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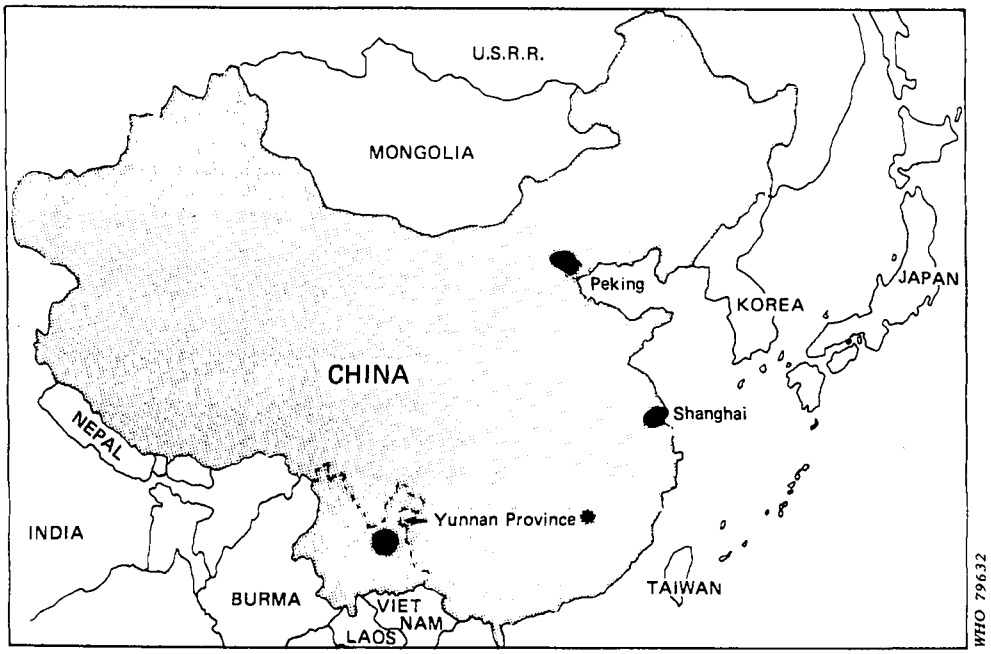
REPORT ON A VISIT TO THE PEOPLE'S REPUBLIC OF CHINA TO CONSIDER MATTERS RELATING TO THE CERTIFICATION OF SMALLPOX ERADICATION

14-30 July 1979

F. Fenner[1] and J.G. Breman[2]



✸ Province of last reported smallpox case in China, March 1960
■ Areas visited by team members

Note: Throughout this report the capital city of China is refered to as Peking rather than by its more recent spelling 'Beijing'.

[1]Director, Centre for Resource and Environmental Studies at The Australian National University and Chairman of the Global Commission for the Certification of Smallpox Eradication

[2]Medical Officer, Smallpox Eradication Unit, WHO, Geneva

TABLE OF CONTENTS

1. Conclusions

1.1 Endemic smallpox was eradicated in China in 1960, and there have been no imported cases since then.

1.1.1 A mass vaccination campaign launched in 1950 was effective because of good organization and widespread community participation.

1.1.2 Detailed records of this campaign have been kept at the provincial and municipal levels.

1.1.3 The Country Report prepared by the Ministry of Health is satisfactory.

1.2 Continuing surveillance for suspected smallpox is conducted efficiently.

1.2.1 The epidemic prevention service is widespread and penetrates into all parts of the community; adequate records of infectious diseases and of vaccinations are kept at all levels.

1.2.2 Outbreaks of smallpox would rapidly have come to the attention of health officials had they occurred, and would have been notified to higher levels and dealt with correctly.

1.2.3 Chickenpox is not a notifiable disease, but since the form of smallpox occurring in China was variola major there would have been little confusion between the two diseases.

2. Recommendation

The People's Republic of China should be certified free of smallpox by the Global Commission.

3. Objectives

Reviewing the situation in December 1978, the Global Commission concluded that it required more information before it could finally consider the certification of five countries. One of these was the People's Republic of China, of which the December 1978 Report said: "Considering the extensive health service network in China and its capability for effective surveillance, the Commission expressed confidence that smallpox transmission had been interrupted. However, it was believed that more substantial documentation would be of considerable importance to provide persuasive evidence of this fact to the world community. A more complete country report should be sought, if possible on a province-by-province basis. Useful information would include documentation of the last cases, an account of past smallpox eradication activities in individual provinces and current epidemiological surveillance activities indicating how suspected cases would be detected. Certification of freedom from smallpox was deferred pending receipt of additional information".

Negotiations for a visit were completed at the time of the World Health Assembly in May 1979, and an invitation was issued to Professor F. Fenner, as Chairman of the Global Commission, accompanied by Dr. J.G. Breman of the Smallpox Eradication Unit of WHO, to visit China during the second half of July. The objectives of the visit were:

3.1 To obtain a satisfactory, officially authorized Country Report on the Eradication of Smallpox in China.

3.2 To obtain an independent evaluation of the nature of the system for the surveillance and control of infectious diseases in China.

3.3 To examine and discuss the mode of storage of variola virus stocks retained in the laboratory in China.

3.4 To further establish links between WHO and some of the relevant scientists and administrators in China.

4. Itinerary and Persons Seen

Details are set out in Annex 1.

We were met at the airport by Dr. Xüe Gong-zhuo, Director of the Foreign Affairs Branch of the Ministry of Health, Dr. Wang Zhao-yuan, Director of the Hygiene and Anti-epidemic Services, Ministry of Health, Dr. Jiang Yü-tu, of the Institute for the Control of Biological Products, and administrative officials from the Ministry of Health. Shortly after arrival, a tentative itinerary was presented to us by Professor Xüe, and our comments requested. It involved visits to relevant institutions and discussions in Peking, a field trip to view part of the Peking municipality rural health service, and visits to Shanghai and Kunming, Yunnan Province, where detailed itineraries were being drawn up locally.

Dr. Jiang Yü-tu and Mr. Yang Hui from the National Serum and Vaccine Institute in Peking, accompanied us throughout the trip.

On the first working day, Dr. Wang Zhao-yuan read the China Country Report to us, an oral translation (and subsequently a written translation), being provided by Dr. Jiang. After brief discussions with Dr. Wang, Dr. Jiang, Dr. Li He-ming and Mr. Zhao Khai we agreed to meet a few days later for further discussions, and again just before our departure from China.

On Monday evening, Mr. Tan Yun-he, Vice-Minister of Health, hosted an official dinner.

During subsequent days in Peking, we visited the National Institute for Biological Preparations and the National Serum and Vaccine Institute, the Fangshan District Epidemiological Station, and its rural commune and production brigade epidemiological stations. We gave lectures on the global eradication of smallpox and on monkeypox, and showed the WHO film "The Search". During the latter part of this week, we again met Drs. Zhao, Li and Jiang, and discussed the Country Report.

In Shanghai we were hosted by Dr. Xü Wei, Vice-Director of the Municipal Epidemiological Station. We visited the offices and laboratories of the Municipal and district and lower level community Epidemiological Stations, the Quarantine Station, the Shanghai Vaccine and Serum Institute and the First Shanghai Medical College. We gave the same series of lectures as in Peking to the Shanghai Branch of the Microbiological Society.

Our arrival in Kunming was delayed one day by rain. Dr. Fu Kwei-chen, Chief of the Anti-Epidemic Department, looked after us. By working on Sunday morning, we were able to visit the Provincial and Municipal Epidemiological Stations, a rural health unit, the Institute for Biology (where poliovaccine is manufactured), and visited urban and rural schools, ranging from kindergarten to middle-school, where we participated in vaccination scar and facial pock mark surveys. Since the last cases of smallpox in China occurred in this province, we discussed the smallpox eradication there at length with provincial health officials.

We returned to Peking on Sunday 29 July, and on 30 July, again discussed the Country Report with Drs. Zhao, Li and Jiang. We finalized our report on Monday 30 July. Dr. Breman returned to Geneva with both reports that evening; Professor Fenner returned to Australia the following day.

5. Provision of Health Services and Infectious Diseases Control

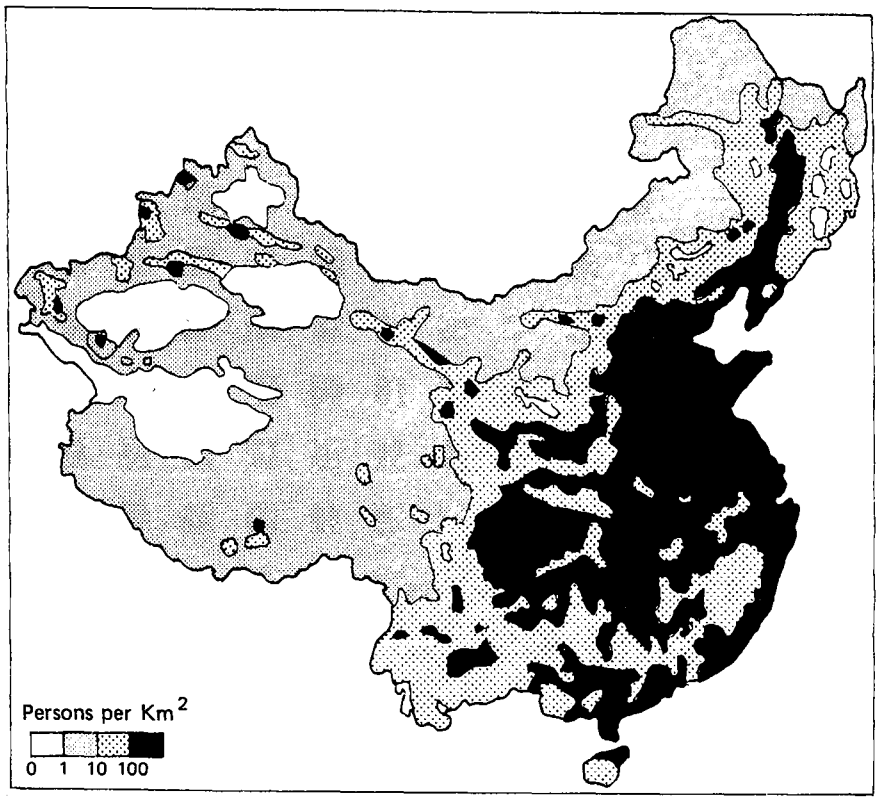
5.1 The Health Delivery System

The current population of China is estimated at 975.2 million, of which the majority lives in the three great river basins of eastern China. The mountains and deserts of western China are sparsely populated (Figure 1).

The administrative divisions of the country consist of 22 provinces, 5 autonomous regions and 3 centrally administered cities (Figure 2 and Table 1).

FIG. 1

POPULATION DENSITY



The comparative levels of administration in urban and rural areas are as follows:

Urban	Rural
Municipality (up to 14,000,000 persons)	Province or autonomous region
District (200,000 - 900,000)	County
Neighbourhood or street (40,000 - 80,000)	Commune
Residents committee (1,000 - 8,000)	Production brigade
Group (50 - 150)	Production team

Figure 2

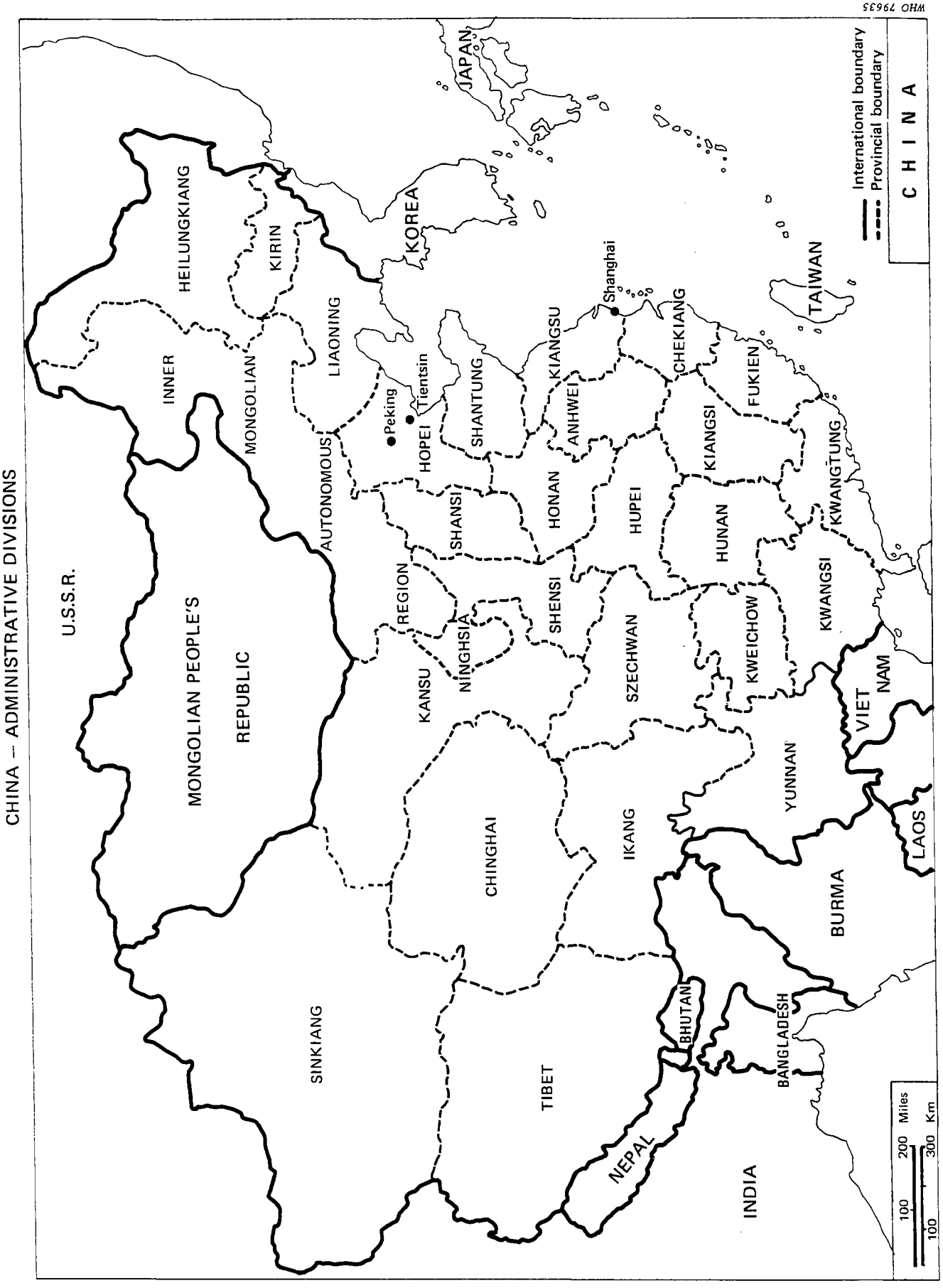

CHINA — ADMINISTRATIVE DIVISIONS
WHO 79635
U.S.S.R.
MONGOLIAN PEOPLE'S REPUBLIC
INNER MONGOLIAN AUTONOMOUS REGION
HEILUNGKIANG
KIRIN
LIAONING
HOPEI
Peking
Tientsin
SHANTUNG
KIANGSU
Shanghai
ANHWEI
CHEKIANG
FUKIEN
TAIWAN
KOREA
JAPAN
SHANSI
HONAN
HUPEI
HUNAN
KIANGSI
KWANGTUNG
KWANGSI
SHENSI
NINGHSIA
KANSU
SZECHWAN
KWEICHOW
YUNNAN
VIET NAM
LAOS
BURMA
CHINGHAI
IKANG
SINKIANG
TIBET
BHUTAN
NEPAL
INDIA
BANGLADESH
International boundary
Provincial boundary
C H I N A
100 200 Miles
100 300 Km

TABLE 1

Administrative Divisions and Population of The People's Republic of China, 1970 [a]

Divisions	Capital	Estimated 1970 population (in millions)
Provinces		
Anhwei	Hofei	39
Chekiang	Hangchow	31
Fukien	Foochow	18
Heilungkiang	Harbin	25
Honan	Chengchow	55
Hopei	Shihkiachwang	46
Hunan	Changsha	41
Hupei	Wuchang	35
Kansu	Lanchow	16
Kiangsi	Nanchang	25
Kiangsu	Nanking	51
Kirin	Changchun	21
Kwangtung	Kwangchow (Canton)	40
Kweichow	Kweiyang	20
Liaoning	Shenyang (Mukden)	29
Shansi	Taiyuan	20
Shantung	Tsinan	60
Shensi	Sian	22
Szechwan	Chengtu	75
Tsinghai	Sining	2.5
Yunnan	Kunming	24
Taiwan		
Autonomous Regions		
Inner Mongolia	Huhehot	9
Kwangsi (Chuang)	Nanning	25
Ningsia (Hui)	Yinchwan	2.5
Sinkiang (Uigur)	Urumchi	10
Tibet	Lhasa	1.5
Centrally Administered Cities		
Peking		7 [b]
Shanghai		10 [b]
Tientsin		4
Estimated Total		765 [c]

[a] Adapted from Sidel, V.W. and Sidel R, Serve the People: Observations on Medicine in the People's Republic of China, Beacon Press, Boston, 1974

[b] These estimates include the population of the rural areas under the jurisdiction of the central city.

[c] Current population estimate 975.2 million.

All health-related activities appeared to be an integral and accessible part of daily life and community development; the providers of curative and preventive medicine live in the localities they serve. Each municipality, province or autonomous region has a multi-tiered health organization which parallels the administrative structure as shown.

Numbers of health personnel and hospital beds are indicated in the country report. The ratios of these to the population are as follows:

Doctors (traditional and western)	1 per 1,620 population
Paramedical staff (excluding "barefoot doctors")	1 per 680 population
"Barefoot doctors"	1 per 2,300 population
Hospital beds	1 per 512 population

In urban and rural areas, there are hospitals and "polyclinics" with specialist medical, surgical, dental and laboratory services down to, and including, the neighbourhood or commune level.

"Polyclinics" and dispensaries are located at lower levels within residential areas, at pre-school nurseries (for children aged 2-3½ years) and kindergarten (3½-7 years), schools, factories, etc. These were adequately staffed and amply supplied with equipment and drugs. In rural areas, the famed "barefoot doctors", with support from other paramedical staff, provide first line health care to persons within their own production units. These teams and brigades use western medicines and also have facilities for growing, preparing and giving traditional concoctions and treatments. Doctors from higher levels come frequently to peripheral health stations to consult on difficult problems and participate in continuing training of staff.

The preventive services are given priority, especially at the peripheral level where health workers usually perform treatment and public health functions. At the municipality-province and neighbourhood-commune levels, there are "hygiene and anti-epidemic" control units. They have the following duties:

- reporting, investigation and control of infectious diseases
- vaccination
- environmental health
- food and water hygiene
- family planning
- health education, nutrition
- occupational health.

Each health unit appeared to have some autonomy in planning and executing the local health programme. Citizens from the community participate vigorously in assuring that streets are kept clean, that the elderly are kept physically and intellectually active and that infectious diseases are promptly and completely notified and controlled. This is part of a national "patriotic health movement" first aimed at eliminating the four "pests" (flies, mosquitos, rats and sparrows - later replaced by bedbugs), but which has been extended to include the maintenance of a high standard of food, water and environmental sanitation.

International quarantine activities are conducted in municipalities and other areas needing this service. Of these, surveillance and vaccination have had utmost priority since liberation.

5.2 Infectious Disease Control

As mentioned above, immunization programmes against preventable diseases have been given high priority. Immunization records are kept at the local health unit for each child who is registered shortly after birth. Children are given the following vaccines: smallpox, BCG, measles, DPT and oral polio. In certain areas, Japanese B encephalitis, mengingococcal (type A) and TAB are also given. The vaccination cards (example Annex 2A), and records which we saw in all areas visited, were well kept. Epidemiologic data was clearly presented and understood by the health staff. Careful planning, organization and execution marked the vaccination programmes in the areas we visited. Campaign success was most often measured by the number of vaccinations given compared to the known target population.

The effectiveness of the health delivery system can be measured best by a decrease in disease incidence. While earlier national data were not available for comparison, there was a marked decrease in all diseases preventable by vaccines for the 1951-1978 period in the areas visited. Measles and poliomyelitis were still present and constituting a problem in the most distant rural zones, but more important health problems were dysentery and viral hepatitis. These and other diseases were approached by standard control methods, buttressed by an intensive health education programme.

5.3 Infectious Diseases Surveillance

Reporting of communicable diseases is done at all health units down to the production brigades to which "barefoot doctors" are attached. An example of the organization of the reporting system is given in Annex 2B. Class I diseases, including smallpox, cholera and plague, require immediate notification to the next highest level (within 6 hours in a municipality and 12 hours elsewhere), and immediate investigation (example Annex 2C). Special regulations are distributed throughout the country concerning the manner in which these diseases are handled. Class II diseases (i.e. other reportable infectious diseases) must be reported within 12 hours in a municipality or within 24 hours elsewhere. Summary reports of cases of diseases seen are reported frequently (apparently daily in municipalities and every 5-10 days elsewhere). These merit investigation by personnel of the anti-epidemic stations at the neighbourhood or commune level. Chickenpox is not a reportable disease.

For example, if a child develops gastroenteritis or measles, or an adult, hepatitis, a card will be filled out at the local treatment centre. The neighbourhood or commune epidemic control staff will investigate the cases and conduct contact tracing, take laboratory specimens and give treatment and vaccinations as indicated, and assist with disinfection procedures if appropriate.

A monthly summary of infectious diseases is prepared according to a standard format (example Annex 2D).

Information appears to move up to the district level quite rapidly. Feedback of epidemiological information to the periphery was stated to occur in Shanghai municipality, but not in Peking. In Yunnan, an excellent feedback system existed. At the provincial, municipality and district levels, there is a monthly "Infectious Diseases Bulletin" giving the total cases of reported diseases, comparison with the previous month and comparison with the same month in the previous year. Cross notification to neighbouring provinces and to areas where cases originate was practised in Shanghai and Yunnan. Negative reporting is included on the monthly report form sent by the commune to the district level. It was difficult to assess how promptly or completely information from municipalities, provinces and autonomous regions was passed to the national level or how this information was exploited.

The epidemiological data appeared to be relatively complete in the places visited, because of the good coverage by health personnel, utilization of services by the people and attention to record keeping. It was not possible to assess the quality of diagnosis. The data at and below the province and especially district levels are used to plan epidemiological studies and control programmes. There appeared to be no shortage of vaccines, drugs or other materials needed for the control of infectious diseases.

Medical personnel learn about smallpox when they study vaccines and vaccination. If a suspect case of smallpox (variola major) occurred, it would be promptly detected in almost all areas. The quarantine service uses a special surveillance and vaccination form.

Although chickenpox is not reportable, it appears to be a mild disease of childhood, and is not a public health problem. In one nursery in Shanghai, chickenpox was routinely recorded on the childrens' health cards but not reported to higher levels. Variola minor would undoubtedly cause more difficulty and could conceivably spread through two or three generations before detection and laboratory confirmation. At present the vaccination coverage is so high, and the reporting system so sensitive, that containment would be prompt once detected. One anecdote reported at the Yunnan epidemiological station laboratory underscored the sensitivity of the system. A refugee from Vietnam was evaluated in March 1979 for suspect smallpox. Inoculation of CAM and rabbit cornea were negative. The clinical and negative laboratory findings supported the diagnosis of chickenpox. There is probably variation in effectiveness of surveillance systems in different provinces due to geography, population density and communications. However, as the same general administrative and health structure exist everywhere, along with a high level of awareness of prevention, smallpox would not go undetected.

More detailed reports on visits to Fangshan District Health Department near Peking, to Dou Dian Commune of Fangshan District, Cao Yang neighbourhood in urban Shanghai, Luwan District Epidemic Prevention Station in urban Shanghai, school clinics in Western Hill District, Yunnan and Daguan Kindergarten, Kunming City and Yunnan Province are presented in Annex 3 to substantiate the points made here.

6. The Smallpox Eradication Campaign in China

The organization of the campaign is described in the China Country Report and the Special Report from Yunnan Province (document numbers: WHO/SE/79.142 and SME/79.10); some further observations are presented.

The scheme of operation of the 1950 Smallpox Eradication Campaign was developed by the National Ministry of Health and comprised a massive propaganda campaign to enlist the support of the whole population (a "Mass Patriotic Health Movement"), organization of production and distribution of vaccine from five Vaccine Institutes located in various parts of the country, the mobilization and training of vaccinators and an intensive effort to achieve universal vaccination, mostly during the year 1951. The scheme involved measures to control the possible spread of smallpox during travel of persons within China, both by railroad and by sea or river. Examples of those measures are given below under Shanghai Municipality.

The mass vaccination campaigns and other measures were eventually successful in controlling smallpox and the last foci of the disease were reported in 1960 in border districts in Yunnan Province. No smallpox has been reported anywhere in China since then.

The smallpox-free status of the country has been maintained through continued surveillance and control activities. Vaccination of all newborn children has continued to be compulsory.

Until 1978 mandatory mass revaccination of the whole population was conducted on a six yearly cycle, although this interval has now been somewhat extended. The system for ensuring supplies of potent vaccine and for carrying out vaccination appears to be very efficient.

The surveillance system for infectious diseases has been outlined in this report, and is described in the China Country Report. We had no way, in the time available, of determining directly how effectively the system worked in remote rural areas, but it is our impression that the dictum "Prevention First" is, and has always been, the major guiding force for the health system of the whole country. Public health and preventive medicine appeared to us to enjoy a degree of respect and a status found in few other countries.

The details of the smallpox eradication campaigns in each province, autonomous region and municipality differed somewhat. We were able to investigate in some detail what happened in the Shanghai Municipality and in Yunnan Province. In both places, extremely detailed information is held by the local Epidemiological Stations. Some of that information is summarized below.

Shanghai Municipality

We discussed the Shanghai campaign at the Municipal Epidemiological Station, the Luwan District Epidemiological Station and also at the Quarantine Station.

The incidence of smallpox and the numbers of deaths by months for the years 1940 through 1951 is shown in Table 2. It is likely that cases and deaths were grossly under-reported up to 1951; in 1951 registration of the causes of death was improved, and demonstrates that cases were still greatly under-reported.

Shortly after the promulgation of the regulation on mass vaccination in October 1950, a severe epidemic of smallpox occurred in Shanghai, from December 1950 until July 1951, when the last case in the municipality was recorded. Preparations for the mass vaccination campaign were begun in October 1950, with launching of the Mass Patriotic Health Movement and training of vaccinators, who comprised 6,944 persons with some medical training, organized in 1,836 mobile teams. Liquid vaccine was supplied by the Vaccine and Serum Institute of Shanghai.

In 1951, among a population of 5,333,036 persons, 6,891,128 vaccinations, including vaccination of travellers to the area, were performed. The actual vaccination coverage rate in the population of Shanghai was believed to be about 95%. The data from Luwan district revealed the same picture on a smaller scale; 442,762 vaccinations were carried out among the 398,262 persons living in the district.

Quarantine Service: part of the national plan for the mass vaccination campaign was to prevent the movement of smallpox cases, or persons incubating smallpox, around the country. For this purpose, special "Internal" Vaccination Certificates were developed and demanded of all travellers moving outside their home towns by public transport. The work of the Quarantine Service, which organized this programme in Shanghai, was particularly important, as not only was Shanghai the country's main communications centre, but a severe epidemic of smallpox occurred there during the height of the campaign in early 1951.

There was at the time little international travel through Shanghai, and the Quarantine Service was organized to cope with the following groups: travellers by boat to elsewhere in China, travellers by train and the persons who lived in boats in the Huangpu and adjacent rivers. With boat travellers, ships' crews were mobilized to assist the campaign by propaganda and by forming "health groups" among them. Crew members were urged to report all cases of smallpox, among passengers or crew. An elaborate system was developed for supervising the issue of Internal Vaccination Certificates for both boat and train travellers within China, with facilities for immediate vaccination if necessary.

Among the boat-dwellers, a total of 76,221 vaccinations were performed in 1951. Nine cases of smallpox were discovered on 5 boats - all case contacts were vaccinated and no other cases occurred. Among travellers and boat crews, 785,321 persons were vaccinated. Out of 3,576 boats that left Shanghai in 1951, 7 cases of smallpox were detected among passengers before boarding and 28 after boarding. No cases originating in Shanghai occurred in other parts of China. In the first four months of 1951, 72 cases of smallpox and 4 cases of chickenpox were detected among intending train travellers.

This "internal quarantine", facilitated by extensive community participation, played an important part in limiting the continuing spread of smallpox in China in 1951, and considerably accelerated the achievement of eradication.

TABLE 2

Cases and Deaths of Smallpox in Shanghai from 1940 - 1951 by months

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1940	cases	4	5	1	5	3	5	-	-	-	-	-	1	24
	death	-	2	-	1	1	1	-	-	-	-	-	1	6
1941	cases	12	6	3	4	13	8	11	4	1	5	8	17	92
	death	2	1	1	1	7	4	5	2	-	2	-	2	27
1942	cases	11	5	19	3	7	4	1	-	-	-	-	2	52
	death	5	1	6	2	2	-	1	-	-	-	-	-	17
1943	cases	1	1	6	4	4	2	-	-	1	-	-	-	19
	death	-	1	1	3	1	-	-	-	1	-	-	-	7
1944	cases	4	5	15	14	22	19	5	4	1	4	3	8	104
	death	2	2	5	2	4	6	4	-	-	-	-	-	25
1945	cases	18	11	12	19	19	7	2	-	1	-	7	20	116
	death	11	5	7	8	4	4	3	-	-	-	1	5	48
1946	cases	90	101	179	120	105	18	7	1	1	2	12	55	691
	death	11	13	37	20	21	4	2	-	-	-	-	7	115
1947	cases	121	165	373	488	458	210	76	14	8	4	34	166	2,117
	death	25	30	87	95	74	41	15	3	4	2	7	54	437
1948	cases	361	494	547	411	273	130	59	16	4	2	1	12	2,310
	death	81	117	160	92	52	32	17	3	4	2	1	2	563
1949	cases	21	43	47	54	38	18	9	10	1	1	-	-	242
	death	8	17	15	14	14	5	4	1	1	-	-	-	79
1950	cases	2	18	62	56	40	69	50	12	9	26	67	516	927
	death	-	1	8	9	12	9	28	31	24	24	52	87	285
1951	cases	958	646	722	325	55	18	10	-	-	-	-	-	2,734
	death	159	233	495	508	375	120	53	53	-	-	-	-	2,015

Yunnan Province

Yunnan is a province in the southwest of China, with a population (in 1978) of about 30 million. It is of particular interest in the smallpox eradication programme because the last outbreak of smallpox, and the last imported case, both occurred in this province.

The overall strategy in the province of Yunnan followed the pattern established in the national directive of October 12, 1950. Vaccine was provided by the Institute for Biological Products in Kunming, until 1953, when the National Vaccine and Serum Institute of Chengtu (Szechwan province) assumed that responsibility. The mass vaccination campaign led to a rapid fall in the incidence of smallpox, with only 3 cases being reported in 1956. In 1957, an outbreak with 30 cases and 2 deaths was initiated in Yong Shan in Suijiang district because of the activities of a local variolator. This was successfully contained; more serious were the outbreaks in several sub-districts along the Burma border, as described in the Country Report and Special Report from Yunnan Province (document numbers WHO/SE/79.142 and SME/79.10)

As detailed in these reports, the proportion of the population of this area vaccinated between 1952 and 1958 varied from 8% to 17%. In October 1959, an intensified vaccination campaign was effected through house-to-house visits by members of an 85-person strong team sent from Kunming, the provincial headquarters, and the vaccination rate rose to 99%. This and other control measures led to rapid control of the outbreak. Control has been maintained by revaccinating all individuals in the border areas every 3 years, instead of every six years as in the rest of China.

Comment on Smallpox in the Autonomous Region of Tibet

A total of 16 cases of smallpox were reported from Tibet in 1960. Detailed information on these cases was not available at the time of our visit. The area became an autonomous region in 1965, and since that time, health services, including communicable disease control, have been developed similar to those operating throughout China. The area is very sparsely populated; although it is one of the largest of the 30 administrative divisions in the country, it contains only around 0.2% of the population. It is separated from the neighbouring countries by the high Himalayan mountain chain. The Chinese health authorities clearly stated that there had been no indication of smallpox having occurred in Tibet since 1960.

7. Smallpox Vaccine Production

Since mass vaccination was the main method of eradication of smallpox in China, we enquired into several aspects of the provision of vaccine. In addition to the information given in the official report, we made several other observations.

7.1 Production Facilities

There are currently six National Serum and Vaccine Institutes under the direct control of the Ministry of Health (with somewhat different names in different places): one in each of the six larger "regions" of China. They are :

Location	Region served	Current smallpox vaccine production
Peking, in Peking Municipality	Northern Region	Tissue culture, some lyophilized
Shanghai, in Shanghai Municipality	Eastern Region	None since 1967
Wuhan, in Hupei Province	Middle and South Region	Calf and tissue culture, some lyophilized
Changchun, in Kirin Province	Northeastern Region	Calf and tissue culture
Chengtu, in Szechwan Province	Southwestern Region	Calf vaccine
Lanchow, in Kansu Province	Northwestern Region	Calf vaccine

In addition, there are three small institutes that are controlled at the provincial level, but which may contribute vaccines regionally (e.g. the Eastern Region now gets its smallpox vaccine from the Ji-an Institute in Kiangsi Province):

Location	Current smallpox vaccine production
Ji-an, in Kiangsi Province	Calf vaccine
Canton, in Kwantong Province	Calf vaccine
Chengchow, Hunan Province	Calf vaccine

When the first mass vaccination campaign was launched in October 1950 and through to 1953, it was a matter of great difficulty to produce enough vaccine; five institutes then contributed: Peking, Shanghai, Dairen (later closed), Kunming (later ceased to be a Vaccine Institute) and Lanchow. The former Kunming Vaccine Institute in Yunnan Province now operates under the Academy of Medical Sciences; it produces the greater majority of the polio vaccine used in China.

7.2 Vaccine Used

The most widely used vaccine is the "Temple of Heaven" strain, which is said to have been obtained as follows: in 1926, pus from a smallpox patient was passed three times in monkeys, then 5 times in rabbits (skin/testes), 3 times in calf skin, 1-2 times in rabbit skin and 1-3 passages in calf skin. Tissue culture seed virus was obtained by 1-3 passages of this material in chick embryo fibroblasts.

Initially, all institutes used calf lymph "Temple of Heaven" strain of vaccine, usually treated with 1% ether to reduce bacterial contamination. Variations occurred later. For example, in Shanghai, a USSR strain was used between 1954-1959. However, it allegedly produced more severe reactions (at vaccination site, and fever) than the "Temple of Heaven" strain, and its use was discontinued in 1959.

Some institutes (e.g. Peking) began using tissue culture vaccine (chick embryo fibroblasts) in about 1970; some still continue to use calf lymph. In 1970 an attenuated strain (G-9) was selected by testing plaque-purified "Temple of Heaven" strains in children and selecting for slight local lesions. This strain produces smaller pocks on the CAM than the parental strain. This has been used experimentally in several million primary vaccinations, but has not yet replaced the standard "Temple of Heaven" vaccine.

7.3 Vaccine Potency and Stability

Potency has been tested by different methods at different places and times. Shanghai (up to 1967, when production ceased there) used scarification of guinea pig cornea; Peking at first used CAM and later plaque haemadsorption tests. The potency of vaccine now in use is said to be equivalent to the WHO standard.

Liquid vaccine (now suspended in 5% protease-peptide) was used for all early work and is still the most widely used formulation. It is dispensed in capillaries (10 doses/capillary), with 10 capillaries in a container (expiry time - 3 months at 4°C). Tests showed stability for 7 days at 37°. Lyophilized virus is now produced at Peking and Wuhan Institutes for use in border regions, and is dispensed in 25 dose ampoules. It is claimed that observed take rates after primary vaccinations were always about 95% or better (Table 3).

TABLE 3

Primary Smallpox Vaccination Success Rate [a]

China, 1959-1965

Year	No. of vaccinees observed	Vaccination successful (vaccinees)	
		No	%
1959	20	20	100.00
1960	1526	1502	98.43
1961	162	154	95.06
1963	826	790	95.64
1964	1429	1429	99.79
1965	829	826	99.64

[a] This table represents an example of much information available on the recording of vaccination success rates.

7.4 Complications of Vaccination

Apart from local lesions and fever, complications appear to have been very rare (Table 4). Encephalitis is almost unknown, even when the USSR strain was used, and vaccinia gangrenosa very rare. At first (in early mass campaigns and in vaccination of the newborn), few exceptions were made to mandatory vaccination. However, exceptions have been progressively increased as the risk of smallpox diminished. In Shanghai, these include acute infections (until 2 weeks after recovery), fever, eczema, hepatitis, severe dermatitis, diarrhoea, heart and kidney disease, blood dyscrasias and hyper-sensitivity. In 1963, about 2% of the susceptible population were not vaccinated because of contra-indications; now about 5% are not vaccinated.

In the mass campaign in Shanghai in 1963, there were 390 persons with complications among 3.93 million observed vaccinations and revaccinations, including 3 cases of encephalitis and 7 cases of vaccinia gangrenosa (Table 5). In 1965, a survey showed 9 serious complications among one million primary vaccinations, including one case of encephalitis.

7.5 General Comment on Vaccine Production

As mentioned in the Country Report, consultations were regularly held between the officers of the Vaccine Institutes and other public health officials who were concerned with smallpox vaccine production. We saw the Report of the 1974 conference; it was a large and detailed document (in Chinese) of 266 pages; from extracts translated for us (and submitted separately), it clearly contained a great deal of detailed information about many aspects of vaccine production and use.

TABLE 4

Observed Complications of Primary Smallpox Vaccination
China (1972-1978)

Production strains	Type of vaccine[a]	Observation sites	No of vaccinees	Complication				
				Generalized vaccinia	Progressive vaccinia	Post-vaccinial encephalitis	Purpura hemorrhagica	Multiform vesicular eruption
T	CC	Jinhua	308,140	0	0	0	0	1
	CL	Jinhua	87,779	0	0	0	0	0
		Zhanjiang	827,462	0	0	1	1	5
		Shantou	1,259,658	0	0	0	0	4
G-9	CC	Jinhua	388,364	0	0	0	0	0
	CL	Zhanjiang	898,718	0	0	1	0	1
		Shantou	1,129,258	0	0	0	0	3

[a] CC = Cell culture-grown vaccine CL = Calf Lymph vaccine

TABLE 5

Adverse Reactions Observed in Years when Mass Vaccination
Against Smallpox was Carried Out in Shanghai

		Year of Mass Vaccination		
		1963	1972	1978
Persons vaccinated		5,173,365	7,580,089	6,376,903
Percentage vaccinated (percent)		83.2	84.3	75.4
Individuals observed		3,937,013	5,138,348	6,376,903
Individuals abnormal reaction		390	247	179
Ratio abnormal reaction (percent)		9.9	4.81	2.80
Among these abnormal reactions	(Encephalitis	3 (no deaths) (0.08/100,000)	-	-
	(Gangrenosa	7 (0.18/100,000)	2 (0.04/100,000)	-

8. Variola Virus Stocks in China

On 17 July 1979 we visited the National Institute for the Control of Biological Products, and discussed variola virus stocks with Dr. Li He-ming, Dr. Wang Tai-jiang and Dr. Jiang Yü-tu. The matter was also discussed with other Ministry of Health officials upon our arrival and on the day of our departure.

8.1 Stocks Held

On three occasions - in 1961-62, 1966 and 1978, the Ministry of Health carried out enquiries throughout China and established that the only variola virus stocks held in the country were those located at the National Institute for the Control of Biological Products in Peking. These were said to consist of scab material and about 20 ampoules of CAM extract of each of two strains of variola virus - "Tibet 1956" and "Sinkiang 1956"; both strains are presumably from outbreaks of variola major.

8.2 Storage of Variola Virus Stocks

The virus stocks are stored in a double-locked metal box of which the Vice-Chief of the Virology Department of the Institute, holds the only key. This box is stored as the only item within a deep-freeze cabinet of which Dr. Wang Tai-jiang, Chief of the Virology Department of the Institute, holds the only key. The deep-freeze cabinet is located in a single-roomed locked building, which contains several other deep-freeze cabinets for type cultures of other kinds of virus.

8.3 Past Use of Variola Virus

The virus was last used in 1967, as control material for CAM lesions when investigating material from a suspected case of smallpox. Then, and previously, it was used in an air-locked room fitted with U.V. lights, and lysol was freely used for disinfection after work was completed. At that time, staff of that laboratory were revaccinated yearly; since work with variola virus ceased in 1967, all laboratory personnel have been revaccinated every six years (i.e. the same as the rest of the population in China).

8.4 Proposed Future Use of Variola Virus

The Chinese authorities plan to retain these strains of variola virus, but would not use it except within a maximum containment laboratory, the construction of which it is hoped will be started next year. When this was completed, the variola virus stocks would be stored there.

The reasons given for wishing to retain variola virus stocks were:

- China was a vast and populous country and needed to retain stocks for comparative diagnostic work if this was ever needed again.

- Chinese scientists were proposing to study the monkeys found in the south of the country to determine whether they harboured monkeypox virus. They might need the variola virus stocks for comparative studies.

8.5 Comment

The laboratory does not conform with WHO standards for facilities storing variola virus. As a repository only, the physical and administrative arrangements seem adequate for the particular situation, but the building housing the virus stocks, and the cabinet itself, would not offer maximum security against a determined saboteur.

The Chinese authorities indicated that they had decided to construct a maximum containment laboratory for use with dangerous pathogens (not just for smallpox); they were anxious to obtain WHO help (advice, support for visits to maximum containment facilities, and possibly the supply of some items of equipment such as high efficiency particulate air filters). The question of nominating the Chinese laboratory as a WHO Collaborating Laboratory for Pox Virus Research, though mentioned on earlier occasions, was not raised during our meeting.

9. Special Consideration for the Global Commission

In our view, there are no special considerations that should give rise to uncertainty in the minds of Commission members about the eradication of smallpox in China. The pockmark survey in Yunnan Province, near the Burma border, accessible even now only by horseback or foot, showed that many cases had occurred before 1960, but none after that date. Inner Mongolia, Tibet and Sinkiang are remote thinly-populated and vast regions where smallpox reportedly occurred in the mid-1950s, and, in Tibet, until 1960. Despite efforts made by the team, data on the last outbreak in Tibet in 1960 were not obtained. Such records are presumably unavailable due to the administrative situation in that area around 1960.

The same vaccination and surveillance system that we have observed elsewhere in the People's Republic of China operates in the autonomous regions, although it is probably less efficient than in more populous areas. However, cases of smallpox should have been detected had any occurred since 1960. Observations in a Nepal Smallpox Eradication Programme report on pockmarks in refugees from Tibet supports the claim that the last cases in Tibet occurred in about 1960.

It is on consideration of the data submitted in the Country Report and during our visit, and of the fact that certification of smallpox eradication requires only that there should have been no endemic smallpox detected during the previous two years despite sensitive surveillance, that the team recommends the certification of China.

Acknowledgements

We are grateful to the many officials of the Ministry of Health and administration in Peking and Shanghai, and in Yunnan Province, for the excellent assistance and cordial welcome given to us. Special gratitude goes to Professor Xüe Gong-zhuo, Chief, Bureau of Foreign Affairs of the Ministry of Health, Dr. Wang Zhao-yuan, Director, Hygiene and Anti-Epidemic Services, Dr. Li He-ming, Vice-Director, National Institute for the Control of Biological Products, Peking, Mr. Zhao Khai, Chief, Smallpox Vaccine Division, National Vaccine and Serum Institute, Peking, and Dr. Jiang Yü-tu, Epidemiologist, National Institute for the Control of Biologic Products, Peking, for helping to schedule our programme and prepare all required documents. Dr. Wu Jia-sheng, Epidemiologist, Epidemiological Station of Luwan District, urban Shanghai and Dr. Fu Kwei-chen, Chief, Anti-Epidemic Department, Health Bureau, Yunnan Province Bureau of Health, and their staff are thanked for assistance in their respective areas. Mr. Cao Yong-lin, Mr. Liu Wen-tang and Mr. Yang Hui were extremely helpful in coordinating our activities and serving as interpreters.

ANNEX 1

PLACES VISITED AND PERSONS CONTACTED IN THE PEOPLE'S REPUBLIC OF CHINA

15-20, 29-31 July 1979

Ministry of Health officials, Peking

Tan Yun-he	Vice Minister of Health
Xüe Gong-zhuo (Dr)	Chief, Bureau of Foreign Affairs
Wang Zhao-yuan (Dr)	Director, Hygiene and Anti-Epidemic Services
Zhang Yun-su (Dr)	Chief, Anti-Epidemic Bureau
Jiang Yü-tu (Dr)	Epidemiologist, National Institute for the Control of Biological Products
Wu Da-shou	Member of Bureau of Foreign Affairs (International Health Department)
Cao Yong-lin	Interpreter for Bureau of Foreign Affairs (International Health Department)
Liu Wen-tang	Liaison Officer from Bureau of Foreign Affairs (Liaison Department)
Yang Hui	Interpreter from National Vaccine and Serum Institute

17 July 1979

National Institute for the Control of Biological Products, Peking

Li He-ming (Dr)	Vice Director
Wang Tai-jiang (Dr)	Chief of Virology Department
Ao Jian	Vaccine Research Worker
Yan Zhi-lin	Smallpox Laboratory
Yü Yong-xin	Vice Chief of Virology Department, in charge of Japanese B. encephalitis vaccine

18 July 1979

Fangshan County Health Department, Peking Municipality

Liu Qing-kai (Dr)	Director, County Health Bureau
Cai Ting-yü (Dr)	Chief, Epidemic Prevention Service
Zheng Zhi-wei (Dr)	Deputy Chief, Epidemic Prevention Service

Dou Dian Commune, Hospital Director and staff

Dou Dian Production Brigade, officials and doctors

19 July 1979

National Vaccine and Serum Institute, Peking

Chen Zheng-ren	Director
Zhang Yi-hao (Dr)	Vice Director
Zhe Wen-yuan (Dr)	Chief, Epidemiology Division
Zhao Khai	Chief, Smallpox Vaccine Division
Cui Cheng-yi	Administrative Liaison Officer

20 July 1979

Chen Ning-qing (Dr)	Director, Institute of Epidemiology and Microbiology

21-25 July 1979

Hygiene and Anti-Epidemic Station of Shanghai

Wang Yi-xian (Dr)	Director of Health Bureau
Xü Wei (Dr)	Vice Director
Zhang Yü-nan	Chief Administrator
Tsau Chiang (Dr)	Chief Epidemiologist
Kong Lai-nei (Dr)	Epidemiologist
Soo Kong-ping	Epidemiologist
Yue Sin-kung	Bacteriologist

23 July 1979

First Medical College of Shanghai

Su De-long (Dr)	Vice President of College of Medical Sciences, Dean of School of Public Health
Lin Fei-qing (Dr)	Chairman, Department of Microbiology
Wen Yu-mei (Dr)	Department of Microbiology

24 July 1979

"New Village" in Cao Yang Neighbourhood, urban Shanghai

Zhu Feng-yun	Chief Administrator
Mao Shou-zhang (Dr)	Vice Director of "Street" hospital
Wang Ah-kang	Vice Director of "Street" hospital

Epidemiological Station of Luwan District, urban Shanghai

Ding Qiu-ming (Dr)	Vice Director and Chief Epidemiologist
Li Li-shi (Dr)	Epidemiologist
Wu Jia-sheng (Dr)	Epidemiologist

Shanghai Quarantine Station

Chen Chun-sheng (Dr)	Vice Director
Gong Sheng-guan	Health Inspector
Fang Zu-hong	Health Inspector
Lu Yuan	Health Inspector

25 July 1979

Shanghai Serum and Vaccine Institute

Wei Xi-hua (Dr)	Director
Zhang Qing (Dr)	Chief, Virology Department
He She-min	Chief, Production of Japanese B encephalitis vaccine
Chen Chi-hui	Chief, Production of Measles vaccine
Zhang Yü-hua	Biochemist
Chu Jia-yong	Bacteriologist
Chen Shon-yang	Administrator

27-29 July 1979

Yunnan Province Bureau of Health

Jiang Jia-zu (Dr)	Vice Director of Health Bureau
Fu Kwei-chen (Dr)	Chief, Anti-Epidemic Department, Health Bureau
Zheng Ling-cai (Dr)	Director, Epidemic Prevention Station (met in Shanghai)
Jiang Wei-zhang (Dr)	Vice Director, Epidemic Prevention Station
Li Ken-tao (Dr)	Epidemiologist, Epidemic Prevention Station
Chou Ching-lai (Dr)	Epidemiologist, Epidemic Prevention Station
Wang Shi-quei	Head Administrator, Epidemic Prevention Station
Peng Bo (Dr)	Director, Epidemiological Station, Kunming District

First Middle School of Kunming

Yang Zuo-yan	Principal (and teachers)
Shi Lian (Dr)	Physician
Zhang Hui-jie (Dr)	Physician

Li Ji Fang Primary School, Gao Quiao Village, Bi Ji Commune, Western Hill District, Principal and teachers

Clinic at Bi Ji Commune, Director and staff

Daguan Kindergarten, Kunming City

Wang Xin-lan	Director (and staff)
Lin Guang-quing (Dr)	Physician

28 July 1979

Institute of Medical Biology, Kunming

Gao Wen-jü (Dr)	Vice Director
Dong De-xiang (Dr)	Head, Poliomyelitis Vaccine Production Department
Zhao Mei (Dr)	Head, Poliomyelitis Vaccine Control Department
Liao De-fu (Dr)	Physician

29 July 1979

Laboratory staff of Epidemic Prevention Station, Yunnan

Shen Zi-zhong	Head, Radiological Monitoring Service
Tang Xia-min	Laboratory Technician
Yu Qi-chang (Dr)	Staff member
Jin Yong-nian	Head, Radiological Monitoring Service

Epidemiological Station, Kunming Municipality

Li Bieng-hui (Dr)	Head, Surveillance Department
Chen Yu-rong (Dr)	Epidemiologist, Hygiene Department
Chen Yan-quian	Head, Industrial Hygiene Department
Kang Kuo-yao	Head, Laboratory
Li Zong-pin	Head, Quarantine Department

Lectures and Films

20 July 1979	For Society of Microbiology in Peking (Chairman, Dr Chen Zheng-ren)
25 July 1979	For Society of Microbiology in Shanghai (Chairman, Dr Liu Fei Quing)

Full half-day sessions with lectures in English and translated, and WHO film "The Search":

F. Fenner - The Global Eradication of Smallpox
J.G. Breman - (1) Introduction to film
(2) Human Monkeypox

ANNEX 2A

VACCINATION CARD IN SHANGHAI MUNICIPALITY[a]

BCG Primary Inoculation (PI) | Smallpox Vaccination (P vaccination) | Pertussis whole course | DPT whole course | BCG (R No.1) | DPT Booster No.1 (B No.1) | Revaccination for Smallpox | DPT (B No.2) | Polio sugar-coated pills revaccination

BCG revaccination (R) | Polio sugar-coated pills | Polio sugar-coated pills

Group No.

Record of Vaccination for Children in Shanghai

Name ..... Sex ..... Date of birth year month day Place of birth .....

Name of parents ..... Occupation ..... Name of unit where parents work and address .....

Address of family District (county) ..... Street (commune, town) ..... Road (brigade) ..... Lane (team) No.

Name of nursery ..... Place District (county)

Name of nursery in which the child was transferred

*Date of transfer of card
*Date of receiving card
*Date of transfer of card
*Date of receiving card

		Date yr	mo	day	Method	Type of vaccine	Batch No.	Vaccinator's unit	Name of vaccinator	Tuberculin test Date	Result
BCG											
Primary inoculation						Lyo./Liquid					
Revaccination	1					Lyo./Liquid					
	2					Lyo./Liquid					

		Date yr	mo	day	Batch No.	Dosage	Vaccinator's unit	Name of vaccinator	Record of adverse reaction
DPT									
Whole course	1								
	2								
	3								
Booster	1								
	2								

	Date yr	mo	day	Batch No.	Vaccinator's unit	Name of vaccinator	Examination of reaction Date	Result	Record of adverse reaction
Smallpox									
Primary vaccination									
Not taken, repeat v.									
Revaccination									

	Date yr	mo	day	Type of virus	Batch No.	Vaccinator & his unit	Date yr	mo	day	Type of virus	Batch No.	Vaccinator & his unit
Polio												
Sugar-coated pills												
Sugar-coated pills												

	Date yr	mo	day	Batch No.	Dosage	Vaccinator & his unit	Booster dose	Date yr	mo	day	Batch No.	Dosage	Vaccinator & his unit
JBE													
Whole course	1												
	2												

	Date yr	mo	day	Batch No.	Dosage	Vaccinator & his unit	Booster dose	Date yr	mo	day	Batch No.	Dosage	Vaccinator & his unit
Meningococcal meningitis													
Whole course	1						1						
	2						2						
							3						

	Name of preparation	Date yr	mo	day	Batch No.	Dosage	Vaccinator's unit	Vaccinator	Reaction or immunity test result
Other vaccines (preparations)									

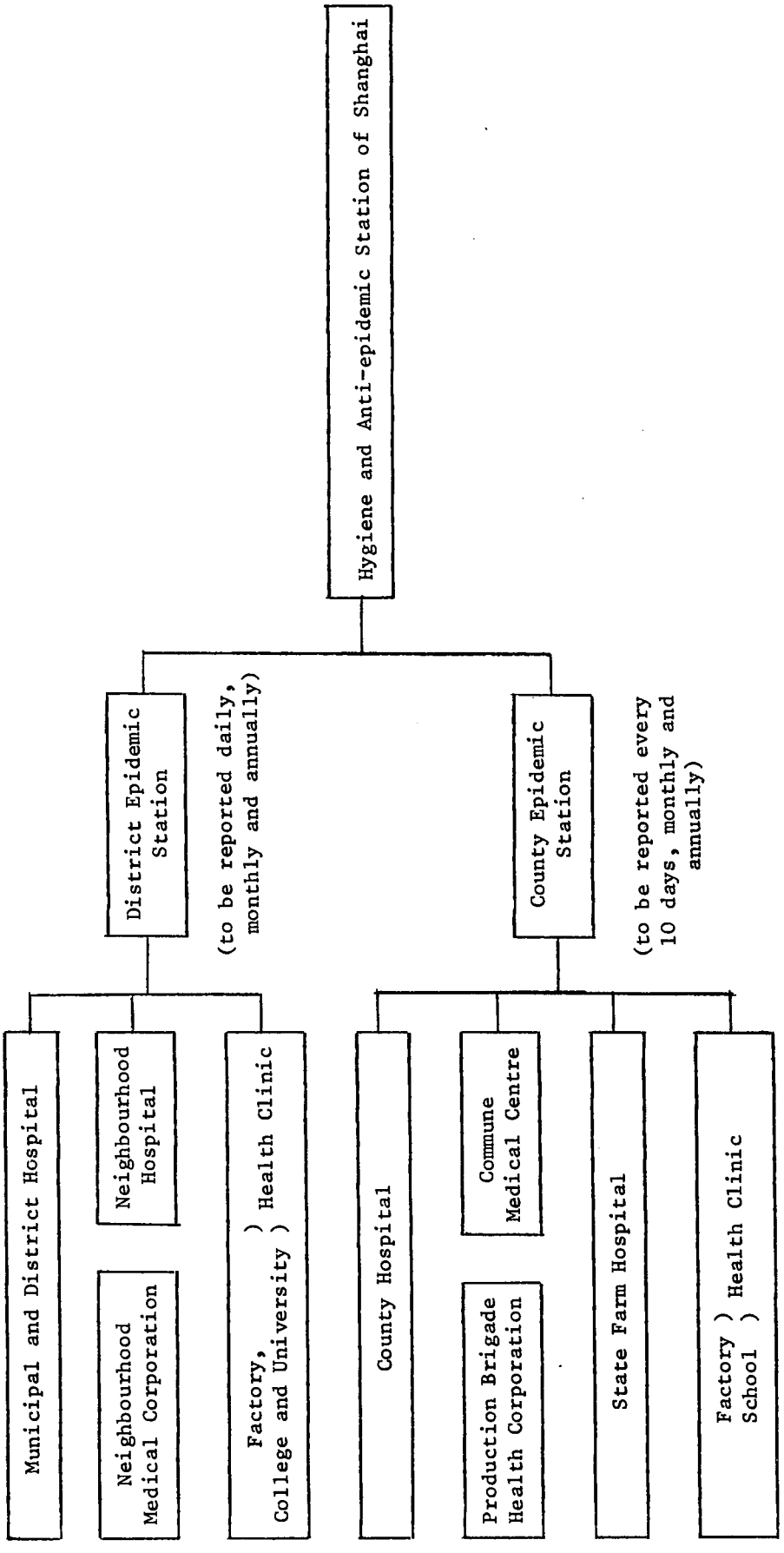
	Name	Date yr	mo	day	History of infectious diseases	Name of illness	Date of onset yr	mo	day
Contra-indications									

Note:

[a] Translated from Chinese

ANNEX 2B

COMMUNICABLE DISEASES REPORTING SYSTEM OF SHANGHAI MUNICIPALITY, 1979



ANNEX 2C

Annex 2C

NOTIFICATION CARD FOR INFECTIOUS DISEASES IN SHANGHAI MUNICIPALITY[a]

Outpatient No. .....

Hospital No. .....

Case Death Correction Discharge Case No. Neighbourhood No.

Name of the patient ..... Sex ..... Age year ..... month .....

Address ..... District (or county) .....

Occupation: labourer, farmer, fisherman, boatman, staff member, medical personnel, foodhandler, cook, nursery teacher, retired person, housewife, schoolchild, student (university, middle school), nursery child, other child, rest.

Name of the unit in which the patient is living/working/studying ..... Address .....

Parents' occupation ..... Address of the unit in which parents are working .....

Date of onset of present illness: year ..... month ..... day ..... Date came to see doctor .....

Place where patient became ill ..... Date came to Shanghai: year .... month ..... day ...

The patient was admitted to hospital/referred to another hospital/kept at home

Date of admission to hospital: year ..... month ..... day .... Date of discharge: year .... month ..... day ...

Condition at discharge: Recovered Not recovered Died (Date: year ..... month ..... day ....)

Sequalae or cause of death .....

Carrier state at time of discharge from hospital: Positive ... Negative ... Type of organism ..

Unit reporting ..... Name of individual reporting .....

Date of report: year ..... month ..... day .... Telephone No. .....

Diagnosis:

Plague	Poliomyelitis
Cholera	Typhus fever
Smallpox	Relapsing fever
Diphtheria	Acute viral hepatitis
Typhoid	Chronic persistent hepatitis or CAH
Paratyphoid A, B, C	Rabies
Bacillary dysentery	Brucellosis
Amoebic dysentery	Ancylostomiasis
Measles	Kala azar
Scarlet Fever	Filariasis
Schistosomiasis	Scrub typhus
Malaria	Haemorrhagic fever with renal syndrome
Pertussis	Tick-borne encephalitis
Anthrax	Influenza
Japanese B. encephalitis	Leptospirosis
Meningococcal meningitis	

Evidence for diagnosis: Clinical ..... Laboratory .....

Correction of the diagnosis: .....

Clinical features: .....

[a] Translated from Chinese

ANNEX 2D

MONTHLY ANALYSIS OF CASES (DEATHS) OF COMMUNICABLE DISEASES IN SHANGHAI MUNICIPALITY, 1979

Reported by .....

	Name of Disease	Total	Sex			Age					Occupation													
			Male	Female	Not clear	Under 1 year	1	over 60	not clear		Worker	Peasant	Fisherman	Staff	Medical Personnel	Food Handlers	Housewives	Primary schoolchildren	Middle school & College students	Kindergarten children	Other children	Retired persons	Others	Not clear
		(1)	(2)	(3)	(4)	(5)	(6)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)
Analysis for the current month	(1) Diphtheria (2) Total for Typhoid & Paratyphoid (3) Typhoid (4) Para A (5) Para B (6) Para C (7) Paratyphoids (unclassified)																							
	(8) Total for dysenteries (9) Bacillary dysentery (10) Amoebic dysentery																							
	(11) Measles (12) Scarlet Fever (13) Schistosomiasis (14) Malaria (15) Whooping Cough (16) B. Anthracis (17) Encephalitis (18) Cerebro Spinal Meningitis (19) Poliomyelitis																							
	(20) Acute Viral Hepatitis Total Male Female																							
	(21) Chronic Persistent Hepatitis (22) Brucellosis (23) Ancylostomiasis (24) Filariasis (25) Haemorrhagic Fever (26) Influenza (27) Leptospirosis (28) (29)																							
Corrections for the last month																								

ANNEX 3

VISITS TO HEALTH SERVICES

A. Fangshan District Health Department

Fangshan District is one of nine rural districts which, along with nine urban districts, comprise Peking municipality with its population of eight million people. The purpose of the visit was to observe health services in a more rural setting, the district health centre being about 30 km from Peking.

The population of the district is around 600 000 with 31 communes divided into 458 production brigades.

There are 38 medical institutions and the medical personnel in the district are divided as follows: 1310 technical workers, of whom 61 are surgeons, 267 other western-type doctors, 147 traditional doctors, 174 nurses, 462 health aides with higher schooling and the remainder are administrative and other paramedical workers. There are about 1900 "barefoot doctors" working at the production brigade and production team level. They are trained in both western and traditional methods for diagnosing and treating mild illness and referring more complicated cases to a higher level.

The county has 634 hospital beds (about one bed per 1000 population); 270 of these are in two major district hospitals and the others at the commune level. At the district level there is a school for training paramedical workers, a group for the control of pharmaceutical products, as well as an anti-epidemic and maternal child health service.

Every commune has a health station with an epidemic prevention and mother-child health service. There are 306 beds in the 31 commune "hospitals". Production brigades have cooperative medical health stations.

In the district we visited the anti-epidemic unit. There were 35 staff members including 10 epidemiologists and senior laboratory workers, 11 laboratory technicians and paramedics, nine less trained paramedical workers and five support personnel. There are divisions of epidemiology, environmental hygiene and laboratory services. The major activity of the unit is the prevention of acute infectious diseases. The principle of "prevention first" was applied particularly by attention to the following:

Control of water and sewerage: Tap water is available in 190 brigades and well water in 70 brigades; the remainder use surface water. Bacteriological and chemical testing of water is done periodically.

Surveillance of workers handling food and those at factories: The main concerns are enteric pathogens and job-related injuries.

Vaccination: Children receive free BCG, smallpox, polio, measles and DPT and Japanese B encephalitis vaccines. Vaccination is done at the brigade level. As refrigeration is not often available, planning is done so that the vaccines are brought in a thermos filled with ice and used within a few days.

Acute communicable disease control: Cholera, plague, smallpox, diphtheria, kala azar and relapsing fever have been eliminated. Polio, vivax malaria, pertussis and dysentery have decreased markedly. Measles incidence has decreased but it is still a problem. Main problems are hepatitis and pneumonia and to a lesser extent bacterial dysentery.

The smallpox eradication activities were discussed in some detail. Between 1950 and 1952 there was a mass vaccination programme. This was repeated in 1963 (following the epidemic in Moscow) and in 1970-1973 (one prolonged campaign). Between these campaigns newborns were vaccinated before six months of age (subsequently changed to 1 year and then 2 years of age). Revaccination of persons 6 to 55 years of age is done every six years. Since 1978 there has been a change in vaccination policy, as above for primary vaccinees, and for others the first revaccination is given at age 7-10 and the second at age 18-20. There is no compulsory revaccination for others. People cooperate fully with vaccination and return to the health station if there is no reaction. Health cards go with individuals if they move.

Assessment of the campaign was done by registration at the brigade level; children who did not have a record of vaccination were called and a sample of persons were checked for vaccination 'takes'. Contraindications to vaccination are considered to be infectious diseases (undiagnosed fever, diarrhoea, etc.), eczema and other severe dermatitis, allergies, blood dyscrasias, chronic diseases of the heart, kidney or liver, pregnancy and epilepsy. It was estimated that contraindications were found in only 2% of the population vaccinated in 1963. The only reaction noticed was local purpura.

Vital statistics and disease rates in the commune were as follows:

Year	Neonatal Mortality Rate[a]	Infant Mortality Rate[a]
1975	11.7	22.9
1976	13.6	22.3
1977	13.0	24.4
1978	12.7	19.6

Year	Crude Birth Rate[b]	Crude Death Rate[b]	Natural increase[b]
1964	40	15	25
1968	17	7	10

[a] per 1000 live births
[b] per 1000 population

Disease specific death rates (1978) per 100 000:

	Male	Female
Cardiovascular disease	221	221
Stroke	161	151
Cancer	71	49
Respiratory disease	76	59
Other infectious disease	61	48
Digestive tract disease	45	29

The vaccination schedule for children is as follows:

Vaccine	2 months	3-5ms	8ms	1 year	2 yrs	3 yrs	4 yrs	5 yrs	6 yrs	7 yrs	8 yrs
BCG	X										X
Smallpox				X							X
Poliomyelitis		X		X							X
Measles			X		X						
DPT		X						X	X		
Japanese B encephalitis (killed)		X		X	X		X				X

The incidence of infectious diseases has fallen markedly between 1965 and 1978; specific rates were available but we only obtained an index comparing these two years. Meningitis was 3% of the 1965 rate, poliomyelitis 4%, Japanese B encephalitis 5%, measles 10%, dysentery 25% and hepatitis 91%. Hepatitis is a continuing severe problem with "epidemics" in 1965, 1970 and 1973. Measles peaks every five years with a rate of 3.5 per 1000 persons in peak years. Malaria (F. vivax), has been almost completely eliminated since 1965. Since 1967 Japanese B encephalitis has remained about the same level with a small rise in 1974.

The laboratory at the district level does bacteriological analysis for: dysentery (Shigella flexneri, 2A and Salmonella typhosa recently isolated); total bacterial count and faecal coliforms in water; serological surveys for hepatitis B (haemagglutination); environmental examinations (zinc and sulphur in water, methyl benzene in air near factories).

Notifications of disease are sent every five days to Peking Municipality. If an outbreak occurs, such as dysentery, notification to a central level may occur more rapidly. Cross notification to other districts is not done.

B. Dou Dian Commune of Fangshan District

There are 12 production brigades with 19 800 people. A description of agricultural activities was given.

At the commune hospital there are 41 staff members; 11 western-style doctors, 16 traditional practitioners, eight paramedical workers and six administrators. There are 15 hospital beds, recently installed and not yet used. Specialists periodically visit the production brigades for the various sections which include surgery, internal medicine, obstetrics and gynaecology, dentistry, traditional medicine, radiology, laboratory the outpatient dispensary. Half the commune hospital doctors are helping production brigade cooperative centres at any time. Emergency appendectomies and hernias could be handled. The medical centre has been certified since 1970 by the municipality health authority. "Barefoot doctors" are trained for three to six months at this hospital, then given short refresher courses every year. Twelve production brigades were described as having cooperatives. Of the 63 barefoot doctors, 34 are women.

For care each member of the commune pays 1.5 yuan (US$1) per year and five fen (US$0.03) for an outpatient visit. Each production brigade grows, packages and dispenses their own traditional medicines. Barefoot doctors are trained in groups of 10 at the commune hospital and their skills are updated periodically. Six of the production brigades have running water, but most still use wells. Bleach is used to disinfect wells. A specially designated and trained individual picks up night soil, the exclusively used fertilizer.

Vaccination is done in the production brigade by barefoot doctors directed by the commune staff. Traditional methods of treatment are also used extensively; these include acupuncture and herbal remedies. Contraceptive methods and family planning propaganda is also given by the barefoot doctors.

A production brigade (350 hectares in size) at Dou Dian (same name as commune), was visited. It is one of the largest in the commune and consists of 4200 persons from 1018 families. Fourteen barefoot doctors, of whom eight are women who can act as midwives, and two trained midwives work in this brigade. Infectious diseases are reported every five days to the commune on a reporting card. One third of the commune staff is in the field daily to see patients with the barefoot doctors. Vaccines are kept in thermos flasks with ice and ordered only when immunizations are scheduled. Each brigade has one to two flasks.

The major medical problem was gastrointestinal disease (diarrhoea) in all age groups. Viral hepatitis was not stated to be a major problem. Chickenpox in adults was not seen. Zoster was seen, but infrequently.

The production brigade had a large facility for the production of medicinal plants and a small-scale pill-making factory next to the offices of the Health and Epidemiology Centre.

C. Cao Yang Neighbourhood in Urban Shanghai

The object of this visit was to see how health services operate in a densely populated urban setting. Cao Yang was established after liberation between 1949 and 1951 on an area previously covered with graveyards. Workers lived in shanty towns before 1949.

There are currently 80 000 persons from about 20 000 families living in 2 km^2. There are nine "lanes" (equivalent to production brigade in the rural setting) within the neighbourhood. Education is compulsory through high school. There are eight of each of the following: high schools, intermediate schools, primary schools, kindergartens and nurseries.

Textile mills provide the major employment in the area. There is an active social programme for retired (7000) and infirm persons. Free medical care is available at the factories for workers, their families and retired persons. Men retire at 60 and women at 50 or 55 if they are professionals.

Within the "street" there is a district general hospital and a neighbourhood hospital plus 16 health stations.

The first place visited was a nursery with 340 children, 2 to 3½ years, these are sons and daughters of factory workers. The cost was 2 yuan (US$1.50) per month plus a small amount for food. Two doctors work in a dispensary at the nursery each morning and provide a regular general health check of children. A complete examination of each child is performed on school entry and every three months. Complete records are maintained including development charts and vaccination status. Vaccination coverage is over 94% for BCG, smallpox, measles, DPT, poliomyelitis and Japanese B encephalitis. A few cards were seen and about 25 children were viewed. All had vaccination scars; none had pockmarks. All illnesses are recorded, mild chickenpox and mumps being most common infectious diseases. If a child is absent for two days there is a home visit. "Disinfection" of the home is done if infectious disease is present.

Rural villages are reported to have similar nurseries, however teachers would supervise health matters with doctors visiting periodically.

A visit was made to a "lane" health centre doing preventive work. The centre was responsible for 6900 persons from about 1600 families. One doctor appointed by the district and three paramedicals were present.

The main tasks handled were vaccination, family planning and "patriotic health" activities, i.e. environmental hygiene. Vaccination of children less than two years was a concern of this clinic and a well organized card system was seen. Smallpox vaccination was given and 'takes' were read. "Emergency" acupuncture was done for minor complaints.

At the neighbourhood "polyclinic" there were 38 doctors with speciality services as follows: internal medicine, surgery, obstetrics and gynaecology, ophthalmology, dentistry, physical therapy, radiology and laboratories doing ECGs and EEGs. This hospital cares for the neighbourhood population of 76 587 with the aid of the district hospital.

The epidemic prevention station is located at the polyclinic. They presented demographic information and data on dysentery, Japanese B encephalitis, meningitis, hepatitis, diphtheria, poliomyelitis and measles. The station receives reports of infectious diseases daily from peripheral units and reports daily to the district. Investigations are done by members of the prevention station who also help to "disinfect" the premises of patients. The station will also receive cross-notification of infections from other health units outside its jurisdiction and will act on these. Bacillary dysentery is the major problem in this unit and an investigation form was provided.

In sum, the work of this station was detection of cases, investigation, health education and disinfection.

We asked how venereal disease had been controlled. Prostitution was abolished after liberation and prostitutes were retrained and given jobs. All persons with positive serologic tests for syphilis were treated. In this way sexually transmitted diseases were claimed to be eliminated in China, even before smallpox eradication.

D. Luwan District Epidemic Prevention Station in Urban Shanghai

This station was established in 1950 when the population was about 400 000. The current population is about 344 000 due to some readjustment of administrative zones.

A description of smallpox eradication activities in 1950 and 1951 was given and is covered in the main text under "Shanghai Municipality" in section 6. Since July 1951 there have been no suspect cases. Severe chickenpox is not seen. Suspicious cases would probably come to dermatology services and they would notify the epidemic prevention station, however, this has not occurred. Teaching about smallpox (and other class I agents) still occurs when vaccination is discussed.

Vaccination "take" rates were assessed in 1963 (2.6% negative among 2362) and in 1978 (2.8% negative among 1048). Most of these were primary vaccinees but the "negatives" were said to occur in adults. In 1951 primary vaccinees comprised about 25% of those vaccinated and only 1.6% in 1978.

The laboratories were visited. Bacterial examinations were done for food handlers and contacts of patients with dysentery. Culture media was provided by the municipality laboratories. Influenza isolations were done from specimens taken at district health stations. Chemical analyses of water for lead, copper, zinc and chromium was done. Water in Shanghai is chlorinated and fluoridated. Air sampling is done at factories.

Screening for carcinoma of the cervix is done by a separate maternal-child health institute on a yearly basis for women over 30. Some specimens are collected at district and local levels.

Epidemiological information for a variety of infectious diseases was presented. Poliomyelitis was discussed in some detail. In 1956 the rate was about 40 cases per 100 000/year. Administration of Sabin type vaccine was begun in 1961 and the incidence dropped promptly. A "few cases" continued yearly to 1974. In 1977 there were no cases and one case in 1978, imported from another district. The vaccination (three doses) coverage rate is 90-95% for children. Coverage in other districts is not felt to be as high.

Measles data were presented from 1952-1978. Outbreaks occurred every two years before vaccination began in 1965; incidence rates then decreased promptly. In 1977, 34 cases per 100 000 population/year were reported. Currently 98% of the population has been vaccinated. A rise in mean age of cases has been observed; schoolchildren are currently involved and have mild disease, whereas preschool children were more affected previously. Rubella has been causing many cases diagnosed as measles. The epidemic prevention station has recently been investigating every measles case by serologic means. Booster doses of measles vaccine were felt to be needed in Shanghai and such a campaign was held in 1974-1975.

Diphtheria has been eliminated since 1974. In 1951 a very high incidence occurred; with mostly adults affected.

Tuberculosis is handled by the Institute for tuberculosis control. These institutes exist in each district. In 1952 the annual incidence rate was 246 cases per 100 000 and 12.6 cases per 100 000 population.

Deaths are registered at the district level. Autopsies are not routinely done.

4. The Daguan Kindergarten, Kunming City was visited. There were 140 children, 3-7 years who live in the school and are children of workers who visit them at weekends. There are 38 staff members: 21 teachers, two doctors and two nurses. The cost is about 15 yuan (US$10) per month for room and board. Most children have received all vaccinations when they arrive but this is checked by the medical staff. Major problems are mild respiratory illnesses. Chickenpox is seen and poses no difficulties in diagnosis.

About 80 children were seen by us. None had facial pockmarks.

5. Visits were made to the Provincial and Municipal Epidemiological Stations in Kunming, Yunnan Province. Yunnan Province has a population of about 30 000 000. The provincial station was established in 1953 when all such stations were officially established throughout China. These are totally supported by the government (not in part from vaccine sales or other incomes as occurs with vaccine and serum institutes; or from local health units which charge a very nominal fee for care).

Surveillance of epidemic disease is done in accordance with national regulations. Epidemiologic "research" is done at the same time as routine work.

The provincial station has two sections - hygiene and epidemic prevention. The hygiene section monitors food contamination, school health and environmental (water, air) and occupational pollutants (including radiological safety). There are also parasitology, health education, laboratory, administrative and political sections.

The epidemiological prevention section investigates and controls infectious diseases; there is a central laboratory. Planning and coordinating at the district level involves both sections. There are 146 epidemic prevention stations at the subregional and district level; 240 persons are employed, 70% are medically trained. Their stated goal is to help mobilize the people to participate in preventive health services.

In addition to doing investigations, personnel distribute 20 different products, including vaccines. Surveillance workers go routinely to restaurants, factories, grain and rice distribution centres, etc., to take samples for analysis. Training of lower level staff is an important provincial task. We visited the laboratory and administrative units. We discussed the following with knowledgeable staff members and viewed their equipment: background radiation, environmental health, occupational health and virology (a recent suspect case of smallpox from a Vietnamese refugee had been analysed). Our impression of these facilities was favourable.

The statistics unit at the municipality was extremely well organized and members showed us a variety of reporting forms, reports and feedback bulletins. Records of the last cases of smallpox in the municipality, in 1951, were seen.

Reporting regularity and disease incidence from each reporting unit is regularly assessed at the municipality level. Each peripheral health unit is visited every six months. Units with two or three late notifications are contacted personally. Monthly, annual and decennial reports are compiled and shared with similar level and higher units and neighbouring provinces (on an informal basis). The reports for June 1979 and 1978 (ready for printing) were seen.

E. Visits to Urban and Rural Schools and one Rural Clinic in Kunming District and Bi Ji Commune in Western Hill District, Yunnan Province

The object of these visits was to see how health services were provided in Kunming District and to view vaccination scars and the faces of some children. Kunming city has a population of 600 000 and the district 1.8 million.

1. The First Intermediate School of Kunming is one of 30 in the city. There are 2535 students between 12-17 years divided into 43 classes. Of the 190 employees, two are doctors. There is a very complete sports programme as part of the stress on good health. Courses on hygiene and other forms of health education are part of the school programme.

The students have received the usual vaccines before they arrive and meningitis (type A), TAB and influenza vaccines are given. Herb medicines are used to prevent these diseases. The major health problem is the common cold. No smallpox has been seen in this school since liberation in 1951.

Three hundred and fifty-one children were seen by us, mostly about 15-16 years of age. All but one of 145 examined for a vaccination scar had been vaccinated and none of the children had five or more facial pockmarks; faces of 206 children were scanned and no pockmarking was seen.

2. The Li Ji Fang Primary School in Gao Quiao village was visited. This rural school has 500 students aged 7 to 12, in 12 classes. There are 20 teachers. Eighty-five per cent of the students are from farming families and the others from shopkeeper families, all living and working in the area. Before liberation there was one class only.

Health work is done mainly by the teachers, but there is a commune clinic nearby which follows the children quite closely. Vaccination (smallpox, BCG and influenza) is given by a barefoot doctor who comes from a production brigade clinic; traditional medicines are also distributed. The major health problems are influenza and other respiratory diseases.

Two hundred and four children were seen; 122 of 129 had vaccination scars and none had five or more facial scars. The remainder were scanned and did not have pockmarks.

3. The clinic at Bi Ji Commune was seen. There are 12 300 persons from 2532 families in this commune. Eight production brigades have 53 production teams; each brigade has three to five barefoot doctors. The clinic has a staff of 16. There are departments of medicine, obstetrics and gynaecology (including family planning), ear, nose and throat, dentistry and preventive medicine. About 100 to 200 outpatients are seen per day. An anti-epidemic group at the commune level assists with preventive activities in brigades. Smallpox has not been seen in the commune since liberation.

Vaccination is emphasized. A vaccination card for each child is kept at the clinic caring for that family, either at the commune, brigade or team level. BCG, smallpox, measles, polio, DPT, meningitis, TAB and Japanese B encephalitis vaccines are given. The simplified vaccination record form was designed at the provincial level. Records appeared to be extremely well kept.

Reporting of notifiable disease is well organized. The brigade collates reports received from teams. A card is sent from brigades and communes to the district level within 24 hours after a case is seen. Forms used are similar to those seen in Shanghai. A register of reportable notifiable infectious diseases was viewed. Dysentery and measles seemed to be the most common; scarlet fever, influenza, meningitis and pertussis were also noted. Two of the medical staff make daily visits to the brigades, consulting with the barefoot doctors and following up on infectious disease notifications.

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