Annual report on the Medical Department / Straits Settlements.

STRAITS SETTLEMENTS.

Annual Medical and Sanitary Report 1928.

No Map or Index are provided, some good graphs are included. The Model Medical Report has not been closely followed.

P.1. The necessity for a Chair in Public Health at the College of Medicine is emphasized, also the desirability of ensuring locally trained medical men, getting a fair share of the higher posts in the Government Services. At present the local medical service numbers 68 mostly graduates of the local College of Medicine; of these 3 hold specialist posts and 8 hold prize appointments.

P.3. Dr. G.E.Brooke, the Senior Health Officer retired during the year and will be very much missed. The Committee will wish to congratulate him on bringing into be-ing (1) effective Port Health System (2) a Sanitary Inspectors' School, and (3) the Eastern Health Bureau of the League of Nations.

P.4. The Registration of Births and Deaths Ordinance was amended, so as to correct errors in Registration.

P.5. Public Health.

The years 1926 and 27 having been very unhealthy, especially as regards Malaria, the year under review shows a considerable improvement. The death rate was 28.76 per mille against 31.81 and 33.55 for 1926-27. The rainfall was more evenly distributed and there was

less

less flooding. The death rate for Singapore Municipality fell from 33.08 per mille to 28.44, and excluding those infected outside was 26.96 per mille.

P.5. The infant mortality showed considerable improvement it was 185.69 per mille, the lowest being in 1925, 184.78 per mille.

P.6. 5 cases of Plague, 10 cases of Cholera and 8 of smallpox were reported. Over 80,000 primary and secondary vaccinations were performed.

Despite the vigorous antimalarial campaigns the present figures show a great prevalence of the disease, but there was a drop in the number of cases in Malacca and in Singapore Island. There was a slight increase in Enteric Fever especially in Singapore Municipality.

P.8. The venereal clinics and dispensaries have done excellent work over 182,000 attendances 50% more than the previous year, over 900 seamen attended the clinic, attempts are being made to educate the prostitute community as to the dangers of these diseases.

P.10. The 3 years Hookworm and Sanitary Campaign carried out by the Rockefeller Foundation was completed and the work was taken over by the Sanitation department. A full report is given as Appendix (P)

Graphs and diagrams show the improvement in public health during the last generation. The improvement in 1928 was largely due to the anti-malarial measures and infant welfare centres. The average death rate for the last 10 years was 30.51 per mille.

P.13. A report of the work of the League of Nations Eastern

Eastern Health Bureau is given on this and succeeding pages.

P.22. Hygiene and Sanitation has shown marked improvement. The Rural area has been divided into 5 sanitary districts. Rural health sisters have been appointed to all the important centres. They do house visiting and hold maternity and child welfare clinics.

P.24. Very extensive rural anti-malarial work has been carried out and the spleen rate has greatly improved where the work has been done.

P.27. 359 visits were made by sanitary inspectors to schools, the sanitation of Government and State aided schools is satisfactory.

P.28. Tube latrines have been instituted at the instigation of the Rochefeller foundation and have been found very successful. The use of these deep bored pits seems to be a solution of the surface soil polution in Rural areas and estates. The all in cost of a tube latrine complete is only £5.

P.30. The water supplies of the large cities have been greatly extended.

The School Medical and Dental Services are doing good work.

P.33. Health propaganda work has been carried on by Dr. Paul Russell in connection with his sanitation campaign over 70,000 pamphlets have been distributed. 2,000 pairs of shoes were given to the poor children to prevent Hookworm infection.

P.33. Thetraining ot the sanitary personnel has received great imputus. The Royal Sanitary Institute

of

of London has collaborated and the numbers of Sanitary students are rapidly increasing; of 20 students attending the examination in 1928 19 passed. These students are sent to the school by the various Governments.

P.39 gives a report of the King Edwards VII College of Medicine.

On P.40 is it pointed out that a number of students who fail to pass the examinations, drift to Edinburgh to obtain the Scottish Triple Qualification. This drift is also noticed in Ceylon.

P.42. Of the 26,000 Births in Singapore and Penang ¾ were attended by trained midwives.

The Singapore Child Welfare Society is doing good work, it maintains 2 centres; 3 medical men give free services and there are 3 government health sisters and 7 health nurses. Baby shows are held in the Rural districts.

P.47. The travelling dispensaries have done very good work, over 18,000 persons were attended in Singapore and 15,000 in Malacca.

A number of scientific reports and Photos are given as appendices.

The Report of the Rural Sanitation Campaign Appendix (N) is interesting.

Dr. Hoops and his staff are to be congratulated on a year of continued health progress.

(Intd.) G.J.R.

11.12.29.

STRAITS SETTLEMENTS

The Straits Settlements Medical Report for the year 1928

I.—ADMINISTRATION

The Medical Department was visited in April by the Right Honourable W. G. ORMSBY-GORE, M.P., Under Secretary of State for the Colonies, who while in Singapore inspected the College of Medicine and the General Hospital and praised the buildings and equipment.

Mr. ORMSBY-GORE devoted an important section of his subsequent Report to the Public Health of Malaya.

He commended the many sided efforts that have been made to deal with public health problems and noted that, in spite of much anti-malarial effort, Malaria remains the chief cause of mortality and of illness.

He emphasized the need for a Chair of Public Health in the College of Medicine and the desirability of ensuring that locally trained medical men should, when they prove themselves, get a fair share of higher posts.

(*a*).—STAFF

1. The authorised number of the European Staff for 1928 was 148.

2. The following officers were appointed to the posts mentioned during the year.

Name	*Previous post*	*Appointment*	*With effect from*
	(*a*) $1,050 p.m.		
Dr. F. R. SAYERS ...	Senior Health Officer, Perak	Chief Health Officer, Singapore	21-5-1928
Dr. W. M. CHAMBERS	Chief Medical Officer, Social Hygiene	Chief Medical Officer, Penang	29-9-1927
	(*b*) $850—1,000 p.m.		
Dr. R. B. MACGREGOR	Time-scale Medical Officer	Chief Medical Officer, Malacca	19-2-1927
Dr. G. H. GARLICK ...	Time-scale Medical Officer	Physician and Radiologist, Johore	25-11-1927
Dr. E. R. STONE ...	Time-scale Medical Superintendent	Medical Superintendent, Mental Hospital, Singapore	1-1-1928
Dr. J. W. SCHARFF ...	Time-scale Health Officer	Senior Health Officer, Penang	21-5-1928
Dr. N. H. HARRISON	Time-scale Medical Officer	Chief Medical Officer, Trengganu	1-7-1928

3. The following medical officers were appointed to the service after passing through the London School of Tropical Medicine:—

Name	*Date of Arrival*
Dr. B. M. JOHNS ...	... 9th April, 1928
Dr. W. L. BLAKEMORE	... 11th August, 1928
Dr. E. L. ROBERT ...	... 22nd September, 1928

Dr. J. P. CULLEN was engaged locally as a Health Officer for temporary duty on 24th November, 1928.

4. The following officers proceeded on leave during the year:—

Name	*Appointment*	*Date*
Dr. A. G. H. Smart ...	Senior Health Officer, Penang	29th January, 1928
Dr. H. W. Furnivall ...	Medical Officer ...	17th February, 1928
Dr. A. L. Hoops ...	Principal Civil Medical Officer, Straits Settlements	19th February, 1928
Dr. H. B. Dodds ...	Medical Officer, Penang	10th March, 1928
Dr. J. C. Tull ...	Government Pathologist, Singapore ...	31st May, 1928
Mr. E. O'Sullivan ...	Lay Superintendent, Pulau Jerejak ...	1st June, 1928
Dr. C. J. Smith ...	Senior Surgeon, Singapore	15th June, 1928
Dr. (Mrs.) C. H. Duke	Lady Health Officer, Singapore ...	19th June, 1928
Mr. A. C. Brooks ...	Assistant Analyst, Singapore	28th June, 1928
Mr. J. Kerr ...	Senior European Attendant, Singapore ...	25th July, 1928
Dr. J. C. Carson ...	Medical Officer, Singapore	8th September, 1928

5. The following officers returned from leave during the year:—

Name	*Appointment*	*Date*
Dr. E. D. Lindow ...	Medical Officer, Singapore	11th February, 1928
Dr. E. V. Lupprian ...	Medical Officer, Penang	23rd February, 1928
Dr. G. H. Macalister ...	Principal, College of Medicine, Singapore	25th February, 1928
Dr. R. W. C. Kelly ...	Medical Officer, Singapore	25th February, 1928
Dr. W. J. E. Phillips ...	Medical Officer, Johore	9th March, 1928
Mr. W. Peckham ...	European Attendant, Singapore ...	16th June, 1928
Dr. A. G. H. Smart ...	Senior Health Officer, Perak	5th October, 1928
Dr. A. L. Hoops ...	Principal Civil Medical Officer, Straits Settlements	9th October, 1928
Dr. R. D. Fitzgerald ...	Principal Medical Officer, Johore	20th October, 1928
Dr. H. B. Dodds ...	Medical Officer, Penang	1st November, 1928
Dr. H. W. Furnivall ...	Medical Officer, Singapore	1st November, 1928
Dr. J. C. Tull ...	Government Pathologist, Singapore ...	2nd November, 1928
Dr. C. J. Smith ...	Senior Surgeon, Singapore	17th November, 1928
Dr. (Mrs.) C. H. Duke	Lady Health Officer, Singapore ...	18th December, 1928

6. The following officers retired or resigned from the service during the year:—

Name	*Appointment*	*Date*
Dr. D. E. Iago-Jones ...	Medical Officer, Singapore	14th January, 1928 (Resigned)
Dr. G. E. Brooke ...	Chief Health Officer, Singapore ...	21st May, 1928 (Retired)
Dr. W. M. Lupton ...	Temporary Medical Officer, Singapore ...	1st October, 1928 (Resigned)
Dr. A. Dickson-Wright	Professor of Clinical Surgery, College of Medicine, Singapore ...	12th August, 1928 (Resigned)
Mr. R. E. Wilgress ...	Assistant Analyst, Singapore	19th December, 1928 (Agreement expired)

By the retirement of Dr. G. E. Brooke who attained the age limit on 21st May, 1928, Government has lost an officer to whose initiative is due the development of an effective Port Health System and the foundation of the Sanitary Inspectors' School. He also organised the League of Nations Eastern Health Bureau on a firm basis during the first two years of its existence

7. The following Officers were seconded for service in the Unfederated Malay States during the year:—

Name	*To*	*Date*
Dr. W. J. E. Phillips	Johore as Medical Officer	9th March, 1928
Dr. R. Walkingshaw ...	Johore as Medical Officer	20th March, 1928
Dr. J. A. W. Ebden ...	Kedah as Medical Officer	20th May, 1928

8. *European Matrons and Sisters.*—Miss A. O. Laurie was promoted Matron, Grade II, Durian Daun Hospital, Malacca, from 1st January, 1928.

Miss E. M. Howes-Roberts was promoted Matron, Grade II, King Edward VII Maternity Hospital, Penang, on 11th June, 1928, as the substantive holder of the appointment, Miss L. Cave, was transferred to the post of Matron, Grade II, District Hospital, Penang.

The number of Matrons and Sisters in the service, including those seconded to the Unfederated Malay States, is 90.

9. The local medical service numbers 68, mostly graduates of the King Edward VII College of Medicine, Singapore.

Of these, three fill specialist posts:—

Dr. J. H. L. Westerhout ...	Port Health Officer, Penang.
Dr. A. H. Wheatley ...	Medical Superintendent, Leper Settlement, Pulau Jerejak.
Dr. A. C. Dutta ...	Surgeon and Resident Officer in charge Durian Daun Hospital, Malacca.

Eight others hold responsible prize appointments.

(*b*) THE FOLLOWING ORDINANCES AFFECTING PUBLIC HEALTH WERE ENACTED DURING THE YEAR:—

1. An Ordinance to amend Ordinance No. 59 (Registration of Births and Deaths).

The object of this bill is to secure that alleged errors of fact or substance in register books of births and deaths may be corrected only upon the information of people who have knowledge of the truth of the case. As the law stood previously "any error" might be corrected and no safeguard against fraudulent corrections was provided.

2. An Ordinance to amend the Deleterious Drugs Ordinance, 1927.

The object of this Bill is to relieve medical practitioners from the obligation to obtain licences to enable them to possess and use deleterious drugs, as defined in the Ordinance, in the practice of their profession. A general authorisation is granted by clause 6 of the Bill to medical practitioners and certain other persons. The authorisation may be withdrawn in the case of any person convicted of an offence under the Ordinance or in certain cases where the conduct of a medical practitioner is under suspicion.

The power to take the finger impressions of persons convicted of certain offences is extended to the taking of the photographs of such persons.

(*c*) FINANCIAL

The actual medical and sanitary expenditure and the revenue collected in the various settlements were:—

Expenditure	$	*c.*
Singapore	3,073,433	67
Penang	1,033,584	35
Malacca	294,802	51
Labuan	23,832	26
Total ...	4,425,652	79

Revenue	$	*c.*	
Singapore	389,107	76	
Penang	205,103	40	(including payments for lepers.)
Malacca	20,276	48	
Labuan	1,578	45	
Total ...	616,066	09	

Of the expenditure $682, 587.74 was spent on the Health Branch and $172,387.75 on the College of Medicine, Singapore.

It is to be remembered that in addition to the above the Health Services of the Municipalities spent:—

	$	*c.*
Singapore	838,363	82
Penang	157,571	83
Malacca	28,750	59
Total ...	1,024,686	24

The total revenue of the Colony was $34,099,853.

Further particulars are given in Table II.

II.—PUBLIC HEALTH

General Remarks

The years 1926 and 1927 were notoriously unhealthy throughout the whole of Malaya, and were remarkable for a great increase in the incidence of Malaria everywhere.

A consideration of the monthly mortality figures in the Straits Settlements for the past five years—1924 an entirely normal and healthy year—1925 the healthiest year on record, though marred by an unusual mortality in the last quarter—1926 and 1927 unhealthy throughout—and the year under review 1928, shows a welcome return towards the conditions in the two earlier years:—

	1924	*1925*	*1926*	*1927*	*1928*
January ...	2,165	2,054	2,579	2,734	2,577
February ...	2,000	1,857	2,141	2,536	2,219
March ...	2,020	1,991	2,458	2,792	2,401
April ...	2,063	2,099	2,762	2,891	2,615
May ...	2,318	2,457	3,340	3,164	3,004
June ...	2,267	2,245	3,227	3,121	2,921
July ...	2,408	2,208	3,038	3,301	2,980
August ...	2,376	2,298	2,740	3,167	2,495
September ...	2,269	2,332	2,504	2,975	2,496
October ...	2,189	2,514	2,588	3,213	2,524
November ...	2,113	2,463	2,534	2,907	2,607
December ...	2,170	2,588	2,722	2,760	2,677
Total deaths ...	26,358	27,106	32,633	35,561	31,516
Estimated population ...	960,952	994,266	1,025,835	1,059,968	1,095,635
Death-rate per thousand ...	27·42	27·26	31·81	33·55	28·76

The death-rate for Singapore Settlement was 27·84, for Malacca Settlement 25·75, for Penang Island 33·44 and for Province Wellesley 30·72.

In this connection it is to be noted that the rainfall in all Settlements was more evenly distributed than in the two previous years, that it was up to the average in Singapore (2,775·16 m.m.), above the average in Malacca (3,130·5 m.m), but below the average in Penang Island and Province Wellesley (2,263·00 m.m.).

Breeding grounds of the malarial carrying Anopheles Maculatus in ravines and seepages, and of Anopheles Ludlowi in brackish tidal swamps are periodically and thoroughly washed out when the rains are abundant and regular, thus leading to a decline of malaria.

Such rains also have a cleansing effect throughout the whole country and render the heat more tolerable especially in crowded towns, thus influencing both infantile and adult mortality.

The death-rate in Singapore Municipality fell from 33·08 per thousand in 1927 to 28·44 in 1928.

Six hundred and fifty-four of those who died were resident less than 3 months in Singapore. Deducting these, the Singapore Municipal death-rate is 26·96 per thousand.

There were 295,700 Chinese immigrants during the year; 149,354 Chinese deck passengers returned to China.

Indian immigrants totalled 63,072. Against these, 91,252 deck passengers returned to India.

The infantile death-rate 185·69 per thousand is approximately one above the lowest on record 184·78 in 1925.

General Diseases

1. *Beri-beri.*—The deaths registered as due to Beri-beri in the last 18 years are:—

Year	*Number of deaths*	*Year*	*Number of deaths*
1911 (Census 714,069)	2,056	1920	1,025
1912	1,926	1921 (Census 881,939)	1,299
1913	1,657	1922	1,388
1914	1,483	1923	904
1915	1,079	1924	910
1916	1,075	1925	973
1917	2,075	1926	1,098
1918	1,958	1927	1,528
1919	1,430	1928	1,146

The low figures in 1915 and 1916 were due to the repatriation of a large number of invalid Chinese. Eight hundred and sixty-nine of the Beri-beri deaths occurred in Singapore. The majority contracted the disease elsewhere. Since the food rationing in the years 1918 to 1921, which led to a less exclusive use of overmilled rice in the diet of the Chinese labouring class, Beri-beri has not returned to the high figures of pre-war years, but there is still room for improvement.

2. *The Pneumonias.*—Deaths under this head numbered 2,679 (1,806 in Singapore city), as against 3,353 (2,291 in Singapore city) in 1927. Of the total 1,114, including a number of children, were classed as Broncho-pneumonia.

3. *Convulsions.*—No less than 5,040 deaths (1,171 in Singapore city) were so registered in 1928 as against 5,784 (1,405 in Singapore city) in 1927.

Most deaths of infants who are not seen by a medical practitioner are reported to the police as due to "sawan" the Malay equivalent of convulsions It is to be understood, therefore, that a variety of infantile disorders are included under this head.

Dangerous Infectious Diseases

The incidence of dangerous infectious diseases in the Colony was again low.

(1) *Plague.*—There were 5 cases of plague and 4 deaths (all in Singapore); figures for the three previous years are 59 (1925), 7 (1926) and 4 (1927).

The Municipal Health Officer found 2 Decumanus rats affected with plague of 398 examined from the infected area, Cross Street.

(2) *Cholera.*—There were 10 cases and 9 deaths.

(3) *Small-pox.*—There were 8 cases and 2 deaths (omitting one imported case).

Vaccinations.—Eighty thousand nine hundred and seventy-four vaccinations and revaccinations were performed as follows:—

Perfect	33,739
Modified	1,974
Failed	10,894
Not seen	34,357

(4) *Cerebro-spinal Meningitis.*—There were 16 cases and 12 deaths.

OTHER INFECTIOUS DISEAES

(5) *Tuberculosis*—

Year	*Deaths from Tuberculosis in Singapore city*	
—	—	—
1924 ...	... 2,389	(1,276)
1925 ..	... 2,604	(1,254)
1926 ..	... 2,526	(1,570)
1927 ...	... 2,903	(1,523)
1928 ...	... 2,727	(1,411)

I quote the figures for Singapore city, as registration in that area is more accurate than elsewhere in the Colony.

The Municipal Health Officer, Singapore, points out that 25 per cent of the Municipal death-rate is due to two diseases, Tuberculosis and Pneumonia.

The deaths from both these diseases must continue high until the town planning schemes relieve the overcrowding in the city of Singapore.

(6) *Malaria*.—In considering malaria, deaths registered as "unspecified fever" many of which are due to malaria must be taken into account.

Figures for the past 5 years are:—

Year	*Malaria*	*Fever unspecified*	*Total*
—	—	—	—
1924	3,462	2,706	6,168
1925	4,235	2,043	6,278
1926	6,452	2,398	8,850
1927	6,283	2,161	8,444
1928	5,798	1,636	7,434

Even allowing for the increase of population, the present figures show a greater prevalence of the disease than in 1924, despite the vigorous campaign of anti-malarial measures that is carried out steadily.

There is an increase in Penang Island from 832 in 1927 to 1,011 in 1928, in Province Wellesley from 1,464 to 1,626. The increase is attributable to the deficient rainfall, and to the opening of new land.

There is a pronounced drop in Malacca from 2,197 to 1,367 and a drop in Singapore Island from 1,514 to 1,436.

The Municipal Health Officer, Singapore, justly points out that perhaps only 10 per cent of those dying in Singapore were infected in Singapore city. He conducted an enquiry into the origin of 3,438 cases of Malaria reported to him within Municipal limits, and found that 2,307 or over 67 per cent admittedly got the infection elsewhere, while only 499, many of them light cases, were probably infected within the Municipality.

Numbers of persons, treated for and dying of Malaria in the towns of Singapore and Penang, contracted the infection while resident in the Malay States or in the Dutch Islands.

(7) *The Dysenteries* were responsible for 902 deaths as against 1,096, 1,015 and 857, in the three previous years.

(8) *Diarrhœa and Enteritis* caused 1,230 deaths as against 1,409, 1,169 and 1,043, in the three previous years.

(9) *Enteric Fever*:—

Year	*Deaths in the Colony*	*Cases notified in Singapore Municipality*
—	—	—
1925	100	136
1926	120	197
1927	188	235
1928	174	230

The increase in Enteric fever figures may be due to more accurate noti fications.

(10) *Diphtheria*:—

Year	*Deaths in the Colony*	*Cases reported in Singapore Municipality*
—	—	—
1925	24	51
1926	15	46
1927	16	29
1928	21	59

(I am indebted to the Municipal Health Officer, Singapore, for his figures and for the accuracy of his registration).

Venereal Diseases

The attendances at venereal clinics and dispensaries, 182,561, were about fifty per cent greater than last year. The ratio of new cases to total attendances was 8·90. Nine hundred and ninety-five seamen made 7,087 attendances. Pamphlets and posters were distributed both in English and the vernacular. Cinema films were shown and lantern lectures given.

Attempts were made to try and educate the prostitute community in the dangers of venereal disease. The Chinese lady visitor and the free services of Chinese doctors proved useful in this respect.

The Social Hygiene Advisory Board held three meetings during the year.

The Principal Civil Medical Officer while on leave gave evidence before the Committee appointed by the Secretary of State to examine and report on the Women and Children's Protection Amendment Ordinance. The report of that Committee, recently received, recommends, amongst other things, that the existing policy of suppression of "known" brothels should be systematically pursued; that legislation be then passed to render illegal the keeping of a brothel; that sections of the law directed at brothel-keepers who allow prostitutes suffering from venereal disease to remain in brothels, or which permit the examination of prostitutes, be repealed; that the existing provision of free facilities for treatment of venereal disease, and for social hygiene health visitors be vigorously continued; and that the existing policy of the Chinese Protectorate in checking traffic in women and girls be

vigorously pursued. These recommendations have been generally adopted as the policy of the Government (*vide* Appendix *I*, page 115).

Leprosy

(*a*) The number admitted to institutions increased by 12 as against 41 in 1927.

		Remaining on 31/12/27	*Admitted*	*Died*	*Absconded*	*Transferred*	*Discharged*	*Remaining on 31/12/28*
Men	Pulau Jerejak, Penang ...	731	166	102	18	4	1	772
	Singapore ...	29	91	8	9	53	—	50
Women	Penang ...	42	14	3	1	1	—	51
	Singapore ...	55	19	8	1	—	1	64
	Total ...	857	290	121	29	57	2	937

Pulau Jerejak

(*b*) Extensive structural alterations were carried out to the old buildings to improve the light and ventilation.

The Eurasian Camp.—An extension of 4 rooms, a new dining room, a kitchen and bathrooms were completed.

Twenty huts have been completed at Camp E; a further 34 are in process of construction. A jetty and store were also completed at this Camp.

(*c*) *Treatment.*—Nearly all the lepers are voluntarily under treatment; the death-rate continues to decrease.

	1923	*1924*	*1925*	*1926*	*1927*	*1928*
Cases ...	888	891	996	1,070	1,111	1,147
Deaths ..	164	150	143	140	144	121

The pure expressed oil of Hydnocarpus has given the best results.

Reports by Dr. E. D. Lindow, Singapore and Dr. A. H. Wheatley, Medical Superintendent, Pulau Jerejak Leper Settlement, are attached (Appendices *A* and *B*).

Helminthic Diseases

Ankylostomiasis.—The total number of Ankylostomiasis cases treated and of deaths therefrom in the hospitals of the Colony for the past five years is:—

Year	*Remained*	*Admitted*	*Total treated*	*Deaths*
1924 ...	87	1,800	1,887	120
1925 ...	195	4,304	4,499	123
1926 ...	138	3,996	4,134	142
1927 ...	138	3,874	4,012	102
1928 ...	144	3,037	3,181	84

The three years Hookworm and Rural Sanitation Campaign in co-operation with the International Health Division of the Rockefeller Foundation, commenced in 1926, was completed in 1928.

The campaign has had lasting effects. The treatment of many thousands affected by hookworm, though valuable, was not the most important result of the scheme.

The schools and villages in rural areas are nearly all sanitated. Many kampong dwellers have installed and are upkeeping latrines at their own expense.

The tube latrine has been found very satisfactory, where the terrain is suitable.

The standard of estate sanitation has been improved.

The bulk of the rural population of the Colony have been lectured on the causation and significance of filth diseases and the means to be adopted for their avoidance.

The Medical Department will continue and extend the work which has been developed during the campaign. This Government is under an obligation both to the Rockefeller headquarters' staff and also to Dr. MILFORD BARNES who headed the preliminary survey in 1925, and remained with us until the campaign was fairly started, to Dr. P. F. RUSSELL, who, after taking part in the preliminary survey, proved a most capable local director of the campaign for two and a half years, and to Dr. C. H. YEAGER who had the difficult task of completing and turning over the campaign work to the officers of the Health Branch.

A large part of the final campaign report will be found in Appendix *P*.

IMPROVEMENT OF PUBLIC HEALTH

Two graphs and three diagrams numbered *I*, *II*, *III*, *IV* and *V* are appended. The graphs demonstrate the improvement in public health during the last generation.

I is a graph depicting the mean monthly death-rate in Singapore from all causes in the decennial periods 1904-1913 and 1914-1923 and in the five years 1924 to 1928. Material is not available to make such a graph for the whole Colony.

II is a graph giving a monthly comparison between the last two census years 1911 and 1921 and the year 1928.

The improvement in the latter year is attributable more to anti-malarial measures than to any single other cause. The infantile mortality has dropped 50 per cent since 1911.

Diagrams *III* and *IV* and *V* explain themselves. It is not correct to state that every case of pneumonia is avoidable and many cases of convulsions though not shewn as preventable, are preventable.

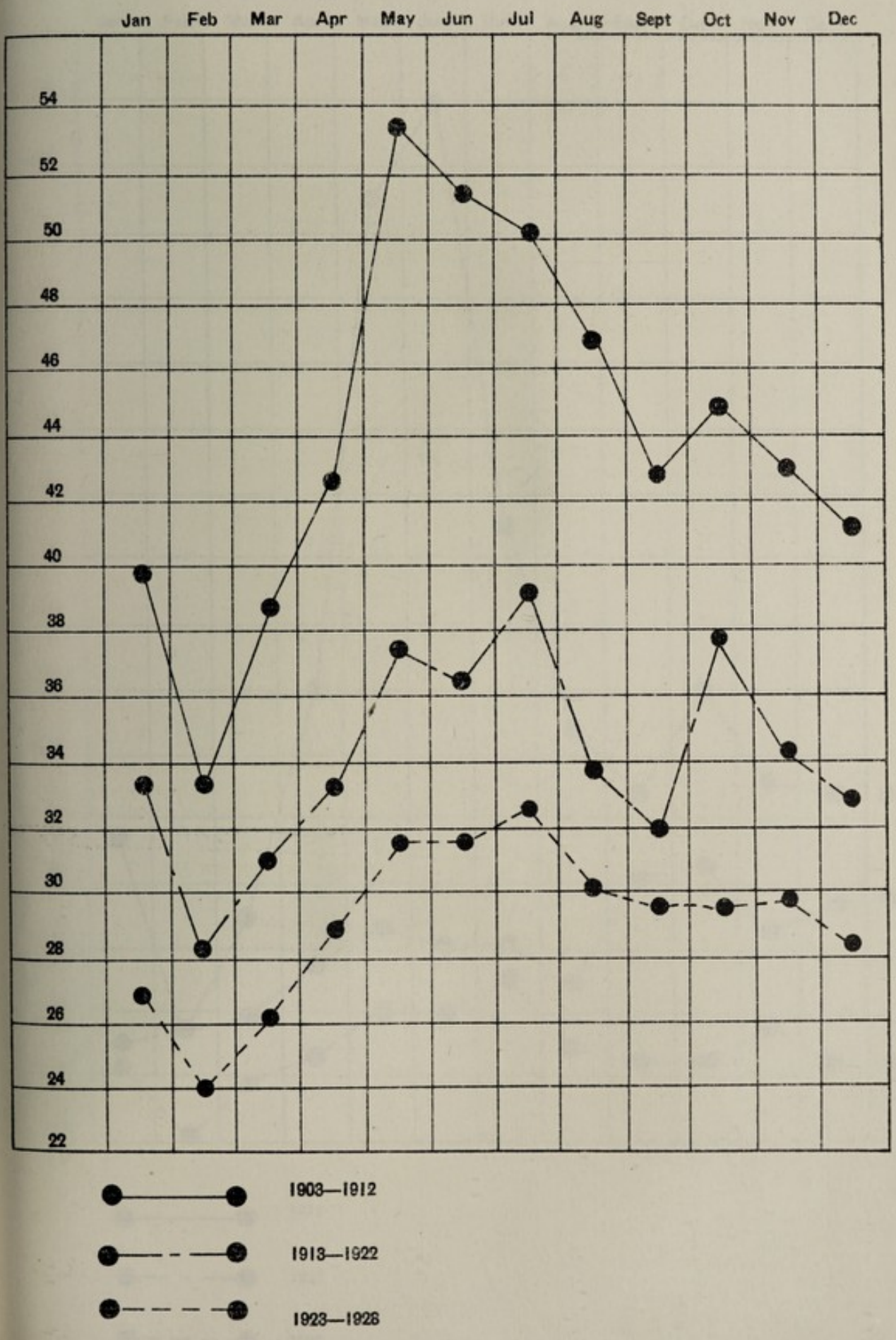
Nevertheless the diagrams do give an idea of the amount of disease and of death that is preventable.

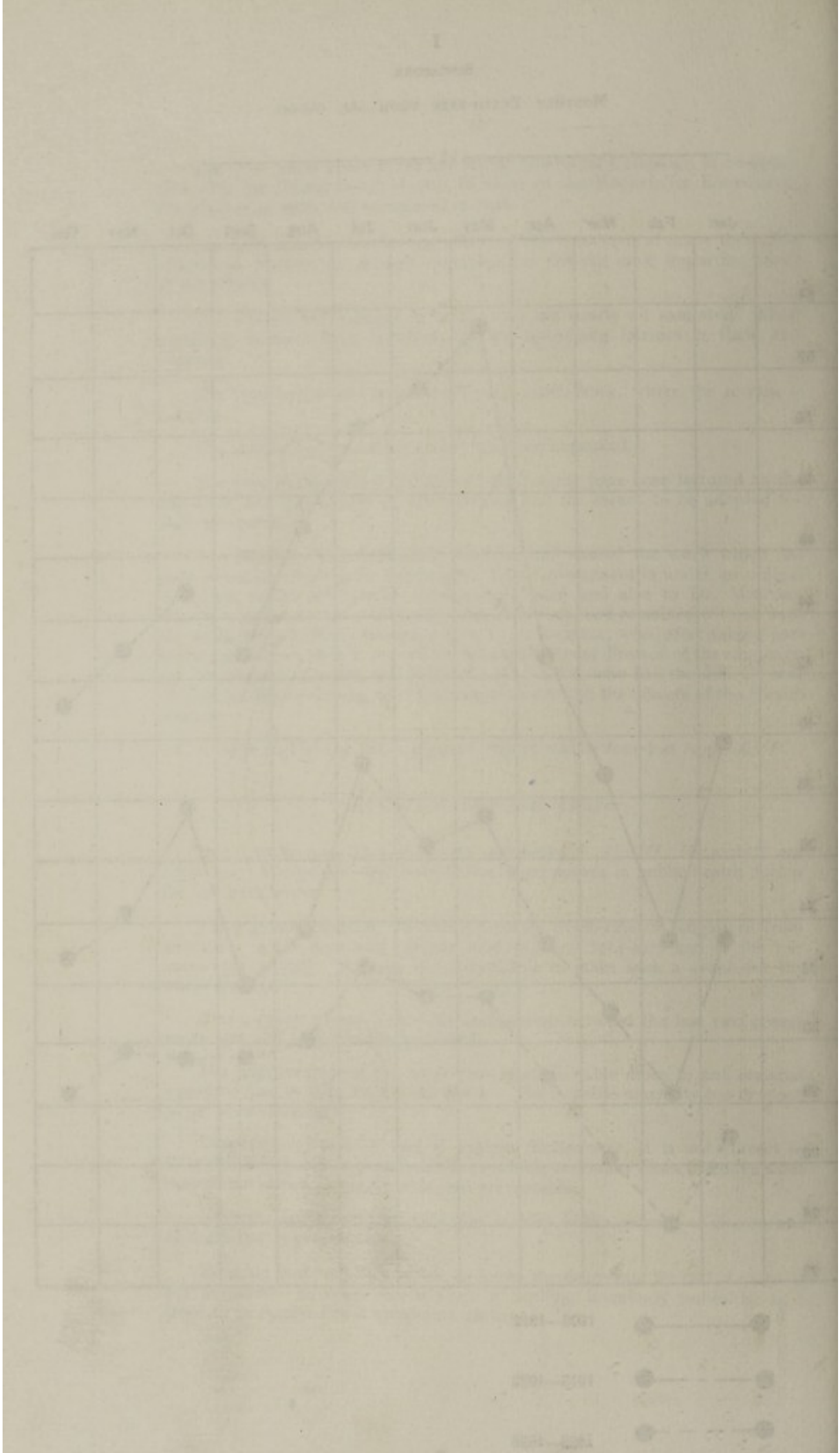
Roughly it should be possible to lower the death-rate by half, *i.e.*, to 14 per thousand. In other words there is nothing inherently unhealthy in a tropical as opposed to a temperate climate.

I

SINGAPORE

MONTHLY DEATH-RATE FROM ALL CAUSES

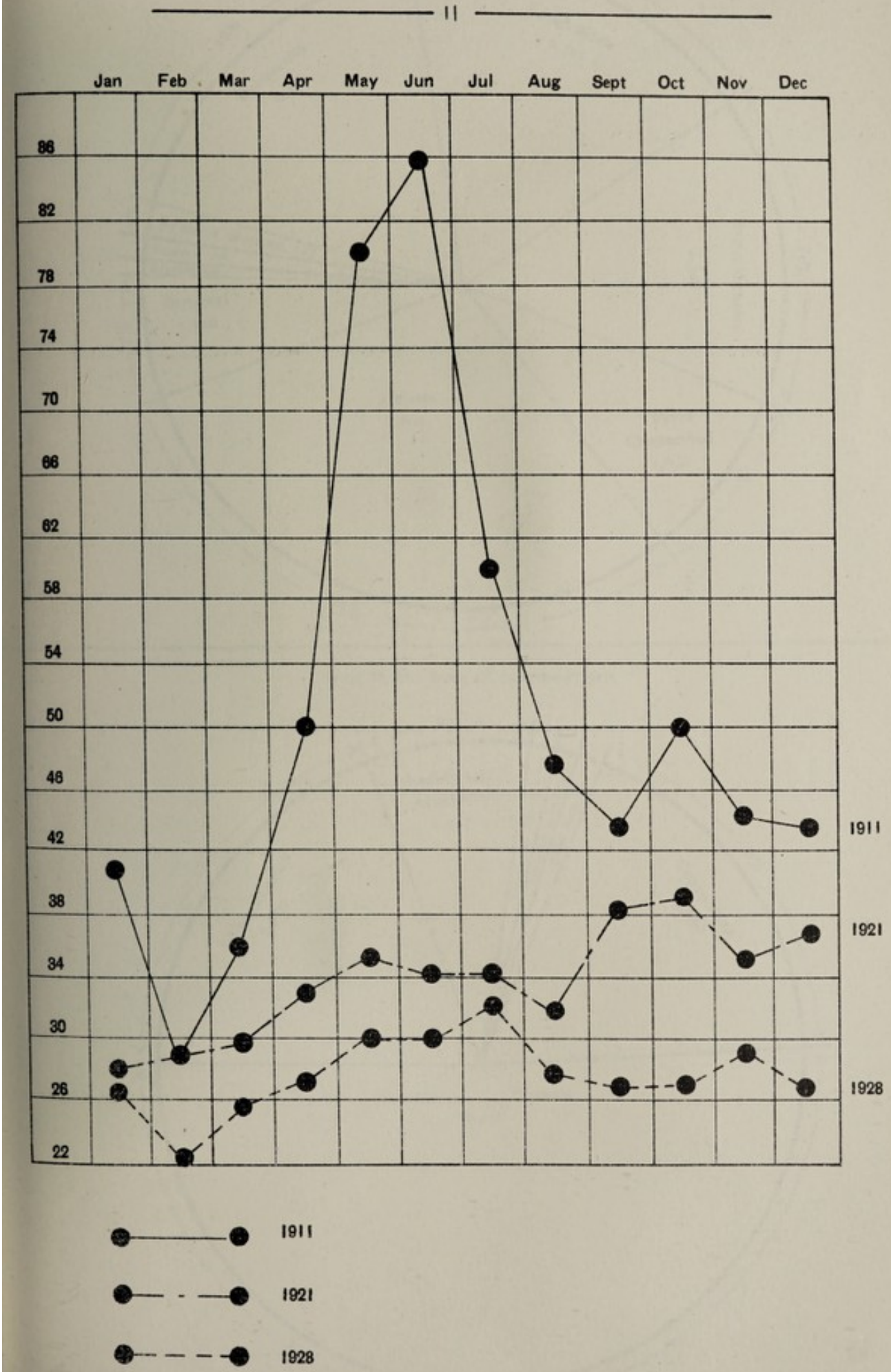


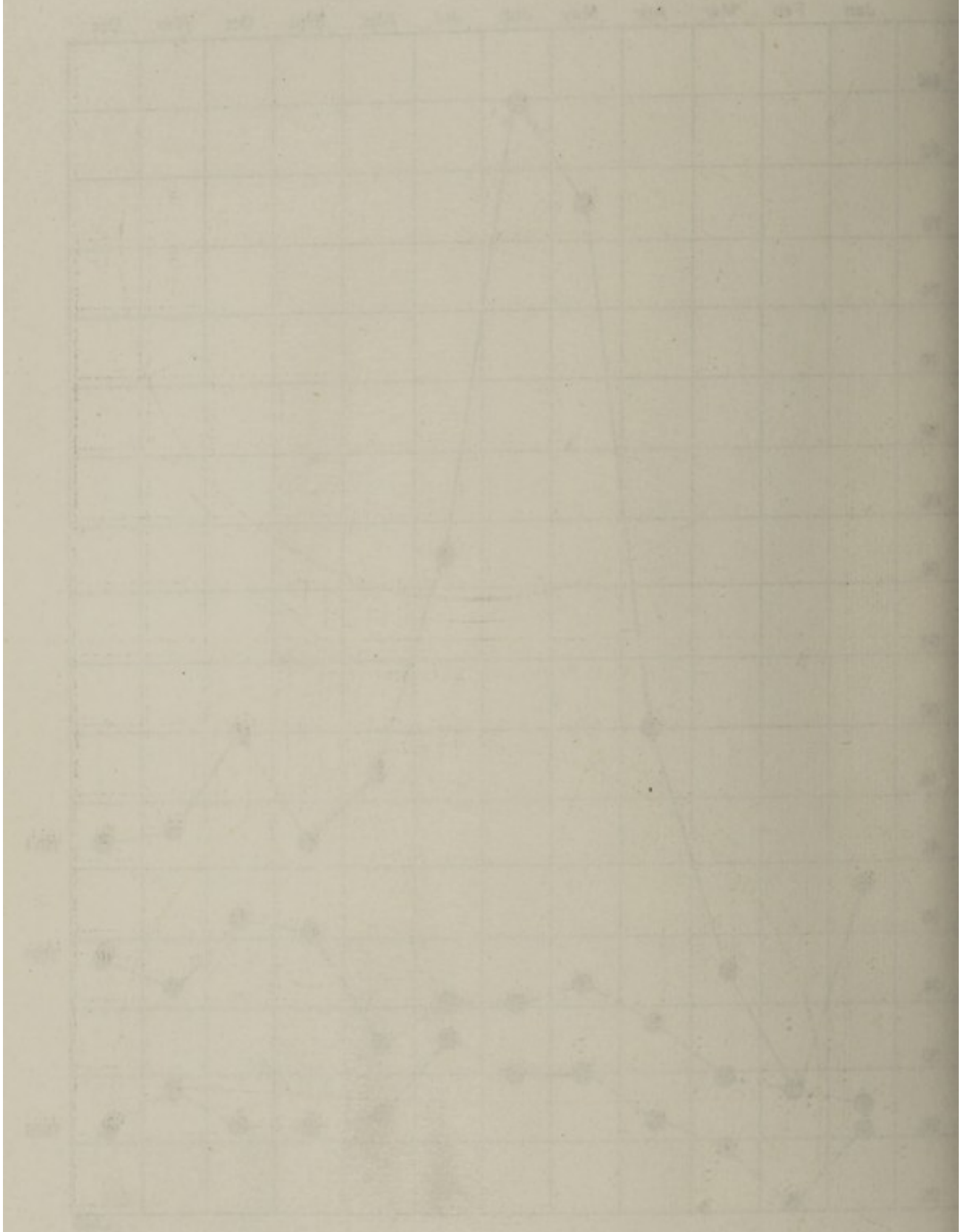


II

SINGAPORE

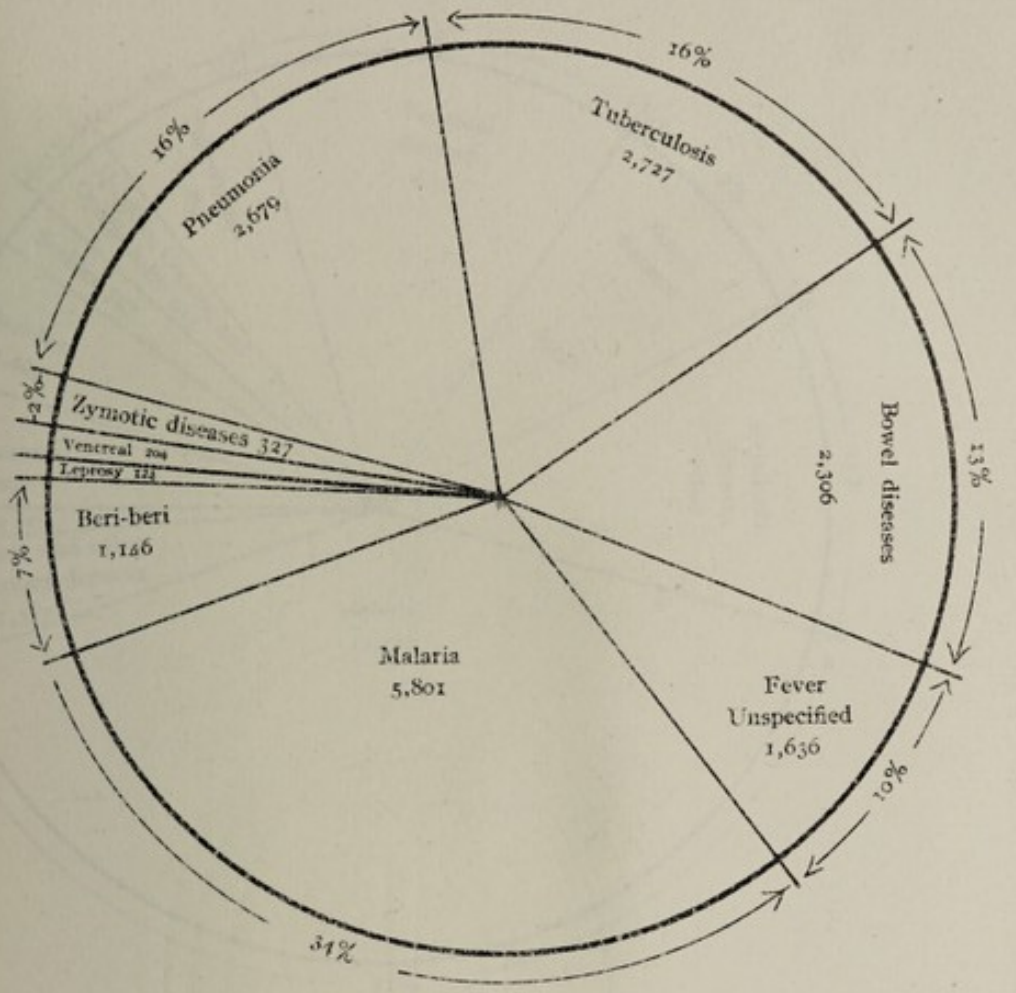
MEAN MONTHLY DEATH-RATE FROM ALL CAUSES



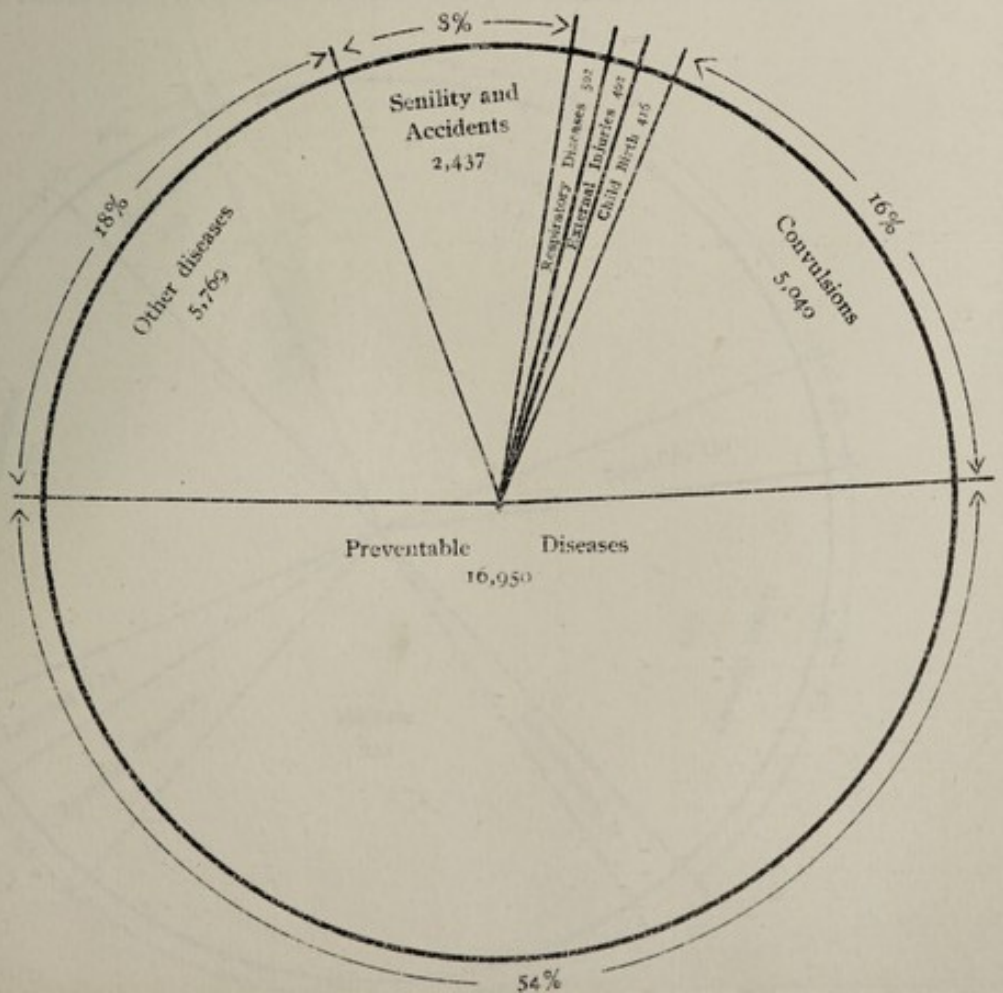


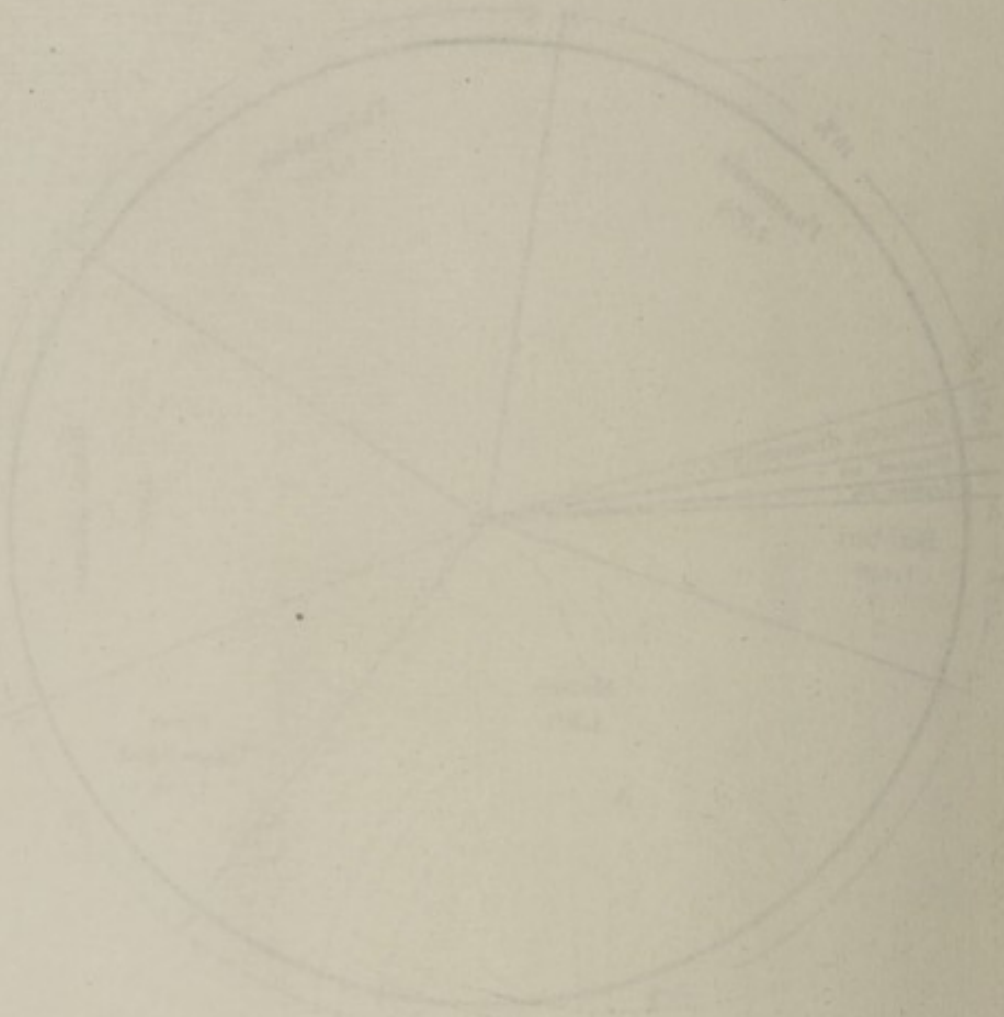
Deaths from Infective and Preventable Diseases registered in the S. S. in 1928.

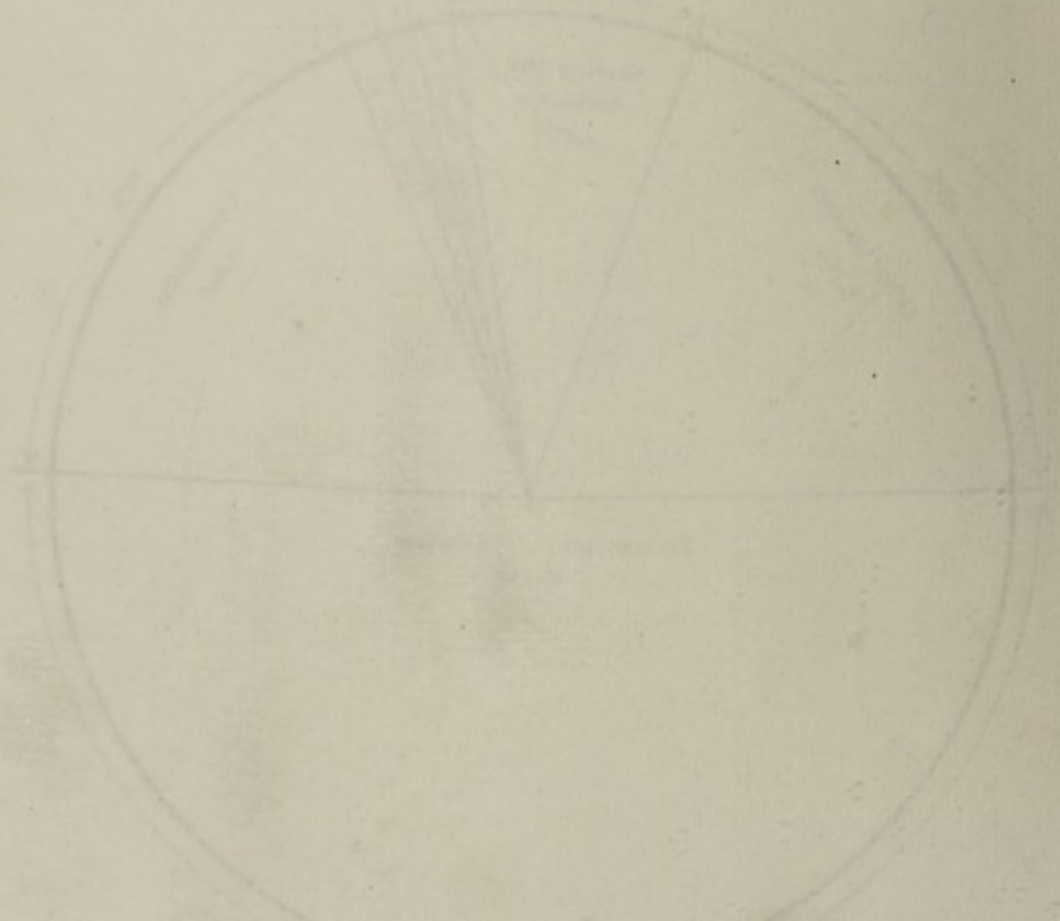
Total Deaths from Preventable Diseases—16,950.



Total Deaths from all causes—31,516.

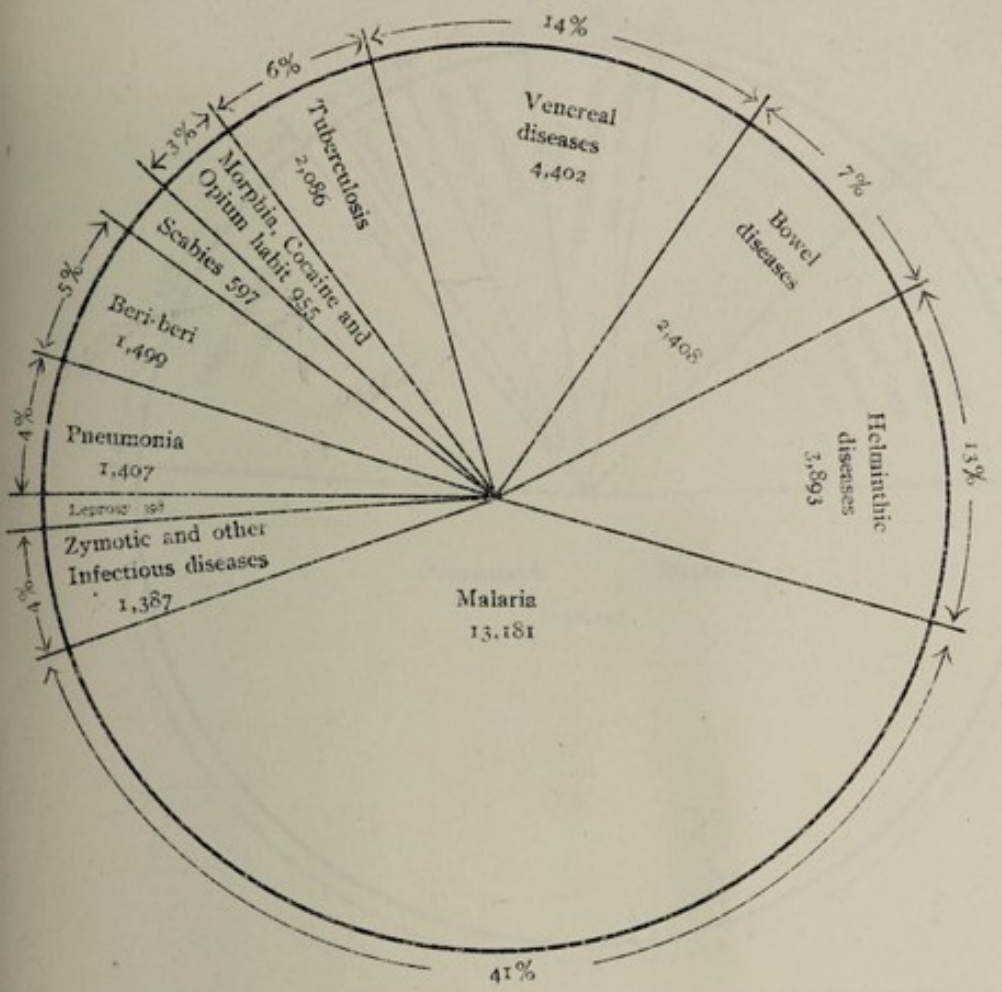




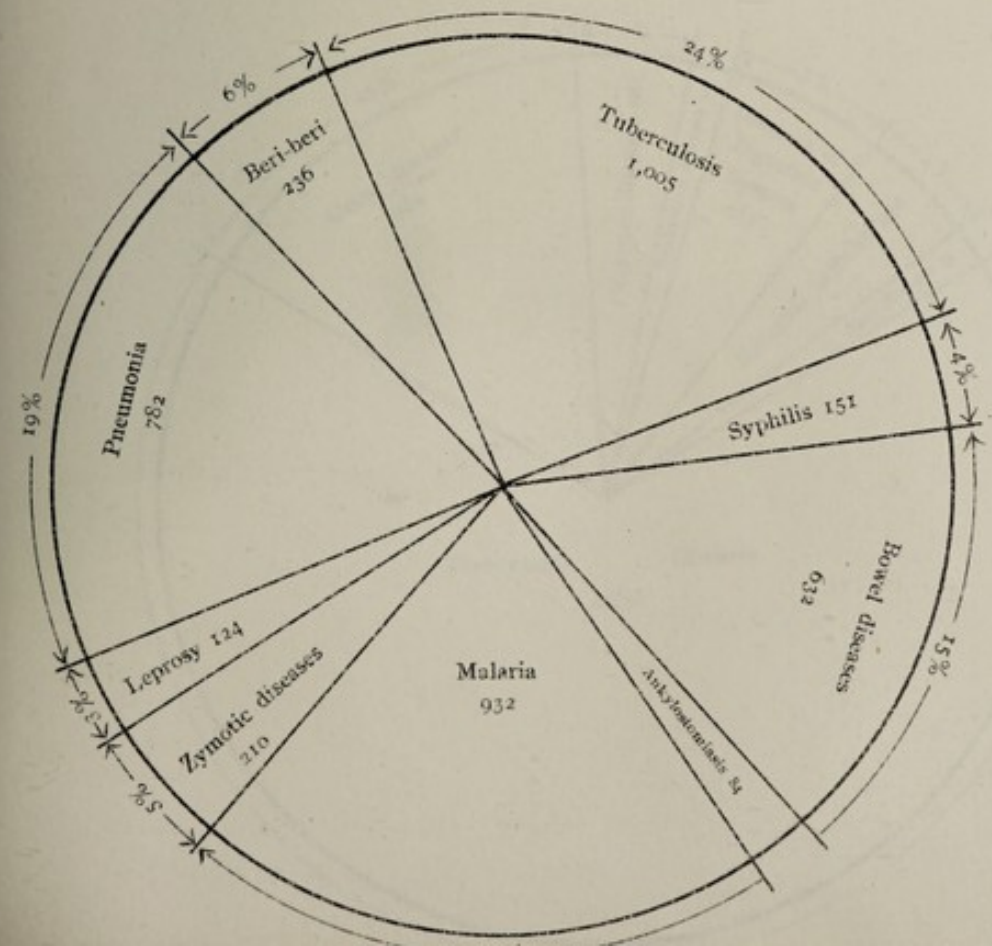


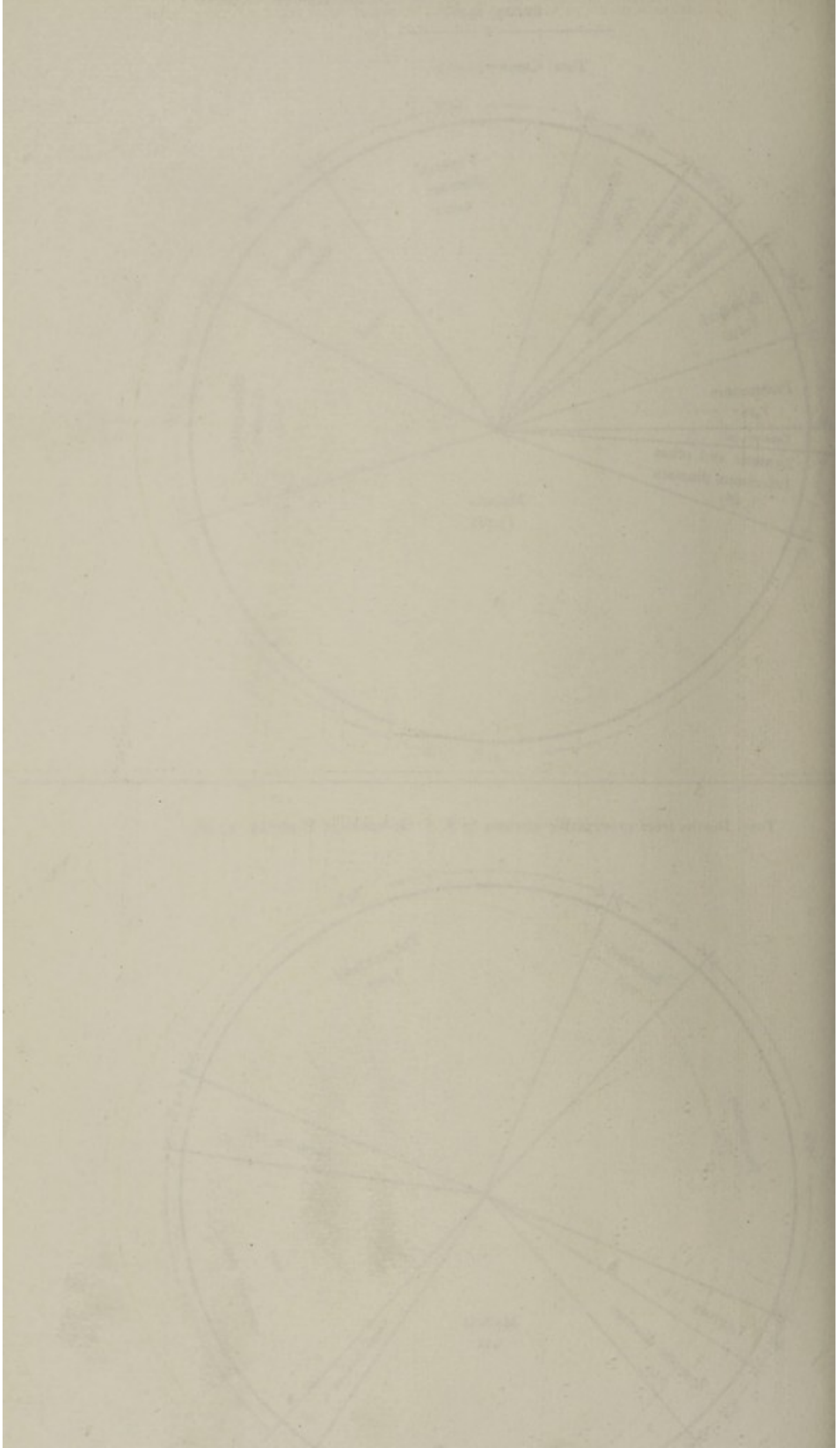
Infective and Preventable Diseases admitted to the S. S. Government Hospitals during 1928.

Total Cases—32,213.



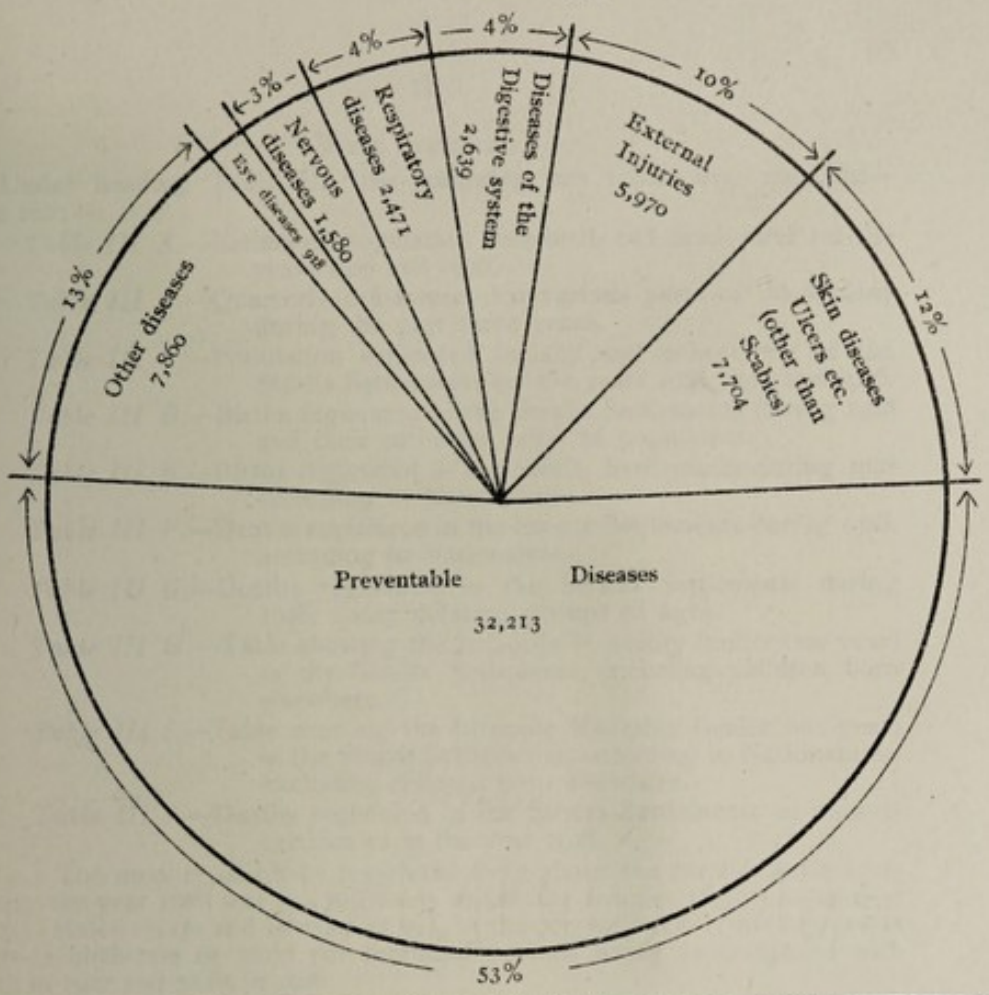
Total Deaths from preventable diseases in S. S. Government Hospitals 4,159.



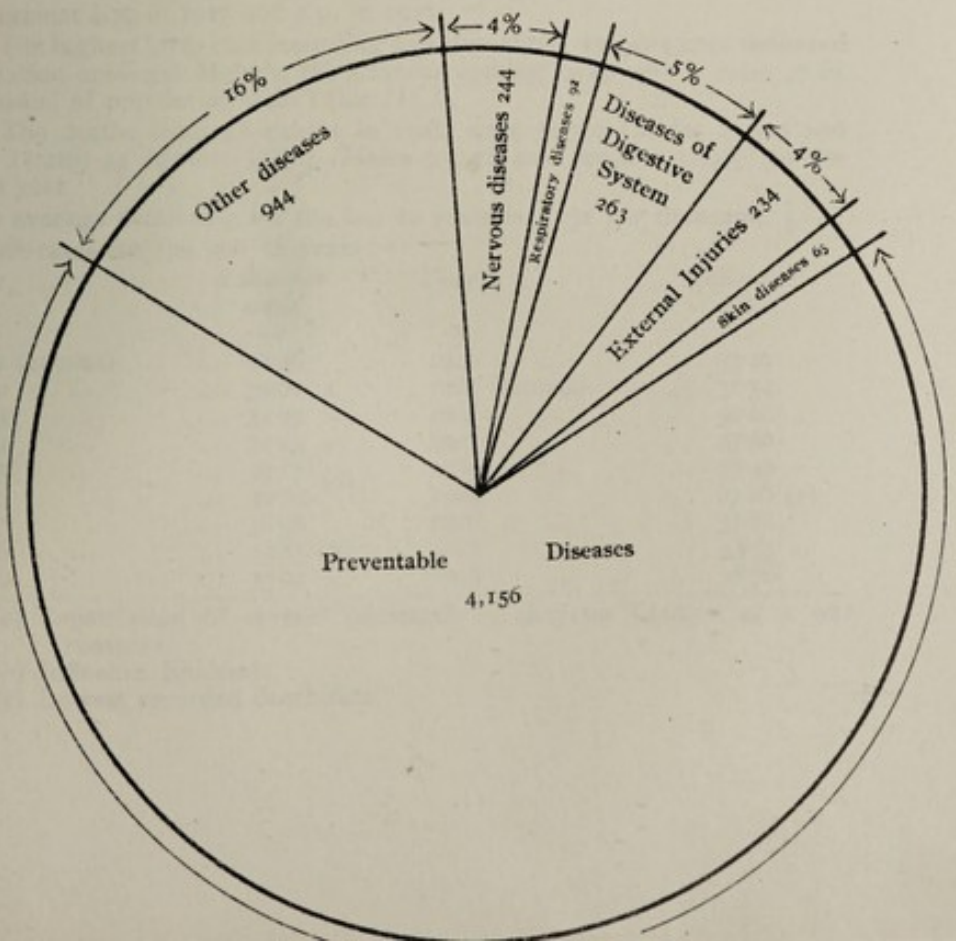


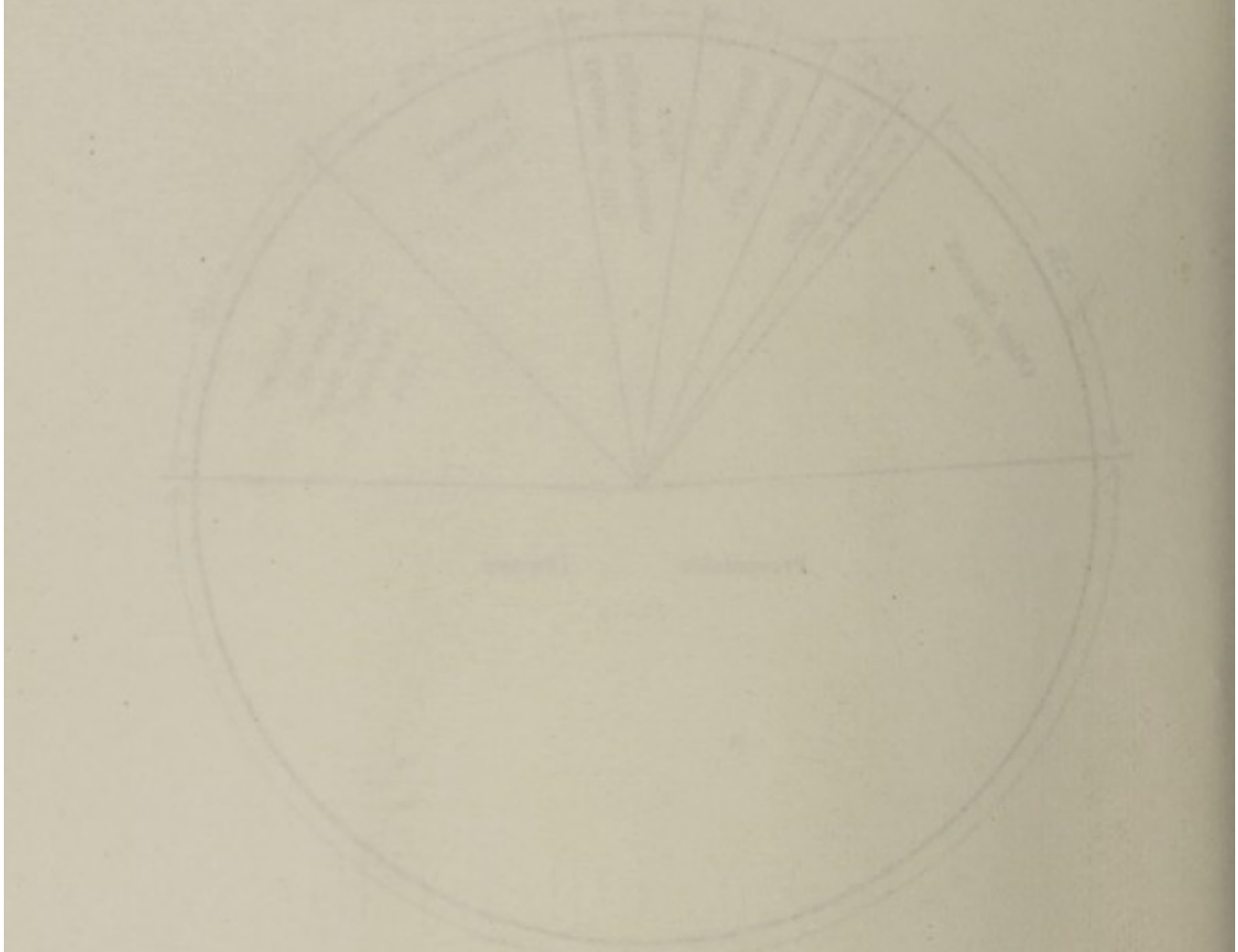
General Systemic and Preventable Diseases admitted to the S.S. Government Hospitals during 1928.

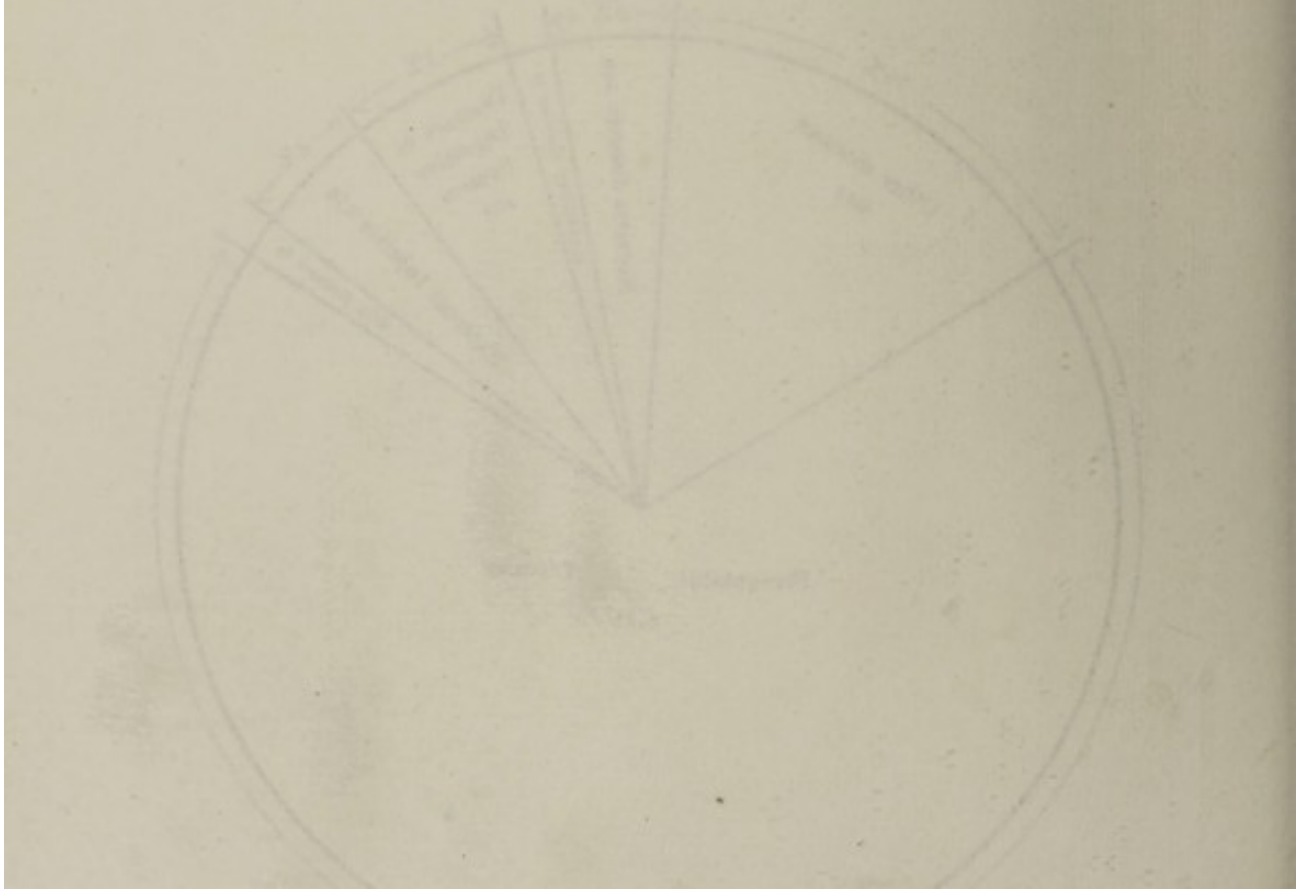
Total Cases—61,355.



Total Deaths from all causes in S. S. Government Hospitals, 5,998.







Vital Statistics

Under heading Table *III*, the following ten tables are appended—page 162:—

Table III A.—Estimated population with birth and death-rates for the years 1927 and 1928.

Table III B.—Quarterly death-rates for various parts of the Colony during the past three years.

Table III C.—Population estimated racially and collectively of the Straits Settlements for the years 1928, 1927 and 1926.

Table III D.—Births registered in the Straits Settlements during 1928 and their ratio per mille of population.

Table III E.—Births registered in the Straits Settlements during 1928 according to Nationalities.

Table III F.—Deaths registered in the Straits Settlements during 1928, according to Nationalities.

Table III G.—Deaths registered in the Straits Settlements during 1928, under different groups of ages.

Table III H.—Table showing the Infantile Mortality (under one year) in the Straits Setlements, including children born elsewhere.

Table III I.—Table showing the Infantile Mortality (under one year) in the Straits Settlements, according to Nationalities, excluding children born elsewhere.

Table III J.—Deaths registered in the Straits Settlements as regards certificates in the year 1928.

2. The number of births registered throughout the Straits Settlements during the year 1928 was 39,479 (males 20,528 and females 18,951) as against 37,233 (Males 19,239 and females 17,994) in the previous year: this represents a crude birth-rate of 36.03 per thousand persons living as compared with 35.13 in 1927 and 32.85 in 1926.

3. In every 100 births registered, there were 51.90 males and 48.10 females, giving a percentage of 92.32 females to every 100 males born.

4. One thousand seven hundred and ninety-eight still births were registered in 1928 as compared with one thousand seven hundred and eighty-five still births in the previous year—the percentage to those born alive was 4.55 as against 4.79 in 1927 and 4.50 in 1926.

5. The highest birth-rate according to nationalities was 41·43 per thousand of population amongst Malays, the Chinese coming next with a ratio 37.65 per thousand of population *vide* Table *III E.*

6. The deaths from all causes in 1928, were 31,516 (Males 20,300 and females 11,216) as against 35,561 (Males 23,072 and females 12,489) in the previous year.

The average death-rate for the last 10 years is 30.51 per thousand.

Death-rates for the last 18 years:—

Year	*Ratio per mille*	*Year*	*Ratio per mille*
1911 (census) ...	46·46	1920	33·20
1912	39·01	1921 (census) ...	31·54
1913	34·93	1922	30·68
1914	34·13	1923	27·80
1915	29·15 (*a*)	1924	27·42
1916	30·70 (*a*)	1925	27·26 (*c*)
1917	36·98	1926	31·81
1918	43·85 (*b*)	1927	33·55
1919	33·04	1928	28·76

(*a*) Repatriation of several thousands of decrepit Chinese as a war measure.

(*b*) Influenza Epidemic.

(*c*) Lowest recorded death-rate.

7. The highest racial death-rate was classed under Chinese with a ratio of 29·83 per thousand of population, the Indians coming next with a ratio of 29·36 per thousand of population.

8. It is always difficult to assess the true infantile mortality. In illustration of this, 15,540 children were born in the Singapore Municipal area and the crude infantile mortality figure was 202·1 per thousand.

But 6,722 infants under 1 year of age came to Singapore from China of whom 3,551 are recorded as remaining in Singapore. Adding these to the births in Singapore during the year the rate falls to 164·5 per thousand aganst a corrected rate of 180·9 per thousand in 1927.

According to Table *III H* and *III I* the uncorrected infantile death-rate for the whole Colony is 193·69 and the corrected 185·69 per thousand for 1928.

9. Table shewing the sick, invaliding and deaths of European officials of all ranks:—

	1926	*1927*	*1928*
(1) Total number of officials on the Establishment	672	689	698
(2) Average number resident in Colony	547	617	607·4
(3) Total number on sick list ...	257	246	427
(4) Total number of days on sick list	3,728	3,125	4,952
(5) Total number invalided ...	7	9	6
(6) Total deaths	5	3	4
(7) Total deaths in Colony ...	5	3	4
(8) Average daily number on sick list	·58	·57	·69
(9) Average number of days on sick list	10·21	12·7	11·62
(10) Percentage of deaths to number resident	·91	·48	·65
(11) Percentage of sick to the average number resident during the year	47·35	39·87	70·29

10. Table showing the sick, invaliding and deaths of non-European Officials:—

	1926	*1927*	*1928*
(1) Total number on the Establishment *	5,815	5,994	9,445
(2) Average number resident ...	5,577	5,252	8,961·4
(3) Total number on sick list ...	2,928	2,948	6,244
(4) Total number of days on sick list	23,966	38,708	49,728
(5) Total number invalided ...	45	54	132
(6) Total deaths	42	24	36
(7) Average daily number on sick list	·24	·57	1·25
(8) Average number of days on sick list	8·18	6·5	7·96
(9) Percentage of deaths to number resident	·73	·45	·40
(10) Percentage of sick to number resident	52·50	56·11	69·67

* The increase in 1928 is due to the fact that the Police non-commissioned officers and constables are included in the 1928 figure for the first time.

LEAGUE OF NATIONS EASTERN HEALTH BUREAU.

A.

In my annual report for 1926 (pp. 16-20) some account was given of the activities of this Bureau in 1925 and 1926, and of the appointment and first meeting of an International Advisory Council for the Bureau, functioning as part of the Far Eastern Commission of the Health Committee of the League of Nations. The Advisory Council held its second annual session at Singapore in January, 1927, under the Chairmanship of Colonel J. D. GRAHAM. I.M.S.

The Administrations represented were China, Japan, Chosen, Formosa, Siam, Dutch East Indies, French Indo China, Macao, British India, Hongkong, Ceylon, Federated Malay States and the Straits Settlements. There was also an American observer from the Philippine Islands.

The Resolutions passed at that meeting were:—

1. The Advisory Council approves the Director's report for 1926, subject to the modifications recorded in the Minutes.

2. The Advisory Council whilst endorsing the principal of dissemination of epidemiological information gratis to all ports likely to make use of it and approving the present form and contents of the Weekly Fasciculus, wishes to record its appreciation of the development and progress of the epidemiological actvities of the Bureau under the direction of Dr. BROOKE, whose energy and personal devotion to this side of the Bureau's work has enabled it to obtain the successful results recorded; also to congratulate him on the issue of the second edition of the AA Code.

3. The advisory Council notes with satisfaction the steady improvement in the system of wireless dissemination of intelligence which is largely due to the enquiries instituted at the last meeting and has resulted in considerable economies whilst at the same time extending tht Bureau's sphere of operations and usefulness.

It views with especial satisfaction the development of telegraphic intelligence regarding infected ships and would urge on all administrations the necessity for a full measure of their assistance to and co-operation with the Bureau in this important matter.

4. The Advisory Council in view of the progress made in wireless transmission and the economies already recorded which have been made possible largely through the generosity of the Governments of French Indo-China, Netherlands East Indies, British India, British North Borneo and Shanghai (Koukaza); in view of the fact that the information furnished by most countries is already given by many of them to the press, and that instances have occurred where the decoded radio messages have been passed direct to the press; in view of the desire of ships at sea to pick up and interpret the coded bulletin, is of opinion.

(*a*) that a resume in clear of the weekly bulletin might with advantage be issued by the Bureau.

(*b*) that the broadcasting of this resume within a limited area of the Eastern Arena should be arranged for forthwith.

(*c*) that the offer of the Netherlands East Indies that Bandoeng should issue this from 8th January should be accepted with thanks.

(*d*) that the offer of British India to re-broadcast this from Bombay and Madras if and when it is picked up from Bandoeng should be accepted with thanks.

(*e*) that the larger question of the broadcasting of such a resumé by one of the large European stations (*e.g.* Rugby, St. Assize, etc.) with a view to its worldwide publicity should be investigated practically with the assistance of the Geneva Bureau.

5. The Advisory Council having considered the report of the Finance Sub-Committee and approved of it recommends that the budget of the Bureau for 1927 be fixed at a total sum of $79,682.40, that the Budget proposition statement for 1928 be fixed meantime at $81,581.00 and that the Health Committee of the League be asked to approve of these and take cognisance of the fact that no allowance has been made for possible increase of expenditure should the Bureau function in Conventional matters on behalf of the "Office Internationale".

6. The Advisory Council having heard and considered the decision of the League of Nations Council at Geneva in regard to the future financing of the Bureau (vide Singapore Resolution VIII of 1926) and the statements of the various delegates in regard to present and future subventions in aid of the Bureau, feels compelled to record again its opinion that the future financial liabilities of the Bureau should be borne permanently by the Health budget of the League without prejudice to such subventions as may be made by any countries desirous of doing so. They have been led to reiterate this opinion because of the indications that exist that future contributions from certain States which were anxious to help the Bureau at its commencement are likely soon to be reduced or withdrawn. In doing this, however, they are agreed that such subventions should, wherever possible, be welcomed and encouraged, more especially from States which are non-contributors to the League, that they be paid to Geneva, and that such expenses as may be necessary in future to meet the cost of the Bureau on the expiry of the Rockefeller subventions should be provided for from the League Health Budget within its stabilised amount.

7. The Advisory Council, having reviewed the question of co-ordination of international research (vide Resolution VII of 1926) in the light of the work done during 1926 or now in contemplation, has recorded the results of its discussion fully in the Minutes and in Appendix IV.

It is of opinion:—

That the difficulties of doing this in Asia are greater than were perhaps realised when the resolution was framed.

That progress in the one research where co-ordination has been attempted has been unequal.

That this is a side of the Bureau's activities which must develop slowly in Asia and cannot be forced.

That the Bureau will do much useful work in the line of co-ordination by playing the role of an exchange bureau for all papers published on subjects in which co-ordination is being attempted, and that the arrangements for this should be undertaken by the Director.

That in view of the difficulty now being experienced in obtaining a suitable permanent Director, the present organisation and staff of the Bureau are not in a position to fulfil all the requirements envisaged by the original Resolution of 1926 and that meantime, at all events, it is inadvisable to attempt this.

The Council is further of opinion that much in the nature of co-ordination of work may be expected from expert Committees if they can be suitably constituted and are able to meet from time to time; but, in view of the difficulties already described, the Council proposes to recommend that meantime only one such additional Expert Committee be set up in order to deal with plague research. The constitution of this Committee will be found in Appendix IV.

8. The Advisory Council, having considered Item 4 of the Agenda dealing with the suggestions transmitted by the Permanent Committee of the "Office International d'Hygiene Publique," having heard a resume of the

position from the Chairman, and having considered and discussed the report of the Sub-Committee convened on 8th January, resolves as follows:—

(*a*) that the report of the Sub-committee be adopted (Appendix V)

(*b*) that a copy of it together with a copy of this Resolution be forwarded to the Health Committee of the League of Nations, Geneva, as a formal reply to the suggestions of the "Office" already referred to.

The following is a summary of tht report of the Sub-committee mentioned in the last resolution:—

SUMMARY.—The points raised in the "Office" note have been dealt with seriatim by the Sub-committee without prejudice to the attitude which the respective Governments will have to take on these points later and without attempting to limit the area of the Bureau's present epidemiological activities.

The Sub-committee agreed:—

that the Bureau is suitable for undertaking such Conventional duties as those indicated.

that, in view of the area desirous of being served in this respect by the Bureau on behalf of the "Office," a very definite case has been made out for some arrangement being entered into for the purpose indicated,

that in the preparation of any such arrangement or agreement details will be furnished by the Bureau and its Advisory Council in so far as this is practicable,

that the confidential nature of certain information asked for under the Convention does not seem to apply to the Far East in the same way as it apparently would appear to do in other countries,

that the organising of the superior technical side of the Bureau is of the utmost importance in this connection, as accurate and delicate secretarial work will be essential,

that, while expressing its opinion in the manner stated, it does not propose to start any machinery for this work or to enter into any correspondence concerning it till such time as further instructions have been received from the Health Committee of the League of Nations and more detailed proposals regarding the negotiations contemplated have taken place in Europe.

B.

The Third Session of the Advisory Council was held at New Delhi in the last week of December, 1927. Professor M. MADSEN, President of the Health Committee of the League of Nations attended the meeting.

The Administrations represented were China, Japan, Chosen, Formosa, Siam, Dutch East Indies, French Indo China, Madagascar, Macao, Australia, British India, Ceylon, Federated Malay States and Straits Settlements.

An American observer from the Philippine Islands was present.

Colonel J. D. GRAHAM, I.M.S. again presided.

Dr. R. GAUTIER, Director of the Bureau, was in attendance.

The Resolutions passed at this session were:—

1927 RESOLUTIONS

1. The Advisory Council approves the report of the Director of the Eastern Bureau for 1927, subject to the modifications recorded in the Minutes. In accordance with the suggestions contained in the report, it recommends that the Director takes steps to obtain from the Health Administrations more accurate information on the places of capture of plague infected rats, this information being of great interest both from the epidemiological and quarantine points of view.

2. The Advisory Council notes with satisfaction the steady advance towards the perfecting of the Bureau's organisation for disseminating epidemiological intelligence as rapidly as possible, with a steady decrease in expenditure under that heading.

3. The Advisory Council, after reviewing the work accomplished in 1927, in connection with the development of intelligence regarding infected shipping, records a general note of appreciation of this service, and its great value to many administrations, and would again urge on all administrations which are not now reporting telegraphically, the need for their assistance and co-operation in this—one of the most important duties of the Bureau.

4. The Advisory Council, having considered the report of the Finance Sub-Committee (See Appendix 2) and approved of it, recommends that the budget proposition statement for 1929 be fixed meantime at Str. $90,510 and that the Health Committee be asked to approve of this and take cognisance of the fact that a moderate allowance ($300 per month) has been made for the increase of expenditure necessary when the Bureau commences to function in Conventional matters on behalf of the Office International.

The Council in approving the Sub-Committee's report would point out that the accounts deal with the period ending 30th November, and they therefore empower the four members of the Finance Sub-committee who are participating in the Interchange to scrutinise in India the completed accounts for the financial year ending 31st December, 1927, when ready, and to record their opinion in regard to this direct to Singapore for communication to Geneva in due course.

5. The Advisory Council notes with satisfaction the progress made in wireless transmission and the economies which have been effected largely through the generosity of the Governments of French Indo-China, Netherlands East Indies, British India, British North Borneo, Shanghai, Reunion, Madagascar and Japan, and would suggest that the various countries in the Eastern area now receiving epidemiological information be asked to assess the value of this information, and more especially of that contained in the resume in clear to the various Shipping Companies now picking it up.

6. The Advisory Council, having reviewed the efforts made by the Eastern Bureau to co-ordinate international research work on oral vaccination and having heard and adopted the report of the Sub-Committee (see Appendix 4A), is of opinion that this work should be continued during 1928 and that further efforts should be made to reach a decision as to the relative value of this method of protection and that by inoculation.

The Advisory Council, having considered the stages leading up to the joint meeting of the Far Eastern Association of Tropical Medicine (Plague Section) and the League of Nations Expert Plague Committee in Calcutta on December, 5-9, having reviewed the discussion of this meeting and its recommendations and having heard the report of the Sub-Committe, resolves:

(1) that the report of the Sub-Committee be adopted (see Appendix 4B);

(2) that the priority programme of plague research be circulated by the Bureau to all Health Administrations interested with the suggestion that they be invited to frame their Plague Research programmes in conformity with the recommendations and to notify the lines of such research programmes to the Eastern Bureau;

(3) that the finding of the Sub-Committee and the programme of research be communicated to the Health Committee for such action as it considers desirable.

7. The Advisory Council is of opinion that a suitable line of work for the Eastern Bureau to undertake is the assembly of detailed information regarding the quarantine stations of the East and their value in the light of modern ideas of isolation and disinfection and of the principles embodied in the 1926 Sanitary Convention.

8. The Advisory Council, having considered Item 6 of the Agenda dealing with the Constitution and Bye-laws of the Advisory Council and the Report of the Sub-Committee appointed in this connection, resolves as follows:—

(1) that the report of the Sub-Committee be adopted (See Appendixes 5 and 9).

(2) that a copy of it, together with a copy of this resolution, be forwarded to the Health Committee in reply to its proposals regarding the constitution of the Advisory Council.

(*a*) The decision regarding the future constitution of the Advisory Council, on which British Administrations had hitherto a preponderant representation, is notable. The Council during its second session had sought the advice of the League of Nations on this point. The Health Committee of the League of Nations thereupon recorded an opinion, which was approved by the Council of the League in March, 1927, that the Singapore Advisory Council should consist of one representative each of Australia, China, India, Japan, Siam and British Colonies and Protectorates.

At Delhi, the Advisory Council agreed to this proposal with the addition of a second Japanese member to represent the Japanese Colonies.

It was noted that there could be no objection to interested administrations, who are not represented in the Council, sending observers at their own expense.

Draft rules of procedure drawn up at Geneva were also adopted, subject to certain amendments (Resolution 8).

(*b*) Another important decision is embodied in Resolution 6.

With a view to evolving an ordered plan of Plague Research, a combined meeting of the League of Nations Plague Commission and of the Far Eastern Association of Tropical Medicine's Plague Section was held during the VII (Calcutta) Congress of the Association, in the first week of December, 1927.

The first meeting of the Plague Section which was held on 5th December was presided over by Col. Graham. At this meeting the Chairman explained the combined nature of the Plague meeting and suggested that the F. E. A. T. M. part of the meeting should consist in the hearing of all the "Plague" papers and the subsequent discussion, whilst the League of Nations part of the meeting would consist in a subsequent meeting of the League of Nations Plague Commission with as many co-opted experts as possible. This was given effect to.

The Session was opened by Lt.-Col. Mackie, Provisional Chairman of the League of Nations Plague Commission, who gave an address on the "Present Position of the Plague Problem."

His paper was followed by one on "Problems of Pneumonic Plague" by Dr. Wu Lien Teh; by one on "Experiments in the Transmission of Plague by X. cheopis and X. astia" by Dr. Goyle, by one on "An unrecognised type of Plague" by Dr. Choksy; by one on "Perpetuation of Plague in wild Rodents" by Dr. Wu Lien Teh; and by one on "Plague amongst South Russian Rodents" by Dr. Nikanoroff.

A full discussion was taken part in by a large number of experts who were co-opted for the meeting of the League of Nations Commission on 8th December, at which Dr. Madsen, presided. The following were present:—Colonel Graham, I.M.S., Lt.-Col. Mackie, I.M.S., Dr. Hirst, (Colombo), Dr. Wu Lien Teh, (Kharbin), Dr. Jourdran, (Hanoi), Colonel Forster, I.M.S., Dr. Hata, (Tokio) and the following were then co-opted:—Dr. Shiga, (Keijo), Dr. Nikanoroff, (Saratow), Dr. Hicks, (Shanghai), Lt.-Cols. Taylor, I.M.S., Gloster, I.M.S., Dunn, I.M.S., Dr. d'Herelle (Alexandria), Dr. Naidu (Bombay) and Dr. Goyle (Lucknow).

The Expert Plague Committee first considered the advisability of sending to Health Administrations a questionaire prepared by Dr. Wu Lien Teh on pneumonic plague. The majority were against the sending of this questionaire through official League channels. The Committee drew up a list of subjects requiring, in their opinion, investigation.

The Committee was of opinion that the role of the Eastern Bureau in this matter was to send this list of proposed investigations to the Health Administrations of the Eastern countries. The Health Administrations which have any plague investigations under consideration should be asked to undertake them if possible along the lines suggested in the list and to notify to the Bureau any work which they may resolve to undertake.

In the matter of plague as in the matter of vaccination the role of the Bureau was, in the Sub-Committee's opinion, more in the nature of stimulating and arousing interest on certain specific points and of guiding investigation on the lines laid down by experts than of actually inducing unwilling Administrations to undertake investigations. The Sub-Committee appreciated the fact that research on plague would be carried out in India along certain of the lines suggested by the Expert Plague Committee and believed that similar selections could be made by Health Administrations and individual workers in other countries, as results obtained from these investigations along the predetermined lines would be comparable and probably of benefit to all.

The following investigations were considered of particular interest and were approved by the Plague Expert Committee in the following order of importance: —

BUBONIC PLAGUE.

1. Further investigations into the methods of destruction of rats and fleas.
2. Investigation on the comparative epidemiological role of the various species of fleas in plague transmission in selected areas of India, as being the most heavily infected country, the species of fleas concerned and their viability under natural conditions.
3. Survey of Plague in wild rodents of Northern Asia (Transbaikalia, Manchuria and other Chinese provinces) by an international mission, provided such mission receives substantial support from the countries concerned.
4. Investigation on the part played by grain and cotton in the dissemination of Plague and measures to prevent this spread (disinfestation).
5. Investigation of the conditions under which Plague is carried over from one season of incidence to another (problem of its recrudescence).
6. Investigations on the relative importance of rodents other than rats in the transmission of plague in various countries.
7. Investigation of rat and flea conditions in ports, shore, lighters, ships), the ship fauna being investigated both in ports and during the voyages, in eastern and western areas. This information should be collected by the Singapore Bureau for providing information applicable to quarantine measures.
8. Prophylaxis and therapeutics: —
   - (*a*) speedy preparation of anti-plague vaccine,
   - (*b*) possibility of reducing local reaction to antiplague vaccine,
   - (*c*) possibility of producing a plague antitoxic serum,
   - (*d*) further studies on anti-plague bacteriophage and its practical applications,
   - (*e*) chemiotherapy of plague.

PNEUMONIC PLAGUE.

1. Investigation of the incidence of bubonic plague cases in outbreaks of pneumonic plague; relative incidence of cases of bubonic plague, secondary pulmonary plague and primary pneumonic plague in the various outbreaks.
2. Study of the possibility of existence of a special ultra-virus or filter-passing form of B. Pestis as the causative agent of pneumonic plague.

(*c*) A prolonged discussion took place regarding the duties of the Singapore Bureau under the new International Sanitary Convention.

The British representatives emphasized the point that certain formal notifications required under articles 9, 14, 28, 50 and 57 of the new International Sanitary Convention, should be supplied to the Office Internationale Paris through the Colonial Office and not direct through the Singapore Bureau.

C.

The Fourth Session of the Advisory Council of the Singapore Bureau was held at Singapore between the 14th and 16th February, 1928.

Those present were:—

Col. J. D. GRAHAM, I.M.S., British India, in the Chair.

Dr. J. VON LONKHUIJZEN	... Dutch East Indies.
Dr. Y. L. MEI ...	... China.
Dr. K. NOBECHI ...	... Japan.
Dr. T. AMAGISHI ...	... Japanese Colonies.
Dr. J. R. REDFIELD	... Siam.
Dr. F. H. GUERIN ...	... French Indo China.
Dr. A. L. HOOPS ...	... British Colonies and Dependencies.

Australia did not send a representative.

Dr. R. GAUTIER, Director of the Bureau, was in attendance.

(*a*) The Chairman referred to the fact that this was the first meeting of the reconstituted Council of nine members' and that the new rules of procedure were in force.

(*b*) The report of the Director of the Bureau for 1928 formed a record of continued progress with two exceptions.

(1) The need for more reliable and regular information from China which it is anticipated will be met gradually, as the present Nationalist Government attains stability. It has already established a Bureau of public health at Nanking.

(2) The Quarantine administration of the Persian Gulf ports, formerly in the efficient hands of officers from India, has been taken over by the Persian Government which has, so far, failed to maintain the wireless communications previously in force.

The new aerial route to India and the Far East via Bushire accentuates the need for early and accurate reports from Persia.

With the exceptions quoted, and Vladivostock, practically all Far Eastern Ports are now in regular communication with the Singapore Bureau.

Several shipping companies have expressed their appreciation of the value of the Bureau wireless summary in clear, which is broadcast to ships in Eastern waters.

The Bureau furnished information *re* 1170 infected ports in 1928 against 859 in 1927: the average annual cost of per infected port fell from $18/73 in 1927 to $10/93 in 1928.

164 ships reported the presence of infectious disease on board, as against 162 in 1927.

The principal notifications were:—

Smallpox	occurred	on	48 ships.
Cholera	,,	,,	21 ,,
Plague	,,	,,	5 ,,
Typhus	,,	,,	1 ship
Diphtheria	,,	,,	1 ,,
Scarlet Fever		,,	3 ships.
Measles	,,	,,	21 ,,
Chicken pox		,,	48 ,,

The Bureau's epidemiological reports are disseminated free by the powerful wireless stations at Saigon and Bandoeng (D. E. I.) throughout the Far East, and are relayed from Tamanarive (Madagascar) to the whole East Coast of Africa.

Japan, Shanghai, British India and British North Borneo also give free wireless service to the Bureau.

(*d*) Consequent on the ratification of the International Sanitary Convention of 1926, the Bureau is now functioning not only for the League of Nations, but as an outpost of the Office Internationale, Paris, with which, under the terms of the Convention, it communicates directly.

(*e*) The Bureau has continued to encourage the co-ordination of research.

There has been much activity in Plague research due largely to the appointment of the Standing Expert Plague Committee at the Calcutta Congress of the Far Eastern Association of Tropical Medicine in December, 1927.

The priority plague research programme of this Committee has been circulated by the Bureau to all Eastern administrations, several of which have agreed to participate in various investigations.

The enquiry into the value of quarantine stations is being continued. Interesting data have been received from several countries, especially the Straits Settlements.

The Resolutions adopted at the Fourth Session of the Council were:—

1928 RESOLUTIONS.

1. The Advisory Council approves the Report of the Director of the Eastern Bureau for 1928, subject to the modifications recorded in the Minutes, and congratulates the Director on the efficient manner in which he has administered the Bureau during the year.

2. The Advisory Council notes with satisfaction the continued progress made in wireless transmission which has been effected largely through the generosity of the Governments of French Indo-China, Netherlands East Indies, British India, British North Borneo, Shanghai, Madagascar and Japan, and empowers the Director to convey the thanks of the Advisory Council to the various radio stations which have broadcasted the bulletins of this Bureau.

3. The Advisory Council passes the accounts for the year, 1928, which have been duly certified by the Auditors of the Bureau. Having considered the proposed estimates for the year 1930, the Advisory Council approves them, with an addition of $1,200 to the vote "Cables" and $500 to the vote "Printing", at a total figure of $95,808.

4. The Advisory Council having considered the various data which have been collected in regard to the co-ordination of international research work undertaken by the Bureau:—

(*a*) Resolves that the collection of data on Oral Vaccination should be continued;

(*b*) Notes with satisfaction that many countries are now actively engaged in following the schemes of research in accordance with the international plague research programme laid down in Calcutta in December, 1927;

(*c*) Notes with satisfaction the replies which have been received to the request of the Advisory Council for information regarding the Eastern quarantine stations, their working and efficiency, and agrees that the collection of further information should be continued;

(*d*) Is of opinion that the collection of evidence of the use of dried vaccine throughout Eastern countries is a legitimate function for the Bureau to undertake and should be proceeded with at the discretion of the Direrter;

(*e*) Considers that the question of the role of Bacteriophage is of such importance that experimental data regarding it should be gathered from all sources by tne Bureau.

The Bureau was visited by the Right Honourable W. G. S. Ormsby-Gore, Under Secretary of State for the Colonies, on 25th April, 1928.

Finance of the Bureau:—

Year	*Estimated expenditure*	*Actual expenditure*
—	—	—
	$	$
1926 ...	... 69,761	62,799 97
1927 ...	... 79,682 40	82,974 05
1928 ...	... 81,581	82,065 62
1929 ...	... 94,010	(As approved by League of Nations Assembly)
1930 ...	... 95,808	(As proposed by the Advisory Council of the Singapore Bureau)

The rise in the estimates in 1929 and 1930, is due mainly to the necessity for paying the travelling and other expenses of delegates attending Council meetings (hitherto met by their governments) and to higher rates of salary sanctioned from Geneva for the Director, Assistant Director and Statistician.

The foundation of the Bureau was rendered possible by a generous subscription of $125,000 gold by the Rockefeller Foundation to the League of Nations, the expenditure to be spread over a period of 5 years.

Several countries in the Far East have also subscribed, in some cases annually, towards the upkeep of the Bureau (Japan, China, Siam, Straits Settlements, Federated Malay States, Ceylon, Hongkong, Dutch East Indies, French Indo-China).

Egypt and the Philippine Islands have paid the cost of telegrams sent to them.

The finish of the Rockefeller contribution is now in sight.

The League of Nations has accepted the principle that the budget of the Singapore bureau is to be financed as an integral part of the Health budget of the League of Nations without prejudice to the acceptance of grants in aid from Eastern administrations and especially from those which do not contribute directly to the League of Nations.

The Straits Settlements and Federated Malay States each subscribed $5,000 annually until 1928 and are now subscribing $3,000 each.

III.—HYGIENE AND SANITATION

Organisation of the Health Branch.

The principal Civil Medical Officer is Chief Health Officer of the Straits Settlements.

There is a Chief Health Officer, Singapore, who is responsible for the port and the rural areas of Singapore, and for the school inspection of the whole Settlement.

He also lectures in the College of Medicine and in the Sanitary Inspectors' School.

Under him are a Rural Health Officer, a Deputy Rural Health Officer, a Health Officer Schools, a Lady Health Officer Schools, a Health Officer, Quarantine Station, a Port Health Officer, a Deputy Port Health Officer, and an Assistant Surgeon employed on Health Duties.

In Penang there is a Senior Health Officer who is responsible for the Port of Penang, the rural areas of the Settlement which include rural Penang, Province Wellesley and the Dindings, and the Schools of the Settlement. Under him there are a Health Officer, Province Wellesley, and a Deputy Rural Health Officer, Penang; and the Deputy Medical and Health Officer, Lumut, and the three Assistant Surgeons in the Province Wellesley District Hospitals, as far as the health work of their districts is concerned. Under him also are the Port Health Officer, Penang, and the Deputy Health Officer of the Quarantine Station.

(The Municipalities of Singapore and Penang have their own Health organisation, comprising in Singapore a Municipal Health Officer with 3 other Health Officers, a Bacteriologist, and several Assistant Surgeons, and in Penang a Municipal Health Officer, a second Health Officer, and an Assistant Surgeon.)

In Malacca there is a Government Health Officer, and an Assistant Health Officer who function for the whole Settlement, including the Municipality of Malacca town.

The Assistant Surgeons in charge of the two district hospitals in Malacca are under the health officer as regards their health work.

In the Island of Labuan the Medical Officer is also Health Officer.

The Unfederated Malay States Health Branches are staffed by officers seconded from the Straits Settlements.

Johore now has a cadre of a Senior Health Officer and three Health Officers, Kedah a Senior Health Officer and one Health Officer, Kelantan, one Health Officer, Trengganu one Health Officer; in the State of Brunei in Borneo the Medical Officer is also Health Officer and Assistant Superintendent of Indian Immigrants.

There are European Chief Sanitary Inspectors in both Singapore and Penang, and a staff of locally trained Sanitary Inspectors in all districts.

The rural area of Singapore is divided into five sanitary districts, similarly the rural area of Penang Island is divided into five sanitary districts, Province Wellesley into four sanitary districts, Malacca into three sanitary districts. The Dindings and Labuan each constitute a sanitary district.

As a rule one or two sanitary inspectors are stationed in each sanitary district.

The Health Office of the district is the centre from which the district health propaganda and welfare work are developed.

Where there is a district hospital the health office is usually situated in or beside the hospital.

There are Rural Health Sisters in Singapore, Penang and Malacca under whom locally trained district health nurses hold maternal and child welfare clinics, do house and school visiting in the villages and kampongs, and in some cases maternity work.

The travelling motor dispensaries in the three Settlements co-operate in these duties, in addition to treating the sick.

Details of rural areas in the Colony, 1928:—

	Area in square miles	*Estimated population*
Singapore	185	85,000
Penang Island	98½	43,718
Province Wellesley	280	138,230
The Dindings	183	17,628
Malacca	720	152,004
Labuan	28½	5,904
Add Municipal area, Malacca which is staffed by part time Government Officers	—	42,338
	1,495	484,822

(A) GENERAL REVIEW OF WORK DONE AND PROGRESS MADE

(I) Preventive Measures

1. *Mosquito and Insect borne diseases.*—

Government provided the following votes for anti-mosquito work in 1928:—

Settlement	*Vote*
	$
Singapore	120,000
Penang	95,000
Malacca	33,000
Labuan	7,000

(1) In Singapore, the anti-mosquito measures were progressive. The policy is to control all breeding place of dangerous mosquitoes within a radius of 1 mile of the principal villages. All ravines near these are drained, and the outside areas oiled. Periodic mosquito surveys are used as a control, as are spleen surveys, malaria case records, and the vital statistics of each district. More than 80,000 anopheline larvae were collected and identified from 1,557 breeding places. Fifty-six thousand two hundred and ninety-eight dollars of the vote were spent on materials. 4.52 miles of subsoil pipes were laid at an average depth of 6 feet and 4.33 miles of main arterial open cement drains were constructed at an average depth of 3½ feet. Forty-five thousand six hundred and seven gallons of anti-malarial mixture, costing $12,424, was sprayed on potential breeding places to protect an area of 15 square miles. Twenty-five thousand nine hundred and ten dollars was expended under the Public Works Department on anti-malarial works. The remainder of the vote provided for the labour employed by the health branch on anti-mosquito work.

There is evidenec of a steady improvement in the prosperity and health of the inhabitants in villages where anti-malarial work has been undertaken. The record of this improvement tabulated for the whole of rural Singapore divided into areas according to the present distribution of malaria is as follows:—

Year	Areas where anti-malaria measures have been in force and extended since 1921 (Bukit Timah, Bt. Panjang, Woodlands, Paya Lebar, Serangoon and Pasir Panjang).			Districts which are normally healthy and where no control measures are required (Siglap, Bedoh and Changi).			Kampongs (hamlets) which are malarial and where no control measures have yet been instituted.		
	No. of Children Examined	No. C. enlarged spleen	Spleen Rate	No. of Children Examined	No. C. enlarged spleen	Spleen Rate	No. of Children Examined	No. C. enlarged spleen	Spleen Rate
			%			%			%
1923 ...	222	74	33·3	154	6	3.8	22	8	36.3
1924 ...	259	57	22	266	22	8.0	16	5	31.2
1925 ...	547	52	14.9	69	3	4·3	31	15	48.3
1926 ...	509	19	3·7	254	18	7.0	65	61	93.8
1927 ...	126	7	5·5	120	7	5.8	48	39	81.2
1928 ...	343	8	2.3	311	1	·32	43	8	18.6

From 1921 up to the end of 1928, approximately $565,286 have been spent on Anti-malaria work in Singapore Island. During 1928, the total expenditure was $124,590. The population protected from malaria by this work, numbers approximately 45,000. The cost per head per annum is approximately $2.77 cents.

A complete record of mosquito breeding places discovered since 1921 has been kept. Plans of mosquito surveys are prepared and collections of mosquitoes are being made.

(2) Provision was first made for anti-mosquito work in the Settlement of Penang in 1924. Special expenditure votes from that year have been $50,000 in 1924 and 1925 and $75,000 in 1926 and 1927, rising to $95,000 in 1928. Such liberality has made it possible for the Health Branch to undertake measures for the permanent control of malaria in village areas that were notoriously malarial.

In rural Penang the problem of malaria eradication is rendered difficult owing to the extent and nature of the breeding places of the malaria carrying Anophelines.

The fact that malaria is prevalent is evident from the record of spleen rates amongst school children which vary from 86 to 21 per cent in unhealthy areas. It can be asserted that malaria, in places where active measures of specific anti-malaria control have taken place, has vastly diminished. Malaria has indeed been banished from a large section of Pulau Jerejak, the quarantine and leper camps, where any fresh case of infection would be immediately recognised. Malaria is almost absent from Penang Hill owing to the elaborate precautions that are taken to prevent its access. In the meantime new areas for the propagation of malaria carrying mosquitoes are constantly being exposed in more distant zones and mosquitoes are ever on the alert to return to places where care is relaxed.

The anti-mosquito measures adopted have been progressive. The breeding places for dangerous mosquitoes in the most populous or important areas are oiled for a distance of ½ to one mile from the outskirts of the village or settlement, the proximal ravines are then drained and the oiling areas are extended further into the country, or new malaria protection zones are formed. In this manner, measures of mosquito control have been taken in the villages of Ayer Itam, Glugor, Tanjong Tokong, Tanjong Bungah, Batu Ferringhi and for 8 miles along the North-west coast line of Penang Island, as well as in the Botanical Gardens, on Penang Hill, and at Pulau Jerejak.

In Province Wellesley where malaria is principally a problem on the inland rubber estates, active anti-malaria measures were taken on 6 of these estates, under supervision of the health branch; mosquito protection zones have been formed around the villages of Butterworth, Bukit Mertajam, Sungei Bakap and Bukit Tambun. In the Dindings, besides the extensive measures of permanent malaria control at Lumut, anti-malaria zones have been formed around the village of Segari and on a number of rubber estates.

Ninety-four notices under Ordinance No. 174 (Destruction of Mosquitoes) were served and an attempt has been made to induce owners of land to undertake, or to pay for such anti-mosquito work as may be required on their land.

A sum of $3,440.09 was recovered for work done on private premises.

Work Done.—In connection with the drainage of breeding places for dangerous mosquitoes 21,622 feet of subsoil drains, 3,010 feet of open concrete channels were laid and 33,120 feet of open earth drains were cut. Seventy-two thousand nine hundred and twenty-seven gallons of anti-malaria oil, consisting of solar oil (45 parts), kerosene (4 parts) and diesel oil (15 parts) were sprayed on breeding places of mosquitoes.

Complete mosquito surveys were carried out over areas totalling more than 150 square miles and continuous weekly surveys were made over an area of more than 9 square miles. Mosquito larvae to the number of 28,174 were

collected and identified; 2,440 mosquitoes were collected in the field, of which 443 were dissected.

(3) Provision was first made for anti-mosquito work in Malacca in 1926 when a vote of $30,000 was provided. A similar sum was voted in 1927; the vote was increased to $33,000 in 1928.

In Malacca preventive work was conducted on similar lines, and protection zones were formed round villages and large kampongs.

Oiling was also carried out in co-operation with the Malacca agricultural Medical Board, and with the Tampin mosquito destruction board, where Malacca borders on the Federated Malay State of Negri Sembilan.

The new work undertaken in Malacca may be summarised as follows:—

Ujong Pasir.—An area of at least one-third square mile of nipah swamp has been drained. The main drain has its outlet in a stream called Parit China. This drain takes all storm and subsoil water from the reclamation behind the jail. The old drains on this reclamation are now flowing into this main channel. Between 20—30 new Portuguese houses have been built in the drained area. The work is as yet unfinished.

Tanjong Kling.—Anti-mosquito work in connection with the government bungalow has been in progress during the year. An area of one-quarter square mile has been drained. Many new houses have been erected on the area drained. The work is as yet unfinished.

Jasin.—(*a*) The area around the old hospital site—now the Jasin club—has been successfully drained with open and under drainage. Many bad breeding places are now eliminated.

(*b*) The ravine at the back of the new hospital has been under-drained and potential breeding places affecting the hospital eliminated.

Alor Gajah.—Drainage works were extended as far as the Alor Gajah Road. The work is still in progress.

Durian Tunggal Village.—A very swampy maculatus breeding area was cleaned up by means of subsoil drainage, open drainage and clearing the Malacca river for two miles down stream. In addition to the elimination of bad breeding places it was made possible to instal a line of bucket latrines in a swampy area where this was previously impracticable.

Eleventh Mile Tebong Road Coolie Line.—Drainage work commenced late in 1927 in this area, was completed during the year. The main line of subsoil pipes supplies water to the coolies and surrounding Malay kampongs.

Kemuning Village.—Two Malay owned maculatus breeding swamps affecting the village and the adjoining Kemuning estate were dealt with.

As a result of anti-mosquito drainage buildings have been put on the improved land in many places.

Mosquito surveys were made.

(4) *Infectious Diseases.*—

There were 2 cases of plague, one imported case of cholera, and one case of cerebro-spinal fever in the rural area of Singapore. The usual precautions were taken, and the diseases did not spread. These diseases did not occur in the rural areas of Penang and Malacca or in Labuan. There were 5 cases of small-pox in Singapore, and 2 in Malacca, in the rural areas.

Vaccination is thoroughly carried out.

Of 3,191 boys examined in Penang rural Schools, only 29 proved to be in need of vaccination.

Measures are taken when necessary to destroy rats, and to examine rats bacteriologically.

(II) General Sanitation and Village Conservancy

Under this heading are included house to house inspection, village scavenging, control of night-soil, (removal and disposal), control of piggeries, cattlesheds and dairies, inspection of markets, surveys of sites and building plans, sanitary supervision of police stations, rubber estates and factories, control of water supplies and sanitary control of schools.

SINGAPORE

The estimated number of houses in the rural districts is 16,347; 3,906 routine house to house inspections were made by district sanitary inspectors. A number of similar inspections in cases of difficulty and complaint were carried out by the health officer. The sanitation of Government buildings and crown land within the Municipal limits was supervised regularly and 233 visits are recorded by the Health Officer under this heading; while routine monthly inspections of all Government offices and quarters were carried out by the sanitary inspector (town) and the mosquito-collector.

Village scavenging and refuse collection is organised by the Health Branch and all the villages of the island are served with one or more incinerators according to their need. There are 20 such incinerators, and during the year more than 45,211 cubic yards of rubish were consumed. The introduction of compulsory household dustbins in Bukit Timah village helped considerably in the scavenging of that village.

Considerable advance has been made during the year in the control of soil pollution. The conservancy overseer supervised the erection of sanitary latrines and the collection and disposal of night-soil in all but one of the sanitary districts. The experimental trenching ground at the 8th mile West Coast Road for the Pasir Panjang district has proved a complete success.

In Bukit Timah, the septic tank has worked very satisfactorily. During the year a similar septic tank was constructed in Paya Lebar. Its water supply is derived from a ravine subsoiled in 1925. It is capable of dealing with a population of 2,000 persons daily and was built at a cost of $4,500.

Sixty-five demonstration concrete box latrines have been distributed in certain chosen centres in the kampongs and villages.

Two hundred and seventy-nine insanitary latrines were demolished and five hundred and eighty-one new latrines erected by the owners of houses. All new buildings in village areas and all coffee shops and eating houses and large rubber estates in the rural area have sanitary latrines, and it is estimated that more than 70 per cent of all dwellings are adequately sanitated.

Building plans in the rural area submitted to the health officer for approval numbered 1,131, more than 3 times the number of the previous year.

Alterations of the sanitary arrangements were made in the majority of the plans submitted.

Reports of births and deaths registered at each Police Station are collected and scrutinised. The Police co-operate in gathering children for vaccination and in finding dwellings of new-born infants for the Health Sister.

Schools.—Three hundred and fifty-nine visits by sanitary inspectors were made to schools. The sanitation of all government and government aided schools is satisfactory.

PENANG ISLAND

Inspection of houses.—The estimated number of houses in Penang rural area is 10,570 and 21,681 routine house to house inspections were made by the senior sanitary inspector and by the staff of district sanitary inspectors. A number of similar inspections were carried out by the Deputy Health Officer, who is required to certify the existence of any specific nuisance when a prosecution is made for a sanitary offence.

Verbal advice and warning to remedy sanitary defects or to clean insanitary premises were issued in the case of 1,672 dwellings. Failure to comply with such advice is recorded in 750 cases, in which subsequent proceedings were taken, either by the service of an intimation notice or else by a Rural Board notice. Such notices were finally complied with in the case of 659 of the recorded notices; there were however 128 prosecutions with 106 convictions, the fines amounting to $530.

Conservancy and Construction of latrines.—Considerable advance has been made during the year in the control of soil pollution.

At the end of 1928, there was a record of 4,139 sanitary latrines newly constructed of types suited to each locality, some of them being communal. It is now probable that more than 50 per cent of rural houses in Penang are adequately sanitated. Conservancy systems have also been established in all the thirteen gazetted villages in rural Penang. These schemes are self-supporting and are adapted to suit the different circumstances met with in each locality. In achieving these results it was found expedient to issue no less than 2,103 notices for the construction of latrines under section 209 (1) of Ordinance No. 135 (Municipal), but there is evidence that the public throughout the Northern Settlement have been more readily persuaded to erect latrines as a result of the treatment and propaganda which has been so liberally supplied by the Rural Sanitation Campaign Staff. There is no question whatever that the educational value of mass treatments even in the absence of sanitation is very great. The demonstration of the actual removal of worms in large numbers, particularly roundworms (but, after the lectures, hook-worms as well) paves the way for the enforcement of latrine building and makes an otherwise difficult proceeding relatively easy.

All but the most poverty stricken have been required to provide their own latrines, but costs have been materially reduced by the mass production of concrete larines, at a cost of $16.30 complete. Light wood and zinc superstructures for pit latrines are constructed at a cost of $12.50.

Tube latrines, bored to a depth of twenty feet with an augur, have been strongly recommended by local officials of the Rockfeller Foundation. The use of these deep bored pits is believed to be the solution of the problem of surface soil pollution in rural areas. Three of these augurs were obtained and assembled in November, six more were purchased in December. Twenty-eight demonstration and experimental pits were bored at Ayer Itam and Tanjong Tokong. During the month of December these augurs were lent to the villagers in a Malay kampong near Telok Bahang; they were instructed how to use them in the construction of their own tube latrines. Forty-nine tube latrines were dug and attap sheds were built over them; they are now in use and the owners appear proud of them.

Under favourable soil conditions the "all in" cost of the tube latrine complete with platform and attap superstructure is only $5.

Boring and maintaining suitable pits in the sandy water logged soil peculiar to the coastal zone has proved impracticable, but further experiments are being made to determine whether, by raising a mound and by fitting a suitable lining around the pit, this difficulty may be overcome.

At the end of this year, conservancy has become merged in the routine activities of the rural boards. Extra provision has been made by the boards concerned for this important sanitary service in villages and kampongs. The work now initiated as a result of the campaign will thus be placed on a permanent basis and progress will be maintained.

Section 206 of Ordinance No. 135 (Municipal) decrees that the manuring of vegetable gardens with crude sewage is an offence punishable by a fine. This section has been extended to include rural areas and, if reasonably applied, may be useful in checking a danger to public health.

An experimental septic tank was constructed in Ayer Itam with a view to discovering whether crude sewage could be treated so as to destroy parasites without lessening its manurial value. This experiment appears to be successful, no living parasites being found in the effluent; it may now be possible to induce Chinese gardeners to avail themselves of such tanks as an alternative to their present practice.

Scavenging.—Village scavenging and refuse collection in rural Penang is organised by the Health Branch; an annual vote of $10,000 is provided by the rural board for this service. There are 11 incinerators, which provide for the needs of all the rural villages.

PROVINCE WELLESLEY

During the latter part of the year, three conservancy overseers were appointed by the Rural Board. Their duty is to supervise conservancy, thus relieving the sanitary inspectors of much ordinary routine work. The conservancy and scavenging staff consists of eight mandores and seventy-eight coolies. Much progress has been made in latrine construction in villages and kampongs, 1,133 new latrines being erected and 290 insanitary latrines re-constructed. All Government buildings, including schools, are adequately sanitated. Private schools have been induced to follow the Government lead.

Schemes for night-soil removal have been inaugurated at Kepala Batas, Sungei Puyu, Sungei Dua, Tassek Glugor and Bukit Tambun, and the existing schemes at Butterworth, Nibong Tebal, Sungei Bakap and Simpang Ampat have been improved and put on a firm bases. Thus 9 villages in 1928, as against 4 in 1927, are provided with controlled conservancy systems. Back lane schemes for Butterworth and Kepala Batas have been prepared and several land owners have been persuaded to surrender land required for back lanes. Plans of new buildings are examined and none are approved unless they conform to lay-outs approved for each village. One thousand and forty-four sanitary houses were inspected and necessary instructions given.

THE DINDINGS

A sanitary inspector is stationed at Lumut, who has charge of village scavenging and conservancy. There are 7 gazetted villages, each is supplied with an incinerator, and there is a staff of 64 coolies and 4 mandores employed by the Rural Board. Conservancy systems have been introduced at Lumut, Pangkor, Pengkalan Bahru and Kampong Bahru. Night-soil is dealt with by dumping from boats half a mile out to sea. Bucket latrines to the number of 68 were constructed by villagers, according to type plans supplied, and 291 deep pit latrines were dug in kampongs. All Government buildings including schools are adequately supplied with sanitary conveniences.

One hundred and seventeen nuisance notices were served for the remedy of various sanitary defects. There were 19 prosecutions for failure to comply with sanitary requirements, with 14 convictions and fines amounting to $65.

MALACCA

There are now 25 village areas gazetted in Malacca, including 2 gazetted during the year under review.

The Municipal Ordinance and Bye-laws are applied to such areas as far as they are applicable.

Twelve of these villages now have a complete system of night-soil removal.

Provision has been made for a two bucket system in three of them with septic tanks for the disposal of night-soil and arrangements for flushing the buckets. One thousand six hundred and ninety-one latrines were built in villages during the year of which 1,457 were erected by private owners. One thousand two hundred and ninety were pit latrines and 401 bucket latrines. Two large villages have been provided with public latrines. Night-soil is disposed of mainly by burial. Nearly 2,000 latrines, including a number of the tube type, were installed by Kampong Malays at their own expense.

WATER

The water supplies of the cities of Singapore, George Town (Penang) and Malacca, which have lately been greatly extended, are pure and abundant. A number of the surrounding villages are served by the Municipal supplies.

The enhanced Singapore supply is derived from catchment areas in Johore, some thirty miles distant: to reach Singapore Island, the pipes are laid on the Johore Causeway.

There are excellent piped supplies at Balik Pulau, a large village on Penang Island, and at Butterworth and Bukit Mertajam in Province Wellesley, where the amount is to be augmented by impounding additional water at Siraya next year.

The Bukit Panchor reservoir, supplying the villages of Nibong Tebal and Sungei Bakap in South Province Wellesley, is affected with a growth of algae which, at times, fouls the water. Treatment with copper sulphate has produced only a transient good effect; a scheme for permanently purifying this water is in hand.

In Lumut, the headquarters of the Dindings, there is a piped supply from hill stations impounded in two catchment reservoirs.

In Labuan, there is a similar supply.

A number of rubber estates have their own piped water systems.

In rural areas, spring water is as a rule plentiful along the foothills. In many such places, the health officers have utilised their anti-malarial subsoil drainage systems to provide the neighbouring villages and kampongs with a water supply, by carrying subsoil water into cemented basins, through which a constant flow is maintained to prevent mosquito breeding.

In kampongs on flat land, the water supply is mostly from shallow earth wells.

(III) School Hygiene

There are in the Colony nearly 60,000 children of school age.

In Singapore, there are whole time male and female school health officers.

In other Settlements, the work is done as a part time duty by members of the health and medical staffs.

The travelling dispensaries have co-operated in this work in rural areas.

The health sister sends sick children and non-vaccinated children for treatment to the travelling dispensary.

The health officer arranges for the dispensary to visit the schools he has inspected, and to treat children.

Quinine is distributed and blood films taken by the assistant surgeon or dresser in charge.

In the cities where dental defects are serious, more children are now being sent to the dentists.

Details of school work are given in Appendix "H", page 107.

(IV) Labour Conditions

Estates

Estates are inspected by Government health officers and their subordinates.

There are 96 rubber or coconut estates in Singapore Island, with labour forces of over 25 coolies.

There are also 29 large rubber factories, whose coolies usually are not housed on the premises, but live in villages or in the city, whence they are brought to their work in lorries.

The large rubber estates in Singapore Island have visiting medical officers. The same system obtains on Penang Island where there are 30 rubber, coconut or spice estates, employing over 25 coolies each. There are 157 similar estates in Province Wellesley, including 31 large European owned estates. One group of estates there, known as "Caledonia", has its own resident medical officer. A number of other estates have visiting medical officers. There are six estates hospitals in Province Wellesley, the largest of whicht serves the "Caledonia" group.

In the Dindings, where there are 38 estates, conditions are similar.

In Malacca, there is a planters' board, known as the Malacca Agricultural Medical Board, which has grouped the whole of the Malacca estates, and engaged six medical officers, four Europeans and two Chinese, stationed at convenient centres. Some of these officers are doing good preventive work. Twenty-eight Malacca estates have small hospitals or sick lines. The Malacca estate medical service, which is paid for by a cess on the planted areas, has undoubtedly reduced the death-rate in Malacca estates. The estates under this board total 722, of which 180 exceed 100 acres in area: the annual revenue of the board is about $110,000 and the average number of coolies employed about 24,000.

In all parts of the Straits Settlements, estates which have no hospitals use the Government hospitals. Even estates with hospitals send most of their serious cases into Government hospitals.

Other Labour

The health of the Public Works and other labour forces in rural areas is cared for directly by the medical department.

Offensive trades operate almost entirely in the Municipalities, where they are controlled effectively.

Factories and shops in cities are controlled by the Municipal authorities.

(V) Housing and Town Planning

The working out of the improvement Schemes is proceeding in the Municipalities of Singapore and Malacca: land is being acquired and laid out.

The sum of ten million dollars, appropriated by Government for the Scheme in Singapore, is being spent.

Two hundred houses are in course of erection in the Serangoon district, and an extensive reclamation scheme is being carried out in the Tiong Bahru area of Singapore.

(VI) Food in Relation to Health and Disease

The inspection and control of food is carried out by the Municipal and Government Health Officers in their respective areas. There are markets at all centres.

Milk vendors, eating houses, coffee shops, meat shops and aerated water factories are licensed and inspected. Water, milk and other beverages and food stuffs both local and imported are regularly analysed, and action is taken if indicated.

The only common deficiency disease is Beri-beri.

In Singapore rural areas, 1,187 inspections were made of slaughter houses, 354 visits were paid to dairies, 888 visits to cattlesheds and 778 visits to piggeries. All the insanitary cattlesheds at the sixth mile Upper Serangoon Road village were moved to the higher ground at Tampenis, some distance from the village. Five-hundred and sixty-nine minor insanitary conditions were remedied on the verbal instructions of the sanitary inspectors. Four hundred and ninety-one warning notices were served on owners requiring compliance with sanitary requirements. There were fifty-seven prosecutions and fifty-six convictions for failure to comply, with fines amounting to $535.

There are 5 markets which have been inspected regularly. The shed erected by the trustees of Perseverance Estate for hawkers stalls proved very useful and to some extent relieved the roads in that neighbourhood of the nuisance of insanitary hawking. Sanitary improvements were effected in 391 coffee shops and eating houses, with the helpful co-operation of the Chief Police Officer, who agreed not to license any shop without the recommendation of the Health Officer.

In Penang rural areas, 14 private slaughter houses were condemned during the year and 12 new ones were erected in their place on approved plans. Each of these private slaughter houses was inspected at intervals of not less than once a month. Eight notices were issued and were effective in securing sanitary improvements. There are 1,313 licensed piggeries, all of which were inspected on one or more occasions during the year.

Two hundred and one dairies and cattlesheds were recommended for licence; sanitary improvements were effected in the majority but the hygienic standard is low, and little can be done to improve conditions owing to the poverty of the owners. Three milk vendors were licensed, but no examination of milk was made, the sale of fresh milk being almost negligible.

There is a public market in Balik Pulau which is maintained in a sanitary state by the Rural Board, there are also 8 private markets in rural Penang.

Sanitary improvements were effected in 173 coffee shops and eating houses with the co-operation of the Chief Police Officer who agreed not to license any shops without the recommendation of the Senior Health Officer.

In Province Wellesley there were 995 slaughter house inspections, 2,601 dairy inspections, 1,505 toddy shop inspections, 49 toddy shop licences issued, 14,464 coffee shop inspections, 3,652 piggery inspections and 1,826 piggery licences issued.

In Malacca, similar work was done. Seven villages have good markets. There are ten dairies in the rural area, supplying milk to Malacca town. Six of the vendors were prosecuted and three were convicted of selling adulterated milk.

(B) MEASURES TAKEN TO SPREAD THE KNOWLEDGE OF HYGIENE AND SANITATION

Many of these are detailed in the Maternity and Child Welfare, Hookworm and Sanitation Campaign, and Social Hygiene reports.

Baby shows have been held in both large and small centres. Health officers and their assistants and health sisters give advice on the preservation of individual health both at clinics and in set lectures. Lantern slides and films are shown, especially in connection with venereal disease, hook-worm and malaria. Pamphlets and posters are issued. Lectures on health are given in all Government schools both English and Vernacular.

The diffusion of knowledge in the principles of hygiene is gradually spreading amongst school children through lectures and by demonstrations

and physical examinations carried out in the schools, amongst mothers through the visits of the health sisters and amongst the population generally through the gradually awakening intelligence of those who share in the sanitary progress in the pursuit of which very few individuals have been allowed to escape. The householder who is unaware of the existence of a sanitary inspector is now a rarity and few owners of land are left in ignorance if their holding proves to be a breeding place for mosquitoes.

Sanitary inspectors have been taught to advise and encourage rather than to adopt the roll of the policeman. The knowledge of their duties, in which they receive a comprehensive grounding during their course of instruction in Singapore, is supplemented by fortnightly lectures at the office headquarters.

Public health museums have been set up in some of the health offices, both for the instruction of staff and the education of the general public: there are also exhibits and posters at the health centres.

Propaganda work received a great impetus from Dr. Paul Russell when director of the Hook-worm and Sanitation Campaign. Since his departure over 70,000 pamphlets and posters dealing with worm infections have been distributed. Two thousand pairs of shoes, the gift of Mr. Tan Kah Kee have been distributed to poor school children in order to encourage the habit of wearing shoes.

(C) TRAINING OF SANITARY PERSONNEL, 1928

The sanitary inspector is to a Health Service what a sergeant is to the army, its backbone.

With the development of rural sanitary work, it became obvious in 1921 that the Government should have a proper staff of sanitary inspectors. A lecture-room, small museum and various offices and a store were fitted out. The collaboration of the Royal Sanitary Institute of London was fortunately obtained; and, in accordance with its practice in suitable tropical centres, the Institute agreed that students locally trained on an approved schedule should be able to obtain the Sanitary Inspector's Diploma of the London Institute after an examination by an approved board of examiners in co-operation with the Government of the Straits Settlements. This facility was much appreciated, for it meant that not only the students destined for Government service would be catered for, but, at the same time, without much expenditure, members of the public might be admitted to the course on payment of the necessary fees. The first session began in May, 1921, and was attended by five selected candidates for Government Service.

The numbers of students rapidly increased until since 1924 it has been necessary to limit the class so as to ensure that all should have adequate training.

In 1926, twenty-six students attended the course, of whom twenty passed. In 1927, thirty-three attended the course, of whom twenty-one passed. In 1928, twenty students attended the course and six others presented themselves for the examination for the Diploma which they had failed to obtain at previous examinations; nineteen passed.

The students are sent by the Governments of the Straits Settlements, Federated Malay States, Unfederated Malay States, Sarawak and British North Borneo, and by the Municipalities of Singapore and Malacca.

A few private students have also been admitted.

So far, the Municipality of Penang has not taken advantage of the opportunity to train its probationers at our school.

IV.—PORT HEALTH WORK AND ADMINISTRATION 1928

A.—SINGAPORE

1.	Number of ports from which vessels arrived	353
2.	Names of ports against which quarantine measures were declared during the year:— Amoy, Bangkok, Basra, Culcutta, Hongkong, Madagascar, Madras, Negapatam, Pnompenh, Pondicherry, Samarinda, Swatow, Rangoon, Bombay, Siam South of Bangkok, Jeddah, Bassein, Saigon, Aden, Tuticorin, Tanjong Balei, Hoihow, Bandjermassin, Belawan	
3.	Total tonnage of ships entering the port	14,363,830
4.	Number of ships entering the port	8,924
5.	Ships examined including pilgrim ships and infected ships	1,342
6.	Outgoing pilgrim ships examined	22
7.	Returning pilgrim ships examined	12
8.	Infected ships examined	9
9.	Ships fumigated or disinfected	335
10.	Crew examined	114,246
11.	Passengers examined including pilgrims and Chinese immigrants	386,763
12.	Outgoing pilgrims examined	11,530
13.	Revenue from charges for fumigation or disinfection of ships and from certificates issued to such ships ...	$24,775.00
14.	Returning pilgrims examined	9,307
15.	Chinese immigrants examined	295,700
16.	Corpses inspected in harbour	30
17.	Water-boats examined in harbour	42
18.	Passengers undertakings issued for surveillance ashore ...	74
19.	Optional certificates issued to ships fumigated or disinfected	316
20.	Bills of health issued	3,345
21.	Permits to import and export corpses issued	35
22.	Revenue from bill of health fees (36 free to warships) ...	$16,545.00
23.	Revenue from permits to import and export corpses ...	$340.00
24.	Charge for water supplied to passengers at quarantine station (recovered from agents)	2,197·15
25.	Total revenue	$51,385.56
26.	Exemption certificates issued to ships	65

St. JOHN'S QUARANTINE STATION, SINGAPORE

1.	Total passengers admitted during the year	13,993
2.	Greatest number admitted in any one day (17/4/28) ...	2,165
3.	Maximum number in residence on any one day (17/4/28) ...	2,944
4.	Minimum number in residence on any one day (14/5/28) ...	14
	Note.—On 257 days there were none in residence).	
5.	Average daily number of passengers in Quarantine Station	147·17
6.	Total sick treated in Hospital *i.e.* total admissions during the year and patients remaining in Hospital on 31/12/27	276
7.	Maximum number in Hospital on any one day (26/2/28) ...	25
8.	Minimum number in Hospital on any one day (17/2/28) ...	1
	(*Note.*—On 79 days there were none in Hospital)	
9	Average daily number of sick in Hospital	4·147
10.	Total deaths during the year	31
11.	Death-rate per mille in Hospitals	32·6
12.	Death-rate per mille amongst passengers admitted ...	2·21
13.	Total cases of Cholera admitted	14
14.	Total cases of Plague admitted	Nil.
15.	Total cases of Small-pox admitted	6
16.	Number of non-infected ships whose passengers subsequently developed infectious diseases on the Island (none out of 114)	Nil.
17.	Number of infected ships whose passengers subsequently developed infectious diseases on the Island (one out of 7)	1
18.	Number of Vaccinations	2,404
19.	Total revaccinations	2,308
20.	Total Inoculations with Anti-Cholera Vaccine ...	475
21.	Total Inoculations with Anti-Meningococcus Vaccine ...	Nil.
22.	Total number of N. A. B. Injections	9
23.	Cases treated as out-door patients (Contacts and Staff) ...	130
24.	Total births (2 passengers, 2 staff and 1 from Pulo Ringgit)	5
25.	Number of Municipal Contacts and patients admitted:—	
	Small-pox contacts	38
	Plague contacts	14
	Cholera contacts	64
26.	Number of Government Contacts and patients admitted:— Cholera contacts	24
27.	Number of Municipal Contacts who developed infectious diseases on the Island	Nil.
28.	Number of Government Contacts who developed infectious diseases on the Island	10
29.	Corpses sent to Station for P. M. Examination and Burial	8
30.	Number of gallons of water distilled during the year ...	Nil.
31.	Number of gallons of Singapore water pumped up ...	2,716,896

CONDENSED RESUME OF PORT HEALTH WORK SINGAPORE FOR 26 YEARS

Year	*Crew and Passengers examined*	*Passengers sent to St. John's Island*	*Visits to Vessels*	*Bills of Health issued*
	—	—	—	—
1903 ...	321,365	21,253	806	1,000
1904 ...	279,297	17,852	712	1,036
1905 ...	323,431	12,109	1,279	1,220
1906 ...	493,021	30,076	1,625	1,674
1907 ...	377,325	25,408	1,226	1,318
1908 ...	303,484	29,356	1,506	1,344
1909 ...	291,625	15,072	1,251	1,299
1910 ...	467,868	35,062	1,920	1,200
1911 ...	538,291	53,961	2,100	1,800
1912 ...	539,677	56,726	1,927	2,145
1913 ...	506,925	56,838	1,818	1,582
1914 ...	402,583	18,193	1,803	1,802
1915 ...	200,978	3,335	821	1,563
1916 ...	426,584	9,738	1,617	1,726
1917 ...	277,442	78,881	694	1,915
1918 ...	284,198	24,182	1,709	2,086
1919 ...	411,921	28,318	2,130	2,160
1920 ...	507,176	31,991	2,023	2,878
1921 ...	511,747	8,950	1,851	2,951
1922 ...	369,072	15,343	1,552	2,720
1923 ...	395,583	7,374	1,360	2,718
1924 ...	408,419	39,053	1,433	2,912
1925 ...	366,671	46,063	1,018	3,204
1926 ...	550,443	78,963	1,650	3,273
1927 ...	643,066	20,169	1,568	3,071
1928 ...	501,009	13,993	1,342	3,345
Total ...	10,663,200	888,259	38,741	53,942

B.—PENANG

1. Penang is the first port of call for almost all ships on their way from India to Far Eastern ports and a large number of the immigrant coolies destined for Malaya are landed at Penang.

One thousand eight hundred and twenty-one vessels arriving in the port were inspected during 1928; crew and passengers numbering 257,507 were examined; fumigation and disinfection were carried out on 27 of these ships.

2. Ports of clearance on which quarantine regulations were imposed, were as follows:—*Small-pox*:—Bombay, Bandjermassin, Madras, Calcutta, Negapatam, Hongkong, Basra, Pnompenh, Samarinda, Tandjong Balei.

Cholera.—Amoy, Hoihow, Tuticorin, Madras, Calcutta, Saigon, Swatow, Bassein, Bangkok and other Siamese ports.

Plague.—Aden and Madagascar.

3. The effectiveness of quarantine regulations may be measured by the absence of infectious disease in the urban district of the port. In George Town, and in Penang Island generally, there have been no cases of either cholera, plague, or small-pox since the year 1924, when one case of the latter

disease was dealt with ashore. On the other hand, the following is the record of passengers arriving infected, or who have become infected while in quarantine, during the period 1924—28. The absence of Cholera in the Quarantine Station may be attributed partly to the fact that since 1927 all immigrant Indian coolies are inoculated prior to their embarkation at Negapatam.

PENANG QUARANTINE STATION STATISTICS 1924—28

Year	Cholera	Small-pox	Plague
1924 ...	151	nil	nil
1925 ...	47	8	nil
1926 ...	91	5	nil
1927 ...	41	11	nil
1928 ...	nil	11	nil

4. The following is the record of ships infected with dangerous infectious disease arriving in the port during 1928:—

Date of Arrival	Ships	Last Port of Clearance	Infection	Number of cases on board
31-1-28	Tilawa ...	Calcutta ...	Small-pox ...	1
3-2-28	Rohna ...	Negapatam ...	Small-pox ...	1
2-3-28	Rohna ...	Do. ...	Small-pox ...	1
16-3-28	Rajula ...	Do. ...	Cholera ...	1
29-3-28	Malaya ...	Tengkah, Siam ...	Cholera ...	1
8-4-28	Tilawa ...	Rangoon ...	Plague ...	1
27-4-28	Rohna ...	Negapatam ...	Small-pox ...	2
27-4-28	Takliwa ...	Rangoon ...	Small-pox ...	1
25-5-28	Rohna ...	Negapatam ..	Small-pox ...	1
11-7-28	Theseus ...	Jeddah	Small-pox ..	1
9-8-28	Naldera ...	Bombay ...	Cholera ..	1
24-8-28	Tairea ...	Negapatam ...	Cholera ...	1
15-12-28	Cremer ..	Hong-Kong ...	Small-pox ..	1
20-12-28	Kum Sang ...	Calcutta ...	Small-pox ...	1

SUMMARY OF PORT AND QUARANTINE STATION WORK PENANG 1928

1.	Passengers and crew admitted to Quarantine Station ...	43,273
2.	Greatest number admitted on any one day (9/11/28) ...	1,573
3.	Passengers medically examined	173,351
4.	Crew medically examined	84,156
5.	Maximum number in residence on any one day (14/7/28	1,901
6.	Minimum number in residence on any one day (20/10/28)	3
	(*Note*.—The camp was not empty at any time during the year)	
7.	Sick treated in hospital (patients remaining on 31/12/27 included)	707
8.	Total deaths during the year	29
	(*Note*.—Of these 3 died within 48 hours of arrival)	
9.	Death-rate among those treated per mille	40·3
10.	Number of Births	5
11.	Cases of Cholera admitted	Nil.
12.	Cases of Plague admitted	Nil.
13.	Cases of Small-pox admitted	11
14.	Number of vaccinations	40,354
15.	Number of Anti-cholera inoculations	487
16.	Number of out-patients treated	1,062
17.	Number of anthelmintic treatments	8,701
18.	Corpses examined in harbour	17
19.	Permits to import or export corpses	24
20.	Certificates to accompany hides	12
21.	Water boats examined	13
22.	Revenue in stamp fees	$4,494
23.	Number of vessels entering the Port (including native craft)	10,748
24.	Total tonnage of these vessels	6,643,148
25.	Number of ships examined (infected ships 14) ...	1,821
26.	Number of pilgrim ships proceeding to Jeddah ...	15
27.	Outgoing pilgrims examined	9,079
28.	Number of pilgrims returning to Jeddah	8
29.	Returning pilgrims examined	5,767
30.	Infected ships proceeding to Quarantine	15
31.	Fumigations and disinfections by disinfecting launch ...	27
32.	Number of disinfection certificates issued	9
33.	Passengers undertaking issued	361
34.	Bills of Health issued (eleven free)	898
35.	Exemption Permits issued	152

V.—KING EDWARD VII COLLEGE OF MEDICINE

1928 ANNUAL REPORT

BY G. H. MACALISTER, M.D., M.R.C.P.

Principal.

I.—GENERAL.

The Council.—Dr. J. GRAY acted as President of the Council until the the return of the Hon. Dr. A. L. HOOPS from leave in October.

Dr. G. H. MACALISTER returned from leave and from special duty in West Africa and resumed duties as Principal of the College in February.

The Hon. Mr. M. B. SHELLEY, Colonial Treasurer, and the Hon. Dr. R. O. WINSTEDT, President, Raffles College, joined the Council as official members.

Mr. R. INGHAM acted as an official member of Council during the absence of the Hon. Mr. A. M. GOODMAN, Secretary for Chinese Affairs.

The Hon. Mr. S. J. CHAN was appointed to serve for three years as a member of the Council.

The Hon. Dr. R. DOWDEN, P.M.O., F.M.S. who had been a member of the Council since 1921 died in June. In a resolution approved at the meeting following this event Council expressed its deep regret at the loss of a valued member.

The Senate.—Mr. A. D. WRIGHT, Professor of Clinical Surgery, resigned his appointment on August, 18th, and proceeded to England having been appointed to a post on the Surgical Staff of St. Mary's Hospital, London.

Dr. J. C. TULL, was absent on leave from 31st May to 2nd November, 1928. During his leave, Dr. TULL attended the International Congress on Cancer held in London in July, as the official delegate of the College. Dr. J. A. COWAN acted as Lecturer in Pathology during his absence.

Dr. G. E. BROOKE, who had been connected with the College since its foundation, resigned the office of Lecturer in Public Health in April. In token of appreciation of his services he was appointed as Lecturer Emeritus in Public Health, and was awarded the Honorary Diploma of the College.

Dr. A. J. COPELAND, Lecturer in Experimental Pharmacology resigned his appointment in March.

Mr. A. J. TURNER, Lecturer in Pharmacy resigned in August, 1928, and was succeeded by Mr. T. ROEBUCK, the general hospital pharmacist.

Students.—There was an entry of twenty-one students in June, 1928, at the opening of the academic year 1928-9. Of these, seventeen entered for the medical and four for the dental course.

There were in December, 1928, one hundred and five students at the College. This total includes five dental students.

The distribution of students in the various years of study is as follows:—

First year	24
Second year	21
Third year	24
Fourth year	11
Fifth year	12
Sixth year	13

The distribution as regards nationalities is as follows:—

Chinese	44
Tamils and other Indians	33
Eurasians	17
Malays	10
Japanese	1

The students may also be classified in the following categories:—

S. S. Government students	13
F. M. S. ,, ...	31
Kedah ,, ,, ...	2
Johore Scholars	2
Scholars and Exhibitioners	33
Private students	24

Thirteen students left the College during the year. Of these four completed the course and obtained the diploma L. M. S. (Singapore); three were advised to leave on the ground of unsuitability for medical study, and seven left in order to prosecute their further studies in Edinburgh.

Only four students, then, completed their course during the year under review. This is the lowest number on record. Two hundred and sixteen have obtained the licence since the opening of the College; that is to say, the average annual output has been 11.3. The average during the five years 1923-7 was 15.2. The small number qualified in 1928 stands out in rather strong contrast.

There is, however, a perfectly simple explanation. New regulations were introduced in 1923, extending the course for students entering in that and in subsequent years from five to six years. The 1922 entries were due to complete in 1927; the 1923 entries should finish in 1929. During the present year, therefore, only those who had failed at some point or other, would be taking the final examination. It was therefore to be expected that this year would show a minimum output.

The Drift to Edinburgh.—It is noticed with regret that the tendency for students to transfer to Edinburgh continues. It is now becoming accepted as an established practice that any student dissatisfied with his progress or with the results of his examinations, shall forthwith sever his connection with the College, travel to Scotland and enter as a candidate for the Scottish Triple Qualification.

During the last ten years, thirty students have taken this step. Of these fourteen were scholars or exhibitioners and eight were Government students.

The tendency is to be regretted in that so many students, by severing their connection with the College, should cut themselves off from membership of the body corporate of the College as a whole, comprehending council, senate, licentiates and students. This deprivation may appear intangible, but it causes a definite loss of the sense of esprit de corps.

Post-graduate Studies in Britain.—While regretting the fact that so many students have thought fit to interrupt their studies at the College, and to proceed elsewhere in search of what they regard, rightly or wrongly, as a more easily obtained qualification, I wish to make it clear that every encouragement is given to those who after qualification can command the resources to enable them to seek higher diplomas and to undertake courses of post-graduate study. At present two students who qualified in 1927 are at work in London, and satisfactory reports of their progress have been received.

Buildings and Equipment.—Minor changes in the arrangement of various laboratories have been carried out during the year, and several deficiencies in equipment have been made good. Details of the work in the various sections are given in Appendices *L* to *O*, page 124.

The Professor of Physiology has made changes which increase the accommodation and improve the amenities of the laboratories in this charge, *viz.*, those of histology, experimental physiology and metabolism. This has necessarily interrupted the course of his research work, but should add considerably to the efficiency of the practical teaching of physiology.

The Curriculum.—Parts of the course have been rearranged. Organic chemistry is now taken in the second year. General pathology is taken in the fourth year, and at the end of this year the professional examination in general pathology and bacteriology, materia medica and pharmacology is held. Special pathology is taken in the final examination. Public health and medical jurisprudence have been transferred to the final year, and are included in the subjects of the final examination. The course as now planned conforms completely with the arrangements in English schools of medicine.

The automatic rota for the arrangement of the hospital appointments introduced as an experiment in 1927 has been found unnecessarily cumbersome and unworkable in practice. It has therefore been discontinued and a return has been made to the simpler system previously in use. In planning the allocation of students to the various duties, care is taken to maintain the right balance between the different duties, and to secure that each student has his full share of responsible hospital duty.

VI.—MATERNITY AND CHILD WELFARE ACTIVITIES IN THE STRAITS SETTLEMENTS.

I.—MATERNITY HOSPITALS

There are Government Maternity Hospitals in both Singapore and Penang, and maternity wards in several of the Government District Hospitals, in the Church of England Mission Hospitals at Singapore and Malacca, and in the Kwong Wai Shiu Hospital, Singapore, a charity supported by the Cantonese community.

Return of women admitted to and delivered in Maternity institutions in the Straits Settlements, 1928.

	Admitted	*Delivered*
1. Maternity Wards, General Hospital, Singapore	908	874
2. Free Maternity Hospital, Kandang Kerbau, Singapore	1,497	1,304
3. Maternity Ward, St. Andrew's Mission Hospital, Singapore ...	266	255
4. Maternity Ward, Kwong Wai Shiu Hospital, Singapore	481	454
5. (1) King Edward VII Maternity Hospital, Penang	1,238	966
(2) Maternity Wards in Province Wellesley and Lumut Hospitals ...	55	55
6. Maternity Ward, St. David's Mission Hospital, Malacca	90	90
7. Maternity Wards in Malacca and other District Hospitals ...	69	69
Total ...	4,604	4,067

II.—TRAINING AND WORK OF MIDWIVES

Numbers of midwives are trained at the Government Hospitals; a few are trained at the two mission hospitals.

Class A midwives comprise women with sufficient English education to undergo a 12 months training and examination similar to the C.M.B. at home: they receive a Diploma. Nurses with British diplomas are registered in this class also.

Class B midwives comprise Asiatics of lower education, who undergo a practical training given in Malay, for from six to nine months, and pass a practical examination.

Class C consists of women who have been registered, though unable to pass an examination, because they were in regular practice before the passing of the Midwives Ordinances.

The number of registered midwives in the Colony is:—

Settlement	*Singapore*	*Penang*	*Malacca*
Class A	117	44	4
Class B	275	107	15
Class C	27	17	12
Total ...	419	168	31

The number of Births in the Colony in 1928 was 39,479.

Of some 26,000 Births in Singapore and Penang Islands, nearly three-quarters were attended by trained midwives.

III.—INFANT AND CHILD WELFARE SERVICES

These are conducted by the Municipalities of Singapore, Penang and Malacca, within their boundaries, by the Singapore Child Welfare Society, and, in the rural areas, by Government.

A.—Municipalities

The Singapore Municipality has six qualified sisters. Four of these, supervise the work of local registered midwives. The other two are in charge of infant welfare clinics. There are 14 educated Asiatic Health visitors, with the local C. M. B., working under these sisters. Four of these visitors attend poor maternity cases; there is also a panel of medical men, who attend such cases and receive fees from the Municipality.

An European lady medical officer is about to be engaged.

Penang Municipality employs two European sisters and eight locally qualified midwives.

Malacca Municipality employs two health visitors under the supervision of a Government European health sister.

B.—The Singapore Child Welfare Society

This Society was incorporated in 1923 under the Presidency of Lady Guillemard.

Lady Clifford, C.B.E., succeeded Lady Guillemard as President in June, 1927.

The object of the Society is to assist the welfare of mothers, expectant and actual, and infants and children up to school age (6 years).

To avoid overlapping, it leaves the care of infants up to one year as far as possible to the Singapore municipal service.

The committee comprises a nominee of His Excellency the Governor, nominees of various local associations, and members elected by the Society. It is not connected with any religious body; it is supported by voluntary contributions and an annual Government grant of $2,000.

Over $50,000 was raised for it by the Chinese community in 1925.

Under the active guidance of the President, the activities of the Society are manifold.

It maintains two centres, each staffed by a trained Matron and two Chinese health visitors.

Three doctors give their services free.

Much home visiting is done and milk is distributed to poor families.

A baby show, open to all nationalities, is held annually. Over $800 was given in prizes last year.

The society manages a children's playground and expects to establish creches and play rooms shortly.

C.—Government Health Branch

Three government health sisters, with the assistance of seven health nurses, conduct clinics, and do home visiting in the rural areas of the three Settlements of the Colony.

They are supervised by health officers.

The clinics are held at various centres on stated days and hours.

The educational and preventive aspect of infant welfare work is kept in view; mothers are instructed in the colloquial.

There is a regular weekly itinerary of home visits in connection with the routes of the motor travelling dispensaries.

Treatment of the newly born is carried out in their homes, but other patients are referred to the travelling dispensary, to which many infants are also sent for vaccination.

Roadside advice is also given to mothers and children who collect at points on the scheduled routes.

Baby shows are held in rural districts and health lectures are given to women school teachers and to inhabitants of villages and Kampongs.

C Class midwives are supervised and instructed.

D

Combined return shewing visits paid to homes and attendances at Child Welfare Clinics in 1928.

	Visits to homes		*Attendances at Clinics*	
Municipalities:—				
Singapore ...	96,232		13,959	
Penang ...	44,100		...	
Malacca ...	20,440		1,255	
		160,772		15,214
Singapore Child Welfare Society ...		30,508	...	13,780
Government:—				
Singapore ...	27,620		4,542	
Penang ...	19,635		17,468	
Malacca ...	22,294		4,071	
		69,549		26,081
Grand total ...		260,827		55,075

IV.—ASSOCIATED ACTIVITIES

A

Womens' and childrens' dispensaries are conducted by Government in Singapore and Penang and by missions in Singapore and Malacca. The dispensaries are staffed by lady medical officers.

The returns for 1928 are:—

	New patients	*Repetitions*	*Total*
Women and children's Dispensary, Kandang Kerbau, Singapore (9,260 of the 15,495 were children)	15,495	19,727	35,222
Women and children's Dispensary, Penang	6,659	10,683	17,342
St. Andrew's Missions Dispensary, Singapore	3,617	7,562	11,179
St. David's Mission Dispensary, Malacca	...	...	6,620
Total ...	25,771	37,972	70,363

B

There were 79,220 attendances at the motor travelling dispensaries in 1928, of whom a considerable proportion were women and children.

C

CHILDREN'S WARDS

There are wards specially for children at three Hospitals in Singapore, under the charge of lady medical officers: many of the children are admitted in a dying condition.

The returns for 1928 are:—

CHILDREN'S WARDS

	Admitted	*Discharged*	*Died*
General Hospital, Singapore ...	601	399	168
Kandang Kerbau Hospital, Singapore	442	259	183
St. Andrew's Mission Hospital, Singapore	577	439	138
Total ...	1,620	1,097	489

D

The St. David's Mission Hospital, Malacca admitted 522 women and children to a womens' and childrens' ward in 1928.

There are womens' wards at every hospital in the Straits Settlements.

VII.—HOSPITALS, DISPENSARIES AND VENEREAL CLINICS

I.—Total inpatients treated and mortality in all Hospitals of the Colony for the past four years:—

Year	Number treated 1st and 2nd Class wards	Number of deaths 1st and 2nd Class wards	Number treated 3rd Class wards	Number of deaths 3rd Class wards	Total 1st, 2nd and 3rd Class wards		Percentage of deaths 1st and 2nd Class wards	Percentage of deaths 3rd Class wards	Percentage of deaths on total treated
					Cases	Deaths			
1925	3,965	198	50,371	4,074	54,336	4,272	4·94	8·80	7·80
1926	7,614	387	60,400	5,346	68,014	5,733	5·09	8·85	8·42
1927	7,192	407	64,483	6,108	71,675	6,515	5·66	9·45	9·06
1928	6,256	410	59,947	5,588	66,203	5,998	6·71	9·33	9·06

II.—The total number of inpatients treated and the total deaths in the hospitals of the Colony for some of the more important diseases are shown in the sub-joined table with the corresponding figures for the preceding three years.

Diseases	1925		1926		1927		1928	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Malarial Fevers	7,042	429	14,203	984	15,426	949	13,181	932
Dysenteries	1,295	366	1,987	575	1,561	511	1,418	501(*a*)
Diarrhœa and Enteritis	696	67	928	89	1,412	158	856	123
Beri-beri	995	150	1,228	221	1,786	361	1,499	236
Pulmonary Tuberculosis	1,966	819	1,964	853	1,941	952	1,866	920
Enteric Fever	139	78	258	85	302	132	347	145
Ulcers	3,357	2	4,795	4	3,266	5	5,392	5
Venereal Diseases	4,721	109	5,371	115	4,983	95	4,402	151
Ankylostomiasis	4,499	123	4,322	174	4,012	102	3,037	84

(*a*)—Dysentery Amœbic ... 796 cases — 252 deaths.
" Bacillary ... 507 " — 212 "
" Unclassified ... 207 " — 34 "

III. The following terminal causes of death were noted in 895 fatal malarial cases:—

	Penang Hospitals	Malacca Hospitals	Singapore: Tan Tock Seng Hospital	Singapore: General Hospital	Total
Coma ...	79	55	61	12	207
Cardiac failure ...	180	48	122	58	408
Pneumonia ...	18	—	—	7	25
Enteritis ...	19	5	—	3	27
Ankylostomiasis ...	7	—	1	2	10
Nephritis ...	4	—	—	1	5
Ruptured spleen ...	—	—	—	1	1
Cerebral Malaria ...	—	—	—	5	5
Tuberculosis ...	—	—	2	3	5
Gangrene Scrotum	—	—	—	1	1
General Peritonitis (following Enteric) ...	—	—	—	1	1
Senility ...	—	—	—	1	1
Cirrhosis of the liver	—	—	—	1	1
Pneumonia ...	—	—	11	6	17
Anæmia and Ascaris	—	—	—	1	1
Blackwater fever ...	—	—	—	1	1
Enteric ...	1	—	—	5	6
Dysentery ...	7	—	6	2	15
Acute atrophy of the liver ...	6	2	1	1	10
Hyperpyrexia ...	35	12	3	—	50
Cachexia ...	20	13	20	—	53
Heart failure ...	39	—	—	—	39
Pericarditis ...	—	—	—	1	1
Beri-beri ...	—	—	—	5	5
					895

IV. The approximate daily cost of diets per head in the Colonial Hospitals was:—

			$ c.
First Class ...	... Full diet	... ...	2 45
First Class ...	... Half ,,	.. ...	2 40½
Second Class ..	... Full diet	... ...	1 93½
Second Class ...	... Half ,,	... ...	1 69½
Third Class (Chinese)	... Full diet	... ...	24¼
Third Class (Chinese)	... Half ,,	... ...	50¼
Third Class (Chinese)	... Milk ,,	... ...	32½
Third Class (Tamils)	... Full diet	... ...	26½
Third Class (Tamils)	... Half ,,	... ...	50
Third Class (Tamils)	... Milk ,,	... ...	32½
Third Class (Sikhs)	... Full diet	... ...	50½
Third Class (Sikhs)	... Milk ,,	... ...	48¾
Third Class (Bengali)	... Full diet	... ...	43¼
Third Class (Bengali)	... Milk ,,	... ...	48¾

V.—OUT-DOOR DISPENSARIES

Year	*Total patients*	*Total attendances*
1928	190,749	333,106
1927	166,428	313,264
1926	159,903	312,090
1925	154,420	273,841
1924	96,284	167,934
1923	73,343	139,656

The number of out-patients for Yaws was 7,870 against 7,971 in the previous year. There is a decrease in the disease owing to widespread effective treatment of the sufferers.

The attendances at the Women's and Children's Dispensary, Kandang Kerbau, Singapore, were 35,222 compared with 33,888 in 1927.

The attendances at the travelling dispensary in Province Wellesley, were 17,712 and in Penang 31,688.

In Singapore the attendances at the travelling dispensary were 18,415, and in Malacca 15,037.

VI.—BUILDINGS

1. The New Mental Diseases Hospital at Trafalgar, Singapore, was completed during the latter half of 1928 and all the mental cases at Sepoy Lines and Pasir Panjang Lunatic Asylums and the Straits Settlements patients at Tanjong Rambutan were moved to it before the end of the year.

On each side of the Administration Block are the rooms accommodating 32 first class patients, male and female. There are 120 beds for lunatics, and 18 for staff in the infirmary, and there is room for 80 lunatics in the infectious diseases hospital where tubercular and dysentery cases are housed. The main wards consist of compact one storied blocks, each of two wards, with a central corridor. The blocks are separated by fences, and accommodate a total of 900 males second and third class.

On the female side there are three similar blocks accommodating 300 females.

Water is provided from the new Johore scheme, and there is a complete modern sanitary system. There is an electric light plant and kitchens with steam cooking arrangements.

Houses for the medical and assistant medical superintendent, and for two members of the local medical service, and for the matron, sister, probationers and dressers are within easy distance of the administration block. There is also housing for some 150 subordinates.

The lunatics in residence at present number over 1,000, and are increasing at the rate of about 50 yearly.

The mental hospital is situated at Trafalgar in the midst of an area of some 200 acres which it is intended to farm with labour provided by the patients.

2. In Penang 20 huts have been completed in Camp *E* of the Leper Settlement and 28 more are in process of construction. Extensive gardens will be provided for the lepers on this site. A jetty at this camp has also been completed.

Extensive alterations and additions have been made to the Eurasian Camp and to the older wards in Camp *A*.

3. In Malacca the new first class maternity ward at Durian Daun Hospital was finished in November. The new out-door dispensary in Church Street was opened on 1st November. It provides separate accommodation for male and female general dispensaries, and for a venereal clinic.

Three isolation wards, each consisting of two rooms, with verandah, cooking accommodation, bathing place and latrine were built at the Malacca quarantine camp as a gift from a local Chinese gentleman, Mr. Teo Tiang Chye.

VIII.—PRISONS AND MENTAL HOSPITAL

A.—PRISONS

(*a*) *Singapore Prison*

ANNUAL MEDICAL REPORT OF THE SINGAPORE PRISON FOR THE YEAR, 1928

By Dr. J. M. A. Lowson, m.b., ch.b.

1. The health of the prisoners was satisfactory, though the number of deaths is higher than in 1927, owing to the greatly increased daily number of prisoners.

2. The water-carriage sewage disposal system worked on the whole well. The dump outide "D" Hall gave some trouble on occasions.

3. *Admission to the Prison Hospital.*—There were one thousand one hundred and three (1,103) admissions including nine Europeans and three Eurasians. This with twenty-six (26) remaining from the previous year gives a total of one thousand one hundred and twenty-nine (1,129). The average daily sick was 33·90.

4. *Principal diseases treated were*:—

(*a*) Dysentery (1) B. Flexner	8	(*d*) Venereal Diseases ...	62
(2) B. Shiga ...	4	(*e*) Pulmonary Tuberculosis	21
(3) paradysenteric Bacilli ...	9	(*f*) Malaria	12
(*b*) Amœbic Dysentery ...	1	(*g*) Diarrhœa	97
(*c*) Unclassified Dysentery ...	15	(*h*) Dyspepsia	14
		(*i*) Injuries	33

The number of cases of Pulmonary Tuberculosis treated shows a rise, but I do not ascribe this to any cause within the Prison.

5. *Deaths.*—There were 28 deaths in the Prison Hospital; of these three occurred within 48 hours of admissions.

6. *Causes of deaths*:—

(*a*) Pulmonary Tuberculosis	12	(*f*) Cerebral Hæmorrhage ...	2
(*b*) Acute Miliary Tuberculosis	1	(*g*) Anæmia	2
(*c*) Malaria	2	(*h*) Enteric Fever ...	1
(*d*) Bacillary Dysentery ...	4	(*i*) Septicaemia	1
(*e*) Acute Lobar Pneumonia ...	2	(*j*) Asthma and Chronic Bronchitis	1

7. Eight cases were transferred to the General Hospital for treatment and major operations. Of these 5 died.

8. Fourteen vagrants with serious complaints were transferred to Tan Tock Seng Hospital for treatment.

9. Transfers to Leper Asylum—3. (Criminals 2 and 1 Vagrant).

10. One transfer to the Mental Hospital—a criminal.

11. Suicide by hanging—one criminal.

12. *Executions.*—There were six—four Chinese, one Tamil and one Boyanese.

13. The figures of the different classes of Prisoners are shown from the following tables:—

	Criminals	*Civil*	*Vagrants*
(*a*) Total population in Prison ...	5,232	6,816	1,057
(*b*) Average daily number in Prison	1,001	251·8	100
(*c*) Total treated in Prison Hospital	874	85	144
(*d*) Percentage of *c* to *a* ...	16·7	1·9	13·6
(*e*) Total deaths in Hospital . .	21	3	4

14. Six hundred and thirty-seven prisoners were examined for Wassermann during the year. Of these 341 were positive giving a percentage of 53·5 and 296 were negative. Out of the positive Wassermann cases 194 were willing to receive N.A.B. injections; of these a good many refused to have the full course.

Four hundred and eighty-nine N.A.B. injections and two hundred and seventy-eight Bismo-Stab injections were given during the year.

(*b*) Penang Prison

1. *Admissions.*—

(*a*) There were 11 cases remaining in Hospital at the beginning of the year. Two hundred and seventy-six cases were admitted during the year, making a total of 287 cases treated in all, as compared with 172 cases in 1927.

(*b*) The daily average number of sick for the year was 12·29 as compared with 10·21 for the previous year.

2. *Diseases.*—The principal diseases treated among the inpatients were—Malaria 67, Tuberculosis 17; Venereal Diseases 14; Diseases of the Respiratory System 22; Bowel disorders 37; Ankylostomiasis 5; Skin Distases 49; Injuries 3.

3. *Deaths.*—

(*a*) There were six deaths during the year with a death-rate of 2·09% as compared with eight deaths and a death-rate of 4·65% of previous year.

(*b*) The causes of death were—Tuberculosis one; Debility one; Heart Failure one; Pneumonia one; Diarrhœa one; Dysentery one.

4. *Out-Patients.*—

(*a*) Two thousand nine hundred and twenty-seven cases were treated as Out-patients during the year as compared with 1,292 cases in the previous year.

The average daily attendance was 32·05. The principal diseases treated among Out-patient's were—

(*b*) Venereal Diseases 280; Opium habit 205; Diseases of Respiratory System 382; Bowel Disorders 431; Skin Diseases 457; Wounds and Injuries 177.

5. *Wassermann Reaction.*—

(*a*) One thousand one hundred and eighty-six specimens of blood were taken for the Wassermann test as compared with 997 in 1927.

(*b*) Three hundred and twenty-two gave a positive result as against 274 in the previous year.

(*c*) Two hundred and ninety-one intravenous injections of N.A.B. were given as against 240 in 1927.

(*d*) One thousand and fifty-five bismuth preparations were given as against nil in 1927.

6. *Hookworm.*—

(*a*) One thousand two hundred Specimens of Stool were examined for ova of intestinal parasites, etc., as compared with 1,042 in the previous year.

(*b*) Six hundred and seventy-two were found to be positive to ova as compared with 569 in 1927. Five hundred and thirty-nine were treated for hookworm.

7. *Prison Strength.*—There were 199 prisoners and 65 vagrants remaining at the beginning of the year. Three thousand five hundred and eight were admitted during the year under review of the total admitted 2,986 were prisoners and 522 vagrants. The number of prisoners and vagrants remaining on 31st December, 1927, were 225 prisoners, 81 vagrants, respectively.

8. *Judicial Hanging.*—There were four cases of judicial hanging during the year.

9. *Health.*—The sanitary condition of the prison, and the health of the prison staff and prisoners were satisfactory throughout the year.

There was no outbreak of Infectious Disease.

(*c*).—Malacca Prison

There were 74 admissions to the Prison Hospital with one death. There were nine cases of Malaria. The average number of sick was 0·55.

The daily average number of inmates was as follows:—

Prisoners	...	...	...	68·40
Remands	...	...	...	6·41
Vagrants	...	...	...	16·54

There were two executions during the year.

B.—SINGAPORE MENTAL HOSPITAL.

BY DR. E. R. STONE, M.B., B.C., M.R.C.S., L.R.C.P., *Medical Superintendent*

1. The mental hospital at Trafalgar was first occupied in September, 1928, by the male mental cases from Pasir Panjang Asylum: during September and October, 1928, the remainder of the mental patients and the staff were moved from Sepoy Lines and Pasir Panjang Asylums. The Straits Settlements mental patients formerly boarded out at the central mental hospital, Tanjong Rambutan, were accommodated in the new mental hospital, the females on 17th November, 1928, and the males on 18th December, 1928.

2. There remained on 31st December, 1927, six hundred and thirty-four males and one hundred and forty-six females. One hundred and eighty-five males and ninety-three females were transferred back to Singapore Mental Hospital from the Central Mental Hospital, Tanjong Rambutan.

The total treated was one thousand three hundred and forty-seven persons

3. Of the admissions nineteen males and thirteen females had previously been under treatment in Singapore institutions for the insane.

4. Of the total treated one hundred and one males and twelve females were discharged as recovered; thirty males and fourteen females as improved; ten males and five females as not improved, and three males and two females as not insane on admission. Nine males and one female absconded. One hundred and thirty-two males and twenty-eight females died.

5. There remained on 31st December, 1928, seven hundred and thirty males and two hundred and seventy females.

6. The average daily number was 645.68 males and 172.28 females.

7. The maximum and minimum daily numbers respectively were one thousand and ten and seven hundred and seventy-three.

8. The nationalities of the admissions were:—

	Males	*Females*
British	5	3
Other Europeans	2	0
Eurasians	2	4
Chinese	212	64
Tamils	46	9
Malays and allied races	14	7
Others	4	6

9. The physical condition of those admitted was:—

	Males	*Females*
Good	181	42
Fair	82	37
Impaired	14	10
Greatly impaired	8	4

10. Twenty-three patients died within one month of admission.

11. Of the new admissions during 1928 forty-one cases had a history of previous insanity. The Wassermann reaction for syphilis was positive in 37 per cent of those admissions in which such a blood examination was undertaken.

12. The recovery rate for the year was 29.89.

13. Criminal population—there remained on 31st December, 1927:—

	Males	*Females*
(*a*) Criminal lunatics	29	3
(*b*) Lunatic criminals	10	0
During 1928—Criminal lunatics:—		
(*a*) Number admitted	6	0
(*b*) Transferred to Tanjong Rambutan ...	0	1
(*c*) Number who recovered and were returned to the civil prison	2	2
(*d*) Number who were not insane on admission and were returned to the civil prison ...	1	0
(*e*) Number who died	3	0
Lunatic criminals:—		
(*a*) Number admitted	2	0
(*b*) Number whose sentence expired ...	2	0
(*c*) Number who recovered	2	0
There remained on 31st December, 1928:—		
(*a*) Criminal lunatics	29	2
(*b*) Lunatic criminals	8	0

14. *Mortality.*—The death-rate based on the average daily number was 19.56.

The chief causes of death were dysentery, general paralysis of the insane, and pulmonary tuberculosis, the former causing 41 per cent of the total deaths. One suicide occurred during the year.

15. *Industries.*—Seven thousand six hundred and eighty yards cotton cloth were woven by the male patients for use in the institution. More looms will shortly be in use in the loomshed.

A sewing woman was obtained who is able also to supervise the work of female patients engaged in sewing.

During the latter part of 1928 a large number of patients were employed on work in the grounds of the new mental hospital and gardening was commenced there.

16. Judging by admissions the incidence of insanity in the Straits Settlements has shown little change in the last three years.

17. Revenue was $17,244.05.

18. Dr. G. B. Leicester continued his duties as Assistant Medical Officer and Dr. Abdul Samat assumed duty as Assistant Surgeon on 20th September, 1928.

IX.—METEOROLOGICAL

Since 1869 the Medical Department has kept records of the rainfall, temperature, humidity and barometer.

The mean temperature for the year was above the normal: it was 79.7° F. in Singapore, 82° F. for Penang, 80° F. for Province Wellesley and 79° F. for Malacca.

The driest month in Singapore was June, 93 millimetres, and the wettest November, 429 millimetres of rain.

The total rainfall for the year in Singapore was 2,775 millimetres as against 2,576 millimetres in the previous year.

The driest month in Penang was February when 10 millimetres of rain fell. The wettest month was September, 506 millimetres of rain. The total rainfall for the year in Penang was 2,263 millimetres as against 2,276 millimetres in 1927.

The driest month in Malacca was February, 104 millimetres of rain. The wettest month was October, 379 millimetres. The Malacca rainfall totalled 3,130 millimetres as against 2,623 millimetres in 1927.

An effort to bring the meteorological conditions to the notice of the inhabitants was continued by furnishing the most important data to the Singapore European papers daily. It is gratifying to note that the reports are displayed in a suitable part of the paper, where they can catch the eye without difficulty.

A further effort has been made to inform the public of the weekly condition of the various hill stations, in the neighbourhood. The returns from Garoet in Java, and Brastagi in Sumatra, are a weekly mean of returns taken during several years' past, since it is impossible to obtain a weekly telegram without payment. The returns from Penang Hill, Taiping Hill and Fraser's Hill are telegraphed to the department each week.

Meteorological returns for the year will be found in Table *IV* and also two graphs showing the wettest and driest months since 1869, and the annual rainfall in inches and millimetres since 1862, *vide* page 167.

X.—SCIENTIFIC (Appendices)

The following reports are attached as Appendices:—

A. Report on Leper Settlement, Singapore.

B. Report on Treatment of Leprosy in Pulau Jerejak Leper Settlement.

C. Report on Pathological Branch, Straits Settlements.

D. Report on the Government Analyst's Branch, Straits Settlements

E. Report on General Hospital, Singapore.

F. Report on Treatment of Opium Habit.

G. Report on Women's and Children's Dispensary, Kandang Kerbau.

H. Report on Schools, Straits Settlements.

I. Report on Social Hygiene.

J. Scientific Report by Professor of Biology.

K. Scientific Report by Professor of Bacteriology.

L. Scientific Report by Professor of Bio-chemistry.

M. Scientific Report by Professor of Physiology.

N. Final Report on the Straits Settlements rural Sanitation Campaign.

A. L. HOOPS,
Principal Civil Medical Officer,
Straits Settlements.

APPENDIX "A"

LEPER ASYLUMS

I.—Leper Asylum, Singapore

Report by Dr. E. D. Lindow, M.R.C.S., L.R.C.P.

1. *Male Leper Camp—*

Remained on 31st December, 1927	29
Admitted during 1928	91
	120
Discharged during 1928	—
Died ,, ,, ...	8
Absconded ,, ,, ...	9
Transferred to Pulau Jerejak	53
Remaining on 31st December, 1928	50
	120

Immediate Causes of death—

Sapræmia from septic ulcerations	1
,, ,, advanced leprosy	5
Tuberculosis of lung and gut	2
	8

2. *Female Leper Camp—*

Remained on 31st December, 1927	55
Admitted during 1928	19
	74
Discharged during 1928	1
Died during 1928	8
Absconded during 1928	1
Remaining on 31st December, 1928	64
	74

Immediate Causes of death—

Sapræmia from septic ulcerations	1
,, ,, advanced leprosy	4
Dysentery	2
Tabes Mesenterica	1
	8

	Male	*Female*
Return of injections administered—		
Ol. Hydnocarpus with .5% Iodine ...	252	382
Sod. Hydnocarpate with .5% Ac. Carbolic	1,233	1,731
E. C. C. O.	81	194
Alepol	443	606
Result of treatment—		
Cured	—	1
Marked improvement	2	5
Improvement	16	14
Stationary	89	42
Retrogressing	5	4

Treatment—

Intercurrent diseases such as ankylostomiasis, beri-beri, pulmonary tuberculosis and malaria were treated before anti-leprotic treatment was actually begun.

The main drug used in treatment was Sodium Hydnocarpate with .5% Ac. Carbolic injected intravenously. The commencing dose for adults is 1cc. increasing by .5 cc. at each subsequent injection (unless there is a reaction when the dose is diminished) till a maximum dose of 5 cc. is reached. Injections are given twice weekly.

Alepol was introduced towards the latter half of the year. It is used in a 1% solution with .5% Ac. Carbolic. This is given intravenously or subcutaneously twice weekly. The commencing dose for adults is 1 cc. increasing gradually by .5 cc. till a maximum dose of 5 cc. is reached. The drug is well tolerated and the results encouraging.

Assistant Surgeon N. W. Ahin was in charge of both camps.

APPENDIX "B"

ANNUAL REPORT OF THE LEPER SETTLEMENT, PULAU JEREJAK FOR THE YEAR ENDING 31ST DECEMBER, 1928

1. *Administration—*

The Chief Medical Officer, Penang, was the Visiting Medical Officer throughout the year.

The resident staff consisted of:—

Dr. A. H. Wheatley, Medical Specialist.

One Lay Superintendent.

Seven dressers.

The general health has been good.

Anti-malarial work has been continued.

Extensive laying of Subsoil pipes was carried out at Camp *C*. and *E*.

One thousand seven hundred and ninety-four gallons of anti-malarial mixture was used for oiling purposes.

The total rainfall during the year was 2,396 millimetres, as compared with 2,227 millimetres for 1927.

The maximum fall of rain on one day was 99·5 mm. on 7th September, 1928.

The water supply was deficient on 62 occasions. Water boats brought 3,988½ tons of water.

The reservoir at the old station has a concrete binding built on to its walls up to a level of 8 feet, and a dam was built at the foot of the ravine above this reservoir. This has improved it to a certain extent.

2. *Buildings. Old Leper Station—*

Wards 1 and 6 had further structural alterations done to them improving light and ventilating conditions greatly.

Wards 7, 8, 10 and 11 had five foot verandahs built on to them; and all cooking is now done in these verandahs.

A dhoby house is under construction.

Eurasian Camp.—An extension of 4 rooms, a new dining room, kitchen and bathrooms were completed.

New Leper Station.—Wards 1 and 2 have had extensive alterations done to them, improving the lighting and ventilating conditions.

Camp E.—Twenty huts have been completed. Thirty-four more are in process of construction. All out-buildings, dressers' quarters, store rooms, dispensary have been completed. The whole camp has been filled in with earth and levelled.

A Jetty was also completed at this camp.

3. *Inmates*—

There were 166 admissions as compared with 164 of 1927. Thirty of these were voluntary.

The daily average number was 743·97 as compared with 706·34 of 1927.

The greatest number on any one day was 774 on 16th December, 1928.

The number of deaths was 102, the lowest on record. The following shows the steady decrease in the death-rate:—

					Deaths	*Percentage*
1921	Remained 438					
	Admitted 217	655	...	...	201	30·68
1922	Remained 450					
	Admitted 249	699	...	...	186	26·06
1923	Remained 498					
	Admitted 190	688	...	...	140	20·34
1924	Remained 539					
	Admitted 187	726	...	...	130	17·90
1925	Remained 584					
	Admitted 247	831	...	...	117	14·
1926	Remained 703					
	Admitted 117	850	...	...	117	13·76
1927	Remained 707					
	Admitted 164	871	...	...	122	14·
1928	Remained 731					
	Admitted 166	897	...	...	102	11·37

Practically every inmate has received treatment for his leprous condition; the steady decrease in the death-rate shows how beneficial treatment is to all cases.

A full report on the treatment by the resident officer in charge is attached.

Tuition in English and Chinese has been regularly given to 16 lads.

The hills adjoining the new leper station have been cleared by the inmates, and vegetables, and fruit trees have been extensively planted.

Two hundred and twenty-four Hydnocarpus Wightiana trees are in flourishing condition, the tallest about 15 feet.

The piggery continues to be successfully worked by the inmates.

The English band formed amongst the Eurasians is a source of great delight to the inmates.

The Boy Scout Patrol of 16 lads has further improved. Photographs of this patrol are attached.

At Chinese New Year each inmate received twenty-five cents from the anti mendicity fund.

Visitors to the station have expressed their satisfaction at the housing, the evident contentment of the inmates, and the manner in which the camps are entirely worked by the inmates.

The following Returns are attached:—

A. Showing the number of admissions, total number of deaths, total number of inmates and the daily average for 1928.

B. The nationalities of the inmates.

TABLE *A*

SHOWING THE NUMBER OF ADMISSIONS, TOTAL NUMBER OF DEATHS, TOTAL NUMBER OF INMATES, AND THE DAILY AVERAGE FOR 1928

Year	Remained from Previous year	Colonial	Perak	Selangor	Kedah	Total	Deaths	Percentage of deaths to total treated	Daily average
1928 ...	731	142	...	...	24	897	102	11.37%	743.97

TABLE *B*

SHOWING THE NATIONALITIES OF INMATES FOR 1928

Nationalities	Colonial	Perak	Selangor	Kedah	Total
Bengali Islam ...	4	—	—	—	4
Bugis	1	—	—	—	1
Cantonese ...	174	64	—	12	250
Eurasian ...	12	1	—	—	13
Filipino	1	—	—	—	1
Fuichew ...	—	1	—	—	1
Hockchew ...	6	1	—	—	7
Hokkien	110	18	4	7	139
Hooichew ...	5	—	—	1	6
Howchew ...	1	—	—	—	1
Hylam	46	2	3	5	56
Hylock Hong ...	3	—	—	—	3
Indian Islam ...	7	—	—	2	9
Javanese ...	1	1	—	—	2
Kheh	73	33	26	12	144
Looichew	3	—	—	—	3
Macow ...	3	1	30	14	48
Malay	7	—	—	—	7
Shanghainese ...	1	—	—	—	1
Siamese	—	—	—	1	1
Tamil	59	19	4	26	108
Telugu	—	—	—	1	1
Teochew ...	74	3	1	13	91
Total ...	591	144	68	94	897

TREATMENT OF LEPROSY AT THE LEPER SETTLEMENT, PULAU JEREJAK, 1928.

BY DR. A. H. WHEATLEY, MEDICAL SUPERINTENDENT.

This has been carried out on the following lines:—

1. General 2. Special 3. Local

1. *General.*—Improvement of the general health by:—

(*a*) Treatment of concurrent diseases mainly malaria hookworm and syphilis.

(*b*) Good food, with plenty of fresh vegetables and fresh fruit.

(*c*) Cleanliness and skin sanitation daily.

(*d*) Exercise. Those who take much exercise appear to improve more rapidly.

(*e*) Constipation is very common in leprosy, and must be attended to, as a constipated leper will never improve.

2. *Special treatment.*—Hydnocarpus Wightiana oil with the addition of 4 per cent creosote is injected once weekly by subcutaneous infiltration in the following order.

1.	Extensor surface	Right arm.	5.	Right buttock.	
2.	Do.	Left arm.	6.	Left buttock.	
3.	Do.	Right forearm.	7.	Extensor surface	Right thigh.
4.	Do.	Left forearm.	8.	Do.	Left thigh.

Dosage.—1 and 2 4 ccs.
3 and 4 6 ,,
5 and 6 8 ,,
7 and 8 10 ,,

After a course of this, a two weeks rest is taken, and if the case is improving, a similar course is again given, but if there is no improvement, then Alepol, a sodium salt of the fatty acids of Hydnocarpus oil is commenced.

A 3 per cent Solution of this is injected once weekly by subcutaneous infiltration commencing with 1 cc and increasing by 1 cc up to a maximum dose of ccs. Another rest of two weeks is taken and then Alepol in 1 per cent Solution is given intravenously once weekly, commencing with 1 cc and increasing by 1 cc to a maximum dose of 10 ccs.

The majority of cases show improvement on these lines of treatment.

Adjuvant treatment with Potassium Iodide is very helpful. It has to be given with some caution; the temperature of the case must be recorded, and the drug lessened or withheld if much reaction occurs.

In mild cases with few skin lesions, the commencing dose has been 5 grains increased by 5 grains daily to a dosage of 30 grs. It is then increased to 40, 60, 80, 100, 120, 140, 160, 180 and 200 grains. These larger doses are taken at 3 or 4 days intervals, in divided doses, once in the morning, and once at bed time.

In severe cases, the commencing dose has been 1 grain daily, and increased by 1 grain daily to the point of toleration.

In either case mild or severe, if severe reactions do occur, the drug is withheld, and when the reaction has passed, treatment is again commenced with a smaller dose.

Nerve and bone pains are frequently complained of during potassium iodide medication, but they are easily relieved by aspirin, or sodium bicarbonate.

Lately Ephedrine Hydrochloride in ½ grain doses has been tried, and relieves these pains very effectively.

If reactions are severe in which fever remains persistent, intravenous injections of Potassium Antimonium Tartrate 0.04 gramme often stop the fever and reaction.

Adrenalin Hydrochloride M. 10 of a 1—1,000 solution in 20 minims of saline is also useful for this purpose.

3. *Local treatment.*—Injections into the skin lesions or nodules with Hydnocarpus oil or Alepol by the infiltration method by passing the needle in various directions from one puncture of the skin are very useful in reducing and obliterating them.

External painting with Acid Trichloracetic 1-5 for face lesions, 1 in 3 for body lesions, and 1 in 1 for nodules is helpful.

This should be done once in 8 days. Injections with pure carbolic and Tuba root 1 per cent into nodules were also tried, but they are not so effective as the oil or Alepol.

For ulcers, I have found that Icthyol 20 per cent, with Hydnocarpus oil, forms an excellent dressing, and cleans them up very rapidly.

A bacteriophage has been tried on 8 cases, two of whom shewed good improvement. It is too early to give a definite opinion, as it has only been 6 months on trial.

One precaution I have learnt by experience is not to press the larger doses of the Hydnocarpus Wightiana oil. If patients complain of much headache, giddiness, or a feeling of debility, after the large doses, it is best to stop the treatment for 2 or 3 weeks, and restart with the smaller doses.

Cases with eye lesions as iritis or any other inflamation should not be treated by injections, till the eyes have completely recovered.

The following number of cases have been under special treatment and considering that the average duration of the disease has been 6 years, the results have been very encouraging. No. of cases 316

Lesions disappeared	20
Definitely improved	146
Improved	130
Not improved	20

The majority of the chronic cases unsuitable for injection treatment have been given Hydnocarpus Wightiana kernels powdered in 20 grain doses. Some take pure Hydnocarpus oil in capsules to point of toleration, and practically every inmate has received treatment for his leprous condition.

The death rate has thus been greatly lowered from 30 per cent in 1921 to 11 per cent in 1928, the lowest on record.

Some illustrative cases are given in the following pages.

FEMALE LEPER CAMP, JELUTONG, PENANG

Annual Report for 1928

		Total
1.	Remained from 31-12-27	42
2.	Admitted during the year	14
3.	Absconded during the year	1
4.	Transferred during the year	1
5.	Died during the year	3
6.	The percentage of deaths for the year is	5·35
7.	The average daily number of patients	48·20
8.	Remained at the end of the year	51

9. *Treatment.—General*: All patients get Hydnocarpus oil internally up to toleration. Counter irritation with trichlor acetic acid is also carried out.

Selected.—Twenty-seven cases have been selected for the injection treatment which consists of:—(1) Subcutaneous injections of Hydnocarpus oil with 4 per cent creosote, once a week. Initial dose 2 cc. increased weekly by 2 cc. Maximum dose 10 cc. After a fortnight's rest, intravenous injections of 1 per cent solution of Sodium Hydnocarpate in normal saline, are given once a week. Dose similar to that of the oil injection. After another fortnight's rest the whole injection treatment is repeated.

10. *Result.*—Of the 27 cases selected, 13 cases show well marked improvement. The others are better than on admission.

11. *General.*—The construction of an enclosure in the garden as a poultry run has helped considerably towards keeping both the wards clean and free from flies.

The garden is worked by the inmates and is well stocked with vegetables for the use of the lepers.

During April an outbreak of chicken pox occurred in the female leper wards. Eleven cases were isolated into the quarantine camp. All recovered. Of the three deaths that occurred, two were old people with advanced leprosy lesions; the third was a girl of about 11 years of age with acute B. tertian malaria.

JESUDASAN
Duration of Leprosy one year.

JESUDASAN

After one year treatment.
Free from all signs of Leprosy.

NG SEE SIT

Duration of Leprosy three years.
Patches on face, body, arms.

NG SEE SIT

After two years treatment.
All patches have disappeared.

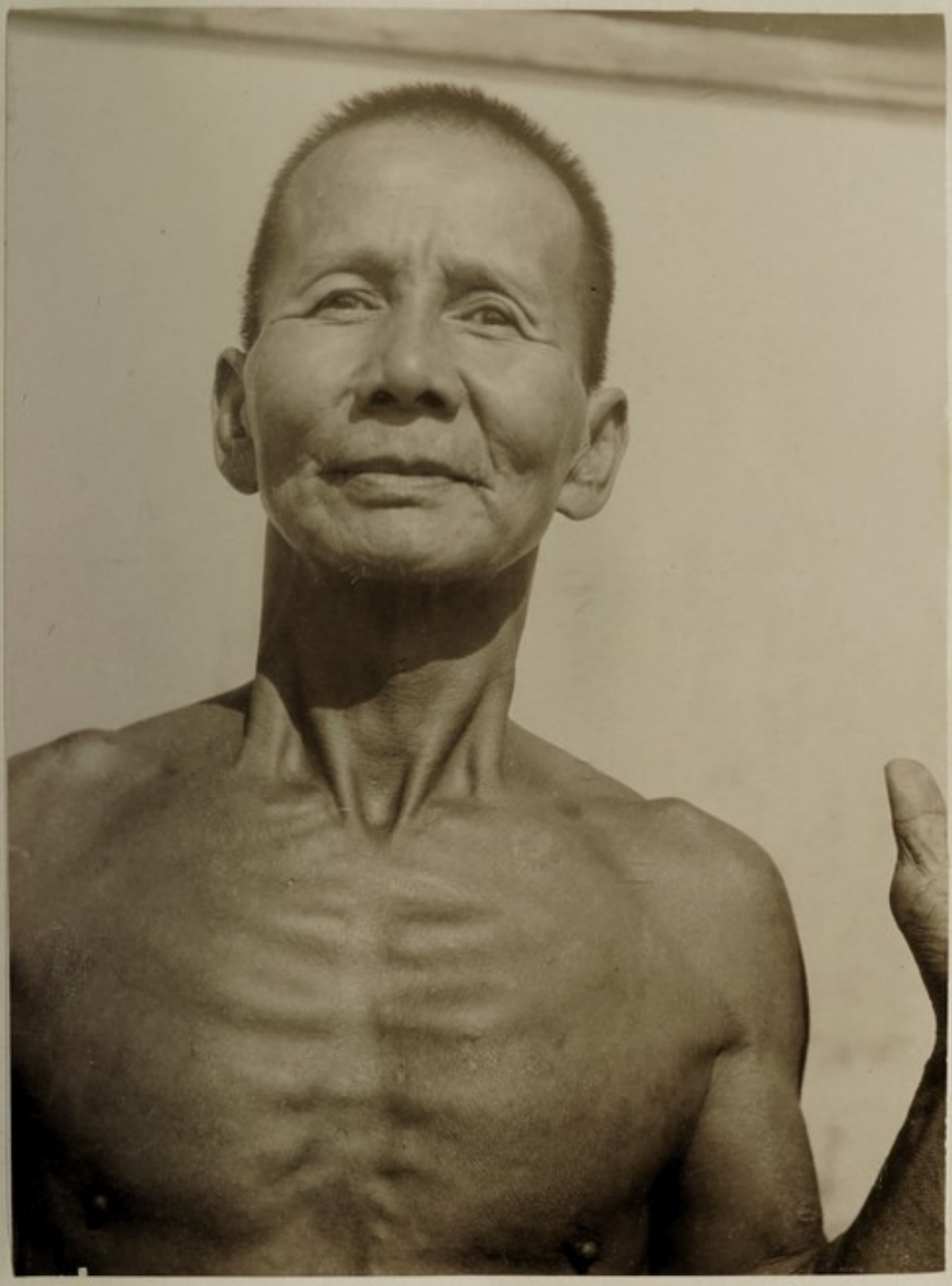
J. KING
Duration of disease two years.
Ears very thickened.
Small patches on face.

J. KING

After two years treatment.
Free from all signs of Leprosy.

CHAN AH ON

Duration five years.
Marked patches of Leprosy
on whole body.



CHAN AH ON

Free from all signs of Leprosy.
After 18 months treatment.

G. ROZARIO

Duration five years.
Marked thickening of ears.
Large patches on face.

G. ROZARIO

After three years treatment.
All Leprous patches have disappeared.

ONG NEE

Duration two and half years.
Nodules on face, large nodules on body.
Marked nodulae thickening of ears.

ONG NEE

After 18 months treatment.
Absence of all signs of Leprosy.

LOW KHYE TECK

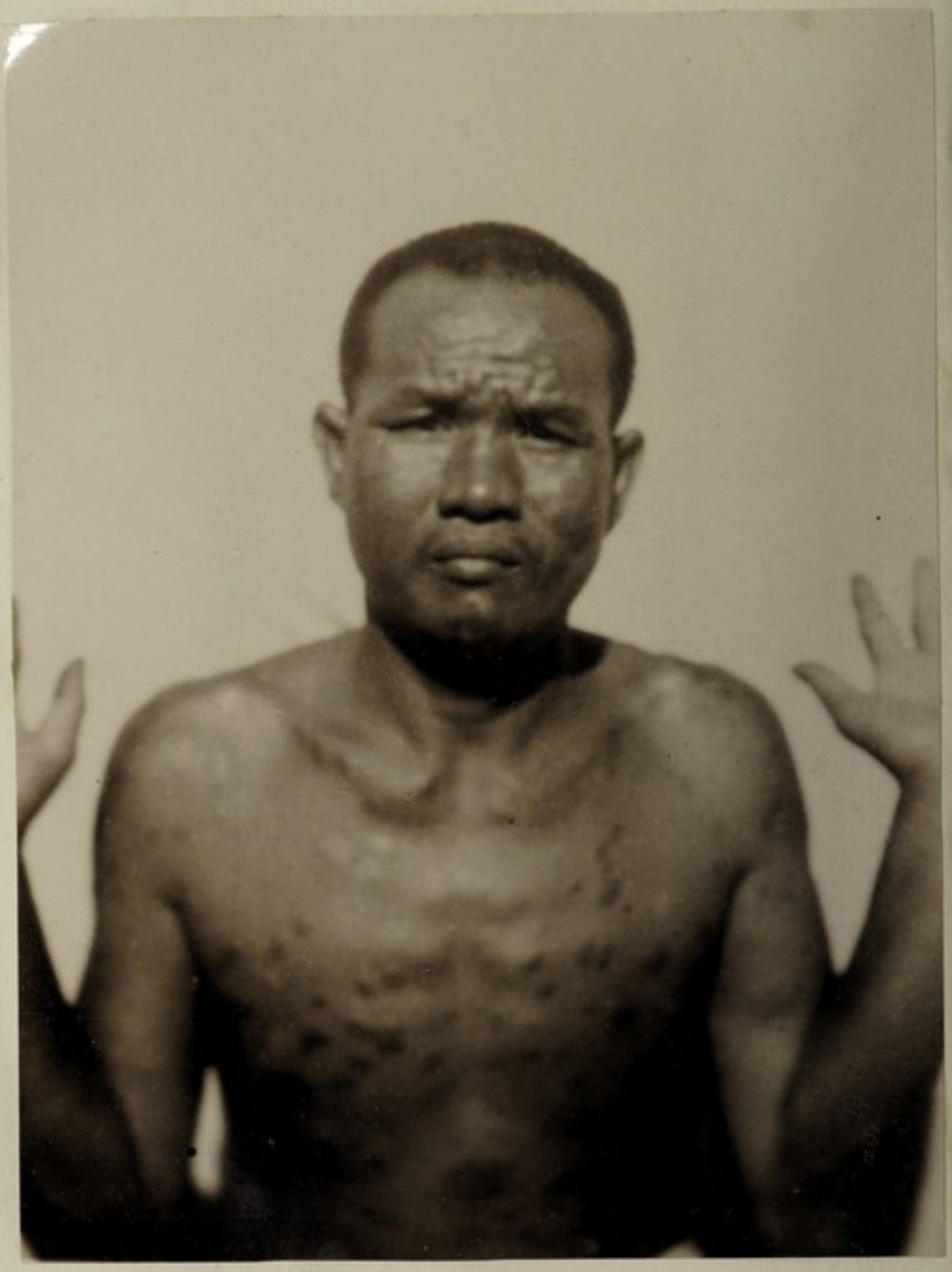
Duration six years.

Marked nodulae thickening of ears. Nodules on face.

Very emaciated and debilitated.

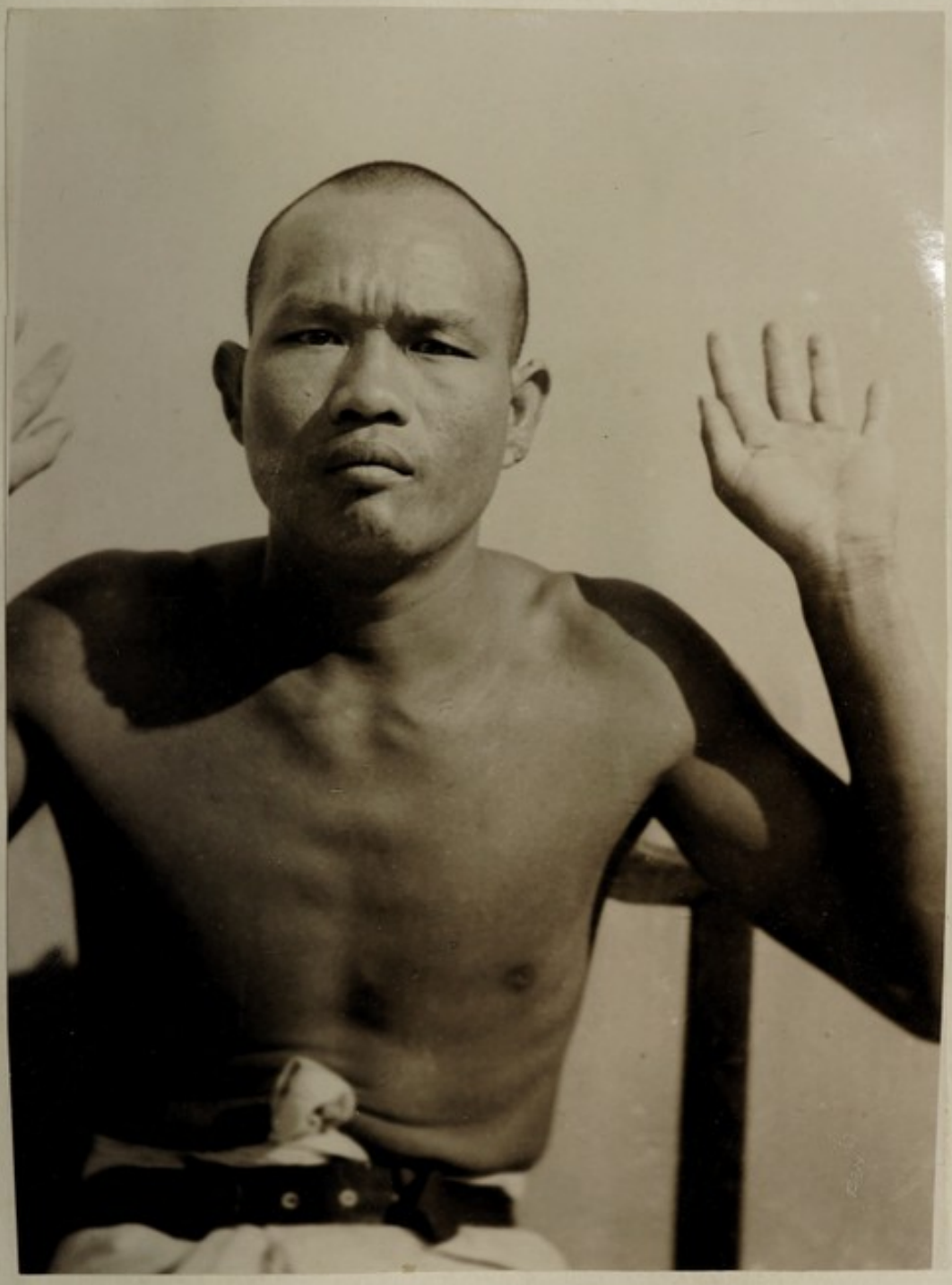
LOW KHYE TECK

After one year treatment.
Disappearance of all Leprous nodules.
An absolutely changed being.



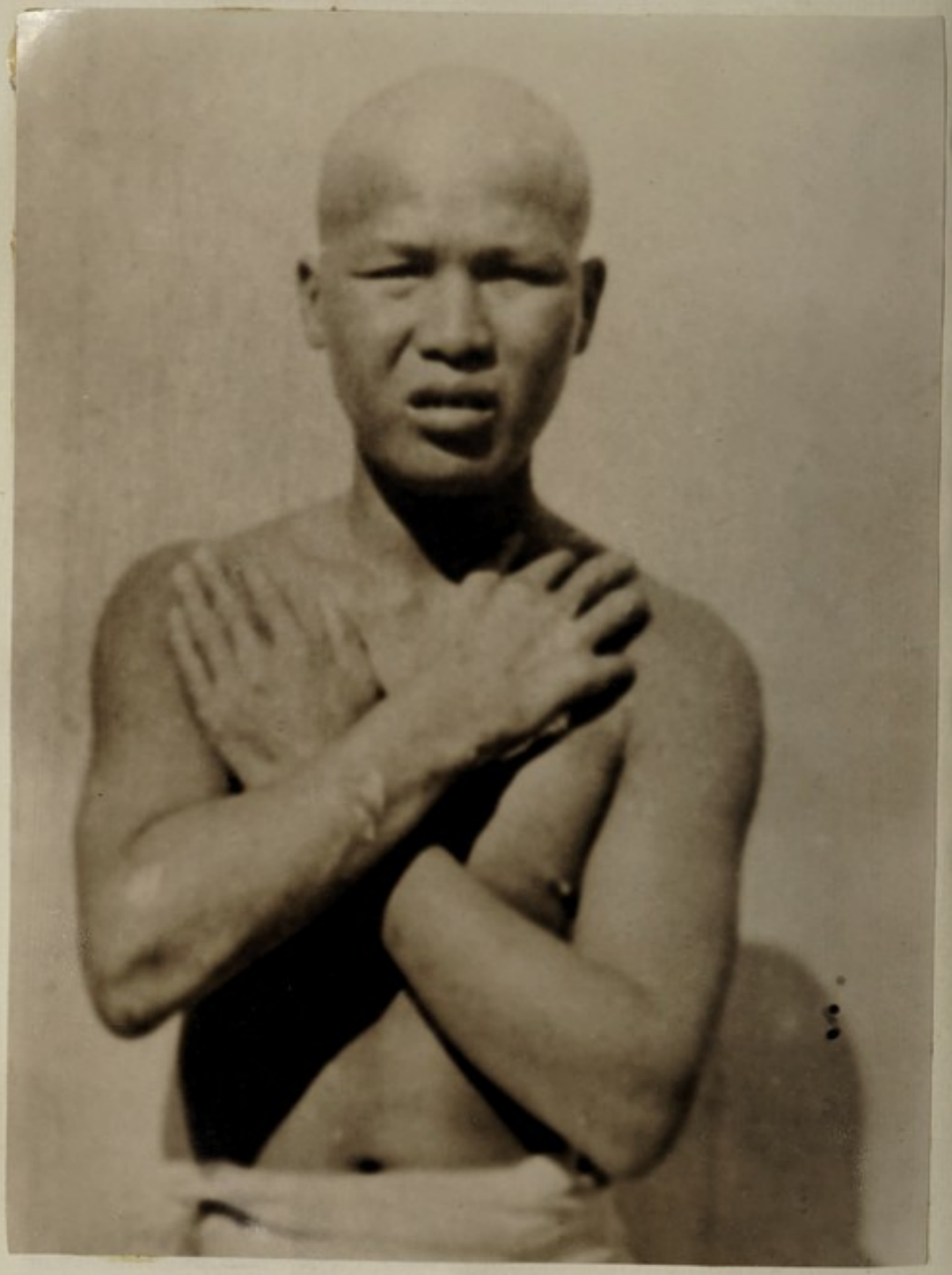
KWAN SENG

Duration three years.
Marked Leprous patches on face.
Nodules on body



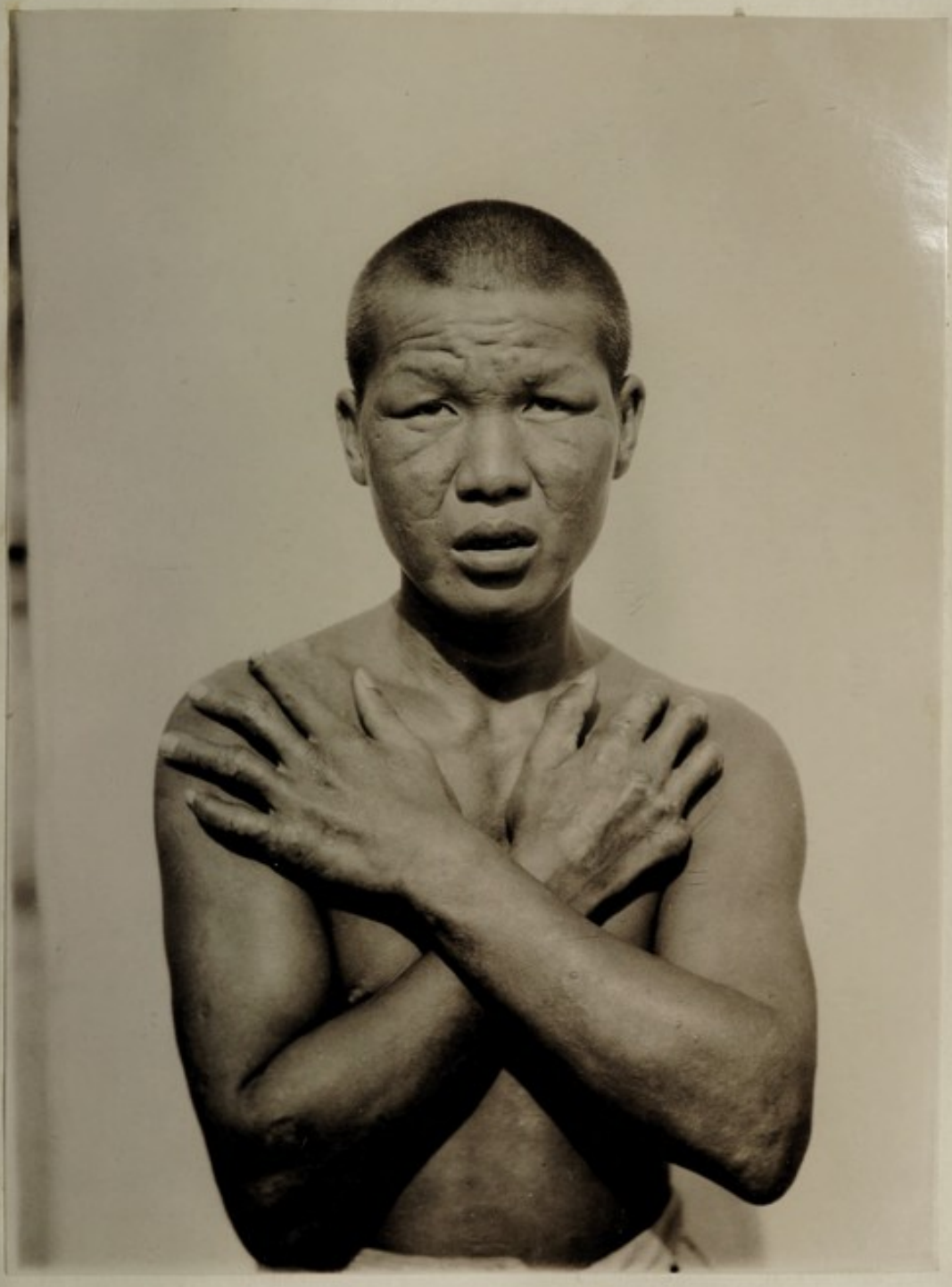
KWAN SENG

After 18 months treatment.
Complete disappearance of patches and nodules.



LOH AH NGOH

Duration six years.
Marked case of Leprosy.

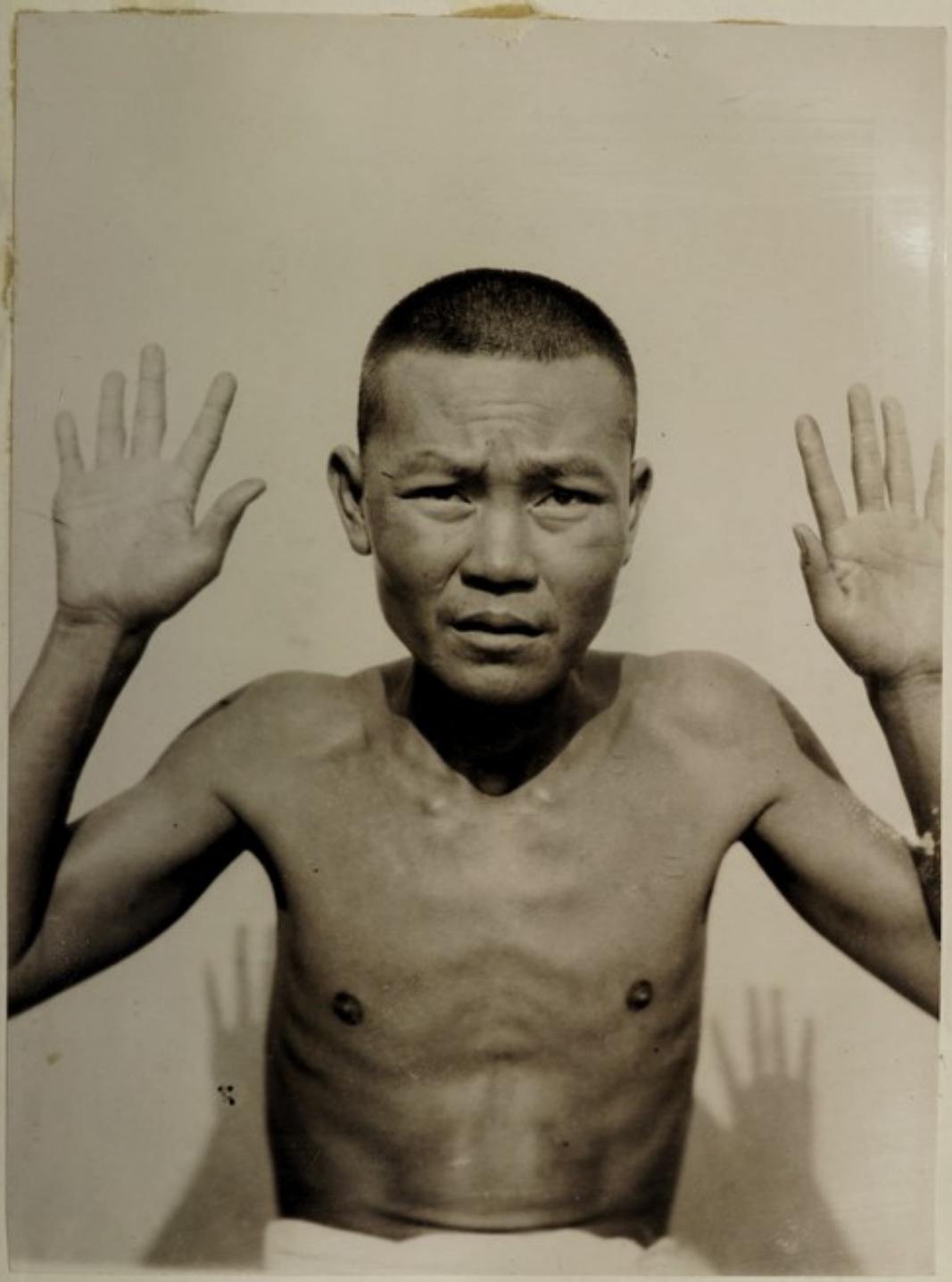


LOH AH NGOH

After two years treatment.
All signs of Leprosy absent.

TAN KIM

Duration of Leprosy one year.
Ears thickened. Patches on face.



TAN KIM

After one year treatment.

Free from all Leprous patches. Ears normal.

THE SCOUT MASTER IS AN

Apparently Cured Case of Leprosy.

APPENDIX "C"

REPORT ON THE PATHOLOGICAL BRANCH STRAITS SETTLEMENTS.

I. Annual Report for 1928 of the Pathological Branch (Singapore)

By J. C. Tull, M.D., M.R.C.P. (London), *Government Pathologist.*

Singapore.

In the Laboratory, Sepoy Lines, a total of 5,431 specimens were examined, including 4,479 sera for complement fixation rest for syphilis, 483 pieces of tissue for histological diagnosis, and 25 police exhibits for the presence of human blood.

A detailed account of these investigations appears in the full report of this Branch.

Central Mortuary—Sepoy Lines.

Total number of autopsies	518
Number at which protocols were taken	221
Number of autopsies on patients dying within 24 hours of admission.	2

Return Shewing Immediate Cause of Death

Injuries from motor car accidents	40
,, ,, gun shot wounds	6
,, ,, stab wounds	11
,, ,, other assault wounds	4
Asphyxia—Drowning	29
Hanging	22
Strangulation	2
Cut throats	2
Poisoning	10
Burns	1
Ruptured spleen, with haemorrhage	2
Other accidents	33
Still born	1
Too decomposed for autopsy	4
Beri-beri	23
Cerebro spinal meningitis	3
Asiatic cholera	4
Dysentery—Amoebic	7
,, Bacillary	2
Amœbic Abscess liver	2
Typhoid fever	19
Haemorrhagic measles	1
Pneumonia—Lobar	44
,, Lobar, with Empyema	10
,, Broncho	32
Malaria, acute subtertian	29
Endocarditis: acute, aortic, ulcerative	2
Chronic aortic	5
Aneurysms, aortic	3
Myocarditis	28
Adherent pericardium	1
Tuberculous meningitis	5

Return shewing immediate cause of death (contd.):—

Neoplasms	15
Arterio sclerosis	1
Visceral syphilis	3
General peritonitis, acute	11
Subphrenic abscess	1
Mesenteric thrombosis	1
Acute intestinal obstruction	1
Acute intussusception	1
Strangulated hernia	1
Septicaemia	5
Tetanus	1
Pulmonary tuberculosis	43
Cirrhosis liver	4
Chronic nephritis	7
Cerebral haemorrhage	1
Schistosomiasis Japonicum	1
Septic cholangitis and cholecystitis	4
Caisson disease	1
Ante partum haemorrhage	1
Retained placenta, with haemorrhage	1
Diabetic coma	1
Acute ascending myelitis	1
Acute mania, with exhaustion	1
Encephalitis lethargica	1

Tan tock Seng's Mortuary Annual Report for 1928.

Total number of post mortem examinations	1,846
Number at which protocols were taken	1,321
Coroner's cases	279
Antopsies on patients dying within 24 hours after admission into hospital	241
Antopsies on patients dying within 48 hours of admission	88

Return showing Immediate Cause of Death in the Cases in which Protocols were Taken.

Motor car accidents	45
Gun shot wounds	5
Stab wounds	15
Other assault injuries	11
Asphyxia by drowning	3
Hanging	16
Strangulation	1
Cut throats	4
Poisoning	4
Burns	4
Ruptured spleen, with haemorrhage	4
Other accidents	21
Bodies too decomposed for autopsy	12
Beri-beri	124

RETURN SHOWING IMMEDIATE CAUSE OF DEATH, ETC.—*Continued.*

Cerebro spinal meningitis	1
Dysentery—Amœbic	59
Bacillary	56
Mixed	14
Amœbic abscess liver	6
Typhoid fever	39
Pneumonia—Lobar	202
Lobar with complications ...	66
Broncho	37
Malaria, acute subtertian	106
Endocarditis—Chronic aortic	35
Chronic mitral	7
Acute ulcerative aortic	1
Aortic aneurysm	4
Myocarditis, with cardiac failure	42
Meningitis, tuberculous	2
Neoplasms	31
Arteriosclerosis	11
Visceral syphilis	33
Peritonitis, generalised acute	30
Ankylostomiasis, with severe anæmia	2
Varied septic conditions	46
Tetanus	1
Pulmonary tuberculosis	113
Cirrhosis liver	21
Chronic nephritis	30
Acute pyelitis	1
Acute nephritis	1
Septic pyelonephritis	11
Septic pyelonephritis, with Cystitis	4
Cerebral haemorrhage	7
Cerebral softening	5
Cerebral abscess	1
Schistosomiasis japonicum	5
Septic cholangitis and cholcystitis	8
Haemorrhagic septicaemia	1
Gas gangrene	1
Acute haemorrhage pancreatitis	1
Hodgkins disease	1
Cirrhosis pancreas	1
Acute intussusception	1
Chronic intestinal obstruction	1
Mesenteric thrombosis	1
Acute encephalitis	1
Acute yellow atrophy of liver	1
Acute gastro enteritis	1
Chronic gastric ulcer with haemorrhage ...	3
Perforated gastric ulcers with peritonitis ...	3
Leprosy	4

MAIN CAUSES OF DEATH EXCLUDING CORONER'S CASES

TAN TOCK SENG'S MORTUARY

—	Autopsies	Malaria	Tuberculosis	Pneumonia	Dysentery	Beriberi	Typhoid	Syphilis	Coroner's cases	Others
January	157	20	26	32	16	7	1	6	26	23
February	114	13	26	15	10	7	7	2	15	19
March	141	21	27	18	10	7	3	13	26	16
April	141	10	31	37	10	3	3	5	21	21
May	165	18	30	24	13	9	4	11	28	28
June	167	20	37	16	15	11	8	4	26	30
July	174	25	36	24	20	10	4	6	15	34
August	165	25	32	24	14	12	2	6	24	26
September	168	21	28	15	12	16	6	5	25	40
October	175	24	38	10	10	23	4	5	27	34
November	141	19	28	16	12	15	3	12	21	15
December	138	16	26	23	14	8	3	8	25	15
Total ...	1,846	232	365	254	156	128	48	83	279	301

CENTRAL MORTUARY GENERAL HOSPITAL

—	Autopsies	Malaria	Tuberculosis	Pneumonia	Dysentery	Beriberi	Typhoid	Syphilis	Coroner's cases	Others
January	55	5	3	5	—	—	3	2	30	7
February	28	—	—	4	—	—	—	—	20	4
March	36	—	2	11	—	—	1	—	16	6
April	55	1	1	5	3	1	5	1	30	8
May	47	3	2	1	1	—	—	—	35	5
June	31	—	2	—	—	—	1	—	23	5
July	45	1	2	4	—	3	1	1	28	5
August	39	2	4	1	—	2	2	1	23	4
September	52	2	1	3	2	2	1	2	29	10
October	52	—	2	8	1	2	—	1	30	8
November	37	3	—	—	1	1	2	—	26	4
December	41	3	3	4	1	—	2	—	21	7
Total ...	518	20	22	46	9	11	18	8	311	73

MAIN CAUSES OF DEATH FOR 1928 IN COMPARISON WITH 1927

TAN TOCK SENG'S MORTUARY

Year	Autopsies	Malaria	Tuberculosis	Pneumonia	Dysentery	Beri-beri	Typhoid Fever	Coroner's cases
1927	2,232	326 or 14·5%	380 or 17%	342 or 15·3%	246 or 11%	209 or 9·4%	43 or 1·9%	350 or 15·7%
1928	1,846	232 or 12·5%	365 or 19·7%	254 or 13·7%	156 or 8·4%	128 or 6·3%	83 or 4·4%	279 or 15·1%

CENTRAL MORTUARY

Year	Autopsies	Malaria	Tuberculosis	Pneumonia	Dysentery	Beri-beri	Typhoid Fever	Coroner's cases
1927	548	40 or 7·3%	46 or 8·4%	68 or 12·4%	12 or 2·2%	28 or 5·1%	13 or 2·3%	336 or 61·6%
1928	518	20 or 3·8%	22 or 4·2%	46 or 8·8%	9 or 1·7%	11 or 2·1%	18 or 3·4%	311 or 60%

The main causes of death as found post mortem were much the same in 1928, as in 1927. Typhoid fever showed an increase, especially towards the end of the year.

Medico legal cases continue to be a very large percentage of total autopsies The number has increased from 422 in 1926 (an unusually high number) to 590 in 1928.

Staff.—

On May, 31st I proceeded to England to attend the International Congress on Cancer, as official delegate from King Edward VII College of Medicine. During my absence for five months Dr. J. A. Cowan, Government Pathologist, Penang, acted for me. The staff of this Branch have continued to do very satisfactory work during the year.

Publications.—

1. Cholera carriers in the s.s. "Hawaii Maru" by J. C. Tull. Malayan Medical Journal. September 1928.
2. A report on the International Congress on Cancer, 1928 by J. C. Tull. Submitted to Government.
3. Gross and histological changes in the gall bladder in Beri-beri by J. C. Tull. Transactions of the Royal Society of Tropical Medicine and Hygiene. Vol. XXII, No. 3, pp. 285 - 287. November 1928.

II. PENANG

By J. A. Cowan, M.B., B.S., *Government Pathologist, Penang*

	1927	*1928*
Blood films.—Total number examined ...	15,905	17,670
Positive subtertian malaria	2,145	2,553
Positive benign tertian malaria ...	722	853
Positive quartan malaria	37	26
Stools.—Total number examined microscopically	15,532	17,096
Positive ankylostome ova	4,567	5,714
Total number examined culturally ...	871	995
Positive B. typhosus	2	5
Positive B. dysenteriac (Shiga) ...	3	11
Positive B. dysenteriac (Flexner) ...	19	23
Positive Salmonella	13	20
Urine.—General examinations	14,136	14,508
Estimations of albumin	36	15
Estimations of sugar	42	204
Cultural examinations	84	24
Sputum.—Total number examined ...	2,024	2,992
Positive tuberculosis	318	358

	1927	1928
Films for Gonococci.—Total	620	680
Positive	285	319
Films for B. Leprœ.—Total	274	241
Positive	76	50
Films for B. Leprœ.—Total	274	241
Positive	1	8
Cultures for B. Diphtheriae.—	19	87
Positive	1	16
Films for other organisms.—	1,461	1,038
Dark ground examinations for Spirochæta pallida.—	143	230
Positive	51	99
Blood Cultures.—	76	34
Other cultures.—	138	84
Blood counts.—	374	136
Blood Chemical examinations.—	65	33
Widals.—	82	166
Positive B. typhosus	9	29
Positive para. A	2	—
Positive para. B	3	2
Positive para. C	—	—
Weil-felix reactions.—	10	12
Positive	—	—
Wassermann reactions.—	3,610	5,921
Positive	1,447	1,973
Complement fixation tests.—	24	12
Agglutination tests for organisms.— ...	46	36
Animal inoculations.—	—	42
Sections.—	34	32
Bacteriological examinations of water.— ...	63	93
Vaccines prepared.—	26	8
Cerebro-spinal fluid, general examinations.— ...	39	9
Cerebro-spinal fluid, Lauge tests.— ...	6	8
Postmortem examinations.—	442	619
Other examinations.—	97	56
Total ...	54,633	63,147

Dr. J. A. Cowan was in charge of the Laboratory from January to end of May and then from 5th November. Dr. J. R. Jacob acted in charge from June to 5th November.

III. MALACCA

REPORT BY C. SUBRAHMANYAM, L.M.S. (SINGAPORE), *Assistant Surgeon Pathologist, Malacca.*

1. *Staff.*—

Assistant Surgeon J. R. JACOB was in charge until May when he was succeeded by Assistant Surgeon C. SUBRHAMANYAM.

2. *Estate Dressers' Class.*—

The practical laboratory instruction for this class was given by the assistant surgeon, pathological branch. The class met in two sections, each section for two hours once a fortnight for five months. The teaching was made as practical as possible. It consisted in the preparation of blood films for malaria, examination of fæces for helminth ova and amœbæ, examination of urine, and the commoner methods of staining for bacteriological examination of pus, sputum, etc.

3. *Work done.*—

Total number of specimens examined, including autopsies		14,038
Autopsies on coroner's cases	56	
Autopsies on hospital cases	59	

4. *Malaria.*—

Blood films for malarial parasite		3,092
Positive		11,96

Types of Malarial infection

P. Falciparum	698
P. Vivax	380
P. Malariæ	92
P. Falciparum and Vivax	66
P. Vivax and Malariæ	6
P. Falciparum, Vivax and Malariæ	4

Incidence of.—.

P. Falciparum	768
P. Vivax	406
P. Malariæ	102
Total ...	1,276

5. *Miscellaneous examinations.*—

Animal inoculations	2
Blood counts—total leucocyte	24
total R. B. C.	8
differential count	77
Cerebro-spinal fluid examination	2
Cultures from blood	3
,, for B. diphtheria (positive 5)	48
,, for Gonococci	1
,, ,, Lepto-spira ichero-hæmorrhagiæ ...	2
,, ,, Meningococci	3

5.	Miscellaneous examinations—*cont.*		
	Cultures from stool		25
	,, ,, urine		7
	Films for B. anthracis		4
	,, ,, Ducrey's bacillus		2
	,, ,, Kock-Week's bacillus		1
	(Positive	1)	
	,, ,, B. Lepræ		61
	(Positive	17)	
	,, ,, Gonococci		230
	(Positive	60)	
	,, ,, Lepto-spira ictero-hæmorrhagiæ		6
	,, ,, Meningococci		9
	(Positive	2)	
	,, ,, T. pallidum (dark ground illumination) ...		21
	(Positive	3)	
	Medico-legal exhibits for examination		35
	Milk analysis—for sugar content		2
	Sections—Histological		42
	Sputum		749
	(Positive to B. Tuberculosis	139	
	,, ,, Pneumococcus	50)	
	Sputum for Curschmann's spirals		3
6.	*Helminth infections.*—		
	Stools examined		4,244
	Positive to ova	3,319	
	Incidence of.—		
	Ankylostoma		2,240
	A. lumbricoides		945
	T. trichiura		2,249
	Oxyuris vermicularis		3
7.	*Other examinations of stools.*—		
	Stool for protozoa, etc.		339
	Positive to A. histolytica	68	
	,, ,, T. hominis	8	
	,, ,, S. mercorales	6	
	,, ,, T. saginata	2	
8.	Urine for general examination—chemical and microscopical		3,680
9.	Wassermann reaction		1,070
	Positive	420	
	Widal Reaction		36
	Positive to B. typhosus	8	
	Other agglutination tests		2
	Water examinations—chemical and bacteriological ...		17

APPENDIX "D"

GOVERNMENT ANALYST'S BRANCH, STRAITS SETTLEMENTS

I.—SINGAPORE

REPORT BY MR. J. C. COWAP, B.SC., F.I.C., *Government Analyst, Straits Settlements*

The work which the department undertakes consists of general chemical investigations and analyses.

Official work is done in Singapore for the Settlements of Singapore and Malacca.

Work is also done (*a*) for the Governments of the Unfederated Malay States of Johore, Kelantan and Trengganu, and (*b*) for Commercial Firms.

Official Work.—The bulk of this is done on behalf of the Monopolies' Department and to a less extent, of the Medical and Police Departments. Other Government Departments also submit samples.

(A) MONOPOLIES DEPARTMENT

The work done for the Monopolies Department mainly falls into three categories, concerning:—

(1) Opium, chandu and chandu dross.

(2) Liquors.

(3) Deleterious Drugs.

(1) *Opium and chandu.*—Reports giving documentary evidence for the Magistrates' courts were issued in 228 prosecution cases instituted under the Chandu Revenue Ordinance.

Forty-nine weekly check samples of chandu from the opium factory were assayed and 95 samples of seized chandu and opium were assayed for value.

Analyses were made on 23 samples of opium purchased by the Monopolies for the manufacture of chandu.

Chandu Dross.—Eighteen thousand two hundred and forty packets of chandu dross were valued on purchase from smokers or on return from government smoking shops.

(2) *Liquors.*—(*a*) Determinations of spirit strength were made for purposes of duty on 1,629 samples of liquor on importation into Singapore and on 178 on importation into Malacca.

(*b*) One hundred and seven samples of brandy were analysed for the purpose of classification under the Liquors Revenue Ordinance. Of these 21 were not admitted as brandy and 5 others were required to produce a certificate of origin.

(*c*) Reports were made on 101 exhibits in illicit liquors cases.

(*d*) Two hundred and thirty-six samples of toddy were analysed for purity. Thirty-two were found to be adulterated and 26 were of poor quality.

(*e*) Twenty-four consignments of arrack were methylated the total volume of spirit being 178,700 gallons.

(*f*) Investigations were made in 4 cases of the substitution of an inferior spirit for various well-known brands of whisky and brandy.

(*g*) Six wines were examined for classification as medicated wines under the new Liquors Revenue Ordinance.

(3) *Deleterious Drugs.*—Exhibits in 12 cases of suspected importation of deleterious drugs were examined, these were mainly cocaine, but also included ganja, heroine and morphine.

(4) *General.*—Two samples of tin-lead alloy were assayed for the opium factory; 6 samples of perfume were examined as to liability for duty.

A point which is worthy of mention is the number of morphine assays carried out in this laboratory for the Monopolies Department. These assays in the year under review reached a total of 5,138, a figure which is certainly unique for any general laboratory, and possibly for any laboratory.

(B) Medical Department

The samples submitted by the Medical Department consist mainly of:—

(1) Water, from the health branch.

(2) Specimens for toxicological analysis from the pathologist and the hospitals.

(3) General.

(1) *Water.*—Twenty-eight samples of water were analysed. In general these were from estate wells.

(2) *Toxicology.*—(*a*) Thirty specimens of stomach washings, stomach contents, etc., were received from the hospitals. Of these 5 contained opium and 2 opium and carbolic acid, and 2 corrosive sublimate, and 1 each hydrochloric acid, chlorodyne, atropine, aspirin, oxalic acid, phenol, and sulphonal.

In an investigation on the incidence of lead poisoning 17 samples of urine were examined, all of which contained lead in considerable quantity.

(*b*) Twenty-six specimens of viscera of persons suspected to have died from poison were sent in by the government pathologist. Of these 6 contained opium and 2 opium and carbolic acid, 3 arsenic, 3 lysol, 2 quinine, 2 tuba root and one each hydrochloric acid, phenol, corrosive sublimate and formaldehyde.

(*c*) One sample each of tinned vegetables, beer and coffee in suspected poisoning cases were examined.

(3) *General.*—The routine examination of clinical specimens is carried out in the laboratory of the general hospital, but 2 specimens of renal calculi and 2 of fæces were submitted to this department.

Two effluents were sent in from the health branch and 1 blinding powder from the general hospital.

(C) Police Department

Work for the Police is undertaken in connection with police prosecutions or investigations. It is shown under various headings below.

(1) *Toxicology.*—Thirty exhibits were examined in 15 cases for any incriminating evidence of poison. The poisons found included nitric acid (2 cases), corrosive sublimate (2 cases), carbolic acid, potassium cyanide, opium, mercuric sulphate and tuba resin.

(2) *Liquors.*—Thirty-two samples of liquors were examined; these were exhibits in illicit distillery and similar cases.

(3) *Chandu.*—Reports were made in exhibits on 7 prosecutions under the Chandu Revenue Ordinance.

(4) *Counterfeit Coins.*—Fourteen lots of exhibits in coining cases were received. The total number of coins examined was 2,188. In regard to the manufacture of counterfeit coins, it is apparent that modern methods are being introduced into the industry. Of the coins received in this laboratory last year, 169 were, like genuine coins, made from a silver copper alloy but of less fineness. Furthermore for the first time heavy stamping machinery, with dies, was found on Singapore Island.

(5) *Bombs.*—Twenty-eight bombs were examined in 7 cases of possession of illegal explosive. These included some of a kind not previously encountered locally, and consisted of potassium chlorate, sulphur and sugar with a glass vial of nitric acid as a detonator.

(6) *General.*—A number of Police prosecutions were directed throughout the year against fairly large scale distribution of imitation standard brandies (inferior liquor being substituted in bottles with forged cork imprints, seals and labels).

Twenty-two samples of brandy were analysed in this connection and in all cases chemical evidence of substitution was obtained.

In connection with a similar fradulent imitation of a standard brand of tinned milk again with forged labels, 12 samples of milk were examined and evidence obtained that the contents of the tins were an inferior product.

Sixteen exhibits were received of chandu paper wrappers, stamps, etc., in a case of imitating government chandu packets.

Nine documents written in secret ink and 2 secret inks were examined.

Two ingots ostensibly gold were found to be copper coated with gold, one alleged stupefying powder was found to contain nothing toxic.

(D) Other Departments

Fifteen samples of drinking water were analysed on behalf of the Naval Base. Two specimens of the viscera of animals were sent in by the Veterinary Department and other samples included a dam deposit, turpentine substitute, acids, frozen oysters, "milton", mail bags, ink, cloth and casting metal.

Unofficial Work.—Most of this work is done for commercial firms in Singapore and for the state of Johore.

(E) Other Governments

Johore—(*a*) *Chandu.*—Reports for court evidence were made on exhibits in 68 chandu revenue cases.

(*b*) *Liquors.*—Similar reports were furnished on 15 samples of illicit Liquor.

(*c*) *Toxicology.*—Seven specimens of viscera and one of vomit were examined. The poisons found were acetic acid, alkali and opium. One specimen of cooked vegetables and one of pills were found to contain no poison.

Three sets of exhibits, details of dentists' equipment, were submitted in order determine liability under the poisons ordinance.

(*d*) *Deleterious Drugs.*—Four samples of suspected deleterious drugs were analysed.

(*e*) *General.*—Exhibits in 2 cases of possession of bombs, and 2 cases of counterfeit coin were examined for the police and 7 samples of drinking water were reported upon for the Medical Department.

Kelantan and Trengganu. Seventy-one lots of chandu dross were assayed for the Governments of these 2 States.

(F) Commercial Firms

(*a*) *Petroleum*—Importation.—Two hundred and eighty-two flash point tests were made on 226 consignments of kerosene including 31 transhipments.

(*b*) *Oils.*—Complete analyses were made on 20 samples of liquid fuel for the Admiralty, and 1 sample of crude oil.

(*c*) *Ship Inspection.*—One hundred and seven vessels which had carried petroleum were tested and certificates issued before entering the harbour or

docks. Five of these were not free from inflammable vapour and had to undergo further cleaning. Two shore storage tanks for petroleum were similarly tested prior to repair.

(*d*) *Explosives.*—Forty-four consignments of explosives were inspected on arrival in Singapore and 16 tests were made as to fitness for importation.

(*e*) *Miscellaneous.*—A large number of miscellaneous samples were submitted by commercial firms. These consisted of ores, coals, sand, sago refuse, medicines, ground nut oil, pyrolignite, gambier, cutch, coconut oil, sago, flour, illipe nuts, pathchouli leaves, rubber, tinned milk, milk powder, waters, chemicals, paraffin wax, benzine, waterproof paint, etc.

Fifteen samples of whisky, brandy and beer suspected of not being genuine, were examined.

Thirty-three samples of rubber, 4 of sludges, 3 of water, 1 of paint and 2 of talc were examined for traces of copper on behalf of a local factory.

(G) General

Reports were made on 22 applications for patent rights.

Staff.—Mr. R. E. Willgress, Assistant Analyst, left the Department in December in order to take the appointment of Municipal Analyst.

Mr. C. L. Southall, government chemist, Fiji, was appointed in his place.

It is with deep regret that I record the death of Mr. Lim Choon Seng, senior laboratory assistant, whose work during his 11 years service was of the greatest value to the department.

During the year the examination of chandu dross purchased by government from smokers has been re-organised and a special staff is now occupied solely on this work. The result of this arrangement is indicated in the monopolies section of this report.

The following table shows details of expenditure and of revenue for the years 1927 and 1928:—

Revenue			Expenditure	
Fees of Office ...	*1927*	*1928*		*1928*
	$ c.	$ c.		$ c.
Petroleum Inspection ...	4,060 00	4,100 00	Personal Emoluments	43,544 85
Miscellaneous ...	11,025 00	13,500 00	Transport	682 82
			Miscellaneous ...	1,348 03
			Stores (C. A.) ...	1,000 00
Total ...	15,085 00	17,600 00	Total ...	46,575 70
	$ c.	$ c.		$ c.
Sale of Pyridine	235 90	248 50	In addition, the Monopolies Department contributed for Stores	2,000 00

II.—PENANG

REPORT BY MR. J. W. HADDON, F.I.C., *Deputy Government Analyst, Penang*

The work carried out in this Laboratory consists principally of chemical investigations and analyses required by various government departments in the settlement of penang. The great bulk of this official work is submitted by the monopolies, police and medical departments.

In addition a considerable amount of chemical work is received from the penang municipality, from the governments of Kedah and Perlis and from commercial firms and other private sources.

(A) MONOPOLIES DEPARTMENT

1. *Opium, Chandu and Chandu Dross.*—One hundred and two exhibits and seizures in connection with prosecutions instituted under the Chandu Revenue Ordinance were examined and certificates issued.

Three thousand one hundred and eighty-seven packets of chandu dross were weighed and valued on purchase by government from chandu smokers. Seventy-four morphine assays were carried out during the year on the chandu dross returned from government smoking shops.

2. *Liquors.*—(*a*) Determinations of spirit strength for duty purposes were made on 1,265 samples of imported liquor.

(*b*) Twenty-six samples of brandy were analysed for purposes of classification under the Liquors Revenue Ordinance. All were passed as genuine.

(*c*) Reports were issued on 270 seizures and exhibits in illicit liquor cases.

(*d*) Fourteen samples of toddy and two of nipah sap were analysed for purity.

(*e*) Ten consignments, comprising 9,322 gallons, of arrack were methylated.

3. *Deleterious Drugs.*—Four samples of cocaine hydrochloride and seventeen samples of bhang were examined and certificates issued.

(B) POLICE DEPARTMENT

1. *Counterfeit Coins.*—Two lots of exhibits in coining cases were received, the total number of coins examined being 69.

2. *Liquors.*—Forty-eight exhibits in prosecutions under the Liquors Revenue Ordinance were examined and reported on.

3. *Opium and Chandu.*—Reports were made on 18 exhibits in prosecutions under the Chandu Revenue Ordinance.

4. *Explosives.*—Ninety samples of crackers and squibs were examined to determine whether their explosive constituents were in accordance with the requirements of the Arms and Explosives Ordinance.

5. *Miscellaneous.*—Other exhibits examined included white arsenic, blinding powder (a mixture of quick lime and powdered chilly) and two samples of medicine.

(C) MEDICAL DEPARTMENT

1. *Water.*—Twenty-four samples were submitted by the health branch. Of these 21 samples were from Bukit Panchor reservoir, Province Wellesley, 2 from village wells and one from the reservoir on Penang hill.

2. *Toxicological Analyses.*—(*a*) Twelve specimens of stomach contents washings, etc., were received from various Government Hospitals. Of these 2 contained opium, 2 sodium carbonate, 2 alcohol, one hydrochloric acid, one creosote, and one carbolic acid.

(*b*) Two specimens of viscera of persons suspected to have died from poison were sent in by the government pathologist: one of these contained opium.

(*c*) One specimen of urine was examined for metallic poison.

3. *Milk.*—One sample of fresh cow's milk was received from the general hospital and three brands of tinned condensed milk were analysed for the Medical Department under the Sale of Foods and Drugs Ordinance.

(D) Other Departments

The sediment in 4 samples of sea water and the moisture in one sample of mud were determined for the harbour survey engineer.

One sample of lead paint was examined for the Public Works Department.

(E) Penang Municipality

1. *Health Department.*—Forty-seven samples of effluent were analysed as a check on the working of the various local septic tank installations.

Twenty-seven samples of fresh milk, purchased from licensed vendors in accordance with the Sale of Food and Drugs Ordinance, were submitted. Of these 24 were adulterated by the addition of water, and one was adulterated both with water and cane sugar.

One sample of ground coffee was examined.

2. *Water Department.*—Six samples of water from Penang municipal supply were analysed.

(F) Governments of the Unfederated Malay States

1. *Kedah.*—The alcoholic strengths of 94 samples of liquor were determined for duty purposes.

Fifty-one lots of chandu dross were valued.

One specimen of stomach contents and one specimen of viscera were examined for the presence of poison.

Two samples of drinking water were analysed.

One sample of mineral (Iron Pyrites) was identified.

2. *Perlis.*—Fourteen lots of chandu dross were valued, and two lots of chandu exhibits reported on.

Twenty-four exhibits in connection with illicit liquor prosecutions were examined and three samples of toddy reported on.

One sample of drinking water was analysed.

(G) Commercial Firms, etc.

1.—*Petroleum.*—One hundred and fifty-two flash-point tests were made on 54 consignments of kerosene imported into the Settlement, and two tests on a consignment for transhipment.

The total quantity of kerosene imported was:—

	Tons		*Gallons*
East Indian Oil	13,043·27	plus	297,200
American Oil	2,800	,,	320,000
Total ...	15,843·27	,,	617,200

Two hundred and thirty-one flash-point tests were carried out on 44 consignments of liquid fuel and solar oil, and eight tests on samples of diesel oil for transhipment.

The quantities imported were:—

Liquid fuel and solar oil ... ... 61,060 tons.
Diesel oil ... ... 28,500 gallons.

2. *Explosives.*—Eleven tests were made on samples from five consignments to determine whether the various explosives were fit for importation.

3. *Water.*—Thirteen samples of drinking water, most of which were taken from wells on Rubber Estates, and four samples of Boiler feed water were examined and reported on.

4. *Miscellaneous.*—Other work carried out for commercial firms included:—

Examination of samples of various forms of produce for evidence of damage by sea water (26 samples), patchouli leaves (27 samples), lead cables (3 samples) and one sample each of patchouli oil and lubricating oil.

Twenty-seven lots of rubber were surveyed prior to export and certificates issued.

(H) General

The following table shows details of Revenue for 1927 and 1928 and of Expenditure for 1928:—

Revenue

Fees of Office	*1927*	*1928*
	$ c.	$ c.
Petroleum Inspection	3,620 00	4,100 00
Miscellaneous	3,466 50	3,347 50
Certificate for Export of Petroleum	160 00	174 50
Total ...	7,246 50	7,622 00

Expenditure

	1928
	$ c.
Personal Emoluments	12,000 00
Stores from England	647 46
Special Expenditure	562 72
Miscellaneous	288 83
Transport	186 22
Total ...	13,685 23

Staff.—The laboratory staff consists of the deputy analyst and one laboratory assistant.

The writer of this report was in charge throughout the year.

APPENDIX "E"

GENERAL HOSPITAL, SINGAPORE

Annual Report by Dr. J. Gray, B.A., M.D., Ch.B., *Chief Medical Officer, Singapore*

1. Dr. W. M. Chambers acted in administrative charge until 25th September, 1928, when Dr. J. Gray resumed his appointment.

2. *Work Done.*—A comparative Table for the years from 1925 to 1928 is as follows:—

Year	Number of patients treated in 1st and 2nd Class Wards	Died	Percentage	Number of patients treated in 3rd Class Wards	Died	Percentage
1925 ...	2,381	126	5·29	7,962	675	8·49
1926 ...	3,100	216	6·96	9,901	839	8·45
1927 ...	3,775	280	7·42	10,842	1,037	9·57
1928 ...	4,137	308	7·44	11,246	881	7·83

3. *Chief Diseases.*—The chief diseases treated in the General Hospital are stated below and compared with previous years:—

Diseases		*1928*	*1927*	*1926*	*1925*
Malaria		2,094	1,967	1,691	841
Enteric fever		244	228	147	89
Tuberculosis		545	481	388	284
Dysentery	Amœbic ...	161	165	104	
	Bacillary ...	50	53	149	133
	Unclassified	23	27	23	
Syphilis and Gonorrhœa ...		889	783	862	650
Beri-beri		346	237	190	149
Pneumonia	Broncho ...	100	104	80	56
	Lobar ...	286	319	237	181
	Unclassified	7	28	—	—
Ankylostomiasis ...		239	317	659	393

4. *Malaria.*—Two thousand and ninety-four cases treated. An increase of 127 cases treated as compared with 1927. Eight hundred and thirty-three are returned as unclassified. Some of these had commenced treatment before admission, others, probably had scanty parasites in the films which were not found in the single rapid examination which time and staff permit.

Typhoid.—Two hundred and forty-four cases were treated as compared with 228 in 1927. The death-rate was 31·5%.

Pneumonia.—Lobar Pneumonia 286 cases, a decrease of 33 cases.
Mortality rate 38·81%.
Total Pneumonia 393 cases, a decrease of 58 cases.
Mortality rate 45·04%.

Syphilis.—Four hundred and ninety-one cases were treated showing a decrease of 28. Neuro-syphilis which is not listed separately shows an increase.

Diarrhœa in Infants under 2 years.—Thirteen deaths in 24 cases show that very little can yet be done unless these cases are admitted earlier.

Tuberculosis.—With 434 cases showed an increase of 42.

Beri-beri.—Three hundred and forty-six cases were treated with 66 deaths.

5. *Ophthalmic Department.*—

Report by Mr. Black, F.R.C.S.

The following operations were performed:—

	Total	*Cured*	*Failed*
Evisceration and Eneucleation of Eyeball	11	11	—.
Cataract Extractions	20	19	1
,, Needling	9	9	—
Pterygium	9	9	—
Trachoma, Radical cure for ...	6	6	—
Iridectomy	8	8	—
Other operations	23	23	—
Total ...	86	85	1

6. Surgical Report by Dr. C. J. Smith, F.R.C.S., M.B., B.Ch., *Senior Surgeon, General Hospital*

From 1st January to 31st December, 1928, total operations 2,655.

Deaths 84.

Pathological condition and nature of operation	Total No. of cases	Cured	Relieved	Died
Amputations.—				
Forearm or hand	7	7	...	...
Foot or leg	14	14	...	...
Fingers	13	13	...	...
Toes	5	5	...	...
Arm	6	5	...	1
Operations on Muscles, Tendons and Ligaments.—				
Tenotomy	2	2	...	...
Suturing divided tendon	12	12	...	...
Stitching wound, face, etc.	2	2	...	...
Removal of ganglion	...	...	...	...
Operation for torticollis	1	1	...	...
Operations on Heart and Blood Vessels.—				
Peri arterial sympathectomy ...	33	33	...	...
Ligature of arteries	1	1	...	...
Ligaturing vessels	2	2	...	...
Excision of varicose veins of legs ...	2	2	...	...
Obliteration of aneurysm	1	...	...	1
Injection of varicose veins	6	6	...	...
Aneurism of external carotid ...	1	1	...	...
Stab-wound of heart sutured ...	1	1	...	...
Operations on Lymphatic Glands.—				
Excision of lymphatic glands ...	56	54	...	2
Lymphaticostomy	...	...	...	...
Dissection or incision of glands ...	11	10	...	1
Removal of foreign body	22	22	...	...
Operations on Bones.—				
Sequestrotomy	16	16	...	...
Plating fractures	9	9	...	...
Bone grafting	3	3	...	...
Plaster of paris	45	45	...	...
Osteomylitis	8	8	...	...
Setting fractures	30	29	...	1
Wiring or pegging fractures ...	7	6	...	1
Osteotomy	9	9	...	...
Excision of coccyx	2	2	...	...
Excision of astragalus	1	1	...	...
Removal of wire from fracture ...	1	1	...	...
Excision part of fibula	1	1	...	...
Exostosis femur	1	1	...	...
Removal of plate	2	2	...	...
Cyst of bone	1	1	...	..
Carried forward ...	334	327	...	7

Pathological condition and nature of operation	Total No. of Cases	Cured	Relieved	Died
Brought forward ...	334	327	...	7
Operations of Joints.—				
Arthrotomy	7	7	...	...
Arthrectomy	5	5	...	...
Aspiration	30	30	...	...
Reduction of dislocation	15	14	...	1
Excision of semi-lunar cartilage ...	4	4	...	...
Mobilisation of joint	55	55	...	...
Hammer toe	1	1	..	...
Operation for dislocated hip ...	1	1	...	...
Clairmont's operation (shoulder) ..	1	1	...	...
Plaster-case to hip joint	4	4	...	...
Operations on skull.—				
Trephining	20	15	...	5
Hydrocephalus	2	1	...	1
Decompression	6	4	...	2
Operations on Ear.—				
Radical mastoid operations ...	25	23	...	2
Plastic	3	3	...	...
Osteoma of meatus	1	1	...	...
Operations on Lips, Mouths and Salivary Glands.—				
Repair of hare lips	13	13	...	...
Repair of cleft plate	4	4	...	...
Excision of Jaw	1	1	...	...
Eneucleation of tonsils and removal adenoids	287	286	...	1
Diathermy, cancer of tongue ...	1	1	...	...
Extraction of teeth	83	83	...	...
Removal of portion of growth for examination	3	3	...	...
Peritonsillar abscess	3	3	...	...
Radium introduced	3	3	...	...
Alveolar abscess	21	20	...	1
Tumour of jaw	1	1	...	...
Polypus of cheek	1	1	...	...
Excision ulcer of tongue	1	1	...	...
Operations on Oesophagus.—				
Oesophagoscopy	5	5	...	...
Operations of Trachea.—				
Tracheotomy	1	1	...	...
Hemithyroidectomy	1	1	...	...
Bronchoscopy for foreign body ...	2	1	...	1
Operations of Noses and Sinuses.—				
Turbinectomy	42	42	...	...
Submucuous resection	84	83	...	1
Opening maxillary antrum	22	22	...	...
Nasal polypus	12	12	...	...
Fracture-moulded	5	4	...	1
Curettage of ethmoid	10	10	...	...
Frontal sinusitis	3	3	...	...
Nasal (not specified)	4	4	...	...
Carried forward ...	1,127	1,104	...	23

Pathological condition and nature of operation	Total No. of cases	Cured	Relieved	Died
Brought forward ...	1,127	1,104	...	23
Operations on Eyes.—				
Removal of foreign body	4	4	...	...
For pterygium	9	9	...	...
Plastic for entropion	4	4	...	...
Excision lachrymal sac	1	1	...	...
Iridectomy	8	8	...	...
Extraction of cataract	19	19	...	...
Needling of cataract	9	9	...	...
Evisceration of eye	5	5	...	...
Enucleation of eye	5	5	...	...
Symblepharon	...	...	...	...
Trephining cornea	4	4	...	...
Incision for ectropion	2	2	...	...
Expression of lids for trachoma ...	3	3	...	...
Excision growth of eye	1	1	...	...
Division of anterior synechiæ ...	2	2	...	...
Muscle advancement for squint ...	2	2	...	...
Other operations	9	9	...	...
Operations on Breasts.—				
Complete amputation	6	6	...	...
Excision of breast	2	2	...	...
Operations on Thorax.—				
Resection rib for empyema ...	15	15	...	...
Empyema drained	4	4	...	...
Aspiration of chest	1	1	...	...
Operations of Hernia.—				
Radical cure of hernia	56	54	...	2
For strangulated hernia	13	9	...	4
Ventral hernia	3	3	...	...
Abdominal Operations.—				
Peritoneal abscess drained	15	14	...	1
General peritonitis	12	9	...	3
Exploratory, partial	23	18	...	5
Gastrectomy, partial	1	...	...	1
Sub-phoenic abscess	1	1	...	...
Perforated duodenal gastric ulcer ...	4	4	...	...
Gastro-Jejunostomy	12	10	...	2
Splenectomy	3	3	...	...
Liver abscess, laparotomy & drainage	2	2	...	...
Cholecystostomy	7	3	...	4
Cholecystectomy	7	7	...	...
Choledocotomy	3	2	...	1
Acute intestinal obstruction ...	2	1	...	1
Intussusception	1	...	...	1
Acute & chronic appendectomy ...	143	136	...	7
Colostomy	4	3	...	1
Stab-wound abdomen Gun-shot wound abdomen	11	6	...	5
Carried forward ...	1,565	1,504	...	61

Pathological condition and nature of operationn	Total No. of Cases	Cured	Relieved	Died
Brought forward ...	1,565	1,504	...	61
Abdominal Operations.—Continued.				
Perforation intestine typhoid ...	11	5	...	6
Resection of intestine	4	1	...	3
Laparotomy, adhesions	1	1	...	...
Pancreatic cyst	1	1	...	...
Calcified glands	1	1	...	...
Colostomy, closed	1	1	...	...
Gastrostomy	4	4	...	...
Abscess abdominal wall	1	1	...	...
Repair abdominal wall	1	1	...	...
Abdominal sinus	1	1	...	...
Enterostomy	2	1	...	1
Tubercular ulcer (abdominal) ...	1	...	...	1
Operations on Rectus and Anus.—				
Excision of haemorrhoids	61	61	...	...
Partial excision of rectum	5	5	...	...
Ischio-rectal abscess	6	6	...	...
Sigmoidoscopy	15	15	...	...
Imperforate anus	5	5	...	...
Dilation of anal canal	3	3	...	...
Anal fissure	6	6	...	...
Fistula in ano	31	31	...	...
Examination under anaesthetic ...	3	3	...	...
Extra peritoneal abscess opened and drained	1	1	...	...
Anal abscess	2	2	...	...
Rectal cyst	1	1	...	...
Recto vesical fistula	1	1	...	...
Carcinoma of rectum	1	...	...	1
Operations on Kidneys, Ureters and Bladders.—				
External urethrothomy	10	10	...	...
Litholoppaxy	9	9	...	...
Suprapubic cystotomy	3	3	...	...
Cystoscopy	75	75	...	...
Cystoscopy diathermy	1	1	...	...
Nephrectomy	4	3	...	1
Nephro-lithotomy	4	4	...	...
Peri-nephric abscess	2	2	...	...
Urethroscopy	1	1	...	...
Sprapubic cystotomy for stone ...	7	7	...	...
Pyonephrosis	1	1	...	...
Nephropexy	3	3	...	...
Decapsulation of kidney	2	1	...	1
Internal urethrotomy	2	2	...	...
Hypospadias	2	2	...	...
Lymphangioplasty	1	1	...	...
Carried forward ...	1,862	1,787	...	75

Pathological condition and nature of operation	Total No. of Cases	Cured	Relieved	Died
Brought forward ...	1,862	1,787	...	75
Operations on the Male Generative Organs.—				
Amputation of penis (cancer) ...	3	3	...	...
Hydrocele, radical cure	35	34	...	1
Varicocele	7	7	...	...
Orchidectomy	3	3	...	...
Ruptured urethra	2	2	...	...
Prostatectomy	3	3	...	...
Circumcision	35	35	...	...
Excision lymphadenoma scrotum ...	4	4	...	...
Undecended testical	3	3	...	...
Prostatic abscess	2	2	...	...
Dilation of stricture	57	57	...	...
Peri-urethral abscess	2	2	...	...
Haematocele	3	3	...	...
Penile tumour	1	1	...	...
Bubonocele	3	3	...	...
Operations on the Female Generative Organs.—				
Ovariotomy	5	5	...	...
Salpingectomy	22	19	...	3
Laparotomy and hysteropexy or round-ligament operation	9	9	...	...
Hysterectomy	18	17	...	1
Perineorrhaphy	5	5	...	...
Amputation uterine cervix	11	11	...	...
Hymenectomy	3	3	...	...
Examination under anaesthetic ...	15	15	...	...
Vesico-vaginal fistula	1	1	...	...
Curettage	65	65	...	...
Colporraphy	1	1	...	...
Ovarian eyst	17	17	...	...
Dermoid ovary	1	1	...	...
Myomectomy	1	1	...	...
Caesarian section	4	3	...	1
Ventral suspension	4	4	...	...
Ruptured ectopic gestation ...	9	8	...	1
Recto-vaginal fistula	2	2	...	...
Haemotometria	1	1	...	...
Marsupialisation of uterus	1	1	...	...
Operation on Cysts.—				
Sebaceous	22	22	...	...
Boher's cyst	1	1	...	...
Ranula	2	2	...	...
Dental cyst	3	3	...	...
Carried forward ...	2,248	2,166	...	82

Pathological condition and nature of operation	Total No. of cases	Cured	Relieved	Died
Brought forward ...	2,248	2,166	...	82
Operation for Abscess.—				
Incision	177	177	...	...
Psoas abscess aspirited	1	1	...	...
Abscess hip-joint	1	1	...	...
Operations on Nerves.—				
Nerve anastomosis	3	2	...	1
Excision neurons of stump	1	1	...	...
Nerve suture	2	2	...	...
Operations of the Spine, Cord and Meninges.—				
Lumbar puncture	2	2	...	...
Bone graft of spine	1	1	...	...
Laminectomy	2	2	...	...
Plaster case to spine	1	1	...	...
Operations of the Skin and Subcutaneous Tissues.—				
Skin grafting	42	42	...	...
Removal of nail	11	11	...	...
Removal bunion	1	1	...	...
Suturing wounds	11	11	...	...
Stab wound	1	1	...	...
Exploration incision, extraction of bullet	2	2	...	...
Palmar fasciotomy	2	2	...	...
Haematoma drained	2	2	...	...
Cellulitis incised	43	42	...	1
Carbuncle	4	4	...	...
Keloid	2	2	...	...
Sinusers scraped	11	11	...	...
Resuture of wounds	48	48	...	...
Urinary extravasation	1	1	...	...
Excision of ulcer	2	2	..	...
Tumour (unspecified)	5	5	...	...
Osteoma	1	1	...	...
Condylomata	1	1	...	...
Excision of scar	1	1	...	...
Tumours.—				
Fibroma	4	4	...	...
Lipoma	4	4	...	...
Naevus	3	3	...	...
Tumour of scalp	2	2	...	...
Rodent ulcer removed	2	2	...	...
Ganglion removed	1	1	...	...
Tumour of vulva	3	3	...	...
Bartholin cyst	2	2	...	...
Vaginal stricture	1	1	...	...
Cyst (unspecified)	3	3	...	...
Total ...	2,655	2,571	...	84

7. X-RAY DEPARTMENT

REPORT BY DR. J. S. WEBSTER, M.B., B.S., D.P.H., AND D.M.R.E.

The record of the work accomplished during the year 1928 again shows a remarkable increase and a comparative table of the radiography undertaken during the last 5 years is instructive. Other work shows a similar large increase.

1924	3,271
1925	3,552
1926	4,747
1927	6,118
1928	9,463

Radiography.—During the year 9,463 radiograms were taken, in addition to a large number of screen examinations. Also a number of foreign bodies were removed in the X-ray room with the help of the fluorescent screen, but no record of these nor of the simple screen examinations has been kept.

The following table given a brief account of the examinations undertaken:—

Barium meals ...	252	Hip	136
,, enemata ...	16	Face and Jaw	96
,, swallow ...	12	Teeth	267
Cholecystography ...	38	Thigh	105
Pyelography ...	6	Knee	120
Lipoidol injections ...	5	Leg	186
Skull	114	Feet	142
Sinuses	101	Shoulder	99
Spine	129	Upper arm	53
Kidneys and Ureters ...	132	Forearm	121
Pelvis and Bladder ...	198	Hand	139
Thorax	398	Joints (small elbow, wrist) ...	414
Clavicle	28	Cystograms	4
Abdomen	84		

Recently, the diagnosis of acute perforation of a gastric or duodenal ulcer by means of the X-rays has been advocated: the method is to make a screen examination in the erect position for the presence of a bubble of gas between the shadow of the liver and the arch of the diaphragm and it is believed to be as certain as it is rapid. In all, five cases have been examined: in two the gas-bubble was found and the consequent operation proved that the diagnosis was correct: in three, it was absent so no operation was performed and no ill-effects ensued.

Cholecystography has been undertaken in many cases and the results are accurate and helpful to the clinician.

Radiotherapy.—

The following diseases have been treated:—

Sarcoma (glandular, retroperitoneal and of bones) ...	8
Cancer (breast and lungs)	4
Uterine fibroids	5
Adenitis, tubercular	2
Exophtalmic goitre	6
Adenoma thyroid	1
Skin diseases (fungus infections, acne, lupus erythematosus)	18

In superficial therapy the results are good: the cases of fibroid uterus and exophthalmic goitre also showed good results. In the malignant conditions, it is rare to see a case at a suitable stage when anything more than palliative results can be hoped for: also, unless the patient is kept in hospital, the attendances are irregular and infrequent.

Electrical treatment and Ultraviolet therapy.—

The number of patients treated in the various procedures is as follows:—

Ionisation	14
Galvanism, faradism, etc.	27
Diathermy, local and general	34
Ultraviolet therapy	46
Radiant heat	22

Here again regular attendance over a prolonged period is required for some of the procedures and then the results are then, sometimes astonishing.

APPENDIX "F"

Report on treatment of Opium Habit

I.—SINGAPORE

Report on patients receiving treatment for Opium Habit during 1928, by E. D. Lindow, m.r.c.s., l.r.c.p.

Opium Habit—

Remained on 31st December, 1927	7
Admitted during 1928	579
	586
Discharged for breaking rules	5
Unfit for treatment	2
Absconded	271
Discharged apparently cured	308
Remaining on 31st December 1928, ...	—

The numbers seeking admission dropped from 925 in 1927 to 579 in 1928.

Less than 10 per cent are really genuine cases and it is very rare to see a patient showing any of the characteristic signs and symptoms of distress.

II.—PENANG

Report on the Treatment of Opium Habit during 1928

by W. M. Chambers, m.d.

Remained on 31st December, 1927	10
Admitted during 1928	262
	272
Unfit for treatment	1
Absconded or not cured	186
Discharged, apparently cured	71
Remaining on 31st December, 1928	14
	272

III.—MALACCA

REPORT ON TREATMENT OF OPIUM HABIT BY R. B. MACGREGOR, M.B., Ch.B.

Eighty-nine patients were admitted for this treatment during the year: the results were disappointing. As in previous year, it was found impossible to distinguish between the addict who really wanted to be cured, the man who wanted merely to reduce his consumption of chandu to what he could afford, and the person who wanted a "rest cure".

APPENDIX "G"

REPORT ON THE WOMEN AND CHILDREN'S DISPENSARY, KANDANG KERBAU, SINGAPORE BY DR. (MISS) E. M. BIRD, M.B., Ch.B., D.P.H.

Year	*New Patients*	*Repetitions*	*Total Attendances*
1928	15,495	19,727	35,222
1927	14,124	19,764	33,888

Nationalities treated.—

Chinese ...	11,768
Eurasians	612
Indians ...	1,709
Malays ...	1,049
Jews ...	195
Japanese	125
Others ...	37
	15,495

Venereal Diseases.—There were 858 cases with 4,749 attendances, whilst in 1927, there were 465 cases with 4,139 attendances.

Microscopical Examinations numbered 3,038.

APPENDIX "H"

I.—MEDICAL INSPECTION OF ENGLISH GIRLS' SCHOOLS, SINGAPORE

REPORT BY DR. (MRS.) C. H. DUKE, M.A., M.B., Ch.B., D.P.H., *Lady Health Officer* (*Schools*)

Six girls' schools were examined during the year:—

(1) St. Anthony's Convent.
(2) Singapore Chinese Girls' School.
(3) Fairfield Girls' School.
(4) Raffles Girls' School.
(5) Methodist Girls' School.
(6) French Convent.

The total number of pupils examined was 3,126.

General Conditions.—Records show that the physical condition of the children has improved since medical inspection was instituted. 42·75% were

fair or poor in condition in 1924, and this percentage declined year by year to 11·8 in 1927. This year the condition is maintained, there being 12·4% with general condition at or below the standard of fair.

Nutrition.—The girls attending schools are, as a rule, adequately nourished but in many cases there is no doubt that the diet is injudicious, as may be seen from the type of food consumed at school during intervals One may infer too from the percentage of girls with anæmia that diets are not well balanced.

Anæmia.—17·6% were found to be anæmic compared to 10·5% in 1927.

Skin Conditions.—There is a decline in uncleanliness and skin conditions such as result from parental neglect.

Defective Vision.—This is found in 3·3% as compared with 3% last year.

Dental Caries.—This percentage is still too high, being 36·5, although there is an improvement since last year when dental caries were found in 40%. The majority of parents have not yet realised the importance of obtaining early treatment.

Vaccination.—Eight hundred and ninety-one children (28·8%) were found to require re-vaccination, and out of this total 84% received vaccination.

Treatment of Defects.—Of those found to have defective or diseased conditions at the first medical examination of the year, the following percentages reported at the second examination that treatment had been received in the intervening period:—

For anæmia 49·9%.

For enlarged tonsils and adenoids 27%.

For dental caries 21·3%.

For eye conditions 29%.

This is an improvement on last year's figures, but there is room for still greater improvement. Children may attend any Government Dispensary for free treatment.

For the Girls' Schools in 1928, the pupils attending the Kandang Kerbau Female Dispensary for treatment numbered:—459, compared to 298 in 1927.

Sanitation.—Sanitation is satisfactory in all the schools except the Short Street branch of Methodist Girls' School. Modern sanitation is installed in the New Raffles Girls' School, opened this year, and it is hoped to have modern appliances installed in the French Convent at an early date, and in the Saint Anthony's Convent now under reconstruction.

SUMMARY OF RESULTS 1928

Schools	No. of pupils	Fair Condition	Nits	Affections of Circulatory System	Affections of Respiratory System	Affections of Skin	Affections of Throat and Nose	Affections of Ear	Affections of Teeth	Defective Vision	Eye Affections	Enlarged Glands	Enlarged Spleens	Deformities	Requiring Vaccination	Re-vaccinated	Improvement in general on anaemic condition	Tonsils treated	Teeth Treated	Eyes
St. Anthony's Convent ...	354	55	34	63	...	13	30	...	107	7	3	3	...	...	111	101	23	10	14	2
S. Chinese Girls' School ...	263	45	2	74	2	17	65	1	131	6	2	12	...	5	75	60	37	14	24	...
Fairfield Girls' School ...	433	50	...	56	1	15	50	2	185	18	6	7	...	5	153	117	21	13	26	6
Raffles Girls' School	452	52	16	61	5	13	42	1	132	13	4	5	1	1	123	94	42	15	45	9
Methodist Girls' School ...	605	75	12	103	3	22	60	2	149	32	4	6	1	2	158	141	67	17	31	10
French Convent ...	1,019	112	52	195	4	40	122	...	423	28	3	35	8	4	271	236	81	33	100	4
Total ...	3,126	389	116	552	15	120	369	6	1,127	104	22	68	10	17	891	749	271	102	240	31
Percentage ...	1928	12·4	3·7	17·6	0·5	3·8	11·8	0·2	36·5	3·3	0·73	2·1	0·3	0·5	28·8	84	49·9	27·6	21·3	29
Do. ...	1927	9·0	3·0	10·5	...	7·5	13·0	0·2	45·0	3·0	1·00	2·0	...	0·5	14·5	88	16·5	...	32·75	21

II.—Annual Report for 1928 on Boys' Schools in Singapore

By Dr. H. W. Furnivall, M.B., B.S.

1. *History of School Work.*—So far as boys' schools go there has been since 1926 a whole time health officer.

2. *Work done.*—The following table gives the numbers of boys systematically examined in Government English, aided and vernacular schools:—

	In Government and Aided Schools	*In Vernacular Schools*	*Grand Total*
	—	—	—
1926 ...	... 3,664	1,674	5,338
1927 ...	... 5,410	1,668	7,078
1928 ...	... 4,072	1,638	5,710

All the government and aided and private schools teaching English, to the number of 63, were inspected as to their sanitary state and accommodation capacity.

The private schools comprise, 15 English, one Tamil and 38 Chinese schools; many of the latter are small.

3. Seventeen Malay vernacular schools were also inspected.

4. *Data elicited from systematic examinations of boys.*—

	1928	*1927*	*1926*
(*a*) *General Condition.*—	—	—	—
Fat ...	... 7·76%	3·46%	—
Good ...	... 72·87%	79·81%	81·0%
Fair ...	... 15·01%	13·93%	11·9%
Poor ...	... 4·24%	2·80%	3·7%

(*b*) *Cleanliness.*—The percentage of dirty children was 0·98% compared with 3·19% in 1927.

(*c*) *Vaccination.*—This was done by the vaccinator attached to the Health Branch. His figures are given below. The total vaccinated was 3,462:—

English Schools	*Malay Schools Boys*	*Malay Schools Girls*	*Reformatory Schools*
——	—	—	—
2,055	1,308	27	72

(*d*) *Eye-sight.*—(1) Defective vision, and (2) Diseases of the eye proper. Total number was defective vision 225 cases, diseases of the eye 298 cases. Those with the defects greater than 6/9 were asked to see The Eastern Optical Co. (who have consented to prescribe glasses free) and to get glasses from the same firm. Under the second category were (*a*) Follicular Conjunctivitis 29, (*b*) Acute Conjunctivitis 4, (*c*) Trachoma 204, (*d*) Leucoma 7, (*e*) Blepharitis 9, (*f*) Strabismus 16, (*g*) Conjunctivitis 2, (*h*) Tie Lids 1, (*i*) Stye 6, (*j*) Nebula 3, (*k*) Ptosis 4, (*l*) Cataract 1, (*m*) Pterygium 2, (*n*) Keratitis 2, (*o*) Scotoma 1, (*p*) Ectropion 2, (*q*) Nystagmus 1, (*r*) Cyst Lacrymal 1, (*s*) Meibomian Cyst 1, (*t*) Proptosis 1. These cases were sent for treatment either to the general hospital or to an out-door dispensary.

(*e*) *Dental Caries.*—The percentage of caries amongst school children was 64·17%: Mr. K. Homma and Mr. W. Foune, the school dentists attended boys who came for treatment.

(*f*) *Sanitation.*—Visits to schools:—The number of visits was 331. Reports and recommendations were submitted to the Inspector of Schools through the Chief Health Officer.

(*g*) *Infectious Diseases.*—

(*a*) Chicken-pox:—There were 54 cases altogether: two of these were teachers.

(*b*) Mumps—8 cases; (*c*) Measles—8 cases; (*d*) Diphtheria—4 cases (one a teacher).

5. *Medical Certificates of Room Accommodation.*—These were given when necessary for all classes of schools, and were sent to the Principals of the Schools stating the number to be accommodated according to Regulation 12 of the School Ordinance, 1920.

6. *Issue of Posters to Schools.*—Framed sets of posters on "Shoes Prevent Hookworm Infection", "Flies Spread Disease", "Spitting Spreads Tuberculosis", "Prevent Hookworm Disease", and "Prevent Disease—Cook Your Food", were given to all Malay Vernacular Schools and to the 13 English Schools.

7. *Lectures. (General Rules of Health to Senior Classes).*—Lectures including short talks on the subject matter of medical posters and cards were delivered at a number of schools.

8. *Cinema Lectures on Hookworm and Malaria.*—These were given to teachers of all schools assembled at Raffles Institution, and to the pupils at 12 English and several Vernacular schools.

9. *Examination of Stools of School Children.*—All Malay Schools, Radin Mas English School, and the Branch School of St. Joseph's Institution at Kampong Bahru were examined.

The following results are given:—

1. *School*	*Hookworm*	*Roundworm*	*Whipworm*
Kampong Glam Malay ...	56·73%	79·63%	84·33%
Rochore Malay	42·95%	85·26%	97·44%
Padang Terbakar Malay ...	94·12%	82·35%	97·06%
Siglap Malay	92·68%	95·93%	96·75%
Sepoy Lines Malay ...	54·69%	81·25%	93·75%
Tanglin Kechil Malay ...	62·83%	83·19%	95·58%
Tanglin Besar Malay ...	70·63%	88·09%	94·44%
Beting Kusa Malay ...	82·69%	84·62%	90·38%
Telok Saga Malay ...	27·27%	72·72%	77·27%

Treatment for Hookworm was given at all these schools.

10. *Travelling Dispensary.*—During its usual itinerary this has been visiting the vernacular schools en route and giving treatment to the boys free of charge.

11. *Pre-Medical Examination of Children before Admission to Schools.*—Over 120 new entrants of the Anglo-Chinese School were examined, whereas at the Victoria Bridge School, two examinations were done. Over 80 boys admitted for 1928 were examined in January, and in December 76 were likewise examined for admission for the year 1929.

12. *Systematic Examination of School-Teachers of Government Aided and Vernacular Schools.*—The total number examined was 130.

13. *Treatment of Diseases of School Children* was carried out at all the outdoor dispensaries.

14. *General.*—Health work amongst the Boys' Schools has progressed considerably, and we are indebted to the inspector of schools for close co-operation and encouragement and also to the heads of schools. In this connection, one would draw attention to the advisability of government schools near electric mains being provided with current, and adequate fittings to facilitate cinema screen demonstrations.

A comparison of the health charts of all Schools for the past two years shews considerable improvement in the year now reviewed, but in respect to dental caries whereas in 1927 out of 7,119 boys examined—3,679 had carious teeth—51·68%; in 1928 out of 5,710 boys examined—3,664 has carious teeth—64·17%. This led us to determine so far as the year 1927 went, the amount of caries amongst boys of ages 6, 7 and 8 years and this shewed 53·90%. It is obvious, therefore, that the primary dentition is chiefly involved in these early years of school life, but nevertheless we were able to note in common

with the existing findings of authorities that the first permanent molars were frequently carious. Possibly this prevalence of caries of the milk teeth which is largely dependent upon factors operating during the pre-school years of life—may in time be beneficially influenced by the work of the welfare and maternal clinics, but it would appear to call for special attention at the hands of a whole time appointed dentist.

We cannot adequately thank Drs. PAUL RUSSELL and C. H. YEAGER for helping us to examine the stools of the school children, and for the loan of the hookworm and malaria films, apparatus, etc.

Dr. K. C. GHOSH officiated as Health Officer Schools, up to November 8th when he went on leave and Dr. H. W. FURNIVALL from November 9th to the close of the year.

III.—PENANG

Vernacular Schools in Penang number 26, with a roll of 2,730 boys. These boys are medically examined annually by the deputy health officer who also visits these schools monthly to supervise treatment for minor ailments and to give lectures. He carried out 93 visits to schools during the year and delivered 73 lectures principally on subjects such as hookworm and malaria prevention, illustrated with posters and diagrams.

2. There are also 11 English schools in George Town with a muster of 5,726 boys which are inspected annually by a medical officer (Dr. LANDOR) Girls' schools number 15 (English, 3 and Vernacular, 12) with a roll of 2,897; these are visited by the Lady Medical Officer (Dr. L. S. O'MAY) who also inspected 12 girl schools with 652 pupils in Province Wellesley and the Dindings. Boys' schools numbering respectively 47 (4,575 boys) and 8 (484 boys) are inspected by medical staff of Province Wellesley and the Dindings. There is thus a total of 17,066 pupils under partial surveillance in the Northern Settlement, not including a large number of private Chinese and Tamil schools which do not as yet receive any attention beyond the sanitary control which is exercised by the health officer when such schools are licensed. The senior health officer made recommendations for the improvement of 31 private schools during 1928.

3. The following gives a summary of school examinations in boys' schools.

SCHOOL DATA (BOYS)

Details of Medical inspection	By Medical Officer in part time Charge of schools	By Deputy Health Officer rural	By Medical Officers in P. W. and the Dindings
Number of schools visited	3	30	46
Number of boys Examined	1,477	3,462	3,877
Number of boys exhibiting gross physical defects	43=(3%)	623=(18%)	285=(7%)
Dental defects ...	283=(19%)	1,551=(45%)	1,062=(27%)
Defects of Eye, Ear, Nose and Throat ...	333=(23%)	399=(12%)	420=(11%)
Skin Diseases ...	127=(9%)	758=(22%)	197=(5%)

4. Hygiene in schools is probably the most important of all the factors concerned in the making of contented and virile citizens. The importance of disease prevention is not yet realized by the public, but an attempt is being made to broadcast the lessons of hygiene as far as possible.

5. Medical examinations in country schools are now followed by visits of the travelling dispensary or of hospital assistants, while in town schools a memorandum is sent through the headmaster to the parents or guardians of the physically defective informing them of the nature of the defect, and of the treatment required.

THE FOLLOWING IS AN EXTRACT FROM THE REPORT OF THE LADY MEDICAL OFFICER (DR. L. O.'MAY) ON THE MEDICAL INSPECTION OF GIRL SCHOOLS IN PENANG

6. The number of girl schools inspected were as follows:—

Penang (town) 7, Penang (rural) 7, Province Wellesley 10, Dindings 1.

Each school was inspected twice, the second visit being especially for the purpose of seeing the progress of statement suggested.

7. Throughout Penang, both in the English schools and in most of a Malay schools, the number of girls shows a very considerable increase on last year's figures, which again were considerably larger than in 1926. In Province Wellesley on the other hand, there has been no corresponding increase during these three years.

8. A table showing the number of girls inspected and detalis of pathological conditions found, is given.

9. The spleen rates in each of the Malay girls schools varied from 1 to 72 per cent. In the English schools the spleen rate is practically nil.

10. *Diseased Conditions.*—It is noteworthy that the general condition of the girls in the English schools is much better than that of those in the Malay schools, the proportion of the "not normal" averaging 30% in the former, against well over 50% in the latter, this is doubtless because those attending English schools belong to the more prosperous classes of the community. Thus there is a much larger proportion of girls with defective vision and hearing in the Malay schools. These show about 30% defective vision as against 10% in English schools, 5% of bad vision as against practically nil, and about 5% of ear disease and defective hearing as against nil. Similar differences are also found in the proportions affected under such conditions as hyperæmia and hyperplasia of the pharynx, naso-pharyngeal catarrh and goitre.

There is no such difference however in the matter of enlarged tonsils or enlarged neck glands.

External diseases of the eye are much more common in some of the Malay schools, which vary greatly in this respect, than in the English schools, which all show about 10% of cases.

11. *Dental Caries.*—The condition of the teeth is almost as bad as it could be throughout all schools, comparatively few children having teeth free from caries, though the Government girls school is somewhat better than the rest.

12. *Ocular defects.*—One third of the girls in the English schools have defective vision. This is probably not due to natural causes, as the corresponding figure for Province Wellesley (about one in twenty) clearly shows.

13. *Tonsils.*—About 35% of the girls in the English schools and a somewhat larger proportion in the Malay schools have enlarged tonsils.

14. *Neck Glands.*—These are enlarged in the great majority of the children, only in the Government girls school is the proportion as low as 50%; in most schools it is 80% or more.

15. *Treatment.*—In the Town schools a fair proportion of the children requiring treatment were found during the second inspection to have received treatment, chiefly in respect of teeth and eyes. There are, however, many parents who manage to pay school fees, but who are quite unable to find money for even the cost of medicine. The outdoor dispensaries provide treatment free of charge, but the majority of parents are too careless to take advantage of this. In the country schools, while teeth continue to be completely neglected, illnesses and ailments, such as malaria, yaws, etc., are treated, either at the local hospital, or by the travelling dispensary.

MEDICAL EXAMINATION IN PENANG SCHOOLS

Name of Schools under inspection roster	Number of Schools	Pupils on roll	Schools inspected	Pupils inspected	General condition not normal	Vaccination required	Defects of		Skin Disease	Eye Disease	Ear Disease	Teeth Defects	Spleen enlargement	Yaws
							Circu. syst.	Resp. syst.						
BOYS														
Penang—														
Govt. English Schools ...	5	2,299	3	1,477	43	6	29	43	127	292	5	283	45	1
Vernacular Schools ...	26	2,730	26	2,518	573	109	3	323	683	20	40	1,111	930	77
Private Schools ...	10	4,396	4	944	50	42	4	79	75	14	6	440	74	1
Province Wellesley—														
Govt. English Schools ...	1	384	1	324	4	41	4	56	72	8	...	118	53	...
Vernacular Schools ...	43	4,121	34	2,816	87	43	4	308	22	9	...	707	347	56
Private Schools ...	4	454	3	206	18	2	1	19	11	...	...	45	1	...
Dindings—														
Vernacular Schools ...	8	531	8	531	176	137	...	...	92	25	...	192	178	16
GIRLS														
Penang—														
English Schools ...	3	1,971	3	1,908	577	...	850	1,237	297	871	209	1,624	9	1
Vernacular Schools ...	12	926	11	782	422	...	534	432	113	198	12	657	227	6
Province Wellesley—														
Vernacular Schools ...	10	476	10	448	268	...	277	195	50	126	...	389	110	1
Dindings—														
Vernacular Schools ...	1	46	1	40	26	...	22	21	9	11	1	33	18	1

IV.—MALACCA

Medical Examination.—The following is a summary of the findings of a complete medical examination of 2,273 pupils in schools in the Rural Area:—

Number of schools	28
Number of pupils examined	2,273
Number of pupils with enlarged spleen	257
Spleen rate	11·3
Number of pupils with skin diseases (including dirtiness)	93
Number of pupils with bad teeth (requiring dental treatment)	490
Number of pupils with enlarged tonsils (requiring removal)	368
Other diseases	48

APPENDIX "I"

SOCIAL HYGIENE BRANCH, MEDICAL DEPARTMENT

ANNUAL REPORT FOR THE YEAR 1928 BY R. W. C. KELLY, M.R.C.S. (ENG.), L.R.C.P. (LONDON), *Acting Chief Medical Officer, Social Hygiene*

A.—SINGAPORE

1. *Facilities for treatment.*—

The following Government clinics are open daily (except Sundays and public holidays) for the free treatment of all nationalities in Singapore.

A. *Male Clinics.*—

(I) Bencoolen Street V. D. Clinic.
(II) North Canal Road V. D. Clinic.
(III) Tanjong Pagar V. D. Clinic.
(IV) General Hospital V. D. Clinic.
(V) Kandang Kerbau Outdoor Dispensary.
(VI) Joo Chiat Road Outdoor Dispensary.
(VII) Bukit Timah Road Outdoor Dispensary.
(VIII) Paya Lebar Outdoor Dispensary.

B. *Female Clinics.*—

(I) Kandang Kerbau Women's Outdoor Dispensary.
(II) Bencoolen Street V. D. Clinic.
(III) North Canal Road V. D. Clinic.

C. *Hospitals.*—(In patients).

(I) General Hospital (Males and Females).
(II) Tan Tock Seng Hospital (Males and Females).

Bencoolen Street Clinic.—This clinic is under the charge of an assistant surgeon with a staff of four dressers. It is situated at the southern end of the town in close proximity to a densely populated Chinese district and is

very popular with all classes of the community. The evening session which was primarily devised for the educated classes is much appreciated.

		1927	*1928*
Average monthly rate new cases	...	212·11	401·3
Average monthly re-attendances	...	2,430·04	3,009·11
Total average	...	2,642·15	3,410·14

North Canal Road V. D. Clinic.—

This is one of the two original clinics started by government to treat sufferers from V. D. and is situated in the centre of the town, close to a densely populated area and within easy reach of the business centre. An assistant surgeon with a staff of two dressers is in charge.

		1927	*1928*
Average monthly rate new cases	...	306·09	332·3
Average monthly rate attendances	...	2,235·17	2,713·6
		2,541·26	3,045·9

Tanjong Pagar V. D. Clinic is situated within the dock area in a building of the Singapore Harbour Board and is intended primarily for the treatment of seamen of all nationalities. It is under the charge of an assistant surgeon with two dressers.

		1927	*1928*
Average monthly rate new cases	...	261·3	270·1
Average monthly rate attendances	...	2,295·5	2,670·9
Total average	...	2,556·8	2,940·10

The General Hospital Clinic situated in the third class admission block caters for both out-patients and hospital in-patients. This clinic is in charge of the medical officer, social hygiene, who is assisted by a European attendant and one dresser.

		1927	*1928*
Average monthly rate new cases	...	112·8	141·4
Average monthly rate attendances	...	873·8	2,013·1
		985·16	2,154·5

Out-door Dispensaries.—

All government out-door dispensaries also treat cases of V. D. Three of these dispensaries being situated in outlying areas are of great use to sufferers who would otherwise have to journey long distances into the city.

Paya Lebar Out-door Dispensary.—

Average monthly new cases ...	...	...	20·7
Average monthly attendances	...	...	69·11
			89·18

Bukit Timah Out-door Dispensary.—

Average monthly new cases	36·3
Average monthly attendances	64·2
	100·5

Joo Chiat Road Out-door Dispensary.—

Average monthly new cases	66·5
Average monthly attendances	184·9
	250·14

Kandang Kerbau Out-door Dispensary.—

Average monthly new cases	36·4
Average monthly attendances	70·10
	106·14

B.—FEMALE CLINICS

These are under the charge of a Chinese Lady Assistant Surgeon.

Average monthly new cases	144·1
Average monthly attendances	706·10
	850·11

Hospitals.—

The returns for inpatients are not shown separately but included in returns for the Hospitals.

Treatment of Seamen

The clinic situated at the docks at Tanjong Pagar caters for men of the mercantile marine and conforms to the international agreement by treating seamen of all nationalities free and proving them with therapeutic agents to carry them through to the next port of call.

	1927	*1928*
No. of seamen treated.—		
New cases	879	995
Re-attendances	3,976	6,092
Total attendances ...	4,855	7,087

Nationalities of seamen treated.—

British	250
Other Europeans	28
Chinese	622
Malays	17
Indians	61
Others	17
	995

Number of new cases at all the Clinics in Singapore.

	1926	1927	1928
New cases.—			
Males	7,284	12,840	15,624
Females ...	1,944	1,266	1,729
Re-attendances.—			
Males	30,019	87,857	129,563
Females ...	4,881	6,124	8,482
Total ...	44,128	108,087	155,398

Ratio of total attendances to new cases.—

The ratio of attendances to new cases shows a steady increase; this is an encouraging sign as it provcs that the standard of work at the clinics is good, and that the patients are coming to realise the benefit of continuing treatment beyond the stage of disappearance of symptoms.

	1926	1927	1928
Ratio New cases to total attendances	4·76	7·66	8·90

Treatment by private practitioners.—

There are at present 12 private practitioners on our list who are supplied with government drugs and who have agreed to treat poor patients at a reduced fee. During the year three gentlemen, applied to be added to this list, and two resigned.

Numbers of patients treated by general practitioners during the year are as follows:—

	Syphilis	Gonorrhœa	Total
New cases ...	1,632	431	2,063
Re-attendances ...	1,707	556	2,263
Total ...	3,339	987	4,326

Ablution Centre.—

A centre was opened at the Bencoolen Street clinic on the 1st July, 1928.

The following are the attendances since its opening.

Europeans	49
Chinese	138
Malays	21
Tamils	106
Others	140
Total ...	454

Blood Examinations.—

The Professor of Bacteriology has examined by the Khan test specimens of blood sent from all the clinics, with the following results.

No. of Blood Tests	Positive	Negative
4,517	1,638	2,879

Analysis of work done in V. D. Clinics:—

(*a*) Intravenous—		
(i) Arsenobenzol	15,118	
(ii) Mercurosol	169	
(iii) Collosol Iodine	608	
(iv) Thiostab	165	
(v) Silbersalvarsan	4	
(*b*) Intramuscular—		
(i) Bismuth	14,497	
(ii) Bicreol	535	
(iii) Contramine	699	
(iv) Trimine	1,203	
(v) Gonoyatren	815	
(vi) Arthigon	76	
(vii) Collosol Manganese	482	
(viii) Manganise Butyrate	321	
(*c*) Hypodermic—		
(i) Vaccines Gonorrhœal	3,439	
(ii) Sulphostab	1,727	
(iii) Sulfarsenol	3,212	
Instrumentations.—		
(i) Irrigations	46,347	
(ii) Dressings	82,911	
(iii) Prostatic massage	2,170	
(iv) Minor operations	520	
(v) Dilatation	445	
(vi) Urethrocope examinations ...	11	
Microscopical Examinations.—		
Gonococci	4,333	
	1,682	6,015

Propaganda.—

The programme as laid down by the Advisory Committee on Social Hygiene has been closely followed throughout the year.

Pamphlets.—

Those published by our Social Hygiene Office along with others ordered from England from the British Social Hygiene Office and the League of the Red Cross Societies, Paris, have been widely distributed, both locally and to other stations. We have had several letters from the interior asking for information all of which have been promptly answered, and advice given or pamphlets sent. The distribution exceeds that of last year.

Posters on the subject of V. D. calling the attention of the public to the facilities offered by Government of free and confidential treatment, and of the location of the various clinics were posted throughout the streets.

Cinema films.—

The following cinema films were received by this office:—

(*a*) *Waste* from the British Social Hygiene Office—London.
(*b*) *Syphilis* Diagnosis and Treatment.
(*c*) *Social Hygiene for men* from the Health Council, Shanghai.
(*d*) *Social Hygiene for women* from the Health Council, Shanghai.
(*e*) *Venereal Disease* from the League of the Red Cross Societies, Paris.

As regards films "Waste" was shown in conjunction with lantern lectures by the chief medical officer, Social Hygiene. "Syphilis" not being suitable for a general audience was reserved for the medical students and medical staff; it was shown also at a meeting of the members of the local British Medical Association.

"*Social Hygiene for men*" was shown on several occasions, a total of 3,000 persons attending the demonstrations.

"*Venereal Disease*" was not considered fit for exhibition to the general public, but was lent to the Military authorities for exhibition to the troops in Garrison.

"*Social Hygiene for women*" was shown privately to a select body of lady social workers by whom it was considered as not fit for release to the public.

Lantern lectures.—

Selections of pictures imported from Europe and America were made into slides and lantern lectures were delivered to the following:—

1.	Moslem Association	600 persons attended
2.	Chinese Association	
3.	Straits Chinese Recreation Club	1,000 persons.
4.	Straits Chinese British Association ...	
5.	The Eurasian Association	250 ,,
6.	The Indian Association	50 ,,
7.	The Industrial and Continuation School (Chinese)	250 ,,
8.	The Straits Chinese Christian Association	
9.	The Chinese Literary Association ...	300 ,,
10.	Young Men's Friendly Band	

Schools.—

A specially selected group of slides which has first been approved of by the Principals of Schools were shown to school boys.

The chief medical officer, Social Hygiene, used these slides as a basis of lecture to the boys. Only those about to leave school, and those in the senior classes were lectured.

The boys were pupils of the following schools:—

Raffles School	254 boys
St. Andrew's School	60 ,,
St. Joseph's School	120 ,,
Y. M. C. A.	50 ,,

Dr. Hu Tsai Kuen lectured in Mandarin to 200 boys of the Young Ching School.

Police Force.—

The Commandant, Police Depôt at Thomson Road, was approached with a view to arranging a lecture for the men. This was agreed to, and Dr. Tan Eng Han volunteered to address them in Malay. This lecture illustrated by lantern slides was very well received by 300 members of the force.

Tamil employees.—

A lecture in Tamil was delivered by Dr. V. K. Thambypillai to some 500 Tamil labourers of the Singapore Harbour Board.

Prostitute Community.—

An effort has been started to try and educate women to the dangers of V. D. by means of lantern lectures and the lady visitor to brothels was instructed to gather a batch of 100 prostitutes at a time to attend these lectures, which were kindly delivered, in Cantonese, by Dr. Hu Tsai Kuen.

Seven lectures have up to the present been given and the following centres selected:—

1. A Vernacular School in Upper Nanking Street—about 150 prostitutes attended.
2. Tung Chai Dispensary—90 prostitutes attended.
3. Bencoolen Street Clinic—4 occasions—in all 450 prostitutes attended.
4. Social Hygiene Office—107 prostitutes attended.

The prostitutes have taken interest in these lectures; several questions concerning venereal diseases were asked, and they were ably explained by Dr. Hu.

The lectures to the public will be continued.

Chinese lady visitor to brothels.—

This lady, who was appointed on the recommendation of the Straits Settlements, Social Hygiene Advisory Board, continues to lecture to prostitutes, and to distributes pamphlets and leaflets. She is also instrumental in collecting the women together for lantern lectures, and has been advised to extend her activities among the sly prostitutes, when she comes to know of their existence.

General.—

The Social Hygiene Advisory Board of the Straits Settlements

Three meetings were held during the year and various recommendations of the Board were submitted to Government.

B.—PENANG

Annual Report, Kampong Kolam V. D. Clinic, Penang

1928

I. *Staff.*—One assistant medical officer, one dresser and one Tamil attendant did duty throughout the year.

II. *Situation and Premises.*—The clinic is housed, at present, in the ground floor of No. 16, Kampong Kolam, Municipal Quarters.

III. *Time.*—The clinic is open daily except on Sundays, and holidays.

The clinic was opened for 308 days during the year.

The night session (7—9 p.m.) commenced on 6th of March and is gaining in popularity with those who are unable to attend in the daytime.

IV. *Financial.*—All cases are treated free of charge.

V *Work Done*:—

	1927	1928
No. of V. D. patients	1,354	3,653
,, ,, non-V. D. patients	2,554	635
Total ...	3,908	4,288
No. of V. D. attendances	8,189	25,337
,, ,, non-V. D. attendances ...	9,422	1,657
Total ...	17,611	26,994

The non-V. D. patients were mostly sufferers from Yaws.

1928 average daily is 87·64 as against 59·49 in 1927.

VI. *The treatment given for.*—

(*a*) *Syphilis* consists of a course of six N.A.B. injections at the interval of a week in gradually increasing doses. Each of these injections is followed by a Bismostab 1 c.c. on the third day. Throughout, a mixture of Pot. Iod et Hydrag Perchl. is given internally. After an interval of two months after completion of the course, the patient's blood is tested again and if necessary, the course is repeated.

(*b*) *Gonorrhœa.*—Consists of irrigation, instillation and prostatic massage. Diluted and concentrated solutions of acriflavine have been tried with variable results; sulfarsenol is occasionally more successful. Phylacogen has been found to be remarkably reliable in rheumatic complications.

(*c*) *Soft Chancre.*—Consists of application of ordinary antiseptic dressings. [The routine followed in the case of fluctuating buboes is to substitute aspiration and hot compresses for the usual open incisions. This is found to shorten the period of "Healing". Attempts have been made to "harden the buboes by proteinshock by T.A.B. injections, milk or alum injections, but owing to the resultant severe reaction, it is not of practical value as a method of treatment in out-door clinics.]

Injections given.—		1927	1928
(II) For Gonorrhœa	(N.A.B. (Intraven) ...	1,746	4,444
	(Bismostab (Intram) ...	Nil.	711
	(Acriflavine (Intraven) ...	Nil.	120
	(Sulfarsenal (Subcut) ...	Nil.	167
	(Phylacogen (Subcut) ...	Nil.	211
	(N.A.B. (Intraven) ...	59	68

CHOWRASTA GENERAL DISPENSARY, PENANG

Two thousand three hundred and seven patients with venereal disease paid 3,721 visits to this dispensary.

C.—MALACCA

THE DISPENSARY, MALACCA

One thousand four hundred and thirty patients with venereal disease made 1,826 attendances at this dispensary.

D.—Total number treated at all the clinics in the Colony.

	Singapore	*Penang*	*Malacca*	*Total*
New cases ...	17,353	4,288	1,430	23,071
Re-attendances ...	138,045	26,994	1,826	166,865
Total ...	155,398	31,282	3,256	189,936

APPENDIX "J"

ANNUAL REPORT OF THE SECTION OF BIOLOGY, KING EDWARD VII COLLEGE OF MEDICINE, SINGAPORE

FOR THE YEAR 1928

By Capt. K. B. Williamson, Dip. Agri.

Teaching.—There were 25 students present at the beginning of the year of whom one was a woman. The number was augmented by 8 students in the second week of February, of whom 3 were women, and of whom none were candidates for examination during the year, having joined in the middle of the session. The new session opened in June with 33 students (including 4 women) of whom nine were re-examined in August, seven passing, and one of the remaining two rejoining the class in October. Two women students gave up attending in November, the present number on the roll being twenty-four including five dental students.

Instruction has followed the lines previously reported. Owing to greater suitability the guinea pig was dissected instead of the rat; and *Achatina fulica*, the giant-snail was tested in class, and was found to be suitable as a Molluscan type. As was the case last year, the students have been practised in descriptive botany with a view to familiarising them with the principles of classification, upon which the recognition of medicinal plants depends; the skeletons of the frog and guinea pig were prepared by them in class. Some simple experiments on vegetable physiology were also carried out, the verandah garden proving useful for the work. The cockroach was again found to be the most suitable introductory type for the study of insects. Elementary animal histology, though more difficult than that of plants, continues to be studied practically; and permanent microscopical slides dealing with most of the types have been purchased and should prove very useful. It is regrettable that the work of making new microtome slides in the laboratory was interrupted by the assistant who had been trained for the work having left to better his prospects during the year. At the request of the health branch, a course of instruction on mosquitoes was given to the candidates under training for the sanitary inspectors' certificate.

Research.—Research has proceeded during the year.

By the courtesy and with the assistance of Professor Rosedale, chemical analyses have been carried out in the biochemical laboratory, the related bacteriology and microscopical work, together with water testing, having been done in the biological laboratory, as well as in the field. Valuable help has also been given by the temporary assistants allotted by the Health Branch.

The following papers have been published during the year, or are in the press:—

Mosquito-breeding and Malaria in relation to the Nitrogen Cycle.
Bull. Ent. Res. XVII pt. 4 May, 1924.

Comparative tests on the Larvicidal and Spreading Power of Rubber, Crude and Solar Oils (with P. D. Rajamoney).
Mal. Med. Jour. Vol. III No. 2, June 1928.

The Nitrogenous and Organic Content of the Soil in relation to Malaria Ibid. *in the Press.*

Organic and other Chemical Factors which influence the breeding of Anopheline Mosquitoes, with special reference to nitrification.
Trans. VIIth Cong. of Far Eastern Association of Tropical Medicine. *in the Press.*

APPENDIX "K"

ANNUAL REPORT

OF THE

SECTION OF BACTERIOLOGY, KING EDWARD VII COLLEGE OF MEDICINE, SINGAPORE,

FOR THE YEAR 1928

By W. A. Young, M.R.C.S., L.R.C.P., M.B., B.S.

The most important item of the work of this department has been the training of the unqualified laboratory technicians, as the efficient running of a department of this type depends to a very large degree on the skill and trustworthiness of these men.

As the result of this training, the practical class work of the students has been extended, and the routine work for the general hospital, etc., has been increased and more exact methods of diagnosis have been introduced.

A large increase of stock type cultures has been made for teaching and research purposes, the total number of strains now numbering 251.

Stock typhoid-para typhoid vaccine only has been prepared during the year in quantities sufficient for mass inoculation of a large number of people. This was prepared for the inoculation of the whole of the subordinate staff of the General Hospital following a small outbreak of enteric. An investigation of the whole staff for "carriers" has been made . Other stock vaccines will be prepared when more cold storage accommodation is available.

Potent dysentery bacteriophage for therapeutic use is now in course of preparation.

An investigation into the comparative value of the Kahn test and the Wasserman reaction in 1,700 cases from the Social Hygiene Clinics has been carried out and will be reported on in the New Year. Assistant surgeons attached to the social hygiene clinics have been trained in the use of the "Dark-ground illumination" technique for the diagnosis of primary syphilis.

The exact dysentery rates for the Mental Hospital and Prison are being worked out with a view to testing the efficacy of Dysentery Enterovaccine during the coming year.

Investigations are proceeding on (1) the cultivation of the Bacillus of Leprosy, (2) the cultural reactions of pathogenic and non-pathogenic leptospira with special reference to the organisms causing the mild forms of leprospiral fever, (3) an organism isolated from an inguinal bubo resembling plague, (4) the bacteriology of "acute food poisoning", etc. The completion of many of the problems at present under investigation is dependent on an increase of animal accommodation during the coming year.

APPENDIX "L"

ANNUAL REPORT ON THE SECTION OF BIOCHEMISTRY, KING EDWARD VII COLLEGE OF MEDICINE, SINGAPORE, FOR THE YEAR 1928

By J. L. Rosedale, Ph.D., D.Sc., F.I.C.

Systematic courses of lectures and practical instruction in biochemistry were given to the third year students throughout the year. The department undertook the teaching of organic chemistry to second year students and the course consisting of lectures, demonstrations, and practical work commenced in October.

Various structural alterations in the laboratory have been carried out and the equipment has been added to, so that the department is able to offer adequate opportunities to those desiring further experience in biochemistry and research. The staff of the department has been augmented by the appointment of a full-time demonstrator, and Dr. C. J. OLIVEIRO assumed duties in October. Forty-four students at present receive regular instruction in the department.

The chemical constitution of the proteins of fish has occupied the greater part of the time available for research. A systematic survey of the diamino-acid content of the principal local types of fish (including fresh water specimens) has been completed. Not only the flesh but also such parts as roes, livers, skins and heads have been included. Several points of interest have arisen during the course of this work. It has been found that the various proteins require different lengths of time for complete hydrolysis; in most cases considerably longer than mammalian tissues. The most interesting analytical date come from the analysis of the heads of fish, which are frequently on sale in this country. Their protein, in many respects, resembles the constitution of gelatin—a deficient protein. Methods are now being worked out for the isolation and determination of the mono-amino acid groups.

Feeding experiments on certain aspects of local dietaries have been in progress during the year. From these it appears that the content of fat-soluble vitamin in coconut oil may be improved by the action of direct sunlight. The value, however, is not maintained if the oil is allowed to become rancid. Small samples of oil should therefore be exposed to the sun and utilised as soon as possible thereafter.

The experience of this laboratory is in accord with that of the Pasteur Institute, Coonoor, S. India, in that a difference exists between polyneuritis columbarum in pigeons, and beri-beri in man. Our experiments indicate that the administration of adequate protein, mineral matter and anti-scorbutic vitamin to a rice diet protects pigeons from typical avian polyneuritis for a considerable period. The existence of two factors in the anti-neuritic vitamin was observed in the laboratory during 1927 (Biochem Journal XXI, 1927). Further experience shows that only the factor which is not precipitated by lead salts is necessary for the prevention of avian polyneuritis if the diet is complete other than in regard to *B* vitamin. When adequate minerals and the anti-scorbutic vitamin are withheld, both factors seem required to prevent the onset of avian polyneuritis. When the factor not precipitated by lead is withheld, but the precipitated factor is given with an otherwise complete diet, a form of polyneuritis sets in, although the typical "headback" condition has not been observed. Such condition cannot be cured by small doses of a potent extract given by the mouth, although some alleviation is achieved by inoculation. From work carried out in the department it is suggested that the reason for this is due to lowered activity of the digestive functions of the pancreas (Biochem Jour. XXII, 1928).

APPENDIX "M"

ANNUAL REPORT OF THE SECTION OF PHYSIOLOGY, KING EDWARD VII, COLLEGE OF MEDICINE, SINGAPORE FOR THE YEAR 1928

BY J. R. KAY-MOUAT, M.SC., M.A., M.B., CH.B., D.P.H.

The increase in the number of students and separation of the years of study required alterations and additions which have been done by the laboratory staff and necessitated the curtailment of all other work.

The previous arrangements sufficed for thirty students in two rooms, the experimental and histological laboratories. The number of students from January to March was thirty-four and the equipment just sufficed.

Accommodation and equipment was improved during April and May by the professor and his staff, with what outside assistance was necessary, for the histology work to be done in the following session.

The bench accommodation was arranged to provide forty single places and twelve double places so that fifty-two could be readily accommodated and sixty-four if required. Enough was provided to enable the full class of forty-five to be taken without curtailing the course in any essential part. The staining and mounting of slides had to be limited to the preparation of slides from fresh tissues. Stained sections were only exhibited for examination by students. Except for learning the technique the time spent in preparing slides can be dispensed with and used otherwise with advantage. The disadvantage of so large a class is the impossibility of giving individual help over the many difficulties the students encounter in this work.

During the month of September the experimental laboratory received similar attention. The Michaelmas term was the first under the new system by which the second and third years of study are separated. This separation resulted in a class of 23 for the third year and 22 for the second year. The accommodation was adequate, but the equipment required considerable modification because:—

(1) For the time being the demonstrator was assigned to the Professor of Biochemistry and was replaced by an additional laboratory assistant.

(2) Both clases were required to use the same apparatus. An extra laboratory assistant was appointed to maintain the equipment which was beyond the capabilities of one assistant.

The actual charges made include:—

(1) Extension of the electric installation so that each student can use more apparatus at the same time.

(2) Permanent connections to the switches and terminals, saving much time in arranging apparatus.

(3) Fixed and variable resistance for each bench.

As regards the course itself:—

All demonstrations have been omitted.

It is impracticable to demonstrate technical details single handed to a class.

Individual teaching has been omitted.

About a quarter of an hour is the least time that is of use to give an individual student in an experimental class, as it would take five hours to go round a class of twenty, this has been omitted.

Experience has already shown that detailed notes and diagrams are required. The time spent in studying these will reduce the amount of practical work that can be done. The respiratory and circulatory experiments were partly done by the students and partly demonstrated on a few of the most intelligent students.

Apparatus of a simple robust type is being constructed so that the students can manipulate it by themselves without damage.

The work on respiration, circulation, work and metabolism done by the students themselves required more space than was available in the laboratories. The former lecture room is therefore being made into a laboratory.

The results of the changes are a distinct advance. The second year students do a course of general physiology with corresponding practical work to teach them the fundamental facts. The third year students take special physiology and are given more detailed work. The better students progress quicker as they are more dependent upon their own initiative, but the inferior students learn less.

Very little progress has been made with investigations and no new research has been commenced this year. The metabolism laboratory is being fitted out first for investigations on muscular exercise and respiration. Rapid and automatic or semi-automatic means are being devised for the investigations. The metabolic laboratory is however as yet only a room with three tables, sundry pieces of apparatus and material in the form of sand, concrete, slate slabs, planks, bolts and other fittings. By next term the bench accommodation and fixing of much of the apparatus is expected to be completed.

The investigations on the effects of muscular work in the tropics have progressed sufficiently to give indications of the means of obtaining further information, and promise to yield results which will give precise information for the maintenance of efficiency in the tropics.

APPENDIX "N"

EXTRACTS FROM THE STRAITS SETTLEMENTS RURAL SANITATION SURVEY AND CAMPAIGN FINAL REPORT AND TABLES, 1925—1928

By Paul F. Russell, M.D., and Clark H. Yeager, M.D., Dr. P.H.

Introduction

1. *Genesis.*—As the result of negotiations between the Government of the Straits Settlements and the International Health Division of the Rockfeller Foundation, the latter organization agreed to carry out a preliminary survey of hookworm infection in the Straits Settlements, upon the results of which plans for co-operative health work might be based. For this purpose, it detailed from its regular staff, Dr. M. E. Barnes and Dr. Paul F. Russell, who arrived in Singapore, February 24th, 1925. In co-operation with the Medical Department, these officers conducted surveys in the following settlements or provinces:—Singapore, Penang, Province Wellesley, the Dindings, Malacca and Labuan.

The surveys included a study of hookworm infestation, of general sanitary conditions, and of organised health work. Special reports were made to the Principal Civil Medical Officer on the completion of the work in each settlement. The final printed report summarized the results of the completed surveys. Although these studies dealt primarily with the medical and health work conducted by Government, there was included such data from Municipalities as have a special bearing upon the subject. This work was completed on September 21st, 1925. The Survey Report was published 31st December, 1925.

The recommendations of this survey were:—

(*a*) Organization of the health and medical services into distinct divisions.

(*b*) Improved methods of securing accurate diagnoses as to the cause of death.

(*c*) Public Health Nursing, Maternity, and Child Welfare Work developed and extended to Rural areas.

(*d*) An adequate anti-venereal disease program.

(*e*) Conservancy extensively developed by the general introduction of standard types of latrines, organization of adequate sanitary inspection, and increased attention to soil sanitation on estates and at schools.

(*f*) Provision for the administration of anti-hookworm treatment on a wide scale, both for the general and estate populations. Provision for the examination and treatment of immigrants passing through the quarantine station at Singapore.

(*g*) Greater emphasis given to laboratory work in the dispensaries and smaller hospitals.

(*h*) The development of an effective system of public health education.

Following the survey an agreement was entered into by the two organizations for a three-year Sanitation Campaign, 1926—1928, the Government to work towards the control of soil pollution and the International Health Division to attempt mass anthelmintic publicity and treatment. An effort was to be made during the campaign to organize District Health Centres which should be able to continue active efforts not only along the lines of the campaign but also in a general rule health program, involving infant and maternal welfare as well as the control of communicable disease. In other words the campaign was to be but the starting point of a more active practice of rural Preventive Medicine by the Straits Settlements Government through its medical department.

The Rural Sanitation Campaign began in Malacca in February 1926, was centered in the Northern Settlement in 1927 and was extended to include Singapore in 1928. Dr. M. E. Barnes was director until his departure in July, 1926, when he was succeeded by Dr. Paul F. Russell, Dr. Russell directed the work until his departure on leave in June, 1928, when the work was turned over to Dr. Clark H. Yeager until the close of the campaign December 31, 1928.

2. *Acknowledgments.*—Acknowledgment for co-operation and assistance is made to the various officers of the Straits Settlements Medical Department with whom the members of the International Health Division have worked.

The District Officers have invariably given their active and often enthusiastic support.

Other Government Departments have also co-operated, particularly the Education Departments in Malacca and Penang, to whom great credit is due for the success of the treatment campaign in the vernacular schools.

We wish to especially acknowlege the aid at the outset of the work of Dr. M. E. Barnes who, as Senior Representative of the International Health Division in Malaya and Siam was in charge of the Straits Settlements Campaign until July, 1926, and who with Dr. Paul F. Russell was author of the final survey report.

We also wish to acknowledge the loyal services of the staff assigned by the Medical Department to duty with the treatment campaign.

The bored-hole or tube-latrine (the name used in the Straits Settlements) was introduced as an improved feature of rural sanitation during the last six months of the campaign. The work of Dr. W. A. Young, Professor of Bacteriology of King Edward VII College of Medicine, Singapore, is especially appreciated, as he made the bacteriological examinations of the water in our test bearings and gave many useful suggestions.

3. *General Information.*—In the published Survey Report a certain amount of relevant general information is given which cannot be repeated here.

Vital Statistics

Only 410,838 of the population is rural, the rest residing in the Municipalities of Singapore, George Town (Penang) and Malacca. The sanitation campaign has been limited to rural areas, except for certain lectures and treatments in some of the Government schools of Malacca and George Town.

The general and infant mortality rates although not appaling are still considerably higher than necessary. One of the reasons for this is found in the available statistics of deaths from the "filth diseases" where night-soil disposal is careless or promiscuous. The total of 8,931 deaths in five years in the Colony is by no means complete for it does not include many kampong deaths from ankylostomiasis. This is a disease from which the Malays suffer greatly and the Malays are the race who patronize hospitals least. In the 1926 report of the Medical Department it is estimated that 21 per cent of all hospital admissions were for bowel diseases, including helminth infections. Of the total deaths in hospital 18·5 per cent were from these causes.

Whereas 62·2 per cent of George Town municipal school-children are free from ankylostomiasis, only 12·3 per cent of rural dwellers are uninfected; whereas 22·9 per cent of these rural people have heavy infections (three or four plus) only 6·2 per cent of the municipal children are heavily burdened.

Races.

Numerous races with a great diversity of customs and habits are to be found in the Straits Settlements. The chief groups are as follows:—

(i) *Malay*.—It seem probable that the Malays ethnologically belong to a race that is allied to the Polynesian and that they have been in the Peninsula for at least a thousand years, emigrating probably from the South. The Malay is an intelligent and friendly individual, disinclined to toil and satisfied with the immediate comforts or food, shelter, and family. Although there are Malay populations in municipal areas, the Malay may be said to live by preference in his rural kampongs. A typical Straits village is made up of a nucleus of Chinese and Indian shops, closely packed together, where the shop-keepers and their families live. For half a mile or more on all sides of this centre are scattered the Malay kampongs, each one perhaps having its own name, but being closely related to the village centre. The term "kampong" indicates a collection of Malay houses, three or more in number. The houses are usually 50 to 100 feet apart, built upon stilts, with a small clearing around each house and a rice field nearby. Fishing and the cultivation of rice are the chief occupations of the rural Malay.

The Malays are Mohamedans but are rarely fanatical in their religious customs. They do not regard Western medicine highly. They still have many interesting and deeply rooted animistic superstitions that antedate their conversion to Mohamedanism. They respond well, however, to public health appeals, when once they understand the significance. Shy by nature, they are only to be interested by individual and personal attention. In the kampongs nearly all of the Malays go barefooted and even in the municipal areas foot-covering is not popular with them.

(ii) *Indians*.—There are several type of Indians in the Straits Settlements including Tamil, Singhalese, Malayalam, Telugu, Hindustani, Bengali, Sikh and Pathan, but the South India Tamil Coolie from Madras Presidency outnumbers all other types. These Tamil coolies are found chiefly either on the rubber estates or else in the Public Works Department of the Government or of the Municipalities. They are industrious, but as a rule are unlettered and superstitious. A majority of the Tamils are Hindus and they are often fanatical. The average length of their stay on one rubber estate used to be estimated as three and a half years. It is probably less than that now. Very few Tamils

settle permanently in the Straits Settlements but many return several times from India. Tamil coolies are not infrequently poorly nourished, partly because of their strict dietary and caste regulations, partly because they prefer an alcoholic beverage known as "toddy", and partly because of the disinclination of the bachelors either to cook for themselves or to club together and be served by one cook. Most of these coolies go barefooted.

(iii) *Chinese.*—The Chinese are to be found in literally every phase of life in Malaya. They are merchants and clerks, tin miners and rubber planters, contractors and coolies, farmers and factory hands, physicians and hospital attendants, landlords and houseboys, bankers and beggars, legislative councillors and thugs, Buddhist priests and Christian evangelists. More than any other race, they have permeated into the life of the Straits Settlements. They may be divided into two general classes, *viz.*, the China-born immigrants, who enter the Colony usually *via* Singapore from South China, and the Straits-born citizens, whose ancestors may have lived in Malaya for generations. Large numbers of China-born Chinese settle permanently in the Straits Settlements, but it is unusual for Straits-born Chinese to go to China to reside permanently.

The Chinese of all classes are well-nourished. For financial inducement Chinese coolies will subject themselves to incredibly hard and unhealthy conditions of toil, shelter and environment. But they rarely neglect their food. The Straits-born families are as a rule better housed and are more apt to wear foot-covering than the imigrants. Housing conditions among the Chinese of the lower classes in the municipalities are often highly insanitary. Practically all the coolies go barefooted even in the larger towns, unless a thin rubber sandal can be called foot-covering.

Among the many Chinese tribes in Malaya, each with a separate dialect, are Cantonese, Khek, Hokkien, Tiewchiew, Hakka, Hok Chia and Hylam. Those who can read have a common link in written Mandarin, but the rest cannot understand each other until they master the few bazaar and bizzare Malay terms by which most business in the Straits Settlements in conducted.

(iv) *Eurasians.*—The term "Eurasian" usually means a Portuguese-Malay. There are numerous other Eurasians in the Colony, but the direct descendants of the early Portuguese conquerors form a majority. Eurasians maintain some of the habits and customs and even the language and religion of the Portuguese. They respond fairly well to public health instruction. Except for a group of Eurasian fishermen near Malacca Town, the race prefers office work to manual labour, and there is a large class of Eurasian clerks, stenographers, hospital dressers, sanitary inspectors, etc. The Eurasian is by preference an urban dweller.

(v) *Europeans.*—The Europeans in the Settlement are usually concerned with the business of the Government or else with some phase of the rubber, cocoanut or tin industries. A majority are British, but there are a number of Americans and Continental Europeans. As a rule these occidentals are temporary residents. They usually live in well-ventilated houses with safe water supplies and use sanitary though primitive bucket latrines. Septic tank installations are gradually becoming more common.

Europeans are able to maintain good health, usually remaining for periods of from two to four years between furloughs of from eight months to a year.

(vi) *Others.*—This includes Japanese, Siamese, Philippine, Javanese and related Malay-like people.

Publicity

Although from time to time efforts have been made in the Colony to acquaint the people with methods of conserving health, such efforts have not been systematic or sustained. With large populations of varied people who are unfamiliar with Western ideas of medicine and to a large extent are disbelievers, all health work labours under a heavy handicap. Many of the

desired reforms require the changing of customs which have been followed by Eastern peoples for centuries. Needless to say, such habits will not be abandoned until the people are convinced that the new ways recommended are better than the old. Health education, therefore, appears to be absolutely essential to an adequate public health program.

The chief reason why in such a campaign as this hookworm disease is given special emphasis, is because this disease is an excellent text for public health lessons. It is so common, so simple to explain, so easily cured and above all so completely preventable that even the most illiterate coolie can understand it and thus obtains his first idea of Preventive Medicine. Moreover, hookworm disease of itself is important, the direct cause of much disease, the indirect cause of far more deaths than is commonly realized. It, therefore, has considerable propaganda value.

During the campaign special afforts have been made to determine what publicity methods are adaptable to local conditions.

1. *Lectures.*—In table number 39 are grouped statistics regarding public health lectures by the campaign staff during 1926 - 1928. A dozen languages or dialects have been used, including, in one case, Latin the common tongue at a Catholic training college at Pulau Tikus, Penang. Malay is the lingua franca of Malaya, but as commonly used by foreigners, it is a hybrid dialect useful in commerce but almost useless in public health. The campaign staff has been chosen to include men speaking as many dialects as possible and the rule has been to speak to small numbers of people using wall and hand charts, specimens and demonstrations. Pictures have far more propaganda value in Malaya than words.

Attempts have been made to meet the individual needs of the people, often at the expense temporarily of efficiency and sometimes of economy. Lectures at unusual hours, at places off the beaten track, lectures requiring special equipment, lectures to perhaps only a single family or even to a single individual, all such propaganda work has seemed worthwhile from the standpoint of the receipients.

Cinema and lantern shows have been found very useful and the Foundation's hookworm and malaria films have been of considerable value. An attempt has been made to adopt the hookworm film to local needs by inserting and cutting. Scenes in Penang have been filmed and they add to the interest of the show.

Mosques, churches, schools, estates, shop-houses, theatres, court-houses, clubs, hospitals, police stations, out-door gatherings, private homes, public highways, all have been utilized for lectures. Under the heading of lectures might also be grouped numerous conferences with Government officials, business men, leading Chinese towkays, Indian chetties and Malay penghulus, all essential pathways to the multitude.

During the last six months of the campaign cinematograph lectures and demonstrations have been given in nearly every school in and near Singapore. In addition to these, a number of special lectures have been given upon request.

2. *Pamphlets.*—Although a fairly high percentage of the adult Asiatic population in the Colony cannot read, it has seemed well worthwhile to prepare and distribute public health pamphlets for the benefit of the schoolchildren and the 10 per cent or more of their parents who can read. The following have been written and distributed by the campaign staff:—

A. *Hookworm Infection.*—Illustrated.

(*a*) Malay-script—three editions.

(*b*) Malay—romanized—two editions.

(*c*) Indian—Tamil—two editions.

(*d*) Chinese—two editions.

(*e*) English—two editions.

B. *Roundworm Infection.*—English—one edition.

C. *General Subjects.*—Purchased from the Council on Public Health Education, Shanghai, China Read and passed as suitable by the Protector of Chinese, Malacca. Printed in Chinese and referring to—

Malaria.	Clean Homes.
Tuberculosis.	Venereal Disease.
Infant Hygiene.	Small-pox.

Numerous copies of Blacklock's "Elementary Tropical Hygiene" have been distributed to schoolteachers. Hygiene has been taught but most boys know practically nothing about malaria, plague, small-pox, tuberculosis, helminth and bowel diseases—the great preventable maladies of Asia. They have had scant knowledge of the venereal diseases and not uncommonly have infected their homes after marriage. Girls have finished their schooling in almost complete ignorance of how to care for themselves during pregnancy, of how to prepare the layette, of how to clothe, bathe and feed their babies, of how to keep their homes clean and their family free of worm infections and dysentery. Therefore, special efforts have been made to interest the schoolchildren and their instructors in Preventive Medicine in the hope that the time will soon come when this subject will have a place in the schoolroom at least on parity with mathematics and history.

D. A pamphlet on the bored-hole latrine has been published for public distribution.

3. *Posters.*—There would seem to be no question whatever that posters carefully prepared are a powerful factor in health education, particularly where so many languages and dialects abound. But a poster may easily be misleading and it is astonishing how few really valuable public health posters are available in the East and how difficult it is to prepare them.

The standard hookworm charts of the International Health Division have been very useful. Special reproductions have been made 8 x 10 inches in size with Malay text. These are more easily used and can be passed from person to person for closer examination than the wall charts permit.

The Council of Public Health Education in Shanghai has produced some excellent posters in colors with Chinese text referring to communicable diseases, health habits and infant and maternal welfare. Several sets of these have been purchased at very moderate cost and are of value.

Other useful posters have been secured from the Publicity Bureau of the United Province Health Department, India; from the Indian Red Cross Society; and from the Health Department of the Federated Malay States.

Local Chinese and Malay artists have prepared several posters for the campaign and, following a poster contest in the Penang schools, five posters in colors have been lithographed for general distribution. A coloured poster on the tube-latrine setting forth its advantages in Malay, Chinese and English has been lithographed and distributed.

4. *Special Exhibits and Contests.*—

(*a*) Shows.

When opportunity has offered, special exhibits have been prepared. For example at the Malacca Agri-Horticultural shows in 1925 and 1926, at the corresponding Balik Pulau, Penang, show in 1927, at the Malacca Infant Welfare Association Baby Show in 1926 and elsewhere the Campaign has cooperated with the medical and health officials. Exhibits demonstrated Intestinal Worm Infections, Malaria, Infant Welfare, Maternal Hygiene, Tuberculosis, Small-pox, Venereal Diseases and Yaws. Pamphlets, posters, specimens, cinema and lantern shows were used. The Euscope has proved its worth in these exhibits for it enables laymen easily to see microscopic preparations.

(*b*) Contests.

In the Penang Schools in 1927 three special contests were held to stimulate an interest in Preventive Medicine. The first was a Public Health Poster Contest open to students in seven English Schools:—

Penang Free School.	Anglo-Chinese Girls' School.
Government Girls' School.	Anglo-Chinese Boys' School.
Convent School.	Bukit Mertajam High School.
St. Xavier's Institution.	

Over 200 posters were drawn by Malay, Indian, Chinese, Eurasian and European Children. The judges were Mrs. G. SINCLAIR, Hon. Secretary Penang Impressionists; Mr. H. R. CHEESEMAN, Inspector of Schools, Penang; and Dr. PAUL F. RUSSELL. Money prizes and certificates were given by the Campaign. Some of the posters were remarkably well drawn.

The second was a Public Health Elocution Contest. Two boys each from the Penang Free School, St. Xavier's Institution and the Anglo-Chinese School declaimed in the Town Hall, suitable essays on Public Health subjects, previously chosen for them by the Campaign. The Hall was crowded and many denied entrance. The Hon. Mr. R. SCOTT, Resident Councillor, presided and the following acted as Judges:—

The late Hon. Mr. P. K. NAMBYAR
The Hon. Mr. QUAH BENG KEE, O.B.E.
,, ,, ,, PALGRAVE SIMPSON
,, ,, ,, P. M. ROBINSON
} Penang Member of the Straits Settlements Legislative Council.

Mr. H. R. CHEESEMAN, Inspector of Schools, Penang.

Mr. FRED AERIA, J.P.

Prize medals were generously donated by Mr. KHOO SIAN EWE, J.P., Dr. K. L. TENG, LIM GIM HOE, Esq., and Dr. A. O. MERICAN.

Finally a Public Health Essay Contest was arranged between the first six schools listed above. Subject for girls: "Home Conditions in Penang and How They May Be Made More Healthy; for boys: "Health Conditions in Penang and How They May Be Improved".

Lady CLIFFORD graciously offered a prize for the best essay. The Penang Chinese Chamber of Commerce generously donated money prizes for the four essays in each group receiving the highest score.

These contests required much time, but were well worth it, for in each case the young people became so thoroughly interested that their parents were perforce drawn into a consideration of some of the aims of Preventive Medicine.

(*c*) Shoes.

Although complete control of soil-pollution is the ultimate goal in the Straits Settlements, efforts are being made to persuade people to wear shoes, for many years must elapse before one may walk barefooted in Malayan kampongs and avoid hookworm infection. The chief obstacles in the way of widespread shoe-wearing are inertia and expense. Therefore through the courtesy of the Hon. Mr. GOODMAN, Secretary for Chinese Affairs in the Colony, a conference was held with TAN KAH KEE Esq., Malay's leading manufacturer of shoes. At this meeting he suggested that he would make plans for the manufacture of special rubber-soled shoes of wide-toe last to retail at a low price. He further very generously offered 2,000 pairs of these shoes to the Campaign for free distribution through the Education Department to schoolchildren.

This offer has attracted considerable notice and is being carried out. It has had publicity value and may aid in establishing this essential health habit in Malaya. "Better Shoes than Shrouds".

Examinations

1. Stool Diagnosis

A. Methods

(i) *The 20-field Flotation Egg Count.—*

Most of the stool examinations in the Survey and Campaign have been made according to the following technique:—

(*a*) Two grams of stool are left in the original ¼ or ½ ounce sanitary tin "Pill-box" container, weighing being done on ordinary balances sensitive to about the hundredth of a gram. This two grams of stool is thoroughly mixed with a solution of salt (NaCl) so thoroughly saturated that the specific gravity, frequently tested, is 1,200. Boards holding 12 specimen tins are used.

(*b*) When the mixture is complete, the tin is filled to the brim without spilling and is capped with a 2 x 3 glass slide.

(*c*) Not less than 10 or more than 60 minutes later the slide is deftly everted and the adherent film of stool mixture is examined by low power objective (16 mm) and a 10 x ocular.

(*d*) Using a mechanical stage merely for convenience, twenty separate fields are examined beginning at the upper left sector and including all quarters of the film. No precise movements are required. All hookworm ova seen in 20 fields are counted.

(e) A record is made field by field on a specially ruled microscopist's form The total for 20 fields is entered. If the specimen is too small to furnish 2 grams the total number of eggs counted in 20 fields is multiplied by the proper factor to get a corrected total on the basis of 2 grams.

(*f*) If no hookworm eggs are found in 20 fields the whole slide is re-examined and if still negative a second slide is made and searched. If a single egg is found in researching or on the second slide the specimen is credited with 1 egg and called one plus.

(*g*) Grading is done for convenience by the following table, although results may be analysed by egg totals rather than by intensity groups:—

Group	*Ova in Twenty Fields*
+	10 or less
+ +	11 to 29
+ + +	30 to 59
+ + + +	60 or more

This grouping was suggested as a result of special studies made by Dr. Barnes and reported 28th June, 1926. All stools have been classed as mushy. Formed stools are extremely rare.

(*h*) Other helminth ova, such as those of roundworm or whipworm, are graded roughly, but no attempt has been made to classify them as to intensity.

This method does not overtax the capabilities of the average local microscopist. It is, of course, useless as an intensity index in individual cases, as are all methods using small samples of a single stool of only one day's output. It is admittedly less accurate than Stoll or Lane egg counts when the latter are done by well-trained workers. But the meticulous and sustained precision of movement essential to these two counts and the unremitting attention to minute details are habits foreign to the local technicians and impossible of attainment except in very rare cases.

This 20-field flotation count is undoubtedly an excellent and highly accurate method for determining incidence rates of hookworm, roundworm and whip-form infection. The smear method is decidedly inferior. The Lane method is slightly more accurate than the flotation in the experience of the writers.

But as a measure of intensity, the 20-field count is open to some question. It is undoubtedly less accurate than Stoll or Lane counts in the hands of consistently skillful technicians. But the necessity of pushing the Lane count "to finality", a process sometimes requiring half a day for a single specimen, and the essential prolonged scrupulous delicacy of motion involved in the Stoll count, make them both not suited to average microscopists in our service in the Straits Settlements.

One of the aims of the campaign has been to train men for local routine rural health service-lectures and treatments as well as examinations. Therefore the method of diagnosis that is be at suited to average conditions, provided it gives the necessary information should be chosen. There is no doubt whatever that the 20-field flotation count provides a reliable and useful guide to the intensity of hook-worm infection in group of people. As noted before, single counts from single specimens are as worthless in flotation as in Stoll or Lane counts for estimating numbers of worms in an individual. Stoll and Lane counts under field conditions are average and not accurate counts, giving at greater cost and with a certain dissimulation no better guide to intensity than the 20-field count.

As a result of certain studies by Dr. BARNES and Dr. RUSSELL reported with the Survey, in the 1926 Quarterly Reports and in a special report dated 28th June, 1926, certain local factors have been suggested subject to further study. They are:—a mushy stool factor of between 50 and 60 convert Stoll dilution eggs per gram into female worms (instead of 25 as commonly reported); a factor of 64 which when multiplied by the 20-field count will give the Stoll equivalent in eggs per gram; a factor of 1, which when multiplied by the 20-field count will give the number of female worms harbored.

(ii) *Stoll and Lane Counts.*—The dilution and the direct centrifugal flotation methods have been used to a limited extent following the technique given by their authors.

(iii) *Worm Counts.*—Worm counts were made following the Darling technique. All counting and sorting was done by the directors. Oil of chenopedium was given in equally divided doses totalling 1.5 c.c at 7 A.M. and 8 A.M. followed by one half ounce of magnesium sulphate one hour after the last dose. Stools were collected on the day of treatment at 2 P.M. and at 7 A.M. on the next two days. When a second treatment was given there was an interval of ten days between treatments. Stools were washed through a 40-mesh sieve, and the residue examined on enamel trays.

The hookworm incidence during 1926, 1927 and 1928 in over 189,000 stool examinations by Government hospital and dispensary laboratories was 34.8 per cent. This is about the same as the rate among Penang Municipal school-children of 37.8 (Table 10) as would perhaps be expected as a large percentage of the hospital cases are Municipal dwellers. The general rate found by the campaign staff in 37,000 examinations between 1925 and 1928, inclusive was 71·5 per cent, ranging from 88·2 per cent in Province Wellesley to 37·8 per cent in George Town, from 87·1 per cent in Malays to 27·5 per cent in Europeans.

This European rate is naturally made higher because only these suspected of hookworm infection would as a rule send specimens for examination.

Females are less numerously infected than males. This is particularly true of Europeans, but scarcely true of Indians.

As regards age, the hookworm incidence rates increase as age increases. The rate is slightly higher for native than for foreign born and slightly higher on estates than elsewhere.

Occupational grouping is highly unsatisfactory for there are few well demarcated classes. Agriculture, marine and domestic groups among the Malays are hopelessly intermingled. A Malay fisherman frequently also plants padi. A Malay woman is domestic but also plants padi. School children are classed as domestic. The strictly desk-shop group has the lowest incidence. (Table 16).

As regards intensity the Penang Municipal schoolchildren are least heavily infected, the Northern Settlement Rural dwellers most heavily. (Table 17). Malays are the most heavily infected of all races and Europeans the least. The fact that Chinese are slightly more heavily infected than Indians is probably a reflection of the repeated anthelmintic treatments to Indians on estates.

Among Malacca schoolchildren 41·6 per cent by estimation harbour more than 60 worms, 11·5 per cent more than 120. In the Northern Settlement 22·9 per cent in rural areas have over 60 worms and 6·8 per cent over 120.

By Stoll counts the estimated average number of hookworms in 1,662 cases is 99·2. But these cases were often hospital cases and this average may therefore be higher than a real average.

Worm counts in 145 cases gave an average of 90·6 worms, 17·6 per cent of these were Ankylostoma duodenale and the rest Necator americanus (except for 3 worms identified as Ankylostoma braziliensis) (Table 21). Note the series of worm counts by Drs. Lindow and Tull (Table 22).

Roundworm rates are also high, 62·2 per cent for total examinations, with a decreasing incidence after the age of 12 years. It is highest in Malays—81·4 per cent and lowest in Europeans 12·9 per cent.

In 45·9 per cent of 30,239 stoll examinations at least three kinds of helminth ova were found—usually the trio hookworm, roundworm and whipworm.

Even in the Penang English Schools 17·8 per cent of 5,709 examined had three species of worms.

Other intestinal worm ova seen:—

Taenia	22
Hymenolepis nana	7
Hymenolepis diminuta	8
Dipylidium caninum	4
Oxyuris vermicularis	230

2. *Soil surveys.*—In order to determine whether or not the various soils of the Colony are suitable for the growth of hookworm larvæ numerous soil surveys were made, as reported in table number 36. This was not a quantitative but a qualitative study in which only samples of soil showing obvious evidences or possibilities of contamination were used. There was no difficulty in finding polluted soil almost anywhere in the Colony. Of all soils, only clay gave evidence of being inhospitable to hookworm larvæ. Sand, humus, sandy loan and laterite, all disclosed abundant larvæ.

In this testing a modified Baermann apparatus was used. Soil was collected from suspicious places and taken in small tins to the laboratory where it was put into large glass funnels. These had been lined with a 60-mesh wire

screen over which was placed a piece of ordinary cotton cloth. On the tube at the lower end of the funnel was fastened a short length of rubber tubing closed by a pinch-cock.

Water heated to about 115 degrees F was poured into the funnel between the glass and the wire and not directly into the soil. The level of the water was left slightly below that of the surface of the soil. Free-living nematodes and hookworm larvæ tend to pass through the cloth and the wire into the water, through which they sink to the bottom of the funnel tube. After periods of from six to twelve or more hours, a small amount of water is withdrawn from the rubber tubing. This water is examined under the microscope.

According to a recent paper by Lane (Trans. Roy. Soc. Trop. Med. and Hyg. Vol. XXI No. 4 Jan. 1928) the temperature of the water is not important. Moreover in quantitative studies with hookworm cultures when one is studying the viability of hookworm eggs in various soils, Lane has evidence that it is necessary to trap the cultures so that those larvæ which will migrate out of the culture dish may be caught and counted.

Identification of hookworm larvæ was based on the following criteria:—

(*a*) Characteristic and pronounced greenish sheen of the hookworm larva.

(*b*) General shape of body. Many free-living nematodes are bulky and at once ruled out. Many show ovaries and ova and are thus easily excluded.

(*c*) Characteristic sheath of the hookworm larva which wrinkles in the concavities as the larva wriggles. This sheath is the most characteristic feature but is not always present.

(*d*) The hookworm larva has a cylindrical mouth cavity about as long as the diameter of the larva at the posterior end of this mouth cavity. Head fairly blunt. Three sections of œsophagus not sharply marked off. Reproductive primordium small.

(*e*) Tail of hookworm larva tapers in a uniform manner to a fine tip but does not form a long tail.

(*f*) Hookworm larva has a characteristic movement not easily described but soon recognizable.

The soil surveys indicate that soil pollution in the Colony is not focal but general and widespread.

3. *Hemoglobin Determinations.*—Tallquist scales were used by dressers. They were occasionally checked by Dare readings but not a great deal of value attaches to the tables given. The fact that 41·0 per cent of some 5,023 readings in Malacca were less than 65 per cent would seem to indicate a widespread anemia. But only 4·1 per cent of these were below 45 per cent.

Malaria and dysentery are the cause of much anemia in the Colony and it is not easy to trace precisely the influence of hookworm infection alone. However Darling, Barber and Hacker ("Hookworm and Malaria Research in Malaya, Java and the Fiji Islands"; Pub. No. 9 Rockfeller Foundation 1920) state that—

"There is a steady loss of hemoglobin with an increasing number of worms. The rate of loss in worm groups over 100 is higher than it is in groups lower than 100. This is probably due to the host's ability to make good the losses due to few worms."

They found, further, that on the average, 12 hookworms are capable of causing the loss of one per cent of hemoglobin as measured on a Dare hemoglobinometer.

Doctor Barnes in the final printed survey report presented graphs based on 2,500 cases at Tan Tock Seng Hospital grouped solely with reference to the numbers of hookworms expelled after treatment regardless of primary complaint. The average hemoglobin of each group was computed and in all of these graphs, the downward trend of the hemoglobin with the increasing number of hookworms is apparent at a glance, in spite of the individual variation in resistance which is made evident by the small number of cases included in the larger worm groups. Correlation between numbers of hookworms and loss of hemoglobin cannot be disregarded.

Anthelmintic Treatments

A. *Methods.*—Treatments are reported in Tables Nos. 33 and 34. It is interesting that of the more than 56,000 treatments given by the campaign, 66·6 per cent have been given to Malays. They have responded with an enthusiasm which guarantees that the treatments have been effective and beneficial.

Mixed treatments have been given as a rule, the maximum dose containing of 1·3 c.c. of carbon tetrachloride and 0·6 oil of chenopodium. These drugs have been put together into a purgative dose of magnesium sulphate or castor oil and all taken at one time in the morning into an empty stomach. It has been the practice to use only oil of chenopodium for—

(*a*) Children under 10 years of age. (Empirically).

(*b*) Tamils of any age. (Because of fondness for alcoholic toddy).

(*c*) Persons with heavy ascaris infections. (Because carbon tetrachloride merely stimulates ascarides to potentially harmful activity. It does not cause their expulsion).

Unfortunately there is no ideal anthelmintic that will always kill all intestinal worms and never endanger the host. Therefore anthelmintic therapy must always be a compromise between efficiency and safety. Probably carbon tetrachloride should never be given in greater quantities than 2·0 c.c. or 2·5 c.c. as a total dose. Oil of chenopodium up to 1·5 c.c. is considered a safe dosage.

It has been found by various observers that oil of chenopodium is only toxic when it is emulsified by the bile and thereupon absorbed by the intestinal mucosa. For this reason, although it is essential to give the drug on an empty stomach, it is wise to insist on an ample evening meal the night before. Giving the drug in castor oil to children is also good practice for rapid emulsification is thereby prevented. Giving the drug in magnesium sulphate to persons over 6 or 7 years of age is a usual procedure. To give either this drug or carbon tetrachloride in the purge lessens slightly the percentage of worms expelled.

Recently Lamson states that intoxication following carbon tetrachloride is usually due to one or more of the following complications:—

(*a*) Irritation or mechanical obstruction by ascarides.

(*b*) Chronic or acute alcoholism.

(*c*) Presence of undigested food in the intestinal tract.

(*d*) Calcium deficiency.

He suggests avoiding, if possible, the first three factors.

As regards calcium, he believes that most normal individuals have sufficient reserves. But underfed persons, *e.g.*, many estate Tamil coolies, should as a routine procedure have their calcium reserve built by, *e.g.*, a quart of milk a day or by feeding various calcium salts. Calcium lactate, carbonate or chloride are all useful, the first named perhaps the best. About 3 grams a day in divided doses for a week before treatment is recommended.

Active treatment of carbon tetrachloride poisoning, Lamson suggests, should consist in oral administration of calcium chloride. Frequent small doses should be given until relief is obtained or until signs of air hunger give warning of acidosis. Parathyroid extract is an additional aid in treating those cases of toxemia. This calcium therapy is still to be tried out on a wide scale.

The first treatment for toxæmia either from carbon tetrachloride or from oil of chenopodium is immediate evacuation of the bowels by copious and repeated hot soap-suds enemas. Stimulants and symptomatic treatment may be given as indicated. No individual treated should be allowed to go more than three hours without a good bowel movement. Food may be taken two hours after active purgation.

B. *Quarantine, Estate and School Treatments.*—Coolies recruited from India enter Malaya through the quarantine station at Penang or at Port Swettenham, Federated Malay States. As a rule, these coolies are given anti-hookworm treatment prior to their departure from India, and again at the Quarantine Stations. On most estates in Penang, Province Wellesley, Dindings and Malacca, routine treatments for hookworm infection are given, although estates vary markedly in the thoroughness with which these treatments are carried out. It is evident, however, that something has happened in the past ten years to materially reduce the general prevalence of hookworm infestation among the estate coolies, and it is fair to assume that the treatments have been important factors in bringing about this decrease. Thus, in 1916, the late Dr. S. T. DARLING found that 90·7 per cent of the incoming coolies at Port Swettenham were infected with hookworms. During the present survey the infection rate among incoming coolies at Penang was found to be 44.3 per cent, and the general infection rate among coolies on estates was 73.3 per cent.

In Penang and Province Wellesley, the routine treatment of school-children for ankylostomiasis was started by government medical officers in November 1924, 832 children being treated by the end of the year.

C. *Discussion.*—In the Table number 35 are recorded the results of a re-survey 3—6 months following treatment. It must be remembered that soil pollution in these area had not been controlled. There was, however, an increase in negative cases from 5.9 per cent to 51.4 per cent. Intensity fell from an average 20—field-egg-count of 26.1 to 8.4.

Hill in a recent study (Jl. Preventive Medicine Vol. I No. 8 Nov. 1927) in Porto Rico found that in an unsanitated area where a thousand people were treated intensively until a majority were cured, there had been a return one year later to 20 per cent of the original intensity of hookworm infection. Apparently in three years the intensity would be back to its former level. In the present campaign where it has been necessary to give treatments in advance of the control of soil pollution, re-infection must have been the rule. Doubtless the infection and intensity rates in two or three years time will in the rural areas be no less than at the beginning of the survey. It must not be assumed, however, that the treatment campaign has therefore been a total loss. The gain has been two-fold.

(1) There is a considerable educational or psychological value in mass anthelmintic treatment by the demonstration of actual removal of worms in large numbers. Particularly roundworms but, after the lectures, also hookworms in a stool make a real impression in the minds of the people. In a country where sanitary latrines are so rare, where a sanitary conscience is non-existent, in the general public, where ignorance, illiteracy and superstition are universal among all but the governing class and the schoolchildren, and where autocratic methods of administration have never been in vogue, it is a question whether the control of soil pollution could ever be accomplished without at least one preliminary mass-treatment campaign. Worms in a bottle have little persuasive appeal to the average Malayan individual beyond perhaps helping

to induce him to take some medicine. But worms in his own bowel movement stir the imagination of even the most sceptical person and frequently arouse enough antipathy to these parasites to lessen materially his resistance to the idea of spending money and labour for a sanitary latrine.

(2) The second gain has been in a curbing of heavy infestations and in a reduction of the total number of worm parasitizing the general population. With district health centres and district medical officers carrying on the mass treatments at yearly intervals in the future it is hoped that this gain will be held until soil pollution is controlled.

It is of course obvious that so far as eradicating hookworm infection is concerned mass therapy without coincident soil sanitation is like "bailing with a sieve". The universal use of sanitary latrines is the only possible way of eradicating hookworm infection.

One further point must be noted. It has been held by some that mass treatments tend actually to increase rather than decrease the incidence of hookworm infection, in the absence of sanitation, by causing a sort of "mass diarrhœa" that inundates the whole countryside with viable hookworm eggs and thus results in intensifying the amount of soil infestation with larvæ and so the amount of infection and disease in man.

It is true that the vermifuge does not kill the eggs which the purge brings to the ground and were there a "mass diarrhœa" it is conceivable that increased soil infestation might result. But there is in practice no such sudden and dire result. When treatments are given in a kampong the people go to their usual places of retirement which doubtless already teem with hookworm larvæ. Wherever possible special pits are dug at the place of mass treatment, *e.g.*, at schools. These are then filled in.

Control of Soil Pollution.—Cognizant of the evils of soil pollution, the government of the Colony has undertaken to bring about as soon as possible the widespread use of sanitary latrines. The campaign is an aid as regards propaganda but the actual business of latrine construction and conservancy is being handled departmentally. The question of soil pollution in the Colony has several important divisions.

A. In the first place one must consider the diversity of races and the following notes give the broad difference as regards conservancy habits:—

(1) *Europeans.*—The European in the Straits Settlements usually lives in a house having a bucket latrine. Modern plumbing is gradually appearing. Soil pollution by children under the direction of their Chinese, Indian or Malay nurses is not uncommon.

(2) *Eurasians.*—The Eurasian is chiefly an urban dweller and uses a bucket latrine, although the children are not taught to be careful. The Eurasian fishermen near Malacca Town either use the sea or else pollute the shore.

(3) *Malays.*—The Malay is more or less subject to the conservancy regulations of his religion. The chief rule is that water must be available at or near the place frequented. This water for cleaning purposes may be a running stream or quiet water, or water in an artificial container provided that the amount of water be at least 65 gantongs in volume (a gantong is nearly a gallon) and provided also that a dipper or a tap be present to prevent contamination of the reservoir. The Malay prefers to use the jungle near a little stream or near a rice field. Malay children commonly pollute the soil around the houses. However, the Malay is not averse to using a latrine provided a minimum of labour and expense is involved in its construction and maintenance, and provided that this latrine fulfills approximately the requirements of his religion. Pit latrines are much more popular than the bucket type.

(4) *Chinese*—The Chinese in his conservancy habits is influenced by the economic value of night-soil rather than by rules of religion. Wherever possible the night-soil is put on vegetable gardens. Therefore bucket latrines

are most frequently used and direct soil pollution is not common. The Chinese will build and maintain a sanitary bucket latrine if sufficiently urged by the health officer, but it is always necessary to guard against the use of the night-soil for gardening purposes.

(5) *Indians.*—The Tamil coolie in his conservancy habits is influenced by several factors. In the first place he has not been accustomed to use a latrine in India. Privacy is his only concern and this is often a small matter. He considers the enforced use of a latrine a senseless exaction on the part of the authorities in Malaya. In the second place, he has many superstitions about the terrors of darkness, about sickness-producing odors and about the restrictions of caste. His Hindu religion does not regulate night-soil disposal to any extent and soil pollution around the coolie lines and over the rubber estates by children and by adults is very common.

The Indian Mohammedan requires water as do the Malays, and will use a latrine. The Indian shop-keepers in the towns commonly have bucket latrines, but these are usually not of a sanitary type. Soil pollution by children in the towns is common.

B. In the second place soil pollution must be considered on the basis of place. In general there are four distinct problems.

1. *Government Buildings.*—These are mostly (*a*) dwellings for government servants, police and coolies and (*b*) schools. The Legislative Council in November, 1926 and early in 1927 voted sufficient funds to provide sanitary latrines for every government building in the Colony. This is a definite forward step and the fact that all government buildings, especially schools, are now provided with sanitary latrines makes it possible without embarrassment to urge private individuals to build latrines.

2. *Estates.*—There is ample authority under existing laws both through the Health and Labour Departments to insist on the provision of sanitary latrines by estates for the use of the coolies.

Sanitation on the learger estates is supervised in Penang, Province Wellesley, and the Dindings by the health officers and their staffs. In Malacca, the supervision is by the medical officers of the Malacca Agricultural Medical Board.

As a rule, latrines are provided on the larger estates, but the opinions of estate managers differ greatly as to their utility. Everywhere one used to hear that "the Tamil coolies will not use latrines." It certainly is true that the Tamil coolies, until the rationale is clear to them, do not use the latrines provided unless they are forced to do so, and that they usually manage to evade even drastic rules.

But it has not been amply demonstrated that the Tamil coolie will not use a latrine willingly when once he understands why it is to his advantage and when the latrines are reasonably built and located. Some latrine faults encountered have been—

(*a*) Not conveniently located with reference to the lines.

(*b*) Not situated near water, or not provided with water for cleansing purposes.

(*c*) Not lighted at night.

(*d*) Not kept clean.

(*e*) Not constructed in accordance with the religious customs of the coolies.

(*f*) Emit highly effensive odors which the coolies believe may cause disease.

(*g*) Not comfortable.

Managers have become increasingly interested in this phase of their estate economy.

Certain recommendations suggest themselves as essential to a solution of the question of estate latrines—

(*a*) The type of latrine should be that best suited to the location in question.

(*b*) Latrines must be located close to the line—not more than 5 yards away. They should be constructed with the comfort of the coolie in mind, *i.e.*, not too small, not too far away and not completely enclosed. Sometimes lights are feasible.

(*c*) They must be maintained in a sanitary condition.

(*d*) Special small box latrines with small holes should be provided for children and located right beside the lines. The lines' ayah must be held responsible for any soil pollution by children. Probably most of the infection among a group of coolies is caused by the children around the lines.

(*e*) Systematic instruction of the coolies as to the reasons for the adoption of new customs on their part. This last point is very important, and unless it is effectively carried out, satisfactory results cannot be expected.

3. *Gazetted Villages and Municipalities.*—The Municipalities of Singapore, Penang and Malacca are provided with conservancy systems. Bucket latrines are used and the night-soil is collected by Chinese coolies. In Singapore it is put into a disposal plant; in Penang it goes into a collecting plant and thence to the sea; in Malacca it goes to sea *via* boats. Unfortunately in all three cases (*a*) there are numerous houses without any latrines at all and (*b*) much of the crude night-soil gets to vegetable gardens. The fact that 60 per cent of the Municipal schoolchildren of Penang were found to have either hookworm or roundworm infection or both (Tables 10 and 17) is an indication of a defective conservancy system.

The larger villages in the Colony are gazetted. In such villages, to control soil pollution, four steps are necessary—

(*a*) The village should be further gazetted for a compulsory night-soil removal system.

(*b*) Back lanes and ditches should be considered with reference to lining up latrines properly.

(*c*) Notices should be served to all householders requiring them to build sanitary latrines.

(*d*) The Rural Board should provide a removal system for which a monthly tax is collected.

4. *Kampongs.*—The problem of sanitation in the kampongs is a more difficult one. It requires a simple, cheap latrine and an active latrine persuasion and construction campaign, going systematically from kampong to kampong with definite instruction, models, tools and materials. The cost must be less than $10 (Straits) and the upkeep must be as close to nil as possible. Bucket latrines are wholly unsuitable. Pit latrines have answered the purpose except where there is a high ground water level. In Province Wellesley, for example, it is rarely possible to go deeper than a foot before coming to the water level. This same water table supplies the wells.

So far not much progress has been made towards a solution of this problem. A beginning has been made in Malacca where 800 pit latrines have been built by Malays in the southern district following lectures, demonstrations and treatments.

A record of a latrine survey, made in 1926 and 1927, of 70 villages and 10,410 houses in Malacca and the Northern Settlement, showed that only 10·9 per cent of the houses had sanitary latrines and 69.4 were completely devoid of them.

C. *General.*—Three further points referring to soil pollution may be noted.

1. *Vegetables.*—Most of the vegetables sold in Malaya are grown by Chinese whose practice it is to use human night-soil as a fertilizer. The crude material is obtained either by a definite removal contract with the householders of a village, sometimes in the past with tacit approval of the authorities, or else it is surreptitiously purchased from municipal or government conservancy coolies. It is dumped into small sumps of water for dilution and within a few days is sprinkled on the growing vegetables. This is an excellent agricultural practice and the Chinese know from generations of practical experiment, the proper dilution of night-soil for each particular kind of vegetable. Sometimes only urine is collected and used.

Unfortunately there are prevalent many diseases of which the medium of communication from person to person is the human dejecta. Among them are ankylostomiasis, ascariasis, bacillary dysentery, amœbic dysentery, enteric fever, and the various infant and adult diarrhœas. Cholera and tuberculosis may also be transmitted by this route. This vicious circle, into mouth, through body, into a defective conservancy system, on vegetables and back into mouth again is so direct in Malaya, that all of the disease-causing organisms or eggs involved easily retain their viability.

Lettuce purchased in the Penang market has been washed thoroughly in running water in the campaign laboratory, has then been cultured and from the culture hookworm larvæ have been obtained—a chain of events only possible if the lettuce were previously contaminated with human night-soil. Other lettuce has been carefully washed in running water, then washed in a saturated salt solution. The top ¼ inch of this solution after 10 minutes has then been centrifuged and ascaris eggs have been demontrated. This has been done several times in the campaign laboratory, Penang.

It is recommended that—

(*a*) The whole question of vegetable fertilizers in Malaya be studied with a view either to—

(i) render human night-soil innocuous as regards disease, or

(ii) to make available a substitute fertilizer for the gardener. For example, fish or an artificial fertilizer if made available might be found as effective and almost as cheap.

(*b*) It should be widely advertised that it is literally impossible to render night-soil contaminated vegetables or unpeeled fruit safe to eat and still palatable by mechanical washing or by disinfectants Chemicals if strong enough to kill the worm eggs will spoil the vegetables. If the vegetables are kept in boiling water for ½ a minute all disease-producing intestinal parasites should be destroyed. Ascaris eggs are incredibly resistent to drying, pickling and to chemicals.

2. *Playgrounds.*—Finding several European children in Penang living in one neighbourhood infected with hookworms, an examination was made of soil samples from their playground on the race course, north of the stand. Gross contamination was obvious in one place. Four samples of the sandy loam were taken and two were positive, showing hookworm larvæ. To this playground children are taken morning and evening by their nurses and here undoubtedly some of them become infected with hookworms. The pollution may have been by a child directed by its nurse, by a coolie, or by a golf caddie. The nurses are not above suspicion.

3. *Soil Disinfectants.*—There is no substitute for a sanitary latrine in the control of soil pollution. Various disinfectants have been tried, but none found feasible. Doubtless crude oil spread liberally over the ground around a coolie lines would render the soil unfavourable to hookworm larvæ. No experiments have been made, but crude oil is disagreeable and expensive.

Experiments were done in the campaign laboratory with "Izal" powder and "Extermo". Neither one, as reported in the 1927 Annual Report, will prevent the hatching of hookworm eggs and neither one will deter the hookworm larvæ in their growth even when applied to the culture in high concentration or when thoroughly mixed with it.

Properly maintained night-soil disposal systems are the only hope of preventing intestinal diseases.

District Health Centres

One of the aims of the Campaign as expressed in the agreement was "the development of Rural Health organizations under which hookworm as well as other health measures may be conducted." This has been attempted as an extension of the work of existing health departments by starting district health centres. These units are based on political districts throughout the Colony, not only because this is logical geographically, but also because the existing hospitals are located, one to each of these districts. In some districts the population is as much as 40,000 in other districts it is less, Labuan for example having only about 6,000. In Penang the area is about 50 square miles per district.

Each District Centre is to consist of approximately the following staff:—

One Part time district health officer—this is the assistant surgeon in charge of the district hospital.

One full time district health dresser—a male nurse who will lecture, vaccinate and dispense.

One full time district health nurse—a female who is a qualified midwife.

One or more full time sanitary inspectors.

One part time microscopist—a dresser who also does routine hospital work.

One full time coolie.

There are three full time rural health sisters in the Colony, one in Singapore, one in Malacca and one in the Northern Settlement. These specially qualified sisters are supervising the health nurses, are themselves doing house-to-house visiting and are organizing infant and maternal welfare clinics in connection with the health centres.

These health centres will be able to carry on the anti-hookworm campaign, they will be able to attack malaria, they will fight the communicable diseases and they will do active rural infant and maternal welfare work.

An important feature of these centres is the monthly staff meeting at which the health officer and the district officer are present to confer with the members of the unit about their problems.

The sanitary inspectors are not a new feature and various other activities are not now. But the active anti-hookworm work is new and the rural maternal and infant welfare work is new. These centres would seem to furnish a thoroughly logical method for the practice of rural preventive medicine by government.

This fact has been recognized, for six centres have been approved and the necessary recurrent expenditure authorized. The first centre was opened in 1926 in Jasin, Malacca. Under the direction of the government health department, Singapore, 2 health sisters began their work in Singapore in May and June, 1927. The senior health officer, Penang, opened a health centre at Tanjong Tokong, in August, 1927. A centre was opened at Butterworth, in Province Wellesley, in the same month. The last one was opened in Alor Gajah, Malacca, in December, 1927.

The reaction to these centres has been most gratifying. The health sisters and nurses particularly are supplying a warmth of friendly spirit that is thawing out the well-known shyness of the Malays. In Table 40 statistics are given. But far better than figures is a visit to one of these centres. There can be no doubt about their value or about the response of the rural people. It is earnestly hoped that the authority and funds will soon be available for the districts which remain without this health service.

Expenditure

The yearly budget of the Campaign has been $36,000 Straits, a total of $108,000, half provided by each organization. During the first two years, the International Health Division's share has been $21,200, the Government appropriating the balance. In the third year the proportions have been reversed. These sums do not include the salaries and allowances of the Division's men nor do they include a considerable expenditure by Government each year over and above its nominal share.

Summary

1. At the invitation of the Straits Settlements Government, through its Medical Department, there was in 1925 a "Survey of Hookworm Infection, General Sanitary Conditions and Organized Health Work" in the Colony, conducted by Medical Officers of the International Health Division of the Rockfeller Foundation at the expense of this Foundation.

2. Following the survey the two organizations agreed to a co-operative "Rural Sanitation Campaign" to extend over 1926, 1927 and 1928, with a total budget of $108,000 equally shared.

3. The Straits Settlements is a British Crown Colony in Asia, with a uniformly moist tropical climate, having a population of about a million Malays, Chinese, Indians and Europeans approximately half rural, half urban, largely illiterate ignorant of modern health habits but responsible to logical appeals.

4. The soil is universally favourable to the growth of hookworm larvæ and a majority of the people do not wear shoes. The hookworm infection rate as determined by the Campaign staff in 40,440 stool examinations was 71.5 per cent. Over 21,000 of these examined were Malays, with a rate of 85.8 per cent. The other rates were: Indians, 57.1 per cent; Chinese 44.7 per cent; Eurasians, 38.4 per cent; Europeans, 27.0 per cent; others 35.3 per cent. The Province Wellesley infection rate was 88.2 per cent; Rural Penang 86.1 per cent; Malacca 78.7 per cent. The total Rural Straits Settlements rate was 80.3 per cent.

5. The reason why so many people in the Straits Settlements have hookworm infection is obvious when it is realized that 69.4 per cent of rural homes have been totally without latrines. Only 10.9 per cent in a survey of 10,410 houses had sanitary latrines.

6. This very great hookworm incidence rate is not the only evidence of seriously defective conservancy in the Colony. In 1926, approximately 21 per cent of all hospital admissions were for preventable bowel diseases due to defective waste-disposal. Some 18 per cent of all deaths in hospital were from the same cause. Approximately 10 per cent of all of the deaths in the Colony are due to preventable bowel diseases for which the last of soil sanitation is directly responsible. This results in a needless loss of 2,500 lives per year.

7. The campaign staff, travelling some 120,000 miles, gave over 1,500 lectures to 80,000 people. It has treated over 56,000 persons for intestinal worms. Every village and kampong in Malacca and the Northern Settlement was visited. Posters and pamphlets have been prepared and distributed, cinema shows and special exhibits, and contests prepared.

8. A special method of stool diagnosis has been developed that gives a reliable intensity index without requiring more than average technical skill.

By this method as well as from evidence obtained by other tests, it is estimated that about 50 per cent of those infected harbour more than 25 hook-worms. About 25 per cent habour more than 50 worms. Seventeen per cent of the worms are Ankylostoma duodenale, the remainder Necator Americanus. Eight per cent of 48,125 hospital admissions in 1926 were diagnosed as primarily hook-worm disease.

9. There are 48 gazetted villages in the Colony. By the end of 1928, twenty were well in hand as regards control of soil pollution.

10. Vegetables in the Colony are usually grown by Chinese gardeners who use human night-soil as a fertilizer. This partly explains the high round-worm infection rate of 62·2 per cent. It also helps to explain the prevalence of dysentery.

11. There are 12 districts in the Colony suitable for Rural Health Centres. The Government has established such centres in six of these districts since September, 1926. Three European health sisters and three Asiatic health nurses or visitors are organizing the infant and maternal welfare work. The response by the people has been notable. The unprecedented number of Malay women who have applied for treatment and health advice for themselves or their babies is a certain index that the health sisters and nurses are supplying a much needed and appreciated Rural Health Service.

12. In many ways not mentioned in this report the Colony has been extending its health service to its rural population during the past three years. For example:—

(*a*) A large amount of permanent anti-malaria drainage has been carried out in rural areas.

(*b*) A comprehensive scheme for Social Hygiene with medical officers, clinics and propaganda has been put into operation. This will, of course, chiefly deal with urban populations, but will not neglect rural needs which unfortunately are increasing.

(*c*) Two new rural hospitals in Malacca have been opened. These are being used not only as curative institutions but, with more than half of the patients suffering from preventable diseases, are logically being used as health centres for the practice of preventive medicine. The excellent new Singapore Hospital has few rural patients, but is an evidence of the willingness of Government to spend very large sums of money for the welfare of its people.

(*d*) The splendid new building of the King Edward VII College of Medicine, Singapore was opened. This is a co-operative institution in which the Federated Malay States have a share, and towards which the Division of Medical Education of the Rockfeller Foundation has also liberally contributed. It is graduating men well qualified for local curative practice. Active steps are being taken to establish a chair of Preventive Medicine, for it is realized that no phase of medical training to-day is more important. The world over it is becoming obvious that an important part of a medical curriculum should be prevention.

(*e*) The travelling motor dispensaries have proved their usefulness in rural districts and there are now four in the Colony, one each in Singapore, Malacca, Penang and Province Wellesley. These dispensaries have in the past been limited to administering drugs for malaria, yaws and other diseases. They are now giving anthelmintic treatments and are beginning to dispense health propaganda—pamphlets, posters and cinema shows. In some cases, the staff of the district health centre has been able to go with the travelling dispensary thus effecting that combination of curative and preventive medicine so essential in Malaya.

13. The fact that the Colony, through its medical department, arranged for the survey and campaign here reported, the fact that it has inaugurated the various medical and health services mentioned above, and that it is

spending 10 per cent of its income for medical and health work, these facts are notable and augur well for the future. Rarely does one see a tropical country where the possibilities of permanent benefit are so great. The political and social situation is such that modern Preventive Medicine should flourish. The facts that at present the exceptionally good roads are far ahead of the sanitation, that the Health Department is understaffed and that only half of the districts are provided with rural health service, as noted above, are not discouraging. For, granted the continued support of money to be applied in the future more and more towards Preventive Medicine, there is every reason to believe that the Straits Settlements may become the model Colony of the tropics as regards Public Health. Already she and her neighbours, the Federated Malay States, are doing excellent work in malaria control in the tropics.

The first quarter of 1928 was a period of transition for the Straits Settlements Rural Sanitation Campaign involving moving the office and laboratory from the General Hospital, Penang to temporary shelter in the office of the senior health officer until the new offices on the ground floor of the same building were ready; involving packing supplies and equipment preparatory to going to Singapore early in April; involving, further, the transfer of the entire campaign field staff back to the Medical Department.

Dr. V. G. Heiser, Director for the East of the International Health Division of the Rockfeller Foundation visited the Colony in January and Dr. L. W. Hackett of the Malaria Experiment Station in Rome, also of the Foundation, was here in March.

Dr. Clark H. Yeager arrived in Singapore in May, 1928 to relieve Dr. Paul F. Russell who returned to the United States on leave June 28, 1928. The work of this department was directed by Dr. Yeager until the close of the campaign December 31, 1928.

Following the transfer of the staff back to the Medical Department a series of examinations were made doing the 2nd quarter 1928 in the Singapore municipal and rural schools to determine relative infestation with hookworms. Groups of incoming Chinese coolies were also examined.

During the third quarter 1928, the examination in schools was continued, and a series of lectures and demenstrations were given in schools and other places.

During the last quarter some examinations were made and treatments were continued at the health centres and by travelling dispensaries Educational propaganda was continued and pamphlets and posters on the new bored-hole latrine was distributed.

An important feature of the work in 1928 was the introduction of the bored-hole latrine, and most of the time during the last two quarters was spent in improving methods of boring, and in introducing this type of sanitation. An interesting piece of work has been a series of bacteriological and other tests which were conducted in order to come to a decision as to safe sites for the location of the bored-hole or tube-latrines (the name used in the Straits Settlements).

In March, a plan was worked out with the medical department, Penang, whereby the anthelmintic mass therapy is to be done in a routine way making use of the travelling dispensaries, the programmes of which have been slightly altered. On the assurance that the treatments would be pushed vigorously through the regular organizations the campaign staff was transferred back to the medical department. Arrangements were made for the campaign to supply all of the necessary anthelmintic drugs during the year 1928 in accordance with the agreement.

The obvious advantage of this plan has been to change the basis of anthelmintic mass therapy from that of temporary campaign methods to that of permanent department routine. This was done to avoid a hiatus at the close of the campaign, 31st December, 1928. A further-advantage is a saving of expense in transportation charges.

Sanitation.

There has been a notable and very gratifying acceleration in the matter of soil-sanitation in the Colony since the beginning of the year 1928.

For example, in Malacca near Kesang, 800 pit latrines have built by Malay householders. The fact that they have been built by Malays at their own expense and are being used is a most satisfactory demestration of possibilities.

A second notable point is the fact that in the Northern Settlement soil-sanitation was vigorously forwarded in 1928. In the first quarter latrine notices were served to the house-holders of six villages and there are many evidences of a determination to get results. In Singapore also progress was made. There has been increased interest since the introduction of the tube-latrine.

A further development was the report made by Dr. Heiser about the possibilities of bored tube-latrines (16 inches in diameter and 20-30 feet deep).

During the 2nd quarter 1928, the work of the campaign was centered in Singapore. Hookworm treatments throughout the Straits Settlements were administered by Government Officers, at the various Health Centres and by the Travelling Dispensaries.

An interesting feature of the work was the examination of specimens to determine the presence of hookworm in representative groups of pupils in some of the municipal and rural schools. Another phase of the work examination of Chinese immigrants.

In the Singapore Rural Schools 307 out of 454 examinations or 67.6 per cent were positive to hookworm. In the Municipal schools 280 out of 619 or 45.2 per cent were positive hookworm. In the municipal schools 13.2 per cent of the positive hookworm stools, were classified as three or four plus, and 27.0 per cent of the rural positive cases were in these relatively heavily infected groups. This shows that the improved sanitation of the municipal area has resulted in a lowered mass infestation.

In examinations other than schools 209 out of 365 or 57.3 per cent of the specimens were positive to hookworm at the Tan Tock Seng Hospital. One hundred and thirty-seven out of 147 or 93.2 per cent of the passengers examined on the s.s. "Sandikian" were positive.

During the 3rd and 4th quarters 1928 there was increased interest in propaganda, consequently a series of lectures, cinematograph shows, and demonstrations were given in nearly every school in and near Singapore, in addition to a number of specially requested demonstration.

The fact that 14.4 per cent of the pupils in municipal schools were classes as 3 or 4 plus, and 20.6 per cent of the rural positive cases were as classified during the quarter ending Sept., 30th gave further evidence that the improved sanitation in the city limits accounts for a lower mass infestation.

The Bored-Hole Latrine.

Special articles are now in the course of preparation on the bored-hole latrine. One article "The bored-hole Latrine" includes a general statement of the value of the latrine and its advantages and a few paragraphs on the selection of sites. Another article "Practical Bored-hole Latrine Construction", describes apparatus which has been used successfully, and general information which has been found useful. Another article "Safe sites for bored-hole Latrines", gives the results of a series of bacteriological examinations and other tests to determine the direction and extent of travel of bacteria from an inoculated hole, and some suggestions for safe location of bored-hole latrines and protection of well water.

While it is not expected that the bored-hole latrines will replace bucket latrines in built up towns, it is believed that thousands of these latrines can be used to great advantage in the rural areas of the Straits Settlements. Bucket latrines have certain advantages ever the bored-hole latrines in the towns, and in some less thickly populated sections, buckets have answered the

purpose better than the ordinary pit latrines. However, there is evidence of gross soil pollution from bucket latrines in many places. The scavenger system if properly working is quite satisfactory, but as in most other countries, it doesn't always work within the city limits to say nothing of the widely scattered soil pollution from the bucket system in the less thickly populated centres. There are places where more of the bucket contents by accident or intention are thrown on the ground or behind bushes than ever reach the selected disposal area. As an example of one of the many faults of the bucket system, we might point out, that within the city limits of Singapore where an attempt has been to select good materials and maintain an efficient system, that buckets remain in use for months with large holes near the bottom through which the contents leak. When such worn out buckets are found in the latrines of a large teaching institution where hygiene and sanitation are taught, what is to be expected in other places where supervision is known to be more lax? In the outlying areas fresh faeces can frequently be seen scattered on the soil behind the bucket latrines. This is not the fault of the inhabitants who use the latrines, but is due to faulty construction and collection. This criticism is not directed at the people who planned or started the bucket system nor against those who are attempting to maintain it. Bucket latrines are a necessary evil within the city and town limits which will exist until proper water carriage systems are in use, and it is not believed that anyone else could have done any better under similar circumstances. Now that we have the bored-hole latrine, it is hoped that enthusiasm in over-estimating the value of the bucket latrine will not result in the installation of buckets in so many outlying places where they are almost as good as none.

Another point worth consideration is the cost of collection and disposal from buckets. Places are known where the fees for this service would pay for the installation of flush water-closets within a year. The flow from the toilets in many places can be run into bored-holes instead of septic tanks which cost many times more than boring.

Our best cultures of pathogenic organisms have come from the soil around bucket latrines.

TABLE NUMBER 10.

HOOKWORM INFECTION INCIDENCE RATES—STRAITS SETTLEMENTS, 1926—28
STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN STOOL EXAMINATIONS
Salt Flotation Method.

—	Total Number Examined	Number Found Infected	Per cent Found Infected
Singapore	3,997	2,766	69·2
Penang Municipal Coolies ...	162	134	82·7
Penang Municipal School-children	7,040	2,663	37·8
Penang Municipal Totals ...	7,202	2,797	38·8
Penang Rural	4,453	3,833	86·1
Penang Totals	11,655	3,833	56·9
Province Wellesley ...	2,920	2,576	88·2
Dindings	968	689	71·2
Malacca	20,240	15,921	78·7
Labuan	383	259	67·6
Rural Totals Straits Settlements	29,089	23,352	80·3
Pulau Jerejak Quarantine ...	708	313	44·2
Complete Totals Straits Settlements	40,871	29,154	71·3

TABLE NUMBER 12

HOOKWORM INFECTION INCIDENCE RATES BY SEX AND RACE 1925—28, STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN EXAMINATIONS

—	—	Examined	Positive	Per cent Positive
Malay ...	Males ...	17,820	15,338	86·1
	Females ...	3,256	2,862	87·9
	Total ...	21,076	18,200	86·4
Indian ...	Males ...	4,961	3,367	67·9
	Females ...	1,837	1,242	67·6
	Total ...	6,798	4,609	67·8
Chinese ...	Males ...	6,740	3,099	46·0
	Females ...	1,749	552	30·8
	Total ...	8,489	3,651	43·0
Eurasian ...	Males ...	437	192	43·9
	Females ...	494	158	32·0
	Total ...	931	350	37·5
European ...	Males ...	107	35	32·7
	Females ...	43	4	9·3
	Total ...	150	39	26·0
Others ...	Males ...	209	112	53·6
	Females ...	52	22	42·3
	Total ...	261	134	51·3
All Races ...	Males ...	30,274	22,143	73·1
	Females ...	7,575	4,840	63·9
	Total ...	37,849	26,983	71·3

NOTE :—Of the 1925 survey examinations only those of the Northern Settlement are included in this able. All 1926, 1927 and 1928 examinations are included

TABLE NUMBER 16

HOOKWORM INFECTION INCIDENCE BY OCCUPATION OF HOST STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN EXAMINATIONS 1925—28

Groups	Examined	Positive	Per cent Positive
Agriculture	5,172	4,278	82·7
Desk-Shop	1,249	702	56·2
Street	1,213	828	68·3
Artisan	119	87	73·1
Marine	179	135	75·4
Domestic	27,549	19,303	70·1
Totals ...	35,381	25,333	71·6

NOTE :—1925 Survey figures not included

TABLE NUMBER 17

HOOKWORM INFECTION INTENSITY RATES BY RESIDENCE STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN EXAMINATIONS 1925—28

(20—field—count flotation method)

—	Number included	Negative		One plus		Two plus		Three and four plus	
		No.	%	No.	%	No.	%	No.	%
Malacca	20,240	4,319	21·3	8,403	41·5	5,046	24·4	2,472	12·2
Penang — Municipal	162	28	17·3	72	44·4	50	30·9	12	7·4
Coolies									
Penang — Municipal	7,040	4,377	62·2	1,501	21·3	725	10·3	437	6·2
Schoolchildren									
Penang — Municipal	7,202	4,405	61·2	1,573	21·8	775	10·8	449	6·2
Totals									
Northern Settlement Rural Totals ...	6,565	806	12.3	1,887	28·7	2,271	34·6	1,601	24·4
Singapore	3,872	1,180	30·5	703	18·2	1,154	29·8	835	21·5
Labuan	383	124	32·4	149	38·9	75	19·6	35	9·1
Rural Totals Straits Settlements	27,188	5,249	19·3	10,439	38·4	7,392	27·2	4,108	15·1
Pulau Jerajak Quarantine	708	394	55·7	240	33·9	64	9·0	10	1·4
Totals Straits Settlements	38,970	11,228	28·8	12,955	33·2	9,385	24·1	5,402	13·9

TABLE NUMBER 20

INTENSITY OF HOOKWORM INFECTION AS MEASURED BY STOLL COUNTS
STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN EXAMINATIONS.

—	Number of cases	Total eggs per gramm	Average eggs per gram	Estimated average number of female hookworms	Estimated average total number of hookworms
Malays	887	2,309,748	2,604	52	104
Indians	290	634,810	2,189	44	88
Chinese	485	1,175,200	2,423	48	96
Totals ...	1,662	4,119,758	2,478	49·6	99·2

N. B.—1. Cases in Malacca and Penang. 2. Factors used. (*a*) Eggs per gram divided by 50 equals estimated female worms. (*b*) Estimated female worms times 2 equals estimated total worms.

TABLE NUMBER 21

INTENSITY OF HOOKWORM INFECTION MEASURED BY WORM COUNTS BY STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN STAFF 1925—7

Race	Cases	Average No. Hookworms per case	Hookworms expelled							
			Necator Americanus				Ankylostoma Duodenale			
			Females	Males	Totals	Species %	Females	Males	Totals	Species %
Malay	69	85·5	2,996	2,540	5,536	93·6	250	126	376	6·4
Indian	39	98·0	1,378	1,352	2,730	71·4	572	520	1,092	28·6
Chinese	37	91·9	1,302	1,256	2,557	75·2	484	360	844	24·8
Totals ...	145	90·6	5,676	5,147	10,823	82·4	1,306	1,006	2,312	17.6

TABLE NUMBER 22

HOOKWORM INFECTION INTENSITY AS MEASURED BY WORM COUNTS AFTER TREATMENT BY DOCTORS LINDOW IN SINGAPORE AND TULL IN PENANG

Number of Hookworms expelled	Tan Tock Seng Series		Penang Series	
	Number of cases	Percentage of total cases	Number of cases	Percentage of total cases
1 to 49	542	70·4	479	85·5
50 to 99	103	13·3	54	9·8
100 to 199	89	11·5	14	2·5
200 to 299	16	2·0	11	1·9
300 to 399	7	0·9	—	—
400 to 599	8	1·0	2	0·4
600 to 799	2	0·3	—	—
800 to 999	3	0·4	—	—

TABLE NUMBER 31

HAEMOGLOBIN DETERMINATIONS IN MALACCA 1926, (TALLQUIST SCALE USED BY CAMPAIGN DRESSERS)

Race	Haemoglobin Grouping										Total number of cases
	10—25		30—45		50—65		70—85		90—100		
	No.	%	No.	%	No.	%	No.	%	No.	%	
Malay	0	—	164	4·9	1,765	53·9	1,395	41·9	0	—	3,324
Indian	0	—	9	0·9	77	6·9	859	77·3	166 (a)	14·9	1,111
Chinese	2	—	27	7·2	127	33·9	218	58·1	1	—	375
Eurasians	1	—	3	—	91	42·7	117	54·9	1	—	213
Totals ...	3	—	203	4·1	2,060	41·0	2,589	51·5	168	3·4	5,023

(a) These Indians were intelligent municipal dwelling well paid survey office employees not subject to either hard work or under nourishment

TABLE NUMBER 33

ANTHELMINTIC TREATMENTS BY RACE BY STAFF OF STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN 1925—8

—	1925	1926	1927	1928	Totals	
					Number	Per cent
Malays ...	48	17,906	19,081	892	37,927	66·6
Indian ...	14	1,652	7,217	941	9,824	17·3
Chinese ...	33	2,170	5,386	267	7,856	13·8
Eurasian ...	—	433	695	—	1,128	2·0
	—	6	42	1	49	0·1
Others ...	—	27	94	—	121	0·2
Totals ...	95	22,194	32,515	2,101	56,905	100·

N. B.—After the 1st quarter in 1928 treatments were given by Government

TABLE NUMBER 34

TOTAL ANTHELMINTIC TREATMENTS STRAITS SETTLEMENTS 1925—8

	1925 Survey	1926	1927	1928	Totals
Campaign Malacca	70	22,194	1,949	—	24,213
Campaign Northern Settlement	25	—	30,566	2,101	32,692
District Health Centres	—	—	3,320	10,937	14,257
Government Hospitals and Dispensaries	49,473 (1) (2)	79,528	71,336	29,799	230,136
Estate coolies and Schoolchildren (not included elsewhere) ...	17,000 (2)	17,287	9,008	14,070	57,365
Malacca Agricultural Medical Board	18,000	23,056	18,174	—	59,230
Private Physicians	10,000 (2), (3)	12,000 (2), (3)	14,210 (3)	—	36,210
Quarantine Station	—	—	—	9,419	9,419
Totals ...	94,568	154,065	148,563	66,326	463,522

(1) Pulau Jerajak and Government Hospitals only. Dispensaries not included. (2) Estimated conservatively.
(3) Includes only Penang. Reports in 1927 for 8 physicians; estimates for 1925 and 1926 on that basis.

TABLE NUMBER 35

RESURVEY STOOL EXAMINATIONS IN MALACCA 1926, STRAITS SETTLEMENTS

RURAL SANITATION CAMPAIGN STAFF

	First Examination		Second Examination	
Group 1.— Eighteen Malay Vernacular Schools Second examination from 3 to 6 months after first treatment ...	Number	Per cent	Number	Per cent
Pupils examined	1,407	—	1238	—
Stools without hookworm eggs	83	5·9	636	51·4
,, one plus ,, ,, ...	511	36·4	378	30·5
,, two plus ,, ,, ...	524	37·2	178	14·4
,, three plus ,, ,, ...	230	16·3	32	2·6
,, four plus ,, ,, ...	59	4·2	14	1·1
Average 20-field ,, ova count	26·1	—	8·4	—
Stools without roundworm eggs	397	28·2	626	50·5
,, with ,, ,, ...	1010	71·8	612	49·5
Hemoglobin Average	174	59·9	252	66·5
Group 2.— Alor Gajah Vernacular School second examination six months after first treatment				
Pupils examined	79	—	85	—
Stools without hookworm eggs	0	—	28	32·9
,, with one plus ,, ...	33	41·8	40	47·2
,, two plus ,, ...	25	31·7	10	11·7
,, three plus ,, ...	8	10·1	7	8·2
,, four plus ,, ...	13	16·4	0	—

TABLE NUMBER 36

SOIL SURVEYS 1925—7

STRAITS SETTLEMENTS RURAL SANITATION CAMPAIGN STAFF

(Modified Baermann Apparatus)

		Soil Samples taken	Samples showing Hook-worm Larvae
Penang	1925	10	7
	1927	15	14
Prov. Wellesley	1925	10	8
	1927	15	14
Dindings	1925	7	4
Malacca	1925	37	30
	1926	33	31
Totals ...	...	127	108

N.B.—Details of infestation given in reports. All types of soil included. Places obviously likely to be infested chosen for sampling. Object to show that the various types of soil will grow H W L rather than to indicate widespread infection. The latrine survey indicates the widespread infection.

TOTAL NUMBER 39

PUBLIC HEALTH LECTURES BY STAFF OF

STRAITS SETTLEMENTS RULES SANITATION CAMPAIGN 1926—8

	Number of Lectures grouped according to language of lectures			Number of attendance grouped according to their race		
	Malacca	Northern Settle-ment	Totals	Malacca	Northern Settle-ment	Totals
Malay ...	326	414	740	19,003	24,102	43,105
Indian ...	75	94	169	7,243	3,764	11,007
Chinese ...	117	256	373	4,635	19,125	23,760
English ...	124	128	252	285	2,002	2,287
Totals ..	642	892	1,534	31,166	48,993	80,159

1. Health Centre Lectures excluded. *See* Table 40.
2. Several dialects included under Indian and Chinese.
3. One hundred and ten cinema shows were given in 1927. During 1928 in almost all schools in and near Singapore.
4. About 100,000 pamphlets and 8,000 posters were distributed in 1926, 1927 and 1928.

TABLE NUMBER 40

DISTRICT HEALTH CENTRE STATISTIC 1926—1928

	Malacca	Northern Settlement	Singapore	Totals
Health Lectures	1,528	1,749	...	3,277
Attendance at Lectures ...	20,458	7,232	...	27,690
Anthelmintic Treatments ...	14,587	2,794	314	17,695
Other Treatments	3,237	20,194	3,110	26,541
Total Treatments	17,824	22,988	3,424	44,236
Attendance at Health Centres ...	4,055	4,438	1,533	10,026
Visits made by Health Sister or Nurse	14,452	5,721	6,911	27,084
Stools Examined	4,647	139	...	5,386
Stools Containing Hookworm Ova	3,999	338	..	4,337

Health Units Opened—

1. Jasin, Malacca, 26th September, 1926.
2. Paya Lebar, Singapore, 2nd May, 1927.
3. Joo Chiat Road, Singapore, 11th June, 1927.
4. Tanjong Tokong, Penang, 1st August, 1927.
5. Butterworth, Province Wellesley, 21st August, 1927.
6. Alor Gajah, Malacca, 6th December, 1927.

TABLE *I.*

Staff

1. The sanctioned European staff in the Straits Settlements numbers 149, distributed as follows:—

General

Principal Civil Medical Officer, Straits Settlements.
Accountant, Medical Department, Straits Settlements.

Hospitals and Dispensaries

Chief Medical Officer, Singapore.
One Financial Officer, Hospitals, Singapore.
Chief Medical Officer, Penang.
Chief Medical Officer, Malacca.
Senior Surgeon, Singapore.
One Radiologist, Singapore.
Surgeon, Penang.
Thirteen Medical Officers, Singapore. (Two ladies).
Five Medical Officers, Penang. (One lady).
One Dispensing Chemist, Singapore.
One Medical Officer, Labuan.
One Matron, Super-scale, General Hospital, Singapore.
One Matron, Grade I, Penang.
Five Matrons, Grade II, Singapore.
Two Matrons, Grade II, Penang.
One Matron, Grade II, Malacca.
Forty-two Sisters, Singapore.
Fourteen Sisters, Penang.
One Sister Malacca.
Two European Attendants, Singapore.
One European Steward, Singapore.
One Lay Superintendent, Leper Settlement, Pulau Jerejak.

Health Branch

Chief Health Officer, Singapore.
Senior Health Officer, Penang.
Six Health Officers, Singapore. (One lady).
One Health Officer, Penang.
One Health Officer, Malacca.
Three Sanitary Inspectors. (Two chiefs).
Lay Superintendent, Quarantine Station, Singapore.
Three Public Health Sisters.
One Sister, Quarantine Station, Singapore.
Lay Superintendent, Quarantine Station, Penang.

Pathological Branch

One Pathologist, Singapore.
One Pathologist, Penang.
One Bacteriologist, Singapore.

College of Medicine, Singapore

Principal.
Professor of Physiology.
Professor of Anatomy.
Professor of Medicine.
Professor of Surgery.
Professor of Clinical Surgery.
Professor of Midwifery and Gynæcology.
Professor of Bacteriology.
Professor of Biology.
Professor of Bio-chemistry.
Professor of Dental Surgery.
Dental Mechanic.
Janitor.

MENTAL HOSPITAL

Medical Superintendent.
One Matron, Grade I.
One Sister.
Three European Attendants.

SOCIAL HYGIENE BRANCH

Chief Medical Officer.
One Medical Officer.

ANALYST'S BRANCH

Analyst, Singapore.
Deputy Analyst, Penang.
Four Assistant Analysts, Singapore.

2. In addition four superscale officers, sixteen time-scale Medical and Health Officers and nine Nursing Sisters are borne on the establishment for service in the Unfederated Malay States, making a total of 178.

3. The local qualified medical staff (Specialists, Deputy Medical Officers, Deputy Health Officers, Assistant Medical Officers, Assistant Health Officers and Assistant Surgeons) numbered 68.

TABLE *II*

FINANCIAL

1928

Revenue

Singapore—	$ c.	$ c.	
Hospitals Board	314,804 61		
Medical General	5,725 00		
Health	50,978 15		
Analyst	17,600 00		
		389,107 76	
Penang—			
Hospitals Board	103,135 61		
Payment for Lepers	78,549 49		
Medical General	23,418 30		
Health			
Analyst			
		205,103 40	
Malacca—			
Hospital Board	18,026 98		
Medical General	2,249 50		
Health			
		20,276 48	
Labuan	1,578 45		
		1,578 45	
Total ...		$616,066 09	

1. The revenue collected in the Medical Department is classified under three headings, viz:—

(*a*) Hospitals Board (Hospitals and Dispensaries).

(*b*) Medical General which includes Medical, Pathological Branch, College of Medicine, Singapore, Mental Hospital and Government Analayst's Branch.

(*c*) Health Branch.

2. The income from "Hospitals and Dispensaries" and Mental Hospital, Singapore, is paid into the account of the Hospitals Board, which is administered by a Special Committee. In addition to the amounts paid into the Hospitals Board Account as shown above the Board received contributions from Government for the various Settlements as follows:—

	$
Singapore	778,960
Penang	330,900
Malacca	107,050
Labuan	3,460
Total ...	$1,220,370

3. No income is derived from the pathological Branch.

4. Fees collected under Medical General and Health Branch are paid into the Treasury as General Government Revenue.

5. Fees collected under College of Medicine, Singapore, are paid into the College Fund.

1928

EXPENDITURE.

	$ c.	$ c.
Singapore—		
Hospitals Board		897,219 11
Medical General (including Pathological Branch)—		
Personal Emoluments	82,824 64	
Other Charges	21,265 37	
College of Medicine—		
Personal Emoluments	172,387 75	
Other Charges	31,436 54	
Analyst's Branch—		
Personal Emoluments	48,306 98	
Other Charges	4,089 54	
Health Branch—		
Personal Emoluments	262,132 58	
Other Charges	386,781 17	
Hospitals and Dispensaries (including General Hospital, Tan Tock Seng Hospital, Mental Hospitals, Maternity Hospital and all Out-door Dispensaries)—		
Personal Emoluments	1,023,553 71	
Other Charges	6,918 29	
Social Hygiene Branch—		
Personal Emoluments	50,267 88	
Other Charges	48,351 88	
Medical Proper, General Clerical Service—		
Personal Emoluments	30,208 23	
Health Branch, Personal Emoluments	5,115 00	
Social Hygiene Personal Emoluments	2,575 00	
		2,176,214 56
Total ...		$3,073,433 67

Penang—

	$ c.	$ c.
Hospitals Board		481,428 97
Medical General including Pathological Branch—		
Personal Emoluments	9,883 94	
Other Charges	5,076 84	
Analyst's Branch—		
Personal Emoluments	12,000 00	
Other Charges	1,685 23	
Health Branch—		
Personal Emoluments	66,295 88	
Other Charges	147,856 95	
Social Hygiene Branch—		
Personal Emoluments	6,915 00	
Other Charges	9,029 57	
Hospitals and Dispensaries—		
Personal Emoluments	275,632 71	
Federated Malay States Agency ...	1,904 74	
General Clerical Service Personal Emoluments	15,874 52	
		552,155 38
Total ...		$1,033,584 35

Malacca—

	$ c.	$ c.
Hospitals Board		114,116 22
Medical Personal Emoluments ...	7,944 50	
Medical Other Charges	1,500 00	
Pathological Branch—		
Personal Emoluments	5,095 30	
Other Charges	2,369 67	
Health Branch—		
Personal Emoluments	22,284 50	
Other Charges	49,739 24	
Social Hygiene Branch—		
Personal Emoluments	1,807 80	
Other Charges	2,403 96	
		180,686 29
Total ...		$294,802 51
Labuan		$23,832 26

SUMMARY

	$ c.
Singapore	3,073,433 67
Penang	1,033,584 35
Malacca	294,802 51
Labuan	23,832 26
Grand Total ...	$4,425,652 79

The Other Charges of the Hospitals and Dispensaries are shown under the Hospitals Board Expenditure.

1. The total expenditure of the Medical Department for Straits Settlements for the year 1928 amounted to $4,425,652.79.

2. Under College of Medicine, expenditure for Personal Emoluments is shown as $172,387.75. Half of these amounts were refunded by the Federated Malay States Government.

TABLE III *A*

ESTIMATED POPULATION, WITH BIRTH AND DEATH-RATES FOR THE YEARS 1927 AND 1928

	POPULATION		BIRTHS		DEATHS		BIRTH-RATIO PER MILLE		DEATH-RATIO PER MILLE	
	Estimated 1927	Estimated 1928	1927	1928	1927	1928	1927	1928	1927	1928
Singapore	532,296	553,366	17,464	19,332	17,383	15,404	32.81	34.94	32.66	27.84
Penang	181,104	186,171	6,860	6,874	6,523	6,225	37.88	36.92	36.02	33.44
Province Wellesley	135,028	138,230	4,734	4,747	4,303	4,247	35.06	34.34	31.87	30.72
Dindings	16,931	17,622	508	573	566	429	30.00	32.51	33.43	24.34
Malacca	188,828	194,342	7,403	7,673	6,582	5,005	39.20	39.48	34.86	25.75
Labuan	5,781	5,904	264	280	204	206	44.02	47.49	34.02	34.38
Total ...	1,059,968	1,095,635	37,233	39,479	35,561	31,516	35.13	36.03	33.55	28.76

TABLE III *B*

QUARTERLY DEATH-RATES FOR VARIOUS PARTS OF THE COLONY DURING THE PAST 3 YEARS WERE:—

YEAR	1926				1927				1928			
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Singapore ...	26.42	36.01	32.60	30.41	28.42	34.07	35.67	32.39	25.05	29.49	29.10	27.99
Penang Island ...	33.93	41.42	32.81	29.23	33.72	37.78	36.19	36.34	32.58	38.67	31.80	30.69
Province Wellesley	27.88	36.51	32.09	32.33	29.91	31.99	32.79	32.72	27.87	31.16	30.02	27.89
Dindings ...	26.39	28.13	30.76	31.49	27.53	28.20	38.43	39.27	21.23	25.11	27.31	23.70
Malacca ...	29.17	33.18	29.69	29.54	35.06	36.16	35.40	32.81	23.81	25.97	25.28	27.95

TABLE III *C*

POPULATION, ESTIMATED RACIALLY AND COLLECTIVELY OF THE STRAITS SETTLEMENTS FOR THE YEARS 1928, 1927 AND 1926

Settlement or Province 1928	Europeans 1928	Eurasians 1928	Chinese 1928	Malays 1928	Indians 1928	Other Nationalities 1928	TOTAL		
							1928	1927	1926
Singapore	9,708	6,676	421,048	65,801	41,566	8,567	553,366	532,296	511,441
Penang	1,491	1,722	117,640	38,188	25,185	1,945	186,171	181,104	176,126
Province Wellesley	499	394	35,838	68,857	32,168	474	138,230	135,028	131,930
Dindings	31	32	4,121	5,633	7,784	21	17,622	16,931	16,260
Malacca	681	2,066	55,912	93,368	42,061	254	194,342	188,828	184,437
Labuan	26	15	1,597	4,116	102	48	5,904	5,781	5,641
Total ...	12,436	10,905	636,156	275,963	148,866	11,309	1,095,635	1,059,968	1,025,835

TABLE III *D*

BIRTHS REGISTERED IN THE STRAITS SETTLEMENTS DURING 1928 AND THEIR RATIO PER MILLE OF POPULATION

Settlement or Province	Male	Female	Total 1928	Total 1927	Total 1926	RATIO PER MILLE		
						1928	1927	1926
Singapore	10,241	9,091	19,332	17,464	15,798	34.94	32.81	30.89
Penang	3,459	3,415	6,874	6,860	5,923	36.92	37.88	33.63
Province Wellesley	2,451	2,296	4,747	4,734	4,557	34.34	35.06	34.54
Dindings	286	287	573	508	473	32.51	30.00	29.09
Malacca	3,941	3,732	7,673	7,403	6,640	39.48	39.20	36.00
Labuan	150	130	280	264	300	47.49	44.02	53.71
	20,528	18,951	39,479	37,233	33,691	36.03	35.13	32.85

TABLE III *E*

BIRTHS REGISTERED IN THE STRAITS SETTLEMENTS DURING 1928 ACCORDING TO NATIONALITIES

Settlement or Province	Europeans		Eurasians		Chinese		Malays		Indians		Japanese		Other Nationalities & Unknown		Total	
	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio
Singapore	148	15.23	162	24.27	14,988	35.60	2,890	43.92	S. 842 N. 149	23.84	77	21.32	76	8.87	19,332	34.94
Penang	63	42.25	46	26.71	4,718	40.11	1,174	30.74	812	32.24	...	...	61	31.36	6,874	36.92
Province Wellesley ...	...	...	8	20.50	1,605	44.78	2,267	32.92	860	26.73	...	...	7	14.77	4,747	34.34
Dindings	...	...	...	...	139	33.77	302	56.36	131	16.83	...	...	1	47.62	573	32.51
Malacca	5	7.34	92	44.53	2,420	43.28	4,607	49.34	S. 530 N. 12	12.89	2	22.22	5	27.56	7,673	39.48
Labuan	...	...	2	25.00	84	52.59	192	46.64	2	19.6	...	...	...	...	280	47.49
Total ...	216	17.36	310	28.43	23,954	37.65	1,432	41.43	3,338	22.42	79	20.31	150	13.26	39,479	36.03

S. —denotes Southern. N. —denotes Northern.

TABLE III *F*

DEATHS REGISTERED IN THE STRAITS SETTLEMENTS IN 1928 ACCORDING TO NATIONALITIES

Settlement or Province	Europeans		Eurasians		Chinese		Malays		Indians		Other Nationalities and Unknown		Total	
	No.	Ratio p. mille	No.	Ratio p. mille	No.	Ratio p. mille	No.	Ratio p. mille	No.	Ratio p. mille	No.	Ratio p. mille	No.	Ratio p. mille
Singapore	73	7.52	111	16.63	12,146	28.85	1,874	28.48	1,056	25.41	144	16.88	15,404	27.84
Penang	25	16.77	28	16.26	3,270	31.62	1,134	29.70	1,272	50.51	46	23.65	6,225	33.44
Province Wellesley	1	2.00	4	10.15	1,251	34.91	1,840	26.72	1,126	35.00	25	52.74	4,247	30.72
Dindings	...	...	...	...	144	34.94	153	27.16	131	16.83	1	47.62	429	24.34
Malacca	1	1.47	39	18.88	1,665	29.78	2,520	29.87	778	18.50	2	7.87	5,005	25.75
Labuan	...	...	1	62.50	50	31.31	147	35.98	7	68.62	1	208.33	206	34.89
Total ...	100	8.04	183	16.78	18,976	29.83	7,668	27.79	4,370	29.36	219	19.36	31,516	28.76

TABLE III *G*

DEATHS REGISTERED IN THE STRAITS SETTLEMENTS IN 1928 UNDER DIFFERENT GROUPS OF AGES

Ages	Singapore	Penang	Province Wellesley	Dindings	Malacca	Labuan	Total
Under 3 months	2,201	646	494	74	1,228	43	4,686
3 months and under 1 year ...	1,733	546	139	18	478	31	2,945
1 year to 5 years	1,382	644	694	72	386	22	3,200
5 years to 10 ,, ...	409	263	235	24	154	4	1,089
10 ,, 20 ,, ...	588	278	264	25	213	7	1,375
20 ,, 25 ,, ...	908	334	260	35	238	4	1,779
25 ,, 35 ,, ...	2,266	836	491	68	672	15	4,348
35 ,, 45 ,, ...	2,162	887	461	40	575	16	4,141
45 ,, 55 ,, ...	1,676	703	361	30	416	19	3,205
55 ,, 75 ,, ...	1,716	800	602	37	500	45	3,700
75 years and above	332	204	244	6	144	...	930
Unknown	31	84	2	...	1	...	118
Total ...	15,404	6,225	4,247	429	5,005	206	31,516

TABLE III *H*

TABLE SHOWING THE INFANTILE MORTALITY (UNDER ONE YEAR) IN THE STRAITS SETTLEMENTS INCLUDING CHILDREN BORN ELSEWHERE

Settlement	Births	Deaths	Ratio per mille of Births		
			1928	1927	1926
Singapore	19,332	3,950	204.32	232.99	227.94
Penang	6,874	1,192	173.41	179.88	178.29
Province Wellesley	4,747	633	133.35	154.63	136.93
Dindings	573	92	160.56	181.10	205.07
Malacca	7,673	1,706	222.34	291.64	268.22
Labuan	280	74	260.71	212.12	257.42
Total ...	39,479	7,647	193.69	224.04	214.79

TABLE III *I*

TABLES SHOWING THE INFANTILE MORTALITY (CHILDREN UNDER ONE YEAR) IN THE STRAITS SETTLEMENTS AND NATIONALITIES, EXCLUDING CHILDREN BORN ELSEWHERE

NATIONALITIES	SINGAPORE			PENANG			PROVINCE WELLESLEY			DINDINGS			MALACCA			LABUAN			TOTAL		
	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio	Deaths	No. born elsewhere	Ratio
Europeans	6	1	40.54	1	...	15.87	...		...	...	...	...	...	...	...	...	...	...	7	1	32.41
Eurasians	30	...	185.18	6	1	130.49	1	...	125.00	...	...	...	13	...	141.30	...	...	...	50	1	161 29
Chinese	2,791	158	186.22	746	77	158.12	180	6	112.14	25	1	179.86	465	10	192.15	15	...	178.57	4,222	252	176.25
Malays	749	40	259.17	200	5	170.36	264	2	116.45	40	3	132.45	1,120	8	243.11	59	...	307.29	2,432	58	212.74
Northern Indians	19	1	150.35	2	2	166.26	...	1	204.65	...	...	...	3	...	250.00	...	...	...	24	4	176.75
Southern Indians	130	3		133	11		176	3		23	...	175.57	104	7	196.23	...	...	...	566	24	
Japanese	6	...	77.92	...	...	...	...	...	...	...	...	...	1	...	500.00	...	...	...	7	...	88.61
Other Nationalities and Unknown ...	16	...	21.05	7	1	114.75	...	...	...	...	...	...	...	...	..	...	...	...	23	1	153.33
Total ...	3,747	203	193.82	1,095	97	159.30	621	12	130.82	88	4	153.58	1,706	25	222.30	74	...	264.29	7,331	341	185.69

TABLE III *J*

DEATHS REGISTERED IN THE STRAITS SETTLEMENTS AS REGARDS CERTIFICATES IN THE YEAR 1928

Particulars	Singapore	Penang	Province Wellesley	Dindings	Malacca	Labuan	Total
Died in Hospitals	4,448	1,392	631	80	737	18	7,306
Certified by Medical Practitioners	3,882	804	1	...	251	12	4,950
Certified by Registering Officers after death	4,100	598	...	...	569	30	7,297
Uncertified	2,974	1,431	3,615	349	3,448	146	11,963
Total ...	15,404	6,225	4,247	429	5,005	206	31,516

TABLE *IV*

Meteorological Returns for the Straits Settlements for the year 1928 and also two graphs showing the wettest and driest years since 1869, and the annual rainfall in inches and millimetres since 1862.

Meteorological Return for the year 1928

Singapore

—	Temperature						Rainfall		Winds		Remarks
	Solar Maximum	Minimum on Grass	Shade Maximum	Shade Minimum	Range	Mean	Amount in m. m.	Degree of Humidity	General Direction	Average Force	
January ...	149.6	72	85.7	73.3	12.4	78.3	300.29	84	N. E.	1.7	
February ...	147.3	72.3	86.5	73.3	13.2	78.7	330.36	83	N.E.	1.9	
March ...	145.7	72.6	87.6	74.	13.6	79.6	231.14	81	N.E.	1.9	
April ...	148	73.	88.1	74.7	13.4	80.2	219.77	83	N.E.	1.4	
May ...	151.7	73.7	89.1	75.6	13.5	81.1	104.38	80	S.W.	1.5	
June ...	152.1	72.1	88.9	75.	13.9	80.8	93.44	80	S.E.	1.6	
July ...	147	71.1	87.4	75.8	11.6	80.6	218.75	79	S.W.	1.6	
August ...	149.9	71.	87.8	74.5	13.3	80.1	230.96	80	S.W.	1.2	
September ...	149.4	70.7	87.7	74.8	12.9	80.1	213.40	81	S.E.	1.4	
October ...	147.2	70.3	86.9	74.4	12.5	79.5	230.66	82	S.E.	1.7	
November ...	142	71.	85.7	73.8	11.9	78.7	429.59	86	N.E.	1.2	
December ...	141.	70.8	86.8	73.7	13.1	79.	172.42	83	N.E.	1.7	
Mean ...	147.6	71.7	87.3	74.7	12.6	79.7	2,775.16	82		1.5	

Meteorological Return for the year 1928

Penang

—	Temperature						Rainfall		Winds		Remarks
	Solar Maximum	Minimum on Grass	Shade Maximum	Shade Minimum	Range	Mean	Amount in m.m.	Degree of Humidity	General Direction	Average Force	
January ...	166	70	95.	71	24.	83.1	159	87.	N.W.	...	
February ...	168	70	97.5	72	25.5	83.6	10	78.2	N.W.	...	
March ...	166	70	95.	72	23.	83.2	126	79.9	N.W.	...	
April ...	170	70	94.	71	23.	82.3	299	81.8	E.	...	
May ...	165	70	93.5	71	22.5	82.6	189	82.2	E.	...	
June ...	162	70	94	70	24.	82.2	42	75.	S.	...	
July ...	164	69	94	70	24.	82.5	115	70.	S.	...	
August ...	162	69	93.5	68	25.5	81.3	190	73.	N.W.	...	
September ...	160	69	94	69	25.	81.8	506	77.	N.W.	...	
October ...	164	68	94	67.5	20.5	81.8	266	78.	N.W.	...	
November ...	158	68	94.5	60.5	34.	78.5	157	73.4	N.W.	...	
December ...	164	68	94.5	71.	23.5	82.	204	82.1	N. E.	...	
Means or Extremes ...	163	69	94.4	69.	24.	82.	2,263	78.		...	

Meteorological Return for the year 1928

Malacca

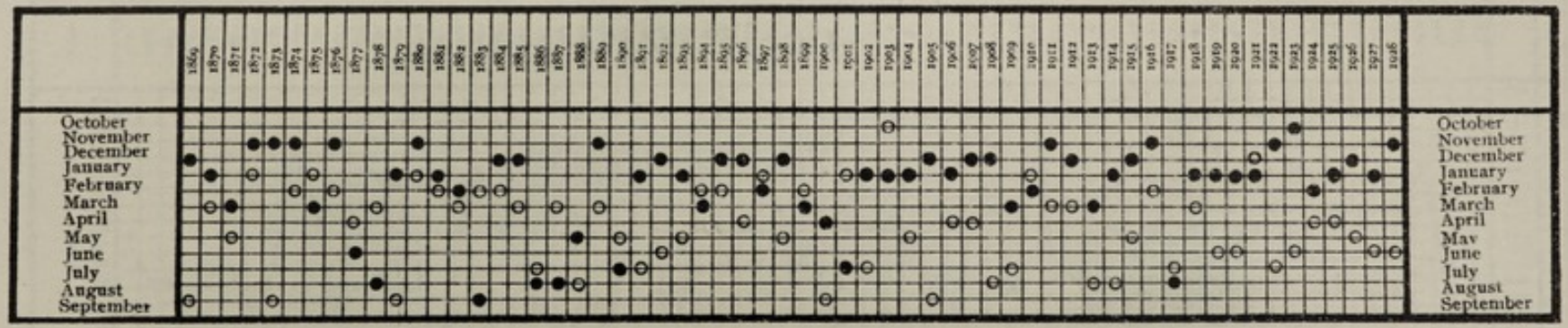
—	Temperature					Rainfall		Winds	Remarks
	Solar Maximum	Shade Maximum	Shade Minimum	Range	Mean	Amount in m.m.	Degree of Humidity	General Direction	
January	116	89	73	16	79	131.1	88	N.E.	
February	114	88	73	15	78	104.6	89	N.E.	
March	117	89	74	15	80	168.4	88	N.E.	
April	126	90	75	15	80	344.0	88	N.E.	
May	125	89	75	14	80	247.6	90	N.E.	
June	125	89	74	15	79	350.2	89	N.E.	
July	122	88	74	14	79	203.2	88	N.E.	
August	123	88	74	14	79	268.2	89	N.E.	
September ...	121	88	74	14	79	244.6	88	N.E.	
October	123	89	74	15	79	379.6	87	N.E.	
November ...	119	89	74	15	79	330.6	87	N.E.	
December	119	88	74	14	79	358.4	88	N.E.	
	120	88	74	14	79	3,130.5	88		

Meteorological Return for the year 1928

Labuan

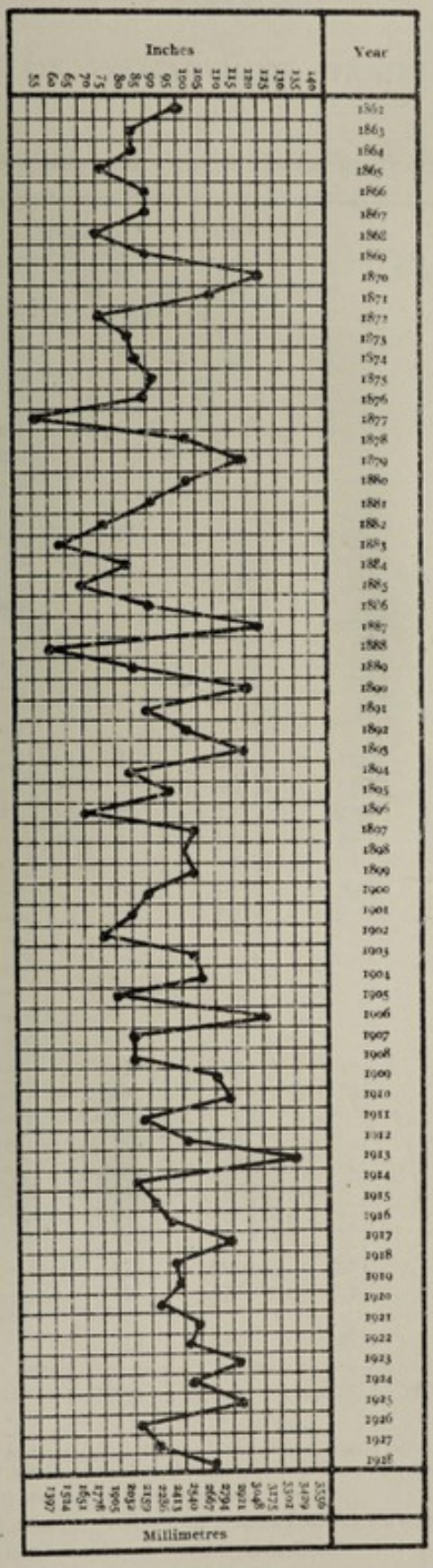
—	Temperature					Rainfall		Winds		Remarks
	Solar Maximum	Shade Maximum	Shade Minimum	Range	Mean	Amount in Inches	Degree of Humidity	General Direction	Average Force	
January ...	142	87.	77.4	9.6	82.2	365.5	84	N. E. & N. W.	1	
February ...	138	87.1	78.3	8.8	82.7	176.	85	N. E.	1	
March ...	133	86.5	78.4	8.1	82.4	91.	84	N. E. & N. W.	1	
April	131	87.1	77 8	9.3	82.4	361.5	84	N. E. & S. W.	1	
May	141	86.8	77.5	9.3	82.1	187.5	84	S. W. N. E.	1	
June	136	86.1	76.8	9.3	81.4	217.5	82	S. W.	1	
July	133	86.8	76.8	10.0	81.8	304.	83	S. W.	1	
August ...	126	86.	76.9	9.1	81.4	372.	84	N. E, S. W.	1	
September ...	133	86.	76.	10.0	81.	319.6	83	S. W. N. W.	1	
October ...	134	86.	76.	10.0	81.	298.	83	S. W.	1	
November ...	135	86.4	76.5	9.9	81.3	302.5	84	S. W.	1	
December ...	135	86.2	76.8	9.4	81.5	185.5	84	S. W.	1	
Mean ...	134	86.5	77.1	9.4	81.7	3,270.5	...	...	1	

SHOWING THE WETTEST AND DRIEST MONTHS DURING THE SAME YEARS



Wettest months during the years
Driest months during the years

Annual Rainfall



Showing the Annual Rainfall in Inches and Millimetres since 1862

TABLE V

HOSPITALS OR INSTITUTIONS STRAITS SETTLEMENTS

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928.

DISEASES	*Remaining in Hospital at end of 1927	YEARLY TOTAL		†Total Cases Treated	‡Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
1.—EPIDEMIC, ENDEMIC, AND INFECTIOUS DISEASES						
1. Enteric Group—						
(*a*) Typhoid Fever ...	18	331	145	349	15	
(*b*) Paratyphoid A. ...	...	6	...	6	...	
(*c*) Paratyphoid B. ...	5	8	...	13	...	
(*d*) Type not defined	...	2	...	2	1	
2. Typhus	...	...	...	...	...	
3. Relapsing Fever ...	...	...	...	...	...	
4. Undulant Fever ...	...	...	...	...	...	
5. Malaria—						
(*a*) Tertian ...	80	2,978	80	3,058	35	
(*b*) Quartan ...	8	267	9	275	8	
(*c*) Aestivo-autumnal	188	5,477	645	5,665	134	
(*d*) Cachexia ...	49	1,387	50	1,436	40	
(*e*) Blackwater ...	...	8	1	8	1	
(*f*) Mixed infection ...	12	248	20	260	3	
(*g*) Unclassified ...	97	2,816	127	2,913	51	
6. Small-pox	1	13	...	14	1	
7. Measles	6	64	...	70	...	
8. Scarlet Fever ...	...	2	...	2	...	
9. Whooping Cough ...	...	7	...	7	...	
10. Diphtheria ...	...	21	9	21	...	
11. Influenza	12	526	12	538	...	
12. Miliary Fever ...	...	...	...	...	...	
13. Mumps	...	66	...	66	...	
14. Cholera	...	4	1	4	...	
15. Epidemic diarrhœa ...	...	...	...	...	...	
16. Dysentery—						
(*a*) Amœbic ...	41	796	252	837	25	
(*b*) Bacillary ...	14	448	213	462	7	
(*c*) Undefined or due to other causes	4	174	36	178	7	
Carried forward ...	535	15,649	1,600	16,184	328	

The form shows in the main the arrangement of diseases in the *International Nomenclature, 1921 Edition*. To save space the unimportant diseases of any class can be grouped in their places as "Other Diseases" of the Class.

* *i.e.* the year previous to that for which the return is made

† "Total cases treated" will, of course, include those remaining in Hospital at the end of the previous year.

‡ The figures in this column to be carried on to the next year's Return.

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	535	15,649	1,600	16,184	328	
I.—EPIDEMIC, ENDEMIC AND INFECTIOUS DISEASES.—*Continued*						
17. Plague—						
(*a*) Bubonic ...	...	5	...	5	...	
(*b*) Pneumonic ...	...	...	...	...	...	
(*c*) Septicæmic ...	...	...	...	...	...	
(*d*) Undefined ...	...	...	...	...	...	
18. Yellow Fever ...	...	...	...	...	...	
19. Spirochætosis icterohæmorrhagica ...	...	...	...	...	...	
20. Leprosy	864	398	124	1,262	938	
21. Erysipelas	...	15	3	15	1	
22. Acute Poliomyelitis ...	...	3	1	3	1	
23. Encephalitis Lethargica	...	3	1	3	...	
24. Epidemic Cerebrospinal Fever ...	...	14	3	14	...	
25. Other Epidemic Diseases—						
(*a*) Rubeola (German Measles) ...	...	...	...	...	...	
(*b*) Varicella (Chickenpox ...	2	88	1	90	13	
(*c*) Kala-azar ...	...	...	...	...	...	
(*d*) Phlebotomus Fever ...	...	...	...	...	...	
(*e*) Dengue ...	3	202	...	205	3	
(*f*) Epidemic Dropsy	...	...	...	...	...	
(*g*) Yaws ...	3	30	...	33	1	
(*h*) Trypanosomiasis	...	...	...	...	...	
26. Glanders	...	...	...	...	...	
27. Anthrax ...	...	...	...	...	...	
28. Rabies	...	1	...	1	...	
29. Tetanus	2	49	34	51	2	
30. Mycosis	...	...	...	...	...	
31. Tuberculosis, Pulmonary and Laryngeal ...	148	1,866	920	2,014	161	
32. Tuberculosis of the Meninges or Central Nervous System ...	1	28	26	29	1	
33. Tuberculosis of the Intestines or Peritoneum	1	44	39	45	1	
34. Tuberculosis of the Vertebral Column ...	3	23	7	26	8	
Carried forward ...	1,562	18,418	2,759	19,980	1,458	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	1,562	18,418	2,759	19,980	1,458	
I.—EPIDEMIC, ENDEMIC, AND INFECTIOUS DISEASES.—*Concluded*						
35. Tuberculosis of Bones and Joints ...	18	66	6	84	19	
36. Tuberculosis of other organs—						
(*a*) Skin or Subcutaneous Tissue (Lupus)	...	1	...	1	...	
(*b*) Bones ...	...	...	...	...	...	
(*c*) Lymphatic System	4	24	...	28	1	
(*d*) Genito-urinary ...	...	3	...	3	...	
(*e*) Other organs ...	4	31	7	35	5	
37. Tuberculosis disseminated—						
(*a*) Acute ...	...	...	...	...	...	
(*b*) Chronic ...	...	...	...	...	...	
38. Syphilis—						
(*a*) Primary ...	42	594	...	636	38	
(*b*) Secondary ...	138	1,637	39	1,775	145	
(*c*) Tertiary ...	78	422	35	500	45	
(*d*) Hereditary ...	...	42	27	42	1	
(*e*) Period not indicated ...	2	50	45	52	2	
39. Soft Chancre ...	45	663	...	708	61	
40. A.—Gonorrhœa and its complications ...	61	733	4	794	57	
B.—Gonorrhœal Ophthalmia ...	8	36	...	44	12	
C.—Gonorrhœal Arthritis	25	225	1	250	18	
D.—Granuloma Venereum	...	...	...	...	...	
41. Septicæmia ...	2	61	57	63	...	
42. Other Infectious Diseases—						
Trypanosomiasis ...	4	19	...	23	1	
II.—GENERAL DISEASES NOT MENTIONED ABOVE						
43. Cancer or other malignant Tumours of the Buccal Cavity ...	...	39	15	39	1	
44. Cancer or other malignant Tumours of the Stomach or Liver ...	3	82	49	85	7	
Carried forward ...	1,996	23,146	3,044	25,142	1,871	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	1,996	23,146	3.044	25,142	1,871	
II.—GENERAL DISEASES NOT MENTIONED ABOVE.—*Continued*						
45. Cancer or other malignant Tumours of the Peritoneum, Intestines, Rectum	1	20	11	21	2	
46. Cancer or other malignant Tumours of the Female Genital Organs	2	36	7	38	6	
47. Cancer or other malignant Tumours of the Breast	1	16	3	17	1	
48. Cancer or other malignant Tumours of the Skin	3	27	[illegible]	30	2	
49. Cancer or other malignant Tumours of Organs not Specified	5	44	12	49	[illegible]	
50. Tumours non-malignant	4	67	3	71	1	
51. Acute Rheumatism ...	5	63	1	68	3	
52. Chronic Rheumatism ...	...	32	...	32	1	
53. Scurvy (including Barlow's Disease) ...	...	2	1	2	...	
54. Pellagra	...	2	...	2	...	
55. Beri-beri	166	1,499	236	1,665	210	
56. Rickets	..	1	...	1	...	
57. Diabetes (not including Insipidus) ...	2	59	10	61	10	
58. Anæmia— ...						
(*a*) Pernicious ...	...	27	6	27	...	
(*b*) Other Anæmias and Chlorosis ...	3	52	6	55	3	
59. Diseases of the Pituitary Body ...	...	...	...	...	...	
60. Diseases of the Thyroid Gland—						
(*a*) Exophthalmic Goitre ...	...	7	...	7	2	
(*b*) Other diseases of the Thyroid Gland, Myxœdema	...	7	...	7	...	
61. Diseases of the Parathyroid Glands ...	...	...	...	...	...	
62. Diseases of the Thymus	...	...	...	...	...	
63. Diseases of the Suprarenal Glands ...	...	...	...	...	...	
64. Diseases of the Spleen	...	4	2	4	...	
Carried forward ...	2,188	25,111	3,350	27,299	2,113	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	2,188	25,111	3,350	27,299	2,113	
II.—GENERAL DISEASES NOT MENTIONED ABOVE.—*Concluded*						
65. Leukæmia—						
(*a*) Leukæmia ...	...	3	...	3	...	
(*b*) Hodgkin's Disease	...	5	2	5	1	
66. Alcoholism ...	2	128	...	130	...	
67. Chronic poisoning by mineral substances (lead, mercury, etc.)	...	3	1	3	1	
68. Chronic poisoning by organic substances (Morphia, Cocaine, etc.)	24	955	2	979	17	
69. Other General Diseases—	1	35	5	36	2	
Auto-intoxication ...	...	...	...	...	...	
Purpura Hæmorrhagica	...	3	3	3	...	
Hæmophilia ...	...	12	...	12	...	
Diabetes Insipidus ...	...	22	...	22	...	
III.—AFFECTIONS OF THE NERVOUS SYSTEM AND ORGANS OF THE SENSES						
70. Encephalitis (not including Encephalitis Lethargica) ...	...	...	...	...	...	
71. Meningitis (not including Tuberculous Meningitis or Cerebro-spinal Meningitis) ...	...	12	12	12	...	
72. Locomotor Ataxia ...	10	12	...	22	7	
73. Other Affections of the Spinal Cord ...	2	9	3	11	2	
74. Apoplexy—						
(*a*) Hæmorrhage ...	1	20	8	21	1	
(*b*) Embolism ...	...	2	1	2	1	
(*c*) Thrombosis ...	...	2	2	2	...	
75. Paralysis—						
(*a*) Hemiplegia ...	51	76	9	127	51	
(*b*) Other Paralyses	34	60	11	94	15	
76. General Paralysis of the Insane	10	23	20	33	11	
77. Other forms of Mental Alienation ...	777	1,034	140	1,811	1,003	
Carried forward ...	3,100	27,527	3,569	30,627	3,225	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,100	27,527	3,569	30,627	3,225	
III.—AFFECTIONS OF THE NERVOUS SYSTEM AND ORGANS OF THE SENSES.—*Continued*						
78. Epilepsy	3	50	1	53	1	
79. Eclampsia, Convulsions (non-puerperal) 5 years or over ...	...	2	1	2	1	
80. Infantile Convulsions	...	33	18	33	...	
81. Chorea	1	6	...	7	2	
82. A.—Hysteria ...	...	10	...	10	1	
B.—Neuritis ...	11	84	1	95	6	
C.—Neurasthenia ...	...	40	...	40	1	
83. Cerebral Softening ...	...	11	10	11	...	
84. Other affections of the Nervous System, such as Paralysis Agitans	7	94	7	101	1	
85. Affections of the Organs of Vision—						
(*a*) Diseases of the Eye ...	33	92	...	125	18	
(*b*) Conjunctivitis ...	15	387	...	402	22	
(*c*) Trachoma ...	3	28	...	31	3	
(*d*) Tumours of the Eye ...	...	7	...	7	...	
(*e*) Other affections of the Eye ...	101	404	...	505	145	
86. Affections of the Ear or Mastoid Sinus ...	5	172	4	177	5	
IV.—AFFECTIONS OF THE CIRCULATORY SYSTEM						
87. Pericarditis ...	...	22	3	22	...	
88. Acute Endocarditis or Myocarditis ...	3	48	40	51	...	
89. Angina Pectoris ...	...	1	...	1	...	
90. Other Diseases of the Heart—	...	...	...	...	...	
(*a*) Valvular—	1	49	26	50	...	
Mitral ...	8	80	37	88	5	
Aortic ...	7	48	31	55	2	
Tricuspid ...	...	...	...	...	...	
Pulmonary ...	...	1	1	1	...	
(*b*) Myocarditis ...	3	113	65	116	7	
Carried forward ...	3,301	29,309	3,814	32,610	3,445	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,301	29,309	3,814	32,610	3,445	
IV.—AFFECTIONS OF THE CIRCULATORY SYSTEM.—*Continued*						
91. Diseases of the Arteries—						
(*a*) Aneurism ...	3	25	9	28	3	
(*b*) Arterio-Sclerosis	2	28	13	30	3	
(*c*) Other diseases ...	2	21	2	23	2	
92. Embolism or Thrombosis (non-cerebral) ...	1	2	1	3	...	
93. Diseases of the Veins—						
Hæmorrhoids ...	3	149	...	152	7	
Varicose Veins ...	...	17	...	17	...	
Phlebitis	...	8	2	8	...	
94. Diseases of the Lymphatic System—						
Lymphangitis ...	2	15	...	17	1	
Lymphadenitis, Bubo (non-specific) ...	15	237	...	252	15	
95. Hæmorrhage of undetermined cause ...	...	2	...	2	...	
96. Other affections of the Circulatory System ...	...	21	9	21	...	
V.—AFFECTIONS OF THE RESPIRATORY SYSTEM						
97. Diseases of the Nasal Passages—						
Adenoids ...	...	52	...	52	1	
Polypus	...	9	...	9	1	
Rhinitis	...	8	...	8	...	
Coryza	...	39	...	39	...	
98. Affections of the Larynx—						
Laryngitis ...	1	15	...	16	1	
99. Bronchitis—						
(*a*) Acute ...	41	1,136	7	1,177	41	
(*b*) Chronic ...	37	527	16	564	49	
100. Broncho-Pneumonia ...	9	415	275	424	10	
101. Pneumonia—						
(*a*) Lobar ...	33	960	487	993	35	
(*b*) Unclassified ...	5	32	20	37	1	
Carried forward ...	3,455	33,027	4,655	36,482	3,615	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,455	33,027	4,655	36,482	3,615	
V.—AFFECTIONS OF THE RESPIRATORY SYSTEM—*Continued*						
102. Pleurisy, Empyema ...	14	185	45	199	10	
103. Congestion of the Lungs	...	...	...	...	...	
104. Gangrene of the Lungs	...	7	7	7	...	
105. Asthma	35	460	2	495	30	
106. Pulmonary Emphysema	...	3	1	3	...	
107. Other affections of the Lungs—						
Pulmonary Spirochætosis ...	1	30	14	31	3	
	...	...	...	...	...	
VI.—DISEASES OF THE DIGESTIVE SYSTEM						
108. A.—Diseases of Teeth or Gums—						
Caries, Pyorrhœa, etc. ...	4	170	1	174	3	
B.—Other affections of the Mouth—	...	...	...	...	...	
Stomatitis ...	...	19	1	19	1	
Glossitis, etc. ...	2	24	5	26	...	
109. Affections of the Pharynx or Tonsils—						
Tonsillitis ...	4	320	1	324	6	
Pharyngitis ...	...	77	...	77	3	
110. Affections of the Œsophagus	2	5	...	7	1	
111. A.—Ulcer of the Stomach ...	4	61	21	65	2	
B.—Ulcer of the Duodenum ...	2	23	3	25	3	
112. Other affections of the Stomach—						
Gastritis	13	258	5	271	17	
Dyspepsia, etc. ...	1	136	...	137	9	
113. Diarrhœa and Enteritis—						
Under two years ...	4	186	64	190	4	
114. Diarrhœa and Enteritis—						
Two years and over	20	670	59	690	22	
Colitis	9	109	8	118	7	
Ulceration ...	...	2	...	2	...	
114A. Sprue	...	11	...	11	2	
Carried forward ...	3,570	35,783	4,892	39,353	3,738	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,570	35,783	4,892	39,353	3,738	
VI.—DISEASES OF THE DIGESTIVE SYSTEM.—*Continued*						
115. Ankylostomiasis ...	144	3,037	84	3,181	97	
116. Diseases due to Intestinal Parasites—						
(*a*) Cestoda (Tænia)	...	1	...	1	...	
(*b*) Trematoda (Flukes) ...	...	...	...	...	...	
(*c*) Nematoda (other than Ankylostoma)—						
Ascaris ...	39	846	...	885	23	
Trichocephalus dispar ...	...	2	...	2	...	
Trichina ...	...	...	...	...	...	
Dracunculus	...	4	...	4	...	
Strongylus ...	...	...	...	...	...	
Oxyuris ...	...	...	...	...	...	
(*d*) Coccidia ...	...	...	...	...	...	
(*e*) Other parasites ...	...	3	...	3	...	
(*f*) Unclassified ...	...	...	...	...	...	
117. Appendicitis ...	4	187	10	191	13	
118. Hernia	12	186	10	198	11	
119. A.—Affections of the Anus, Fistula, etc.	15	323	8	338	21	
B.—Other affections of the Intestines—	...	58	10	58	6	
Enteroptosis ...	...	8	...	8	1	
Constipation ...	...	134	...	134	5	
120. Acute Yellow Atrophy of the Liver ...	...	2	2	2	...	
121. Hydatid of the Liver ...	...	1	1	1	...	
122. Cirrhosis of the Liver—	...	...	...	...	...	
(*a*) Alcoholic ...	...	2	1	2	..	
(*b*) Other forms ...	20	221	81	241	18	
123. Biliary Calculus ...	...	8	1	8	...	
124. Other affections of the Liver—						
Abscess	4	67	18	71	5	
Hepatitis	...	26	3	26	5	
Cholecystitis ...	4	57	13	61	2	
Jaundice	2	48	1	50	3	
Carried forward ...	3,814	41,004	5,135	44,818	3,938	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,814	41,004	5,135	44,818	3,938	
VI.—DISEASES OF THE DIGESTIVE SYSTEM.—*Concluded*						
125. Diseases of the Pancreas	2	6	3	8	...	
126. Peritonitis (of unknown cause)	2	58	47	60	1	
127. Other affections of the Digestive System ...	9	154	17	163	7	
VII.—DISEASES OF THE GENITO-URINARY SYSTEM (NON-VENEREAL)						
128. Acute Nephritis ...	32	359	81	391	17	
129. Chronic	33	421	163	454	58	
130. A.—Chyluria ...	...	...	..	...	...	
B.—Schistosomiasis ...	...	5	5	5	...	
131. Other affections of the Kidneys—						
Pyelitis, etc. ...	2	81	18	83	3	
132. Urinary Calculus ...	...	38	...	38	2	
133. Diseases of the Bladder—						
Cystitis	1	69	6	70	4	
134. Diseases of the Urethra—						
(*a*) Stricture ...	3	77	2	80	12	
(*b*) Other ...	10	189	3	199	10	
135. Diseases of the Prostate—						
Hypertrophy ...	...	4	...	4	...	
Prostatitis ...	...	22	2	22	...	
136. Diseases (non-venereal) of the Genital Organs of Man—						
Epididymitis ...	1	73	...	74	2	
Orchitis	1	69	...	70	4	
Hydrocele ...	12	108	...	120	5	
Ulcer of Penis, etc. ...	8	144	7	152	8	
137. Cysts or other non-malignant Tumours of the Ovaries ...	3	28	...	31	...	
138. Salpingitis—						
Abscess of the Pelvis	...	18	2	18	2	
	...	12	...	12	2	
Carried forward ...	3,933	42,939	5,491	46,872	4,075	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,933	42,939	5,491	46,872	4,075	
VII.—DISEASES OF THE GENITO-URINARY SYSTEM (NON-VENEREAL.—*Contd.*						
139. Uterine Tumours (non-malignant) ...	...	9	2	9	...	
140. Uterine Hæmorrhage (non-puerperal) ...	...	1	...	1	...	
141. A.—Metritis ...	1	11	...	12	1	
B.—Other affections of the Female Genital Organs—	4	78	...	82	1	
Displacements of Uterus ...	1	30	...	31	...	
Amenorrhœa ...	...	5	...	5	...	
Dysmenorrhœa	...	22	...	22	...	
Leucorrhœa ...	...	9	...	9	...	
142. Diseases of the Breast (non-puerperal)—						
Mastitis	...	5	...	5	...	
Abscess of Breast ..	1	11	...	12	1	
VIII.—PUERPERAL STATE						
143. A.—Normal Labour ...	11	3,008	...	3,019	24	
B. Accidents of Pregnancy— ...	...	...	...	...	...	
(*a*) Abortion ...	1	50	...	51	...	
(*b*) Ectopic Gestation ...	1	13	2	14	...	
(*c*) Other accidents of Pregnancy	1	88	5	89	2	
144. Puerperal Hæmorrhage	...	10	1	10	...	
145. Other accidents of Parturition ..	7	26	8	33	1	
146. Puerperal Septicæmia	...	31	15	31	...	
147. Phlegmasia Dolens ...	...	1	...	1	...	
148. Puerperal Eclampsia ...	...	15	1	15	...	
149. Sequelæ of Labour ...	...	...	...	...	...	
150. Puerperal affections of the Breast ...	...	26	...	26	...	
IX.—AFFECTIONS OF THE SKIN AND CELLULAR TISSUES						
151. Gangrene	5	32	15	37	2	
Carried forward ...	3,966	46,420	5,540	50,386	4,107	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	3,966	46,420	5,540	50,386	4,107	
IX.—AFFECTIONS OF THE SKIN AND CELLULAR TISSUES *—Continued*						
152. Boil—	1	60	8	61	2	
Carbuncle ...	6	52	1	58	1	
153. Abscess—	58	1,078	6	1,136	45	
Whitlow	4	50	...	54	..	
Cellulitis	25	339	30	364	19	
154. A.—Tinea ...	3	37	...	40	1	
B.—Scabies ...	18	597	...	615	28	
155. Other Diseases of the Skin—	5	191	...	196	14	
Erythema ...	5	75	...	80	7	
Urticaria	...	10	...	10	...	
Eczema	17	346	...	363	21	
Herpes	...	22	...	22	...	
Psoriasis	...	7	...	7	1	
Elephantiasis ...	1	13	...	14	2	
Myiasis	...	...	...	...	...	
Chigoes	...	...	...	...	...	
Cutaneous Leishmaniasis ...	...	...	...	...	...	
Ulcers	333	3,303	5	3,636	394	
X.—DISEASES OF BONES AND ORGANS OF LOCOMOTION (OTHER THAN TUBERCULOUS)						
156. Diseases of Bones—						
Osteitis	3	21	1	24	2	
157. Diseases of Joints ...	...	...	...	...	...	
Arthritis	31	311	3	342	39	
Synovitis	3	51	1	54	3	
158. Other Diseases of Bones or Organs of Locomotion	7	98	...	105	6	
XI.—MALFORMATIONS						
159. Malformations—						
Hydrocephalus ...	...	5	1	5	2	
Hypospadias ...	...	2	...	2	...	
Spina Bifida, etc. ...	...	27	1	27	2	
Carried forward ...	4,486	53,115	5,597	57,601	4,696	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	4,486	53,115	5,597	57,601	4,696	
XII.—DISEASES OF INFANCY						
160. Congenital Debility ...	...	5	3	5	...	
161. Premature Birth ...	...	19	13	19	...	
162. Other affections of Infancy	1	46	36	47	...	
163. Infant neglect (infants of three months or over)	...	4	3	4	...	
XIII.—AFFECTIONS OF OLD AGE						
164. Senility	38	184	45	222	41	
Senile Dementia ...	...	...	...	...	...	
XIV.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES						
165. Suicide by Poisoning ...	...	5	2	5	...	
166. Corrosive Poisoning (intentional) ...	...	4	3	4	...	
167. Suicide by Gas Poisoning	...	...	..	...	...	
168. Suicide by Hanging or Strangulation ...	...	9	7	9	...	
169. Suicide by Drowning ...	...	5	...	5	...	Attempted Suicide
170. Suicide by Firearms ...	...	...	...	...	...	
171. Suicide by cutting or stabbing Instruments	...	5	2	5	...	
172. Suicide by jumping from a height ...	...	...	...	...	...	
173. Suicide by crushing ...	...	...	...	...	...	
174. Other Suicides ...	...	...	...	...	...	
175. Food Poisoning ...	...	18	1	18	1	
Botulism ...	...	...	...	...	...	
176. Attacks of poisonous animals—						
Fish Bite ...	...	6	...	6	...	
Snake bite ...	1	9	...	10	...	
Insect bite ...	...	6	...	6	...	
177. Other accidental poisonings ...	1	37	7	38	...	
178. Burns (by Fire) ...	2	120	12	122	5	
179. Burns (other than by Fire)	15	157	4	172	5	
180. Suffocation (accidental)	...	...	...	..	...	
181. Poisoning by Gas (accidental)	...	...	...	...	...	
182. Drowning (accidental)	...	5	1	5	...	
Carried forward ...	4,544	53,759	5,736	58,303	4,748	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Contd.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	4,544	53,759	5,736	58,303	4,748	
XIV.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES. —*Continued*						
183. Wounds (by Firearms, war excepted) ...	3	39	1	42	3	
184. Wounds (by cutting or stabbing Instruments)	28	850	33	878	17	
185. Wounds (by Fall) ...	47	1,320	21	1,370	38	
186. Wounds (in Mines or Quarries) ...	...	12	...	12	1	
187. Wounds (by Machinery)	7	169	...	176	2	
188. Wounds (crushing, *e.g.* railway accidents, &c.)	35	835	28	870	30	
189. Injuries inflicted by Animals, Bites, Kicks, &c.	5	70	1	75	8	
190. Wounds inflicted on Active Service ...	...	...	...	...	...	
191. Executions of civilians by belligerents ...	...	...	...	...	...	
192. A.—Over fatigue ...	...	...	...	...	...	
B.—Hunger or Thirst	...	1	1	1	...	
193. Exposure to Cold, Frost bite, &c ...	...	3	...	3	...	
194. Exposure to Heat— Heatstroke ...	...	3	...	3	1	
Sunstroke ...	...	3	...	3	...	
195. Lightning Stroke ...	...	...	...	...	...	
196. Electric Shock ...	...	...	...	...	...	
197. Murder by Firearms ...	...	...	...	...	...	
198. Murder by cutting or stabbing Instruments	...	2	2	2	...	
199. Murder by other means	...	...	...	...	...	
200. Infanticide (Murder of an infant under one year)	...	...	...	...	...	
201. A.—Dislocation ...	4	166	...	170	5	
B.—Sprain ...	4	113	...	117	2	
C.—Fracture ...	66	897	103	963	89	
202. Other external injuries	11	1,092	5	103	18	
203. Deaths by Violence of unknown cause ...	...	...	...	...	...	
Carried forward ...	4,748	59,343	5,931	64,091	4,962	

RETURN OF DISEASES AND DEATHS (IN-PATIENTS) FOR THE YEAR 1928—*Concluded.*

DISEASES	Remaining in Hospital at end of 1927	YEARLY TOTAL		Total Cases Treated	Remaining in Hospital at end of 1928	REMARKS
		Admissions	Deaths			
Brought forward ...	4,748	59,343	5,931	64,091	4,962	
XV.—ILL-DEFINED DISEASES						
204. Sudden Death (cause unknown) ...	...	...	...	...	...	
205. A.—Diseases not already specified or ill-defined—	48	1,410	55	1,458	22	
Ascites ...	...	2	...	2	1	
Œdema ...	..	1	...	1	...	
Asthenia, Marasmus, etc.	...	18	2	18	...	
Shock ...	...	13	4	13	...	
Pyrexia of uncertain Origin	18	584	6	602	6	
B.—Malingering ...	...	18	...	18	...	
XVI.—DISEASES, THE TOTAL OF WHICH HAVE NOT CAUSED 10 DEATHS ...						
Total ...	4,814	61,389	5,998	66,203	4,991	


PLAN
OF
SEPOY LINES
SHEWING
GOVERNMENT BUILDINGS
Scale 10 Chains to the Inch
Note
Brick Wall & Tile Roof thus
Attap