LEAGUE OF NATIONS

Health Organisation

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

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REPORT OF CHINA

GENEVA, 1937.

Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene

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INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

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INTRODUCTION.

With a view to preparing for the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene, convened by the Council of the League of Nations at Bandoeng (Netherlands Indies) for August 3rd, 1937, the various countries invited to attend have been asked to draft national reports dealing with the various questions on the agenda of the Conference.

Attached herewith is the Chinese Report, drawn up by Dr. J. Heng Liu, Director of the Chinese National Health Administration and Central Field Health Station, with the assistance of various experts.

The delegation of China will be composed as follows :

Dr. J. Heng Liu, Director of the National Health Administration and Central Field Health Station ; or

Dr. P. Z. King, Deputy Director of the National Health Administration and Central Field Health Station, *President of the Delegation.*

Dr. Wu Lien Teh, Director, National Quarantine Service, Shanghai.

Dr. C. K. Chu, Secretary, Medical Education Commission.

Dr. Leonard Hsü, Councillor, Ministry of Industry, Professor in Yenching University.

Professor Wu Hsien, of the Peiping Union Medical College.

Dr. Chang Fu-Liang, Rural Reconstruction Expert, Director of Kiangsi Rural Welfare Centre, Kiangsi.

Dr. Hsü, Head of the Rural Health Centre in Kiangninghsien.

M. Tao, Sanitary Engineer in the Central Field Health Station.

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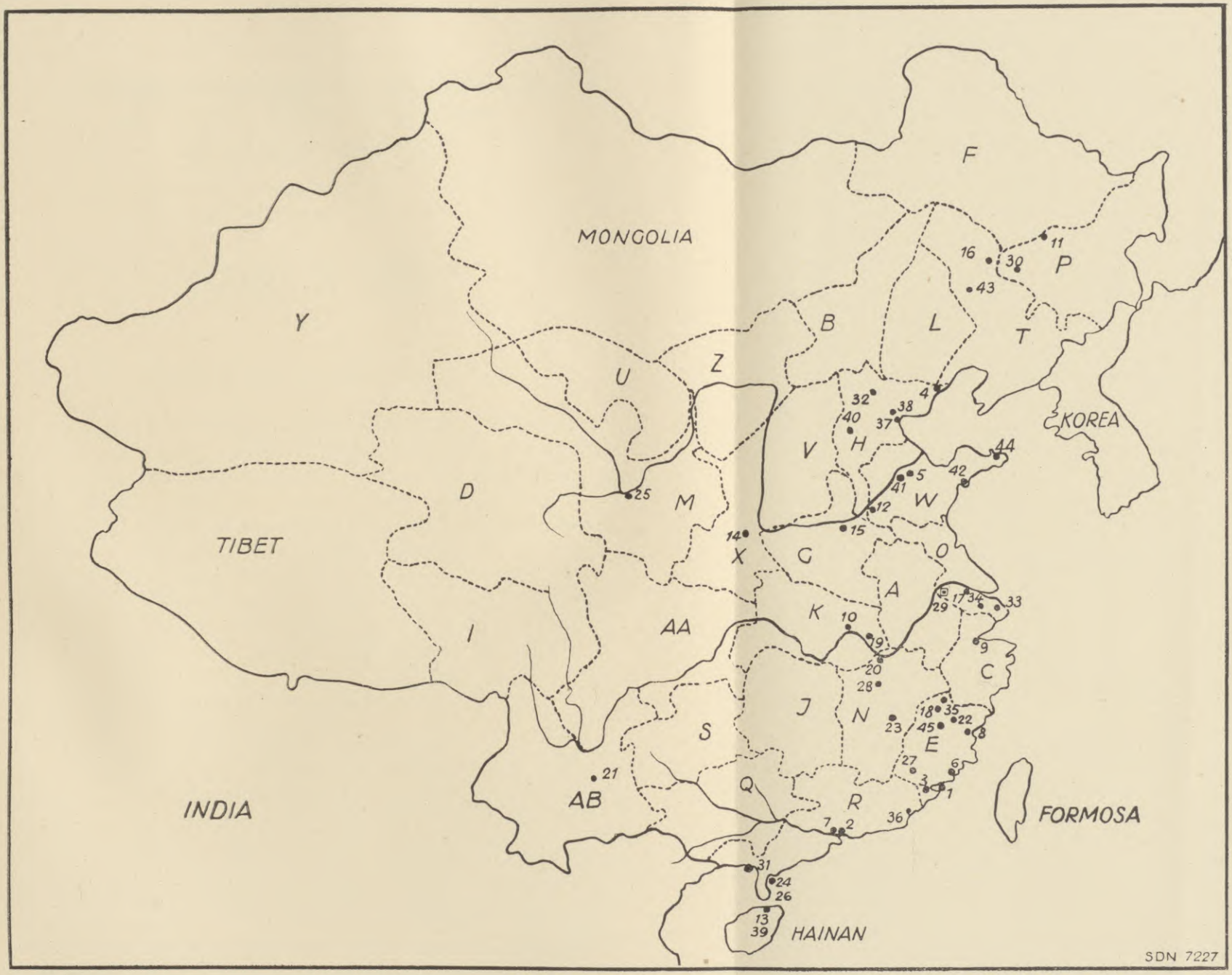

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE.

(*Bandoeng* (*Java*), *August 3rd*, 1937).

REPORT OF CHINA

I. HEALTH AND MEDICAL SERVICES.

For over four thousand years China has remained an agricultural country. Even to-day no fewer than 340 millions of her population live on the land. The inhabitants of metropolitan cities, like Shanghai and Tientsin, find farms worked with manual labour within a mile or two of their modern dwellings. In Nanking and Peiping, agriculture is carried on right inside the city. With the exception of a few districts, such as Wusih with its cotton and silk manufactures, and Tangku with its chemical works, handicraft is the outstanding occupation of many farmers who have found agriculture alone insufficient for their needs. China is therefore in a stage of transition from mediæval farming to modern agriculture and from handicraft to machine industry.

No one can predict how long this period of transition will last. Some important facts, however, deserve our attention. First, China is over-populated. In some provinces the density reaches 2,000-3,000 per square mile. In North China, the *per capita* ownership of land is generally around four acres for a family of five or six persons. The *per capita* income of a farmer is estimated at less than forty dollars a year, and 90% of this sum is spent on food. In the south, the situation is still more difficult because of tenancy and surplus taxation. A tenant is obliged to hand over 50% of his products to an absentee land-

owner and the surtax paid by the latter may be 200% over the regular tax. Both suffer from poverty as the result of insufficient cultivable land. Secondly, poverty is widespread on account of the lamentable lack of capital for reconstructive purposes. Ignorance, with insufficient funds for education, is a common evil, and the percentage of illiteracy among farmers is extraordinarily high. The most important predisposing causes of disease are therefore ignorance and poverty, and it is not surprising that completely controllable diseases, such as smallpox and dysentery, rank among the chief causes of mortality. Further, it is only in the last few years that the building of highways has figured prominently in reconstruction programmes. It will take some years before all inland towns and villages are opened up.

According to the available information, China has an annual general crude death rate of about 30 per thousand of the population, and the financial loss each year is incalculable. This loss is especially serious when we realise that the chief causes of morbidity and mortality, such as acute gastro-intestinal infections, tuberculosis in various forms and parasitic diseases, affect a very large percentage of the adult population forming the productive elements of the nation. To cope with the situation, a Ministry of Health, now known as the National Health Administration, was formed soon after the National Government was established at Nanking (1928).

It was early realised that, unless the attention of the Government and the public was directed to the problems of rural health, it would not be possible for the Ministry to carry out a programme of medical socialisation on a satisfactory scale. The Ministry therefore established a rural health demonstration station at Shiaochuang, about three miles from Nanking city. Although, unfortunately, this work was short-lived because of political difficulties, it has exerted a lasting influence on rural education in normal and primary schools in various parts of the country.

Under the joint auspices of the Bureau of Public Health, the Municipality of Greater Shanghai, and the National Shanghai Medical College, rural health services have been established in Kaochiao. In North China, the National Asso-

ciation of the Mass Education Movement selected the district of Tinghsien for an experiment in modern government along the lines of citizenship, livelihood, education and public health. The National Health Administration has drawn freely upon the experience of Tinghsien in framing its rural health programme, and this co-operation between the Government and a private institution is one of the best examples of what each can contribute in the pioneering period of national reconstruction.

From her collaboration with the League of Nations, China has received a powerful impetus toward rural reform, the results of which are especially obvious in the field of public health. As will be gathered from page 19, nine out of the eighteen provinces have established provincial health services, while more or less advanced preparations to instal such work have been made in three more. In Kiangsi, ten centres of social welfare, of which health protection forms an integral part, have been developed. In addition, the law requires that each county or district contribute 5% of its self-government tax for the promotion of health activities. In other provinces, the County of Kiangning has an annual budget of $40,000 [1] for rural health, the County of Lanchi in Chekiang maintains a health service costing about $15,000 a year, and Hua Hsien, of Shensi, one of the poorest provinces in China, devotes over $10,000 a year to health protection. As shown in the Appendix, over 200 rural health units have been established. The rapidity of this development is encouraging for three reasons : (1) It shows that modern medicine is penetrating to the masses and taking root there ; (2) it proves that the trend of both central and local government is away from bureaucracy and towards social welfare ; (3) it indicates that, in spite of the very difficult conditions, the authorities, who alone can support health work in rural areas on a permanent basis, can find the necessary funds if and when they decide to embark upon such activities.

China is a country with such widely different customs, traditions and modes of life that no single rural medical organisation is universally practicable. Taking an experimental point

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[1] One dollar Chinese national currency is equivalent to U.S. $0.30.

of view, the National Health Administration has granted local authorities permission to try out whatever organisation they consider desirable. However, one type of organisation, which had been shown to possess advantages over others after seven years' experience, was adopted as the standard in 1934 and sanctioned by the National Government in 1937. An order to apply this system, whenever and wherever practical and possible, has been issued by the National Government to the provincial Governments.

In each hsien (district or county) there should be a *hsien health centre* with a full-time health officer and a number of assistants, including public health nurses and midwives. The health centre is divided into five sections : clinic and hospital, diagnostic laboratory, central supply of drugs and sterilised dressings, health education and administrative office. Under the health centre, which is generally located in a district town, there should be a *health station* in each larger marketing centre, which usually is the seat of the sub-district magistrate's office. The population which the station is supposed to take care of averages about fifty thousand. This station, with a health officer in charge and a nurse, should hold daily clinics for general medical relief, preventive vaccinations and inoculations against smallpox, diphtheria and cholera, carry on child health work in the neighbouring schools and put into effect simple measures for improving sanitation. Under the supervision of each health station, *health sub-stations*, each taking care of between ten to fifteen thousand population, are run usually by a woman nurse with midwifery and public health training. A sub-station is located, whenever possible, in a school situated in the central village, as the school is considered the centre of community life. The work includes a daily clinic for simple medical service, delivery of normal cases with ante- and post-natal visits, health work in one or two schools, smallpox vaccination and health talks. At the beginning of the organisation, the health officer of the station is supposed to visit the sub-stations once a week or twice a month. For the future it is planned that assistant medical officers would be attached to the health station to visit the subsidiary sub-stations at least once a week. The lowest level of the organisation takes the form of *village health*

workers (Figure 1).[1] These are laymen selected from general village organisations, who are given a short period of training in the reporting of births and deaths, undertaking smallpox vaccination, simple sanitation and methods of applying ordinary antiseptics. The rural medical organisation in China therefore consists of four levels which, when well co-ordinated, are able to bring the fundamentals of modern medical science into the homes of backward farmers. Furthermore, it has been shown that, once such an organisation has been fully extended over a county or district, the amount of money required is no more than ten cents per head annually, or just one-third of the sum actually spent by the people each year in the old-fashioned and unscientific way for their medical needs. It is logical, therefore, that the authorities should collect ten cents yearly from each farmer in order to develop this type of basic organisation. Kiangning Hsien, in Kiangsu, has succeeded in doing so, and it is for other areas to follow this example.

Rural health services in China have not existed long enough to produce spectacular results. The present status of the various activities may be summarised as follows :

Vital Statistics.

Since the introduction of modern ideas of government into this country about thirty years ago, the police authorities have been charged with the task of collecting birth and death reports. Up to the present this system has reached only the marketing towns, and even in cities and district towns little reliable information is available. In the villages, where the majority of the population live, there are no police, and the village elders have no notion of statistics. Thus it is only quite recently that accurate information on vital statistics is being provided for. Birth and death reports in villages are obtained by the village health workers referred to above, and general information on the chief causes of mortality has been made available through the same channel.

Attention is drawn to Figure 2, which shows a village health worker eliciting information on births in his village from a

[1] For the illustrations, see end of this report.

peddler of noodles. There is a sound reason for this because, by long-standing custom in North China, noodles are presented to a family in which a child is born.

Rural field workers are agreed that the crude birth rate is about 30 per mille, the crude death rate about 25, infant mortality around 200 and maternal mortality about 10. Excluding endemic diseases, the chief causes of mortality are gastro-intestinal infections, including typhoid, dysentery, cholera, tuberculosis of all forms, especially the pulmonary type, tetanus neonatorum, summer diarrhœa and enteritis of infants, smallpox, diphtheria and acute exanthemata. In the light of modern knowledge, most of these diseases are preventable.

Even in the most developed districts, old-style practitioners still attend over 65% of all patients, while about 26% die without receiving any treatment at all.

Health Education.

In view of the widespread absence of health consciousness, training in matters of health is of prime importance. Apart from the use of posters and models to emphasise specific measures of health protection, the authorities are concentrating attention on health teaching in schools. The rural normal schools particularly are requested to follow a programme of health training. Various methods of practical training in cleanliness, control of communicable diseases, detection of early signs of disease and sanitary improvements have been adopted.

Much attention is also paid to training classes for adults (Figure 3) and it is hoped that the combined results of these efforts will lead to improvements in personal as well as community health.

Experience shows that health education and school health are inseparable and are best handled by public health nurses. On account of difficulties in transport, home-visiting on a large scale is out of the question ; but, to make up for this drawback, public health nurses may satisfactorily replace physicians in rural school health work. They are usually able to detect and correct conditions like pediculosis, ringworm of the scalp

and trachoma. Each nurse is able to take care of about 1,000 children at a cost of no more than 60 cents per head per year. Results obtained in many districts are gratifying. The picture of a newly reconstructed drinking-well (Figure 4) shows to what extent villagers are willing to listen to the advice given by public health nurses.

Control of Communicable Diseases.

Apart from the fact that the general public has no idea that most of the prevalent diseases are preventable, environmental conditions render the application of even the simplest principles of prophylaxis exceedingly difficult. Jennerian vaccination was introduced into China over one hundred years ago, but smallpox continues as a chief cause of mortality. It is therefore not surprising that other infectious diseases more difficult to control are rampant. A considerable amount of this suffering is the result of unhygienic habits. Education is the prerequisite for control, and smallpox vaccination forms the thin end of the wedge for the introduction of specific methods of control. When the majority of the population of a given area is protected against smallpox and the efficacy of this method is brought home to the people through absence of infection in their midst and a heavy toll in neighbouring districts, they will not only believe in Jennerian vaccination but will offer less resistance to other types of prophylactic treatment.

Immunisation of the farmers by inoculation against any disease is a difficult matter. It took five years of continued effort in some areas to vaccinate 10% of the total population each year against smallpox, with a ratio of six males to four females. The same length of time was required to reduce the expense of inoculation to two cents per operation. In the case of diphtheria, healthy baby contests are being utilised for the immunisation of the pre-school age group of children, with encouraging results.

In a district with a population of about half-a-million, preventive work against smallpox and diphtheria is sufficient to keep a full-time physician busy with organisation and supervision. It should be realised in this connection that

preventive inoculations, even under the most difficult conditions, produce some of the most tangible results in a rural health service and should therefore receive adequate attention.

Maternity and Child Health.

For various reasons, including over-population and a high birth rate, farmers do not value children as much as do other classes of the population. The situation is complicated by the inferior position traditionally accorded to women. It is therefore extremely difficult to effect any improvement in maternal and child health under rural conditions. In many parts of China, midwifery is practised by any old woman who has the courage to deliver babies. The social status accorded to these so-called midwives is extremely low. Tetanus neonatorum is prevalent, as well as other causes of infant mortality due to poverty and ignorance, such as summer diarrhœa, enteritis and nutritional disturbances. The amount of care given to pre-school children is negligible, and consequently 45% of the children die before reaching the age of 5 years.

Short courses for the old-style midwives have been tried, but on account of their age, beliefs and habits, results are not particularly encouraging. At best they need close supervision, which is very costly even if practicable. The graduates of well-organised midwifery schools are of excellent quality, but are not easily available for rural work, as often they are too expensive and unwilling to live under rural conditions.

It would certainly be illogical to lay the sole stress upon the reproductive aspects of maternity without considering the merits of birth control. In China, no religious teachings stand in the way of contraception, but there are economic difficulties which have to be faced before this question emerges into the realm of practical policy.

Medical Relief.

The principal difficulties facing medical relief work under rural conditions are : (1) Owing to gaps in their clinical training, the standard of many doctors is not as high as might be

desired ; (2) modern medicine has to compete with the old-style practice, which is still deeply rooted in the confidence of the people ; (3) it is not easy to procure adequate facilities for diagnosis and treatment ; (4) difficulties of transportation keep the people away from the modern institutions, thus precluding prompt and efficacious treatment ; (5) medical relief, especially hospitalisation, is expensive. Each visit of a patient to a clinic costs at least 30 cents, including drugs and staff salaries, while each bed in a modern hospital works out at $1.50 a day.

On the other hand, medical relief is becoming better appreciated. Local authorities sometimes consider public health as identical with medical relief. Often a farmer is willing to pay heavily for drugs whilst unwilling to spend a few cents on smallpox vaccination. A similar tendency prevails in cities, but the effect is particularly apparent in rural work. As a consequence, a health officer is obliged to build the framework of his organisation on the basis of clinical service. It is hoped that, with the help of village health workers, most of the less serious infections will in due course be prevented, by early treatment of a simple character, from developing into serious trouble. The daily clinics in health stations can also do much to relieve the congestion in hospitals, both by attending sufferers requiring merely ambulant treatment and referring patients needing institutional care to the hospitals as soon as possible. Such an arrangement will not only increase the efficiency of the service but also reduce expenses.

Personnel.

(1) *Social Status of Technical Workers.*

A physician sent to a village to take charge of a health station is generally given a simple house to live in and a helper to look after his food and clean his house. Because of the family system, he will generally not be accompanied by his wife, who has to remain behind to take care of his parents. In the morning the physician will be busy with his daily clinic. In the afternoon he tours some village in his district to inspect the local health

workers or examine school-children referred to him by the public health nurse. Spring and autumn will be particularly busy seasons because of vaccination campaigns against smallpox and diphtheria. During the long winter evenings and in the hot summer he may find it difficult to spend his spare time satisfactorily.

The social problem as it affects technical workers is a serious one in rural health administration. Quantity production of doctors, even if attainable, would be a rather wasteful method of improving the situation. Obligatory Government service would be practicable, particularly if more or less free medical education were made available to country lads. It may also be assumed that a doctor, after having served the period agreed upon, will often feel inclined to continue the work to which he has become accustomed. An experiment of this kind is shortly to be made in Kiangsi Province. If successful, it will go a long way towards solving the question of continuity.

(2) *Personal Promotion.*

The question of personal promotion is rendered difficult by the different standards of medical schools in China. Two separate scales of pay have been introduced into rural medical service, based upon the grade of school from which the workers graduated. Since some of the doctors from lower-grade schools may turn out to be just as capable as their colleagues from first-class institutions, such discrimination is apt to cause discontent. This is the more serious as the graduates from lower-grade schools are always in the majority, so that no work of any considerable scope can be undertaken without recruiting a large percentage of such workers.

Further, it is not easy to satisfy graduates from the high-class schools who expect more comfortable positions, especially as teachers, regardless of their personal qualifications. The policy developed under these circumstances may be outlined as follows :

Carefully selected graduates from high-class schools are used for work in health centres only and are gradually trained for specialised duties. The doctors from lower-grade schools

are first put to work together with their colleagues from first-class schools in the health centres ; after a period of about three months they are sent to the health stations. They are required to report at the centre every week to discuss business and technical matters under the leadership of the chief of the centre. Moreover, the station doctors serve by rotation for three months of each year in the health centre. The head doctors of the latter in their turn spend at least two months every year in a metropolitan medical centre. Reading material is provided for all stations and centres and, whenever opportunity presents itself, social meetings and entertainments are arranged for.

Salaries are usually low to begin with but are raised as quickly as possible to a " saturation level ". The worker in question is satisfied and probably entertains no wish to seek for another position. Obviously, no hard-and-fast rules can be applied, each locality and even each worker being individually considered.

Thus far, the scheme has proved fairly satisfactory, but it is by no means ideal. The workers must be guaranteed security of tenure as well as adequate insurance against sickness, old age and death. These demands cannot be realised by the medical services alone, but can be satisfied only by a general stabilisation of the Government services. Until that time comes, difficulties will be met with, and whatever attempts are made will be pioneering in character. It is clear, however, that such pioneering efforts will hasten the creation of a stable socialised service.

(3) *Divergence of Training.*

The divergence in training referred to above proves unfortunate in many directions. The practical experience given to the students of many schools is far from satisfactory. The situation is further complicated by the existence of schools of either the " Anglo-American " or the " German " pattern, the graduates of which find it difficult to co-operate with each other. The National Health Administration and the Central Field Health Station have been giving courses of training to prepare graduates from the various medical schools for public health work. For particular training in rural health, the Health

Station of Kiangning Hsien is being used as the demonstration centre.

Under these circumstances, it has often been suggested that a new type of doctors specially trained for rural work should be created. Without denying the theoretical soundness of this idea, one would hesitate to add to the existing diversified types of doctors. Careful experimentation is called for. The *Experimental Medical School in Nanchang* is an outcome of this policy. If it succeeds in its object, it will exert a profound influence on the future standards of medical education in China as a whole. For there is now every indication that the State will take the responsibility of protecting the farming majority against the evils of disease, and that the minds of political and social leaders are turned significantly in this direction.

APPENDIX.

I. The National Health Service under the Central Government of China is composed of :

A. The *National Health Administration* under the Executive Yuan, which looks after matters of legislation, supervision and registration, and national quarantine service.

B. The *Central Field Health Station* under the National Economic Council, which undertakes the technical activities related to public health, with the aid of the following nine departments :

(1) Bacteriology and Epidemic Disease Control ;
(2) Chemistry and Pharmacology ;
(3) Parasitology ;
(4) Sanitary Engineering ;
(5) Medical Relief and Social Medicine ;
(6) Maternity and Child Health ;
(7) Industrial Health ;
(8) Epidemiology and Vital Statistics ;
(9) Health Education.

II. *Subsidiary Health Organisations* under the National Health Administration and the Central Field Health Station are :

(1) The local quarantine services in the ports of Shanghai, Hankow, Amoy, Tientsin, Tangku-Taku, Chinwangtao, Swatow and Canton ;

(2) The National Epidemic Prevention Bureau, principally in charge of serum and vaccine manufacture, with headquarters in Nanking and branch laboratories in Peiping and Lanchow ;

(3) The North-west Epidemic Prevention Bureau ;

(4) The Mongolian-Suiyuan Epidemic Prevention Bureau, primarily producing biological products for the control of animal diseases ;

(5) The Mongolia Health Centre in Suiyuan ;

(6) The Central Hospital at Nanking ;

(7) The Central Hygienic Laboratory, including the Narcotics Division ;

(8) The Public Health Training Institute ;

(9) The First National Midwifery School in Peiping ;

(10) The Central Midwifery School in Nanking ;

(11) The Central School of Nursing at Nanking ;

(12) Urban and rural health demonstration centres.

III. *Provincial Health Services*, consisting of an administrative office, a hygienic laboratory, a provincial hospital, nursing and midwifery schools, and an urban health centre in the capital of the province, with subsidiary services in districts and settlements, have been established in the following provinces : (1) Kiangsi ; (2) Hunan ; (3) Kansu ; (4) Ninghsia ; (5) Chinghai ; (6) Shensi ; (7) Chekiang ; (8) Yunnan ; (9) Fukien. Surveys with a view to introducing similar services have been undertaken in Kwangsi, Shansi and Szechwan.

Detailed plans concerning the construction of a provincial hospital, the establishment of schools of midwifery and nursing in Yunnan, as well as of a health station for the Kochiu mining district, are now being carried out.

In Fukien, travelling clinics for each of the five health districts have been organised. A provincial hospital will soon be opened. Courses for midwives and nurses have been started and two health stations opened at Foochow. For the year 1936/37, a sum of $350,000 is provided for public health work, including an anti-plague service and the establishment of a leprosy hospital.

In Kiangsu, Shansi and Shantung, plans have been made for the establishment of local health organisations.

IV. *Municipal Health Services* on an elaborate scale exist in Shanghai, Peiping, Canton and Nanking. Their detailed description is not germane to the present discussion, but it should be noted that all these administrations pay much attention to suburban and rural districts within their respective spheres.

V. *Rural Health Services*. — Detailed information on rural public health activities will be found in Tables I and II. Further statistical material dealing with various phases of public health work in China is appended.

Table I. — Number of Government Health Institutions in Certain Provinces in 1936.

Province	Provincial centre	Hsien centre	Health station and health sub-stations	Others
Chekiang ..	1	12 hsien hospitals	22	—
Chinghai...	1	—	1	2 travelling clinics
Hunan	1	6	4	13 health offices attached to schools
Kansu.....	1	5	6	44 health offices
Kiangsi....	1	81	12 (including 10 welfare centres)	—
Kiangsu ..	(1 provincial hospital) [1]	44 hsien hospitals	9	17 maternity homes
Kwangsi...	(3 provincial hospitals)	5 hsien hospitals	—	—
Ninghsia...	1	—	2	1 travelling clinic
Shensi.....	(Provincial commission on public health) [1]	9	4	3 travelling clinics
Anhwei....	1	3	1	—
Yunnan ...	1	3	10	Anti-malaria unit
Fukien ...	Health division	8	2	10 travelling clinics
Suiyuan ...	1	—	—	—
Shantung .	—	4	1	—
Hopei	—	1	2	—
Total....	15	181	76	91

[1] This organisation serves as a centre for public health activities, as no regular provincial health bureau has been organised.

Table II. — Details of some Rural Health Organisations, 1936.

Location			Type of organisation			Number of staff								Current budget
Province or City	Hsien	District	Municipal Government	Hsien Government	Private organisation	Year of establishment	Physician	Nurse	Midwife	Pharmacist	Sanitary inspector	Others	Total	
	Total		3	12	2		47½	63½	37	8	3	143	302	$ 209,278
Chekiang	Wuhsing			+		1933	1	2	2	—	—	1	6	4,800
	Wukang			+		1932	3	—	1	1	—	1	6	5,800
	Lanchi			+		1935	2	6	7	—	—	6	21	11,069
Hopei	Wanping	Chingho			+	1931	1	—	2	1	—	2	6	4,540
	Tinghsien			+		1929	7	10	—	1	—	32	50	35,500
Kiangsu	Hsiaohsien			+		1933	2	1	—	—	—	1	4	4,452
	I-hsing			+		1936	2	4	1	—	—	5	12	11,988
	Kiangning			+		1931	9	19	10	—	—	29	67	41,900
	Chujung			+		1934	2	2	3	1	1	1	10	4,080
	Taihsien			+		1932	2	1	2	1	—	7	13	7,824
	Yencheng			+		1933	1	1	1	1	—	3	7	6,369
Shanghai	Kaochiao		+			1929	3	2	4	—	1	6	16	15,000
	Kiangwan		+			1933	3	3	1	1	—	17	25	14,596
	Woosung		+			1929	3	6	1	1	1	6	18	13,000
Shantung		Lungshan			+	1932	½	½	—	—	—	—	1	2,200
	Chowping			+		1934	4	3	1	—	—	16	22	15,360
Shensi	Hwahsien			+		1934	4	3	1	—	—	10	18	10,800

Table III. — National Health Budget for 1936/37.

	$
1. National Health Administration	288,000
2. Central Field Health Station	360,000
3. Central Hospital	514,642
4. Central Midwifery School	42,000
5. First National Midwifery School	55,008
6. Shanghai Quarantine Station	108,000
7. Amoy Quarantine Station	40,800
8. Wuhan Quarantine Station	12,000
9. Tsin-Tang-Chin Quarantine Station	26,400
10. National Epidemic Prevention Bureau	261,516
11. North-West Epidemic Prevention Bureau	50,000
12. Mongolia-Suiyuan	28,800
13. Mongolia Health Centre	62,000
14. National Medical College of Shanghai	298,000
15. The National College of Dentistry	84,000
16. The National College of Medicine and Pharmaceutics	26,000
17. The Medical Legal Institute	66,000
18. For health work in the North-Western Provinces	79,080
19. For health work in Yunnan	10,920
20. For special health work	274,716

Table IV. — Special Courses on Public Health : Entrance Requirements : Total Number of Graduates during 1936.

Public health officers' course	(Medical School)	154
Public health nursing course	(Nursing School)	182
Course for sanitary engineers	(College of Engineering)	12
Special course for training in bacteriology and serology	(Medical School)	3
Special course for public health officers	(Medical School)	—
Special public health officers' course for Fukien	(Medical School)	11
Special course for public health nurses for Fukien	(Nursing School)	23
Course for sanitary inspectors	(Junior Middle School)	142
Course for graduate pharmacists	(College of Pharmacy)	5
Internships and assistant residentships	(Medical School)	162
Course for rural overseers	(College of Engineering)	2
Course for diagnostic laboratory technicians	(Junior Middle School)	—
Senior technicians' course	(Junior Middle School)	—
Course for doctors in maternity and child health	(Midwifery School)	21
Health education course for schoolteachers	—	119
Special public health course for Kiangsi (spring 1935)	(Medical School)	21
Course for teachers of public health nursing	(Nursing School)	—
	Total	857

Words in parenthesis = Requirements for entrance.

Table V. — Medical Personnel registered with the National Health Administration.

	To end of 1936 :	During 1936 :	
Doctors	8,932	1,071	
Pharmacists	474	78	
Dispensers	2,263	—	(No more to be registered)
Midwives.	3,174	557	
Dentists [1]	145	145	
Nurses [1]	575	575	

II. RURAL RECONSTRUCTION.

(Figures 5-8)

Introduction.

The term "rural reconstruction", though sanctioned by usage, is an ambiguous one. The Chinese expression for the movement, *hsiang ts'un chien shei*, should be translated as "rural construction". Several other terms, such as "rural rehabilitation", "agricultural reform", and "village improvement" have been used, but none seems to afford a satisfactory description of the evolutionary process as a whole. They all refer to a variety of efforts aiming at advancing or directing the social and economic development of the rural population, undertaken under national or provincial, official or private, progressive or conservative auspices. Most of these activities have been inaugurated since 1931.

The origin of the movement may be traced to three factors : (*a*) China's contact with the industrial Powers of the West and the consequent decline of rural economy ; (*b*) proposals on the part of Chinese thinkers and statesmen for a controlled or planned social development of the country, as exemplified by Dr. Sun Yat-sen's "*Three People's Principles*". (*c*) a series of incidents taking place almost simultaneously in 1931/32 and causing a national crisis unparalleled in the previous history of China ; these incidents included the great Yangtze and Hwai River Flood, the Japanese military aggression in China, the

[1] Registration of dentists and nurses started in 1936.

communist movement in certain areas, and the spread of the world economic depression to China.

As the composite achievement of divergent social forces, the objectives of the movement are by no means unified. At least three different objectives may be discerned :

(*a*) Efforts to increase production. China, being a newcomer in the race of industrialisation, has not been given the opportunity for free and unhampered growth. So rural decline is not counterbalanced by industrialisation in cities. The following figures summarise the economic self-sufficiency of China as estimated in 1935 (1) [1] :

Economic goods	Rates of self-sufficiency %	Economic goods	Rates of self-sufficiency %
Rice	96.0	Acids	88.8
Wheat	96.5	Soda	85.1
Textile	79.0	Tiles and bricks	92.3
Silk	200.0	Cement	83.3
Wool	26.7	Leather	60.4
Knitting	98.3	Iron and steel	5.0
Flour	95.8	Machine	23.5
Sugar	40.4	Dye	7.4
Tobacco	98.8	Gasoline and kerosene	—
Wood-oil	237.8	Electric supplies	15.8
Glass	53.0	Electricity	49.6
Paper	38.9	Rubber	76.5
Matches	101.5		

The figures showing the percentage ratios between the estimated consumption and the estimated amount supplied by Chinese producers and industrialists (taking the amount of consumption as 100) clearly indicate the general lack of self-sufficiency. The urgent necessity of increasing production is shown by the fact that, from 1885 to 1935, there was a total import excess of treasure and commodities amounting to $11,545,000,000 (2), and that, although the population increased by 31% between 1873 and 1933, the corresponding increase in farm acreage was only 1% (3). The difficulties attending large-scale development of modern industries have compelled

[1] See numbered References on page 37.—*Editor.*

the authorities to turn their attention to agricultural production and the furtherance of rural industries, which still form 70% of China's industrial output (4).

(*b*) Another objective is "national salvation". The external crisis confronting the country since the Mukden incident has had a profound effect on China economically and psychologically. The military occupation of the three North-Eastern Provinces, causing a loss in Government property of $1,785,000,000; the Shanghai conflict in 1932, involving a further loss of $1,560,000,000 (5); and the extensive smuggling activities in North China between August 1935 and April 1936, resulting in a decrease in Customs revenue of $25,507,000 (6), are some examples of the seriousness of the situation. In the meantime, the appreciation of silver, largely due to changed currency policies in the United Kingdom, Japan and the United States, caused a steady decline in agricultural prices, a fall in internal trade, a continuous drain of capital from the rural districts to the cities, and a mass exportation of silver from China. For example, at a time when the farmers desperately needed credit facilities, silver stocks in Shanghai increased from $253 million in 1931 to $359 million in 1932, $457 million in 1933, and $517 million in 1934. In 1934 and 1935, smuggling of silver from China reached a total of $570,000,000 (7). All these factors contributed to the serious depression that set in. The situation became so intolerable that, in November 1935, China was forced to abandon the silver standard and adopt monetary reforms, thus preparing a financial foundation for rural reconstruction.

(*c*) The third objective is better local self-government. Radical attempts in this field and regarding agrarian reforms in general were made by the communists in the sovietised areas. As a result of the Central Government's successful campaign in Kiangsi in 1935, an extensive programme of rural reconstruction and more efficient local self-government has been instituted (8).

Rural reconstruction may thus be described as a national movement of a composite nature, largely inspired by the desire for national salvation, and having as its objective the increased economic and political efficiency of the rural population.

Institutions dealing with Rural Reconstruction.

Institutions in China that are interested in rural reconstruction may conveniently be divided into two classes, private and governmental. As a rule, the private institutions furnish the initiative and the preliminary exploring and experimentation, and the governmental institutions lay emphasis upon extension and standardisation (9).

The private institutions may be divided into four groups. Firstly, there are the social or educational service agencies, such as the National Association for the Mass Education Movement, the National Vocational Educational Association, the National Social Educational Association, the China International Famine Relief Commission, the National Christian Council, the Y.M.C.A., the Y.W.C.A., and scores of local agencies. These agencies are primarily interested in rendering practical service to the population. In order to demonstrate the value of rural service, they establish special centres whose sphere of influence ranges from small villages to groups of hsien.

The second group consists of universities, colleges, rural normal and agricultural schools. Either independently or in collaboration with other rural agencies, all these schools maintain special rural centres. But these serve only as field laboratories for teaching and research. As a result, most of their activities are confined to the particular branches in which they are interested.

The third group consists of banks, including some of the Government or semi-Government banks taking a leading interest in the promotion of rural credit and co-operative marketing. Some of these banks operate special departments for rural credit and agricultural co-operation ; some maintain agricultural warehouses, while others form consortiums, such as the Agricultural Consortium, the Fishing Consortium, etc. Their main aim is to promote their own business by assisting the farmers through cheaper credits than the village usurers and landlords care to give.

The fourth group consists of scattered individual efforts for village self-government or rural welfare. The usual method of approach is to organise a self-government association in

the locality, which undertakes various activities in accordance with the wishes and needs of the local population. The most notable example is Peng Yu-ting's work in Honan. At the peak of his activities, the Federated Self-government Union of Cheng-ping, Ssi-chuan and Nei-hsiang maintained a well-armed village volunteer corps, amounting to 50,000 men ; in less than two years, and after nine major campaigns, this body reduced the bandit-infested countryside to peace and order. The union looked after its own finances and undertook an enormous amount of reconstructional work, including land registration, road building, rural telephone service, motor transportation, rural education, afforestation, cotton and sericultural improvement, organisation of co-operatives and village warehouses, public health and centralised relief.

Among the Government institutions, three organisations, which were all dissolved after the completion of their commissioned task, had been instrumental in promoting large-scale rural reconstruction. One was the National Flood Relief Commission, organised in 1931 to deal with the Yangtze floods, which affected 25 million people in 131 hsien of five provinces, and caused a total material loss of two billion dollars (10).

Under the capable leadership of Dr. T. V. Soong, the commission performed the titanic task of administering in cash and in kind relief amounting to $70,000,000. The work was extended to 269 hsien, granting free relief to nearly 5,000,000 persons and camp relief to 1,000,000 ; 500,000 suits of winter clothing were distributed ; and medical help was extended to 2,500,000 ; loans for farm rehabilitation were granted to 360,000 farmers. Some 2,800,000 persons were employed on labour projects so that, including their families, at least 10,000,000 received relief from the commission (11).

This work constituted the first definite step toward governmental rural service on a national scale based upon modern technical approach. The successful completion of the programme gave a vivid demonstration of the value of modern rural health work and rural co-operatives. The way was also paved for technical collaboration between the League of Nations and China, which has been an important factor in

the development of governmental programmes of rural reconstruction in this country.

The second organisation was the Rural Rehabilitation Committee of the Executive Yuan, with M. Wang Ching-wei as Chairman. Besides co-ordinating rural reconstruction work in China, the committee was instrumental in establishing the National Agricultural Research Bureau and the National Rice and Wheat Improvement Institute in the Ministry of Industry, in launching agricultural relief and co-operative work in North China, in sponsoring the first National Co-operative Conference and in pushing forward reforms in taxation (12).

The third organisation was the Headquarters of the Commander-in-Chief for the Suppression of Bandits of the Military Affairs Commission. In the course of his campaigns against the communists in Central China, General Chiang Kai-shek pointed out emphatically that rural economic and political reconstruction should be complementary to military reconstruction in the task of national unification. Thus, in all the areas under his military control, he enforced the *pao-chia* system of local self-government based on small units of ten (a *chia*) and 100 (a *pao*) homes, which were made collectively responsible for the misdeeds of any individual in the unit in question. Starting from this *pao-chia* system, he instituted mass reform programmes, including road-building, irrigation, agricultural improvement, civic education, organisation of co-operatives and land registration. Permanent features of these reforms were the in-service training of the magistrates and the incorporation of social and economic projects in hsien administration (13).

The branches of the National Government that are at present actively engaged in various phases of rural reconstruction are the National Economic Council, the Ministry of Industry, the Ministry of Finance, the Ministry of the Interior, the National Reconstruction Commission. The National Economic Council is mainly interested in road-building, hydraulic engineering, cotton and sericultural improvement. In the field of health, it maintains the Central Field Health Station, which confines its activities to technical research and extension. Far-reaching projects of the council concerning co-operatives,

tea improvement, animal husbandry in the north-west and rural welfare centres in Kiangsi have recently been placed under the ægis of the Ministry of Industry. The Council has conducted studies on land tenure and light industries and has served as the chief liaison office for technical co-operation between the League of Nations and China.

Under the Ministry of Industry, important work is done in rice and wheat improvement, insect control (Figure 5), animal husbandry, fishery, testing and standardisation of agricultural products, agricultural credit and rural industry. In the field of co-operation, definite steps are taken to effect unified administration of co-operative enterprises, to improve existing legislation and to spread better business methods among co-operators. In-service training of provincial and hsien workers in agricultural extension, animal husbandry and co-operative organisation is undertaken. To facilitate agricultural marketing, a $60 million rural credit bureau has been formed. Co-operative treasuries are gradually extended to provinces and hsien ; more centralised sales agencies have been organised for wood-oil, tea, fishing and rural industrial products ; and special organs for inspecting, testing and standardising agricultural commodities destined for export are established in Shanghai and other ports.

The Ministry of Finance has concentrated its energies on the gradual abolition of exorbitant irregular rural taxes and surcharges. The currency reforms, promoted under the leadership of Dr. H. H. Kung, have done a great deal to restore rural prosperity and agricultural prices. The Ministry is also instrumental in promoting food control, reclamation of waste areas, opening of granaries, and in encouraging the commercial banks to take up rural loans.

The Ministry of the Interior has made two important contributions to rural reconstruction—the establishment of the experimental hsien and the in-service training for magistrates. The idea underlying the former is to approach the problem of rural reconstruction experimentally and on a hsien unit basis. For this purpose special hsien are set aside in the different provinces to study local administration. At present, experimental hsien, some bearing this name officially,

are established in Kiangsu, Chekiang, Shantung, Hopei, Anhui, Kiangsi, Hupei, Hunan, Shansi, Yunnan, Fukien, Szechuan and Kwangsi. The training of magistrates is of recent origin, and is largely a continuation of the work undertaken in this direction by the Military Headquarters in Kiangsi. Magistrates from all over China are called to the capital in groups of one hundred or more ; they are required to go through a special course of training, including instruction in rural economics, agricultural extension, rural health, rural education, economic planning, etc.

The National Health Administration was the first technical institution in China organised on a national scale. Its activities in promoting rural health have been considered in the first section of this report.

The National Reconstruction Commission is the oldest reconstructional agency established by the National Government. It is now chiefly interested in power generation, coal-mining, irrigation and manufacture of electric supplies. The irrigation of rice-fields by means of electric power in Kiangsu is an interesting experiment in rural electrification.

Many other organs of the National Government are also extending their services in various degrees to the rural field. For instance, the Ministry of Railways has recently put in force a schedule of reduced freight rates for transporting agricultural products. The Ministry of Communications is gradually increasing the number of postal and telegraphic offices in rural towns and villages, many of which have facilities for postal remittances and savings. The Legislative Yuan, under the capable leadership of Dr. Sun Fo, has passed many important laws relating to rural reconstruction, such as the Land Law, the Law of Co-operative Societies, etc.

The work of the National Government organs is supplemented by provincial and district agencies. Thus, in Shansi, General Yen Hsi-shan has for more than two decades worked on village self-government and provincial economic planning. Recently, he introduced a scheme of communal ownership of land in villages. In Kiangsi, the provincial Government has established a provincial bureau of health, a provincial co-operative commission, a provincial institute of agriculture, and a number of

rural educational and welfare projects under provincial auspices. In Hunan and Szechuan, provincial planning commissions have been established with the main object of furthering rural reconstruction. Kwangsi has also been to the fore in rural organisation and mass training. In all provincial Governments there is a bureau of reconstruction, one of whose functions is agricultural, co-operative and industrial administration and promotion. In recent years, these provincial bureaux have shown a remarkable amount of vitality and initiative.

The experimental hsien work carried out in many districts has already been referred to. The different stations have programmes of their own, varying in the emphasis laid upon particular phases of the work. Thus, the chief contributions of Kiangning and Lanchi are tax reform and land reporting ; of Ting-hsien, (Hopei) rural health ; of Hochai (Shantung), village self-policing ; and, of Chowping (Shantung), the system of peasant schools. Recently, special commissioners of administrative inspection, a kind of super-magistrates over several hsien, have been appointed in more than thirteen provinces.

The New Life Movement and the People's Economic Reconstruction Movement, sponsored by General Chiang Kai-shek, represent another significant trend in reconstruction. While the former emphasises the social and moral spirit of the people, the latter is interested in agricultural, mining, industrial and commercial development. Though sponsored by Government leaders, both movements are based upon collaboration between the people and the Government. Their national headquarters are in Nanking, with provincial offices in the provincial capitals and many sub-offices in the hsien. At present the headquarters of the People's Economic Reconstruction Movement is planning to promote rural and handicraft industries and their marketing (14).

Analysis of the Movement.

It will be noted that, at present, the leadership and initiative of rural reconstruction in China is not in the hands of the peasants but of Government officials, social workers, bankers, enlightened village gentry, etc.

Two main categories of activities may be discerned : (*a*) those primarily concerned with regional and local development ; and (*b*) those based on national policies. The first category includes agricultural extension, rural industry (Figures 7 and 8), rural co-operation, rural education, rural health and social welfare and local administration ; the second social or community statistics, land tenure, irrigation, frontier settlement, transportation, taxation and currency (15).

The financial sources of rural reconstruction are : (*a*) taxation ; (*b*) domestic and foreign loans, such as the American Cotton and Wheat Loan ; (*c*) financial collaboration between the Government and private concerns ; (*d*) advances from banking and industrial houses ; (*e*) voluntary contributions or assessments from the villagers ; (*f*) contribution of philanthropic bodies or special grants from foundations ; (*g*) Contributions of labour by the farmers, as in the case of road-building, well-digging and dyke construction.

The total amount spent for rural reconstruction during the last few years has shown a steady increase. The National Government has spent for reconstructional projects (exclusive of salaries and some of the Ministerial enterprises) : in 1933/34, $10,736,229 ; in 1934/35, $27,064,620 ; in 1935/36, $36,374,890 ; and in 1936/37, $53,110,221 (16).

Regarding the results of all these efforts, it may be stated that improved strains of the staple crops, such as wheat, rice, cotton, soya-bean, kaoliang and millet, have been developed through pure line selection, resulting in an increase in yield of 30% or more (17). In food supply, China is short each year about 44,000,000 *shih tan* [1] of rice and 16,000,000 *shih tan* of wheat. According to the present programme of improvement, the country can be self-sufficient in rice and wheat in less than five years (18). In cotton, China was almost self-sufficient in 1936. The cotton consumption of China is about 14,500,000 tan, and the production since 1919 has shown the following increases and decreases (19) :

	tan		tan
1919.	9,028,390	1934	11,201,999
1921.	5,429,220	1935	8,142,911
1931.	6,399,780	1936	14,468,288

[1] One *shih-tan* = 50 kg. ; one *tan* = 60.479 kg. or 133.33 lb.

According to Buck's study of 891 hsien in twenty-two provinces in 1934, 46% of farmers operated their own land, 25% owned part of the land and rented the rest, and 29% rented their farms (20). This situation is quite serious, but increase in farm income and reduction of taxes and interests on loans will prove helpful. It is estimated that, from July 1934 to August 1935, at least 5,200 items of exorbitant taxes and surcharges amounting to about $50,000,000 were abolished. Further reforms are contemplated in the various provinces (21). In 1935, the gross farm income showed an increase of 10% over 1933 and 1934 (22), and agricultural loans by banks amounted to about $100,000,000 (23). From 1934 to 1935, the number of co-operative societies rose from 9,948 to 25,842, and their membership from 373,856 to 992,578 (24). The area surveyed in eight of the provinces has already reached the figure of 42,019,000 mow [1] (25).

Irrigation and reclamation, construction of canals, digging of wells, building of levees and sea-walls, dredging and afforestation are also making steady progress. As a result of these operations, satisfactory results have been achieved in flood control; new areas are irrigated, and interesting experimental farm projects (such as that at Kingshui, in Hupeh) are instituted. Between 1919 and 1935, approximately 150,000 hectares of forest land were opened and 600 million trees planted (26). Since it is estimated that one-eleventh of the arable land in China is occupied at present by graves, it is hoped that the propaganda of the Chinese Cremation Society, founded in 1936, will popularise cremation as against the land-consuming method of burial.

Compared to the needs of China as a whole, the progress made so far cannot be considered spectacular. For example, out of a total of 220,000,000 hectares of forest land required, only 150,000 hectares, or less than 1/1,400th part, have so far been afforested (27). With a rural population of over 340 million and more than 60 million farm households, there are at the present time only 1,000,000 members of co-operative societies (28). Farmers receive only 2.4% of their financial assistance

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[1] One mow = one-sixth of an English acre.

from the banks, the remaining 97.6% still coming from personal loans at high interest from landlords and usurers (29).

The social and cultural aspects of rural reconstruction are even less satisfactory. It should be considered, however, that, until a physical and economic foundation is laid, social and cultural work cannot be developed on any considerable scale. The growth of highways, rural postal establishments and co-operative societies from 1930 to 1935 shows an upward trend in rural communication and economic organisation (30).

Year	Highways (in kilometres)	Rural postal establishments	Co-operative societies
1930	46,666	29,068	2,463
1931	66,111	29,570	3,618
1932	70,899	29,148	3,978
1933	72,251	28,908	6,632
1934	84,809	31,972	9,948
1935	96,345	33,656	25,842

It is not unreasonable to expect that, in a few years, the nation will take more serious and systematic interest in such social problems as rural education, community recreation, rural health, social welfare and local self-government. At present, the progress in these fields is not adequate to meet the needs of the rural population. How much help can be rendered to the 340 million peasants by 181 hsien health centres and 177 rural health stations and clinics (31) ? While China has nearly 2,000 hsien, 100,000 villages and one to two million hamlets, there were, in 1932, but 477 rural normal schools with 50,150 students (32). While the country is spending millions of dollars for charity, modern social administration has just made a small beginning. As to local Governments, less than a score of hsien have a modern experimental administration. Furthermore, according to data from the Ministry of the Interior, in 1932, from 37% to 84% of the total number of hsien in ten provinces experienced changes of magistrates (33). It is true that the general situation is greatly improved since that

year, but the insecurity of office is an index of the technical and political weakness of local administration.

It is possible, however, that social and cultural improvement will come after material and economic advancement. The reconstructional programme of China may be divided into four different aspects: (*a*) financial, such as tax and currency reforms; (*b*) physical, including the development of railways, highways, waterways, airways, postal and telegraphic services; (*c*) economic, including agriculture, irrigation, rural industry and co-operation; and (*d*) social and cultural, such as public health, rural education, community recreation, social welfare and local self-government. The first furnishes the financial basis of reconstruction, the second the physical basis of political and economic unification of the country, the third economic productivity, and the fourth social control and social happiness (34). Not until the first three aspects of reconstruction have made sufficient progress can the fourth aspect proceed efficiently.

When we review the entire development of rural reconstruction, three distinct trends may be discerned. One is the change from the negative type of emergency measures, such as flood relief, famine relief, poor relief, drought relief or war relief, to the more positive, preventive type of technical service, which takes the form of co-operative organisation, agricultural extension, highway construction, building of canals, afforestation, river improvement, development of water-power and the development of rural industries. Another trend is from the amateur, sentimental and unorganised conception of rural improvement to the technical, scientific and systematic conception of community reconstruction. It is due to this change that more modern-trained men can find themselves useful in rural reconstruction. It is hoped, too, that this change may not only make rural work more scientific, but help to relieve the present intellectual unemployment, and to find for men with technical training a wider social application of their knowledge than cities and Government offices can offer.

Thirdly, it is inevitable that the independent, individualistic approach of different technical lines should give way to a more correlated and integrated approach (or the vertical technical to the horizontal community approach).

In spite of many shortcomings, there are several signs pointing toward co-ordination, correlation and planning (35). Sufficient centralisation of control will result in better co-ordination. Plans are under consideration to make the People's Economic Reconstruction Movement an agency of co-ordination, not only among Government organs, but also between private and Government forces.

Under the present scheme, the hsien is the working administrative unit. In other words, the hsien Government is the political machinery through which technical services of all kinds may be extended to the population under State auspices. It is necessary, then, to work out co-ordinated and correlated hsien unit programmes of agricultural extension, co-operatives, public health, etc. These programmes must be so simple that the population can bear the cost, and so organised that the different groups of people in the hsien all receive fair and equal treatment. Finally, they must be so planned that there is a sufficient staff to carry on the work.

To achieve ultimate success, the problems of methods, personnel, organisation and finance must be tackled analytically, systematically and realistically. One of the organisations that is inspired by this idea is the North China Council of Rural Reconstruction, composed of representatives of a number of the leading universities. It maintains seven departments—namely, agriculture, engineering, social medicine, education, economics, social administration and local government. It has a correlated training and research programme in rural reconstruction of the horizontal community type based on the hsien unit. It operates two field stations actually in the hsien Government offices where rural reconstruction training and research are conducted. At the same time, authorities of at least two provincial Governments are interested in the horizontal approach, and they are planning to apply this method on a province-wide basis.

Summarising, it may be stated that the rural reconstruction movement presupposes three things : (*a*) If China is to survive in the family of nations, she must modernise her social organisation and vastly increase its working efficiency ; (*b*) modernisation of China means largely the application of scientific

knowledge to community reconstruction from the village unit up ; and (*c*) this application must be a planned process, taking into consideration the social factors of population, resources and technical skill, and making use of the local unit of government as the medium of co-ordination and correlation of technical services.

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III. SANITATION AND SANITARY ENGINEERING.

Introduction.

The sanitary environment of the Chinese farmer is very poor. He lives in a house usually constructed with mud bricks and straw, with no windows for admitting light and air (Figures 9, 10 and 15). Sometimes he lives together with his pigs in the same room. He drinks the water that is most easily available. Flies and mosquitoes are his companions in summer. No medical care is available in the villages, and often he has to travel ten or twenty miles to reach an old-type Chinese physician.

The improvement of these insanitary conditions in villages requires time and planning. It is a field that needs creative investigation and experimentation. A special group of personnel has to be trained to undertake such work, necessitating the inculcation of sympathy for and understanding of the problems of the farmer.

Experimental Work in Kiang Ning Hsien.

As a pioneer in the field of rural sanitation, the Central Field Health Station in Nanking instituted co-operation with the

Kiang Ning Hsien Government in July 1935, thus making the whole hsien, an area of 7,350 sq. li [1], an experimental district. The aim of this work is threefold : (1) To provide a field laboratory for training health workers, including doctors, engineers, inspectors and nurses ; (2) to provide field facilities for the study of certain sanitary problems in rural China ; and (3) to promote the welfare of the farmers by improving their sanitary environment, such as housing, water supply, excreta disposal, etc. It is hoped that the time will not be distant when Kiang Ning Hsien can formulate certain principles on the basis of experimental data, which will be useful for reference for co-workers in the field of rural sanitation in other parts of China.

Kiang Ning Hsien is situated south of Nanking, and has a population of 448,000. It is divided into 7 districts, which are subdivided into 35 chen and 53 hsiang. The Health Centre is located in Tung Shan Chen. The other six districts have one health station each, and there are nine sub-stations.

On account of the limitation in personnel, the work of sanitation has been hitherto restricted to three districts. It may be outlined as follows :

(1) *Training of Personnel.*

During the first year of experimentation at Kiang Ning Hsien, it was found that the usual type of engineers, coming from urban surroundings, turned out to be unsuitable and dissatisfied when placed out on rural stations. A special type of man with practical engineering knowledge coming from rural districts was then selected and required to go through a four months' course of training in sanitary engineering. The first month's training was carried out in the field and constituted a study of the general sanitary conditions of the farmers. During the following three months the training took the form of lectures, discussions, demonstrations and actual practice in sanitation and construction. Two students graduated in December 1936, and were assigned to the health stations in the hsien. It is hoped that these men will be competent enough

[1] One sq. li is equivalent to 0.128 sq. mile.

to work out practical solutions for the sanitary problems of rural China under the direction of an experienced sanitary engineer.

(2) *Sanitary Survey.*

To acquire more complete data of the sanitary conditions, surveys of water sources, fæces containers and housing conditions are being made. The existing maps of the hsien are incomplete and inaccurate, and the survey includes, therefore, population and location of villages, roads and streams. Maps showing all villages have been plotted out, and will be extremely useful in promoting health work.

Water surveys, including 125 ponds, 15 wells, 9 river sources and 141 homes, show that about 74% of the village population use pond water, 17% use river water and 9% use well water for domestic purposes. The prevalent use of pond water is largely due to its convenience. Ponds are everywhere. They are used for irrigation, washing and drinking. Wells are not favoured because of superstitions and also economic reasons.

Laboratory analyses show that all existing water sources are highly polluted (Figure 11). Turbidity is the only criterion used by the farmers in judging the quality of water. Boiled water is used for drinking, but cold water is used for washing eating-utensils. About 25% of the families have no kongs [1] for sedimentation, and no family uses alum for coagulation.

The local system of collecting and storing fæces and the method of applying fæces to the farm were also investigated ; 150 containers of human fæces and thirty-five piles of animal fæces have been studied. There are no public latrines in the villages. Practically every family has one fæces container and stores separately. The containers are of three general types (Figures 12, 13 and 14) : earth pit, brick-paved pit and kong. The kong and the brick-paved pit are more commonly used.

Most containers are used for both squatting and storage. The women use buckets and the fæces are then poured into these containers. In other words, new fæces are constantly added to the old fæces.

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[1] A *kong* is a Chinese term for a vitrified tile cistern.

The concentration of fæces depends upon the following factors : (*a*) rain : all containers are open, without cover. (*b*) ground-water table : in the case of pits, fæces are easily dried where the ground-water table is low, but there are places where ground-water seepage dilutes the fæces quite considerably ; (*c*) some farmers place animal fæces (of dogs and pigs) together with the human fæces. In such containers one may find about 20% animal fæces.

The farmers use fæces when they need them for their fields. The period of storage varies from a few days to four or five months.

The human fæces are applied mostly to vegetables. A wooden scoop is used to take them out from the pits and place them in wooden pails, into which water is added for dilution. The contents of the pits are thoroughly mixed before being taken out with the scoop.

The animal fæces are largely of oxen and donkeys, those of dogs, pigs, etc. constituting a minor portion. They are either stored in shallow pits or piled on the ground, the latter practice being more common. They are mixed with ashes or decayed organic matter and then ploughed into the soil. Water is then added to the field. The period of storage is usually from three to five months.

All houses of the farmers are poorly ventilated and lighted. Most houses have no window at all and they depend upon the door only for light and air (Figure 15). The floor of the houses is, almost without exception, of earth, and is very uneven. Only 50% of the houses are constructed of brick and tile, whereas the remainder are huts made with earth and straw. The rooms are extremely damp during rainy days.

(3) *Housing Improvement.*

Improvement projects in the Chinese villages must take into consideration the financial condition of the farmers. They are of no value if they are far beyond the financial capacity of the people. A pure charity programme will die as soon as the external source of financial aid ceases. The work of housing improvement in Kiang Ning Hsien has been carried out with

a view to arousing the farmers' enthusiasm and inducing them to participate as far as possible in the programme.

The Chinese farmers have lived under oppression so long that some of them refuse to have their houses improved on the ground that they fear additional taxation will follow. It is only after strenuous efforts on the part of the sanitation workers that the sympathy and co-operation of the people are secured. No better evidence of appreciation can be shown than the fact that the inhabitants of some villages in District II have paid 40% and those of some villages in District V have paid 50% of the required expenses of improvement. Instead of refusing the improvement, they now come to the health stations and request to have their houses improved, and they are willing to share the expenses. For the really poor families, the station supplied all materials and the farmers in turn supplied the labour.

The work of housing improvement done in Kiang Ning Hsien consisted of four parts: (*a*) Plastering the walls with earth, paper base and lime. This not only improves the wall itself but also the lighting of the room. (*b*) Installing roof windows with glass plates about 18 inches by 26 inches. This is considered the most economical method of admitting sunlight into the room, but does not help ventilation, as the windows on the roofs are fixed (Figures 16 and 17). (*c*) Making ventilation holes in the wall. Ordinary windows are too expensive, and loop-holes about 3 inches by 10 inches in size are used instead. Much difficulty was encountered at first, as the farmers were not able to see the need of good ventilation. Further, they are afraid of wind and rain and they object to having large holes, being afraid of burglars. (*d*) Repairing straw roofs. Some straw roofs leak very badly, and most of them are out of repair. They are renewed in part or in full. By the end of 1936, 199 houses had been improved in thirteen villages (Figures 18, 19 and 20).

To improve one house costs, on the average, $4.36 Chinese national currency, and to improve one room costs $1.72. Plastering one fong (100 square feet) of wall area costs $0.32; installing one roof window costs $0.55; making one ventilation hole costs $0.05, and repairing one fong of straw roof costs $0.44. These figures are low enough to be within the financial reach

of the Chinese farmers. It is expected that in due course, as education progresses, they will improve their housing conditions themselves.

Experiments on other features of housing are being carried on in Kiang Ning Hsien. These include (1) floor ; the existing floor of rural houses is of earth. Three new types are being tried : (*a*) the earth floor is first made even, and bricks are laid with a one-inch sand cushion. The joints of the bricks are filled with lime mortar. The cost is estimated at $4 per fong (100 square feet), excluding labour. (*b*) Making 6 inches of 1 : 3 : 5 lime concrete, broken bricks being used for coarse aggregate. The estimated cost is about $5 per fong. (*c*) Making 6 inches of lime earth, composed of one part of lime and two parts of ordinary earth. Such a floor will cost about $2 per fong. It is proposed to reduce the cost further by adding broken bricks. (2) Roof repair : (*a*) the tiled roofs need repair only in part ; (*b*) straw roofs are repaired with three or four alternate layers of straw and earth ; (*c*) the use of one sheet of oil-paper on straw roofs will protect the house better against rain ; (*d*) roofs made of rush mat with oil-paper and straw will also be tried.

In many villages, the farmers have no chimneys for their kitchen ranges. The smoke collects on a rush-mat and creates a very bad atmosphere in the room. The least expensive method of constructing chimneys is also under experiment. The separation of the pig-pen is another project which Kiang Ning Hsien is striving to secure.

The mud and straw houses break down in about four or five years. An investigation of the conditions of the houses is, therefore, being made, so that sanitary improvements may be enforced when the farmers rebuild their houses. Standard drawings are being prepared for different types of houses.

(4) *Water Supply.*

In view of the high pollution present in the existing ponds, rivers and wells, and as part of the scheme of investigation to solve the water problem, attempts to construct deeper wells (Figures 21 and 22) at the lowest possible expense are being carried out at Kiang Ning Hsien.

Four wells have been bored costing about $50 each, with depths from 28 to 36 feet. A 16-inch auger is used for boring, and 9-inch cement sewer pipes are lowered gradually into the hole. Broken stones are placed at the bottom of the well to a depth of about two feet before the pipes are lowered. The joints of the lower five-pipe sections are left open, whereas those of the upper sections are made with 1:2 cement mortar. Broken stones are used to fill the space around the lower sections. Sand is used for filling around the upper sections, serving as a filtering medium. Concrete apron and hand pump are installed on top of the well.

Tests on yield and quality of the well water have been made. The average yield of the wells is about two gallons per minute, and the rate of pumping is about six gallons per minute. This output is adequate for the villages, the population of which ranges from 150 to 300, and the average consumption is only about two gallons *per capita* per day. Laboratory analyses show that the waters are fairly satisfactory physically and chemically, but bacteriologically they are polluted, though to a much less extent than the old wells, ponds and rivers. The pollution may be due to the following causes : (*a*) the ground water may be polluted at these depths ; (*b*) leaky joints of the cement pipes introduce pollution from the ground water in the surface stratum ; (*c*) pollution is present in the pipes or pumps ; (*d*) faulty sampling ; (*e*) carelessness in examination. More analyses will have to be made before conclusions can be reached.

With regard to the ponds, it is considered economically not justified and practically not possible to improve the quality of their water. The ponds are so numerous in the villages that they are difficult to control. Something could be done with the rivers by regulation, education or other means of improvement. But the majority of the villages are too far from river sources. Wells are therefore considered as the only means of improving village water supplies in Kiang Ning Hsien. The enthusiasm of the people in this new project is evidenced by the petitions sent in to the station for constructing more wells, and the fact that the people in Hu Shu Chen are willing to share one-third of the expenses of boring wells.

(5) *Latrine Improvement.*

Existing latrines and the present system of storing fæces are without question great menaces to public health, and an endeavour is being made in Kiang Ning Hsien to replace them

with bored-hole latrines (Figure 23) in chens (village centres) and schools.

These latrines have been constructed at a cost of about $4.20 per hole, including a concrete squatting-plate. They are from 10 to 15 feet deep, and need very little maintenance to keep them clean. Fly nuisance is avoided. Where the ground water table is too high, the ground-level is raised with earth so that the water-level is at least 5 feet below the surface. The construction of the superstructures is left to the people, and efforts to encourage them to construct such superstructures have been quite successful. Fifty-two latrines with 210 holes have so far been constructed.

The farmers use fæces as fertiliser, and each family has its own container. They cannot afford to lose any portion of this important property. The construction of bored-hole latrines in the farmers' homes is, therefore, not feasible, and studies are being undertaken to develop a form of latrine and a system of storage that will be suitable for private uses.

Parasitological studies [1] of fæces have also been made, and the results thus far obtained can be summarised as follows :

(*a*) Results of the stool examination of 1,000 primary school-children show ascariasis, 72.5% ; hookworm infection, 25% ; the total helminthological infestation is 78%.

(*b*) Results of examination of 100 fæces specimens collected from three kinds of latrines in twenty-five different villages are as follows :

Type of latrine	Ascaris ova per gm.	Hookworm ova per gm.
Kongs	4,600	1,625
Brick paved pits.	925	6,812
Bored-hole latrines.	0	0

(*c*) Results of examinations of a small amount of vegetables show the presence of ascaris ova and many larval nematodes which require further study.

Experiments on the effect of storage and digestion on the fertilising value and the viability of the parasitic ova have recently been started. Six types of containers are used : (1) covered kongs, (2) open kongs, (3) open pits, (4) bored-hole latrines, (5) deep kongs buried to a depth of about 10 feet, and (6) cement pipes buried to a depth of about 10 feet and sealed at bottom. Fresh fæces with urine diluted with one part of water are used. Samples are taken once a week for chemical and

[1] This work is done through the co-operation of the Department of Parasitology, Central Field Health Station, Nanking, by Dr. J. Y. C. Watt.

parasitological examinations. Later, experiments on the effects of stirring, seeding, varying water content, composting and reaction will be carried out if desirable.

In the meantime, some deep kongs and sealed cement pipes buried to a depth of about 10 feet will be introduced to the homes in the villages with the aim of investigating their practical adaptability. A bucket system with storage kongs moved to outskirts of villages or otherwise controlled will also be introduced as an experiment.

(6) *Refuse Disposal.*

The problem of refuse disposal in the villages of Kiang Ning Hsien is not so important as the other factors already discussed, because the farmers' houses are more or less scattered. Wood ashes are composted with animal fæces to be used as fertiliser, and garbage is used for feeding hogs. Refuse boxes have been placed on the streets in the village centres.

Sanitation Activities in Other Rural Districts.

(a) *Tinghsien.*

The Chinese National Association of the Mass Education Movement has been interesting itself in the practice of rural health since 1931. The village health workers and the primary schools are employed as the prime movers in sanitary improvement. But the lack of competent technical assistance, plus the prevailing economic backwardness, has prevented the health workers from making much progress in sanitation. Work has thus far been limited to improvements in health stations and schools. A brief description is herewith given :

(1) *Improvement of Drinking-wells* [1]. — Out of the sixty-seven drinking-wells in the schools, thirty-four were remodelled by the end of 1935. The improvement consists of measures of eliminating surface pollution only, by constructing aprons and curbs and adding covers to the wells. It costs about $3 to improve one well.

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[1] See C. C. Chen : " Development of Systematic Training in Rural Public Health ", 1935.

(2) *Latrine Improvement.* — Squatting latrines are used. Wooden covers with handles are placed on top of the holes to decrease opportunities for access of flies.

(3) Three bath-houses have been constructed. They are provided with showers, the water being stored in petroleum cans. At present, only school-children and village health workers enjoy the privilege free. It is hoped that in the near future facilities may be open to the general adult population though there are certain difficulties in connection with the provision of towels and soap.

(b) *Shanghai* [1].

In co-operation with the Shanghai Medical College, the Bureau of Health of Greater Shanghai established in 1932 a rural health station at Kaochiao, comprising 207 villages. One deep well has been driven and disinfection of shallow wells with bleaching powder is practised in the summer months. More than 100 fæces kongs were abolished, and new latrines of the Java type and the septic type have been constructed to replace them. Shop inspection and street cleaning are placed under the regular supervision of the sanitary inspectors.

Another health station was established by the Bureau of Health in 1933 at Kiangwan, a rural district in North Shanghai. Besides regulation of the street-cleaning service in the centre, no other sanitation work has been achieved thus far.

(c) *Foochow* [2].

The Fukien Christian College has started on a rural programme at Wu-Li-Ting, about two miles from the city of Foochow. With the co-operation of the Foochow Health Bureau, new wells with hand pumps have been constructed with the aim of improving the water supply of the villages. Improvement of latrines and houses is also being planned.

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[1] See T. A. Li : " Problems of Rural Health in China " (in Chinese), 1935.

[2] See T. Y. Koo : " Report on Foochow Sanitation Work ", December, 1936.

(d) *Tsinan* [1].

Since 1933, the Cheeloo University at Tsinan, Shantung, has undertaken a study into the epidemiology of ascariasis and amœbiasis with a view to solving the problem of fæces disposal in North China ; the main emphasis was placed on rural conditions. Composting, or the use of heat of fermentation, was tried as a method of sterilising fæces material, preventing fly-breeding and increasing fertilising value.

Fly studies were also taken up. They are emphasised because of their particular importance in the spread of fæcal-borne diseases. Flies were trapped in different locations. The species were identified and morphological studies on the more important species undertaken.

In experimenting with composting, the *Indore Process* developed in India was tried in order to see how this method can be adapted to Chinese farms. Compost stacks for mixing various proportions of human fæces, animal fæces, straw, wood ashes, lime, municipal and farm refuse have been set up. The results thus far obtained warrant the following tentative general conclusions :

(1) As little as 10% by weight of vegetable waste when composted with human fæces results in the sterilisation of fæces with the destruction of ascaris eggs during the dry spring and autumn months. Larger quantities (20 to 30%) of vegetable matter are required for successful disposal during the rainy summer season.

(2) During warm dry weather, stacks with a volume of only a few cubic feet at the time of making can be heated to above 50° C. In cooler weather (not freezing) larger volumes of material composted in pits are required to secure satisfactory heating. As the minimum air temperatures approach freezing point, the volume of material placed in one pit must be increased

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[1] See Gerald F. Winfield : " Composting in North China as a Farm Process to Control Fæcal-borne Diseases and to Increase Fertiliser ", 1936.

to ensure heating and the exposed surface of the pit must be covered with a layer of dry straw. During quite cold weather, some shelter from the north-west wind should be provided in order to produce successful heating.

(3) Pure cow manure can be heated to a lethal point for the destruction of pathogens.

(4) This process of composting gives promise of being able to reduce fly-breeding considerably, if not to eliminate it completely, although the danger of fairly heavy winter breeding of flies must be guarded against.

Further tests to determine the fertilising value of the composting products are being conducted at Tsinan, using the manurial fertilisers now in common use, the nitrate fertiliser and no fertiliser as controls. How far this process will meet agricultural and economic demands remains to be seen.

Conclusion.

Rural sanitation is a new term in China. In view of the general poverty of the farmers, the progress made in this direction during the past few years gives promise of a great future.

Table VIII. — Home Survey on Water Supply in Kiang Ning Hsien, December 1936.

Families investigated : 141, with a total of 839 persons, living in 10 villages.

Average consumption per person : gallons, 2.15.

Domestic water source :	a pond in	74% of the cases
	a river in	17% ,, ,,
	a well in	9% ,, ,,
Water container :	a cistern in	76% of the cases
	a wooden pail in	24% ,, ,,

Used boiled water for drinking purposes : 100% of the cases

For washing rice, vegetables or utensils,

pond water was employed in		86% ,, ,,
river ,, ,,	,, ,,	8% ,, ,,
well ,, ,,	,, ,,	6% ,, ,,

Use of alum : None.

Table IX. — Summary of Expenditure of Housing Improvement, Kiang Ning Hsien, December 1936.

		District 1	District 2	District 5
Average cost of :		$	$	$
Improving one house		4.91	4.28	3.88
Improving one room		—	1.72	—
Plastering one fong of wall area		0.32	0.29	0.35
Installing one roof glass		0.48	0.54	0.64
One ventilation hole		0.05	0.06	0.04
Repairing straw roof, per fong		—	—	0.44
Total cost of housing improvement		319.81	282.88	80.62
Number of houses improved		65	66	21
Amount paid by farmers	Total sum	0	$36.09	$25.22
	Number of families paying	0	25	9
	% of sum required for each house	0	40	50
	% of total sum expended in district	0	12.8	31.2

IV. NUTRITION.

Routine Food Analysis.

The basic knowledge required for the study of nutrition is the nutritive value of foods. In spite of imports and exports, the foods consumed in China are nearly all of local origin. Tables of food values published in other countries are to a large extent applicable to China, but there is a fairly large number of Chinese food products which are unknown in other countries and which must be analysed as a preliminary to nutritional studies in China.

The routine analysis of Chinese foods was begun by Embrey and Wang at the Peiping Union Medical College about 1919. This was followed by Adolph in the University of Shantung. A fairly complete list of food values was published by Wu in 1928. This list comprised about 240 plant foods and thirty animal foods, and it embodied all the analyses of Chinese foods carried out up to that time. While there are undoubtedly still many foods not yet analysed, the data at present available, together with food values published in other countries, are sufficient for the calculation of protein and energy values in dietary studies.

Vitamin Assay.

Within the limits of error of the biological methods, the results of vitamin assay done in other countries are probably applicable to Chinese foods. For this reason, no systematic survey of vitamin contents of Chinese foods has been undertaken. However, the vitamin contents of certain foods of peculiar importance in China, such as pi-tan (preserved egg) and soya-bean milk, have been studied by Tso, Wan and others. Since the introduction of the chemical method for the determination of vitamin C, many fruits have been assayed for this vitamin by Hou and by Chi and Read in the Lester Institute, and by Sah and collaborators at Tsing Hua University. Among the fruits, the Satien pumelo has been found to be the richest in vitamin C. Among the vegetables, mustard leaves and amaranth rank high in this vitamin.

Quality of Protein.

The contents of the different amino-acids in the proteins of certain Chinese foods were studied by Lin and Chen. The protein of the shark's fin, esteemed as a delicacy, was shown to be an incomplete protein. The biological value of certain cereals and legumes was studied by Li and Pien. Among the cereals, rice was found to have a relatively high biological value (77), while the proteins of millet and kaoliang are much lower (57 and 56). The proteins of the mung bean, peanut (58, 59) are about the same as those of millet and kaoliang, while that of soya-bean curd (65) is somewhat higher. The biological values of the proteins of cabbage and sweet-potato were found by Kao, Adolph and Liu to be 76 and 72 respectively. These findings confirm the general belief that the quality of vegetable proteins is lower than that of animal proteins.

The biological value of mixed proteins in some vegetarian and omnivorous diets was studied by Wan and Lee. They showed that, in spite of the supplementary relation between proteins of different origin, the quality of the protein in a cereal-legume mixture is considerably lower than that of the protein in mixed diets containing animal foods. Thus, the protein of

a wheat-soya-bean-beef mixture has a value of 89, that of a wheat-milk mixture 83, while that of wheat-millet-peas-soya-bean mixture has a value of 74, compared at the same level (10% of diet by weight). The biological values of mixed cereal proteins were also studied by ADOLPH and CHENG and by LAN.

MINERAL CONTENT.

The calcium, phosphorus and iron contents of the more important foods have been reported by WU. A more complete and systematic determination of the mineral constituents in Chinese foods has been carried out in the Department of Biochemistry, Peiping Union Medical College, and the results will be published shortly. The iodine content of foods has been studied by ADOLPH and by TANG and collaborators.

DIGESTIBILITY AND UTILISATION.

The effect of bulk on digestibility has been studied by ADOLPH and WU, who found no significant decrease of digestibility of protein when considerable amounts of indigestible material were added to the Chinese diet. Wan studied the digestibility and biological value of diets containing processed wheat bran and came to the conclusion that bran can be incorporated in the diet to the extent of 15%. In the studies on the biological value of the cereal and legume proteins referred to above, data on digestibility were also obtained. ADOLPH and collaborators have conducted some experiments on the metabolism of calcium, iodine and copper. They found that the calcium of soya-bean curd was utilised to the same extent as that of milk. The metabolism of calcium and phosphorus under pathological conditions was studied by LIU and collaborators.

VEGETARIAN DIET.

Attempts have been made by WU and collaborators in the Peiping Union Medical College to construct a vegetarian diet of high nutritive value. Many diets were tried on rats, and some were found to rival the best omnivorous diet as far as growth

is concerned. However, no vegetarian diet has been found which can support reproduction and lactation of rats with as good results as can be obtained with a well-balanced diet containing a fair percentage of animal foods.

In the Department of Biochemistry of the Peiping Union Medical College, rats have been raised on a strictly vegetarian diet for twenty generations. This shows that a carefully constructed vegetarian diet is able to support growth and reproduction of rats. However, the size of the vegetarian rats is much smaller than that of omnivorous rats of the same age. The infant mortality of the vegetarians is higher.

Tang and collaborators have compared the learning ability of vegetarian and omnivorous rats, using a water maze. They came to the conclusion that the omnivorous rats are superior to the vegetarians.

Optimal Diet.

Wu and collaborators have tried to find the optimum diet for rats, and they have devised a diet which is much better than the stock diets used elsewhere. The growth and reproductive performance of rats raised on this diet surpassed all previous records. These findings show that an adequate diet is not necessarily the optimum diet and is therefore capable of improvement.

Basal Metabolism.

The basal metabolism of the Chinese as compared with Westerners has been studied by Earle, Garven, Necheles and Kilborn. Their results indicate that the metabolism of the Chinese is somewhat lower than the Western standard, but that the difference is within the limits of normal variation. Wu and Chen found the basal metabolism of vegetarian rats only slightly lower than that of omnivorous rats, showing that the nature of the diet has little effect on basal metabolism.

Dietary Statistics.

Within the last ten years, no fewer than twelve dietary studies have been made on different groups of people in different localities.

Some of these studies were made as a part of investigations on the standard of living, and the results are particularly valuable in showing the relation between poverty and malnutrition. The diet of the middle-class people is nutritionally better than that of the labourers ; and for the same social class the diet is better in South China than in North China, because South China is relatively richer. However, all these studies agree in the general findings. Chinese diet is characterised by :

(1) Preponderance of cereals ;

(2) Low percentage of animal foods ; and

(3) Lack of milk and other dairy products.

It is generally agreed that the caloric value of the Chinese diet is sufficient. Excepting the Peiping ricksha-pullers (6) and the Shanghai factory workers (13), the caloric value of the Chinese diet appears to be ample. However, on account of the preponderance of cereals, the Chinese diet is probably not as efficiently utilised as the less bulky Western diet. The net caloric intake of the Chinese, therefore, is probably sufficient but not excessive.

The accepted protein requirement of adults is 1 gramme per kg. body weight. Taking the body weight of the Chinese as 60 kg., an intake of 63.3—112 grammes should be sufficient. However, since the protein in Chinese diet is mainly of vegetable origin and therefore not as efficiently utilised for growth as the mixed proteins of Western diet, the protein intake of the Chinese is not quite satisfactory. It is probably adequate for maintenance in adults, but certainly not optimal for growth of children.

Milk and other dairy products constitute an important source of vitamin A and calcium in Western diet. Since these foods are not included in Chinese diet, the Chinese have to get practically all the vitamin A and calcium from green, leafy vegetables. The actual consumption of green, leafy vegetables is, however, no larger in China than in the West. It is obvious, therefore, that Chinese diet is low in vitamin A and calcium. On account of the lack of animal foods, Chinese diet is probably deficient also in vitamins D and B_2.

In North China, where there is abundant sunshine throughout the year, deficiency of vitamin D and calcium is not important. In South China, where different conditions prevail, the intake of calcium is fortunately a little higher than in the North.

Food Statistics.

The diet of the people is determined to a large extent by the food produced in the country. Ten years ago no statistics on the production of food were available. The Ministry of Industries has in the last few years collected considerable statistics on the production of crops in different provinces. These records show the staple foods of the farmers in the different provinces.

Among the staple foods in China, rice occupies first place and wheat second. Rice is more consumed in South China, while wheat is more important in North China. Next to wheat come millet and corn. In spite of the extensive use of soya-beans, this food constitutes only 4%, and all the legumes together constitute only 12% of the total consumption of staple foods.

Deficiency Diseases.

Deficiency diseases are very prevalent in China. Xerophthalmia is common among factory workers (Li, 1927) and soldiers (Pillat, 1929). Out of 336 cases of blindness studied by Chang (1930) at the clinic of the Peiping Union Medical College, 116 cases were found to be due to keratomalacia. Urinary calculus, in which vitamin A deficiency is an important etiological factor, has been known in China for a long time and is quite common in the South. Frazier and Hu (1931, 1934) observed a new skin lesion which they believed to be associated with vitamin A deficiency.

Rickets and osteomalacia are commonly met with in the clinic of the Peiping Union Medical College. The latter disease has been carefully studied by Maxwell, who reached the conclusion that it is, like rickets, due to a disturbed calcium and phosphorus metabolism. Liu, Hannon and collaborators have studied the calcium and phosphorus metabolism in osteomalacia

and found that it may be characterised either by low serum calcium or low serum phosphorus. Both types of osteomalacia responded to vitamin D therapy.

Beriberi is prevalent in South China, where polished rice is the staple food. Scurvy and pellagra are comparatively rare in China. Goitre is endemic in certain regions of the North. Adolph found the food and water in these regions to contain very little iodine.

Diet and Health.

The significance of nutrition goes beyond the deficiency diseases. From the standpoint of public health, milder forms of deficiency are more important because they are more prevalent. This question is more serious in China than elsewhere, because the mass of the people are subsisting on what would seem to be a subminimal diet in the West.

Lee, Reid and Read have studied the nutrition of ten groups of factory workers and two groups of professional workers in Shanghai. Just as the diet of the former group compared poorly with the diet of the latter, the height and weight measurements of the former group was found to be decidedly inferior. Studies such as this are much needed, but a well-controlled, extensive health survey in relation to nutrition has not been undertaken in China.

Infant Feeding.

On account of the lack of cow's milk, the feeding of infants is a serious problem when breast milk is not available. Attempts have been made by Tso at the Peiping Union Medical College and Reid at the Lester Institute to use "soya-bean milk", with suitable supplements, for infant feeding. The results are quite encouraging, although it is not likely that soya-bean milk can be made to equal cow's milk.

Education in Nutrition.

Until the economic level of the people can be raised, the only way to improve the Chinese diet is to encourage increased consumption of green, leafy vegetables and soya-beans, and the use of slightly milled cereals instead of the highly milled products.

This change of habit can only be brought about by education. Ten years ago there was no book on nutrition written in Chinese. To-day there are several books on the market. Besides, books on hygiene for secondary schools now contain some reference to food and nutrition. Popular articles on nutrition are frequently seen in newspapers and journals. The Council on Public Health has recently appointed a committee to draw up a set of recommendations regarding the minimum nutritional requirements for the Chinese people under the existing social and economic conditions. These recommendations will be given wide publicity.

Nutritional Research.

Ten years ago there were only two institutions in China where work on food was done. To-day there are no fewer than a dozen institutions conducting researches into food or nutrition. Side by side with awakened public interest, the volume of work on nutrition is increasing rapidly. The Chinese Physiological Society issues "Nutrition Notes" from time to time, giving a review of study and research in the field of nutrition in China.

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Table X. — Daily Intake of Food Constituents in China.

	North China (middle-class) (1)	Hong-kong (students) (2)	Changsha (coolies) (3)	Peiping (middle-class) (4)	Peiping (school-teachers) (5)	Peiping (coolies) (6)	Shanghai (coolies) (7)	Central China (farmers) (8)	Shanghai (middle-class) (9)	Shanghai (coolies) (10)	Nanking (middle-class) (11)	Honan (students, winter) (12)	Honan (students, summer) (12)	Shanghai (factory workers) (13)
Protein (grm.) ...	78	94	67	92	84	76	88	112	87	82	86.3	112	95.4	63.6
Fat (grm.).....	21	75	27	40	47	30	49		54	49	48.2	52	41	46.7
Carbohydrate (grm.)	492	497	605	562	493	505	531		427	560	409.4	625	602	498
Total calories ...	2,471	3,097	3,008	2,977	2,742	2,595	2,913	3,461	2,544	3,008	2,801	3,420	3,150	2,660
Calcium (grm.)...				0.337					0.519		0.627	0.772	0.647	0.661
Phosphorus (grm.)				1.178					1.024		3.100	1.170	0.931	0.918
Iron (grm.)				0.0187					0.0158		0.078	0.0198	0.0127	0.030

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Table XI. — Distribution of Protein and Energy among Different Classes of Food in Chinese Diets.

	North China (middle class) (1)		Hong Kong (students) (2)		Changsha (coolies) (3)		Peiping (middle class) (4)		Peiping (school-teachers) (5)		Peiping (coolies) (6)		Shanghai (coolies) (7)	
	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.
Cereals	78	87	58	70.6	84.2	91.9	73.9	82	74.5	80.4	88	93	68.1	77.1
Legumes	11	4.8	—	—	6.8	1.2	10.8	3.8					15.5	5.4
Roots and tubers													7.9	3.5
Green, leafy vegetables	4.7	3.2	2.4	1.4	9.0	2.8	3.8	2.5	10.9 [1]	4.4 [1]	6.3 [1]	2.8 [1]		
Fruits													0.7	0.5
Meat, fish and poultry			24	7.2			9.7	6.1					5.4	3.4
Milk	6.0	2.1	—	0	0	0	—	—	75	5.4	1.7	0.9	0.8	0.3
Eggs			15.5	4.9			0.9	0.3						
Sugars and starches		0.4						0.4						0.6
Oils		2.3		16		4.1		3.9						7.9
Miscellaneous							0.9	1.1	7.1	9.8	3.7	3.5	1.7	1.2

	Central China (farmers) (8)		Shanghai (middle class) (9)		Shanghai (coolies) (10)		Nanking (middle class) (11)		Honan (students) (12) Winter		Honan (students) (12) Summer		Shanghai (factory workers) (13)	
	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.	P.	E.
Cereals		89.8	52.5	65.7	60.6	74.7	63.4	76.3	83.25	82.3	90.27	83.6	58.2	77.5
Legumes		89.8	11.2	4.3	18.4	7.1	7.7	3.4	11.54	3.6	6.1	4.9	21.7	12.5
Roots and tubers		8.5					7.7	4.3						
Green, leafy vegetables		0.4	5.8	3.2	5.3	3.1			2	1.7	2	1.9	3.8	1.5
Fruits		0.1	1.6	1.6			0.05	0.07						
Meat, fish and poultry			22.1	9.3	10.3	4.0	18.4	8.1		2.6		1.0		
Milk		1.0	4.7	2.2	0.9	0.3	0.23	0.18	5.21		3.63		14.6	6.4
Eggs							1.4	0.5				0.5		
Sugars and starches		0.2		2.0			—	0.07		0.2				
Oils		—		9.6	3.3	10.0	—	6.1		7.6		7.0	1.6	2.1
Miscellaneous		—	2.3	2.4	1.3	0.9	1.2	1.0		2		1.1		

[1] Including legumes. [2] Included in cereals.

Table XII. — Percentage (by weight) of the Chief Food Constituents in the Diet of the Rural Population in China.[1]

Province	Number of hsiens reported	Rice	Wheat	Barley	Corn	Kaoliang	Millet	Proso-millet and barnyard millet	Oats	Buck-wheat	Soya-beans	Broad-beans	Field peas	Green and red beans	Others
Chahar	6	—	3	1	4	9	46	12	11	7	3	1	1	2	—
Suiyuan	10	—	10	2	1	4	17	32	25	5	1	1	1	1	—
Ninghsia	4	14	34	2	3	1	4	27	2	9	—	—	4	—	—
Tsinghai	5	—	40	28	—	1	2	3	6	2	—	4	14	—	—
Kansu	20	2	26	10	12	6	8	12	4	7	3	2	5	1	2
Shensi	39	6	36	4	11	3	16	9	—	5	3	1	3	3	—
Shansi	72	1	27	2	11	9	22	7	9	3	3	1	2	3	—
Hopei	98	1	14	3	18	16	29	5	—	2	6	—	1	5	—
Shantung	75	1	19	3	13	23	20	3	—	1	11	1	1	4	—
Kiangsu	45	43	18	12	7	5	1	1	—	1	4	3	2	2	1
Anhwei	28	43	20	8	3	7	1	—	—	2	5	3	3	5	—
Honan	56	3	30	6	12	13	19	1	—	1	6	—	3	5	1
Hupeh	21	34	21	11	4	3	14	—	—	1	3	3	3	2	1
Szechuan	55	33	12	7	15	4	4	—	1	1	6	4	6	5	2
Yunnan	23	44	9	5	14	3	1	1	2	3	4	8	3	3	—
Kweichow	21	37	6	7	16	3	5	1	1	4	8	3	5	4	—
Hunan	37	49	4	3	4	3	16	—	—	3	5	5	2	4	2
Kiangsi	23	48	7	4	2	1	10	1	—	6	6	5	5	5	—
Chekiang	42	66	10	2	7	1	2	1	—	1	3	2	1	2	2
Fukien	19	50	7	4	1	—	21	—	1	1	3	2	2	2	6
Kwangtung	41	73	3	2	4	1	2	1	—	—	6	1	1	3	3
Kwangsi	32	52	3	2	10	2	13	1	—	1	7	1	2	3	3
China	772	28	16	6	8	5	13	5	3	3	4	2	3	3	1

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V. MEASURES FOR COMBATING CERTAIN DISEASES IN RURAL DISTRICTS.

1. Malaria.

(*See Maps 2 and 3.*)

The Chinese have been familiar with intermittent fevers from time immemorial. Three demons of malaria were believed to exist, one with a bucket of cold water to give the chills, another with a stove to set up the fever and the third with a hammer to produce the headache. A fair description of malaria is given in the " Internal Classic ", a medical work traditionally ascribed to Huang Ti (2698-2598 B.C.), but actually compiled about 249-221 B.C. Various febrifugal remedies, including decoctions of barks, were used for treatment. Cinchona bark was first administered in 1692 A.D., when the Jesuit Fathers cured the Emperor K'ang Hsi of tertian ague. During the first half of the nineteenth century, quinine played an important rôle in establishing the superior merits of modern medicine.

The malaria situation in China was ably reviewed by Faust in 1926 (1) who noted the following *geographical distribution :*

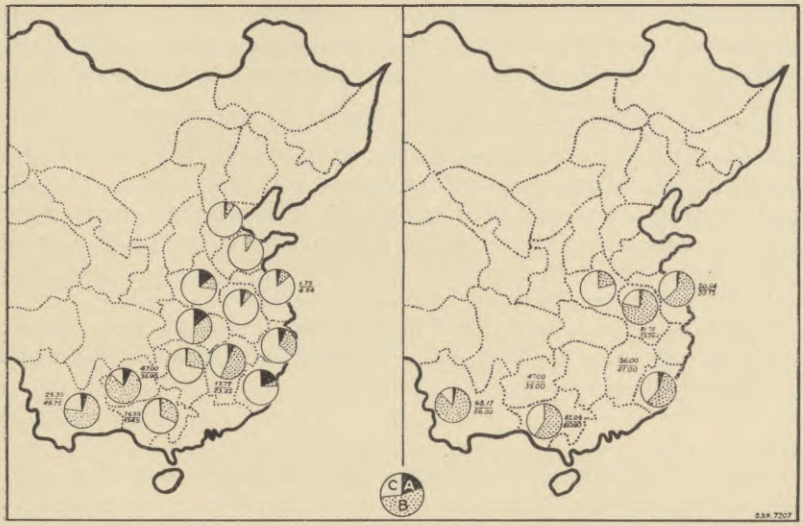
(1) Complete absence of endemic malaria in the north-west, outside of a line drawn through Kalgan, Central Shansi (north and south), Southern Shensi and Central Kansu (east and west) ; (2) severity of the infection beginning in the lower Yangtze valley and extending along the south-east coast, reaching its saturation point in Formosa, Hainan and Tonkin (French Indo-China) ; (3) heavy infection in South-Western Yunnan, particularly in the region adjacent to Burma ; (4) heavy infection in the upper Yangtze valley (Min River,

Map 2.

PARASITE AND SPLEEN INDICES AS WELL AS THE RELATIVE DISTRIBUTION OF THE THREE TYPES OF MALARIA IN SOME OF THE PROVINCES SURVEYED IN EPIDEMIC TIMES.

Map 3.

PARASITE AND SPLEEN INDICES AS WELL AS THE RELATIVE DISTRIBUTION OF THE THREE TYPES OF MALARIA IN SOME OF THE PROVINCES SURVEYED IN ENDEMIC TIMES.



Explanation of Map 2.

Figures above the horizontal line in the circle indicate parasite index.

Figures below the horizontal line in the circle indicate spleen index.

Plain portion in the circle corresponds to percentage of tertian infection.

Dotted portion in the circle corresponds to percentage of subtertian infection.

Black portion in the circle corresponds to percentage of quartan infection.

Explanation of Map 3.

Figures above the horizontal line in the circle indicate parasite index.

Figures below the horizontal line in the circle indicate spleen index.

Plain portion in the circle corresponds to percentage of tertian infection.

Dotted portion in the circle corresponds to percentage of subtertian infection.

Black portion in the circle corresponds to percentage of quartan infection.

Central Szechuan) ; (5) relatively little malaria in Manchuria, except for a focus of heavy infection in the Amur basin (Lahasusu and Taheiho), near the Maritime Provinces of Siberia ; and (6) a singularly low incidence of malaria in Hunan Province.

With regard to the *prevalence of the three types* of the disease in various parts of China, he stated that tertian was the most widely distributed form, quartan had a " spotty " distribution and subtertian was much more common in the south, but was also found endemically north of a line from Peking to Seoul.

Information on the *distribution of anopheline mosquitoes* was very incomplete. In FAUST's paper, " A Preliminary Check List of the Mosquitoes in the Sino-Japanese Areas ", not more than ten species of anopheles were included for China.

As far as the *relation of rainfall and temperature to malaria* was concerned, he found that rainfall had a very definite bearing on the endemicity and epidemicity of the disease in China. Taking a mean yearly average of 30 inches of rainfall, as it occurs just south of the Tsingling Range between the Hwai River valley to the south and the Yellow River valley to the north, as a dividing zone, he found there were very few endemic centres of malaria north of this zone.

During the ten years which have passed since FAUST's review, satisfactory progress has been made in many directions, and these may be summarised as follows :

Incidence and Distribution of Malaria.

Among the reports on the incidence and distribution of malaria in the various parts of the country during the past ten years, those of GEAR (2 and 3) for 1933 and 1934 and of HSU (4) for 1935 may be chosen as examples. These authors divide the country into three sections : the North or Yellow River basin, the Central or Yangtze River basin, and the South Section or Pearl River basin. Their data represent the percentage incidence of malaria among all new patients treated during the years in question in hospitals distributed in various parts of these three sections :

Section	1933	1934	1935
North	1.22	0.69	0.20
Central	1.89	1.70	1.50
South	2.66	2.21	4.10
Total	1.80	1.57	1.40

As far as these figures go, it seems that the incidence for the whole country has gradually dropped from 1933 to 1935. The incidence in the north section seems to be less, that in the central section remains about the same and that in the south section appears to have increased during these three years.

During the past ten years, two malaria epidemics involving a considerable territory occurred in the lower Yangtze valley, especially in Kiangsu and Anhwei. The first of these took place after the flood in 1931, the second in the autumn of 1936. Epidemics of minor importance have also occurred from time to time among civilians and troops in other parts of the country, such as Kiangsi, Fukien, Kweichow, Kwangsi, Yunnan, Honan and Hunan. Malaria surveys made in Kiangsi in 1934 and in Fukien in 1935 by the Central Field Health Station (5), as well as in 1935 in the three south-west provinces of Kweichow, Kwangsi and Yunnan, revealed many endemic and epidemic centres.

Parasite and spleen indices as high as 36 and 41% respectively were found at Kwangchang in the eastern part of Kiangsi. Malaria incidence among the troops stationed in various parts of the same province was likewise very high.

In the south of Kweichow, where the disease occurs in hyper-endemic form, parasite and spleen indices as high as 47 and 35.9% respectively were reported (6), while in Yunnan these indices were found very high in most places between Kunming and the Burmese frontier in the south (7).

Investigations in Kwangsi (8) showed that the disease varies from hyper-endemicity in some places to absence in other localities. In some parts of the province, parasite and spleen indices as high as 60 and 72% respectively were found.

Parasite and spleen indices found in certain provinces, both during endemic and epidemic periods, are shown in the accompanying maps. Since, with the exception of Fukien, extensive parts of the provinces in question were surveyed, the figures may be considered as representative. It will be noted that, with the exception of Kiangsu, the indices are rather high during endemic periods. Here malaria may be considered hyper-endemic rather than endemic. Except in Kweichow, the spleen index is always lower than the parasite index, as it is typical for endemic and hyper-endemic malaria. In all

the provinces surveyed, both indices are higher during epidemic times ; especially in the non-hyper-endemic areas, the parasite index considerably surpasses the spleen index. This difference is not so marked in the hyper-endemic regions.

It appears, therefore, that during the past decade, malaria has been more widely distributed in China than previously. More epidemics have occurred, especially in places where in the past the disease was rare or even entirely absent. Undoubtedly, this is due in large measure to movements of troops, which carried the infection from place to place. Natural causes, such as floods and famine, also played a detrimental rôle by lowering the health of the people.

Distribution of the Various Types of Malaria.

In studying the more accurate data now available on the distribution of the different malaria types, it is best to consider separately the figures obtained during endemic and epidemic times.

Observations on the types of infection during endemic times have been made in most of the central provinces, such as Kiangsu, Chekiang, Anhwei, Kiangsi, Hupeh, Hunan and Honan, in the northern provinces of Shantung and Hopeh, as well as in Fukien and the south-west provinces, such as Kweichow, Kwangsi and Yunnan. The following data may be submitted :

Province	Locality	Year	Number of patients	Tertian	Subtertian	Quartan
				%	%	%
Kiangsu	Nanking	1933 (9)	565	55.93	38.41	1.41
		1932 (10)	—	65.00	27.00	8.00
	Shanghai district	1933 (11)	878	59.90	6.30	33.80
Fukien ...	Mintsing.....	1935 (12)	100	74.00	7.00	19.00
Kwangtung and Hunan	Border regions..	1934 (13)	241	73.86	25.72	0.42
Kweichow	Southern district	1935	110	14.55	78.18	7.27

During a survey made in 1935 in the endemic centres of Kwangsi, tertian was the chief infection found, subtertian next ; the quartan type was very rare.

Surveys made in various places between Kunming and the Burmese frontier in 1935 revealed that, in the majority of the endemic centres, subtertian malaria was most frequent, averaging 73.23% ; the tertian type averaged 17.17% and the quartan 9.60%. But in some of the old endemic centres near the frontier, quartan infection is very common, reaching in one locality 55.56%.

The following observations may be recorded regarding the type distribution during epidemic times :

During the 1931 and 1936 Nanking epidemics there was a very high incidence of subtertian malaria. In one series of patients surveyed in 1931 (14), this type was as numerous as the tertian form and it was much higher in another series examined in 1936 (15). The incidence of quartan malaria was very low at the time of these epidemics.

Among 167 patients observed during a malaria epidemic at Soochow in 1931 (16), 63% were found to be infected with the subtertian type, 24% with the tertian and 10% with the quartan ; 3% showed mixed infection. The percentages in another group of 187 sufferers examined in 1933 (17) were 66% for the subtertian, 33% for the tertian and 1% for the quartan types.

The type distribution in eighty-six children at Hangchow in 1931 (18) was 82.35% subtertian, 14.70% tertian and 2.95% quartan.

Epidemic malaria had not been reported from Hunan Province before 1933, but since that year numerous subtertian cases have been seen (19).

In Changchow (Fukien), among 425 patients treated in a hospital during the epidemic year of 1933 (20), 62.40% showed subtertian infection, 31.60% tertian, 3.10% quartan and 4.90% mixed infection.

Malaria epidemics have occurred in the Ning-erh district of Yunnan since 1934. A survey made in the autumn of 1935 on 289 children led to the detection of 197 malaria patients—84.77% subtertian, 7.61% tertian and 1.02% quartan.

The incidence of subtertian malaria was high in most of the epidemic centres of Kwangsi during 1935. Very high percentages were found during the recent epidemic in Kiangsu and Anhwei (21) :

Province	Subtertian	Tertian	Quartan
	%	%	%
Kiangsu	65.63	32.10	2.27
Anhwei	77.56	21.24	1.20

The distribution of the various malaria types during both endemic and epidemic times is shown in the maps on page 63. Most of the figures used for Map 2 are culled from 1934

hospital reports. It will be noted that all three forms of infection are found practically everywhere. However, with the exception of Kweichow and Yunnan, where the disease occurs in hyper-endemic form, tertian malaria is much more prevalent than the other two types. The quartan form is more irregular in distribution, with a fairly high incidence in Fukien, Hunan, Hupeh, Anhwei and Yunnan. The figures for epidemic malaria embodied in the Map 3 are based on actual surveys and hospital reports in different years. It will be seen that, in general, subtertian malaria is prevalent during epidemics. An exception is formed by Honan, where the tertian type still preponderates. Quartan malaria constitutes only a very small part of the total.

Seasonal Distribution.

The seasonal distribution of malaria in China varies somewhat according to localities and the occurrence of either the endemic or epidemic form. Rainfall and temperature also play a rôle. In the northern dry climate, the case number rapidly increases in spring and reaches its highest peak fairly early. Thus, in a village near Peiping surveyed in 1927 during an endemic period (22), the malaria incidence gradually increased in February, March and April, more rapidly in May and June to reach the highest mark in August. In the central part of the country, where rainfall is more uniform throughout the year, very little malaria is seen during the first calendar months. The case number rapidly increases after May or June, culminating in autumn—in endemic years usually in September, in epidemic years in October. In other words, the highest point of the yearly malaria curve is usually reached about one month earlier in endemic than in epidemic times. This is due to the greater frequency during epidemics of subtertian infections, which usually increase during the later months of the year. In South Western Yunnan, with an almost tropical climate, malaria is more evenly distributed throughout the wet months (June to November).

Regarding the different types, it has been shown by extensive investigations that tertian infections are most frequent in July,

subtertian in October and November. The distribution of quartan malaria is more irregular, though more cases are seen in early spring or late autumn.

Age and Sex Distribution.

Malaria in China affects more males than females, with a predilection for young adults. According to a 1933 Nanking survey, the sex ratio of malaria patients was five males to one female, as against three males to two females in the population in general. Individuals between 21 and 30 years were more affected than any of the other age-groups. Reviewing malaria patients of twenty-five hospitals throughout the country in 1934 (23), males and the age-group of 15-34 years were found overwhelmingly involved.

Anopheline Mosquitoes.

Our knowledge of anopheline mosquitoes in China has considerably increased during the last few years. FAUST (24), summarising the information available up to 1928, divided the country into four belts :

(1) The southern belt situated south of 25° N. latitude contains strictly Oriental forms, the most important representative species of which are *A. minimus*, *A. jeyporiensis*, *A. maculatus* and *A. culicifacies*. FENG has extended the northern limit of this belt to 30° N. latitude by finding *A. minimus*, *A. maculatus* and *A. aitkeni* in Kiukiang, Kiangsi Province (25).

(2) The middle belt, comprising the area between 30° and 35° N. latitude, with only one species—namely, *A. hyrcanus* var. *sinensis*.

(3) The northern belt, between 35° and 40° N. latitude, in which three species are found—*A. pattoni*, *A. lindessayi* var. *japonicus* and *A. hyrcanus* var. *sinensis* in the hilly districts, and *A. hyrcanus* var. *sinensis* on the plains.

(4) The belt north of 40° N. latitude, on which very little information is available. *A. maculipennis* was reported by FAUST, but FENG considers this as erroneous.

With regard to highlands, *A. hyrcanus* var. *sinensis* has been found in Szechuan, Shansi, Kweichow, Kwangsi and Yunnan. From Sinkiang, *A. sacharovi* has been reported. Recently, no fewer than eighteen Oriental species have been found on the south-western plateau, including Kweichow, Kwangsi and Yunnan (26).

Turning to the actual importance of the various species in malaria, it may first be stated that *A. minimus, A. jeyporiensis* and *A. maculatus* have been found repeatedly as the most important malaria carriers in the southern belt, especially in the south-west provinces, where they are responsible for hyper-endemic and epidemic infections. *A. hyrcanus* var. *sinensis* is the chief, if not the only, carrier in the middle belt, and *A. pattoni* and *A. hyrcanus* var. *sinensis* are responsible in the northern belt, the former in the hilly districts, the latter in the plains. Since *A. hyrcanus* var. *sinensis* is the most widely spread species in China and has been proved both naturally and experimentally to be infected with all three types of malaria parasites, this mosquito should be regarded as the most important potential carrier in the whole country.

Control.

Malaria in China is primarily a rural problem, it being safe to state that over 95% of the disease occurs in rural districts. Larvæ of malaria-carrying anopheles breed abundantly in rice-fields. Thus, *A. hyrcanus* var. *sinensis*, which is practically the only carrier in the central plains, is a typical rice-field breeder. *A. minimus* and *A. jeyporiensis*, the chief transmitters in the southern hilly districts, breed mainly in grassy irrigation ditches along rice-fields.

In rice-growing areas, water is needed for at least three-fourths of the cultivation period of about three months. Owing to the lack of a modern irrigation system which supplies water to the field when actually wanted, farmers usually keep the water continuously in the fields instead of draining it off at regular intervals. They continue to do so even after cutting the rice, in order to soften the ground and secure easy ploughing for the subsequent raising of wheat, beans, cotton and vegetables. During the interval between the rice harvest and the raising of other crops, lasting about two months, the fields are lying idle so that grass and weeds grow luxuriantly. For all these reasons, rice-fields are the best breeding-places for mosquitoes.

Great strides in the control of malaria in China could therefore be made if the fields were drained off at regular intervals, thus

exposing mosquito larvæ and pupæ to dryness and killing them before they develop into adults. However, this is a big engineering problem which may not be financially practicable in every place. But it is possible to improve the situation by less costly means. For example, farmers can be taught not to keep water in the resting fields for too prolonged periods. If water is necessary to keep the fields softened for easy ploughing, improved methods of storage can be introduced. Thus, a small but deep pond may be dug at one corner of each field so as to keep the water instead of spreading it all over the field. The farmers can also be instructed to keep the fields, especially their edges, free from grass, whenever it is absolutely necessary to continue irrigation. By enforcing these simple rules, breeding of mosquitoes could be substantially reduced.

It has been the policy of the Government to bring anti-malaria knowledge to the farmers. A great amount of propaganda material, like posters and pamphlets, has been distributed free through local Governments, health centres and anti-malaria units. Anti-malaria films, which would considerably strengthen this campaign, are in preparation. It is planned to establish an experimental station to study the most economical methods for the control of mosquito-breeding in rice-fields.

An established policy of the Government is also to send out units consisting of clinicians and malariologists to combat malaria epidemics. These units assist the local Governments and make at the same time epidemiological studies in the various centres, thus laying safe foundations for future campaigns. During epidemic seasons, large quantities of quinine, atebrin and plasmoquine are distributed free of charge. However, the country needs much larger quantities of anti-malarial drugs ; at the same time their price must be reduced so as to make them available to the poor farmers.

For urban malaria, which is comparatively a minor problem, adequate anti-mosquito measures should be adopted. Experiments in this direction were undertaken in 1927 in a university campus at Peiping (27). But no practical control work followed until 1935, when a restricted area of Nanking City was brought under mosquito control. This work, which is more or less

experimental in character, has been continued since. The Central Field Health Station established a Division of Malariology in 1931, which is conducting experiments on methods of malaria control, and is the central organisation from which technical advice on malaria is issued to all parts of the country.

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2. Plague.

(Figures 24-31.)

Repeated references to plague are found in Chinese chronicles and old medical books. The first of these was "Sources of Disease", by Ch'ao Yuan-Fang, published in 610 A.D. The fact that the western outskirts of China are contiguous to, in part even actually comprise, regions belonging to the Central Asiatic endemic areas makes it clear that inroads of plague must have been frequent events since time immemorial. Considering the vast extent of these border regions from Siberia in the north to the confines of Indo-China, Burma and India in the south, it is also obvious that plague invasions must have taken place by different routes. Indeed, even the limited foci, to which the disease is restricted at present, differ so markedly as to origin and character of their infection that separate discussion is indicated.

North Manchuria.

Passing reference only needs to be made to North Manchuria, the main scene of the extended pneumonic outbreaks of 1910/11 and 1920/21. Not only has Manchuria been practically free since 1921, but plague appears quiescent since 1928 even in the tarabagan districts of Outer Mongolia and Transbaikalia.

South-West Manchuria.

Plague in South-West Manchuria, known to exist for barely two decades, is active up to the present time. Infection was no doubt derived from Inner Mongolia, presumably from wild rodents, but is now entrenched among the local *R. norvegicus*, with *X. cheopis* as the principal vector. Human outbreaks are prevalently bubonic in character. It is interesting to note that the earliest, rather vague, information we possess reaches back to the time when the first railway-line penetrated this territory in 1917, and that records became more definite *pari passu* with the opening of additional railway-lines. Nevertheless, there can be little doubt that more primitive means of communication play a most important part in the spread of the disease which, though largely rural in character, is often found in villages well away from the railway-lines.

Jehol.

Fatal epidemics of rural plague were frequent in the Weichang area of Jehol from 1888-1899 ; no doubt here, also, infection was originally derived from Inner Mongolia.

In 1933, and again in 1936, limited outbreaks were noted in other districts of Jehol. It is unlikely that these recent manifestations were due to a local recrudescence of the infection. As shown by the recent invasion of areas in Kirin Province to the east of Changchun, the foci in South-West Manchuria show at present a tendency to slow extension, and it is probable that the above-mentioned Jehol districts were reached in this manner.

Shansi and Shensi.

There is no doubt that both past and present outbreaks in Shansi, Shensi and adjacent districts can be traced back to the Ordos country of Inner Mongolia, where the presence of a suspicious malady among tarabagan-like rodents, which was occasionally transmitted to man, was noted by PRJEVALSKI during his 1870-1873 expedition. Inroads of plague from this focus into China proper took place at various times and by different routes. Even at present we may distinguish from the outbreaks traceable to enzootics, which had become gradually established among the *R. norvegicus* of Shansi and Shensi, another group of epidemics originating from the northern parts of the Ordos country and extending in an easterly direction towards Suiyuan.

Though at least no major outbreak of plague has taken place in Shansi and Shensi since 1932, the Central Government at Nanking decided, in 1935, to appropriate $4,000 for initial expenses and $1,000 monthly for a plague research laboratory at Yulin, Shensi. Owing to the recent political disturbances in this province, no actual use could be made of these funds ; work has therefore been suspended until the re-establishment of normal conditions.

Sinkiang.

The outbreaks noted in Sinkiang (Chinese Turkestan) by SVEN HEDIN in 1894 and other observers early in the present

century represent no doubt an eastern extension of the wild rodent foci in adjacent parts of Russian Turkestan. In the autumn of 1935 a bubonic epidemic, followed towards the end of the year by pneumonic plague, was reported from Western Sinkiang. Having better means of communication at their disposal, the Russian authorities, with the approval of the National Government, despatched a plague unit to the focus. As yet, no detailed report on these activities has been received.

The South China Plague Focus.

There is no need to enter into a general discussion of modern plague outbreaks in South China. It is well known how the infection, first obtaining a foothold in Western Yunnan, gained, at the time of the Mohammedan rebellion of 1855, impetus to invade the whole of Yunnan Province and then slowly to progress towards the east, reaching the coast first in 1867 at Pakhoi and then in 1894 at Canton and Hong-Kong. From here a number of other places in China were invaded, but in most of them plague again disappeared after having persisted for a varying number of years. Pakhoi, Canton and Hong-Kong also became free from infection during the third decade of the present century.

Whilst therefore, in general, the ravages traceable to the South China focus may be said to have been of a passing rather than a permanent nature, rat epizootics leading to limited epidemics continue to exist in a few areas.

Hainan.

Information has recently become available that, in the middle of the large island of Hainan (originally invaded by plague in 1895), an endemic area persisted in the southern half of the Ting-an district. The first outbrek known to have occurred in this focus commenced in December 1904 and lasted with some interruptions until August 1905, causing a considerable mortality. Since that time, annual epidemics have occurred, being kept in check by inoculations practised on a large scale by the Nodoa Hospital. The last outbreack on record was in 1937. Rat mortality in the dark and insanitary huts was conspicuous.

Kwangchow-wan.

Another endemic area exists in the territory of Kwangchow-wan, situated in Kwangtung Province to the east side of Lui-chow peninsula.

It can be gathered that, as in South China in general, the plague season falls principally in the spring. To our knowledge, no details as to the rodents and fleas involved have been published.

An endemic focus also seems to exist in the An-pu district of Lui-chow peninsula (100 miles east of Pakhoi), the last limited outbreak being noted in the spring of 1935.

Fukien Province.

The principal ports of Fukien Province, Amoy and Foochow, were invaded in 1894 and 1901 respectively. Only two further outbreaks, in 1902 and 1914, are definitely known to have occurred in the latter port ; whilst the early Amoy records, though probably also incomplete, show frequent epidemics up to 1917. The infection gradually spread from these ports to various rural districts, an important rôle being apparently played by the water (junk) traffic. Endemicity seems to have persisted up to the present day in three areas.

The first of these comprises an irregular quadrangle in the north with Yenping, Kutien, Sungki and Kienyang as the corners. Here a serious outbreak of bubonic plague, claiming over 100 deaths, took place in the autumn and winter of 1934/35.

The second endemic area lies along the coast between Foochow and Amoy, but does not include these two ports. Recent outbreaks recorded in this belt, which is about 100 kilometres wide, were in 1931 at Shih-ma and Changchow, and in 1933 at Tung-an, all situated on the mainland not far from Amoy. In 1935, an epidemic involving a dozen villages broke out in the area round Hui-an, a district city lying at the mouth of a small river north-east from Chuanchow (or Zayton, city of twin pagodas, visited by Marco Polo in the thirteenth century).

The third endemic area lies to the south of the highway linking Changchow and Lungyen. Here sporadic cases were recorded in May and June 1934, and a serious outbreak occurred

in 1935, starting in the outskirts in March and reaching the city itself in the middle of May. Lasting until the first week of September, it claimed at least 400 victims.

Though there are marked differences in the climate of the various parts of the province, the plague season is fairly uniform. The onset of the epidemics is usually in March or April, tending to be one or two months later in the north. The climax is reached in July and August ; then a gradual decline sets in, the outbreaks usually ending during November or December. Sporadic cases continue during the off-season. Towards the end of the season there is a tendency to pulmonary involvement, but cases of this kind, if they do occur, show only a familial spread.

As a rule, only 10 to 20% of the settlements within the endemic areas are involved during any plague season, so that, generally, each locality is free from the disease for periods lasting from five to ten years. However, a carry-over to the next season has been observed in several instances, while in a few localities severe epidemics recurred for several years in succession.

The anti-plague work in Fukien is now centralised in a Plague Prevention Bureau directly under the provincial Government in Foochow, with an annual budget of $30,000 and headed by an expert temporarily lent by the National Health Administration. Details of its organisation are as follow :

The *medical service* is now in the hands of the travelling clinics established by the provincial Health Department, which co-operate so closely with the Bureau that no separate medical unit is required. However, trained nurses and technicians are still kept available in the laboratory division to assist the head in the investigation of plague cases.

The *laboratory division* has, in addition, four technicians specially trained in rat and flea work and able to assist in research.

The *technical department* is directed by an expert lent every year for a few months by the National Health Administration. It is headed by a permanent senior engineer assisted by (1) a junior engineer in charge of building supervision ; (2) three sanitary inspectors in charge of rat-proofing, food control, fumigation, trapping and general sanitation ; (3) fifteen trained fumigators ; (4) labourers hired whenever necessary to make up fumigation units, each consisting of one trained fumigator and two helpers.

The *general affairs division* consists of a secretary assisted by two clerks.

Since the work in the northern and coastal areas has but recently been taken over by the Provincial Plague Prevention Bureau, no comprehensive epidemiological data are available at present. Such studies have been undertaken in the southern focus, but even here great difficulties are met with on account of the poor communications and insecurity of travelling. However, the data on Lungyen City embodied in the Appendix may be considered as representative of the situation and the policy adopted by the Bureau. It is now possible to introduce similar measures, carefully adapted to local conditions, in the two above-mentioned foci. Plans are under consideration to study and combat plague in the island of Hainan and the An-pu district of Kwangtung as well, and it is hoped that it will soon be possible to control the situation in these last strongholds of the infection in South China.

Appendix.

Anti-plague Campaign at Lungyen, 1935.

The houses of Lungyen (population, including the suburbs, about 12,000) are generally of solid construction, with floors of hard lime mortar ; the foundation walls made from rubble usually reach about 3 feet below the soil surface and 5 feet above. The roofs, made from burnt-clay tiles, offer ample passage-ways for rats. Though the standard of cleanliness is quite satisfactory, convenient harbourage for rats is offered by large quantities of stores in both houses and compounds. Rat-burrows are not particularly frequent (about one per room), but infestation is heavy. The relative incidence of the different species, specific flea indices and details on forty-six plague cases personally observed by the plague detachment are shown in the tables on pages 81 to 84.

The measures carried out in 1935 may be summarised as follows :

I. *General Measures.*

(1) *Propaganda.* — Every endeavour was made to explain to the people the object of the anti-plague campaign and the methods adopted. Thousands of handbills and pamphlets were distributed and many posters and signboards exhibited. Parades

and processions were organised, speeches made at street corners and at the Plague Bureau. Lantern-slide demonstrations and exhibits of rat-proof containers were arranged as well. Individual instruction was freely given by the staff whenever working in houses. A general clinic was held at the Bureau, with a nominal charge, so as to win the confidence of the sick.

(2) *Management of Cases and Contacts ; Vaccination.* — Bubonic patients were isolated in the houses, those showing pneumonic features in a temporary isolation hospital. Serum prepared by the National Epidemic Prevention Bureau was administered but was found of little avail. Contacts of pneumonic patients were isolated. Inoculation with anti-plague vaccine prepared by the National Epidemic Prevention Bureau was administered to 7,000 persons.

(3) *Rat-proofing.* — It was difficult to carry out large-scale permanent rat-proofing of existing buildings. However, building rules governing the construction of new houses were promulgated ; it is estimated that their application would increase the cost of construction by only 5%. Simple and inexpensive methods were designed to prevent access of rats by way of roofs, through windows and through sewers and drains (see *infra*, paragraph (6)). The use of double walls and ceilings was prohibited and lime-mortar floors were made compulsory for dwelling-houses.

(4) *Cyanogas Fumigation.* — The whole town was twice fumigated with cyanogas, the gassed burrows being sealed up as usual. The number of rat carcases recovered after fumigation corresponded to that of George and Webster (1933), being three rats per 1,000 burrows gassed.

(5) *Foodshops* were not only found heavily infested, but human cases were most frequent in and near them. Since they were financially able to carry out improvements, a special campaign was instituted. A large number of shops selling small amounts of food besides non-alimentary articles was persuaded to give up this side-line of business. In dealing with the 244 genuine foodshops, demands were kept as economically as possible and ample use was made of locally manufactured food containers. In this way, expenses could be restricted to an average of $13 local currency per shop.

When large stocks were kept whole rooms were rat-proofed instead of individual containers, and a second smaller rat-proof compartment was built in the sales room ; stock kept outside of these had to be placed in individual rat-proof containers.

(6) *Street sewers and house drains* were found to constitute a very important system of communication for rats, besides offering much harbourage. To improve this situation, a dam was constructed across the river so as to introduce the water into the street sewers. Connections were made from the trunk line to existing separate laterals so that the whole sewer system of the southern part of the town is now satisfactorily flushed. The northern district could not be so improved, as its higher elevation makes it impossible to raise the water-level sufficiently without the use of pumps.

To prevent rats from running and nesting in house-drains, specially made tiles were distributed at the expense of the Bureau. They are of burnt red clay and of a size suitable for closing the mouth of the drain ; five parallel openings, 4 inches long and half an inch wide, permit outflow of water. All tiles were installed under the supervision of the Bureau staff.

II. *Measures in Individual Houses.*

(1) *Elimination of Rat Harbourage.* — Several general cleaning-up campaigns were conducted, in which the military authorities co-operated. Notice was served on each family as to the date by which specified measures had to be taken for the cleaning of their house and compound as well as for the elimination of harbourage among stored agricultural implements, household articles, etc. Large quantities of litter and valueless materials were removed and burnt by the people themselves or by inspectors checking the proper carrying out of instructions.

(2) *Rat-proofing of food containers* (Figures 28-31) in private houses was strenuously advocated. Results were most gratifying, as out of about 12,000 such receptacles over 90% were rendered safe.

Table XIII. — Plague Foci in South-West Manchuria.

Year	Tungliao area	Kaitung area	Nungan area
Up to ?	outbreaks from 1917		1916 (Aug.) about 70 cases (?)
1923	onwards		1918 (Aug.) about 60 cases
			1920 (Sept.) about 50 cases
			1921 (Aug.) about 300 cases
1924	Suspicious outbreak in June near Hsiao-Nao-Pao		
1925	Ditto in July		
1926	Suspicious outbreak near Nei-Mu-Ko-La, north of Liao River		
1927	Bacteriologically confirmed outbreak mostly north of the Liao River (Aug.-Nov.)	Some places in this area seemed also involved	
1928	Considerable outbreak centring in Chien-Chia-Tien east of Tungliao (Sept. Nov., about 350 cases)	Small outbreaks in two localities (Aug.-Oct.)	Suspicious (? pneumonic) outbreak in Nov.-Dec.
1929	About 16 localities affected from July-Oct., about 250 cases	Small outbreaks, Aug.-Oct.	During Aug.-Oct., about 100 cases in two Mongolian villages.
1930	Small outbreaks Sept.-Oct.	About 15 localities affected from July-Sept., about 100 deaths	9 villages affected July-Oct., about 150 deaths.
1931		Two villages affected in Sept., 18 deaths	
1932			About 70 cases end of Aug.
1933	About 10 localities affected from Aug.-Oct. Over 150 deaths. [1]	Sept.-Oct., less than 100 cases in two foci	More than 20 localities affected Aug.-Nov., about 500 deaths. [2]
1934	22 deaths in July in village about 25 miles north of Tungliao		About 70 deaths in Aug.-Sept. in village 20 miles west of Halahai-Chengtze (15 miles north of Nungan).

[1] Followed, according to Tsurumi, towards the end of November by 30 pneumonic cases.

[2] According to Tsurumi there were at least 1,800 cases with 1,546 deaths.

Remarks. — Between December 25th, 1934, and January 23rd, 1935, 75 cases with 74 deaths were reported in Kangpin town, 130 miles north of Mukden, followed between February and April by cases in villages near Powangfu, 30 miles to the north-west.

In 1935 were recorded : (*a*) In July, 6 cases with 4 deaths in *Kirin Province*, 5 of them on the Kirin Railway east of Changchun ; (*b*) in August, 6 cases in a village about 3 miles south-west of Shari Station on the Taonan-Talai line.

In August 1936, several small outbreaks were reported in *Kirin Province* and 4 suspected deaths in a village 19 miles north-west of Kailu (?), north of the Liao River.

Table XIV. — Plague Foci in North-West China.

Year	Shansi	Shensi	Suiyuan
1919-1927	Outbreaks in Hsing and Lin districts.		
1928	Major outbreak originating in Hsing district (50 villages affected) and spreading to Lin district (38 villages affected) and Tsik'ou district. Independent focus in Hung-yuan district.	Five counties affected.	Over 500 cases due to infection directly from Ordos Country.
1929-1930			Prevalently pneumonic outbreak lasting from Aug.-Feb.; 667 deaths.
1930	Plague in parts adjoining Shensi Province.	Suiteh district, 80 miles west of Fenchow, affected.	
1931	Major outbreak in Hsing and Lin districts. Over 2,300 deaths, 40 deaths at Pao-teh.	At least seven districts affected. Over 5,000 deaths.	
1932	Autumnal outbreak in Hsia district.	Autumnal outbreak in Mi-cheh and Anting districts.	Autumnal outbreak. No details.

Table XV. — Plague Incidence in Kwangchow-wan 1928-1936.

Year	Cases	Deaths	Remarks
1928	57		
1929	53		
1930	241	236	During first half of year
1931	10	2	During first half of year
1932	8	8	March
1933	Apparently free		
1934	38	18	Comprising (*a*) 25 cases occ. May-June on Tanhai Island; (*b*) 7 cases in July; (*c*) 3 cases in August at Tamsoui; (*d*) 3 cases Oct.-Nov. on Tanhai.
1935	55		Occurring March-May on Nao-chow and Tanhai Island.
1936	10	5	Occurring April-May on Tanhai Island.

Table XVI. — Specific Rat Indices at Lungyen From December 1935 to November 1936.

Month	Total rat index	*R. norv.*	*R. r. r.*	*R. r. alex.*	Shrews
December	6.505	3.030	2.030	1.090	0.387
January.....	4.067	2.942	0.816	0.269	0.429
February.....	5.387	3.129	0.753	1.389	0.116
March	4.196	1.943	0.337	1.444	0.078
April	3.545	2.040	0.263	1.307	
May	3.203	1.500	0.303	1.306	0.030
June	4.554	3.037	0.313	1.127	0.076
July	4.456	3.119	0.191	1.057	0.088
August	4.588	2.601	0.010	2.704	0.098
September ...	4.299	2.077	0.000	2.139	0.083
October	3.440	1.559	0.000	1.801	0.080
November ...	3.720	1.805	0.000	1.860	0.055

Table XVII. — Specific Flea Indices at Lungyen From December 1935 to November 1936.

Month	Total flea index	*X. cheopis*	*L. musculi*	*C. anisus*	Unknown *Ceratophyllus* species
December	3.739	1.040	2.054	0.497	0.147
January.....	1.169	0.228	0.485	0.081	0.135
February.....	3.541	0.992	2.171	0.067	0.312
March	2.676	0.178	2.197	0.201	0.099
April	5.033	0.485	4.125	0.527	0.137
May	3.166	1.419	1.558	0.181	0.017
June	3.726	2.748	0.926	0.052	0.000
July	3.673	3.672	0.097	0.016	0.000
August	2.961	2.961	0.000	0.000	0.000
September ...	?				
October	3.140	1.260	1.570	0.310	0.000
November ...	4.424	1.826	2.586	0.012	0.000

Table XVIII. — Types of Plague Cases, Lungyen, 1935.

Bubonic (mortality 55%) :

Femoral	26
Inguinal	2
Cervical	1
Multiple	3
Unknown	8
	40

Pneumonic (mortality 100%) 6

Table XIX. — Rat-proofing of Foodshops, Lungyen, 1936.

Rooms rat-proofed	70
Rat-proof compartments in sales rooms	77
Wooden containers tin-lined	743
Galvanized iron tins made	3,204
Large earthenware jars installed for grain storage	235
Miscellaneous small rat-proof containers installed	251
	4,580

3. Ankylostomiasis.

The presence of hookworm disease in China was definitely established about three decades ago. The research work of the China Hookworm Commission in 1923/24 threw much light upon the epidemiology of the disease ; but, though further information on this topic as well as on suitable methods of control is desirable, the medical profession has since that time given little attention to the problem of ankylostomiasis. The present situation may be shortly reviewed as follows :

Geographical Distribution.

Unlike malaria, ankylostomiasis is not of nation-wide importance in China. Though hookworm infestation has been found in the northern parts of the country, especially in the region around Chefoo, the disease represents a serious clinical and public health problem only in the provinces of the Yangtze basin and the south-eastern coastal region. An important endemic area is situated round the border of Southern Kiangsu and Northern Chekiang. Many cases are also reported from Northern Anhwei. Two further seriously infected regions in the Yangtze basin are the Hupeh-Hunan area and Szechuan Province. In the south-eastern coastal region, ankylostomiasis constitutes a very serious problem in Kwangtung Province, where, according to Oldt (1926), 60% of the farming population are infected. Endemicity reaches its maximum in China in the island of Hainan, belonging geographically to Kwangtung Province, where 80% of the total population are infected (Bercovitz, 1924). Ankylostomiasis is practically absent in the mountainous south-western provinces of Kweichow and Yunnan. For instance, a survey made in one of the mines in Kweichow revealed not a single instance of infection among 106 miners.

With the exception of Hainan, where a high percentage of the urban population is infected, the disease is usually limited to the farming population. It has a peculiarly patchy distribution, so that, even within endemic centres, villages free from infection will be found at a short distance from heavily infected localities. The reasons underlying this peculiarity will be dealt with later on.

Importance of Night-soil Pollution in the Spread of Ankylostomiasis.

Everywhere in the central and southern parts of the country where ankylostomiasis is mainly distributed, it is the common practice of the farmers to collect fresh human night-soil from individual receptacles or public latrines and store it in pits. Fresh supplies of night-soil are added from time to time, so that a certain amount of infective material is always present in the pits, the contents of which serve as fertilising material for all agricultural purposes. Therefore, both the places where these pits are located and the fields fertilised from them are highly infected. Particularly dangerous are localities where fresh human night-soil is used for special crops, such as mulberry trees and vegetables. In such situations, the incidence of hookworm disease is particularly high as compared with neighbouring villages, where no such crops are cultivated or different methods of fertilisation are practised.

Generally speaking, the incidence of hookworm disease in China is mainly associated with cultivation of the following four crops, arranged in order of their importance : mulberry trees, vegetables, cotton and rice. Thus, in the areas with serious endemicity, between Southern Kiangsu and Northern Chekiang, as well as in Kwangtung Province, the cultivation of mulberry trees for silk production is chiefly responsible for the spread of ankylostomiasis. Of the people engaged in planting the trees, 70% are stated to be infected. The growing of vegetables is probably responsible for the presence of the disease in the Hupeh-Hunan area. In Kwangtung, about 65% of the vegetable-growers are said to be infected. The cultivation of cotton is also associated with hookworm infestation, though not to such

a high extent. Contrary to the general belief, rice cultivation plays only an insignificant part in the spread of hookworms in China, principally because the wet method of using night-soil in the fields is unfavourable for the production of soil infestation.

Control.

Though the epidemiological studies of ankylostomiasis in China have led to the suggestion of definite methods of control, little actual work has been done in this direction. In Hainan, where the disease is highly endemic, attempts at mass treatment have been made by some private institutions, but results have been unsatisfactory, because the ignorant people did not realise the value of this service.

In considering the problem of ankylostomiasis control in China, it must be realised that, for economic reasons, human night-soil, however dangerous, cannot be replaced by commercial fertilisers for a long time to come. So the only alternative is so to modify the methods of its use that ground pollution is reduced to a minimum. However, this is a problem involving great difficulties. Extensive research is necessary to evolve a method of treating night-soil in such a manner as to prevent or minimise the spread of hookworm and other parasitic diseases, and yet not interfere with its fertilising value. It is gratifying to note that, recently, such studies have been commenced by scientific institutions and health centres, so that one may hope for an early solution of this vital problem.

The National Health Administration has created a sound foundation for hookworm control in China by encouraging the use of sanitary latrines in rural districts and carrying out propaganda by the free distribution of suitable pamphlets and posters. Plans have been recently made to establish a field unit for hookworm control in one of the highly endemic centres of Kiangsu, designed for mass treatment as well as for the conduct of field experiments on the control of the disease.

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4. Tuberculosis.

Only vague references to tuberculosis are found in old Chinese medical literature. Symptoms like cough or hæmoptysis were considered as manifestations of separate diseases. A wasting condition, probably identical with phthisis, is mentioned by some authors, but is ascribed to indefinite causes, such as " weakness of the kidneys ". The medical missionaries commencing hospital work in South China were not struck by the prevalence of lung tuberculosis, considering it not only rarer but also less virulent than in Europe (Hobson, 1842). It was only at the beginning of our century that due attention was paid to the curative as well as prophylactic problems of this disease.

Though since that time much useful work has been done, it is still difficult to get a true insight into the incidence of tuberculosis in China. Gear collected, in 1933 and 1934, statistics on the in-and out-patients of a number of hospitals throughout China. He found, in 1933, that open tuberculosis was present in one out of every twenty patients seen, and was second only to venereal disease amongst the infectious and parasitic diseases. From the 1934 material it was concluded that, in South China, tuberculosis forms 3.74% of all patients and thus does not figure in the group of the nine most important numerical groups. Tuberculosis is the sixth disease in numerical importance in the Yangtze Region, with a percentage of 4.34, while in North China it is more prominent still, with a percentage of 6.89, being thus the fourth most frequent disease condition.

Several workers tried to determine the frequency of tuberculosis by tuberculin tests. Korns (1925) found 30% positives in a group of 2,049 school-children in Peiping and Paotingfu. In 1934, Lai, Kao and Chien, in Shanghai, recorded a large number of tests carried out in an urban and a rural area respectively among individuals of different age-groups. The number of positives increased with age, reaching 94% among 111 persons above 24 years. Positive reactors were more numerous in the business centre of the city than in the rural area.

Health examinations on three groups of altogether 900 students showed an incidence of 13.4% of tuberculous scars in the respiratory system.

It is clear that even comprehensive statistics like those of GEAR, based as they are upon patients voluntarily seeking the aid of modern medical institutions, are unable to furnish exact information on the spread of tuberculosis in China. As aptly stated by this author, the chief agencies in killing people are not the predominant causes of sickness, so that we should place reliance upon mortality records rather than upon morbidity statistics ; thus, both in an urban district (Peiping) and in a rural area (Ting Hsien), respiratory tuberculosis headed the mortality list with rates of 3,03 and 3,975 per mille respectively. Further data on the mortality figures in Peiping, in Shanghai and, for the sake of comparison, also in Hong-Kong, are embodied in the accompanying tables. It will be noted that the mortality figures for Shanghai are considerably lower than those for Hong-Kong. ANDERSON pointed out, however, that the Shanghai figures are not fully reliable ; 35.5% of the general Shanghai mortality rate amongst Chinese in 1930-1932 was made up of undiagnosed exposed corpses ; many patients presumably went to their homes to die. ANDERSON calculated for these three years a rate of 2.158 per mille. Generally speaking, he put the mortality rate from pulmonary tuberculosis in China at about 5 per mille. However, referring to such statements as, " there are 25 million sufferers from phthisis in China ", he believed that so complicated are the factors, and so greatly do they vary from place to place, and even from time to time, that to deduce the whole from the part, or even from some of the parts, is apt to be misleading.

CHUN showed in 1928 that there is a progressive rise in the proportion of non-respiratory tuberculosis as one proceeds from south to north in China. GEAR, in 1934, confirmed this and furthermore demonstrated that there is an increase in the total frequency of tuberculosis from south to north. His figures are as follows :

	Percentage of all cases	
	Respiratory	Non-respiratory
South China	2.61	1.13
Yangtze Region . .	2.96	1.38
North China	3.03	3.86

The mortality figures available for a number of Chinese cities generally confirm a higher incidence of non-respiratory tuberculosis in the north and of lung tuberculosis in the Yangtze region and South China. However, as far as these figures go, some deviations from this rule seem to exist. Particularly noteworthy is that, in both years under observation, the deaths from lung tuberculosis in Peiping were vastly in excess of those from other forms of the disease.

The figures showing an appreciable incidence of non-pulmonary tuberculosis in China are of particular interest in so far as, in the unamimous opinion of all observers, the bovine type of tubercle bacillus only plays a very insignificant rôle (if any) in this country. Infection is undoubtedly due in the overwhelming majority of cases to close contact with human sufferers, facilitated, not only by overcrowding due to poverty, but also by the traditional system according to which all members of even large families live together under the same roof (Figure 10).

Concerted work against tuberculosis in China is now largely centred in Peiping and Shanghai. In the former city, which on account of its dry climate and brilliant sunshine is particularly suited to the treatment of tuberculous sufferers, a small sanatorium was founded more than twenty-five years ago. The scope of its work has been considerably increased ; in addition, seven other sanatoria have been established, bringing the total capacity to 267 beds. To co-ordinate the work, the Peiping Tuberculosis Club was founded in 1933, under whose guidance steps are being made to found a large tuberculosis centre.

At Shanghai, two sanatoria exist : (1) a private institution founded in 1934, which admits, besides forty first-class, also twenty second-class patients at low rates ; (2) the Ching Chong Sanatorium at Kiangwan, opened in 1933, which has a capacity of 150 beds (eighty for poor patients), and is supported by public subscription.

The National Anti-Tuberculosis Association was founded in Shanghai in 1933, under whose auspices conferences are held and a vigorous programme of propaganda is carried out.

Increasing interest is taken by general hospitals in treating tuberculous patients by modern methods. Special mention

may be made of the hospital of the Peiping Union Medical College, the specialist staff of which also took over responsibility for the Hopkins Sanatorium, and the Chinese Red Cross Hospital in Shanghai, possessing an efficient Tuberculosis Division.

It must be admitted that the means available at present for the treatment of tuberculous patients are inadequate, it being estimated, for instance, that Peiping requires 3,000 beds to meet the actual needs. On the other hand, it should be realised that the general progress now being made is bound to exert a favourable influence on the incidence of tuberculosis. Ever-increasing attention is paid to matters like improving housing conditions and general sanitation, public health education and propaganda. It is particularly gratifying that these efforts are no more limited to cities, but are extended to rural areas, particularly endangered on account of the low economic and educational level of the peasants and the tendency of individuals contracting tuberculosis in cities to return to their village homes.

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Table XX. — Incidence of Principal Infectious and Parasitic Diseases in China

(*Gear's Hospital Survey*, 1933).

Diseases	Number of patients	Percentage of total cases
1. Venereal diseases	12,943	6.2
2. Tuberculosis	10,263	4.9
3. Malaria	3,749	1.8
4. Dysentery	2,492	1.2
5. Influenza	2,327	1.1
6. Typhoid and paratyphoid	1,516	0.7
7. Leprosy	627	0.3
8. Kala-azar	281	0.2
9. Diphtheria	277	0.1

Table XXI. — Results of Mantoux Tuberculin Tests in Shanghai.

Age	Total			Urban series			Rural series		
	Cases	Positive	%	Cases	Positive	%	Cases	Positive	%
0-4.....	205	17	8.3	150	14	9.3	55	3	5.7
5-9.....	1,123	503	44.7	667	356	53.3	456	147	32.2
10-14.....	2,153	1,290	60.0	1,010	726	72.0	1,143	564	49.3
15-19.....	647	507	78.5	523	432	81.8	119	75	63.0
20-24.....	464	400	86.4	2,355	1,258	65.0	1,773	789	44.5
25 and above ..	111	104	94.0						
Total.....	4,703	2,821	60.0						

Table XXII. — Results of Health Examinations of Chinese Students of Both Sexes (after Anderson).

Institution	Year	Average age	Number examined	% tuberculosis scars
Chinese Red Cross Hospital, Shanghai	1932/33	21.7	289	9.7
Soochow University	1933	20.3	311	15.4
West China University	1932	21.0	300	13.7

Table XXIII. — Morbidity Figures of the 1934 Hospital Survey compared with Mortality Figures of Two Chinese Experimental Areas.

1934 Survey		Special health area, Peiping		Ting Hsien area	
Diseases	%	Diseases	Death rate per 100,000	Diseases	Death rate per 100,000
1. Skin	20.10	Respiratory tuberculosis	303	Respiratory tuberculosis	397.5
2. Conditions of violence	9.40	Respiratory diseases	260	Senility and apoplexy	283.1
3. Digestive ...	8.54	Digestive	244	Respiratory	225.2
4. Venereal....	5.92	Cardio-renal	166	Convulsions	150.0
5. Eye.....	5.21	Convulsions	125	Diarrhœa and enteritis	137.0
6. Miscellaneous conditions ..	4.93	Senility and apoplexy	120	Cardio-renal	123.8

Table XXIV. — Tuberculosis Deaths in the First Inner Ward of Peiping.

Year	Total deaths	Crude death rate	Deaths from	
			Lung tuberculosis	Other forms of tuberculosis
1929/30	1,705	17.4	253	48
1930/31	1,482	15.1	196	46
1931/32	1,839	17.3	238	42
1932/33	2,141	18.2	263	53
1933/34	1,688	14.4	293	50

Table XXV. — Tuberculosis Mortality in Shanghai and Hong-Kong.

Year	Shanghai		Hong-Kong	
	Estimated Chinese population	Chinese tuberculosis deaths	Estimated population	Deaths pulmonary tuberculosis
1927....	812,075	975 (1.20)	890,400	1,595 (1.79)
1928....	821,400	871 (1.06)	979,440	1,731 (1.76)
1929....	830,760	966 (1.16)	1,047,260	2,158 (2.06)
1930....	971,397	855 (0.88)	1,074,400	1,994 (2.62)
1931....	987,397	956 (0.96)	878,947	1,983 (2.60)
1932....	1,030,554	746 (0.72)	900,812	2,042 (2.52)
1933....	1,065,554	873 (0.81)	922,643	2,225 (2.71)
1934....	1,100,496	987 (0.89)	944,492	2,179 (2.31)
1935....	1,120,860	903 (0.80)	966,341	2,237 (2.31)

Note. — The limited number of non-Chinese, varying from 16,500 (1927) to 21,370 (1935) is included in the Hong-Kong figures.
Figures in parenthesis indicate deaths per mille population.

Table XXVI. — Percentages of Deaths from Lung Tuberculosis and Tuberculosis of Other Organs in Various Cities of China for (*a*) Year ending June 1934 ; (*b*) Year ending December 1935.

City	1933/34			1935		
	% lung tuberculosis	% other tuberculosis	Total deaths	% lung tuberculosis	% other tuberculosis	Total deaths
Peiping	15.56	2.76	34,195	19.76	2.15	23,438
Tientsin.....	1.29	34.46	7,899	—	—	—
Weihaiwei...	7.14	4.85	3,849	4.74	6.33	4,214
Tsingtao ...	2.63	28.65	4,135	3.60	25.05	5,044
Nanking ...	7.30	6.13	10,117	8.48	0.75	10,792
Shanghai....	15.17	2.62	18,136	12.99	3.10	18,259
Hankow	14.78	16.79	5,810	13.10	13.66	10,615
Hangchow ..	8.12	4.13	6,190	4.53	7.42	5,402
Canton	4.16	0.08	17,079	—	—	—

Table XXVII. — Percentages of Incidence of Various Types of Tuberculosis (1933 Survey).

Type	North China	Yangtze Region	South China	Total
Respiratory.....	48.09	70.92	58.58	65.49
Intestinal and peritoneal.....	4.21	3.21	4.16	3.51
Vertebral	6.59	3.64	5.16	4.33
Bones and joints ...	21.40	9.97	16.78	12.78
Skin and subcutis ..	0.75	0.86	1.77	0.97
Lymphatic.....	14.94	8.42	9.39	9.61
Central nervous.....	0.88	0.56	2.60	0.82
Uro-genital	2.24	1.43	1.08	1.51
Others.....	0.89	1.00	1.08	0.98
Total cases.....	1,472	6,378	1,299	9,149

Table XXVIII. — Tuberculosis Sanatoria in Peiping.

Name of sanatorium	Number of beds
Hopkin's Sanatorium	73
Red Cross Sanatorium	38
Pa Ta Chu Sanatorium	40
Folks Sanatorium	30
Chung Hua Branch Hospital	20
Chung Hua Hospital	16
Central Hospital	25
Hsiang Shan Sanatorium	25
Total	267

All these sanatoria are connected with dispensaries which select suitable cases for in-patient treatment.

5. Pneumonia.

No description of the pneumonia syndrome can be found in the old-style Chinese medical works. This lack, however, cannot be entirely explained by the inadequate methods of clinical examination then prevailing. For we note that early modern nosographers like Hobson (1842) were also silent in regard to this disease, which was perhaps not frequent enough to attract their particular attention.

Even nowadays it is not easy to gather comprehensive information on this subject. Gear recorded, for 1933, 11,877 cases of respiratory diseases (exclusive of tuberculosis), corresponding to 5.1% of the total cases dealt with. It can be seen,

however, that the 1,294 instances of all forms of pneumonia formed only 10.88% of the total 11,877 respiratory affections.

GEAR noted that, during 1934, a general influenzal outbreak occurred in China, leading to an increased incidence in the hospital admissions for this disease. The incidence was highest in South China, with 1.24% of all patients, and lowest in North China, with 0.55%. Similarly, bronchitis and pneumonia showed a higher hospital incidence, together with the same geographical differences :

	South China %	Yangtze Region %	North China %
Influenza.	1.24	1.03	0.55
Bronchitis	3.16	1.67	2.51
Pneumonia	0.85	0.49	0.28

The figures of Chinese patients admitted during the years 1918-1930 to the Harbin Plague Prevention Service Hospital also indicate a comparatively low incidence of all forms of pneumonia in most years. In contrast to this, lobar pneumonia was considerably more frequent and also more fatal among the Russian inmates of the Harbin Municipal Hospital. In this connection, attention should be directed to the drinking habits of the latter as well as to possible racial differences.

It is necessary, however, to consult mortality statistics before coming to final conclusions. GEAR (1936), comparing his 1934 hospital material with an urban and a rural study area in Peiping and in Ting-hsien respectively, found in the former a death rate from respiratory diseases of 2.60 per mille of population (surpassed only by pulmonary tuberculosis with 3.03 per mille), in the latter a rate of 2.252 (surpassed only by lung tuberculosis with 3.975 and senility and apoplexy with 2.831 per mille of population). There seems no doubt, however, that the pneumonias formed only a minority of the total deaths from respiratory diseases. The figures available for Shanghai show a low mortality from pneumonia of all forms. Due account should be taken, however, of the large number of exposed corpses where no diagnosis was possible.

The statistical material from Hong-Kong is of particular interest apart from its reliability, because here separate figures for broncho-pneumonia and lobar pneumonia are given. It

will be seen that the former type invariably outnumbers the latter. This is not peculiar to Hong-Kong or South China, since throughout China broncho-pneumonia appears to be more common than the lobar type. It occurs either as a primary or secondary condition in children, while it is usually secondary in adults.

An interesting study of 242 typed cases of lobar pneumonia has been made by Wu and Ch'iu in Peiping. While type distribution and clinical appearances corresponded to what is found in other countries, certain interesting discrepancies could be noted :

(1) The incidence of the lobar form in Peiping was very low. Amongst 41,740 patients treated in the Union Medical College Hospital during a period of ten years (1922-1931), there were 242 cases, equal to 0.58%. The authors suggest that this fortunate state of affairs might be accounted for by the dry and sunny weather prevailing. Indeed, in Nanking, with a more moist climate, 106 patients with lobar pneumonia were treated in the Central Hospital during the six months from January to June 1936.

(2) 80% of the Peiping cases fell between the ages of 11-40, the third decade of life being most frequently involved.

(3) The mortality of the different types may be summarised as follows :

Types	Cases	Deaths	Percentage
I	99	12	12.1
II	42	8	19.1
III	14	4	28.6
IV	76	17	22.4
Total	231	41	17.1

The mildness in type I and the severity in type IV are in marked contrast to experiences gained elsewhere. It should be added that the general mortality from lobar pneumonia was even lower in Nanking than in Peiping as only eight (7.6%) of the above-mentioned 106 patients treated in the Central

Hospital died. However, no far-reaching conclusions should be drawn from observations extending over such a short period.

Both on account of the comparative infrequency and the limited mortality of lobar pneumonia, symptomatic treatment is usually resorted to. Serotherapy has not been used extensively, and artificial pneumothorax has been tried in a very limited number of instances only.

Summarising, it may be said that, in contrast to other respiratory diseases, including broncho-pneumonia, the lobar type of this disease is not particularly important from a public health point of view. However, the peculiar features shown by this type in China render a further study of this problem desirable.

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Table XXIX. — In-patient Records of Pneumonia, Harbin Hospital.

Year	Total number of admissions	% of pneumonia cases
1918-1921	867	2.537
1922-1924	738	0.948
1925/26	1,140	1.052
1927/28	648	0.771
1929/30	551	0.181
Total	3,944	1.242

Table XXX. — Chinese Deaths from Pneumonia of all Forms in Shanghai.

Per mille of population.

1928	1929	1930	1931	1932	1933	1934	1935
0.47	0.47	0.49	0.45	0.37	0.30	0.38	0.34

Table XXXI. — Pneumonia Mortality in Hong-Kong.

Per mille of population.

	1928	1929	1930	1931	1932	1933	1934	1935
Broncho-pneumonia . .	1.68	2.07	2.63	3.61	3.23	3.60	3.20	4.33
Pneumonia . .	0.91	0.90	1.03	1.46	2.38	0.93	0.56	0.48

6. Leprosy.

Historical Summary.

Reference to leprosy in Chinese literature may be found as early as the Chou dynasty, sixth century B.C. A disciple of Confucius is supposed to have died from this disease. Its infectious nature was first mentioned by Li Ting in the Ming dynasty. The "Golden Mirror of Medicine", a standard work of the Ch'ing dynasty (1739), considered leprosy comparatively rare and mainly restricted to malarial districts. The use of chaulmoogra oil in treatment dates back several thousands of years, as recorded in numerous legends. The first definite allusion to it in Chinese medical literature was in the fourteenth century. The drug was not universally used, because some doctors feared its irritating effects, whilst others who were successful with it kept the method as a family secret.

No extensive effort was made to alleviate the hard lot of the lepers until the advent of missionaries. We find that, early in the seventeenth century, the Misericordia Hospital, founded in Macao by Portuguese priests in 1569, comprised also a hospice for lepers, which housed about seventy patients of both sexes. It is not surprising that the medical missionaries who came to China after 1835 paid much attention to leprosy, a disease particularly mentioned in the Bible. Hobson, in 1842, referred to the horror with which the Chinese considered this unclean and contagious disease. Relying upon information from Chinese sources, he also believed that leprosy was mainly met with in the lower and damp regions of Kwangtung, Kwangsi and Fukien provinces. Manson, working in Amoy, Fukien province, found in 1871 that leprosy formed about 7% of those seeking hospital aid.

Early missionary institutions devoted specially to leper treatment were located at Swatow (1866), Fatshan (1881) and Pakhoi (1887). Systematic treatment with chaulmoogra oil was adopted from 1920 onwards.

Present Distribution of Leprosy.

In China, as elsewhere, leprosy is undoubtedly a disease of rural areas, and for this reason exact nosological studies are rendered very difficult. A great deal of useful information has come to hand, however, showing that leprosy is much more prevalent than was formerly believed. Maxwell (1937) gives the general incidence as follows :

(1) A southern group in which the prevalence of leprosy is very great. This group includes the provinces of Kwangtung, Kwangsi, Yunnan, Kweichow.

(2) An intermediate group in which the disease is common but markedly less prevalent than in group 1—Fukien and Hunan. Hupeh ought, perhaps, to be included in this group.

(3) A central group where leprosy is widely present but very much less prevalent—Kiangsu (except an area in the north of the province), Chekiang, Anhwei.

(4) A western group in which the prevalence of the disease is very great—Western Yunnan, Western Szechwan (Sikang), Kansu and Eastern Tibet. This area spreads over from Kansu into a small part of Southern Shensi.

(5) A northern group where leprosy is absent or nearly so—Hopei, Honan, Shansi, Shensi (except as noted above) and Manchuria, to which must be added the eastern and densely populated part of Szechwan. There are one or two minor exceptions to the complete absence of the disease from this group. In Manchuria, a few cases of leprosy are found, but mostly among immigrants from the heavily infected areas of Shantung and Korea. In Honan, there appears to be a very small and strictly limited area in the centre of the province where leprosy is found. Two small areas are also known in Eastern Szechwan.

(6) Shantung and the adjoining part of Northern Kiangsu. Here, and entirely separated from the other areas of heavy infection, we strike a region in which leprosy is extremely prevalent and with a history dating back for many centuries. While accurate information is still lacking on this point, there is reason for believing that the province of Shantung contains areas where leprosy is almost unbelievably prevalent and where the local incidence is higher than in any other part of China.

Another striking fact about leprosy in Shantung is the sharp line of demarcation limiting the area where the disease is prevalent. To the south and east of the Yellow River, leprosy is present, and in many places the incidence is very high ; to the north and west of the river leprosy is absent, this region joining the leprosy-free area of the northern group of provinces. To the south, the area of heavy infection passes into the northern part of Kiangsu, but again is limited with some strictness to the south by the Yangtze River.

Leper Hospices and Clinics.

The fact that modern care for lepers was first instituted under missionary auspices left its stamp upon the work up to the present day. The first period, lasting to 1921, was characterised by individualistic efforts mainly by missionaries. It should be noted, however, that, even at this early period, much help was given by Chinese benefactors or local authorities in the form of grants of land or buildings and financial subsidies.

A new epoch began when, in 1921, the International Mission to Lepers co-ordinated the work by appointing a secretary for Eastern Asia with headquarters at Shanghai. A survey of the situation was undertaken. New leprosaria were established and suitable drugs supplied to existing centres and to hospitals treating leper out-patients.

Another forward step was the foundation of the Chinese Mission to Lepers in 1926. It assumed responsibility for some institutions, among which are the Lo Ting Leper Hospital, Kwangtung, the Leprosarium at Nanchang in Kiangsi, the Sinhua Leprosarium in Hunan, the Hongkew Clinic for Skin Diseases at Shanghai (taken over in 1930) and the National Leprosarium in the same city, erected at a cost of $120,000 in 1935. In addition, grants-in-aid were given to other leprosaria. The chaulmoogra oil preparations supplied by the mission to the above and other institutions are chiefly Wightiana ethyl esters from the Philippine Islands and iodised ethyl esters manufactured by the Institute of Materia Medica in Peiping. The publication of literature on leprosy with a view to enlightening the public, and the efforts to secure Government co-operation and legislation in the interests of the lepers, form an important part of the programme.

On its part, the Government has not been slow in giving assistance to the different leprosaria. Recently, the Kiangsi Provincial Government contributed $10,000 for an expansion of the Nanchang leprosarium and appropriated $9,000 for its annual maintenance. The Canton municipality, established in 1920, granted a subsidy of $35,800 to two missionary

leprosaria in Kwangtung Province, and recently adopted a comprehensive programme to bring leprosy under control.

There are altogether twenty-seven leprosaria reported up to 1937 in the country :

Province	Locality	Number of inmates	Province	Locality	Number of inmates
Kwangtung	Pakhoi	120	Chekiang	Hangchow [2]	100
	Sheklung	800			
	Tungkun	250	Kiangsu	Shanghai [1]	100
	Taikam	200			
	Swatow	150	Shantung	Tsinan [2]	50
	Yeungkong	100		Tenghsien [2]	250
	Hoihow [1]	150		Tsingchowfu	50
	Sunwui	100			
	Chingyuen	75	Hupeh	Siaokan [2]	130
	Loting [1]	50			
			Hunan	Sinhua [1]	50
Yunnan	Yunnanfu	100			
	Chaotong [2]	100	Kiangsi	Nanchang [1]	240
	Kiulungkiang	100			
Kweichow	Pichieh	50	Kansu	Kaolan [1]	50
			Szechwan	Moshi	
Fukien	Yenping	50			
	Amoy	200(?)		Total	4,015
	Foochow	400			

[1] Supported by Chinese Mission to Lepers.
[2] Supported by International Mission to Lepers.

The Tsinan Leper Hospital is in a class by itself, because it admits only patients for whom cure might be expected. The others, though bestowing as much attention as possible on early cases, also admit advanced sufferers. Facilities for diagnosis, treatment and research are excellent in some, particularly in the National Leprosarium of Shanghai. In all of them attempts are made to provide occupational opportunities in addition to routine treatment.

The number of leper clinics as apart from leprosaria cannot be exactly stated, because a number of general hospitals give treatment on a small scale to lepers of the vicinity. It was estimated in 1936 that altogether seventeen such centres for

Map 4. — Map of China showing Leper areas. Hospitals and Clinics.

treatment existed. Among the more important ones which devote their whole attention to lepers are :

(*a*) Three city clinics at Shanghai, Swatow and Jukao (Kiangsu) ;

(*b*) Two village clinics at Iam Tsau (Swatow district) and four clinics in Weihsien (Shantung).

Plans for Future Work.

The latest phase of leper work in China may be said to date from 1932, when the first National Leprosy Conference (followed by a second conference in 1935) was convened by the Chinese Mission to Lepers. From this, certain ideas were crystallised—viz., that leprosaria can only take care of a small minority of the total leper population estimated at 1,000,000 (it is even estimated that they house only one-third of 1%), and that leprosy is a rural problem in China. It is true that not a few lepers may be found in large cities like Shanghai, but nearly all of them gravitate from rural areas in the hope of getting work, or at least of escaping attention or even persecution. This being the case, village clinics are much more likely to benefit the sufferers than leprosaria situated in cities, especially if one considers that treatment can only yield permanent results if started early and continued for a long time. From the point of cost *per capita*, the advantage is all on the side of the village clinics. For all these reasons, the attention of both the National and local authorities, as well as charitable undertakings, is centred mainly upon the extension of these clinics, including mobile units.

7. Mental Diseases.

Since the legendary period of Chinese medicine, different psychotherapeutic methods have been practised in this country, but no satisfactory references to mental diseases are found in the classical medical works. Probably one of the principal reasons was that reputable practitioners disliked to discuss these methods, which were mainly used by sorcerers and quacks. It should be noted, however, that asylums for the unfortunate victims of insanity were sometimes founded by enlightened officials. Such institutions were mentioned at the time of the Chou dynasty (1121-249 B.C.) ; modern examples are asylums

founded in 1885 at Fatshan and, during the present century, at Peiping (see later) and Kaifeng (1933).

The pioneers of modern medicine in China paid little, if any, attention to mental diseases, which they believed to be considerably rarer than in the West (Hobson, 1849). All the greater, therefore, is the credit due to J. G. Kerr (1824-1901), who, from 1872, pointed to the error of such views and whose indefatigable energy led in 1898 to the opening of a proper hospital for the insane at Canton.

This lack of attention bestowed until recently on mental diseases in China makes itself felt in the absence of reliable information on the incidence of insanity. McCartney, in 1926, gathering all available data, conservatively estimated the number of mental patients in China to be about 1,300,000. When differences in tradition, cultural background, religious beliefs and mode of living are considered, one would naturally expect to find the distribution of the various forms of psychoses different from what is common in Europe or America. However, the general types met with are quite similar : schizophrenia, maniac-depressive conditions, epilepsy and syphilitic psychoses constitute the great majority of conditions seen in psychiatric practice. Relevant data collected in the Canton Hospital are as follows :

Types of insanity	1918		1922		1925	
	Men	Women	Men	Women	Men	Women
Maniac-depressive insanity ...	78	47	103	95	94	101
Dementia præcox	60	8	109	29	114	27
General paralysis of the insane .	32	8	46	7	51	6
Alcoholic psychoses	9	0	23	2	13	0
Epilepsy alone or with insanity .	3	2	14	2	9	5
Idiocy or imbecility	2	0	4	7	3	5

At present, there are four big mental hospitals in China—namely, the Canton Municipal Psychopathic Hospital, the Peiping Municipal Psychopathic Hospital, the Mercy Hospital in Shanghai and the Elizabeth Blake Hospital in Soochow.

The Canton Hospital carries on the work of the institution founded by Kerr, which was taken over by the municipality

in 1927. It is at present capable of accommodating about 800 patients. In 1936, 905 sufferers were admitted and 798 discharged, the average number of inmates throughout the year being 760.

The history of the Peiping Hospital also goes back to an earlier institution, a Refuge for the Insane, run in connection with the Min Cheng Pu Hospitals (a series of institutions founded under the auspices of the Central Sanitary Department from 1906 onwards). The present organisation, created in 1933, is under municipal administration, and is assisted by the Peiping Union Medical College, which provides the entire professional staff, including physicians, nurses and social workers. Its 250 beds are practically always occupied. An extension is urgently needed to take care of new applicants for admission.

The Shanghai Mercy Hospital, founded in 1935, is a private Roman Catholic institution run in co-operation with the specialist staff of the National Medical College. The more expensive rooms are rarely occupied, hence half of the 600 beds are usually empty.

The Elizabeth Blake Hospital of the Presbyterian Mission has a special psychiatric division with 150 beds.

Taking all the hospitals together, we have thus 1,800 beds for 1,300,000 sufferers, or one for every 720. The main difficulty in providing for expansion of this work may be said to lie, not so much in lack of funds to build hospitals as in the scarcity of trained personnel. Among the medical schools in China, two only (the Peiping Union Medical College and the National Medical College at Shanghai) have separate neuro-psychiatric divisions ; in most others, psychiatry is taught by internists. Indeed, one of the four above-mentioned hospitals has no specialist on its staff, while three are at present unable to provide social workers. The training of different grades of specialist workers is therefore of prime importance.

It would be premature under these circumstances to decide whether the present practice of founding asylums should be continued or the system of agricultural colonies adopted. Both with regard to the welfare of the patients and the expense involved, agricultural colonies would be certainly preferable. However, it is problematical whether patients would be received

into families as they are in Gheel, Lierneux, Clairmont, etc. The Chinese population in general, and the farmers in particular, are in mortal fear of demented people. To them, mental patients are invariably dangerous, destructive and homicidal. The insane are believed to be possessed of the devil and suffer because they have to pay the penalty of their own or their ancestors' sins, and are thus left to their own destiny. An educational campaign is therefore necessary before agricultural colonies can be thought of.

To perform this task, as well as for many other reasons, it would certainly be advisable to add to existing public health institutions special psychiatric divisions charged with control of mental hygiene as well as curative activities. Such workers would be able, not only to remove unwarranted fears and to demonstrate the curability of mental diseases, but they could be of great help to mentally under-developed or wayward children. As more psychiatrists become available, each important health centre would have such a division where the problems of mental hygiene might be discussed and dealt with, early psychotic patients treated ambulantly and social work undertaken. Gradually, more reliable statistics than are available at present would be collected and experiences gathered, permitting the working out of satisfactory plans for the disposal of advanced cases.

8. Drug Addiction.

(Figure 32.)

The history of the opium evil in China is so long and involved that it is impossible to deal here with the many phases through which it has passed. Suffice it to say that the Government made from the earliest times many efforts to suppress this evil. In 1935, General Chiang Kai Shek, Chairman of the Military Affairs Commission, was appointed concurrently Director-General of Opium Suppression. Under his leadership remarkable progress has been made, and the Government now controls and regulates the production, transportation, sale and consumption of opium and allied drugs.

In order to ascertain the extent of opium addiction, a system of registration of all addicts was inaugurated. The total number of registered smokers, reported at the end of November 1936 by the various provinces and municipalities, amounted to 3,995,850. Realising the fact that many of the addicts are aged and infirm or sick, and that their habit is of long standing and therefore cannot be cured within a short period, the Government has adopted a policy of gradual reduction.

A limited cultivation of poppy is permitted to provide opium for persons who, unable to undergo a complete cure within a short time, smoke on a yearly decreasing ration. Such addicts are required to register and sign a pledge for the complete eradication of the habit by the end of 1940 at latest, as called for in the programme of suppression.

In order to attain thorough and satisfactory results in opium suppression, the policy of prohibition must be supplemented by determined efforts at curing opium or other narcotic addicts. To this the Government has given the utmost attention. Addicts are encouraged to discontinue their habit voluntarily. Failing this, they are compelled to undergo compulsory treatment, or suffer severe penalties.

In 1934, 597 anti-opium hospitals were reported to be in existence, including general institutions assisting in the work. By the end of 1935, there were 964 anti-opium hospitals and 299 other institutions offering anti-opium treatment, and 339,198 persons were reported as completely cured of addiction.

Two methods of treatment are generally used, the so-called " blister " method and the administration of gradually decreasing doses of opium tincture. The course of treatment consists not only of medical care, but also comprises methods to promote physical recovery and moral renaissance. The aim is to provide the addicts, on the one hand, with opportunities for physical exercise so as to improve their physique and build up their resistance, and, on the other, with spiritual inspiration so as to raise and strengthen their moral fibre.

The number of anti-opium hospitals needed in the different provinces is determined by the actual number of registered smokers. It is proposed to establish such institutions even in the remote regions of the interior. It should be noted in this

connection that, as a rule, the addicts dislike hospitalisation, especially in small towns and rural districts. A person loses social prestige when he becomes known as an addict openly seeking treatment in an anti-opium hospital. Further, hospital care is comparatively costly and the middle and lower classes can afford to pay but little. Finally, since addicts of the labourer class must work daily to make a living and provide for their family, they cannot stop their work to stay in hospital. Therefore, in spite of the Government's efforts to extend the service as far as possible, there are many addicts who evade hospitalisation.

Table XXXII. — Anti-opium Hospitals and Stations, and Number of Addicts cured and under Treatment.

(Figures brought up to December 31st, 1935.)

Provinces and municipalities	Anti-opium hospitals and stations	Other hospitals	Addicts cured	Addicts under treatment
Kiangsu	61	—	79,658	2,129
Chekiang	47	91	10,985	139
Anhwei	61	8	9,213	—
Hupeh	45	74	48,647	—
Hunan	1	52	15,540	—
Shantung	78	35	35,293	754
Shansi	106	—	7,230	—
Shensi	66	1	22,180	507
Szechuen	39	2	3,723	392
Kweichow	47	4	—	—
Kiangsi	119	—	1,550	522
Honan	109	—	16,974	3,086
Hopei	130	—	32,149	—
Kansu	19	—	3,310	107
Fukien	1	7	—	—
Ninghsia	10	—	4,117	—
Charhar	5	8	9	—
Chinghai	5	—	250	—
Nanking	2	—	14,831	482
Peiping	2	—	9,297	268
Shanghai	4	17	6,886	326
Tientsin	2	—	7,790	361
Tsingtao	3	—	9,243	165
Weihaiwei	2	—	323	15
Total	964	299	339,198	9,253

Table XXXIII. — Reported Cases of Narcotic Offenders dealt with by Various Provinces and Municipalities in 1935.

Provinces and municipalities	Number of cases	Number of offenders	Action Taken							
			Fine	Imprison-ment	Life impri-sonment	Death Penalty	Under arrest	Compulsory treatment	Pending on Dec. 31st/35	Acquittal
Kiangsu	2,557	4,302	—	—	—	31	—	—	—	—
Chekiang	1,607	2,768	—	17	—	119	9	1,779	844	—
Honan	1,354	1,538	—	130	5	112	49	920	269	53
Hupeh	77	87	—	76	—	—	1	—	10	—
Anhwei	8	23	—	3	1	8	8	3	—	—
Kiangsi	12	29	—	12	1	3	7	—	6	—
Fukien	131	340	—	—	—	4	—	—	—	—
Shantung	3,780	6,042	8	263	—	520	—	5,199	52	—
Shansi	4,863	5,583	—	5,477	—	106	—	—	—	—
Shensi	6	13	—	2	5	6	—	—	—	—
Suiyuan	8	26	—	1	—	1	12	—	4	8
Szechuen	4	7	—	—	2	2	—	1	2	—
Hopei	6,823	11,133	1,447	1,625	28	24	3	7,559	74	373
Peiping	3,171	4,804	—	80	3	6	—	4,633	71	11
Tientsin	785	965	—	—	—	—	—	—	965	—
Shanghai	413	758	—	151	3	3	—	424	—	177
Nanking	900	1,449	—	189	27	58	—	—	—	1,175
Tsingtao	1,438	3,350	—	—	—	—	—	3,251	99	—
Weihaiwei	283	402	59	55	—	—	—	173	115	—
Wuchang-Hankow garrison head-quarters	123	223	—	47	3	15	—	132	—	6
Total	28,343	43,842	1,514	8,128	78	1,018	89	24,074	2,511	1,803

The schedule for the prohibition of narcotic drugs expired at the end of 1936. Prior to this date, it was stipulated by law that persons found to be unlawfully engaged in the manufacture, transportation or sale of narcotic drugs were liable to the extreme penalty. Beginning from 1937, *consumers* of narcotics are also liable to the same punishment. This shows the Government's determination to stamp out the drug evil at all costs.

FIGURES 1 TO 32.

Figure 1. — A village health worker vaccinating a child.

Figure 2. — A village health worker questioning a peddler of fried noodles on the occurrence of new births (see text).

Figure 3. — Mass education in a village class.

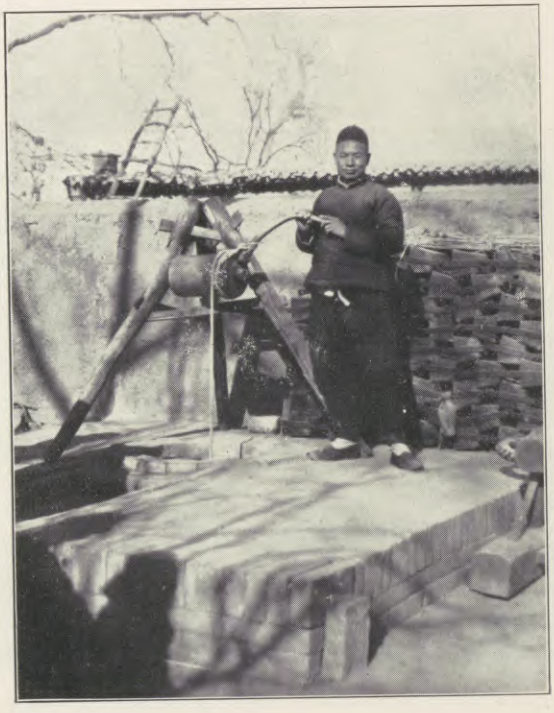

Figure 4. — A reconstructed well with bricked apron.

Figure 5. — Soldiers helping the farmers in anti-insect campaigns.

Figure 6. — University professors conducting teaching and research in magistrate's yamen.

Figure 7. — Girls are taught rug-making.

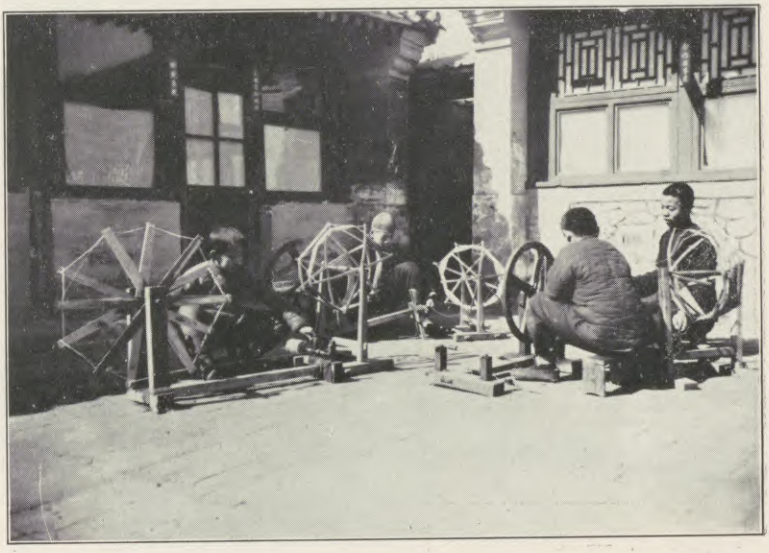

Figure 8. — Boys spinning on locally made wheels.

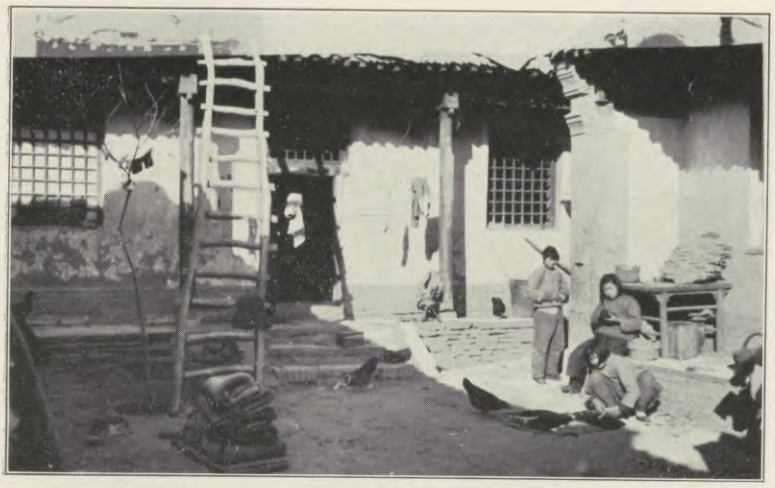

Figure 9. — Typical home of a farmer's family.

Figure 10. — Group showing three generations living together under the same roof.

Figure 11. — Pollution of water source (night-soil container).

Figure 12. — Earth pit for storing night-soil.

Figure 13. — Brick-paved pit for storing night-soil.

Figure 14. — Large earthenware jar for storing night-soil.

Figure 15. — A typical farmer's hut.

Figure 16. — Inserting skylights in a roof.

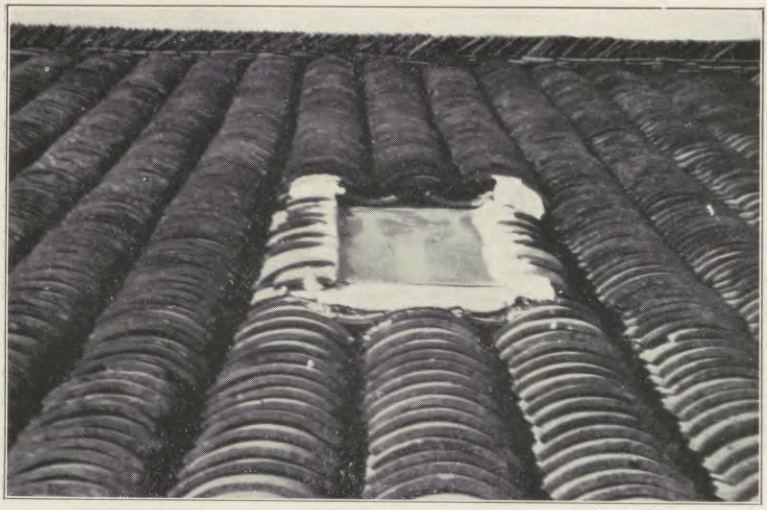

Figure 17. — Construction details of a skylight.

Figure 18. — An improved house with windows and skylights.

Figure 19. — View of a village which has not been improved.

Figure 20. — A village that has been modernised.

Figure 21. — A close-up view of the well construction.

Figure 22. — A village hand-pump. Note the concrete apron surrounding the well.

Figure 23. — Bored-hole latrine showing squatting-plates.

Figure 24. — Rubbish heaped outside a house in Fukien Province. Ideal for rat harbourage.

Figure 25. — A typical farmstead in a plague-affected village.

Figure 26. — Anti-plague workers in a village street in South Manchuria.

Figure 27. — Transferring cyanogas dust from a large to a small drum. Note the gas-masks.

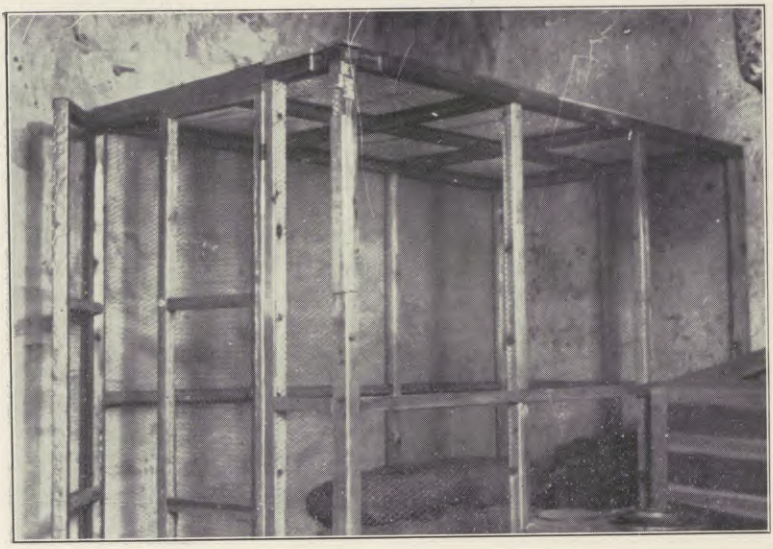

Figure 28. — A wire cage serving as a rat-proof storeroom for bulky food articles in shops (Lungyen, Fukien).

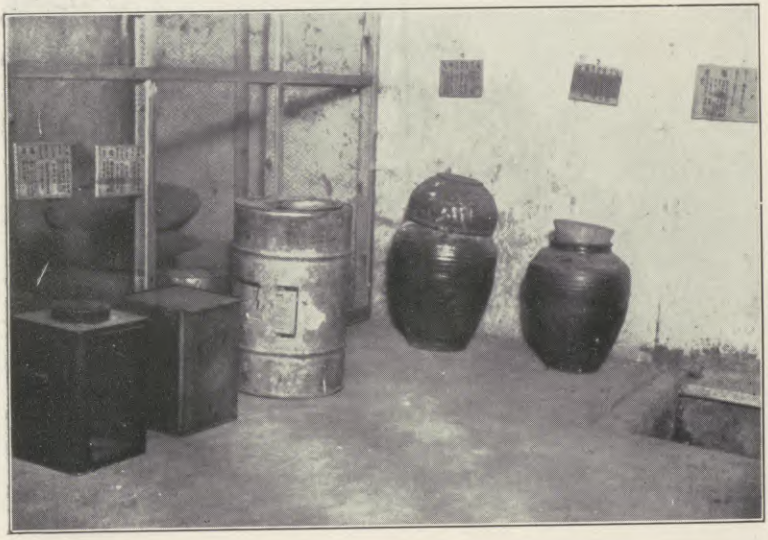

Figure 29. — Some specimens of rat-proof containers for food.

Figure 30. — Rat-proof containers for spiced foods. Note the plate glass over the jars.

Figure 31. — Shop after rat-proofing. Note the tin-lined covers of the earthenware jars.

Figure 32. — Open-air theatre staging an anti-narcotic play.

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