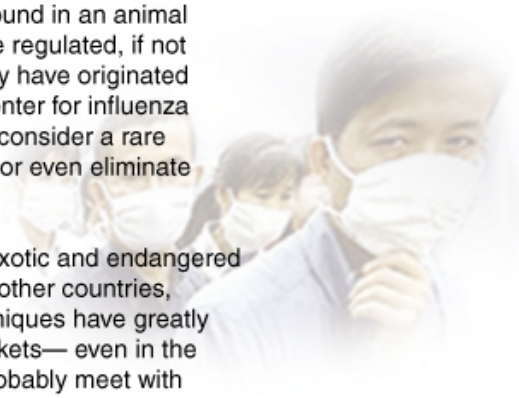
Polling and other data indicate that voluntary cooperation will be much greater in Western societies and may be a function of the degree of trust in governmental and public health officials. Experts cautioned that use of coercion by police to enforce quarantine rules should be a last resort. (U)

While participants lauded the overall rapid and effective mobilization of the international public health community, they did note that WHO was quickly overstretched in early phases of the epidemic, despite supplemental aid by the Centers for Disease Control and Prevention (CDC) and other organizations. One participant declared that WHO probably could not cope with a second public health-care crisis on top of SARS.

- This overload was reflected in the Toronto, Taiwan, and Hong Kong health-care systems, which were on the verge of breakdown when health-care workers were quarantined or refused to work in a potentially dangerous and exhausting environment, reported several experts.

Are Live Animal Markets the Culprit? (U)

One expert who visited China during the SARS epidemic cautioned that the country's live animal markets are notorious breeding grounds for emerging pathogens, especially "zoonotic" diseases (an infection found in an animal host that has been transmitted to humans) and should be regulated, if not eliminated entirely. Many have speculated that SARS may have originated in a public market in Guangzhou, China—called an epicenter for influenza pandemics—from civet cats, exotic animals the Chinese consider a rare delicacy. A recommendation to more stringently regulate or even eliminate these markets was echoed by several participants. (U)

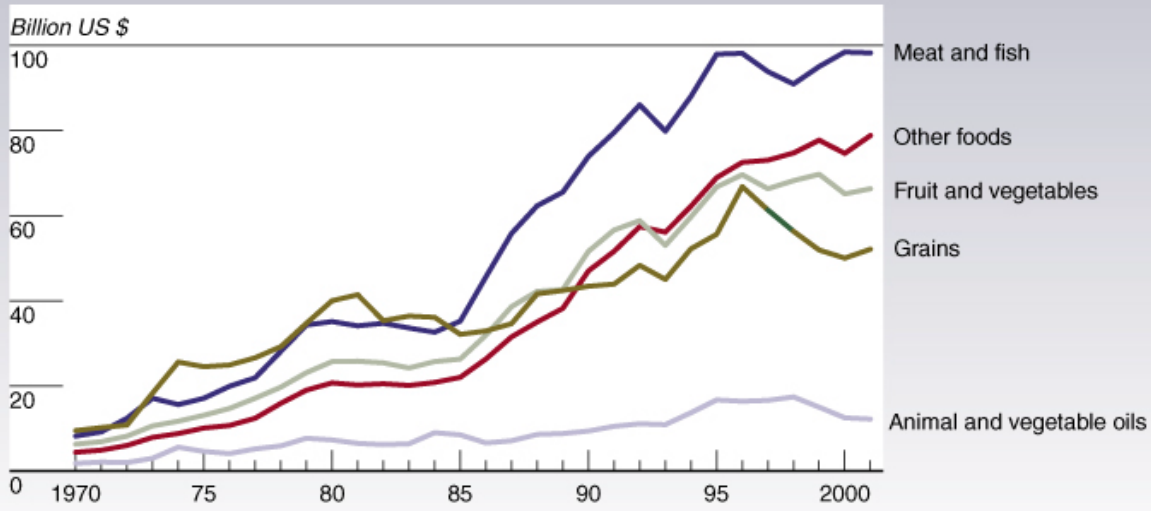


Live animal markets selling poultry, pigs, bush meat, or exotic and endangered animals are a long-standing tradition in China and many other countries, employing millions of people. Although refrigeration techniques have greatly reduced their number, any attempt to regulate these markets— even in the numerous live pig and poultry markets in the US—will probably meet with resistance. (U).

With regard to zoonotic infectious diseases, attendees also noted the health risks posed not only by animal husbandry but also by illegal traffic in animals and plants, which amounts to about $3 billion per year in the United States. For instance, in 1977, over 1.7 million reptiles were imported into the United States as pets. Scientists suspect the recent US cases of monkeypox in humans ultimately came from a Gambian rat imported as a pet. (U)

Global Trade in Agricultural Products (U)

The growth in agricultural trade brings a higher risk of cross-border transmission of infectious diseases.



Source: United Nations.

OTI Production 102757AI 7-03

UNCLASSIFIED

- Continued efforts by local health-care workers in a high-risk environment were facilitated when the workers were reassured their families would be cared for and when the press portrayed them to the public as heroes. Conversely, when these measures were not taken, workers were much less willing to put in the long hours and expose themselves to SARS. (U)

"WHO and CDC played a key role in keeping SARS largely contained, although there are still some enormous weaknesses internationally. For example if SARS emerges in Sub-Saharan Africa in the fall, the crisis will be bad."

The panel identified several SARS-related health-care shortcomings that should be addressed in the future:

- Lack of rapid and sustained access to data on travel routes used by passengers leaving infected areas.

- Lack of data about the global trade and movement of exotic animals, legal and illegal, and their interaction with humans.

- Fragmentary data about movement of people and goods in times of epidemics; currently this information is "stovepiped," making data correlation laborious and time consuming.

- Inadequate preparation for possible resurgence of SARS in the fall, especially if it spreads to areas with inadequate public health infrastructure, like Sub-Saharan Africa or rural China; if it occurs during flu season; or if it mutates to a more virulent form.

- Limited capability to recognize new diseases during initial observations by health-care providers, especially in developing countries. (U)

Communication Is Key to Managing the Public Reaction (U)

Participants concurred that understanding and managing the public's psychological and behavioral

reactions to an unexpected outbreak of infectious disease are integral to successful response and containment. A fearful and confused public, surrounded by speculation, rumor, and exaggerated media reports can lead to genuine panic—facilitating disease transmission and hindering quarantine efforts, in addition to augmenting economic impacts and social instability.

- They underlined the need for honesty and openness from governments and public health officials when communicating with the public. Without understating the risks involved or dismissing people's fears, officials with relevant expert knowledge should provide a clear indication of what measures should be followed. (U)

Several panelists stated that China's coverup of the epidemic for over two months put the entire world at risk. They attributed this to China's fear of potential negative economic and political fallout and its historical reticence to share information on what could be perceived as a weakness. They felt this problem could be mitigated in the future if the

international community worked with China to impart the benefits and methods of effective communication. They also spoke of the need to find incentives for governments, especially in developing countries, to rapidly communicate to the world any sign of an impending epidemic. (U)

With regard to the social and psychological dimension of SARS, panelists lauded the following actions:

- Immediate government commitment at the highest levels in Vietnam to promptly enact a SARS alert, response, and containment measures.
- Prompt agreement by Singapore leaders with WHO's travel restrictions to the country until SARS was under control, despite initially ineffective response efforts.
- CDC and WHO's ability to acknowledge their uncertainty about SARS and balance the good news with the bad, without sugarcoating the facts.
- Prompt reporting of first SARS cases in South Africa and India. (U)

Conversely, they gave low marks for poor handling of SARS vis-à-vis the public to:

- China for coverup or partial reporting of the disease for almost three months, endangering the world by its actions.
- Taiwan for the coverup of its second wave of cases in May 2003.
- Canada for its initial indignation over WHO's travel restrictions on Toronto. (U)

Participants had mixed reviews for media handling of the epidemic. They underlined the need for communication and public education programs to address these issues, to sustain the public's trust, and to ensure that people follow directions to help control the disease's spread. Both official spokespersons and the press played important roles. Especially important was the need to motivate health care workers and other first responders to expose themselves and their families to risks. (U)

Figure 3
World Airline Travel (U)

Percent change from 2002 to 2003 by month. Industry sources attribute the sharp decline in travel to the Iraq war as well as to SARS but believe the impact from SARS was greater.

	Percent Change World Travel	Percent Change Asia Pacific Travel
January	10.9	15.5
February	3.6	5.8
March	-7.0	-8.3
April	-17.0	-36.0
May	-21.0	-55.0
June	-11.8	-35.8

Source: World Tourism Barometer, June 2003.

UNCLASSIFIED

OTI Production 102761AI 9-03

Economic Impacts: Hard To Assess Accurately (U)

The panel's economists agreed that the impact of SARS at a macroeconomic level was most evident in Hong Kong and Singapore and in the transportation industry (see figure 3). Economic growth in the second quarter 2003 in Singapore and Hong Kong was about 5 percentage points less than had been expected prior to the outbreak. The impacts on growth in Taiwan and mainland China were less, probably between 1 and 2 percentage points for the quarter. Growth has apparently rebounded in all of these regions as the threat has diminished.

Figure 4
Economic Impact of Selected Infectious Disease Outbreaks, 1990-2000 (U)

Disease Outbreak	Country	Time Frame	Impact	Cost US$
E. Coli 0157	United States/Canada	Periodic	Food recall/destruction	NA
BSE	United Kingdom	1990-98	N/A	9 billion
Cholera	Peru	1991	Seafood-Export barriers	770 million
Plague	India	1995	NA	2 billion
Influenza A (H5N1)	Hong Kong	1997	Poultry destruction	22 million
Cholera	Tanzania	1998	NA	36 million
Nipah Virus	Malaysia	1999	Pig destruction	540 million
West Nile Virus	United States	1999	NA	400 million
Rift Valley Fever	Saudi Arabia	2000	Cattle destruction	NA

Source: World Health Organization, June 2003

UNCLASSIFIED

OTI Production 102808AI 8-03

- The panelists agreed that, if SARS returns and intensifies but remains concentrated on the mainland, China could be a big loser in the long run because foreign direct investment would be channeled elsewhere. The health experts were divided, however, over the likelihood that the disease could remain regionally confined.

- One panelist noted that, even if the disease remains concentrated in Asia, the region's importance to the global electronics industry could lead to global shortages and production disruptions.

- The economic impact of a wider epidemic—SARS or something else—involving more deaths, more plant closures, population dislocations, and panic could be very great (see figure 4). (U)

The panelists noted that psychological intangibles—especially negative factors such as fear and risk avoidance, but also resilience—are not represented in economic models. One panelist noted that a careful examination of Hong Kong economic data this year might clarify the channels of economic effects, helping predict the impact of future epidemics. (U)

SARS and Politics (U)

Discussion of the political aspects of SARS centered mainly on decisions taken by leaders that directly hindered response and containment efforts in the early phases of the epidemic, as in China and Taiwan. Both China and Taiwan eventually disclosed all pertinent information, issued reprisals to those involved in the coverup, and cooperated with international health authorities in SARS response, treatment, and control measures. Participants cited the following reasons for lack of transparency in the case of China:

- Fear of upsetting foreign investors and incurring sizable economic losses.

- Lack of communication and shared political goals between Chinese national and local bureaucracies.

- Cultural reticence to reveal information that could be perceived as a weakness.

- Lack of incentives for local governments to be more open.

"What Happens If a Country Overreacts to a Disease Outbreak?" (U)

Though China's initial coverup of the SARS epidemic was widely denounced, overreacting to an infectious disease outbreak can also have devastating consequences. For example, on 20 September 1994, a hospital in Surat, India, admitted seven patients with symptoms resembling pneumonia. Two soon died, and numerous others with similar symptoms were hospitalized in the region. Tests revealed the presence of bacteria resembling the plague, but they were not confirmed. A week later, the Indian Government declared an outbreak of the plague, setting in motion widespread panic, worldwide alarm, and major economic losses in India. Over half a million people fled the area, schools were closed, quarantine was imposed on a large-scale, and the government subjected all persons and cargo leaving the country to rigorous inspections. On 3 October, the government declared the epidemic under control, and a few weeks later WHO declared it to be over. (U)

On 7 October, WHO personnel arrived to investigate and reported that there had been an outbreak of plague limited to the town of Surat, India, with 52 deaths and 876 clinically confirmed cases; however, a subsequent report stated that, according to WHO bacteriological standards, not a single case of plague had occurred. Meanwhile, press releases had already exaggerated the disease's spread; within a week of initial reporting, most flights to and from India were stopped, and numerous countries placed an embargo on goods from India—all measures taken despite WHO's request that no travel or trade restrictions be imposed on India. (U)

In 1994, India's trade deficit was twice that of the previous year, and total economic losses from the outbreak were estimated to be over $2 billion. Though WHO and the Centers for Disease Control and Prevention stated publicly that world response to the Indian outbreak was excessive and unnecessary, this incident may have served to discourage other countries from prompt and open reporting. (U)

UNCLASSIFIED

OTI Production 102822ai 9-03

- Lack of an adequate national system of information management. (U)

The panelists also affirmed that the experience with SARS had enabled the Chinese Government to gain valuable crisis management experience in areas such as effective inter-governmental actions when forced to shut down parts of Beijing. They commented that with outside support, China could begin addressing some of its major public health problems such as inadequate rural health care, rapidly increasing rates of HIV infection, hazardous animal husbandry and trade practices, and live animal markets which could easily lead to another pandemic. Attendees underscored the need for political will on the part of all governments to sustain infectious disease preparedness and prevention efforts, even after the threat of SARS has subsided. (U)

"Attitudes towards epidemics and how they are dealt with on a national level often reflect cultural biases. In China, for example, the typical attitude towards problems like SARS is that, 'Well, it'll just go away'."

Preparing for the Next Pandemic (U)

Panelists stated that while the future course of SARS is uncertain—the disease could reappear in force in the fall or winter of 2003 and even coincide with global influenza season, making it difficult to differentiate these diseases' symptoms—a major influenza outbreak or other epidemic will undoubtedly arise eventually, and concrete steps are needed to be better prepared. (U)

Disease surveillance should be expanded beyond ports-of-entry into the heartlands and major population centers. The world was fortunate with SARS because the peak of transmissibility occurred after patients were visibly ill; this pattern is uncommon with other infectious diseases.

- In many developing countries, surveillance capacity is virtually non-existent and should be created before a disease takes hold in remote areas, spreading out of control and becoming a threat to other countries, including the United States. Financial, human, and training resources must be mobilized for these purposes. Both local and national health systems need more accurate data on hospital bed and morgue capacity and health care worker availability.

- Countries should ensure that they have sufficient flu drugs and vaccines and prepare to mobilize rapidly.

- Global efforts must be augmented to ensure the development of and access to infectious disease countermeasures, such as vaccines, antibiotics, and antisera. (U)

"We have to augment our detection capacity worldwide, and port-of-entry and border control are the most important areas. In the US, we don't *have* ***sufficient personnel monitoring these areas."***

Efforts such as these, the experts noted, would also serve in the event of a bioterrorism attack, citing as evidence the degree to which US bioterrorism preparedness facilitated US SARS response. US public health, security, and public safety personnel had trained, communicated, and worked together before SARS hit the United States. (U)

Implications for the United States (U)

Though the United States has the most advanced biomedical and public health capabilities in the world, including a fortified public health response "apparatus" due to recent bioterrorism preparedness efforts, its citizens, both at home and abroad, are still vulnerable to the threat of infectious disease. (U)

Though new pathogens may be more likely to emerge outside the United States, incoming flights of unmonitored cargo or smuggled exotic animals or immigrants pose considerable risk. "Pathogens don't carry passports," as one panelist remarked.

- Even if Washington managed to keep a foreign epidemic outside its borders, the multiple global

"ripple effects" of such an outbreak would be destabilizing, causing economic ramifications, anxiety, and the costly mobilization of US public health defenses. (U)

Regarding more specific implications for the United States, panelists noted the following:

- All of the means advocated by panelists for improved infectious disease response, such as improved surveillance methods, better data integration, and honest and open reporting of outbreaks fill a dual function, in that they can be leveraged to protect US citizens in the event of a bioweapons attack. As such, panelists urged that these SARS-related recommendations also be considered as part of future homeland defense preparedness efforts.

- Limited, labor-intensive methods, such as quarantine and isolation, worked well but can be implemented only once astute local clinicians recognize and report an anomaly. Hence, the United States must ensure adequate public health training for all "first responders" to infectious disease outbreaks. (U)