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APPROVED FOR RELEASE 1994  
CIA HISTORICAL REVIEW PROGRAM

2 July 96

TITLE: Intelligence Implications Of Disease

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VOLUME: 16 ISSUE: Spring YEAR: 1972

# STUDIES IN INTELLIGENCE



A collection of articles on the historical, operational, doctrinal, and theoretical aspects of intelligence.

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*Genesis of a project*

## INTELLIGENCE IMPLICATIONS OF DISEASE

Warren F. Carey and Myles Maxfield

Outbreaks of meningitis in China are not unusual, but the winter of 1966-1967 was something else again. It began innocently enough with a few reports of school closings in Canton. News of this routine precaution turned out to be the signal for one of the worst series of epidemics to hit China in many years, and the beginning of Project IMPACT. The concept of this project—forecasting disease problems and epidemics, and the assessment of their effects on military and civilian activities—had hardly scratched the surface of implementation in the CIA's Office of Scientific Intelligence (OSI); but the opportunity was present in December 1966. China was in turmoil as millions of its people were participating in the Great Cultural Revolution. The demonstrations, riots, large dislocations of the population and general chaos attendant on this revolution were, epidemiologically speaking, some of the best ingredients for a successful epidemic. On the other hand, this mass upheaval had no precedent, there was no up-to-date quantifiable disease information of any sort on China and the status of China's public health conditions and medical capabilities were uncertain to say the least.

In the early stages of the project there was even uncertainty over the actual cause for the school closings in China. Two disease names, meningitis and Japanese B encephalitis, were being cited in reports describing the same outbreak in Canton (some reports combined both diseases into one—"Japanese B meningitis"). The confusion of reporting terminology was soon clarified. Distinct but similar Chinese words were being used to describe the disease; but which disease was it? Encephalitis is a viral disease, transmitted by mosquitoes, and is usually associated with seasonal periodicity of occurrence in warm weather. With the advent of colder weather the mosquitoes die and the disease subsides. By contrast, meningitis is a bacterial disease, having in temperate climates its greatest prevalence during cooler weather; although large outbreaks have occurred in hot, dry climates. The disease is mainly one of children and young adults and is more common where living conditions are crowded, as in barracks and institutions. The key to the correct diagnosis was a

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report that cited the specific use of antibiotic nosedrops to treat encephalitis. The disease was thus remotely diagnosed as meningitis because antibiotics are not effective against viral encephalitis.

Identification of the etiology of this outbreak was crucial to our forecasting—meningitis had the greater potential for spreading rapidly from person to person by discharges from the nose and throat of infected persons. A significant point too was that the general pattern of behavior of meningitis epidemics tends markedly to repeat itself over a two to three year cycle. Thus it appeared that China was going to have an extended disease crisis. The first intelligence assessment was made in an OSI publication in January:

“It is becoming increasingly evident that Communist China is being confronted with a serious disease control problem. Factors suggest a breakdown of public health measures under the impact of mass movement of people, and perhaps the beginning of a series of new disease problems.”

Subsequent reports on the magnitude of the epidemic exceeded the prediction: travellers arriving in Hong Kong reported meningitis raging throughout Kwangtung Province, Radio Canton repeatedly advised people to guard against exposure to the disease—but it was too late. By mid-January, the epidemic in Canton was out of control, as supplies of sulfadiazine used in the prevention as well as the treatment of the disease became depleted. Red Guards took over the hospital facilities to care for their personnel only and some additional 900,000 visitors in Canton with the Cultural Exchange Program were exposed to meningitis. As the epidemic gained momentum, the entire public health infrastructure began to collapse.

A pattern of spread began to develop primarily to the north of Kwangtung Province. It became possible to predict a chronological sequence from one province to the next by tracing the movements of Red Guard units. In mid-January the epidemic was reported in Fu-ch'ing, Fukien Province (bordering Kwangtung Province on the northeast) and a Red Guard unit from Chi-mei diverted its march at this time to avoid Fu-ch'ing. At Ching-kang Shan, over 60,000 Red Guard each day were visiting the cradle of the Chinese Communist Revolution. Following an outbreak of the disease, the area was placed under quarantine. So it went—little being done to restrict mass movements until an outbreak occurred. In almost perfect order, meningitis infected one province after another all the way to the northeast Soviet border, and, as it struck, the movement and activities of Red Guards were hampered.

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At this point, OSI analysts knew the identity of the disease and where it was going. The question now was how to quantitatively estimate the impact on the Chinese population? The only reports received were general descriptions such as "many sick and dying"; "many dead"; "no drugs"; "hospitals overcrowded"; "quarantines"; and "the most serious thing that has happened since the liberation." An attempt was made to model the epidemic on paper based on an analysis of outbreaks that have occurred in Western countries. In such disease outbreaks a very high percentage of people are known to carry the infection and about one-half to one percent of these will become ill with the disease. Given the estimated Chinese population in the infected provinces and also the ones in the path of the epidemic, a range of about 2.5 to 5.0 million cases was arrived at. It was an impressive range but descriptive accounts of the epidemic still appeared to be in excess of calculations.

The medical situation was presented to analysts in the Office of Economic Research (OER) who were able to complement the analysis. Projected population figures showed that there were 130 million children in the 0-4 age group and in the 0-24 age group about 500 million. Well over half of China's population consisted of young people—the very ones most "at risk" in a meningitis epidemic. It became apparent that in addition to the actual epidemic problems, considerable alarm and panic was being generated which could impede control of the disease. Real and imagined symptoms would initiate frantic appeals for medical assistance and drugs, thereby disrupting internal distribution systems. OER analysts also indicated that in addition to producing sulfadiazine, China imports small amounts of this drug to meet the normal requirements. Overall, there existed a close balance between supply and demand. The amounts needed for treatment based on the calculated incidence rate was small in comparison to that needed to provide broad prophylactic protection to a large segment of the population.

State Department officials were advised of these new developments. It was clear that an excellent opportunity was present to help "reduce tensions" between the U.S. and Chinese Governments by rescinding the U.S. ban on exports of drugs and other medical supplies. A formal offer to assist China in controlling the epidemic was made by the State Department. China did not respond to this gesture. Nevertheless, by February, shortages of sulfadiazine began to occur, with reports of many Chinese resorting to ineffective traditional medicines and urgent calls for sulfadiazine being placed on higher echelons by local health units. Soon thereafter China solicited

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Western European and Asian pharmaceutical companies to make available substantial quantities of sulfadiazine. An accounting of the total amounts imported to China was attempted but much of the information was related to negotiations on purchase prices. At least several hundred metric tons were known to have been shipped between February and April to supplement China's internal production. Calculations based on chemoprophylactic dosage requirements (0.5 grams for children, 1.0 grams for adults each 12 hours for four doses) indicated that enough had been imported to protect about 100 million persons.

Chinese authorities broadcasted many appeals for "masses" of doctors and nurses to act in halting the contagious disease that was erupting and flowing from place to place. They then attributed the epidemic to medical workers who had not followed Chairman Mao's orders for the care of the country's 700 million persons. In retrospect, the "barefoot doctors" program to provide medical services and disease reporting in rural areas was a logical outgrowth of this massive epidemic. Whether the ensuing decline of the disease was due to the extensive use of sulfadiazine or to the normal decline of the epidemic cycle was never ascertained. It was followed by other predicted disease outbreaks (i.e., hepatitis, measles), and a recurrence of a much less severe meningitis epidemic in the winter of 1967-1968. As a postscript, China's failure to prevent and control the spread of diseases was viewed by the USSR as a fundamental weakness of the Chinese health services and the Soviet Ministry of Health abruptly rescinded the 1960 Sino-Soviet agreement on mutual abolition of vaccination requirements for travellers between these countries.

Project IMPACT went global in the summer of 1968 when a new strain of influenza rolled out of China and within a short period of time affected one out of every four persons in the world. The strain was not an unusually lethal one but it was only by chance that it was not. Again, various Agency sources provided the first indication of the beginning of this worldwide pandemic when the disease moved from China via travellers to Hong Kong in late June. An estimated 500,000 cases resulted in Hong Kong alone including 30 percent of the personnel at the American Embassy. At this time a unique opportunity was available to review statistical data on influenza (a program to computerize disease information to derive trends, cycles and predictions had already been initiated under a CIA Project called BLACKFLAG); the current epidemic in Hong Kong was causing the highest incidence since the first Asian Type A2 epidemic of 1957. While the epidemic appeared to be progressing in a new way, initial

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curiosity subsided when a laboratory report from Hong Kong identified the strain as the common Type A2 variety.

Soon, however, separate reports from laboratories in Japan, U.S., and England identified antigenic (genetic) changes in specimens isolated in Hong Kong. Investigators at the Japanese National Institute of Health identified the Hong Kong influenza virus as a new Asian Type A3. In the U.S., isolates of the disease showed a magnitude of antigenic dissimilarity which had not been observed previously with Type A2 specimens. The World Health Influenza Center in London also noted an antigenic shift from previous A2 strains. Summarized findings noted: "the emergence of a new strain occurs every 10-15 years and together with rapid transportation, and in the absence of specific vaccines, leads us to believe that the disease may cause extensive outbreaks throughout the world in the coming months." Medical members of the Scientific Intelligence Committee were informed of these developments. The Defense Intelligence Agency member, in turn, alerted representatives of the Army Surgeon General's Office and following their conference with scientists at the Communicable Disease Center, an overall emergency plan was approved. Orders were issued to produce as rapidly as possible, large quantities of vaccine to protect military, public health and Government personnel, and civilians in high risk categories. The World Health Organization in August officially designated the new virus strain as Hong Kong/A2/68.

The race began in many countries to manufacture vaccine before the disease struck. Data was available on earlier flu epidemics from which could be derived a projected pattern of an eastward movement across Europe enabling a forecast of this spread. The disease would be in the Soviet Union about February, 1969, some two to three months after it reached Europe. Thus, the Soviets had an estimated seven month lead time, and reports on their progress in manufacturing and distributing Hong Kong flu vaccine were anticipated. Instead, the Soviets continued to vaccinate the urban population (about 75 percent) with the standard A2 vaccine which was shown even in August, to have very little protective value against Hong Kong flu (this decision later was reported to be based on their inability to make the new vaccine in less than a year and their gamble that A2 vaccine would help). By late January, the flu was present in many Soviet cities and incidence rates began to increase sharply. Central Asian areas also were facing their worst winter in 90 years as record snow fall and cold temperatures helped to disrupt medical assistance plans. A massive educational campaign on TV and local news media

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was initiated in Soviet cities on how to avoid the disease. "Flu stations" were set up on corners to dispense cold remedies, but in the absence of specific prophylaxis, this effort was largely academic. Workers were given an extra day of sick leave in addition to the usual five days granted for flu cases. About 25 percent of the Moscow population was stricken (about 30 percent in Leningrad) and it was assumed that comparable figures occurred in most other population centers known to have been infected. The disease produced an ever widening ripple of effects on military and civilian activities (i.e., disruption of military training and industrial production schedules, which were costly in terms of sick relief payments, medical assistance, etc.). As the effects were felt in the Soviet Union they called the disease "Mao's flu." The direct and indirect cost of the epidemic was calculated to be several billion rubles.

Soviet health officials were criticized for their inept handling of the epidemic which caused considerable harm to the economy and to the health of the people. It caused five to six times as much illness as the total of all other infections. In response, health officials in the USSR recommended that they be freed from "petty supervision by dozens of incompetent authorities." The Soviet Medical Gazette in an excellent review of the controversy noted that in the absence of more specific preventive measures, scientists, doctors, and particularly the Soviet population, are still indebted to the practical health workers.

Influenza also reached Southeast Asia and project IMPACT was applied to forecast, and quantify the effects upon Viet Cong and North Vietnamese Army (VC/NVA) forces. A chronology of the times and locations of outbreaks was made from reports over the 1968-1970 period including any quantifiable figures on the rates of sickness and the frequency of VC/NVA requests for drugs and other medical supplies. There evolved a pattern which showed that the occurrence of influenza was a function of traffic density and personnel moving south from North Vietnam and coincided with the dry season when the bulk of all military supplies moved down the Ho Chi Minh Trail. Incapacitation rates ranged from about 40 to 70 percent and there was very good evidence that except for the isolation and quarantine of patients, no capability existed to specifically protect their military personnel by mass vaccinations. In December 1970, reports of outbreaks among VC/NVA forces in North Vietnam-Laos border area began to be noted with increased frequency—the stage was set for the beginning of the 1971 influenza epidemic there.

Staff personnel of the Special Assistant/Vietnam Affairs (SA/VA) were consulted, and together with their data on traffic routes, troop

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concentration, and locations of waystations (Binh Trams), made it possible to construct a model of the direction of the influenza epidemic. Tchepone was a key junction on the Communist roadnet which extends into Southern Laos—if Tchepone became infected, the disease would move from Binh Tram to Binh Tram north and south in Laos and back to North Vietnam (see Figure 2). In late December there were indications that the NVA 4th and 16th AAA Battalions at Tchepone had become infected. It was estimated that in the primary infected area of Quang Binh Province the epidemic peak would occur about 30 January 1971 and in the secondary infected area south of Tchepone the peak would be about mid-February 1971. An overall 50 percent infection rate was calculated for VC/NVA personnel in those areas and it was estimated that one-half of those infected would be incapable of performing normal duties for about a week.

A warning was sent to indigenous intelligence teams operating in Laos and Cambodia to take special precautions during these peak influenza periods. Inasmuch as vaccination was not practical, an anti-flu drug, amantadine HCL, which had been shown to help prevent the disease was recommended for these teams. During February 1971, South Vietnamese army units entered Laos and conducted extensive operations near Tchepone and other areas in and near the primary infectious zone. Unfortunately, these operations took place just after the predicted time for the peak incidence. Combat effectiveness of committed VC/NVA forces probably was affected to a lesser degree by the declining incidence rate of influenza during February. This aspect was, however, difficult to quantitate.

#### *The Future*

Keeping ahead of meningitis and influenza required an extended all-out effort to assess, in each case, the disease with its special conditions so that the epidemic consequences could be projected. Analysts in what appeared to be completely unrelated fields of interest, all had significant bits of data to support and extend the forecasts. Disease intelligence can provide an initiating and vital role in the more familiar political, military and economic categories of intelligence. Project IMPACT clearly indicated that nothing is more international than diseases which recognize no political boundaries and few natural ones. Human diseases move freely across national frontiers and spread as conditions permit from one area to another. Even in the case of diseases of plants and animals, there is little doubt today that pathogenic organisms themselves are either already globally distributed or can rapidly become so. The appearance of something new

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like Hong Kong influenza or the recent and costly spread of Venezuelan equine encephalomyelitis into the U.S. from Mexico can have demonstrable intelligence implications. Such disease events undoubtedly will occur in the future, and they will be much nastier to all facets of human activity.

Disease impact predictions require the retrieval and analysis of immense amounts of unclassified and classified data. This must be done in a very short time period if it is to be responsive to the current world disease situation. The techniques learned in working out the basic approaches on a few selected situations has led the Office of Scientific Intelligence to initiate an extensive effort to develop computer assisted working tools to retrieve the desired data quickly and to calculate statistical summaries and the probability of an epidemic spread. Mathematical models also are being designed for a multitude of epidemic diseases to give a rapid up-date and display capability. Project IMPACT depends upon such systems, but its best asset is still the cooperation of analysts in varied disciplines who help in the predictive processes.

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