

SPECIAL REPORT ON SMALLPOX AND ITS ERADICATION IN YUNNAN PROVINCE, CHINA ^a

1. Background Information

INC

Yunnan Province is located on the south-western border of China. Its climate is subtropical with relatively uniform warm temperatures and mean annual rainfalls ranging between 500 and 2500 mm. In summer the weather is changeable under the influence of both south-eastern and south-western monsoons.

The population of approximately 30 million is composed of over 20 ethnic groups with considerable differences in levels of socio-economic development and culture and language.

Before the liberation of China, communications were limited, partly by the local topography. Now many railway lines exist and highways serve all districts. There are also four rivers which are navigable and air services link many of the districts both within the province and to other areas of China.

Yunnan Province's 4000 km of international frontier borders, from west to east, Burma, Lao and Viet Nam, and there are no major physical features marking the largely inapparent boundary. The populations on either side of the border are related by family or trade.

Health Services

The province, with Kunming as capital, is divided into eight autonomous quarters, seven administrative quarters and two provincial cities and is subdivided into 128 districts. At each level there are administrative organs and health and medical units including hospitals and epidemic control organizations. In the communes there are hospitals and in the production brigades cooperative medical units exist. There are preventive and curative health services in factories and mines, government offices, colleges and schools. In addition, there is an institute of medical biology, and an institute of epidemic diseases as well as specialized infectious disease units with branches in the districts.

There are 47 789 medical and health personnel in the province including 3000 epidemic control workers, 5010 high-level doctors, 24 708 intermediate level doctors and 10 198 barefoot doctors. Comprehensive medical and health care is available in both rural and urban areas.

Communicable Disease Reporting

In the early 1950's infectious disease cases were reported directly to the provincial health bureau. Following Central Government regulations issued in 1955 and subsequently, cases of 24 infectious diseases, including smallpox, require notification and control measures. All health personnel, whether practising traditional Chinese medicine or western medicine or involved in public health are required to report these diseases. Similarly workers in various occupations, for example, teachers as well as students and also the general public, are obliged to report cases of infectious disease.

^a Prepared by the Department of Health, Yunnan Province. This report was received in Geneva on 31 July 1979.

Epidemiological reports are forwarded from all peripheral units to the district sanitary and epidemic control station which compiles a summarized report forwarded every 10 days to provincial, municipal and quarter sanitary and epidemic control stations. The provincial stations compile monthly and annual reports for the provincial health bureau and the central Ministry of Public Health. Around 97% of the district reports are submitted on time every 10 days.

Smallpox, along with plague and cholera, must be notified within 12 hours in rural areas and within six hours in urban areas. Sanitary and epidemic control stations above the district level are required to report immediately to higher authorities and to visit the affected area, institute control measures and carry out an epidemiological investigation.

2. Smallpox Epidemiology

Before liberation there were smallpox cases throughout the province. Since there were no epidemiological or communicable disease control organizations during the pre-liberation Kuomintang regime, accurate data do not exist. After liberation, during 1950-52, the number of districts in which smallpox existed was about 40-50. The highest incidence was in 1951 when 6225 cases were reported (table 1). Of these 998 died: a case fatality rate of 15.9%. In the Luoping District, five of its six subdistricts were affected, with a total of 787 cases and 225 deaths; a case fatality rate of 28.61%. In Mu Xi village in Kang Le sector, a farmer named Li Zhao Chang had five family members; four contracted smallpox and two died in one day. In the family of another farmer, named Li Shao Zhi, seven of eight persons contracted smallpox and two died. These examples illustrate the severity of the disease in that district.

To control and then eradicate the disease, the Central People's Government promulgated a smallpox vaccination regulation, on 12 October 1950, the object being to promote free vaccination for all. Included in this vaccination action were practitioners of traditional and western medicine, and specially trained vaccinators. The incidence of smallpox dropped significantly (table 1).

In 1957 an epidemic of smallpox with 30 cases and two deaths occurred in Suijiang District in Zhaotang Subregion (figure 1) as a result of the practice of variolation by nasal inhalation promoted by itinerant local healers.

Between 1958 and 1960 there were several outbreaks in Monglian, Cangyuan, Lancang, Zhencang, Monghai and Zunang Districts, all bordering each other (figure 1). These cases resulted from the introduction of smallpox from Burma during these three years. There were 1104 cases and 162 deaths during this three-year period (table 2). Importation from Burma was partly the result of the ill defined boundary between China and Burma. The bordering districts of China are populated by ethnic minorities having strong ties with Burma and visits to and by relatives across the border are common. In addition, there was a residual element of the Kuomintang rising causing difficulties so that vaccination coverage was incomplete in this area.

In view of these factors vaccination in the border areas was emphasized and villages were covered by mass vaccination efforts yearly.

The outbreaks of 1960 were the last to occur in Yunnan Province and since March of that year no further cases, endemic or imported, have been reported.

FIG. 1

YUNNAN PROVINCE : LOCATION OF DISTRICTS AFFECTED BY SMALLPOX IN 1957 - 1960

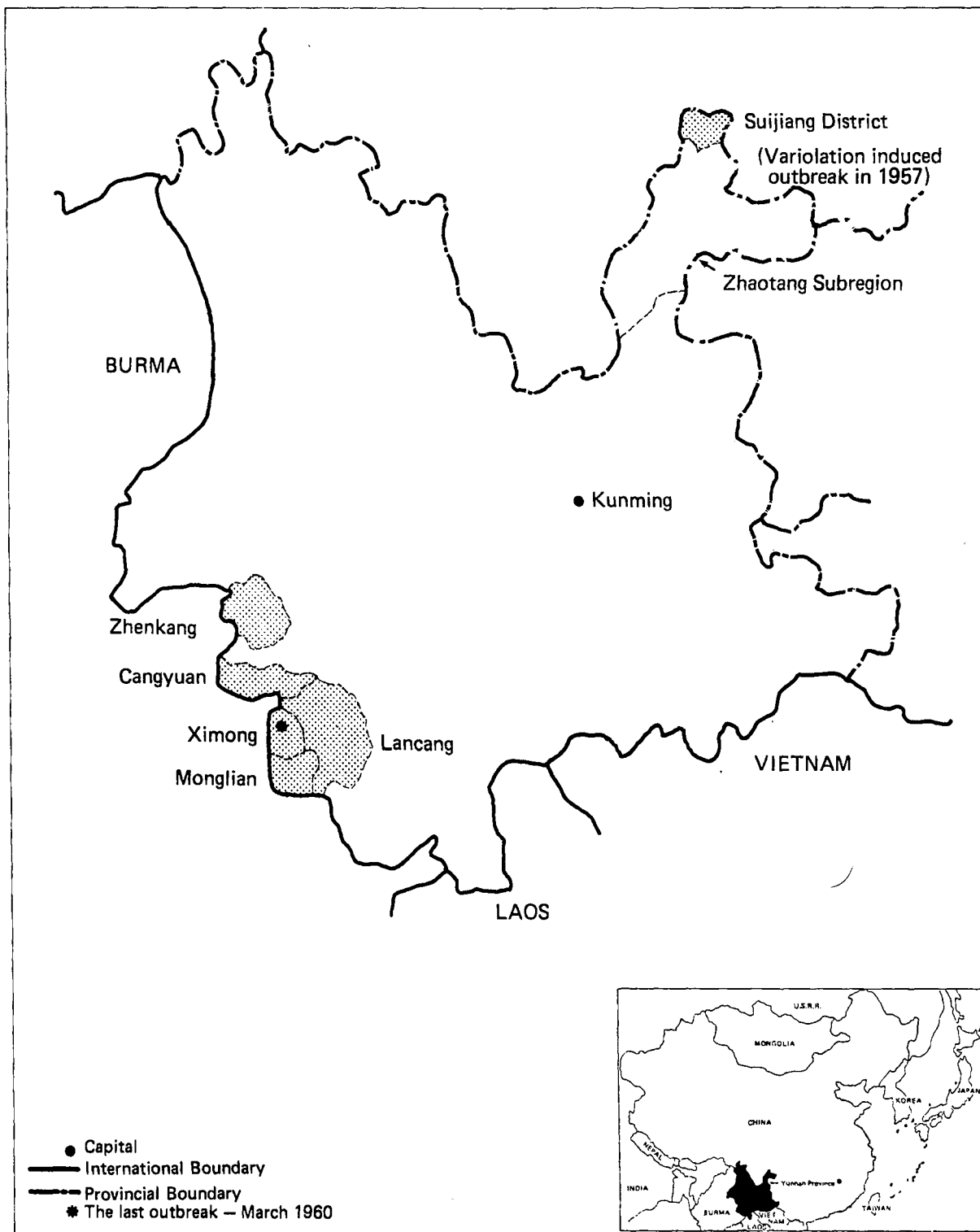


TABLE 1
REPORTED SMALLPOX CASES, INCIDENCE RATES AND CASE FATALITY RATES,
YUNNAN PROVINCE, 1950-1960

Year	Cases	Incidence rate per 100 000 population	Case fatality rate
1950	1 698	10.4	40.7
1951	6 255	38.2	16.0
1952	2 667	16.3	12.5
1953	207	4.11	15.4
1954	100	0.57	5.0
1955	32	0.18	0
1956	3	0.02	0
1957	92	0.53	3.8
1958	333	1.76	17.7
1959	743	3.94	13.5
1960	28	0.15	10.7

TABLE 2
REPORTED SMALLPOX CASES AND DEATHS, BY DISTRICT,
YUNNAN PROVINCE, 1958-1960

District	1958		1959		1960		Number of communes affected
	Cases	Deaths	Cases	Deaths	Cases	Deaths	
Monglian	333	59	1		1		6
Cangyuan			672	96			5
Lancang			10	1			3
Zhenkang			59	3			2
Monghai					20	2	1
Ximong			1		7	1	4
Total	333	59	743	100	28	3	21

3. The Last Smallpox Epidemic, Cangyuan District, 1959

This district is at 23.5°N latitude, it has a 480 km border with Burma and in 1959 was divided into six subdistricts with a population of 62 537, and 12 716 families. The Wa nationality comprised 86% of the population; the remainder being mainly Dai, Lazu, Mongol and Han.

From spring of 1959 smallpox occurred throughout most of the district, affecting five of the six subdistricts (table 3). Only Yanshuai Subdistrict was exempt because it was separated from the other subdistricts by high mountains. A total of 24 sectors of the five subdistricts were infected. Danjia Subdistrict was the most severely infected; for example, in Hai Bie village 163 of 233 persons (70.0%) developed smallpox.

The epidemic began during the first 10 days of January 1959 and peaked in March (figure 2). The incidence fell in April and there were only sporadic cases from May through July. From August through October there was a mild rise in incidence, when cases occurred in the villages of Mong Bai, Ban Kao and Ban Me. The outbreak was over in November.

An analysis of the 672 cases in Cangyuan District indicated males were affected slightly more often than females and more cases were observed in the 1-10 and 21-30 year age groups, the younger of these accounting for 36.4% of all cases (table 3). Newborn and other children below 1 year were also infected, while the oldest patient was 60 years of age.

FIG. 2

DISTRIBUTION OF 672 SMALLPOX CASES BY MONTH,
CANGYUAN DISTRICT, 1959

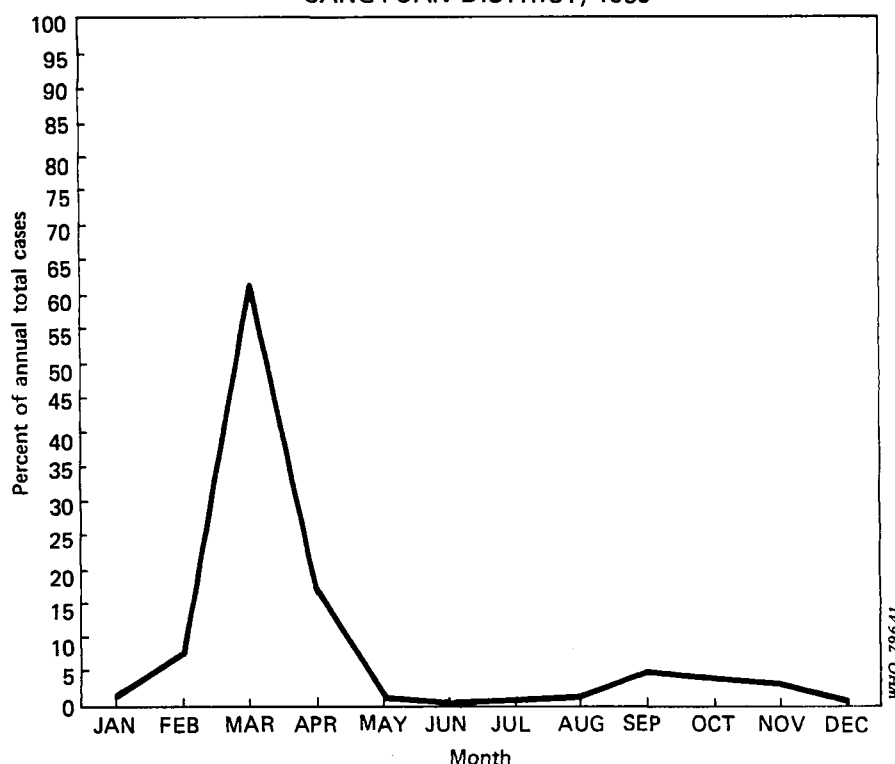


TABLE 3
REPORTED SMALLPOX CASES BY SUBDISTRICT, AGE AND SEX,
CANGYUAN DISTRICT, 1959

Subdistrict	Total	Sex		Age group (years)				
		M	F	<1	1-10	11-18	19-30	>30
Banhong	36	24	12	2	21	4	5	4
Danjia	447	242	205	3	162	56	152	74
Yonghe	48	25	23	4	23	9	12	
Nuoliang	83	41	42	7	23	23	28	2
Mongjiao	58	28	30	9	16	10	15	8
Total	672	360	312	25	245	102	212	88

Source of Infection

In the winter of 1958 smallpox occurred in Burma. Members of ethnic minorities went to and returned from Nageng and Damanhai in Burma where they became infected with smallpox which they introduced into China causing local spread of the disease (tables 4 and 5).

TABLE 4
REPORTED SMALLPOX CASES BY SOURCE OF INFECTION AND SUBDISTRICT,
CANGYUAN DISTRICT, 1959

Subdistrict	Total cases	Cases infected in Burma		Cases infected locally	
		Number	% of total	Number	% of total
Banhong	36	1	2.8	35	97.2
Danjia	447	72	16.0	375	84.0
Yonghe	48	15	31.2	33	68.8
Nuoliang	83	30	36.1	53	63.9
Mongjiao	58	26	44.8	32	55.2
Total	672	144	21.4	528	78.6

TABLE 5

REPORTED SMALLPOX CASES BY PLACE OF ONSET OF RASH AND SUBDISTRICT,
CANGYUAN DISTRICT, 1959

Subdistrict	Total cases	Onset in Burma		Onset locally	
		Number	% of total	Number	% of total
Banhong	36	1	2.8	35	97.2
Danjia	447	63	14.1	384	85.9
Yonghe	48	5	10.4	43	89.6
Nuohiang	83	2	2.4	81	97.6
Mongjiao	58	2	3.4	56	96.6
Total	672	73	10.9	599	89.1

Factors affecting Local Transmission

Although mass vaccination against smallpox had been carried out in Cangyuan District in 1952, it had been affected by the complex local situation in the border area. Mass vaccination had been delayed in the border villages. In the six years 1952-57 there were 35 181 vaccinations given, a coverage rate estimated at 56.2%. However in Danjia Subdistrict the campaign only began in 1958, when only 1332 vaccinations were given among a population of 3355, an estimated coverage of 39.7%. In 1959 special vaccination groups were organized in Yunnan Province. They went to subdistricts and gave vaccinations and inspected vaccination scars. A total of 12 518 persons were found not vaccinated in Cangyuan District; 22 339 persons had not been vaccinated in the previous three years or had no 'take' (tables 6 and 7).

As mentioned above, smallpox cases entered China from neighbouring Burma and as quarantine procedures were not promptly and effectively executed local spread of the disease continued. In addition, no health education was conducted and in some instances where entire families lived in one room, relatives and friends came freely to visit patients while ill and patients circulated freely during convalescence and while still infective.

Notification of cases in border villages was delayed. Health authorities were not aware of the extent of the epidemic at first and this too assisted the spread and resultant mortality due to smallpox. Disinfection of households was not performed.

TABLE 6

SMALLPOX VACCINATIONS PERFORMED BY YEAR, CANGYUAN DISTRICT, 1952-1959^a

Year	1952	1953	1954	1955	1956	1957	1958	1959 ^a
Population	59 725	60 873	62 085	63 467	65 034	66 601	67 267	62 537
Number vaccinated	4 752	5 205	3 961	5 587	9 237	6 439	11 270	61 777
% vaccinated	7.95	8.55	6.38	8.79	14.20	9.67	16.75	98.78

^a to October

TABLE 7
VACCINATION STATUS OF SMALLPOX CASES BY SUBDISTRICT,
CANGYUAN DISTRICT, 1959

Subdistrict	Total cases	Never vaccinated		Vaccinated within 10 days of rash onset		Previously vaccinated	
		Number	% of total	Number	% of total	Number	% of total
Banhong	36	-	-	11	30.5	25	69.5
Danjia	447	365	81.8	4	0.8	78	17.4
Yonghe	48	28	58.3	10	20.8	10	20.8
Nuoliang	83	29	34.6	7	8.4	47	56.5
Mongjiao	58	30	51.7	-	-	28	48.2
Total	672	452	67.3	32	4.8	188	27.9

Control Measures Taken

There were 85 vaccinators trained from the paramedical corps to conduct mass vaccination by house-to-house visits. They also examined for and recorded previous vaccinations, and read 'takes' while simultaneously covering persons missed by their first visit. All persons were vaccinated irrespective of previous vaccination history. During one month 35 605 persons were vaccinated in Cangyuan District, a coverage of 95.6% (table 8).

In villages with cases, isolation of patients was ensured, treatment given and houses disinfected. Vaccination was done by house-to-house visits in infected and adjacent villages and along roads leading to the infected villages, markets, etc. Disinfection was done in those houses whose members had no vaccination certificates. In this way the spread was stopped and herd immunity raised, resulting in nil incidence of smallpox since that time.

4. The Last Endemic Smallpox Case

The last case occurred in Nan Kan village, Li Suo commune, Ximong District, Si Mao Subregion. The patient, Hu Xiao Fa, a male aged 23, at the time and married, was a member of the Lagu national minority and a native of Lancang District. He was an official of the Lancang grain distribution centre.

Onset of the illness was in early March 1960 and he was isolated in the Ximong District hospital for three months. There was residual facial pockmarking.

He resigned from his work and subsequently became a member of the Li Suo commune. He is currently 42 years and well (photograph supplied with original report).

5. The Last Imported Smallpox Case

This occurred in Ni Bai village, Jing Xin commune, Monglian autonomous District, Si Mao Subregion. The patient, named Ya Ah, a 23 year old male, was of Lagu nationality. At that time there was an epidemic of smallpox in Leng Kan Na Me area in Burma. The patient went to Leng Kan during the first 10 days of March 1960. He was infected there and returned via Six Hang village in Burma. His illness began late in March. No secondary cases occurred and there have been no further cases reported in this district since that time. It is, therefore, considered that Ya Ah was the last imported case of smallpox in Yunnan. He died in 1977 of pulmonary tuberculosis.

TABLE 8
VACCINATIONS PERFORMED BY SUBDISTRICT, CANGYUAN DISTRICT, 30 OCTOBER-30 NOVEMBER 1959

Subdistrict	Population	Protected		Newborn or contra- indicated	Suitable for vaccination	Vaccinated			% ^a
		Vaccinated within 3 years	Previous smallpox			Primary vaccination	Re- vaccination	Total	
Yonghe	4 302	306	379	39	3 578	721	2 341	2 341	86.4
Danjia	3 355	980	671	24	1 680	1 466	214	1 680	100.0
Banhong	8 518	578	273	122	7 545	929	6 462	7 391	97.8
Nuoliang	15 500	3 322	1 576	128	10 474	4 709	4 865	9 574	90.9
Yanshuai	19 910	10 708	1 785	54	7 363	3 859	3 424	7 283	98.9
Mongjiao	7 080		407	58	6 615	834	5 781	6 615	100.0
Total	58 665	15 894	5 091	425	37 255	12 518	23 087	35 605	95.3

^a Percentage vaccinated of those suitable

6. Vaccination

For the purpose of vaccination measures taken in Yunnan Province following the regulations of 1950 and 1962 the whole province was divided into six areas. After mass vaccination, the population of one of these areas was vaccinated every year, except districts bordering other countries which were covered every year. Quarantine measures and surveillance were strengthened along frontiers from 1963 onwards. From 1962 to the present, 4 000 000 to 7 500 000 doses of smallpox vaccine have been given annually.

To assess the immunity status of the population a special vaccination scar survey was done from March to May 1979. The vaccination scar rates ranged from 82.7% in Monglian to 95.8% in Ximong (table 9). This indicates a high herd immunity level in the area. Even among the 0-4 years age group coverage was found to be high, 77.7% (table 10).

7. Pockmark Survey

Concurrently with the March-May 1979 vaccination scar survey, persons were examined for facial pockmarks due to previous smallpox. The results are presented in tables 9, 11 and 12. No facial pockmarks were observed in persons less than 22 years of age.

8. Suspected Cases of Smallpox

In 1962 a total of 42 cases with two deaths alleged due to smallpox were reported by health personnel of Monghai, Monglian and Ximong Districts. The provincial epidemiology station investigated and found that excepting the two deaths, all recovered without facial scarring; 32 of the 40 cases had a vaccination scar. Vaccination of the remaining eight resulted in one accelerated reaction and seven primary type responses. The clinical history indicated the two dead patients succumbed to pneumonia. Concurrently, there was a chickenpox epidemic in the area. This outbreak is not considered to have been caused by smallpox.

TABLE 9
RESULTS OF SMALLPOX VACCINATION SCAR AND FACIAL POCKMARK SURVEY,
YUNNAN PROVINCE, MARCH-MAY 1979

District	Persons observed	Persons with vaccination scar		Persons with facial pockmarks	
		Number	Percent	Number	Percent
Monglian	7 157	5 915	82.7	256	3.6
Lancang	7 885	7 259	92.1	140	1.8
Ximong	2 174	2 034	95.8	420	19.3
Cangyuan	9 047	8 006	88.4	767	8.5
Monghai	27 555	25 388	92.1	<u>a</u>	-
Rural sub-total	53 818	48 603	90.3	1 583	2.9
Kunming municipality	20 102	18 906	94.0	57	0.3
Grand total	73 820	67 509	91.5	1 640	2.2

^a Not performed

TABLE 10

RESULTS OF VACCINATION SCAR SURVEY BY AGE GROUP FOR RURAL AND URBAN POPULATIONS,
YUNNAN PROVINCE, MARCH-MAY 1979

Age group (years)	Rural population ^a			Urban population ^b		
	Persons observed	Persons with vaccination scar		Persons observed	Persons with vaccination scar	
		Number	%		Number	%
0-4	8 021	6 228	77.7	773	688	89.0
5-19	21 646	20 482	94.6	12 323	11 412	92.6
20+	15 104	13 746	91.0	7 006	6 806	97.2
Total	44 771	40 456	90.4	20 102	18 906	94.0

^a Monglian, Cangyaun, Ximong and Monghai Districts

^b Kunming Municipality

TABLE 11

AGE DISTRIBUTION OF 764 POCKMARKED PERSONS,
YUNNAN PROVINCE SURVEY, 1979

Age groups	Persons examined	Persons with pockmarks
0-4	4 266	0
5-19	18 825	0
20+	14 227	764
Total	37 318	764

TABLE 12

AGE DISTRIBUTION OF 256 POCKMARKED PERSONS,
MONGLIAN DISTRICT, 1979

Age groups	Persons with pockmarks
0-21	0
22-29	64
30-39	63
40-49	62
50-59	36
60+	31

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