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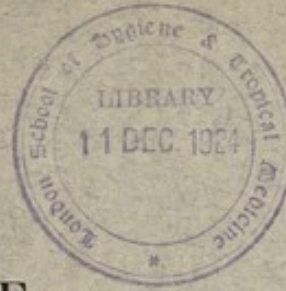
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SIERRA LEONE.


ANNUAL
MEDICAL AND SANITARY
REPORT

FOR THE YEAR

1923.

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1924.



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Donation 530



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THE ANNUAL
Medical and Sanitary Report
FOR THE YEAR
1923.

I—ADMINISTRATIVE.

(i) STAFF.

A.—MEDICAL STAFF (QUALIFIED.)

Director of Medical and Sanitary Services, Deputy Director, Sanitary Service, Deputy Director, Medical Service, Senior Sanitary Officer, two Senior Medical Officers, Medical Officer of Health, eight Medical Officers of the West African Medical Staff, six African Medical Officers.

B.—NURSING STAFF.

One Matron and Senior Nursing Sister, two Senior Nursing Sisters, two Nursing Sisters, *Four African Senior Female Nurses, twenty-one African Male Nurses and Apprentices, seventeen African Female Nurses and Probationers.

C.—SUBORDINATE MEDICAL AND SANITARY STAFF.

Two Superintendent Sanitary Inspectors (European), thirty-two Dispensers (including Store-keepers, who must be qualified Dispensers), twenty-seven Sanitary Inspectors and Learners, eleven Lunatic Asylum Assistant Keepers and Assistants, one Laboratory Assistant, seven Vaccinators, Gate-keepers, Cooks, Stoker, Porters, Servants, Laundresses, etc.

D.—CLERICAL STAFF.

- (a) Sixteen Clerks, three Messengers.
- (b) Early in the year, with the object of economy, the Medical and Sanitary Offices were amalgamated. The economy effected was the saving of one clerk, and one messenger, and the rent of extra offices.
- (c) Both departments are now under one roof and the arrangements has an advantage, viz. rapidity of transit of papers; but it is not an unqualified success; there is dual control (always unsatisfactory), congestion in the office, delay in getting transcriptions done, and the fact that the principal clerks are frequently required in two places at the same time militates against the advantage gained by the move.

E.—TEMPORARY ASSISTANTS.

- (a) Captain Reynolds, R.A.M.C., was employed for eight days in October as Medical Officer Hill Station, when Dr. Malone, the Medical Officer in charge, was on the sick-list.
 - (b) A few temporary lunacy attendants were employed at the Kissy Institutions.
 - (c) In the absence on leave of Dr. Dimock an arrangement was made whereby Government officials could be attended by Mr. Carr, a private dentist, the Government paying for ordinary fillings, extractions, and temporary alleviation of pain, and 25 per cent. of the other charges, provided such officials were certified by the Medical Officer as in urgent need of dental treatment.
2. (a) As compared with pre-war strength we are five qualified officers short; in addition to which in 1923, on account of one officer going on pension and one having prolonged sick leave, our strength was further reduced by two for a considerable period.
- (b) For reasons of economy no provision could be made for an increase of staff: the services of the Dental Surgeon and his mechanic were terminated, and the proposed lady medical officer in connection with infant welfare work was not appointed.

*One resigned during the year.

(c) The European nursing staff, five in number, remained the same; this number, when all are in the Colony, is sufficient, but when, as must happen at times, only three or perhaps two are in the Colony and one of these goes on the sick list temporarily the strain and work on the others is excessive. It is essential for the efficient working of these institutions that the Nursing Home should have two Nursing Sisters and the Colonial Hospital at least two always. There have been unavoidable times when each institution has been in charge of only one Nursing Sister; this is neither fair to the institutions and patients, nor to the Nursing Sister. It is impossible to avoid this contingency with a staff of five and I would recommend an increase of one Nursing Sister.

(d) The changes in sanitary staff are given in the Deputy Director of Sanitary Service's report.

F.—PRINCIPAL ACTING APPOINTMENTS.

(Substantive holders are given in Table D).

3. (a) Dr. H. O'Hara May acted as Director of Medical and Sanitary Services from 16th May (when Dr. F. J. A. Beringer went on leave) up to the end of the year.
- (b) Major W. H. Peacock acted as Deputy Director, Sanitary Service from 1st January to 3rd April and from 8th to 31st December.
- (c) Dr. W. Allan acted as Senior Sanitary Officer from 7th January to 3rd April and from 16th May to 26th June. Also as Deputy Director, Sanitary Service, from 27th June to 7th December.
- (d) Dr. J. C. Murphy acted as Deputy Director, Medical Service, from 1st to 29th April.
- (e) Dr. J. Y. Wood acted as Senior Medical Officer from 30th May to 23rd July.
- (f) Dr. J. M. Mackay acted as Medical Officer of Health from 27th June to 31st December.
- (g) Dr. E. S. Walls acted as Medical Officer of Health from 1st January to 5th February.
- (h) Miss I. Stevens acted as Matron from 1st January to 11th March.

(ii) FINANCIAL.

4. The following tables give the revenue and expenditure for the year and for 1922:—

Medical Revenue.			1923.			1922.		
			£	s.	d.	£	s.	d.
Hospital receipts ...	...	...	151	6	6	115	2	9
Nursing Home receipts ...	...	...	838	9	9	743	6	6
Sale of medicines ...	...	...	189	3	6	215	16	7
Druggists fees ...	...	...	3	10	0	1	10	0
Medical practitioners fees ...	...	...	1	0	0	—		
Maintenance of lunatics ...	...	...	190	2	1	186	9	2
Departmental fines ...	...	...	17	14	8	28	12	3
Total ...	...	...	1,391	6	6	1,290	17	3
Medical Expenditure.								
			£	s.	d.	£	s.	d.
Personal Emoluments ...	...	...	27,643	13	3	28,758	12	6
Other Charges ...	...	...	14,052	10	7	14,747	2	8
Total ...	...	...	41,696	3	10	43,505	15	2
Sanitary Revenue.								
			£	s.	d.	£	s.	d.
Sanitary Services (contribution by Bonthé) ...	...	...	367	9	7	219	17	3
Maintenance of persons in quarantine ...	...	...	74	19	3	—		
Total ...	...	...	442	8	10	219	17	3
Sanitary Expenditure.								
			£	s.	d.	£	s.	d.
Personal Emoluments ...	...	...	7,726	18	4	7,745	18	9
Other Charges ...	...	...	11,588	10	0	11,594	4	6
Total ...	...	...	19,315	8	4	19,340	3	3

5. The attached form, referred to in paragraph 17 of 1922 annual report, shows the cost of patients per day in the various institutions. As the form only came into use in April, 1923, the cost for the last six months of the year only is given.

ANALYSIS OF HOSPITAL EXPENDITURE FOR THE HALF-YEAR, 1st JULY TO 31st DECEMBER, 1923.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Institution.	Total number of patients.	Daily average number of patients.	Hospital days.	Provisions from Store-keeper. Total.	Fresh provisions. Total.	5 and 6 per patient per day.	Wines, spirits, minerals tobacco, Ice. Total.	8 per patient per day.	7 and 9 per patient per day.	Fuel, light. Total.	Miscellaneous: cleaning materials, hospital equipment, replacements.	Total of 5, 6, 8, 11 and 12.	5, 6, 8, 11 and 12 per patient per day.	Total sum recoverable from paying patients.
Nursing Home	...	99	288	840 73 11 10½	148 11 2	0 5 54	24 6 4	0 0 7½	0 6 1	22 0 9	27 10 8½	0 10½	0 7 0½	504 3 6
Colonial Hospital	...	1,176	59,50	2 74 583 269	19 04	0 1 2½	6 0 0	0 0 0½	0 1 5	80 4 10	29 11 24	3 8½	0 1 8½	46 4 7
Lunatic Asylum	...	632	99,50	21,238 18 9 4	601 13 6	0 0 7	14 17 3	0 0 0½	0 7½	21 16 9½	22 19 34	16 24	0 0 7½	13 10 0
Kissy Infirmary	...	382	53,33	9,419 18 11 7	335 3 94	0 0 94	5 18 3½	0 0 0½	0 0 9	25 8 9½	18 3 34	5 9	0 0 104	0 0 0
Bonthe Hospital	...	145	11,36	2,081 10 7 94	89 17 3	0 1 04	0 0 0	0 0 0	0 1 04	5 18 9	1 18 7	2 44	0 1 04	1 5 6

II—PUBLIC HEALTH.

(i) GENERAL REMARKS.

6. The general health of both European and African officials was not so satisfactory as in 1922. There were fourteen invalidings and no deaths amongst Europeans as against five and two respectively in 1922.

Amongst the African officials the figures were 13 and 7 in 1923 against 7 and 6 in 1922; there is no special cause to attribute this ill-health to.

7. The attached table shows the total number of new cases treated during the year at all hospitals and dispensaries as compared with 1922.

HOSPITAL CASES OR IN-PATIENTS :				1923.	1922.
Europeans	...	...	...	131	126
Africans	...	..	...	3,154	2,787
DISPENSARY CASES OR OUT-PATIENTS:					
Europeans	...	...	...	170	233
Africans	...	...	...	46,805	48,540
GRAND TOTAL				50,260	51,686

8. It will be noticed that—

- (a) there is an increase of 372 in hospital patients, due in a great degree to the fact that in 1922 full accommodation in the Colonial Hospital was only available from August to end of the year;
- (b) there is a decrease of 1,798 in the number of out-patients which may be accounted for by the fact that there were no epidemics; and for a considerable part of the year, owing to retirement and sick leave, we were two short in qualified staff, which necessitated closing down one station as a medical officer's station.

9. The subsequent attendances numbered 97,359, a decrease of 6,519; this is out of proportion to the decrease in out-patients, and is accounted for by the fact that the native here, after one or two attendances, being relieved, does not trouble any more. In 1922 the subsequent attendances averaged 2.08 per patient; in 1923 1.93.

10. Freetown was free from epidemics of any sort; outbreaks of Yellow Fever were reported from several ports on the Gold Coast and plague was reported from some of the neighbouring French and Spanish possessions, necessitating the enforcement of quarantine regulations for short periods; no case of either of these diseases occurred in the Colony.

11. The Cape Quarantine Station was requisitioned once during the period for contacts (some sixty in number) from a German boat, on which was found a case of confluent smallpox; there were no other cases.

12. There were sixteen cases of chicken-pox and two cases of smallpox treated at the contagious diseases buildings at Kissy flats.

13. *General Diseases.*—Rare; the following were observed:—Pernicious anæmia; one exophthalmic goitre, two; rickets, three; lymphadenoma, two; gout, one.

14. *Rheumatism.*—Acute rheumatism and rheumatic fever are not common; chronic rheumatism—articular and myalgic, is fairly widespread.

15. *Dysentery.*—There was an increase of fifty-four in the number of this disease treated in 1923.

16. *Tuberculosis.*—This for the last four years shows a steady and somewhat alarming increase; the increase is more evident amongst the Creole population, which is not surprising in Freetown, when one realizes the overcrowding of houses, want of air space and ventilation, and the apparent overcrowding in the houses themselves.

17. *Venereal Diseases.*—Gonorrhœa and syphilis show a steady increase in the numbers treated.

18. The figures in these diseases are only the cases treated by Government medical officers and one fears they are not all representative of the true numbers.

19. Whether the disease be gonorrhœa or syphilis, the native through indifference or persistent negligence fails to come for treatment until almost incapacitated; in the meantime he may be spreading the disease far and wide.

20. Tuberculosis, dysentery, and venereal diseases treated during the last four years are as follows:—

Disease.				1920.	1921.	1922.	1923.
Tuberculosis	...	...	...	65	116	91	138
Dysentery	...	...	...	404	185	252	306
Gonorrhœa	...	...	...	1,143	1,087	969	1,126
Syphilis	...	...	...	472	687	647	723

COMMUNICABLE DISEASES.

21. *Insect Borne, Yellow Fever*.—There was no case during the year. Yellow fever restrictions were observed for a short time owing to the suspicious illness of a European in the Nursing Home; however, the post-mortem cleared all doubts and all restrictions were removed; during the time of restrictions, Friday to Monday, a very useful lot of fumigation and intensive anti-stegomyia work was effected.

22. *Trypanosomiasis*.—One case was discovered in a child while attending out-patients; she was removed to hospital, but before treatment could be completed she was taken away by her parents against the advice of the medical officer in charge and lost sight of; she was supposed to be a native of Sherbro.

23. *Malaria*.—This disease is widespread, both in the Colony and Protectorate. It is, however, gratifying to note a decrease of 1,609 malarias and three blackwaters during the year; the good effects of the anti-malarial measures taken wherever the Sanitary Department is are bearing fruit in no uncertain manner.

24. Malaria and blackwater fever treated during the last four years were as follows:—

Disease.			1920.	1921.	1922.	1923.
Malaria	...	...	3,690	3,690	4,644	3,035
Blackwater fever	...	...	6	7	9	6

25. *Relapsing Fever*.—No cases.

INFECTIOUS AND EPIDEMIC DISEASES.

26. *Smallpox*.—Freetown.—One imported case, one non-imported case. A history of the imported case by Dr. Metzger will be found in an Appendix.

Smallpox.—Protectorate.—Some seventeen cases were reported from various parts of the Protectorate; no deaths were notified.

27. *Chicken-pox*.—This disease was reported fairly frequently both in Freetown and the Protectorate; sixteen cases were isolated at Kissy.

28. *Influenza*.—No case was reported.

29. *Measles*.—This disease was common in the Colony and Dr. Taylor reported on an outbreak in the Port Lokko District where there were eighty cases with six deaths.

30. *Beri-beri*.—Including the forty-three cases at the prison fifty-five cases were treated.

31. *Whooping Cough*.—One hundred and ninety-seven cases were reported.

32. *Plague*.—No case was reported.

Fuller details of these diseases are given in the Sanitary Section.

33. *Leprosy*.—In the Prison report and the report on the Kissy Institutions will be found particulars of the disease and its treatment; four cases were treated at Daru and three at Bonthe.

34. *Helminthic Diseases*.—*Ankylostomiasis*.—This disease is widespread; each medical officer submits an annual special report on this disease. The following table gives the numbers examined with percentage of infection.

Place.			Numbered Examined.	Numbered Infected.	Per Cent.	Remarks.
Freetown	...	...	500	252	65.9	Sir Alfred Jones Laboratory.
Freetown	...	...	402	52	12.9	Hospital Laboratory.
Freetown	...	...	521	112	21.5	Freetown Prison.
Bonthe	...	...	90	60	66.66	Selected cases—no symptoms.
Bonthe	...	...	31	17	54.83	Prisoners.
Kissy	...	...	34	5	14.70	Patients in Male and Female Infirmaries and out-patients.
Moyamba	...	...	87	60	69.09	—
Daru	...	...	100	70	70	—
Bo	...	...	336	153	45.53	Bo School, Pujehun and Kennema from prisons.
Makene	...	...	121	26	21.48	Soldiers and court messengers.

35. All these diagnoses are based on microscopical examinations. Treatment by carbon tetrachloride, thymol or beta-naphthol or oil of Eucalyptus gave satisfactory results.

Ascaris was found in 1,296 of the cases examined and *T. solium* or *saginata* in 146 cases.

(ii) EUROPEAN OFFICIALS.

36. Table showing the sick, invaliding and death-rates of European officials:—

	1921.	1922.	1923.
Total number of officials resident	214	209	188
Average number resident	144	109	102
Total number on sick list	217	159	167
Total number of days on sick list	1,815	1,426	1,462
Average daily number on sick list	4.97	3.90	4.00
Percentage of sick to average number of residents	3.45	3.57	3.92
Average number of days on sick list to each patient	8.36	8.96	8.75
Average sick time to each resident	12.6	13.08	14.33
Total number invalided	15	5	14
Percentage of invalidings to total residents ...	7.00	2.39	7.44
Percentage of invalidings to average number resident	10.41	4.58	13.72
Total deaths	2	2	...
Percentage of deaths to total residents	0.93	0.95	...
Percentage of deaths to average number resident ...	1.38	1.83	...

37. Causes of invalidings and deaths of European officials:—

Causes.	Invalided.	Died.
*Myocarditis and nephritis	1	...
*Neurasthenia and mental trouble	1	...
*Pulmonary tuberculosis	1	...
*Asthma and tonsillitis	1	...
*Heart disease	1	...
Acute muscular rheumatism	1	...
Malaria	2	...
Anæmia	1	...
Asthma and debility	1	...
Yaws and inflamed ear	1	...
Phlebitis	2	...
Myocarditis	1	...
	14	—

*Did not return to the Colony.

(iii) AFRICAN OFFICIALS.

38. Table showing the sick, invaliding and death-rates of African officials:—

	1921.	1922.	1923.
Total number of officials resident	850	850	850
Average number resident	750	750	750
Total number on sick list	1,248	1,071	879
Total number of days on sick list	7,780	7,887	7,586
Average daily number on sick list	21.31	21.60	20.78
Percentage of sick to average number resident ...	2.48	2.88	2.77
Average number of days on sick list to each patient	6.23	7.36	8.63
Average sick time to each resident	10.37	10.38	10.11
Total number invalided	24	7	13
Percentage of invalidings to total residents ...	2.82	0.82	1.52
Percentage of invalidings to average number resident	3.20	0.93	1.73
Total deaths	6	6	7
Percentage of deaths to total residents	0.70	0.70	0.82
Percentage of deaths to average number resident	0.80	0.80	0.93

39. Causes of invalidings and deaths of African officials:—

Causes.	Invalided.	Died.
Pneumonia	1	...
Malignant disease	2	...
Double cataract and cardiac degeneration	1	...
Chronic neurasthenia and anaemia ...	1	...
Hemiplegia	2	...
Nephritis and cardiac incompetency ...	1	1
General paralysis of the insane ...	1	...
Breaking down of cicatricial tissue—the result of previous injury	1	...
Senility	1	...
Heart disease	1	...
Acute inflammation of both eyes ...	1	...
Chronic asthma ... ..	...	1
Hæmoptysis ... ..	...	1
Tuberculosis of the lungs ... ..	...	2
Abscess (chronic) ... ..	...	1
Cerebral abscess following otitis media	...	1
Total ...	13	7

(iv) PRISONERS.

40. Table showing sick and death-rates in Freetown Prison:—

	1921.	1922.	1923.
Total number of prisoners admitted	1,035	1,116	1,040
Average strength	318	276	248
Total deaths	25	12	3
Total number of prisoners on sick list ...	186	290	279
Daily average number on sick list	21	28	15
Sick rate per 1,000 of average strength ...	66·03	101·4	60·48
Death-rate per 1,000 of average strength ...	78·66	43·5	12·09

41. In the appendices will be found the following dealing with Freetown Prison:—

- (a) Laboratory report by Dr. Dimock, Medical Officer in charge of laboratory.
- (b) Annual report with statistical report of Freetown Prison for 1923, by Dr. Dowdall, Senior Medical Officer.
- (c) Sanitary report on Freetown Prison, by Dr. Peacock.
- (d) A general report on the Prison with special reference to beri-beri, its causes and treatment, by Professor Blacklock, Major Peacock and Dr. Wood.

42. Table showing sick and death-rates at all prisons:—

Prison.				Daily Average Number in Custody in 1923.	Sick Rate per 1,000 of Average Strength.	Death-rate per 1,000 of Average Strength.
Freetown	...	...	...	248	60·48	12·09
Bonthe	...	...	...	38	Closed.	...
Batkanu	...	...	...	29		...
Kaballa	...	...	...	43		...
Kennema	...	...	...	22		...
Moyamba	...	...	...	28		...

(v) HEALTH OF TROOPS AND POLICE.

(a) IMPERIAL TROOPS, EUROPEAN.

43. Invalided sixteen, deaths two.

44. Table showing causes of invaliding :—

Tubercle of lung	...	...	...	...	1
Otitis media	...	...	...	...	1
Anæmia	...	...	...	...	1
Gastritis	...	...	...	...	1
Arthritis	...	...	...	...	1
Tropical anæmia	...	...	...	...	11
Total	...	...	...	...	16

45. Table showing causes of death :—

Malaria	...	...	...	...	1	out of hospital.
Malaria	...	...	...	...	1	in hospital.
Total	...	...	...	...	2	

46. Number treated, including officers:—

Malaria	...	...	...	...	135
Diseases of ear and nose	...	...	...	...	4
Diseases of the blood	...	...	...	...	23
Diseases of the respiratory system	...	...	...	...	2
Diseases of the digestive system	...	...	...	...	18
Diseases of the skin	...	...	...	...	27
Local injuries	...	...	...	...	27
Tonsillitis	...	...	...	...	7
Soft chancre	...	...	...	...	3
Gonorrhœa	...	...	...	...	8
Diseases of the urinary system	...	...	...	...	3
Sun-stroke	...	...	...	...	1
Diarrhœa	...	...	...	...	3
All other causes	...	...	...	...	39
Diseases of the eye	...	...	...	...	2
Diseases of the circulatory system	...	...	...	...	3
Diseases of the teeth and gums	...	...	...	...	1
Diseases of the nervous system	...	...	...	...	4
Diseases of the mental system	...	...	...	...	1
Rheumatic fever	...	...	...	...	1
Tubercle of the lung	...	...	...	...	1
Syphilis	...	...	...	...	1
General diseases	...	...	...	...	1
Pyrexia of uncertain origin	...	...	...	...	1
Paratyphoid	...	...	...	...	1
Total	...	...	...	...	317

47. (b) IMPERIAL TROOPS, NON-EUROPEAN.

Invalided	...	...	...	...	11
Died	...	...	...	...	3

48. Table showing causes of invaliding:—

Delusional insanity	...	...	...	...	1
Beri-beri	...	...	...	...	1
Leprosy	...	...	...	...	1
Eye, loss of	...	...	...	...	1
Irido cyclitis	...	...	...	...	1
Gonorrhœal conjunctivitis	...	...	...	...	1
Chronic arthritis	...	...	...	...	1
Myalgia	...	...	...	...	1
Malaria	...	...	...	...	1
Malignant stricture of oesophagus	...	...	...	...	1
Lymphadenitis—groin	...	...	...	...	1
Total	...	...	...	...	11

49. Table showing causes of death :—

Embolism following wound of foot	...	...	1
Peritonitis, acute	...	...	1
Pneumonia	...	...	1
Total	...	...	3

50. Table showing causes of illness :—

Malaria	...	...	74
Nervous system, mental...	...	...	2
Digestive system	...	...	16
All other causes	...	...	108
Diseases of ear and nose	...	...	2
Inflammation of lungs	...	...	7
Syphilis	...	...	3
Diseases of circulatory system	...	...	2
Diseases of respiratory system	...	...	12
Local injuries	...	...	38
Diseases of the blood	...	...	1
Gonorrhoea	...	...	31
Diseases of the eye	...	...	13
Soft chancre	...	...	7
Diseases of the skin	...	...	12
Other diseases due to infection	...	...	9
Diseases due to metabolism and nutrition	...	...	1
Rheumatic fever	...	...	2
Measles	...	...	2
Total	...	...	342

(c) SIERRA LEONE BATTALION, W. A. F. F.

51. The following table gives the sick and death-rates :—

Average Strength of Battalion during 1923.	Total Number of Deaths.	Death-rate per 1,000.	Total Number of Men on Sick List.	Daily Average Sick per 1,000.
351	5	14.24	1,223	2.73

(d) POLICE.

52. The following table gives the sick and death-rates :—

Total Number of Men under Command.	Total Number of Deaths.	Death-rate per 1,000.	Total Number of Men on Sick List.	Daily Average Sick per 1,000.
302	—	—	202	1.82

(vi) HILL STATION EUROPEAN RESERVATION.

(Between 700 and 900 feet above Freetown and overlooking it and connected with it by a winding railway about five miles long and a good motor road.)

53. The average number of residents at Hill Station during the year was sixty-four, divided as follows :—

Official	...	...	34
Military	...	...	5
Missionary	...	...	1
Non-officials and wives of above	...	...	24

(vii) GENERAL TABLE OF INVALIDINGS AND DEATHS OF EUROPEANS.

54. In the following table the figure for "others" under total resident is taken from the 1921 Census and is therefore only approximate.

—	Total Resident.	Deaths.	Invalided.
Officials, including W.A.F.F.	188	—	14
Imperial Military	291	2	16
Others	420	not available	not available

III—HOSPITALS AND DISPENSARIES.

(a) FREETOWN.

55. The finances of the Colony do not yet allow further buildings. On the original plan provision was made for six double ward blocks, Sisters' quarters, Medical Officers' quarters, offices, stores and out-patient department, as well as an European hospital block.

Only three double blocks with operating theatre, and necessary outbuildings, viz. latrines, kitchen, laundry and disinfecting chamber are completed. The capacity being the same as last year, namely, eighty beds and five cots.

56. When the finances of the Colony allow of extension, the administrative block with dispensary and out-patient department should get preference, as the present building (the old law courts) used as offices, dispensary and out-patient department, stores, etc., situated some 300 yards from the hospital, is old, dilapidated, beyond permanent repairs and totally unsuitable for the purpose. It is inconceivable from a health point of view how and why the idea of building an European hospital on this site was hatched and sanctioned; it should be forthwith struck off the programme.

57. Since the dentist was retrenched the building originally designed as a mortuary, then used as a dentist's surgery, is now earmarked for X-ray installation which, with electric light, is provisionally promised for 1925.

58. The total number of admissions during the year was 1,577 with 121 deaths—an increase of 295 and 1 respectively, as compared with 1922. Prevailing diseases were:—malaria, pneumonia, bronchitis, syphilis, dysentery, gonorrhœa, ulcers and local injuries.

59. The total in-patients and the maternity in-patients since 1904 are shown in the following table:—

Year.	Total In-patients.	Maternity In-patients.	Remarks.
1904	1,098	61	
1905	1,358	74	
1906	1,170	46	
1907	1,051	60	
1908	949	57	
1909	1,214	97	
1910	1,447	117	
1911	1,481	125	
1912	1,645	191	
1913	1,465	63	
1914	1,387	?	
1915	1,136	?	
1916	1,096	109	
1917	1,664	105	
1918	1,493	?	
1919	1,477	93?	{ Apparently only full term cases were reported this year.
1920	602	133	{ Hospital burnt—temporary hospital of one male ward and four maternity beds.
1921	737	142	{ New hospital opened—four wards in January, including maternity ward of eleven beds—two more wards in August.
1922	1,282	169	
1923	1,577	200	

60. The annual report of the maternity ward appears in Appendix II. Native women, especially those of the Kroo tribe, will not remain in hospital for more than twenty-four hours after delivery. (It is said of the Kroo women that a certain fetish or custom must be made within twenty-four hours after the birth of a child.) Dr. Wright, the Medical Officer in charge, drew attention to this fact in his annual report for 1919 (page 11), and attributed the wide prevalence of chronic pelvic troubles amongst the women in Freetown to this cause.

61. During the year under review, the maternity ward was free from any case of ophthalmia neonatorum.

62. Out-patient cases during the last four years have been as follows :—

	1920.	1921.	1922.	1923.
New cases	8,152	5,654	10,573	11,335
Subsequent attendances ..	13,270	16,209	10,443	36,985
Total attendances ..	21,422	21,863	21,016	48,320

63. In the opening remarks attention is drawn to the falling off of out-patients and subsequent attendances for the year under review ; in the whole Colony and Protectorate it will be seen from the above table that the falling off is confined to out-stations and dispensaries, with a large increase in Freetown ; this increase in Freetown is emphasized, as from time to time in the local press one reads complaints against the hospital management, the unpopularity of the hospital and Medical Department generally and the ill-treatment of the patients ; the above figures refute these complaints.

64. The Nursing Home (European hospital) remains as last year in the building which was originally the Government rest-house. This building is quite suitable and well equipped for the purpose, except as regards nurses' quarters and site ; it is situated at the corner of two main streets, is very noisy and difficult to keep clean from street dust. It is to be hoped that a new European hospital will soon be built in the reservation area, where suitable sites are available. The present building is admirably suited for offices. The total number of patients was 131 with two deaths as against 126 in 1922 and 175 in 1921 with seven and two deaths respectively in 1922 and 1921. No operations were performed during the year.

65. The number and status of those receiving treatment as in-patients in the institution were as follows :—

	Admissions.	Deaths.
(a) Government officials ..	50	...
(b) Members of mercantile firms ..	22	2
(c) Shipping	50	...
(d) Miscellaneous	1	...
(e) Ladies	3	...
(f) Naval	5	...
Total	131	2

(b) KISSY MEDICAL INSTITUTIONS.

These comprise the lunatic asylum, male and female infirmaries, and infectious diseases hospital, and were in charge of Dr. Metzger, who reports as follows :—

66. "At the lunatic asylum there is a dispensary which serves all the Kissy institutions and out-patients department. At the village of Wellington, medicines are dispensed twice a week in the Church of England schoolroom. Sanitary measures were carried out and compounds kept clean ; the dry earth system still continues and the excreta are buried in trenches or thrown into the sea.

67. The new chicken-pox huts were used during the year. Accommodation in the infirmaries is meagre. Many deserving patients had to be refused admission in consequence. Prevailing diseases were those of the respiratory and digestive systems, malaria, syphilitic and paralytic lesions.

68. Intravenous and intramuscular injections of galyl and novarsenobillon were continued. Galyl was very effective as a first injection or in a series of injections in all stages of syphilis. Novarsenobillon was found to be effective as an auxiliary to galyl, but not as a first injection in cases of primary syphilis. In cases of yaws, novarsenobillon was very effective. Certain cases of non-specific ulcers derived transient benefit from either of the above.

69. One case of chronic ulcer which by its nature was suspected to be dracontiasis, but from which no worm was seen to be expelled, healed up rapidly with a single injection of galyl : the patient was a girl twelve years old who had previously suffered from the disease (dracontiasis) at Sherbro. Injections of bichloride of mercury had been of no avail.

70. Sixty cases were examined by day as well as by night for microfilaria in their blood. The results were negative.

71. "The lepers continue to progress under Moogrol treatment, especially the nodular type reported last year. Another case was admitted during the year. *Bacillus lepræ* was found in the nasal discharge and it was of the nodular type. This case reacted very well and it is regrettable that the patient absconded so that his present condition cannot be described. A circinate type of nodular leprosy was discovered among the patients at the male infirmary. It reacted to treatment. The anæsthetic case does not do well under Moogrol.

72. "Pulmonary tuberculosis runs an acute course. Patients are sent in in a moribund condition so that the treatment is symptomatic.

73. "The total number of out-patients treated at the Kissy and Wellington dispensaries was 7,701.

74. "Two cases of smallpox, fifteen of chicken-pox, two of measles and one of scarlet fever in an European were admitted during the year.

75. "The statistics for other Kissy institutions are as follows:—

—		Admissions.	Total treated.	Died.
Lunatic asylum	...	56	133	23
Infirmary	...	281	349	47 "

(c) HOSPITALS AND DISPENSARIES ELSEWHERE.

76. *In the Colony:*

(a) Bonthe has a hospital—very dilapidated—with usually a Senior Medical Officer in charge.

(b) Sierra Leone village dispensaries with dispensers in charge are Waterloo, Kent, Regent* and York, also Lumley,* Hastings,* Goderich,* Banana Islands and Tombo.*

77. *In the Protectorate:*

(a) The following have permanent hospitals and were in charge of medical officers:—

Daru, on the Railway in the Central Province and the headquarters of the West African Frontier Force.

Pujehun, the headquarters of the Southern Province. This had to be closed as a medical officer station owing to shortage of staff.

(b) The following have "bush" hospitals—i.e. native built huts—and are in charge of medical officers:—

Moyamba, on the Railway in the Central Province.

Bo, on the Railway in the Central Province.

Makeni, the only station in the Northern Province with a medical officer.

(c) The following are in charge of dispensers:—

Kennema, regularly visited by Medical Officer, Bo—the headquarters of the Central Province, Sembehun and Sumbuya in the Southern Province, Kaballa, Port Lokko and Batkanu in the Northern Province.

(d) HOSPITAL AND DISPENSARY STATISTICS.

78. Table showing total number of cases treated at hospitals and dispensaries for nineteen years, 1905–1923.

Year	...	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Patients	...	31,211	32,635	33,027	38,468	33,401	36,052	39,405	41,946	31,536	49,419
Year	...	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	—
Patients	...	50,513	49,368	57,765	55,562	44,698	51,287	48,270	51,689	50,260	...

QUININE PROPHYLAXIS.

79. Quinine was issued gratuitously to the public to the extent of 239,246 grains.

*Reopened during the latter part of the year.

IV—SCIENTIFIC.

80. Reports appear as appendices.

H. O'HARA MAY,

Acting Director of Medical and Sanitary Services.

FREETOWN, SIERRA LEONE.

May, 1924.

V—SANITATION.

i. (a) ADMINISTRATION.

1. Dr. O'Hara May, whose appointment to the office of Deputy Director, Sanitary Service, was noted in the last annual report, arrived in the Colony and assumed duty on 4th April. In consequence of Dr. Beringer's absence on leave, he acted as Director of Medical and Sanitary Services from 16th May to the end of the year. Major Peacock, Senior Sanitary Officer, and Dr. W. Allan, Medical Officer of Health, acted as Deputy Director, Sanitary Service, at various times during the year. Dr. J. M. Mackay, M.C., acted as Medical Officer of Health during the second half of the year. Dr. Allan was promoted to Senior Sanitary Officer, Nigeria, from 21st April, but owing to the absence on leave of Major Peacock he was unable to leave the Colony until 26th December. Complete details as to leave and resumption of duty will be found in another place.

2. The amalgamation of the medical and sanitary offices, which had been under consideration during the previous year, was carried out in February. The temporary sanitary offices in Pultney Street were given up and the office of the sanitary branch was completely united with the medical in the old law courts. There is something to be said on both sides with regard to this arrangement and it is too early to come to a final conclusion as to the advisability of making it permanent. The chief drawback is perhaps the element of dual control in the running of the office. There is no doubt that the new titles of the senior officers of the medical and sanitary department and the loss of its own separate office tend to lower the importance of the sanitary branch in the eyes of the public and to place it in a definitely subordinate position, which is not in harmony with modern ideas. The office of the Medical Officer of Health remains a separate unit and is not affected by the amalgamation.

3. In accordance with the scheme for replacing the public vaccinators (with one exception) by sanitary inspectors, the establishment of sanitary inspectors and learners was increased from twenty-four to thirty at the beginning of the year, but it was not possible until later in the year to fill all the vacancies. Three of the new sanitary learners are ex-Bo school boys, making a total of four from that school. Bo school boys are posted to the Protectorate to work amongst their own tribes, as soon as they have completed their training in Freetown. Seven sanitary learners, having passed the qualifying examination, were promoted fifth Grade Inspectors. There was one death and one resignation. The total number of Fifth Grade Inspectors at the end of the year was seventeen.

4. The staff of vaccinators, which had been reduced from sixteen to eight at the end of 1922, was abolished at the end of the year, with the exception of one post in Freetown. In future vaccination will be carried out by sanitary inspectors, and it is hoped that this change besides effecting a considerable saving, will lead to increased efficiency.

5. Major Peacock inspected the following places during the year:—Waterloo, Kent, Moyamba, Mano, Njala, Bo, Daru, Pendembu and Dr. Allan the following:—Bo, Pendembu, Sembahun and Rotifunk.

6. The total cost of the Sanitary Department during the year was £19,315, distributed as follows:—

	£
Salaries, allowances and travelling	8,479
Labour	7,257
Anti-malarial measures	1,517
Materials and maintenance	1,443
Rent of buildings	508
Library and scientific apparatus	47
Meteorology	36
Miscellaneous	28

With the exception of the item anti-malarial measures, under which some permanent drainage work was carried out in continuation of the Steegmann Scheme, these sums do not include any sanitary works carried out by the Public Works Department.

7. The ratio of Medical and Sanitary estimates to total estimated revenue during the last five years is shown below.

Year.			Medical Vote.	Sanitary Vote.	Ratio of Medical and Sanitary Vote to Estimated Revenue.
			£	£	
1923	...	...	46,658	21,375	1 : 11.1
1922	...	...	51,164	24,106	1 : 11
1921	...	...	57,642	25,252	1 : 12.4
1920	...	...	38,808	18,518	1 : 12.3
1919	...	...	31,606	15,878	1 : 10.7

Notes.—1. In 1919 and 1920 there was special war expenditure on anti-malarial measures under the control of the Senior Sanitary Officer, but not included in Sanitary vote. It has, however, been added to it in calculating the ratio of expenditure.

2. From 1921 this anti-malarial measures vote was included in the Sanitary vote.

3. War bonuses are not included in the Medical and Sanitary votes.

4. In 1921 the salaries were adjusted and war bonus ceased to find place in the Colony estimates.

5. The sum voted is not necessarily expended in full.

(b) LEGISLATION.

8. In furtherance of a recommendation made in the last annual report, a Diseases of Animals Ordinance (No. 15 of 1923) was enacted and came into force in July. This will enable regulations to be made for the purpose of controlling the introduction and spread of infectious or contagious disease amongst animals.

9. Rules made under the Public Health (Protectorate) Ordinance (No. 10 of 1915) were applied to Malema, a native town adjacent to the headquarters of the West African Frontier Force at Daru.

10. By Order in Council No. 7 of 1923, section 2 of the Public Health (Amendment Ordinance (No. 16 of 1910), enabling summary action to be taken in the case of domestic mosquito breeding-places, was applied to the following towns and villages :—Aberdeen) Congo Town, Hill Station, Kissy, Murray Town, Wilberforce.

11. The following table shows the places which were declared infected under the Quarantine Ordinance, 1911, and subsequently declared free from infection, with dates and diseases on account of which action was necessary :—

Place.		Country.	Disease.	Infected.	Free.
Las Palmas	...	Grand Canary	Plague	3rd April, 1923	12th May, 1923
Saltpond	...	Gold Coast	Yellow fever	7th December, 1922	30th April, 1923
Bathurst	...	Gambia	Smallpox	25th May, 1923	6th July, 1923
Cape Coast	...	Gold Coast	Yellow fever	18th June, 1923	20th July, 1923
Quittah	...	Gold Coast	Yellow fever	20th July, 1923	30th July, 1923
Dakar	...	Senegal	Plague	8th August, 1923	18th August, 1923
Rufisque	...	Senegal	Plague	8th August, 1923	10th October, 1923

ii. (1) PREVENTIVE MEASURES AGAINST INSECT-BORNE DISEASES.

12. The following is taken from the report of Dr. J. M. Mackay, M.C., Acting Medical Officer of Health, Freetown :—

“(a) *House to House Inspection.* 98,002 inspections of houses and compounds were carried out during the year, 578 mosquito breeding places being found. 560 prosecutions followed and 474 convictions. The total fines amounted to £113 17s. 6d., making an average fine of 4s. 10d. per case.

“(b) *Mosquito breeding places.* The total number of mosquito breeding places discovered and dealt with was 1,121.

“(c) *Mosquito Larvæ Index.* The mosquito larvæ index taken at the end of each quarter gave the following figures :—

1st Quarter	...	...	1.4 per cent.
2nd “	...	...	3.71 per cent.
3rd “	...	...	2.57 per cent.
4th “	...	...	1.14 per cent.

Three hundred and fifty compounds were examined at each index.

“(d) *Closing of Wells.* At the end of 1922 there remained, so far as was known, only two wells to be closed. These were closed during 1923 in addition to four others, whose presence had not previously been detected. Practically all wells have now been closed.

"(e) *Cesspools*. The usual disinfecting during the dry season and oiling during the rains was carried out.

"(f) *Canalization of Streams*. Towards the end of the year, Alligator, Sanders and Nicol's Brooks were regulated and canalized, all mosquito breeding pools, etc., being filled in.

"(g) *Filling in of Low-lying Land*. A considerable area of low-lying land in the vicinity of the new concrete drain in Sanders Street was raised and drained, thereby obliterating a great number of potential mosquito breeding places.

"(h) *Oiling of Pools and Gutters*. 40,122 pools and gutters were oiled by inspectors in charge of sections and 26,035 by the oiling gang which operated only for six months.

"(i) *Inspection of Trees*. During the latter half of the year, a systematic inspection of trees was carried out. 25,046 trees were inspected and 5,352 holes, likely to contain water in which mosquitoes might breed, were found. 2,960 of these holes were cut so as to prevent water lodging there and 2,452 holes were cemented. 111 mosquito breeding places were found.

"(j) *Drainage*. The following drainage work was carried out by the Sanitary Engineer :

"(1) New concrete drains:

Completion of drain south side of Sanders Street, between John Street and Sanders Brook.

Forming drain in yard of old hospital.

Drain south side of Oxford Street—100 yards.

Completion of Oxford Street drain—76 yards.

Completion of outfall drain, King Jimmy—60 yards.

Circular Road—35 yards.

Charlotte Street—51 yards.

Fort Thornton—26 yards.

Robert Street to Sanders Street—225 yards.

Drain and outfall Nicol's Brook—30 yards.

Part canalization of drain and outfall, Nicol's Brook—25 yards.

John Street-Sanders Street drain—completion.

Sanders Street.

Oxford Street.

Sanders Street outfall drain—continuation of.

Regent Street.

"(2) Improvements to existing drains :

King Jimmy outfall, Charlotte Street, Frederick Street, Sanders Brook outfall,

Wellington Street, Bathurst Street, Wesley Street, John Street, Peter Lane,

Benjamin Lane and Walpole Street.

13. The subjoined graphs (not reproduced in the printed copy), prepared by Mr. G. V. Herd, Superintendent Sanitary Inspector, show the number of samples of mosquito larvæ of various genera collected by the Sanitary staff in Freetown in 1922 and 1923.

14. Outside Freetown routine anti-malarial work was carried out in all the Government stations and sanitary districts of the Protectorate, but nothing of special interest was reported. Prison labour was employed where it was available, and in other cases work was done by paid labour or by court messengers or soldiers. £7,257 was spent on sanitary labour, distributed as follows :—

	£
Freetown	4,256
Wilberforce and Murray Town, suburbs of Freetown, and Cape Sanitary Station, the Quarantine Station near Freetown ...	339
Hill Station	681
Bonthe and York Island	531
Waterloo	62
Fifteen Protectorate towns and Government stations in amounts varying from £17 to £164	1,388

YELLOW FEVER.

15. The death of one European in Freetown, which occurred in September was attributed on clinical grounds to yellow fever, but pathological examination showed that death was due to a streptococcal septicæmia.

TRYPANOSOMIASIS.

16. Trypanosomes of the *gambiense* type were found in the blood of a child who was brought to the Cline Town dispensary. Unfortunately the patient disappeared after the diagnosis was made and all efforts to trace her were unsuccessful.

17. The Registrar at York, who is a dispenser, recorded one death in an outlying village as probably due to Trypanosomiasis, but he did not see the case and the diagnosis was based on a description of symptoms given by the relatives.

18. In accordance with the recommendations made by Professor Blacklock in a report published in the last Annual Medical and Sanitary Report (Appendix viii), fifty prisoners were sent to the Cape Sanitary Station early in October and for the remainder of the year they were employed in clearing the Cape Peninsula with a view to getting rid of the tse-tse fly. On former

occasions it had been assumed that the oil-palms on the Cape Peninsula were of economic value and the method of treatment adopted was merely to remove the lower petioles in order to deprive the fly of breeding-shelter. It is now realized that owing to extensive tapping for the purpose of obtaining palm-wine the trees have become valueless, except from the aesthetic point of view. It was therefore decided to cut down all trees low enough to provide shelter for the fly and leave only the tall ones. By the end of the year this had been done on about half of the peninsula and, if certain difficulties with regard to privately-owned land can be overcome, it will be continued until the whole of the peninsula has been cleared. Efwatakala grass was grown from seed in the compound of the Sanitary Station and this will be planted out at the beginning of the next wet season.

19. If this scheme is a success and it is shown that the Cape Peninsula can be completely and permanently freed from tse-tse fly, there is a possibility that it might be used for a small experimental cattle breeding station or as the site for a dairy-farm, from which Freetown could be supplied with fresh milk and butter, but a cold storage depôt and a plentiful supply of ice would be an essential requisite for such a scheme. It is important to note that cattle imported by sea could be landed on the Cape Peninsula without risk of trypanosome infection in transit.

RELAPSING FEVER.

20. In consequence of reports of this disease from the Gold Coast and of its recent extension in a severe form over a large area of French West Africa, medical officers in this Colony were warned to be on the look-out for it. Dr. Maplestone, Assistant Director of the Sir Alfred Lewis Jones Research Laboratory, Freetown, kindly examined a series of blood films taken from cases of fever in various parts of the Colony and Protectorate. All of these were negative for spirochaetes and Dr. Maplestone stated that he considered it "unlikely that relapsing fever is at present endemic in this Colony."

(2) PREVENTIVE MEASURES AGAINST INFECTIOUS AND EPIDEMIC DISEASES.

CEREBRO-SPINAL MENINGITIS.

21. A solitary case at Pujehun, which was considered by the medical officer to be cerebro-spinal meningitis, was notified in August. The cerebro-spinal fluid was purulent and showed microscopically "numerous masses of degenerated leucocytes with diplococci in pairs and short chains of pairs intra and extra-cellular." Death occurred on the tenth day and there was no post-mortem.

INFLUENZA.

22. No cases were reported during the year.

PLAGUE.

23. In Freetown :

(a) 13,168 rats were brought to the department during the year and were destroyed. They were paid for at the rate of 2d. each until September when the rate was reduced to 1d. During the year Dr. Maplestone, of the Sir Alfred Lewis Jones Research Laboratory, carried out a series of examinations of rats for *B. pestis*. No infected rats were found.

(b) The department continued to use rat-catching varnish, which proved as before to be highly satisfactory.

24. A report on "Rat-fleas in Freetown, Sierra Leone" by B. Blacklock and M. G. Thompson, is published as an appendix. These observers report that "there is a sufficiently large percentage of *X. cheopis* present on rats in Freetown to carry plague effectually in epidemic form, should this disease be imported." They also point out the great difficulty of reducing the rat population owing to the vast amount of natural shelter.

25. Modern experience indicates that the only satisfactory method of getting rid of rats is to build them out and this is a point worthy of serious consideration when building regulations are drafted. A town planning scheme with a view to getting rid by degrees of the congested areas of Freetown would do much to reduce the danger of plague which, under existing conditions, is an ever-present one.

SMALLPOX. CHICKEN-POX. VACCINATION.

26. In Freetown two cases of smallpox were notified during the year. One was a non-imported case on the western outskirts of the town, but the source of infection could not be traced. The other case was landed from the German S.S. "Tsad." Seventeen cases were reported from the Protectorate, nine of these from the Koinadugu District of the Northern Province and the remainder from the Southern Province.

27. Chicken-pox was reported fairly frequently both in the Colony and Protectorate. There was an outbreak, consisting of seventeen cases, at the Agricultural Training College at Njala, the source of infection being a boy who came from a town in the Southern Province, where chicken-pox was prevalent.

28. Record of vaccinations performed :—

	1923.	1922.	1921.
Number vaccinated ...	21,517	26,488	35,989
.. successful ...	10,294	9,795	10,917
.. unsuccessful ...	4,266	6,302	6,794
.. not inspected...	6,957	10,351	18,278

DYSENTERY.

29. It is difficult to give accurate figures with regard to the incidence of dysentery. At the Colonial Hospital, Freetown, 138 cases were treated in 1923 as compared with 127 in 1922. Now that the wells in Freetown have been closed it is unlikely that this disease is to any extent water-borne and, as flies are seldom numerous, it is improbable that they have much to do with it. Its continued prevalence is probably to be attributed to "carriers" and to insanitary conditions of living, especially as regards the handling and storage of food.

LEPROSY.

30. Three new cases were treated at the Kissy Infirmary. Others reported were three in Freetown Prison, four at Daru and three at Bonthe.

31. It is hoped that when the natives begin to realize that the new methods of treatment hold out promise of cure they will bring their cases more readily to the various dispensaries, as has already happened in India, and that in time real progress will be made in the eradication of this disease.

TUBERCULOSIS.

32. There is reason to believe that tuberculosis, especially the pulmonary form, is very prevalent in Freetown and that it is increasing. Eighty-three cases were treated at the Colonial Hospital in 1923 as compared with thirty-seven in 1922. The African has none of the resistance, inherited or acquired, to this disease that the European possesses and he is liable to fall an easy prey to it. There can be little doubt that congested areas and overcrowded and insanitary dwellings have a great deal to do with the prevalence of this disease in Freetown. It is probable that Ankylostomiasis and other helminthic infections are important predisposing causes. The risk of infection through meat or milk is almost entirely absent and we have to deal no doubt with the human strain, transmitted by close and direct contact in small ill-ventilated rooms.

ANTHRAX.

33. Dr. J. M. Mackay, M.C., Acting Medical Officer of Health, Freetown, reports as follows :—
 "During the year three cases of anthrax amongst cattle were discovered. The first case was found on the 16th January, a cow which had died on that day. The second case occurred on the 5th February, also a cow which died on that day. The third and last case was found on the 10th December. This was a bullock which, on inspection before slaughter, appeared to be quite healthy. After slaughter the condition of the spleen was suspicious, and on bacteriological examination *B. anthracis* was demonstrated. One sheep also died of anthrax on the 12th March. No case of human anthrax was discovered."

34. At Bo two bullocks suffering from anthrax were destroyed.

DIPHTHERIA.

35. Two cases of diphtheria, treated at the Princess Christian Mission Hospital, were notified by Captain Wade, R.A.M.C. As far as can be ascertained these are the first cases recorded in this Colony.

OTHER DISEASES.

36. Measles was prevalent during the second quarter of the year in the Colony and it was also reported from the Port Lokko District of the Protectorate. Eighty-five cases were treated at the Colonial Hospital, eighteen at Kissy, twenty-eight at Songo and forty-eight at the Port Lokko dispensary. As a rule the type was mild, but in an outbreak at Magbankitta, in the Port Lokko District, investigated and reported on by, Dr. W. O. Taylor, there were ninety cases with six deaths.

37. Whooping cough was also prevalent in the Colony during the second quarter; 109 cases were treated at the Colonial Hospital, Freetown, seventy-five at Bonthe and thirteen at Waterloo.

(3) PORT SANITARY WORK—FREETOWN.

38. The Port of Freetown was never in quarantine during the year.

39. All ships arriving from infected places (detailed in paragraph 11) were visited and inspected by the Medical Officer of Health.

40. One case of smallpox was discovered on the S.S. "Tsad" in July and the usual precautions taken, viz. disinfection of the ship, vaccination of contacts and the isolation at the Cape Sanitary Station of all persons landing in Freetown.

41. A case of scarlet fever was landed from S.S. "Boutry" in February and treated at the Kissy Infectious Diseases Hospital. This steamer was homeward bound after a stay of some weeks at various West African ports and the source of infection could not be determined.

iii. (1) GENERAL MEASURES.

42. FREETOWN.—A summary of routine sanitary work is given in Table II. The following is from the report of Dr. J. M. Mackay, M.C., Acting Medical Officer of Health :—

A.—GENERAL SANITARY WORK.

"(a) *Sanitary Inspections*—7,903 notices to remove insanitary conditions on premises were served. 127 persons were fined for non-compliance, the fines amounting to £20 2s. 6d."

"(b) *Meat Inspections*—3,688 bullocks, forty-five sheep, twenty goats and five pigs were slaughtered in the public slaughterhouse for public sale. 805 bullocks, 181 sheep and one goat were slaughtered in the Imperial slaughterhouse for the Imperial Government. 405 bullocks, 184 sheep, one goat and twenty-five pigs were slaughtered by the European butchery for public sale. Fifteen bullocks and four quarters of beef were condemned and destroyed by order of the Police Magistrate for *Cysticercus bovis*.

"One bullock was condemned and destroyed for acute septic infection of the spleen and one for anthrax.

"Three livers were condemned, being infected with flukes.

"(c) *Food Inspection*.—The following foodstuffs were condemned and destroyed :

283 tins sardines	92 cases Milkmaid brand milk
70 tins herrings in tomato sauce	21½ doz. Milkmaid brand milk
333 tins pork and beans	35 tins fish cake
145 tins vegetables	7½ doz. baked beans
1 tin pudding	8 doz. curried rabbit
60 tins jellies	131 tins bacon
2,318 tins jam	3 barrels salted beef
18 tins condensed milk	4 bags beniseed
7 bags rice	223 tins cigarettes
2 bags cocoa beans	70 bottles bitters
1 bushel beans	

B—SANITARY BUILDINGS.

"(a) Repairs to dust-bins at Horton Street, Easton Street, Regent Road, Gabriel Street.

"(b) Repairs to latrines at Hagan Street, Brook Street, King William Street, and Lower Bombay Street.

"(c) Repairs to Incinerators at Third Street, King William Street, Rawdon Street, Henry Street, Falconbridge, Smythe Street, West Brook Street, and East Brook Lane.

"(d) Repairs to chutes at Lombard Street, Mercer Street, and Falconbridge.

C—WATERWORKS.

"The Superintendent of Waterworks, Mr. Wilfred Cole, reports as follows :

1. "There is nothing important to chronicle this year.

"The various sections of the Waterworks were maintained in proper repair during the year.

2. "There was only one public standpost erected this year, at Beccles Street, Brookfields. This brings the total number of public standposts to 214.

3. "There were twenty-two new private services erected during the year, bringing up the number to 396, exclusive of fifty-seven services to Government and Municipal buildings.

4. "About 340 yards of 3-inch mains were laid along St. George and Water Streets, and six new hydrants erected. There are now 315 public fire hydrants.

5. "The total quantity of water consumed for all purposes during the year was 156,637,240 gallons, an excess of 9,130,528 gallons over that of last year.

"The average daily consumption was 429,143 gallons as against 404,128 gallons last year. There is thus a steady increase in consumption.

"The maximum daily consumption recorded was 569,480 gallons on the 20th of January, and the minimum daily consumption, 271,860 gallons on the 17th of July.

6. "There was no shortage of water supply this year, nor was it found necessary to resort to pumping in order to augment the gravitation supplies."

OVERCROWDING.

43. A committee consisting of the Director of Public Works (President), Deputy Director, Sanitary Service, Medical Officer of Health and Sanitary Engineer was appointed in July to consider the amendment of the Freetown Improvement Ordinance (No. 23 of 1899) and to make recommendations with regard to building regulations. The committee concluded its labours in December, but the report had not been issued at the end of the year.

44. The congestion of building sites and overcrowding in certain areas, which have long existed, constitute a very definite menace to the health of the town. It is a matter of considerable urgency to regulate the construction of new buildings and by degrees to rectify the errors of the past. The original lay-out of the town was very good and, if the intention to build one house on each town lot (fifty feet in frontage and seventy-five feet in depth), had been adhered to, the result would have been very satisfactory. The present state of affairs is the result of inadequate legal control and the lack of a proper building authority. Fortunately, the number of permanent buildings in Freetown is still a comparatively small proportion of the whole, and it would therefore be possible even now to carry out a good deal of reconstruction without any very enormous outlay. Any complete town-planning scheme will necessarily depend upon a proper survey, and it is hoped that the Ordnance Survey of Freetown, which was commenced in 1912 and interrupted by the war, will soon be resumed.

(2) HILL STATION.

45. Dr. O'Hara May, Acting Director of Medical and Sanitary Services, reports as follows on the Hill Station sanitation :

" *Water Supply*.—During March and April, owing to low level in reservoir, the supply was cut off from 9 a.m.—4 p.m.; this caused very little inconvenience. For the rest of the year a plentiful supply of good water was available.

" *Conservancy*.—This includes road sweeping, collection of house and road refuse, emptying of latrines (there are some fifty latrines to be emptied daily); all night-soil is trenched daily. This works very satisfactorily, there being no nuisance and very few flies. House and road refuse is brought to the incinerator and picked, all incombustible material being buried in a deep pit, the rest incinerated. During the year a large area of bush was cut, the ground stumped and grass planted. The bush for fifty yards round all compounds was cut and kept down.

" *Mosquito Larvæ*. Adult mosquitoes were infrequently seen. Between April and November, the wet season, larvæ were found on sixty-one occasions; of these three were in broken bottles, seven in tins, some thirty-seven in hollows in rocks, two in pools, artificial or otherwise, and the remainder in trees and shrubs, the cactus-like shrub being responsible for a considerable number. All these breeding places were treated—in the case of cactus cut down, rock-pools hacked away, holes in trees cemented, all empty compounds were kept clean. A sanitary inspector visited once a week and the Acting Director of Medical and Sanitary Services inspected every Saturday. The personnel was raised from twenty-six labourers and two headmen in the dry season to thirty-four. The last two months of the year, viz. early dry season extra boys were taken on for bush clearing."

46. At Bonthe there were 118 prosecutions for nuisances with 111 convictions, bringing in a total of £35 12s. 0d. in fines.

47. Dr. Renner, African Medical Officer at Makeni, writes as follows about Robane, one of the two towns which form the Makeni Sanitary District, created in December, 1922 :—

"Robane" as it is to-day, is the larger of the two and by far the more important, as here the six European firms and petty traders are situated. The original village of Robane is still in existence and contains about thirty-eight huts. In January it was almost buried in jungle and dirt; but to-day a road runs round it and it has five public latrines, seven rubbish pits and an open space where no building is allowed to be erected. Just outside the old village a slaughterhouse has been built. It is paved and already in use. A market was completed at the close of last year. It is of a moderate size and of great benefit to the people.

48. "A 'Fuming pit' latrine was tried and found to be most successful in the prevention of flies and nuisance. The construction and method of use were described as follows:—The general principle is to make a deep trench through which a continuous stream of smoke is made to pass. This prevents flies and does away with the objectionable smell. A trench, five yards long and one yard wide, is dug to a depth of ten feet where possible. This allows for six apertures, one of which is used for the fire bucket. The trench is then covered over in the usual way and a shimbeck (shelter) built round. The apertures are provided with covers. At one end the fire bucket filled with damp burning grass is let down to about half the depth of the trench. The smoke from the grass then circulates in the trench. The cost of one pit is a few pence to buy empty cases for the covers. Thrice daily the fire bucket is let down for fifteen minutes and the pit is thoroughly fumigated. We have improved on the first type by having the aperture for the fire bucket in a compartment of its own."

49. The following remarks about the chief, who is "Sanitary Authority" under the Ordinance, are of interest:—

"He is a man of about forty and intelligent. He takes a great interest in the sanitation of his town. I am told that he spent a great part of his life in Freetown, and has seen and appreciated what sanitation has meant for us. Consequently he is ever willing to give me any assistance and I, on my part, have endeavoured to encourage him in every possible way. All the sanitary prosecutions have been sent to his court for trial. When his interest seems to lag, I generally see him on some sanitary matter and at once his interest is awakened. I was thus able to get the slaughterhouse built and paved, the butchers to submit meat for inspection

regularly and any number of men to do odd jobs that I deemed necessary. I feel sure that with a little patience, and a good deal of encouragement and recognition of the chief as head of his people, we shall in time get him to take his right and proper place as the Sanitary Authority of his district."

50. The following sanitary works were carried out in the Protectorate and Colony other than Freetown by the Public Works Department:—

- (1) Improvements to sanitary structures at York Island.
- (2) Manufacture of fly-proof covers for latrines in the Protectorate.
- (3) Covering well and fixing Beck pump in court messengers' lines at Makeni.
- (4) Reconstruction of dam at Moyamba and repairs to water mains.
- (5) Redesigning and improving drains leading to Kissy Asylum.

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

51. The usual courses of lectures to sanitary learners in connection with the syllabus laid down in the regulations were given by the Medical Officer of Health. These courses were also taken by male nurses in training at the Colonial Hospital. Sanitary learners also received instruction in office routine, outdoor sanitary work in all its branches, Police Court duties and so on, under the supervision of the Medical Officer of Health and Superintendent Sanitary Inspectors.

(4) VITAL STATISTICS.

	Population, 1921. Census.	Birth Rate.	General Death-rate.	Infant Mortality Rate (deaths per thousand births).
Freetown	44,142	19.3	30	437
Colony other than Freetown	41,021	18.7	21.5	261

52. The death-rate of thirty per thousand in Freetown compares with a rate of 26.3 in 1922, the actual number of deaths being 1,161 in 1922 and 1,332 in 1923, an increase of 171. In view of the fact that only 17 per cent. of the deaths were certified by a medical practitioner, it is difficult to state the exact reasons for this, but it is worthy of note that there was an increase of 106 in the deaths under three years as compared with 1922. With the exception of measles and whooping cough in the second quarter there was no outbreak of infectious disease during the year.

53. A study of the deaths month by month shows that the increase was spread over practically the whole year and was most marked in the months of April, July, August, October and November. Generally speaking, the highest death-rate occurs during the wet months of the year. The subjoined table shows the number of deaths each month in 1922 and 1923.

TABLE SHOWING THE NUMBER OF DEATHS OCCURRING IN FREETOWN EACH MONTH IN 1922 AND 1923.

—	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1922	88	76	87	85	88	115	126	108	102	97	76	113
1923	92	95	98	115	104	118	167	129	106	120	100	88

54. The Infant Mortality rate (i.e. number of deaths under one year per thousand registered births) in Freetown was 437 in 1923 as compared with 418 in 1922 and the actual number of infant deaths was 373 in 1923 and 311 in 1922. The following table shows the age distribution of infant mortality in Freetown during the year—

Age at Death.	Infant Mortality Rate	Percentage of total Infant Mortality
Under 14 days	197	45
14 days to 1 month	17	4
1—3 months	70	16
3—6	61	14
6—9	52	12
9—12	39	9

It is seen that about half the infant mortality was composed of deaths during the first month of life and that the great majority of these early deaths occurred within the first fortnight. It is natural to suppose that bad methods of midwifery and ignorance and carelessness in the treatment of the newly-born infant have a great deal to do with such deaths, but there are no doubt various other causes, including perhaps syphilis, and research is needed.

55. The fact that the rest of the Colony, which is entirely rural, has a much lower infant mortality suggests that urban life, especially such conditions as congestion of buildings and overcrowding, together with the insanitary conditions that are inevitably associated, have much to do with the high rate prevailing in Freetown.

56. The excess of deaths over births is largely accounted for by the high infant mortality and there is also no doubt that many births still escape registration. According to the 1921 Census the males exceeded the females by 28.5 per cent. and 24.3 per cent. in Freetown and the rest of the Colony respectively, which is an additional factor in producing a low birth rate.

57. The question of improving the system of registration of births and deaths is under consideration. Already, as a result of warnings to the public, there has been an appreciable increase in the number of births registered in Freetown, 853 in 1923 as compared with 744 in 1922. Registration of deaths is apparently quite complete, in view of the necessity to obtain a burial permit, but certification is a more difficult matter, which is intimately connected with social and economic conditions, and will require careful handling.

58. Vital statistics for the Protectorate are not available. Registration of births and deaths is permissive and there are thirteen registration districts, but very few births or deaths are registered. Dr. Easmon, African Medical Officer at Bo, has recently made an investigation into the infant mortality at various places in the Central and Southern Provinces. He found that out of 793 births 254 infants died within twelve months, an infant mortality rate of 320.

iv. RECOMMENDATIONS FOR FUTURE WORK.

59. (1) Town Planning; Completion of the Ordnance Survey of Freetown with a view to dealing with overcrowding and congestion in certain areas.
- (2) Infant welfare work.
- (3) Medical Inspection of school children.
- (4) Measures for the control of tuberculosis.
- (5) The establishment of a clinic for the treatment of venereal diseases.
- (6) Preliminary steps for the control of schistosomiasis and endemic goitre in the Protectorate.

VI—METEOROLOGICAL.

60. The rainfall recorded at Tower Hill, Freetown, in 1923, 125.28 inches, was a good deal below the forty years average, but almost exactly equal to the average for the last ten years. The rainfall in August, 21.82 inches, was considerably less than the average. While there was no absolute break in the rains in this month, there was an appreciable slackening, no measurable rain falling on nine days, as compared with only one dry day in July and three in September. The maximum precipitation on any one day during the year was 5.91 inches, recorded on the 16th July.

61. Records of temperature, humidity and rainfall taken at Freetown (Tower Hill) Bonthe (Sherbro), Bo, Batkanu and Kaballa during 1923 are given in Table III.

W. H. PEACOCK,
Acting Deputy Director, Sanitary Service.

TABLE I.

STAFF.

A—MEDICAL STAFF.

Office.	Name.	Absent on Leave.						Remarks.
		From			To			
Director of Medical and Sanitary Services ...	F J. A. Beringer ...	16	5	23	31	12	23	Invalidated 24th January, 1923, retired 8th February, 1923. Left for Gold Coast as A.D.M.S. 4th March, 1923.
Deputy Director of Medical Service ...	J. B. Bate ...	1	1	23	28	4	23	
Senior Medical Officer	C. H. Allan ...	1	1	23	23	1	23	
..	E. W. Wood-Mason	1	1	23	3	3	23	
..	J. C. Murphy ...	30	5	23	24	11	23	Appointed S.M.O. 8th February, 1923.
..	A. M. Dowdall ...	—			—			
Medical Officer ...	J. McConaghy ...	1	1	23	17	8	23	Invalidated to Islands on sick leave. New appointment—13th June, 1923.
..	J. Y. Wood ...	19	9	23	31	12	23	
..	M. Jackson ...	5	9	23	31	12	23	
..	J. M. Mackay, M.C.	—			—			
..	J. D. Dimock ...	25	7	23	21	12	23	
..	E. S. Walls ...	12	12	23	31	12	23	
..	J. W. Hartley ...	26	12	23	31	12	23	
..	W. A. A. Malone ...	—			—			
African Medical Officer	W. O. Taylor ...	—			—			Emergency leave.
..	M. C. F. Easmon ...	1	1	23	19	1	23	
..	E. J. Wright ...	8	8	23	31	12	23	
..	E. H. Cummings ...	24	4	23	23	7	23	
..	G. N. Metzger ...	17	1	23	16	4	23	
..	E. A. Renner ...	7	8	23	14	8	23	

B—SANITARY STAFF.

Deputy Director of Sanitary Service ...	H. O'Hara May ...	—			—			Arrived from Gold Coast 4th April, 1923.
Senior Sanitary Officer	Major W. H. Peacock	27	6	23	7	12	23	
Medical Officer of Health	W. Allan ...	1	1	23	6	1	23	
Superintendent Sanitary Inspector ...	D. S. Bowen ...	19	9	23	31	12	23	
"	G. V. Herd ...	1	1	23	3	3	23	

C—NURSING STAFF.

Matron and Senior Nursing Sister ...	Miss L. R. Stevens	1	1	23	11	3	23	
Senior Nursing Sister	Miss K. G. Appleton	1	1	23	17	2	23	Sick leave with half pay 1st January, 1923—5th February, 1923.
"	Miss C. Littlewood	3	8	23	31	12	23	
Nursing Sister ...	Miss I. Stevens ...	2	5	23	10	11	23	Vacation leave.
"	Miss V. Bell ...	1	10	23	20	10	23	Leave with half pay.
"	Miss V. Bell ...	7	3	23	17	8	23	
African Senior Female Nurse ...	Miss B. C. Cole ...	19	5	23	18	6	23	
"	Miss L. Johnson ...	—			—			
"	Miss L. Cline ...	—			—			
African Male Nurses and Apprentices ...	(Twenty-one) ...	—			—			
African Female Nurses and Probationer Nurses ...	(Seventeen) ...	—			—			

TABLE I—*continued.**D*—AFRICAN MEDICAL SUBORDINATE STAFF.

Office.	Name.	Absent on Leave.		Remarks.
		From	To	
Chief Dispenser ...	O. E. King ...	—	—	
Store-keeper and Assistant Chief Dispenser	E. G. Luke ...	—	—	
Assistant Chief Dispenser ...	D. T. Betts ...	4 6 23	3 8 23	
First Class Dispenser ...	W. A. Macauley ...	—	—	
" "	L. H. Wright ...	—	—	
" "	O. E. Nylander ...	—	—	
" "	H. E. Frazer ...	—	—	
" "	P. J. John ...	14 11 23	31 12 23	
" "	M. O. Frazer ...	1 1 23	21 2 23	
" "	M. P. Neville ...	—	—	
" "	P. Q. A. John ...	—	—	
Second Class Dispensers	(Eight) ...	—	—	
Third Class Dispensers	(Twelve) ...	—	—	
Laboratory Assistant ...	J. T. Roberts ...	—	—	

E—AFRICAN SANITARY SUBORDINATE STAFF.

Public Vaccinators ...	S. H. Brown and six others ...	—	—	
Fifth Grade Sanitary Inspectors ...	E. A. Nicholson and fourteen others ...	—	—	
Sanitary Learners ...	(Twelve) ...	—	—	

F—CLERICAL STAFF.

First Grade Clerk ...	M. W. Frazer ...	—	—	
Second Grade Clerk ...	S. G. Randle ...	11 6 23	10 8 23	
" "	M. St. G. Auber ...	—	—	
Third Grade Clerks ...	(Four) ...	—	—	
Fourth Grade Clerks ...	(Eight) ...	—	—	

TABLE II.

SUMMARY OF ROUTINE SANITARY WORK DONE DURING
THE YEAR IN THE TOWN.

1. FREETOWN.

—				Approximate Area.	Number of Proclaimed Open Spaces.
1921	...	...	...	2 $\frac{1}{4}$ square miles.	2 Public recreation grounds.
1922	...	...	...
1923	...	...	...

2. POPULATION.

—				No. of Natives.		No. of Europeans.		Total.
				Males.	Females.	Males.	Females.	
1911 Census	...	...	...	33,532		558		34,090
1921 Census	...	...	...	24,830	19,312	700	71	44,913

3. HOUSING.

—				Number Occupied by Europeans.	Number Occupied by Natives.
Number of houses :					
1921	...	...	...	—	—
1922	...	...	...	—	—
1923 (1921 Census)	...	...	...	162	6,350 and 121 unoccupied.
Number of huts :—					
1921	...	...	...	Included in the number of native houses.	
1922	...	...	...
1923	...	...	...

4. ERECTION OF NEW BUILDINGS DURING THE YEAR.

—				1921.	1922.	1923.
Number of houses built without sanction			
Number of huts built without sanction			

ACTION TAKEN.

—				Number of Prosecutions.		—
				Huts.	Houses.	
1921
1922
1923

TABLE II.—*continued.*

8. AVERAGE DAILY NUMBER OF CARTLOADS OF TIN CANS, BOTTLES,
BROKEN CROCKERY AND OTHER INCOMBUSTIBLE MATERIAL REMOVED
FROM HOUSES, HUTS, AND COMPOUNDS.

1921.	1922.	1923.
12	12	12

9. WATER SUPPLY.

Nature of Water Supply.	1921.	1922.	1923.
Pipe-borne water :—			
Source (river, lake or spring) :—			
Number of stand-pipes along roads	210	213	214
Number of stand-pipes in compounds and houses ...	417	434	443
Wells :—			
Public :			
Number	1	1	1
Number with pumps protected against surface water and mosquito-protected ... ..	...	...	...
Private :			
Number	12	2	...
Number protected against surface water and mosquito- protected ... ..	...	...	...
*Tanks :—			
Public :			
Number	4	5	4
Number mosquito-protected ... ..	...	...	...
Private :			
Number	29	29	35†
Number mosquito-protected	9	9	15
Nature of tanks :			
Wood ... ..	...	...	...
Iron	22	31	21
Concrete	7	12	18
Barrels :—			
Number	1,021	1,132	2,025
Number mosquito-protected	247	223	231

* The heading "Tanks" covers all fixed receptacles (including reservoirs) for storage of water.

† Includes tanks at King Tom Police Barracks.

TABLE II—*continued.*

10. DRAINAGE.

Nature of Drainage.	Public.	Private.
Masonry drains :—		
Linear yards of masonry drains :		
1921	11,659	...
1922	12,808	...
1923	13,964	...
Linear yards reconstructed during the year :		
1921 ... ..	...	...
1922 ... ..	...	...
1923	32	...
Linear yards repaired during the year :		
1921 ... ..	...	...
1922 ... ..	...	...
1923	62	...
Linear yards of new drains constructed during the year :		
1921	462	...
1922	1,149	...
1923	1,156	...
Earth drains or ditches :—		
Number of linear yards of ditches cleaned :		
1921	39,473	...
1922	37,080	...
1923	40,122	...
Number of linear yards of ditches dug and graded :		
1921	400	...
1922 ... ..	...	...
1923	63	...
Average frequency of clearing ditches of grass :		
1921	} Quarterly.	...
1922 ... ..		...
1923 ... ..		...

11. INSPECTIONS AND PROSECUTIONS.

	1921.	1922.	1923.
Number of Inspectors employed	19	19	19
Number of houses inspected	92,378	93,642	98,002
Number of houses where larvæ were found ...	483	373	578
Number of notices served to remove conditions causing the breeding of larvæ ... ..	...	...	...
Number of persons fined for having mosquito larvæ on premises	407	330	474
Number of notices served to remove insanitary conditions on premises	4,532	8,501	7,903
Number of persons fined for not removing insanitary conditions after notice ...	142	105	127
Number of soda and aerated water factories inspected ... ..	...	1	1

TABLE III.
METEOROLOGICAL RETURNS.
STATION—FREETOWN (TOWER HILL).
Latitude 8° 29' N. Longitude 13° 9' W.

MONTH.	Absolute Shade, Maximum.	Absolute Shade, Minimum.	Average, Maximum.	Average, Minimum.	Relative Humidity.	Rainfall in Inches.
January ...	95	69	90	74	64	...
February ...	92	72	89	75	65·5	·03
March ...	94	73	89	76	67	·62
April ...	93	72	88	76	73·6	5·14
May ...	91	70	89	75	73·5	8·16
June ...	89	69	87	74	77·9	13·25
July ...	88	70	83	72	84	34·76
August ...	86	69	83	72	81·5	21·82
September ...	88	70	84	73	81·5	24·71
October ...	90	70	87	73	77	11·80
November ...	91	71	88	74	77·5	4·80
December ...	92	73	90	76	73·5	·19
The Year ...	95	69	87·2	74·1	74·7	125·28

STATION—BONTHE (SHERBRO).
Latitude 7° 32' N. Longitude 12° 30' W.

January ...	90	65	88	70	76	·02
February ...	95	65	90	71	72	·54
March ...	93	70	90	73	69	2·07
April ...	93	70	89	73	74	4·68
May ...	91	70	88	74	75	6·38
June ...	89	69	85	73	82	27·07
July ...	85	70	83	72	83	23·33
August ...	84	66	82	71	83	15·47
September ...	89	69	84	72	86	22·74
October ...	90	70	87	72	85	17·72
November ...	92	69	88	73	84	8·6
December ...	95	70	90	73	84	0·6
The Year ...	95	65	87	72	79·4	128·74

TABLE III—*continued*.

STATION—BO.

Latitude 7° 57' N. Longitude 11° 46' W.

MONTH.			Absolute Shade, Maximum.	Absolute Shade, Minimum.	Average, Maximum.	Average, Minimum.	Relative Humidity.	Rainfall in Inches.
January	...	...	96	60	92	66	77	·19
February	...	...	98	60	94	68	76	1·28
March	...	...	97	62	93	70	79	2·05
April	...	...	96	62	90	69	83	9·67
May	...	...	96	61	91	69	83	7·48
June	...	...	92	60	88	67	83	11·39
July	...	...	89	64	84	68	88	19·66
August	...	..	89	62	82	67	87	12·37
September	...	...	89	60	86	67	86	16·82
October	...	...	90	63	89	68	85	17·34
November	...	...	93	56	89	65	85	7·72
December	...	...	92	62	89	67	86	·51
The Year	...	...	98	56	88·9	67·6	83	106·48

STATION—BATKANU.

Latitude 9° 4' N. Longitude 12° 26' W.

January	...	...	99	68	95	70	80	...
February	...	...	98	62	96	69	64	·05
March	...	...	100	67	98	71	59	1·22
April	...	...	97	68	93	71	70	6·74
May	...	...	98	65	95	71	70	6·71
June	...	...	97	70	93	72	87	18·10
July	...	...	96	65	92	67	86	22·60
August	...	...	96	65	93	67	84	22·50
September	...	...	96	63	93	67	82	17·60
October	...	...	96	65	94	67	85	15·05
November	...	...	96	65	93	69	81	9·65
December	...	...	98	61	93	67	86	1·90
The Year	...	...	100	62	94	69	77·8	122·12

TABLE III—*continued.*

STATION—KABALLA.

Latitude 8° 29' N. Longitude 11° 35' W.

MONTH.			Absolute Shade, Maximum.	Absolute Shade, Minimum.	Average, Maximum.	Average, Minimum.	Relative Humidity.	Rainfall in Inches.
January	...	...	95	64	92	67	90	...
February	...	...	96	60	93	66	86	...
March	...	...	96	56	94	72	89	3·0
April	...	...	96	68	93	72	83	4·83
May	...	...	96	68	94	71	78	5·44
June	..	...	95	65	91	69	83	15·65
July	...	...	93	65	89	69	85	14·08
August	...	...	90	67	88	68	87	11·90
September	...	...	92	66	90	70	87	18·24
October	...	...	93	68	91	70	83	12·83
November	...	...	95	68	92	71	81	10·91
December	...	...	94	67	92	71	79	1·56
The Year			96	56	91·5	69·6	84·2	98·44

TABLE IV.
RETURN OF DISEASES AND DEATHS (EUROPEAN)
FOR THE YEAR 1923.

Diseases.	*IN-PATIENTS.					OUT-PATIENTS.	
	§Remaining in Hospital at end of 1922.	TOTAL		†Total Cases treated.	||Remaining in Hospital at end of 1923.	TOTAL	
		Admissions.	Deaths.			Cases treated.	Deaths.
INFECTIVE DISEASES.							
Beri-beri ...							
Cerebro-spinal fever ...							
Chicken-pox ...							
Cholera ...							
Dengue ...							
Diphtheria ...							
Dysentery:—							
(a) Amœbic	1	...	1	...	1	
(b) Bacillary ...							
(c) Type not deter- mined	1	
Endocarditis—infective							
Enteric ...							
Erysipelas ...							
Gonorrhœa	3	
Influenza ...							
Kala-azar ...							
Leprosy:—							
(a) Nodular ...							
(b) Anæsthetic ...							
Malaria:—							
(a) Tertian	2	
(b) Quartan ...							
(c) Aestivo-autumnal	43	...	43	1	13	
(d) Chronic ...							
(e) Type not deter- mined	19	
Blackwater fever	4	1	4	...	1	
Measles ...							
Papataci fever ...							
Plague ...							
Pneumonia	2	...	2	...	...
Pyrexia of uncertain origin	10	
Rabies ...							
Relapsing fever ...							
Rheumatic fever ...							
Septicæmia	1	1	1			
Smallpox ...							
Syphilis:—							
(a) Primary	
(b) Secondary† ...							
(c) Inherited ...							
Tetanus ...							
Trypanosomiasis (sleep- ing sickness) ...							
Tuberculosis	2	...	2	...	1	
Carried forward	53	2	53	1	51	

*In-patients are those treated in hospitals and institutions, and the term does not apply to those treated in their own quarters, even though they would ordinarily be in-patients if there were suitable accommodation.

†“Tertiary Syphilis” is a term sometimes applied to the later symptoms.

‡“Total cases treated” will, of course, include those remaining in hospital at the end of the previous year.

§i.e., the year previous to that for which the return is made.

||The figures in this column to be carried on to the next year's return.

TABLE IV—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.	
	Remaining in Hospital at end of 1922.	TOTAL.		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL.	
		Admissions.	Deaths.			Cases treated.	Deaths.
INFECTIVE DISEASES— <i>continued.</i>							
Brought forward	53	2	53	1	51	
Undulant fever ...							
Whooping cough ...							
Yaws ...							
Yellow fever ...							
Other diseases	2	...	2	...	1	
INTOXICATIONS.							
Alcoholism				
Morphinism ...							
Other intoxications ...							
GENERAL DISEASES.							
Anæmia	3	...	3	...	7	
Anæmia—pernicious	1	...	1			
Diabetes ...							
Exophthalmic goitre ...							
Gout ...							
Leucocythæmia ...							
Lymphadenoma ...							
Myxædema ...							
Purpura ...							
Rickets ...							
Scurvy ...							
Other diseases	10	...	10	...	4	
LOCAL DISEASES.							
<i>Diseases of the Nervous System.</i>							
Sub-section 1.							
Diseases of the Nerves:—							
Neuritis	1	
Meningitis ...							
Myelitis ...							
Hydrocephalus ...							
Encephalitis ...							
Abscess of brain ...							
Congestion of brain ...							
Other diseases		
Sub-section 2.							
Nervous Disorders of Un- determined Nature:—							
Apoplexy ...							
Paralysis ...							
Chorea ...							
Epilepsy ...							
Carried forward	69	2	69	1	64	

TABLE IV—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.	
	Remaining in Hospital at end of 1922.	TOTAL.		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL.	
		Admissions.	Deaths.			Cases treated.	Deaths.
LOCAL DISEASES.—							
<i>continued.</i>							
Brought forward	69	2	69	1	64	
Neuralgia ...							
Hysteria ...							
Other diseases	1	
Sub-section 3.—Mental Diseases :—							
Idiocy ...							
Mania ...							
Melancholia ...							
Dementia ...							
Delusional insanity							
Other diseases	8	...	8	...	...
<i>Diseases of the Eye.</i>							
Conjunctivitis	1	
Keratitis ...							
Ulceration of cornea ...							
Iritis ...							
Optic neuritis ...							
Cataract ...							
Other diseases	1	...	1	...	2	
<i>Diseases of the Ear.</i>							
Inflammation	3	
Other diseases ...							
<i>Diseases of the Nose.</i>							
Inflammation ...							
Other diseases	4	
<i>Diseases of the Circulatory System.</i>							
Pericarditis ...							
Endocarditis ...							
Valvular Disease :—							
(a) Mitral ...							
(b) Aortic ...							
(c) Tricuspid ...							
(d) Pulmonary ...							
Arterio-sclerosis ...							
Aneurism ...							
Other diseases	3	...	3	...	...
Carried forward	81	2	81	1	75	

TABLE IV—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.	
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL	
		Admissions.	Deaths.			Cases treated.	Deaths.
LOCAL DISEASES.—							
<i>continued.</i>							
Brought forward	81	2	81	1	75	
<i>Diseases of the Respiratory System.</i>							
Laryngitis						
Bronchitis	2	...	2	...	7	
Broncho-pneumonia						
Abcess of lung						
Gangrene of lung						
Emphysema						
Pleurisy	1	
Empyema						
Other diseases	4	
<i>Diseases of the Digestive System.</i>							
Stomatitis						
Caries of teeth	3	
Pyorrhœa alveolaris	2	
Glossitis						
Sore throat	1	
Inflammation of tonsils	2	...	2	...	3	
Gastritis	3	...	3	...	2	
Ulceration of stomach						
Hæmatemesis						
Dilatation of stomach						
Stricture of stomach						
Dyspepsia	2	...	2	...	5	
Enteritis	1	...	1	...	3	
Appendicitis	3	...	3	...		
Colitis	1	...	1	...	1	
Ulceration of intestines						
Sprue						
Hernia	1	...	1			
Diarrhœa	2	...	2	...	8	
Constipation	2	
Colic	5	...	5	...	2	
Hæmorrhoids	1	
Pancreatitis						
Hepatitis—acute	1	...	1	1	2	
Abscess						
Cirrhosis						
Jaundice	1	...	1	...	3	
Peritonitis						
Ascites						
Other diseases	1	...	1	...	2	
Carried forward	106	2	106	2	127	

TABLE IV—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.	
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL	
		Admissions.	Deaths.			Cases treated.	Deaths.
LOCAL DISEASES— <i>continued.</i>							
Brought forward	106	2	106	2	127	
<i>Diseases of the Lymphatic System.</i>							
Inflammation of lym- phatic gland	3	...	3	...	...
Splenitis	1	...	1			
Suppuration of lympha- tic gland	1	
Lymphangitis ...							
Elephantiasis ...							
Other diseases ...							
<i>Diseases of the Urinary System.</i>							
Acute nephritis	2	...	2	...	...
Bright's disease	1	...	1			
Pyelitis ...							
Calculus ...							
Renal Colic ...							
Cystitis	1	...	1	...	...
Vesical calculus ...							
Suppression ...							
Hæmaturia ...							
Chyluria ..							
Other diseases ...							
<i>Diseases of the Generative System.</i>							
Male organs:—							
Urethritis						
Gleet ...							
Stricture ...							
Prostatitis ...							
Soft Chancre ...							
Condyloma ...							
Inflammation of scrotum							
Hydrocele						
Orchitis	1	...	1	...	...
Epididymitis ...							
Abscess in testicle ...							
Other diseases ...							
Female organs:—							
Ovaritis						
Ovarian cyst ...							
Endometritis ...							
Displacement of uterus							
Vaginitis						
Carried forward	115	2	115	2	128	

TABLE IV—*continued.*

Diseases.	IN PATIENTS.					OUT-PATIENTS	
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL	
		Admissions.	Deaths.			Cases treated.	Deaths.
LOCAL DISEASES.— <i>continued.</i>							
Brought forward ...	...	115	2	115	2	128	
<i>Diseases of the Generative System—contd.</i>							
Female organs, <i>contd.</i>							
Amenorrhœa ...							
Dysmenorrhœa ...							
Menorrhagia ...							
Leucorrhœa ...							
Other diseases ...							
<i>Affections connected with Pregnancy.</i>							
Abortion ...							
Other affections ...							
<i>Affections connected with Parturition.</i>							
Delayed labour ...							
Retained placenta ...							
Premature birth ...							
Other affections ...							
<i>Affections consequent on Parturition.</i>							
Post-partum hæmorrhage							
Puerperal septicæmia ...							
Mastitis ...							
Abscess of breast ...							
Other affections ...							
<i>Diseases of Organs of Locomotion.</i>							
Osteitis ...							
Arthritis ...	...	2	...	2	...	3	
Spondylitis ...							
Bursitis ...	...	...	...	..	...	1	
Myalgia ...	...	...	...	...	...	1	
Other diseases ...	...	3	...	3			
<i>Diseases of Connective Tissue.</i>							
Cellulitis ...	1	1	...	2	...	...
Abscess ...	...		...	...	...	2	
Other diseases ...							
<i>Diseases of the Skin.</i>							
Ulcer ...	...	...	...	...	...	2	
Urticaria ...	...					
Eczema ...	...	...	...	...	...	3	
Carried forward ...	1	121	2	122	2	140	

TABLE IV—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.	
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	TOTAL	
		Admissions.	Deaths.			Cases treated.	Deaths.
LOCAL DISEASES.— <i>continued.</i>							
Brought forward ...	1	121	2	122	2	140	
Diseases of the Skin— <i>continued.</i>							
Boil ...	...	1	...	1	...	7	
Carbuncle ...	...					
Herpes ...	...					
Psoriasis ...	...					
Oriental sore ...	...					
Tinea ...	...	...	...	...	...	2	
Scabies ...	...	...	...	...	...	1	
Acne ...	...					
Prickly heat ...	...					
Other diseases ...	...	...	...	...	...	3	
Injuries.							
General ...	...					
Local ...	...	3	...	3	1	13	
Tumours.							
Benign ...	...					
Malignant ...	...					
Malformations ...	...					
Poisons.							
Vegetable ...	...					
Animal ...	...					
Other poisons ...	...					
Parasites.							
Animal Parasites							
Protozoa ...	...					
Trematoda (flukes) ...	...					
Cestoda :—							
Tænia solium ...	...	...	...	...	...
Tænia saginata ...	...					
Other cestodes ...	...					
Nematoda :—							
Ascaris ...	...					
Trichocephalus dispar ...	...					
Trichina ...	...					
Dracunculus ...	...					
Filaria ...	...					
Strongylus ...	...					
Ankylostomum ...	...	2	...	2	...	...
Oxyuris ...	...					
Other nematodes ...	...					
Insecta :—							
Insects producing Myiasis ...	...					
Dermatophilus penetrans ...	...	...	...	...	...	1	
Other insects ...	...					
No appreciable diseases	...	3	...	3	...	3	
Total ...	1	130	2	131	3	170	

TABLE V.
RETURN OF DISEASES AND DEATHS (NATIVE) FOR THE YEAR, 1923.

Diseases.	*IN-PATIENTS.					OUT-PATIENTS.
	§Remaining in Hospital at end of 1922.	TOTAL.		‡Total Cases treated.	¶Remaining in Hospital at end of 1923.	Total Cases treated.
		Admissions.	Deaths.			
INFECTIVE DISEASES.						
Beri-beri	23	26	3	49	...	6
Cerebro-spinal fever ...	...	1	1	1	...	...
Chicken-pox	1	56	...	57	1	37
Cholera ... ..	...	...	...	...	...	...
Dengue ... ..	...	...	...	...	...	...
Diphtheria ... ..	...	...	...	...	...	...
Dysentery :—						
(a) Amœbic	3	55	3	58	...	120
(b) Bacillary ... ..	...	1	1	1	...	...
(c) Type not deter- mined ... ..	...	20	7	20	...	104
Endocarditis—infected	...	1	1	1	...	...
Enteric ... ..	...	...	...	...	...	...
Erysipelas ... ..	...	...	...	...	...	...
Gonorrhœa	1	34	...	35	2	1,088
Influenza ... ..	...	...	...	...	...	...
Kala-azar ... ..	...	...	...	...	...	...
Leprosy :—						
(a) Nodular	1	3	...	4	2	3
(b) Anæsthetic	1	1	...	2	1	11
Malaria :—						
(a) Tertian ... ..	...	19	...	19	1	28
(b) Quartan ... ..	...	...	...	...	...	1
(c) Aestivo-autumnal	10	165	1	175	1	813
(d) Chronic ... ..	...	6	...	6	...	24
(e) Type not deter- mined	1	82	2	83	1	1,809
Blackwater fever ...	...	...	...	...	...	1
Measles ... ..	...	2	...	2	...	202
Papataci fever ... ..	...	...	...	...	...	...
Plague ... ..	...	...	...	...	...	...
Pneumonia ... ..	...	75	25	75	3	113
Pyrexia of uncertain origin ... ..	...	17	1	17	2	119
Rabies ... ..	...	...	...	...	...	...
Relapsing fever ... ..	...	...	...	...	...	...
Septicæmia ... ..	...	14	12	14	...	...
Smallpox ... ..	...	12	...	12	...	1
Syphilis :—						
(a) Primary ... ..	...	...	...	...	...	...
(b) Secondary†	1	3	...	4	...	44
(c) Inherited	6	90	4	96	7	398
Tetanus ... ..	...	2	1	2	...	179
Trypanosomiasis (sleep- ing sickness) ... ..	...	8	7	8	...	8
Tuberculosis ... ..	...	1	...	1	...	...
Undulant fever	1	36	14	37	2	98
Carried forward ...	49	730	83	779	23	5,207

*In-patients are those treated in hospitals and institutions, and the term does not apply to those treated in their own quarters, even though they would ordinarily be in-patients if there were suitable accommodation.

†“Tertiary Syphilis” is a term sometimes applied to the latter symptoms.

‡“Total cases treated” will, of course, include those remaining in hospital at the end of the previous year, i.e., the year previous to that for which the return is made.

¶The figures in this column to be carried on to the next year's return.

TABLE V—continued.

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	Total Cases treated.
		Admissions.	Deaths.			
INFECTIVE DISEASES.— <i>continued.</i>						
Brought forward ...	49	730	83	779	23	5,207
Whooping cough	1	...	1	...	216
Yaws	4	...	4	...	144
Yellow fever					
Other diseases	20	...	20	...	49
INTOXICATIONS.						
* Alcoholism	1	...	1		
Morphinism					
Other intoxications	8
GENERAL DISEASES.						
Anæmia	3	1	3	...	321
Anæmia, pernicious					
Diabetes	1	...	1		
Exophthalmic goitre	1	...	1	...	1
Gout	1
Leucocythæmia					
Lymphadenoma	2
Myxœdema					
Purpura					
Rickets	3
Scurvy					
Other diseases ...	11	144	6	155	6	3,061
LOCAL DISEASES.						
<i>Diseases of the Nervous System.</i>						
Sub-section 1.—Diseases of the Nerves :—						
Neuritis	6	...	6	1	27
Meningitis					
Myelitis	1	2	...	3	2	1
Hydrocephalus					
Encephalitis					
Abscess of brain					
Congestion of brain	...					
Other diseases	2	1	2	...	79
Sub-section 2.—Nervous Disorders and Diseases of Undetermined Nature :—						
Apoplexy	4	3	4	...	1
Paralysis	5	36	9	41	6	24
Chorea					
Epilepsy	3	6	2	9	1	12
Neuralgia	8	...	8	...	408
Carried forward ...	69	969	105	1,038	39	9,565

TABLE V—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1922.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1923.	Total Cases treated.
		Admissions.	Deaths.			
LOCAL DISEASES— <i>continued.</i>						
Brought forward ...	69	969	105	1,038	39	9,565
Hysteria ...	...	...	...	...	...	14
Other diseases ...	..	8	..	8	...	148
Sub-section 3.—Mental diseases.—						
Idiocy ...	...	...	...	...	...	2
Mania ...	...	...	...	...	...	...
Melancholia ...	1	...	...	1	...	...
Dementia ...	...	11	...	11	2	2
Delusional insanity...	...	1	...	1	...	4
Other diseases ...	...	...	...	...	...	12
<i>Diseases of the Eye.</i>						
Conjunctivitis ...	...	18	...	18	1	545
Keratitis ...	...	2	...	2	...	18
Ulceration of cornea ...	...	3	...	3	1	7
Iritis ...	1	4	...	5	1	62
Optic neuritis ...	...	...	...	...	...	...
Cataract ...	...	2	...	2	...	21
Other diseases ...	4	14	...	18	2	97
<i>Diseases of the Ear.</i>						
Inflammation ...	...	4	...	4	...	100
Other diseases ...	...	6	...	6	...	257
<i>Diseases of the Nose.</i>						
Inflammation ...	...	...	...	...	...	65
Other diseases ...	...	...	...	...	...	296
<i>Diseases of the Circula- tory System.</i>						
Pericarditis ...	...	2	...	2	...	1
Endocarditis ...	1	1	...	2	...	4
Valvular Disease :—						
(a) Mitral ...	...	19	3	19	1	103
(b) Aortic ...	...	3	1	3	...	50
(c) Tricuspid ...	...	...	...	...	...	...
(d) Pulmonary ...	...	...	...	...	...	...
Arterio-sclerosis ...	1	...	...	1	...	2
Aneurism ..	...	1	...	1	...	6
Other diseases ...	...	19	6	19	2	104
<i>Diseases of the Respira- tory System.</i>						
Laryngitis ...	...	1	...	1	...	47
Bronchitis ...	3	103	2	106	4	4,694
Broncho-pneumonia ...	...	4	2	4	...	14
Abscess of lung ...	...	5	2	5	...	...
Gangrene of lung ...	...	...	...	...	...	...
Emphysema ...	...	...	...	...	...	...
Carried forward ...	80	1,200	121	1,280	53	16,240

TABLE V—continued.

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1921.	TOTAL		Total Cases treated.	Remaining in Hospital at end of 1922.	Total Cases treated.
		Admissions.	Deaths.			
LOCAL DISEASES— continued.						
Brought forward ...	80	1,200	121	1,280	53	16,240
<i>Diseases of the Respiratory System—continued.</i>						
Pleurisy ...	1	31	1	32	1	156
Empyema	3	...	3	...	...
Other diseases ...	1	16	...	17	1	199
<i>Diseases of the Digestive System.</i>						
Stomatitis	2	...	2	...	191
Caries of teeth	1	...	1	...	1,041
Pyorrhœa alveolaris	2	...	2	...	32
Glossitis	112
Sore throat	3	1	3	...	210
Inflammation of tonsils	16	...	16	...	621
Gastritis ...	2	21	1	23	1	121
Ulceration of stomach	1	...	1	...	...
Hæmatemesis	1
Dilatation of stomach
Stricture of stomach
Dyspepsia	18	...	18	1	2,615
Enteritis	6	3	6	1	16
Appendicitis	1	1	1	...	...
Colitis	1	...	1	...	11
Ulceration of intestines
Sprue
Hernia ...	4	39	3	43	1	204
Diarrhœa	53	6	53	1	955
Constipation	11	...	11	...	4,552
Colic	14	...	14	...	469
Hæmorrhoids	5	...	5	...	55
Pancreatitis
Hepatitis, acute	14	...	14	...	220
Abscess	2	1	2	...	1
Cirrhosis	2	2	2	...	7
Jaundice	6	...	6	...	40
Peritonitis	5	4	5	...	2
Ascites	5	2	5	...	46
Other diseases ...	1	14	3	15	...	301
<i>Diseases of the Lymphatic System.</i>						
Splenitis	3	...	3	...	211
Inflammation of lymphatic gland	32	...	32	...	496
Suppuration of lymphatic gland	7	...	7	1	48
Carried forward ...	89	1,534	149	1,623	61	29,173

TABLE V—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1921.	TOTAL		Total Cases treated	Remaining in Hospital at end of 1922.	Total Cases treated.
		Admissions.	Deaths.			
GENERAL DISEASES— <i>continued.</i>						
Brought forward ...	89	1,534	149	1,623	61	29,173
<i>Diseases of the Lympha- tic System—continued.</i>						
Lymphangitis ...	...	3	...	3	...	22
Elephantiasis ...	3	19	1	22	1	39
Other diseases ...	...	...	...	...	...	56
<i>Diseases of the Urinary System.</i>						
Acute nephritis ...	3	28	7	31	1	32
Bright's disease ...	1	...	...	1	...	14
Pyelitis ...	...	...	...	...	...	...
Calculus ...	...	...	...	...	...	...
Renal colic ...	...	...	...	...	...	2
Cystitis ...	...	7	1	7	1	26
Vesical calculus ...	...	...	...	...	...	...
Suppression ...	1	3	1	4	...	1
Hæmaturia ...	...	2	...	2	...	8
Chyluria ...	...	...	...	...	...	...
Other diseases ...	1	15	1	16	...	26
<i>Diseases of the Genera- tive System.</i>						
Male organs:—						
Urethritis ...	...	3	...	3	...	69
Gleet ...	...	...	...	...	...	59
Stricture ...	3	11	1	14	...	87
Prostatitis ...	...	...	...	...	...	...
Soft chancre ...	...	18	...	18	...	180
Condyloma ...	...	...	...	...	...	...
Inflammation of scrotum ...	...	1	1	1	...	7
Hydrocele ...	2	8	...	10	...	117
Orchitis ...	1	31	...	32	...	194
Epididymitis ...	...	8	...	8	...	42
Abscess of testicle ...	...	2	...	2	...	4
Other diseases ...	3	17	2	20	1	35
Female Organs:—						
Ovaritis ...	...	...	...	...	...	14
Ovarian cyst ...	...	1	...	1	...	3
Endometritis ...	...	2	...	2	1	69
Displacement of uterus ...	...	1	...	1	...	1
Vaginitis ...	...	3	...	3	...	20
Amenorrhœa ...	...	...	...	...	...	207
Dysmenorrhœa ...	...	1	...	1	...	102
Menorrhagia ...	...	5	...	5	...	53
Leucorrhœa ...	...	...	...	...	...	33
Other diseases ...	1	9	...	10	1	66
Carried forward ...	108	1,732	164	1,840	67	30,761

TABLE V—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1921.	TOTAL.		Total Cases treated.	Remaining in Hospital at end of 1922.	Total Cases treated.
		Admissions.	Deaths.			
LOCAL DISEASES— <i>continued.</i>						
Brought forward ...	108	1,732	164	1,840	67	30,761
<i>Affections connected with Pregnancy.</i>						
Abortion ...	...	17	1	17	...	72
Other affections ...	1	18	2	19	...	77
<i>Affections connected with Parturition.</i>						
Delayed labour ...	1	146	4	147	...	4
Retained placenta ...	...	5	...	5	...	2
Premature birth ...	...	1	...	1	...	...
Other affections ...	...	4	2	4	...	1
<i>Affections consequent on Parturition.</i>						
Post-partum hæmor- rhage ...	...	...	...	...	...	...
Puerperal septicæmia ...	...	4	3	4	...	...
Mastitis ...	2	3	...	5	1	51
Abscess of breast ...	...	1	...	1	1	8
Other affections ...	...	14	2	14	...	5
<i>Diseases of Organs of Locomotion.</i>						
Osteitis ...	5	10	...	15	1	183
Arthritis ...	1	23	...	24	1	305
Spondylitis ...	...	...	...	...	...	...
Bursitis ...	1	1	...	2	...	3
Myalgia ...	...	23	...	23	...	1,546
Other diseases ...	2	36	...	38	2	498
<i>Diseases of Connective Tissue.</i>						
Cellulitis ...	1	35	...	36	1	418
Abscess ...	1	64	1	65	2	404
Other diseases ...	...	2	1	2	1	34
<i>Diseases of the Skin.</i>						
Ulcer ...	33	231	...	264	14	4,260
Urticaria ...	...	1	...	1	...	20
Eczema ...	...	6	...	6	...	363
Boil ...	...	12	...	12	...	392
Carbuncle ...	...	2	...	2	...	11
Herpes ...	...	1	...	1	...	39
Psoriasis ...	...	...	...	...	...	4
Oriental sore ...	...	...	...	...	...	...
Tinea ...	...	5	...	5	...	213
Scabies ...	1	5	...	6	2	427
Carried forward ...	157	2,402	180	2,559	93	40,101

TABLE V—*continued.*

Diseases.	IN-PATIENTS.					OUT-PATIENTS.
	Remaining in Hospital at end of 1922.	TOTAL.		Total Cases treated.	Remaining in Hospital at end of 1923.	Total Cases treated
		Admissions.	Deaths.			
LOCAL DISEASES.— <i>continued.</i>						
Brought forward ...	157	2,402	180	2,559	93	40,101
Diseases of the Skin— <i>continued.</i>						
Acne ...						
Prickly heat ...						
Other diseases ...	1	17	...	18	...	375
Injuries.						
General ...	...	21	4	21	2	161
Local ...	20	246	7	266	12	4,401
Tumours.						
Benign ...	2	19	3	21	1	69
Malignant ...	1	20	2	21	1	12
Malformations ...	...	...	...	...	...	3
Poisons.						
Vegetable ...	...				
Animal ...	...	1	...	1	...	1
Other poisons ...	...	1	...	1	...	2
Parasites.						
Animal Parasites.						
Protozoa ...	...				
Trematoda (flukes) ...						
Cestoda :—						
Tænia solium ...	...	2	...	2	...	112
Tænia saginata ...	...	4	...	4	...	28
Other cestodes ...	...	...	...	...	...	1
Nematoda :—						
Ascaris ...	...	30	...	30	...	1,266
Trichocephalus dispar						
Trichina ...	...				
Dracunculus ...						
Filaria ...	...	5	...	5	...	2
Strongylus ...	...	2	...	2	...	...
Ankylostomum ...	1	156	1	157	...	52
Oxyuris ...	...	...	...	...	...	1
Other nematodes ...	...	3	...	3	...	...
Insecta :—						
Insects producing myiasis ...	...	...	...	...	...	3
Dermatophilus pene- trans ...	...	2	...	2	...	21
Other insects ...	...	...	...	...	...	8
Undiagnosed ...	...	12	...	12	3	22
No appreciable disease	...	29	...	29	...	164
Total ...	182	2,972	197	3,154	112	46,805

TABLE VI.

OPERATIONS.

(a) LIST OF SURGICAL OPERATIONS PERFORMED IN COLONIAL
HOSPITAL IN 1923.

Nature of Operation.	Number.	Cured.	Relieved.	Unrelieved.	Died.
Suturing of bladder	1	1	—	—	—
Scraping of sinus	2	2	—	—	—
Dilatation of stricture	1	1	—	—	—
Amputation of breast	1	1	—	—	—
Radical operation for hernia	9	4	—	—	1
Radical operation for elephantiasis	4	8	—	—	—
Removal of foreign body	1	1	—	—	—
Opening of abscess	6	6	—	—	—
Removal of tumours	13	12	1	—	—
Amputation	6	5	1	—	—
Removal of necrosed bone	2	2	—	—	—
Circumcision	2	2	—	—	—
Laparotomy (abdominal cyst)	1	1	—	—	—
Laparotomy appendicitis	1	—	—	—	1
Incision for examination of elephantiasis	1	—	—	1	—
Removal of glands	2	2	—	—	—
Suturing of wounds	3	3	—	—	—
Herniotomy	4	2	1	—	1
Removal of retained piece of placenta	1	1	—	—	—
Osteotomy	3	3	—	—	—
Radical operation for mastoiditis	1	—	—	—	1
Excision of tonsil	2	1	1	—	—
Operation for removal of toe nail	1	1	—	—	—
Excision of fistula	1	1	—	—	—
Carbuncle—incision	1	1	—	—	—
Urethrotomy	1	—	1	—	—
TOTAL	71	61	5	1	4

(b) LIST OF SURGICAL OPERATIONS PERFORMED IN THE
NURSING HOME IN 1923.

No operations were performed during the year.

(c) SURGICAL OPERATIONS PERFORMED ELSEWHERE REPORTED BY
MEDICAL OFFICERS.

Station.	Number.	Cured.	Relieved.	Unrelieved.	Died.
Kaballa	10	10	—	—	—
Bo	19	17	—	—	2
Bonthe	9	5	1	1	2
Kennema	1	1	—	—	—
Kissy	7	7	—	—	—
Daru	95	25	68	1	2
Pujehun	10	9	—	1	—
Moyamba	2	2	—	—	—
TOTAL	154	76	69	3	6

APPENDIX I—COLONIAL HOSPITAL LABORATORY REPORT.

The reports of Dr. Hartley and Dr. Malone, who were in charge for five months of the year, are incorporated in this report.

The work has mainly consisted of routine examination of material from the Nursing Home, Colonial Hospital, Freetown Prison, and Kissy Hospital.

During the year 2,287 specimens were sent to the laboratory for examination.

NURSING HOME AND COLONIAL HOSPITAL.

Blood.—Eight hundred and thirty-one samples examined chiefly for suspected malaria. *Plasmodium falciparum* was found on 207 occasions, *Plasmodium vivax* on four and *Plasmodium malariae* on four occasions also. These results emphasize the fact that the vast majority of cases of malaria in Freetown are of the so-called malignant type.

It is a very exceptional occurrence to find the sexual forms of this parasite in the peripheral blood of the patient. In one case only during the year were they observed.

As the presence of these cells is necessary for the transmission of malaria from one case to another, it will be of interest to find if they are more common in nocturnal blood. I hope to carry out an investigation this year.

Chemical, microscopical, or spectroscopical examinations were made on 418 specimens of urine.

Ninety-two specimens of sputum were examined, in fourteen of which *B. tuberculosis* was found.

Twenty-three specimen of pus, chiefly from cases of suspected venereal disease, were examined.

One specimen taken from the nose was found to contain *B. lepræ*. Four hundred and two specimens of faeces were examined:—

Ova of *Ankylostoma* found on fifty-two occasions.

Ova of *Ascaris lumbricoides* found on ninety-one occasions.

Ova of *Trichuris trichiura* found on twenty-two occasions.

Ova of *Tæniide* found on seven occasions.

Entamæba histolytica either in cyst or as free forms found on twenty-one occasions.

The comparatively low percentage of cases harbouring ankylostome ova is explained, I think, by the fact that the majority of patients from whom these results are obtained are accustomed to wearing boots or shoes and so one of the chief routes of infection (i.e. through the skin of the feet and ankles) is closed. The percentage of patients harbouring ankylostome ova in the Freetown Prison is considerably higher.

During the year there were nineteen post-mortem examinations. The cause of death in each of these cases is shown below.

CAUSE OF DEATH.				No.
Myocardial degeneration and cirrhosis hepatis	...	...	...	1
Purulent bronchitis, double pleurisy	...	...	...	1
Chronic nephritis	...	...	...	1
Cerebral malaria, hyperpyrexia	...	...	...	1
Double pyonephritis	...	...	...	1
Chronic valvular disease of the heart	...	...	...	1
Shock following immersion	...	...	...	1
Tuberculous peritonitis	...	...	...	1
Acute lobar pneumonia	...	...	...	3
Pulmonary tuberculosis	...	...	...	1
Epilepsy	...	...	...	1
Drowning	...	...	...	2
Rupture of spleen	...	...	...	1
Empyema of lung	...	...	...	1
Rupture of aortic aneurysm	...	...	...	1
Cerebral hæmorrhage	...	...	...	1

One exhumation was carried out at Tombo village.

Miscellaneous.—One sample of food examined for suspected presence of poison and found to contain a lethal dose of some crude disinfectant containing carbolic acid.

Many slides from cattle and sheep were examined for the presence of *B. anthracis*.

Sections of several tumours were made for diagnostic purposes.

In conjunction with Dr. Wright, a series of observations was made on the blood of newly-born children in the Maternity Wards of the Colonial Hospital.

FREETOWN PRISON.

Blood—Eighty-six smears were examined for the presence of malarial parasites.

In eighteen cases *Plasmodium falciparum* was found, *Plasmodium vivax* and *Microfilaria bancrofti* were each observed on one occasion.

Chemical, microscopical or spectroscopical examination was made on the urine of twenty-five cases.

Ova of *Schistosoma haematobium* was found on three occasions.

Ten samples of sputum were examined, in two of which *B. tuberculosis* was found.

Five hundred and twenty-one specimens of faeces were examined :—

Ova of *Ankylostoma* were found on 112 occasions

Ova of *Ascaris lumbricoides* found on 120 occasions

Ova of *Trichuris trichiura* found on thirteen occasions

Ova of *Tæniidæ* found on fourteen occasions

Entamoeba histolytica either in cyst or as free forms was found on thirty-three occasions.

J. D. DIMOCK.

APPENDIX II—REPORT ON THE MATERNITY WARD, COLONIAL HOSPITAL.

Dr. E. J. Wright was in charge up to 31st July, when I relieved him. During the year ending 31st December, 1923, 200 patients were admitted to the Maternity Ward : of these 140 were delivered in hospital, fifteen had false pain, nine were admitted after giving birth at their homes, twenty-nine had complicated pregnancies, two died in hospital before delivery, and four were non-pregnant patients who were admitted as overflow patients when the general female ward was full.

Of the 140 labour cases, 43 per cent. were primiparæ ; ninety-seven of the labour cases were normal ; the abnormal cases were made up as follows :—

CASE.	No.	REMARKS.
Breech	5	One anencephalic child, one still birth
Accidental hæmorrhage	2	—
Craniotomy	2	—
Dead births	4	—
Dystocia	3	One hydrocephalic child with spina bifida
Eclampsia	4	Two forceps extraction with dead child, one premature labour
Forceps	4	—
Placenta prævia	3	Two podalic version—both still born
Premature labour	8	—
Still birth	2	—
Twins	6	{ 1st twin transverse with prolapsed arm { 2nd twin breech presentation

N.B.—No case has been counted twice, each case has been designated by its outstanding feature.

The patients in a great number of the serious cases were brought to hospital after they had been in labour for a considerable time and were usually in a bad condition ; the signs of protracted labour were intensified on account of harmful and misguided interference at their homes, e.g. a primipara was brought to hospital in a moribund condition after she had been in labour for three days, the head of foetus putrified, was protruding out of the vulva, and the urinary bladder of the mother ruptured ; she delivered a dead child (craniotomy was performed), the mother developed peritonitis and died in hospital.

The Kroo patients who patronize the Maternity Ward to a very great extent do not stay in hospital on the average for more than two days after delivery ; most of them ask for their discharge within twenty-four hours, no persuasion being strong enough to alter their determination.

The Maternity Ward was free from cases of Ophthalmia neonatorum.

The following nine cases gave birth at their homes, but were admitted to hospital on account of delayed third stage of labour or abnormal puerperium :—

CASE.	No.	REMARKS.
Retained placenta	6	—
Puerperal Insanity	1	Relieved
Sapremia	2	—

The twenty-nine complicated pregnancies were made up as follows :—

CASE.	No.	REMARKS.
Abortions	14	—
Toxæmias of pregnancy ...	3	One with placenta prævia
Vulval abscess	1	—
Miscarriages	2	—
Observation	4	—
Rheumatic fever	1	Abortion
Pleurisy	2	—
Malaria	2	Treated with quinine

E. TAYLOR CUMMINGS,

Medical Officer-in-Charge of Maternity Ward.

18th January, 1924.

APPENDIX III—FREETOWN PRISON ANNUAL REPORT FOR 1923.

During the year Dr. J. Y. Wood was in charge during the first seven months and Dr. A. M. Dowdall, Senior Medical Officer, the remaining months.

Health of European Staff—Good.

Health of African Staff—Was fairly satisfactory.

Thirty-five cases against eighty-seven of the previous year. The chief disease was malaria. There was nobody invalided and no deaths. Six were sent to hospital.

Health of Prisoners.—The health of the prisoners was very satisfactory throughout the year. There was no real outbreak of any disease. Three deaths took place during the year, being the lowest number since 1906.

Causes of Death.—Mitral disease, typhoid and beri-beri respectively.

The chief diseases treated were bronchitis, malaria, skin diseases and ordinary digestive troubles. Malaria was greatly reduced, 169 cases being treated as against 304 of the previous year.

Amœbic Dysentery.—Slight increase (three of undetermined type), mostly new-comers and recurrent cases. Twenty-four cases against nineteen of 1922, twenty-four of 1921 and fifty-eight of 1920. Eighteen cases of amœbic cysts (carriers) were also treated.

Beri-beri.—Twenty-three cases were in hospital at the end of the previous year. One case was admitted from Moyamba with beri-beri. Twenty were admitted during the year—all relapses. There was one death. This case was admitted with the disease. There was no new case during the last six months of the year.

Leprosy.—Two cases of leprosy were successfully treated with injections of chaulmoogra oil. A report has been already forwarded.

Two cases of chicken-pox and one of measles were treated. Active measures were taken and there was no spread of these diseases.

Ankylostomiasis.—With the assistance of the authorities of the Sir Alfred Jones Laboratory attempts were made to determine the degree of ankylostome infection in the prison, and the incidence of it has been found to be much greater than was suspected. One hundred and seven cases were treated. A special report has been sent in and the work is still being carried on.

Bilharziasis.—Two cases were treated with intravenous injection of antimony tartrate and were quite clear of that infection as revealed by repeated after treatment examinations of their urine.

Filiariasis.—Five cases were treated.

Tænia saginata.—Eleven cases were treated, against ten of 1922, and twenty-eight of 1921.

All faces of prisoners on arrival were examined and those remaining in gaol at the end of the year. The prisoners engaged in the kitchen had their faces examined frequently to see if they were free from dysenteric infection. All prisoners were weighed monthly to ascertain the rise and fall in their weight, the average weight being 132 lb.

The number of prisoners on the sick list during the year was 254 and three deaths. Subsequent attendances 3,465. Prisoners suffering from ankylostomiasis accounted for so many being admitted to hospital. Total number of prisoners in prison during the year was 1,040, with daily average of 248.

Sanitation.—The sanitary condition of the prison is excellent. The Director of Medical and Sanitary Services visited the prison periodically.

Early in October the scheme suggested by the Commissioner of Lands and Forests for the planting of a kind of anti-tse-tse grass (Efwatakala grass) was put into operation and a gang of about fifty prisoners is stationed at the Cape Sanitary Station for the purpose. A dispenser is in charge of the medical and sanitary arrangements, and the health of the prisoners has been excellent.

A new-hand power rice sheller and winnower has been recently installed: it has not yet had time to prove its merit.

The new dietary, farming, and Cape Sanitary Station are proving their worth in eradicating the beri-beri from Freetown prison, not one new case having occurred during 1923.

One post-mortem examination was made. No major surgical operations were done.

Prisoners released on Medical Grounds. Seven prisoners were released on medical grounds for the following diseases:—

- 4 chronic beri-beri
- 2 chronic amoebic dysentery
- 1 tuberculosis

3 lunatic prisoners were sent to Kissy asylum.

2 medical boards held on prisoners detained on His Majesty's pleasure to determine their mental condition.

A statistical return is attached.

A. M. DOWDALL,
Senior Medical Officer.

FREETOWN PRISON STATISTICAL RETURN FOR THE YEAR 1923.

In-patients—In hospital at end of December, 1922	...	...	25
Admitted during the year	...	...	254
Total	...	...	<u>279</u>

	March Quarter.	June Quarter.	September Quarter.	December Quarter.
Admissions	30	97	73	54
Cured	22	38	45	32
Relieved	14	30	42	26
Not relieved	1	2	1	1
Died	—	1	2	—
In hospital at end of 1923	—	—	—	1
Taken under observation and treatment	—	—	—	253

Deaths.—Causes as follows:—

- 1 from Mitral disease
- 1 from Typhoid
- 1 from Beri-beri.

OUT-PATIENTS.

	New Cases.	Subsequent Attendances.
March quarter	317	482
June quarter	318	568
September quarter	327	577
December quarter	295	505
Total	1,257	2,132

Daily average number of prisoners:—

Males	...	246
Females	...	2
Total	...	<u>248</u>

Average weight of prisoners ... 132 lb.

	Number of New-comers examined.	Remands and Trials examined.	Examined for Cells.	Examined for Corporal Punishment.	Execution.
March quarter ...	190	68	87	4	2
June quarter ...	186	45	81	3	—
September quarter ...	226	42	75	—	—
December quarter ...	241	98	58	3	—

A. M. DOWDALL,
Senior Medical Officer.

APPENDIX IV—SANITARY REPORT, FREETOWN PRISON.

The general sanitary condition of the prison was satisfactory throughout the year and the health of the prisoners showed a very great improvement as compared with previous years.

2. The report of the committee appointed in December, 1922, to investigate the health of prisoners in Freetown prison, which is published as Appendix V, was issued early in June and the recommendations did not therefore come fully into force until the second half of the year.

3. Twenty cases of beri-beri were reported, all except three during the first half of the year. Practically all of these were prisoners who had had beri-beri in 1922 and showed some return of symptoms, which in some cases might have escaped notice, had it not been for the fact that the Medical Officer of the Prison, who was a member of the committee, was carrying out at that time an intensive clinical examination of all prisoners.

4. It is worthy of note that the disease disappeared just at the period of the year when normally it begins to increase rapidly. The subjoined table showing the incidence of beri-beri month by month in 1922 and 1923 brings out this fact very clearly.

TABLE SHOWING INCIDENCE OF BERI-BERI IN 1922 AND 1923.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1922.	...	...	...	...	...	1	1	2	8	26	7	14
1923.	5	3	2	1	4	2	1	...	...	...	...	...

5. There were only three deaths from all causes, giving a death-rate of 12.1 per thousand, which is the lowest for very many years. One death was due to enteric fever. The case, a life sentence prisoner, had been in prison since 1921 and it was impossible to determine the source of infection. The only fatal case of beri-beri, a prisoner transferred from Kennema, was suffering from the disease when he was admitted to Freetown prison.

6. In accordance with the recommendations of the special committee, the quarantine station at the Cape was declared a temporary prison early in October and fifty prisoners were transferred there for the purpose of clearing the Cape peninsula with a view to getting rid of the tse-tse fly. There can be little doubt that the interchange of prisoners between Freetown prison and the Cape will have a beneficial effect on their health.

7. The substitution of hammocks for plank-beds was continued and is proving a great success. The prisoners like them and from a hygienic point of view the hammock is much to be preferred, as it is easily kept clean and free from vermin.

8. With a view to supplying a rice rich in germ and pericarp, as advised by the special committee, a hand-power rice huller and winnower, recommended by the Commissioner of Lands and Forests, was ordered, but had not arrived at the end of the year.

W. H. PEACOCK,
Acting Deputy Director, Sanitary Service.

APPENDIX V—INVESTIGATION INTO THE HEALTH OF PRISONERS
IN FREETOWN GAOL.

The present investigation into the health of prisoners in Freetown gaol has been necessarily very much restricted in its scope by an unforeseen obstacle. It appeared early that the identification of prisoners who had been admitted to hospital would prove very unsatisfactory. There are entered in the hospital record various items such as the name, nationality and age of prisoners admitted, but these proved of so little value in identifying an individual that the attempt had to be abandoned. This difficulty arose from the fact that the hospital admission book was of the usual type supplied to civil hospitals and therefore was not provided with a column in which to enter the prisoners' register number. This number forms the only certain means of identification among prisoners in a locality where many individuals of the same tribe bear the same name. Confronted by this fact, we have been compelled to restrict our investigation to such records as provide definite identification, these being chiefly the records of deaths for the period 1913-22, and the beri-beri figures of the year 1922.

2. *Death-rate.*—The death-rate among all prisoners in Freetown gaol for the period 1913 to 1922 inclusive is shown in the following table:—

TABLE I.
SHOWING DEATH-RATE AMONG PRISONERS IN FREETOWN GAOL.

Year.	Rate per 1,000.	Average Daily Strength
1913	72	276
1914	104	241
1915	108	259
1916	114	262
1917	109	276
1918	82	279
1919	23	348
1920	28	435
1921	79	318
1922	43	276

It is seen from the table that the highest death-rate occurred in the years 1914 to 1917 inclusive.

3. The years 1914 to 1917 were notable for the occurrence in the gaol of numerous cases of dysentery and diarrhoea. The percentage which deaths from these conditions formed of the total deaths from all causes (for the years 1913 to 1919 inclusive) is given in Table II.

TABLE II.
SHOWING PERCENTAGE OF DEATHS FROM DYSENTERY AND DIARRHOEA.

Year.	Total Deaths.	Number of Deaths from Dysentery and Diarrhoea.	Percentage.
1913	20	4	20
1914	25	7	28
1915	28	10	36
1916	30	12	40
1917	30	6	20
1918	23	8	35
1919	8	4	50

Intestinal affections classed as dysentery and diarrhoea are evidently an important factor in elevating the death-rate during the years 1913 to 1919 inclusive.

4. Even after excluding dysentery and diarrhoea however, there remains an abnormally high death-rate which requires explanation. We may note in regard to the year 1918 that of the total deaths, namely twenty-three, no less than nine were due to influenza. In investigating the causes of death other than dysentery and diarrhoea we are struck by the fact that the majority of cases which end fatally are admitted to hospital during the months of May to October. Table IIA, showing the admission of fatal cases month by month brings this out clearly.

TABLE IIA SHOWING MONTH OF ADMISSION OF FATAL CASES (EXCLUDING
DYSENTERY AND DIARRHOEA), FROM 1913 TO 1922.

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8	7	10	8	15	17	15	23	25	18	7	5

From the table it is seen that there is a definitely greater number of admissions of fatal cases in the period May to October. This period coincides with the rainy season; in the month of August, which is the month of highest rainfall, the admissions are almost at their maximum. The factors which are at work in causing the high death-rate, apart from dysentery and diarrhoea, exert apparently a definite seasonal influence.

5. In the year 1913, there was evidence of the existence of beri-beri in the gaol, as in the returns for that year there are shown five deaths from the disease. Again in 1919 this disease appears in the records as a cause of death and it continues to appear during the years 1920, 1921 and 1922. In the years mentioned, of the total deaths the percentage due to beri-beri is as follows:—

TABLE III.
SHOWING FOR THE YEARS 1913 AND 1919 TO 1922 THE TOTAL NUMBER OF DEATHS FROM ALL CAUSES AND THE PERCENTAGE OF THE TOTAL PRODUCED BY BERI-BERI.

Year.			Total Deaths.	Deaths from Beri-beri.	Percentage.
1913	...	...	20	5	25
1919	...	...	8	2	25
1920	...	...	12	3	25
1921	...	...	25	3	12
1922	...	...	12	3	25

These figures of deaths from beri-beri are striking and even if we do not take into consideration deaths from causes, e.g., dysentery, diarrhoea and cardiac affections, which are usually closely associated with beri-beri, we must conclude that deficiency disease has been responsible for a very appreciable proportion of the deaths in the prison for some years.

6. In view of this fact it has been found necessary to investigate the prison dietary and to determine if possible in what manner the deficiency arose. We have undertaken an enquiry into the composition of the diet, the preparation of the various articles of diet consumed, and the methods of cooking; our findings have already been embodied in M.P. 3582/1922.

7. It has also been considered advisable to ascertain for those years in which deaths from beri-beri are recorded, the figures showing the incidence of the disease. The numbers of cases of beri-beri recorded during the years 1913 and 1919 to 1922 are as follows:—

TABLE IV.
SHOWING THE NUMBER OF BERI-BERI CASES RECORDED.

Year.						Cases of Beri-beri.
1913	...	...	...	...	...	26
1919	...	...	...	...	...	53
1920	...	...	...	...	...	...
1921	...	...	...	...	...	41
1922	...	...	...	...	...	59

Note.—The three deaths recorded in 1920 occurred in prisoners who were admitted to hospital before the end of 1919.

From the figures in the tables, it is evident not only that beri-beri produces a great addition to the death-rate during these years, but also that the disease affects fairly large numbers of prisoners. It should be emphasized here that beri-beri cases linger in hospital for long periods and that their convalescence is a tedious and slow one. Furthermore, after discharge from hospital their capacity for labour is usually much impaired.

8. In the year 1922 there were fifty-nine cases of beri-beri, of which three died. The times of the year at which these fifty-nine cases were admitted is shown below.

TABLE IVA. SHOWING MONTHS OF ADMISSION OF FIFTY-NINE CASES OF BERI-BERI DURING 1922.

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
...	1	1	2	8	26	7	14

It is seen that the admission of beri-beri cases in the year 1922 began in June, reached a maximum in October, and then fell but continued till the end of the year.

COMPARISON OF THE HEALTH OF LONG AND SHORT SENTENCE PRISONERS.

9. The following Table V gives the death-rate of convicts (prisoners serving three years or over) and common gaol (prisoners serving less than three years.)

TABLE V.
SHOWING DEATH-RATE AMONG CONVICTS AND COMMON GAOL PRISONERS.

Year.	Convicts (three years and over).	Common Gaol Prisoners (under three years).
1913	148	23
1914	158	68
1915	127	94
1916	142	92
1917	185	46
1918	113	48
1919	39	10
1920	35	21
1921	70	89
1922	68	21

N.B.—In 1918 one death is not included owing to the absence of information as to period of sentence.

These figures suggest that convicts are exposed to conditions causing fatal disease to a much greater extent than are common gaol prisoners. In order to explain the high convict death-rate it has been suggested frequently that mental depression predisposes convicts to fatal disease.

10. Leaving aside the consideration of purely psychological factors, it is necessary to draw attention to the basis upon which these death-rates are compiled. The death-rate is arrived at by taking the average daily strength of prisoners in each group as the basic figure. The average daily strength for any period is the number of prison days divided by the number of days in the period. There is, however, a possible fallacy which has to be considered before comparing the two groups. It is this: that even with an equal average daily strength, the two groups are not necessarily exposed to the same risk. For example ten prisoners for fourteen days gives an average daily strength for a fortnight of ten. But twenty prisoners for seven days also gives an average daily strength for a fortnight of ten. If all the prisoners in the example are exposed on admission to the infection of smallpox which, let us assume, has a fixed incubation period of twelve days, it is clear that none of the seven days prisoners can develop the disease in prison, while all of the fourteen days prisoners may do so.

11. In a similar way if we try to investigate beri-beri as a factor causing a high death-rate among prisoners, we must ascertain, if possible, two facts, namely what is its "incubation" period, and what numbers of each group have remained in gaol long enough to develop the disease. For the first object, namely, ascertaining the "incubation" period, it is convenient to utilize the 1922 figures for beri-beri, inasmuch as they are the most recent and the most exhaustive available for the gaol. Of fifty-nine cases of beri-beri which were recorded in 1922 the average incubation period was approximately fourteen months from the date of admission. The average, however, is derived from a series of which most cases occur earlier than fourteen months, whereas some occur after a much longer period. This fact is brought out in Table Va showing periods after admission to prison, at which fifty-nine cases of beri-beri in 1922 developed the disease.

TABLE VA. SHOWING PERIODS AFTER ADMISSION TO PRISON AT WHICH FIFTY-NINE CASES OF BERI-BERI IN 1922 DEVELOPED THE DISEASE.

0-6 months.	7-12 months.	13-18 months.	19-24 months.	25-30 months.	31-36 months.	Over 36 months.
16	18	7	7	5	2	4

The late-developing cases may be explicable on the grounds that certain individuals possess a greater resistance to the deficiency disease than others, which is a well known fact in so far as the neuritis of fowls is concerned, and also that some of these late-occurring cases may in reality be relapse cases. It is worthy of note that of the thirty-six convicts who developed beri-beri among the fifty-nine prisoners affected in 1922 no less than ten are stated to have had previous attack of the disease. Owing to the difficulty of identification mentioned above it has been impossible to trace all cases back to the original attack, but enough has been done to show that the length of the average "incubation" appears greater than it really is.

12. If we turn now to the deaths of convicts as apart from other prisoners we find that there is a definite increase in the number of deaths from the 7th to the 12th months. The number of deaths at this period is double that which occurs in the first six months stay in gaol.

TABLE VB. SHOWING DURATION OF STAY IN PRISON OF CONVICTS BEFORE DEATH.

0-6 months.	7-12 months.	13-18 months.	19-24 months.	25-30 months.	31-36 months.
14	28	33	37	14	4

13. It would be useful to show the duration of stay in gaol of common gaol prisoners before death if comparable figures could be obtained. But as the vast majority of common gaol prisoners are sentenced to six months or less a comparable figure would be difficult to obtain. For example, the length of sentence passed on 923 prisoners committed to Freetown gaol in 1922 is shown in Table VI.

TABLE VI.
SHOWING LENGTH OF SENTENCE PASSED ON 923 PRISONERS COMMITTED TO THE
FREETOWN GAOL IN 1922.

Up to 6 months.	7 to 12 months.	13 to 18 months.	19 to 24 months.	25 to 30 months.	30 to 36 months.	Over 36 months.
834	28	14	18	1	10	18

14. It is clear from the above table that a disease which had a long "incubation period," say six months or over, would fail to develop in any of the 834 prisoners of the first column. They would be contracting it no doubt, but would be discharged before it developed. A relatively low death-rate among common gaol prisoners may mean in such a case not necessarily that their health is good, but merely that their sentences are short.

15. When we analyse the death figures of convicts in regard to factors which may possibly render them particularly susceptible to disease generally, we cannot differentiate between them and common gaol prisoners as regards such factors as diet, water supply, sleeping accommodation. The occupation of prisoners may have some influence, as there exist differences between the kind of occupation of convicts and such common gaol prisoners as are sentenced to six months or less. Whereas the former are prohibited from leaving the precincts of the gaol until within six months of the expiry of their sentence, the latter are normally employed in outdoor gangs.

16. The 1922 beri-beri figures show a distinct selection as regards occupation. Of fifty-nine cases of beri-beri in this year, thirty-four occurred in tailors, that is 57 per cent. The average daily strength of tailors formed only 15 per cent. of the average daily strength of all prisoners. That is to say that the 15 per cent. of the prison population who were employed as tailors yielded 57 per cent. of all the notified beri-beri cases. It appears therefore that in Freetown gaol in 1922 there was some factor in the occupation of tailoring which rendered tailors particularly prone to develop beri-beri. As a class tailors are not selected because of a poor physique. Of the thirty-four tailors affected eighteen were convicts and sixteen were common gaol prisoners, so that on the figures the conclusion which must be arrived at is that both convict tailors and non-convict tailors are susceptible to beri-beri.

TABLE VII.
17. SHOWING PERCENTAGE AFFECTED WITH BERI-BERI (FIFTY-NINE CASES) AMONG
THOSE WHO ARE CONVICTS AND THOSE WHO ARE COMMON GAOL PRISONERS
AFTER VARYING PERIODS IN PRISON.

	Number of Months in Prison.	Number affected by Beri-beri.
Convicts ...	0-6	4
Common gaol prisoners ...	...	12
Convicts ...	7-12	9
Common gaol prisoners ...	...	9
Convicts ...	13-18	5
Common gaol prisoners ...	...	2
Convicts ...	19-24	7
Common gaol prisoners ...	...	0
Convicts ...	25-30	5
Common gaol prisoners ...	...	0
Convicts ...	31-36	2
Common gaol prisoners ...	...	0
Convicts ...	over 36	4
		59

TABLE VIIA.

SHOWING PERIODS AT WHICH FIFTY-NINE BERI-BERI CASES OF 1922 DEVELOPED
BERI-BERI, DIVIDED INTO CONVICTS AND COMMON GAOL PRISONERS.

	0-6 Months.	7-12 Months.	13-18 Months.	19-24 Months.	25-30 Months.	31-36 Months.	Over 36 Months.
Convicts	4	9	5	7	5	2	4
Common gaol	12	9	2	—	—	—	—

If then we examine the figures for fifty-nine beri-beri cases in six months' periods, dividing the prisoners affected into convicts and common gaol groups, we see that during the first six months stay in gaol only four convicts as compared with twelve common gaol prisoners developed beri-beri. The figures are equal for the second six months and thereafter only convicts appear affected. The excess of common gaol prisoners affected in the first six months has however to be considered in conjunction with Table VI column 1.

18. That tailors are a class who not only are susceptible to beri-beri in 1922 but who contribute largely to the high death-rate among prisoners is discovered from a table of deaths and occupation.

TABLE VIII.

SHOWING THE PERCENTAGE WHICH DEATHS AMONG TAILORS FORM OF THE TOTAL
DEATHS IN FREETOWN GAOL DURING THE YEARS 1913-1922.

Years.	Total Deaths.	Deaths of Tailors.	Percentage.
1913-1922	213	72	33

It is remarkable that in only one year—1920—did the tailor deaths percentage of total deaths fall below twenty-one, that in that year there were no deaths among tailors, and that in the previous year 1919 the percentage was sixty-two.

19. In an endeavour to discover other factors which may predispose tailors to disease generally and beri-beri in particular we have considered carefully the conditions under which tailors work. As a result we have been unable to find that such factors as overcrowding, or insanitary surroundings have any influence and there is no distinction between tailors and any other class of prisoners as regard food, water supply and sleeping accommodation. The factor which appears to be all important is lack of exercise due to the sedentary nature of their occupation. It should be pointed out also that even the exercise of half-an-hour a day prescribed is liable in the rainy season to be curtailed or even omitted altogether during heavy rain.

20. If our belief in the great influence which deficiency disease exerts among the prisoners in Freetown gaol is correct, we should expect that even among those who have not become ill enough to report sick, we should find evidence of the disease in an early form. In order to ascertain if this is so we have subjected to examination 100 prisoners chosen at random.

The results are set out in Table IX.

TABLE IX.

Occupation.	Number Examined.	Cardiac Signs.	Edema.	Altered Knee Jerks.	Ataxia or Romberg's Sign.	Intestinal Parasites.		
						Ascaris.	Ascaris Ankylostomes.	Ankylostomes.
Cleaner ...	25	13	13	13	6	2	1	2
Tailor ...	28	5	11	9	2	1	2	2
Carpenter ...	9	1	4	3	2	—	—	—
Stone-breaking ...	6	2	2	3	2	1	1	3
Painter ...	1	—	—	1	—	—	—	—
Cook ...	5	—	1	1	—	—	—	—
Bathroom ...	17	2	8	10	2	3	1	2
Outdoor ...	4	—	—	3	1	1	—	—
Shoemaker ...	1	—	—	—	—	—	—	—
Not yet placed on labour ...	*4	1	4	2	—	—	—	—

*Men admitted from Protectorate prison.

We see from this that certain signs and symptoms associated with beri-beri are present in a large proportion of the men examined.

SUMMARY.

21. (1) The death-rate among prisoners in Freetown gaol has been high during the years 1913 to 1922 inclusive, with the exception of 1919 and 1920.
- (2) From 1914 to 1917 the death-rate was greatly augmented by deaths from intestinal disease, and in 1918 by the influenza epidemic. It is well known that intestinal diseases are frequently observed as a concomitant of beri-beri.
- (3) The majority of all fatal cases among prisoners are admitted to hospital during the rainy season; the majority of all cases of beri-beri in 1922 were also admitted to hospital during the rainy season; there appears to be some seasonal correlation between beri-beri admission and admission of fatal cases, considering that only one year of beri-beri is compared with ten years of fatal cases.
- (4) Beri-beri was responsible in 1913 and 1919-22 for a very appreciable proportion of the total deaths in the prison.
- (5) The occupation of tailor in the Freetown gaol predisposes definitely to fatal disease. Of the total deaths which occurred in prison during the period 1913 to 1922, namely 213, no less than 72, that is 33 per cent., occurred among prisoners engaged as tailors. The daily average strength of tailors during these years was approximately 15 per cent. of all the prisoners. In the case of beri-beri the predisposition of tailors is clearly shown for 1922, in which year the tailors, representing only 15 per cent. of the daily average strength of prisoners, yielded 57 per cent. of the total admissions (fifty-nine) for the disease.
- (6) The death-rate among convicts is higher than that among common gaol prisoners. We believe that an explanation of this fact is to be found mainly in one disease, beri-beri. This in Freetown gaol is a slowly developing disease of which the maximum effects may not be obvious during the early months of imprisonment.

RECOMMENDATIONS.

22. (1) We have already made recommendations with regard to diet. Effective steps have been taken in the endeavour to prevent overcooking of food, and improvements in the selection and treatment of rice and other articles of diet have been suggested. We are of opinion that a rice which has been properly husked, which retains its pericarp and germ and is free from grit and weevils is the type of rice which should be supplied to prisoners. Urgently as it is required, it is unlikely that a rice of the desired standard can be obtained immediately, and therefore we recommend the continued addition to the diet of fresh uncooked tomatoes, the substitution of liver and brain, whenever available, in the meat ration and the addition of unroasted ground-nuts and the rice polishings to the diet.
- (2) We consider that the conditions of work in so far as the occupation of tailor is concerned require drastic alteration, in the sense that no prisoner should be employed for more than half his working day in tailoring, and that the other half should be spent in some active outdoor occupation, such as stone-breaking.
- (3) While we are in agreement with the idea that the health of long-sentence prisoners would be likely to benefit if they were able to do outdoor work on the land, we do not feel justified in supporting a scheme for a convict prison in the Protectorate until further effort has been made to obtain a satisfactory standard of health in Freetown gaol. We think, however, that the establishment of a subsidiary prison near at hand to which prisoners could be sent in turn for short periods to work on the land as already suggested by one of us (M.P.541/1923) is worthy of consideration.

23. We desire to put on record our appreciation of the courteous and painstaking assistance which, often at the cost of great personal inconvenience, has been afforded us at every stage of our investigation by the Acting Superintendent of Prisons, G. E. Biddle, Esq., and in the later stages by the Superintendent of Prisons, R. White, Esq.

B. BLACKLOCK, M.D.,

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W. H. PEACOCK,

Acting Deputy Director, Sanitary Service.

JOHN Y. WOOD,

Medical Officer of Freetown Gaol.

5th June, 1923.

APPENDIX VI—REPORT ON ANKYLOSTOMIASIS, BERI-BERI, AMOEBIASIS,
FILARIASIS, LEPROSY AND BILHARZIASIS IN FREETOWN PRISON.

ANKYLOSTOMIASIS.

Introduction.—During the first seven months of the year with the assistance of Dr. Maplestone, Assistant Director of the Sir Alfred Jones Research Laboratory, an attempt was made to deal with ankylostome infection in Freetown prison.

Method.—A single specimen of faeces from each prisoner was examined and if negative in plain smear was mixed with saturated salt solution after the method described by Willis in the *Medical Journal of Australia*, 29th October, 1921.

The prisoners found infected were then treated by different methods and the stools examined for adult worms. At the end of a week the faeces were again examined for signs of infection. Those found negative were re-examined weekly until three examinations had proved negative. Those found positive were given a second course of treatment and the same method of examination followed. One prisoner still found positive was given a third course and his faeces examined in the same way. Unfortunately a large proportion of the prisoners (being short sentence men) were discharged before the full routine could be carried out, therefore the results are incomplete. All cases were under identical conditions, being admitted to the prison hospital during week-ends and kept in bed on low diet. No ill effects were observed during or after any course of treatment.

METHODS OF TREATMENT.

- A. Beta-naphthol grs. 40 (in powder) followed in 1 hour by Thymol grs. 30 and Mist. Alba 4oz. after 4 hours.
- B. Carbon tetrachloride m. 30 to 45 on bread.
- C. Ol. Eucalypti m. 30, Chloroform m. 40, Ol. Ricini 10 drs. divided into two doses with 1 hour interval.
- D. Ol. Chenopodii m. 30 in milk.

No oil of chenopodium was in stock and a very small quantity only was obtained privately from Dr. E. J. Wright.

<i>Results.</i> —Total number of prisoners examined	...	...	252
Total number of prisoners positive	...	...	166=65.9 per cent.
Total number of prisoners treated	...	...	71
<i>Treatment A.</i> —Number treated	...	...	15
Number negative after three weekly examinations	...	...	9=60 per cent.
Number positive	...	...	5
Number discharged before examinations completed	...	...	1
<i>Treatment B.</i> —Number treated	...	...	39
Number negative after three weekly examinations	...	...	15=38.4 per cent.
Number positive	...	...	22
Number discharged before examinations completed	...	...	2
<i>Treatment C.</i> —Number treated	...	...	13
Number negative after one weekly examination	...	...	1
Number negative after second weekly examination	...	...	Nil
Number positive	...	...	13
<i>Treatment D.</i> —Number treated	...	...	4
Number negative after three weekly examinations	...	...	1=25 per cent.
Number positive	...	...	3

SECOND COURSE OF TREATMENT.

<i>Treatment B.</i> —Number treated	...	...	25
Number negative after three weekly examinations	...	...	13=52 per cent.
Number positive	...	...	10
Number discharged before examination completed	...	...	2

THIRD COURSE OF TREATMENT.

<i>Treatment B.</i> —Number treated	...	...	...	1
Number negative after three weekly examinations	...	...	...	1
The least number of adult worms found in 24 hours after treatment	...	...	...	2
The largest number of adult worms found in 24 hours after treatment	...	...	...	341

CONCLUSIONS.

Beta-naphthol—Thymol is the most successful form of treatment, while Eucalyptus is a failure, in dealing with ankylostome infection in Freetown prison, but further work is necessary on account of the small numbers dealt with and the incompleteness of the records owing to discharges.

BERI-BERI.

It is now possible to give complete details of the 1922 outbreak which lasted well into 1923. The total number of cases was 63. Of these 18 relapsed after being apparently cured; several relapsed twice and even thrice.

Number of deaths	...	...	...	3
Number released on medical grounds	...	...	...	5
Average stay in hospital	...	...	...	9 weeks

CHIEF SYMPTOMS

<i>Cardiac</i> , change of rhythm in	...	...	...	32=50 per cent. -
Dilatation	...	...	...	30=47.6 per cent. -
Valvular changes	...	...	...	29=46 per cent. -
<i>Knee jerks.</i> —Absent	...	...	...	40=63.5 per cent. -
Diminished	...	...	...	9=14.2 per cent.
Exaggerated	...	...	...	8=12.7 per cent.
<i>Ataxia.</i> —Present	...	...	...	12=19 per cent.
<i>Ankle Clonus.</i> —Present	...	...	...	4=6.3 per cent.
<i>Spastic Paralysis of hand.</i> —Present	...	...	...	1
<i>Intention Tremor.</i> —Present	...	...	...	1
<i>Hyperaesthesia and deep tenderness.</i> —Present	...	...	...	14=22.2 per cent. -
<i>Romberg's sign.</i> —Present	...	...	...	16=25.4 per cent. -
<i>Edema.</i> —Present	...	...	...	47=74.6 per cent. -
<i>Albuminuria.</i> —Present	...	...	...	5=8 per cent.
<i>Anaemia.</i> —Present	...	...	...	8=12.7 per cent.
<i>Ankylostome Infection.</i> —Present	...	...	...	27=43 per cent.

TREATMENT.

Various combinations of tinct. ferr. perchlor. ferr. et amon. cit., tinct. digitalis, liq. strychninae, acid. phos. dil.

The most successful in the wet type of case was—

R:

Mist. diuretica 1 oz. (pot. acet., spt. juniper, tinct. hyosc., and scoparii).

Tinct. digital. m. 5 to m 10.

Tinct. Nux. vom. m 5.

Aq. ad. 2 ozs.

t. i. d.

Amyl nitrite—Inhalations were found of great benefit in tiding bad cases over thoracic crises.

Dry yeast, moistened and made into pills, was administered, dose from $\frac{1}{2}$ dr. twice daily.

Marmite, 1 dr. twice daily was used for one case with no marked beneficial results.

Diet.—Bread, 12 ozs.; agidi, 1 lb.; beef, $\frac{1}{2}$ lb.; sugar, 2 ozs.; rice, 3 ozs.; lard, $\frac{1}{2}$ oz.; salt, $\frac{1}{2}$ oz.; pepper, $\frac{1}{4}$ oz.

For a time $\frac{1}{2}$ lb. bread and $\frac{1}{4}$ lb. sweet potatoes were substituted for the rice without much benefit.

Extras.—Barley water, milk, beef-tea, sweet potatoes, ground-nuts, bananas, pawpaws, tomatoes and oranges.

In August, 1923, the four chronic cardiac and ataxic cases resulting from beri-beri were released, thus bringing the outbreak to an end.

AMOEBIASIS.

An attempt was similarly made to deal with prisoners infected with amoebic cysts (*Entamoeba histolytica*), i.e. those who were serving as carriers for potential amoebic dysentery. Owing to the discharge of short sentence men it was impossible to deal with all those found infected by Dr. Maplestone.

Method of Treatment.—One examination only of each was made. Those found positive were treated with

A. Tabella Emetine & Bismuth. Iod. administered thus: gr. $\frac{1}{2}$ daily for 2 days, gr. 1 daily for 4 days—total 6 grs. Those found positive in a single examination one week after treatment received a second similar course.

B. Emetine Hydrochloride administered hypodermically (in the case of weakly patients considered unfit for the more strenuous Bismuth Emetine Iodide) thus: gr. $\frac{1}{2}$ daily for 2 days, gr. 1 daily for 4 days—total 6 grs., followed where necessary by a second course of treatment.

<i>Results.</i> —Total number of prisoners examined	...	...	252
Total number of prisoners examined positive	...	...	32 = 12·7 per cent.
Total number of prisoners examined treated	...	...	16
<i>Treatment A.</i> —number treated	...	...	13
Number negative after one examination	...	...	10
Number positive	...	...	3
<i>Second Course.</i> —Number treated	...	...	3
Number negative after one examination	...	...	3
<i>Treatment B.</i> —Number treated	...	...	3
Number negative after one examination	...	...	2
Number positive	...	...	1
<i>Second course.</i> —Number treated	...	...	1
Number negative after one examination	...	...	1

These *E. histolytica* carriers must not be confused with cases of active amoebic dysentery, of which there were twenty-one diagnosed in the Colonial Hospital laboratory which were treated at various times, with thirteen relapses or recurrences.

FILARIASIS.

No attempt was made by me to deal with this, but the results found by Dr. Maplestone may be quoted.

Number of prisoners whose blood was examined	...	203
Number of prisoners whose blood contained <i>F. bancrofti</i> larvæ	...	29 = 14·3 per cent.
Number of prisoners whose blood contained <i>F. perstans</i> larvæ	...	7 = 3·4 per cent.

LEPROSY.

A more detailed account may now be given of the two cases of leprosy treated during the first six months than could be done in the quarterly reports.

Case A. Tribe—Temne—undergoing a life sentence—had been isolated on admission two years ago with a diagnosis of leprosy. He was considerably mutilated by the disease, and was unable to rise from the ground. He could barely crawl and had to be carried in the arms. Sensation was entirely lost, so much so that after two months' treatment, when a hypodermic needle was accidentally broken off in a vein, an incision was made, the vein picked up and the needle extracted without his being aware of anything having happened. His veins were at all times difficult to find, appearing and disappearing in different parts of his limbs.

<i>Treatment</i> —Ol. Chaulmoogræ ...	...	...	...	...	750
Chloroform ...	...	...	...	...	250
Acid Carbolici ...	...	...	...	...	10

Of a mixture in these proportions 5 m. gradually increased to a maximum dose of 20 m. was administered intravenously daily for six days in each week for five months. Injections were made into veins in arms, back of hands, legs, over arch of foot, etc., wherever one could be found. If no vein could be discovered the injection was given intramuscularly. In all he received 81 intravenous and 43 intramuscular injections. One intravenous and one intramuscular developed into abscesses. At the end of this course he was given Ol. Chaulmoogræ m. 30 on bread daily up to the present date.

Results—The first sign of improvement was noted after three months' treatment, when he was able to stand if supported. The following month he was able to walk a little with the assistance of a stick but still staggered and frequently fell. Progress continued steadily till the end of the five months when he was able to walk upright without support or aid, and to ascend or descend stairs. Sensation has now been fully regained and for some time he has been doing light manual labour.

Case B. Tribe—Mende—undergoing a sentence of two and a-half years hard labour and now on the point of discharge, was also diagnosed and isolated prior to my taking over the prison. He was shown to the local branch of the British Medical Association as a typical case of anæsthetic leprosy, large pale or pink edged areas of anæsthesia covering much of the body and limbs into which pins could be thrust almost one-fourth of an inch without the patient perceiving it.

Treatment.—The same mixture and dose but entirely intravenous, the majority of the injections being made into the same spot in the same vein day after day. After five months treatment of 124 injections, he was placed on treatment by mouth.

Results.—The majority of the patches have disappeared while sensation has returned in full.

BILHARZIASIS.

As mentioned in the quarterly reports for the first half of 1923, two prisoners were found to be suffering from urinary bilharziasis. Both were Mendes, one from Kennema, the other from Pendembu. They were treated with antimony tartrate intravenously, $\frac{1}{2}$ gr. dissolved in 10 c.c. normal saline gradually increased to a maximum dose of 2 grs. every alternate day, until a total of 25 grs. had been administered. Treatment in one of the cases had unfortunately to be suspended for three weeks, when only half the total had been administered, owing to the development of an abscess during my absence from the prison on other temporary duties, and was resumed later. Active eggs were still present in the urine on conclusion of his treatment. He was given a few weeks' rest and a full course was then again administered, with the result that his urine was still negative some months later, although repeatedly examined during that time. The other case was negative, and remained so, for some months after one full course of treatment. I am satisfied that both are cured.

JOHN Y. WOOD, W. A. M. S.,

Medical Officer-in-charge, Prison.

FREETOWN,

31st August, 1923.

APPENDIX VII—RAT-FLEAS IN FREETOWN, SIERRA LEONE

BY

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Hirst's (1923) work has attracted attention to the importance which must be attached to the relative proportion of various species of *Xenopsylla* on rats in places which appear liable to plague epidemics. He concluded from his observations that *X. astia* was a much less efficient transmitter of plague than is *X. cheopis*.

In Freetown a hundred rats sent by the Sanitary Department were examined during the months of January and February, 1923. The rats came from various parts of the town; the number were:—black rats—62, brown rats—38. All the fleas removed from the rats were collected, a total number of 657. Of these, 654 belonged to the genus *Xenopsylla* and three to the genus *Ctenocephalus*. The 654 *Xenopsylla* comprised 419 fleas of the species *X. brasiliensis*—Baker (1904), and 235 of *X. cheopis*—Rothschild (1903). The *Ctenocephalus* belonged to the species *C. canis*—Duges. In the table are shown the number and sex of the rats harbouring *Xenopsylla* and the species recovered from them.

Species.			Total.	Number infected.	<i>X. brasiliensis</i> .	<i>X. cheopis</i> .
Black rat M.	...	...	21	19	68	36
Black rat F.	...	...	41	30	74	75
Brown rat M.	...	...	17	15	185	87
Brown rat F.	...	...	21	19	92	37
Total	...	...	...	...	419	235

No *X. astia* were found on these rats; Evans (1922), however, records it among rat-fleas sent to her from the Gold Coast.

Xenopsylla brasiliensis Baker (1904), was originally described from Sierra Leone, but its capacity for transmitting plague bacilli has not so far been worked out. Whether it exhibits that relative inability which Hirst attributes to *X. astia* in Ceylon is unknown.

It is of interest to note that Newstead and Evans (1921), who examined 469 black rats from ships in Liverpool (59 of these rats being obtained from ships coming from various West African ports) do not record any *X. brasiliensis* from 469 rats examined, whereas they found 489 *X. cheopis*. Again Balfour (1922) did not report any *X. brasiliensis* on 34 black and 444 brown rats obtained mostly in London, whereas he reports *X. cheopis* on 5.9 per cent. of the black rats and 3.6 per cent. of the brown rats. Hirst (1923) states that *X. brasiliensis* is found on the rats of West Africa, South America, and the uplands of Peninsula India.

Cragg (1920) states that *X. brasiliensis* is not common in India and cites Poona, Mangalore, Bombay City, and Octacamond as the only places from which it had then been recovered by him.

Owing to the smallness of the numbers of West African ship rats examined here and in Liverpool it is not yet possible to say whether *X. brasiliensis* is capable of remaining alive during transport on ships to England.

Whether *X. brasiliensis* is a plague transmitting flea or not, it appears probable from our figures that there is a sufficiently large percentage of *X. cheopis* present on rats in Freetown to carry plague effectually in epidemic form should this disease be imported.

The number of rats in Freetown is large, and owing to the extensive area which is at present capable of providing natural shelter for them, it is evident that vast numbers would survive any ordinary efforts at reduction.

The city of Freetown possesses many quarters in which the native population is overcrowded, and it also contains a large floating population. All these factors are of importance in the case of plague epidemics. The chief protection of this port from the introduction of plague from other coastal regions in the past is probably the absence of a deep water wharf.

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APPENDIX VIII—REPORT ON ANKYLOSTOMIASIS AT MAKENI, NORTHERN PROVINCE.

My examination was confined to the 'A' Company of the West African Frontier Force and children of the court messengers.

The method adopted throughout my examination was as follows:—

Formed stools were used as they were more satisfactory than liquid ones resulting from a dose of salts. An emulsion of the faeces was made with water, and a thick film spread on a slide. This was allowed to dry for ten minutes and then the slide was immersed in a basin of water and gently rocked to and fro until the faecal matter was removed. The ankylostome ova, owing to their stickiness, adhere firmly to the slides and are easily detected.

As you will see, I have given the results of the examination of a few women. But in order to keep my results as accurate as possible, I had to discard specimens from them as I found that in many cases those sent in to me had been taken from the children. Consequently, I lay no importance on the figures I give for the women.

No attempt was made to examine the cases at different periods of the year to find out the seasonal variation, if any, of the disease. But by arranging those soldiers examined according to the date of arrival in Makeni, I have been able to come to some idea on this point.

The results then of my examination are as follows:—

Grand Total examined.	Number Positive.	Percentage Positive.
116	26	22·41

This may be further divided as follows:—

W.A.F.F. LINES.

Number examined.	Positive.	Percentage Positive.
104	23	22·1

Further sub-division of this gives the following detail:—

—	Number examined.	Positive.	Percentage Positive.
<i>Adults</i> (Males) ...	80	20	25·
" (Females) ...	12	2	16·6
<i>Children</i> (Males) ...	3	...	...
" (Females) ...	9	1	11·1

C. M. LINES.

—	Number examined.	Positive.	Percentage Positive.
(Males) ...	12	3	25·
<i>Children</i> (Males) ...	5	3	60·
" (Females) ...	7	...	...

I have attempted, as far as possible, to arrange the children according to their ages, and at the same time to compare the result of those from the W.A.F.F. lines with those from the C.M. lines.

It is as follows:—

Ages ...	0—3	3—5	5—8	8—15
<i>Children</i> (W.A.F.F.)	1
" (C.M.)	3

The comparison, therefore, shows that the number of children infected is greater in the C.M. lines than in the W.A.F.F. lines. I expected a greater number than this. For in the latter lines—

- (i) A stricter sanitary regime prevails.
- (ii) The flow of visitors or relations is not so frequent.
- (iii) The men and their families are stationary, i.e. are not so much on the move.

I next turned my attention to the W.A.F.F. lines and considered them as a huge native compound, the inmates of which live under the most favourable conditions in the district. I therefore took the men infected and arranged them according to their period of residence as soldiers in Makeni. From this I hoped to find out whether they had acquired the disease here, especially would this point to the new arrivals.

I found that none of the men in the company had been here longer than one year and ten months. However, the arrangement showed that—

15 of the infected had been in the district since February, 1922.				
1	"	"	"	August, 1922.
3	"	"	"	January, 1923.
1	"	"	"	August, 1923.

These figures would have been valuable if each man could have shown a history sheet where one could trace his previous illnesses, and tell at a glance whether he had been infected in another district before coming here.

Furthermore, if we consider the men to have been infected soon after arrival in this district, then would not the above give a clue to the seasonal variation of the disease? As it is, we can only surmise that the rate of infection is small in those who have been here within a year, and that during the months of January and February, when it is hot and dry, and there is much dust about, the disease is more prevalent than in August when it is wet and damp.

Now with regard to tribes, the following table is interesting but not convincing. For in a small colony like Sierra Leone, the peculiarities of the different tribes differ very little from each other; also in compound life everyone lives under the same conditions.

Tribe.				Number examined.	Number infected.	Percentage infected.
Mende	...	...	...	28	6	21.4
Kissi	...	...	...	19	4	21.06
Temne	...	...	...	16	4	25
Konno	...	...	...	13	2	15.38
Limba	...	...	...	9	1	11.1
Bandi (Liberia)	...	...	...	6	1	16.6
Koranko	...	...	...	4	1	25
Lokko	...	...	...	3	1	33.3
Sherbro	...	...	...	2	2	100
Yalunka	...	...	...	2	1	50
Susu	...	...	...	2	...	...

In conclusion I must record briefly two eye cases which I attribute to the action of these parasites. The first case is that of a frontier soldier who had a simple conjunctivitis which would not clear up under treatment. He repeatedly complained of something wriggling in his eye. Eventually, he was admitted into hospital for splenitis, and during the routine examination ankylostome ova were found in his stools. Under Thymol the conjunctivitis and splenitis were cured.

The second case is that of another frontier soldier who complained of considerable blurring of vision and profuse lachrymation. He was admitted into hospital, and ankylostomes were also discovered. Two weeks after being on Thymol, his sight began to improve and three months later he was able to take part in the competition for the King's African Cup. Throughout I have used Thymol for all cases and I have found it most efficacious.

- Observation.*—(i) With the exception of the two cases quoted above no symptoms were complained of.
- (ii) Children below 10 years were not found infected.
 - (iii) Cases of simple eye troubles which resist ordinary treatment may be due to ankylostomes.
 - (iv) The seasonal incidence appears to be the highest during the dry season, i.e. in the months of January and February.

E. A. RENNER,
Medical Officer.

MAKENI, NORTHERN PROVINCE,
31st December, 1923.

APPENDIX IX—REPORT ON ANKYLOSTOMIASIS AT BO AND PUJEHUN.

The figures in this report, though on the small side, are a good index of the ankylostome state of the whole of Southern and Central Provinces, being derived from observations on the two provincial gaols at Pujehun and Kennema containing inmates from all over the respective provinces, and also from Bo school, containing representatives of the whole of the Protectorate.

2. The observations deduced from these figures may therefore be taken to apply fairly adequately to the whole of the Southern and Central Provinces of this Protectorate.

3. *Mode of Investigation.*—None of the newer concentration methods were used. Samples of faeces were collected in cigarette tins. One slide was examined from each specimen, time did not permit of more. A thin emulsion in distilled water was made on the slide and covered with a cover slip three-quarters of an inch square.

4. *Pujehun.*—At Pujehun, owing to the delay in getting slides, and cover slips, nothing was done till April and work was stopped on my transfer to Bo in September.

All the prisoners (at the time averaging twenty-eight per diem) and patients admitted into hospital were examined.

One hundred examinations were made with the following results :—

Number containing ankylostome ova	...	...	...	45=45	per cent.
Ascaris	...	...	...	33=33	per cent.
Number containing ankylostome ova only	...	...	...	20=44.4	per cent. of the ankylostome cases.
Number containing no helminth ova	...	...	...	28=28	per cent.
Number of cases with symptoms that could be attributed to ankylostomes	...	...	...	3=3	per cent.
Number of cases with symptoms of other diseases	...	...	...	3=3	per cent.

Bo.—The investigations have been carried out at Kennema prison and the Bo school for sons of chiefs from 12th September up to date. There is no record of work done by my predecessor here. All the cases examined were males with the exception of one female prisoner at Kennema.

(i) *Kennema Prison.*—(Average fifty) : eighty-four prisoners examined with these findings.

Number containing ankylostome ova	...	...	...	40=47.6	per cent.
Number containing ascaris ova	...	...	...	21=25.0	per cent.
Number containing ankylostome ova alone	...	...	...	17=42.5	per cent. of the ankylostome cases.
Number containing no helminth ova	...	...	...	26=30.9	per cent.
Number of cases with symptoms that could be attributed to ankylostomes	...	...	...	...	...
Number of cases with symptoms of other diseases	...	...	...	...	...

(ii) *Bo School.*—The ages of the boys are from seven to eight to twenty approximately ; 152 examinations were made with the following results :—

Number containing ankylostome ova	...	...	...	68=44.7	per cent.
Number containing ascaris ova	...	...	...	73=48.02	per cent.
Number containing ankylostome ova alone	...	...	...	25=36.7	per cent. of the ankylostome cases.
Number containing no helminth ova	...	...	...	36=23.6	per cent.
Number of cases with symptoms that could be attributed to ankylostomes	...	...	...	2=1.3	per cent.
Number of cases with symptoms of other diseases	...	...	...	1=0.7	per cent.

6. In private I had one case of ankylostomes : a Syrian woman with marked anaemia.

7. The totals of these are:—Total number examined 337.

Total number containing ankylostomes	...	...	...	154=45.6	per cent.
Total number containing ascaris ova	...	...	...	127=37.6	per cent.
Total number containing ankylostome ova alone	...	...	...	62=18.3	per cent.
Total number with no helminths	...	...	...	90=26.6	per cent.
Total number of cases with symptoms that could be attributed to ankylostomes	...	...	...	6=1.7	per cent.
Total number of cases with symptoms of other diseases	...	...	...	4=1.18	per cent.

8. From these figures it can be deduced that in the Southern and Central Provinces 26·6 per cent. of the population is free of any helminthic intestinal infection. Of the 73·4 per cent. infected the largest total infection is with ankylostomes, but in children, i.e. in Bo school, the *Ascaris* infection is slightly the higher. At the same time it is interesting to note that though the differences are small the lowest percentage of ankylostome cases is at Bo school and the highest at Kennema prison where there are only adults. The Pujehun figure is intermediate and includes both prison and hospital cases, the latter containing a few children.

9. *The Effects of Ankylostome Infection.*—At the outset it is clear that though nearly half the population is infected with ankylostomes very few show symptoms of ankylostome disease. Ankylostome infection must be differentiated from ankylostomiasis.

10. At the prisons at Kennema and Pujehun no prisoner was excused hard labour for any condition that could have the slightest connection with ankylostomiasis.

11. There were in 337 cases only six with symptoms. One of these was a Bo schoolboy with anæmia who also had hæmaturia due to bilharzia infection. One was a young Syrian woman with anæmia suckling a very fat baby nine months old. Three of the cases seen *in extremis* died, an old man from myocardial degeneration and a small girl from marasmus and anæmia. The third was a small boy with symptoms of tetany (carpopedal spasms and trismus) and he developed a spasmodic affection of the bronchioles which resulted in death.

12. Four cases suffering from other diseases were found to have ankylostome ova. A case of pneumonia and another of pneumonia with empyema and operation were successfully treated and in no apparent way aggravated by the presence of ankylostomes. The other two were the boy with bilharzia referred to above and another with an unexplained inflammation of lymphatic glands in the right iliac fossa.

13. *The Effects of Ankylostome Infection on Schoolboys.*—At the Bo school I submitted a list of all the boys with ankylostome ova in their fæces to the masters and asked for information as to their scholastic and physical prowess. The following is the result:—

—				School Work.	Games and Athletics.
Very good	...	...	...	8	6
Good	...	...	...	30	14
Fairly good	...	...	...	12	10 8
Fair	...	...	...	11	22
Poor and weak	...	...	...	9	18

From this it seems that though in school work the ~~record~~ ^{record} is better than in games of these infected cases, yet on the whole the figures show no bad effects from this infection. It is to be noted that the proportion of ankylostomiasis among the smaller boys, too small to shine much at games in any case, is larger than with the older boys.

14. With regard to the information asked for under section five of Circular Director of Medical and Sanitary Services 12/1923, it was only possible to get a few particulars in the case of Bo school.

Of the sixty-eight cases thirty-seven were from the Central Province, twenty-three from the Northern, and eight from the Southern Province.

The following are the numbers in school according to their provinces—Central ninety-two, Northern fifty-six and Southern twenty.

They are fairly well distributed in the towns in three provinces, the largest numbers from particular towns, four each from Baiima and Panguma, three from Sendunsi, two each from Kulahun, Kaballa, Mereneh, Segbwema, Tunkia. In these cases it is usually a case of two brothers being similarly infected.

15. There is no record of last year's (1922) report here so that I can make no comparison with the findings then.

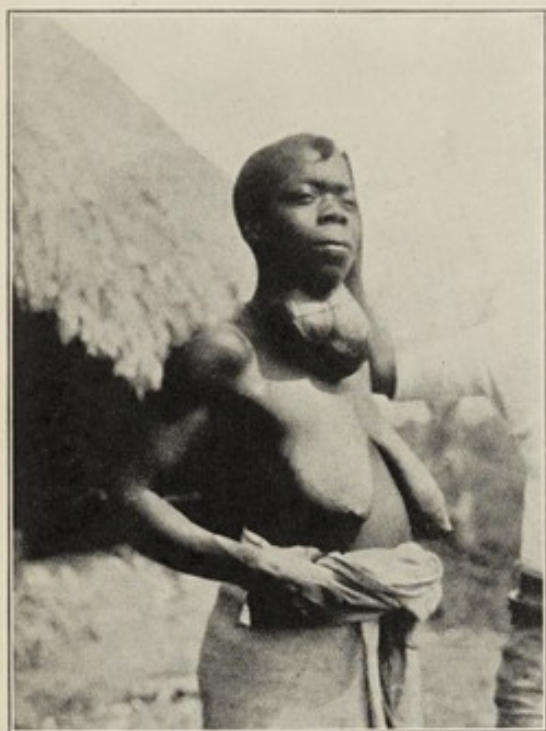
M. C. F. EASMON.

Medical Officer.

Bo,

12th December, 1923.

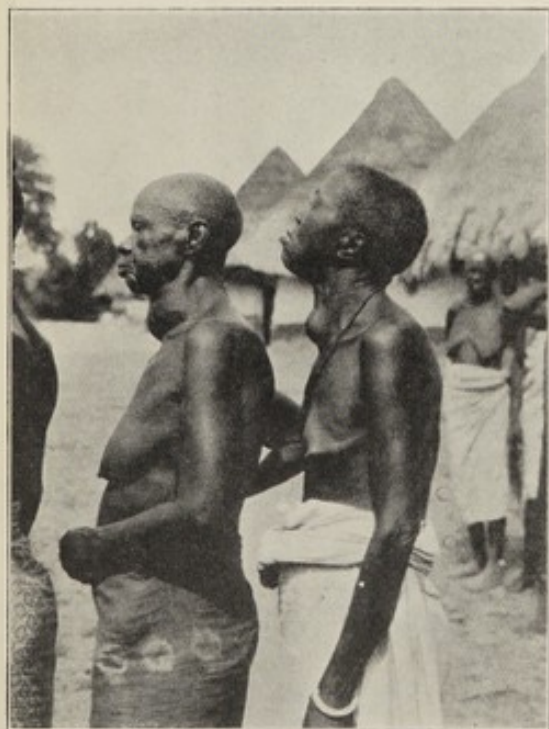




GOITRE. Kaiyima.



GOITRE. Kaiyima.



GOITRE. Jiana (Nimmi Yemma).



GOITRE. Kaiyima.

APPENDIX X—REPORT ON AN INVESTIGATION INTO THE PREVALENCE OF GOITRE IN THE PROTECTORATE OF SIERRA LEONE.

BY D. B. BLACKLOCK, M.D., DIRECTOR, SIR ALFRED LEWIS JONES
RESEARCH LABORATORY.

INTRODUCTION.

This investigation into the prevalence of goitre in certain districts in the Protectorate of Sierra Leone was undertaken during the months of December, 1923 and January and February, 1924. The districts traversed were the mountainous Konno and Koinadugu districts, but parts of certain tribal areas outside the limits of those districts, e.g. part of the Mende country, part of the Limba country and part of the Temne country, also came under review.

PAST AND PRESENT THEORIES ABOUT GOITRE.—Before entering on a detailed statement of the conditions found in Sierra Leone, it is convenient to analyse first the various theories and suggestions which have been advanced as to the causation of goitre, and then later to show in what respects the facts in Sierra Leone conform to such theories. The influence of heredity, sepsis, and other factors will be mentioned later.

GEOGRAPHICAL THEORY.—Formerly endemic goitre was considered to be mainly a geographical and geological disease; it was held that it occurred only in countries situated far from the sea at a high altitude, and in certain geological formations. The influence of meteorological conditions was considered important and of such rainfall, damp, and absence of sunshine in valley situations were most frequently emphasized.

DEFICIENCY AND EXCESS THEORIES.—Arising in part out of the geographical theory, and connected with it, are certain theories which have been current for many years and which attribute the enlargement of the thyroid gland to the absence from or excess in food or water of certain constituents which are essential to the normal functioning of the thyroid gland. In Gippsland, Australia, insufficiency of lime in the food and water has been considered to be the chief factor in producing mild goitrous symptoms; the success of treatment there by the administration of Calcium salts seemed to bear out the correctness of this theory. On the other hand in Derbyshire and in Switzerland thyroid enlargement and enlargement of the parathyroids have been attributed to excess of Calcium salts.

In the year 1896 Baumann of Freiburg discovered in the normal thyroid gland an iodine containing substance to which he gave the name Thyro-iodin. This finding had a definite bearing on a theory then already held by some in Switzerland that it was a deficiency of iodine which was the cause of thyroid hypertrophy. It was now proved that the thyroid gland of goitrous persons differed in chemical constitution from that of normal persons by being deficient in iodine. This discovery appeared to confirm the idea that the thyroid gland of goitrous persons is deficient in iodine, because of a natural deficiency of iodine in the food and water ingested.

THE INFECTIVE THEORY.—For a period the idea that goitre arose as the result of infection by micro-organisms gained ground. McCarrison (1913 to 1914) stated "I have adduced evidence to show that the causal agent of the disease (endemic goitre) is a micro-organism which having its habitat in the soil of endemic localities gains access to the bodies of men and animals by means of water, soil contaminated food, soil contaminated hands or other means, and living in the alimentary tract of the infected individual gives rise to those toxic products which, on absorption into the blood stream, stimulate the thyroid mechanism to increased activity. In a certain portion of all cases this increased activity results in the development of visible goitres, and is the starting point of those many degenerative processes which ultimately involve the hypertrophied organ." The idea of a living organism being *directly* responsible for the enlargement by infection of the thyroid itself or by general infection of the blood, was negated by certain experiments conducted by the same author; he proved by cultural methods that foetal goitre in goats did not yield living micro-organisms. From this date onwards the micro-organismal nature of the disease has been studied carefully; the less recent developments of the micro-organism theory were rather in the direction of showing that the organism exists not in soil but in faeces of goitrous men and animals, and is capable of producing goitre in healthy animals which are fed on such faeces or on cultures prepared from such faeces. The suggestion here, as before, is that the organism, having reached the alimentary tract of the healthy animal or man, proceeds to grow there and produce its toxins which are absorbed, and then cause the stimulatory effect on the thyroid gland. More recent developments of the theory suggest, however, that the organism exists, not only in goitrous faeces, but also in non-goitrous faeces. Further, that it not only exists in the non-goitrous faeces of man, but also in that of goats, rats, pigeons and other animals

Most important of all, this theory has been linked up with the Iodine-deficiency Theory by making the organismal infection responsible, by means at present not quite understood, for producing the deficiency of iodine.

We have thus in goitre to-day two schools of experimental research which are predominant. The one is developed from the old empirical observation of the endemic incidence: this has become the Iodine-deficiency Theory of the present day, largely as the result of the work of Baumann; its operation is seen in the preventive and curative work which is being achieved in the Swiss endemic areas, in America, and elsewhere. The other is the organismal theory, but now so modified that while its supporters admit that deficiency of iodine in the human system is the proximate cause of goitre, they claim that the existence of such deficiency is dependent on and primarily due to the faecal organism or organisms which have been proved to have the effect of producing goitre when administered by the mouth in culture or otherwise. According to the Iodine-deficiency Theory there is a natural lack of iodine in the food and water of certain places; according to the Micro-organism Theory the lack of iodine is not a deficiency natural to the food and water, but is an artificial one produced by the active intervention of faecal organisms which have been ingested. The mechanism of production of iodine deficiency in the human system has recently been the subject of further research and the suggestive observation has been made that certain fats and oils when taken in excess prevent the system from absorbing sufficient iodine for its needs from a diet which contains iodine in an adequate amount. Certain oils on the other hand, such as cod liver oil, which contain an appreciable amount of iodine, while they may exercise a detrimental effect, *qua* oil, on the absorption of iodine are yet—because of their own iodine content,—not only incapable of producing goitre, but are even capable of preventing the development of goitre in animals fed on faecally contaminated food, a diet which would certainly produce goitre in the absence of some such vehicle of iodine.

THE SCOPE OF THE PRESENT INVESTIGATION.—With the object of ascertaining, if possible, whether a natural deficiency of iodine in the water of certain areas would account for the known incidence of goitre in the endemic districts, it was decided that, as part of the investigation, a direct test should be applied. This test consisted in taking a river which passes through a portion of the endemic area and tracing it up to its source in the mountains; by this direct method it was hoped to obtain valuable information on the much debated question of iodine deficiency. It appears reasonable to suppose that if goitre occurs on a river some distance from its source, and if this goitre is due to a natural deficiency of the river water in iodine, then on tracing the river to its ultimate origin in mountain springs we shall find greater or at least as great numbers of persons affected with goitre at the higher levels. A river with many villages on its course is evidently the best calculated to provide the information; for this purpose the river Bagwe seemed well adapted, because not only does it traverse a large portion of the endemic area, but also there are many villages situated on it, and last of all its sources, which lie within the territory of Sierra Leone, are accessible. The results of the examination of the villages at the Bagwe source will be set out in detail in their proper sequence; it will be shown that the results obtained have importance relative to the Iodine-deficiency Problem.

THE ROUTE.—Leaving the railway at Hanga a northerly direction was taken to Panguma; thence to Jiana (Nimmi Yemma), Kaiyima and Kruto; from there to the villages lying at the base of the Loma Mountains to Kurubunro; thence to Nerekoro and the Bagwe-Niger water-shed; and back to Bumbunkorro; from there north-west to Dankiwali and Kaballa, and back to the railway at Kamabai, *via* Lengikorro, Kafogo and Kaninky (*vide* Map).*

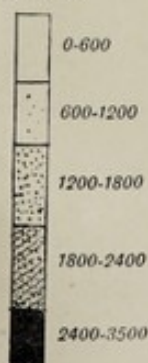
EXAMINATION OF VILLAGES.—All accessible villages were visited and examined as to the occurrence of goitre; the water supply was studied; and as far as possible the source of the water was traced; notes were made of the situation and nature of the water supplies of each village and, particularly, of any factors which might have an influence in determining the occurrence of goitre, such as altitude, geological formation, contamination of the catchment area of streams, or the sources of springs, and local pollution at points where water for domestic purposes was taken. In the course of the period thirty-seven villages were tabulated according to their condition as regards these factors.

INSPECTION OF POPULATION.—The total number of people who underwent examination for goitre was 2,508 of whom 1,547 were males and 961 females. Persons with enlarged thyroid were found in twenty-three villages to the number of 426, of whom 176 were males and 250 females. Not all of these cases, however, had acquired their goitre in the village where they were examined; in certain cases a definite history was obtained which proved that the condition had been acquired elsewhere. A fact which appears to require emphasis here is that Protectorate village children often travel in early youth from the village in which they are born and in which they subsequently reside. It is a not uncommon custom for mothers to take their young children back to their own villages on a visit at a period soon after the child's birth. In such cases it is not always possible to state with certainty that these children were not exposed to goitre-producing causes at their mothers' villages. As far

*Modified from Michell's Geography of Sierra Leone.



Height in feet



ROUTE

Hanga (H)
Lago (L)
Panguma
Dodo
Jockibu (J)
Bambawuru (B)
Punduru (P)
Jiama (J)
Bendu (B)
Bagwema (B)
Maiima (M)
Kaiyima (K)

Saywaia (S)
Kruto
Bandakarafaia (B)
Kimadugu (K)
Bumbumkorro (B)
Kurubunro (K)
Bendugu (B)
Kilborddu (K)
Nerekoro
Jamessudugu
(Return to Bumbumkorro)
Sokurella (S)

Sbirfe (S)
Mamuria
Dankiwalli (D)
Benikorro (B)
Kaballa
Lengikorro
Kafogo (K)
Kalinky (K)
Kamabai
Cumban
Makump



as possible all persons with such doubtful histories were excluded from the figures of the particular village in which they were discovered. This correction reduced the totals for classification as follows:—Of thirty-seven villages examined twenty-two had cases of goitre present in a population of 2,465; among 1,532 males there were 161 with goitre and among 933 females 222. In Table I are set out the names of the villages examined, the tribes to which the people belong, the corrected total number of people examined, the males and females, and the number of each sex affected. The names of those villages in which people were found affected with goitre are printed in dark type.

TABLE I.
Showing number of males and females with goitre in the population of the villages examined.

No.	Name of Village.	Tribe.	Number of persons examined.	Males.	Males with goitre.	Females.	Females with goitre.
1	Panguma ...	Mende	136	100	...	36	...
2	Dodo ...	"	13	13	...	...	...
3	Jokibu ...	"	19	19	...	...	...
4	Bambawuru ...	"	11	11	...	...	...
5	Jiama (N.Y.) ...	Konno	265	191	18	74	17
6	Paya ...	"	21	11	...	10	4
7	Bendu ...	"	15	15	...	...	...
8	Bagwema ...	"	14	14	...	...	...
9	Maiima ...	"	8	8	...	...	...
10	Kaiyima ...	"	148	75	31	73	53
11	Yaiya ...	"	63	44	...	19	6
12	Saywaia ...	Koranko	28	16	5	12	9
13	Kruto ...	"	102	65	13	37	7
14	Bandakarafaia ...	"	37	37	9	...	...
15	Kimadugu ...	"	65	48	13	17	5
16	Bumbumkorro ...	"	77	46	11	31	15
17	Kurubunro ...	"	59	53	10	6	5
18	Tagbadugu ...	"	35	20	...	15	...
19	Bendugu ...	"	70	39	7	31	7
20	Kilbordu ...	"	50	32	...	18	...
21	Nerekoro ...	"	45	27	...	18	...
22	Jamassadugu ...	"	12	7	...	5	...
23	Sokurella ...	"	71	40	5	31	13
24	Sbirfe ...	"	68	33	6	35	14
25	Mamuria ...	"	45	25	2	20	5
26	Dankiwalli ...	"	124	73	9	51	22
27	Benikorro ...	"	80	37	7	43	16
28	Kaballa ...	"	198	109	11	89	18
29	Lengikorro ...	Limba	84	34	...	50	4
30	Kafogo ...	"	104	65	1	39	2
31	Kalinky ...	"	60	32	1	28	...
32	Kamabai ...	"	89	54	1	35	...
33	Bumban ...	"	102	63	...	39	...
34	Kadakhana ...	"	38	22	1	16	...
35	Bundoo ...	"	42	21	...	21	...
36	Makump ...	Temne	43	25	...	18	...
37	Mabourka ...	"	24	8	...	16	...
			2,465	1,532	161	933	222

RELATIVE INCIDENCE IN MALES AND FEMALES.—It is seen that of 1,532 males examined 161 or over 10 per cent. had goitre while of 933 females examined 222 that is over 23 per cent. had goitre. The difference in the totals of males and females coming to be examined was accounted for in various ways by the chiefs. Fear of the white man, fear of vaccination, fear of being operated on for goitre, occupation, and similar reasons were given. The fact that smaller numbers of women presented themselves for examination would not, however, produce any increase in the percentage of females who proved to have goitre, unless it is assumed that those females who had goitre remained for examination in greater proportion than those who had no goitre. As a matter of fact it is probable that the reverse was the case and that proportionately more females with goitre stayed away than those without goitre. On several occasions it was stated by the chief that women whom he knew with goitre had stayed away for fear of operation; this was verified in some villages where such women with goitre were produced late in the day after being reassured by their companions on this subject. It appears therefore that we may accept the large relative preponderance of females affected with goitre in the villages visited as a fact.

The findings in Sierra Leone as regards the sex incidence of goitre correspond with those in other localities where goitre has been studied. In a place where goitre exists in endemic form it more commonly affects females than males. Many reasons for such a relatively large incidence in females have been suggested; the most commonly given being physiological ones which associate increased susceptibility of the female thyroid to hypertrophy, with the temporary enlargements of the gland which accompany normal functions in the female, e.g. menstruation. That is to say, that given an equal adult population of males and females of the same age equally exposed to these influences which produce pathological enlargement of the thyroid gland, the females will be more affected because their thyroid mechanism is naturally more easily disturbed than is the case with males. There is some evidence that even in animals which are living in districts where goitre is endemic there is a tendency among the females to greater thyroid morbidity. McCarrison (1914-15) noted that in the goitrous district of Sanawar thyroid hyperplasia occurred more frequently in female than in male wild rats.

AGE INCIDENCE.

Approximate figures only can be given as the natives have but limited means at their disposal for ascertaining the age of an individual. The incidence of goitre in age groups as determined by the information supplied by the natives and by observation is given in Table II for the total affected and for the 161 males and 222 females who had goitre.

TABLE II.

Showing the age incidence among cases of goitre.

Age Period.	Total.	Males.	Females.
1-10	80	42	38
11-20	83	28	55
21-30	90	34	56
31-40	77	32	45
41-50	39	18	21
51-60	14	7	7
Total ...	383	161	222

It is seen from Table II that whereas up to ten years of age the figures show a fairly equal incidence of thyroid enlargement, the 11-20 period marks a definite increase of the numbers of females affected and the age periods 21-30 and 31-40 maintain this definitely higher incidence of the disease in females. In order to avoid fallacy, it is necessary that the total number of each sex examined at each age period should be equal if conclusions are to be drawn about the relative incidence of any disease in the sexes at the different age periods. In practice it is not always possible to obtain such equal numbers in any one village; approximately equal numbers can, however, sometimes be examined as, for instance, at Dankiwalli of which the results for the age periods 1-50 are given below in Table III.

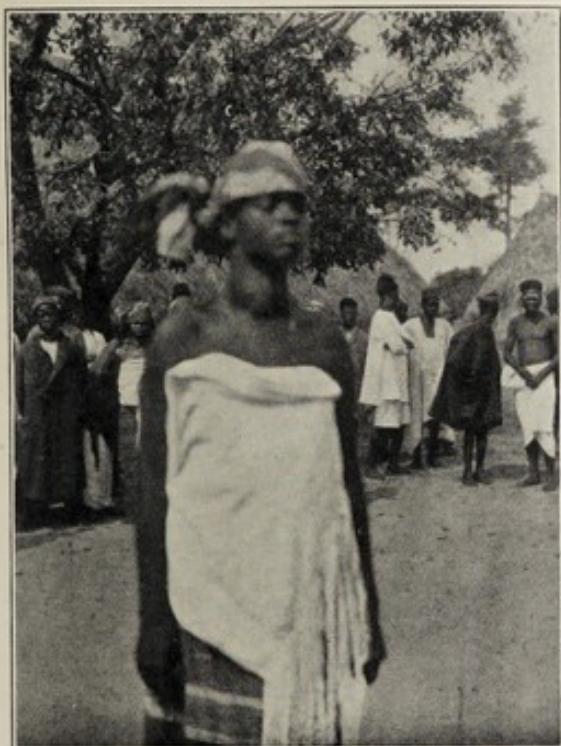
TABLE III.

Giving total males and females examined and total goitres at each age period, at the village of Dankiwalli.

Age Period.	Males examined.	Males with Goitre.	Females examined.	Females with Goitre.
1-10	19	3	22	4
11-20	9	1	9	7
21-30	14	1	8	6
31-40	9	...	8	4
41-50	11	2	4	1

From the table it is seen that the age periods from 11-40 show a great increase in the number of goitres present in females when compared with males of these periods, which is in agreement with the conclusion obtained from the total figures.

TRIBAL INCIDENCE.—From this point of view some interesting observations were made which are set out in Table IV.



NATIVE TREATMENT OF GOITRE, KAIYIMA.
Small incisions in the skin over the
swelling.



GROUP OF YOUNG WOMEN ALL WIVES OF ONE CHIEF.
There were 7 of his wives affected with goitre, but
2 are out of the picture. Kaiyima.



TABLE IV.

Showing the total numbers of each tribe examined and the number of goitres found.

Name of Tribe.	Total examined.	Males examined.	Males with Goitre.	Females examined.	Females with Goitre.	Percentage with Goitre.	
						Males.	Females.
Mende ...	179	143	...	36	...	...	...
Konno ...	534	358	49	176	80	13.7	45.4
Koranko ...	1,166	707	108	459	136	15.2	25.2
Limba ...	519	291	4	228	6	1.3	2.6
Temne ...	67	33	...	34	...	...	...
Total ...	2,465	1,532	161	933	222	...	...

The fact which first impresses itself from the study of this table is that of all the tribes whose members were examined the Konnos had the highest percentage of goitre, the Korankos next, while the Limbas provided a markedly lower figure; the numbers of the Mendes and Temnes examined are relatively small, so although even so the results are somewhat suggestive, we shall omit them from consideration for the time being. It may be said that whatever are the causes which give rise to goitre in Sierra Leone they are operative in the Konno and Koranko villages to a greater extent than they are among the Limba villages. It will be seen also that in each tribe affected by goitre women are affected to a greater extent than men. So far then we have the following facts:—

- (1) Goitre is endemic in Sierra Leone among the Konno and Koranko tribes.
- (2) Women of these tribes are more affected by goitre than are men.
- (3) The excess of women over men affected with goitre is evident chiefly at the age periods from 11 to 40.

A CONSIDERATION OF THE FACTS FOUND IN RELATION TO THE THEORIES OF GOITRE MENTIONED.

GEOGRAPHICAL SITUATION AS A FACTOR.—Although the former belief in the causative influence of distance from the sea, altitude, and so on has lately undergone considerable modification, the statement of certain authorities that "it does not appear to be associated with any geographical or geological condition" seems to be rather too sweeping. Certainly, in so far as the Konno and Koranko districts are concerned, the disease is definitely associated with geographical conditions, inasmuch as these tribes occupy a country at once remote from the sea and of a mountainous character; these factors are common to many endemic areas.

GEOLOGICAL FORMATION AS A FACTOR.—Nothing suggestive of the effects of geological formation was discovered; it is recognized, however, that more specific information on this subject is required before excluding the possibility of such effects. It may be mentioned that the geological evidence which is available on the point (Dixey 1919) indicates that at one period the sea reached the foot of the Koinadugu plateau.

DIET AS A FACTOR.—Although the tribes vary somewhat in their consumption of indigenous foods, no definite association could be established between the occurrence of goitre and the consumption of any article of diet.

OCCUPATION AS A FACTOR.—No evidence was obtained that the common occupations of those tribes which had the largest incidence of goitre had any causal influence. It may be noted here that there is a fact of some possible importance in this as in other diseases affecting these peoples. It is that, taken as a whole, in all the tribes studied, the females of the tribe are much more intimately in contact with water than are the males. Certain occupation of women, i.e. washing clothes and bathing their children and carrying water, necessitate much prolonged contact with water.

SEPTIC CONDITIONS AS A FACTOR.—It is stated that thyroid enlargement may result from a septic focus in the body; it is not suggested that all septic sores, and toxic conditions and septicaemias have this effect. Curiously enough such effect is stated to be produced usually by a septic focus situated in the tonsils, nasal sinuses, or teeth. No evidence was found of such causal relationship during the investigation. At Kaiyima the personal and family history of twenty-eight cases of goitre was taken in some detail and at the same time an examination was made and any physical abnormality noted. A septic condition of the mouth was found in eight cases; the degree of the septic condition and its frequency were not greater than that found in non-goitrous persons. While it is possible that in some cases the septic condition may have had a causative influence, it was not possible to find cases in which the influence of this cause could be estimated.

HEREDITY AS A FACTOR.—In most of the villages where goitre was found to be endemic examples were seen which suggested transmission from parent to child. Sometimes the villagers themselves asserted that a goitrous parent could not fail to have goitrous children. The family history of twenty-eight persons not closely related affected with pronounced goitre was taken, in the attempt to ascertain what influence the hereditary factor might exert; the results are given in Table V.

TABLE V.

Showing the incidence of goitre in relatives of twenty-eight goitrous persons.

Relatives.	Total Number.	Number affected.	Remarks.
Parents	56	8	{ Both parents in two cases Father only in one case Mother only in three cases
Brothers	34	6	
Sisters	39	3	

It appears from the table that heredity may play a part in the production of goitre here, but its importance does not seem great.

CONGENITAL GOITRE was only once observed in spite of the frequent statement of goitrous persons that they were "born with it."

MYXÆDEMA was not observed.

CRETINISM.—Occasional cretins were found, but they were by no means so numerous as might have been expected from the high adult figures in some villages. The reasons of this are obscure, but it is possible that abnormal children among these tribes do not receive that care which would ensure their survival.

EXOPHTHALMIC GOITRE.—While many persons presented a certain degree of exophthalmos and some of those also had thyroid enlargement, in only two cases—males aged twenty-five years—was the complex of symptoms found of exophthalmos, enlarged thyroid, tremor and tachycardia.

NATURAL DEFICIENCY OR EXCESS OF IODINE OR OTHER SUBSTANCES IN WATER AS A FACTOR.—Reference has been made to the intention of examining particularly the villages near the source of the Bagwe river. The villages which are the nearest to the Bagwe-Niger water-shed proceeding up stream are Tagbadugu, Bendugu, Kilbordu, Nerekoro, and Jamassadugu. At lower levels on the river goitre was found to be prevalent; at Tagbadugu no goitre was found among twenty males and fifteen females; at Bendugu seven cases were found among thirty-nine males, and seven cases among thirty-one females; at Kilbordu no cases were found among thirty-two males and eighteen females; at Nerekoro no cases of goitre were found among twenty-seven males and eighteen females; at Jamassadugu no cases were found among seven males and five females. The figures are set out in Table VI.

TABLE VI.

Showing the goitre incidence and the habits of the villagers with reference to the Bagwe water.

Village.	Total Males.	With Goitre.	Total Females.	With Goitre.	Drinking Water Supply.
Tagbadugu ...	20	...	15	...	Stream from springs; enters Bagwe.
Bendugu ...	39	7	31	7	Stream and Bagwe.
Kilbordu ...	32	...	18	...	Spring, not Bagwe.
Nerekoro ...	27	...	18	...	Two springs. Bagwe used for washing and bathing.
Jamassadugu ...	7	...	5	...	Bagwe.

It is seen that if a deficiency of iodine or indeed any substance in the water is the cause of goitre, such deficiency was found to exist at Bendugu where the Bagwe water is used as well as a spring; it was not found to exist higher up at Kilbordu where a spring but not the Bagwe was used; it was not found at Nerekoro where two springs were used for drinking water and where the Bagwe was used for bathing and washing only; it was not found to exist at Jamassadugu where the Bagwe was used for all purposes—drinking, washing and bathing. It is difficult to explain these facts on a natural deficiency theory, unless we assume that a water which

does not present deficiency at its origin, suddenly develops deficiency some distance down. It would be possible doubtless for such a phenomenon to occur, but it would be more than remarkable if, having just developed the deficiency, it suddenly fails to show evidence of it when we come to Tagbadugu; here a stream from a spring and the Bagwe itself into which this stream enters are both used for drinking. It does not seem probable that any *natural* deficiency of iodine or any substance in the water will account for the condition found in these villages; the same may be said of any *natural* excess of such substances in the water.

VILLAGE OF NEREKORO.—Particular attention may be drawn to the village of Nerekoro, because it presents features which are in all probability almost unique. It is a village which, while situated in a hilly country, occupies a position not on the side of a hill, nor in a valley among the hills, but actually on the top of a very rocky eminence. Its position was chosen in the time of tribal warfare as one of great security. Although situated on the top of an eminence it is concealed by the presence of huge granite boulders which stand out prominently and are of such size that the ordinary native huts are dwarfed beside them and are effectually hidden among them. This village is said to have occupied its present position since the time of the great-grandfather of the ruling chief. Two cotton trees of enormous dimensions mark the burial place of his great-grandfather and were planted at the time of his burial. No evidence could be obtained from the chief that there had ever been any history of goitre in this village; this corresponded with the facts observed on the present population. Now, if goitre were due to any deficiency of or excess of substances in the waters which form the source of the Bagwe, we should expect the incidence of goitre at Nerekoro to be exceptionally high. It may be argued that although the springs which drain into the Bagwe at this level are not deficient in substances which prevent goitre, the Bagwe itself here may present deficiency. This appears not to be the case because at a higher level still, at the villages of Jamassadugu, whose inhabitants use the Bagwe solely, not only for drinking but also bathing and washing, no cases of goitre were found.

It appears then improbable that the presence of endemic goitre in the region through which the Bagwe river passes can be accounted for by any *natural* deficiency or excess either of iodine or any other substances in the water of that river.

ARTIFICIAL DEFICIENCY OR EXCESS OF SUBSTANCES IN WATER AS FACTORS.—It has been shown that the prevalence of goitre in the Bagwe area cannot be explained on the natural Iodine-deficiency Theory in so far as the water is concerned. On the other hand the facts which were discovered in the investigation would accord well with a theory of the causation of goitre which would make the iodine deficiency an artificial one, produced either by the ingestion of faecal organisms or their products; these after ingestion acting in such a case as neutralizers of iodine or as inhibitors of iodine absorption. The ingestion of water which had been exposed to faecal contamination and had had its iodine removed or fixed in such a manner that the substance was no longer available for absorption into the system after ingestion of the water, would produce similar results. That such is the explanation of the mechanism by which the iodine deficiency is produced is supported by the facts given below.

The inhabitants of the Konno country have certain habits which tend to produce an unusual amount of pollution of water by faecal organisms; it is the invariable custom for people of both sexes to perform their natural functions in water. So definitely is this custom established that a special portion of whatever stream is available for a village is set aside for the purpose; so that for each village there is a latrine place for men and a latrine place for women, each of which consists of a special area of the available water supply. In the opinion of the chiefs consulted on this question there have never been any dry land latrines used by this tribe in their own country except in time of war when, as an emergency measure, resort might be had temporarily to such a form of latrine. This method of disposal of sewage is not ideal for the village concerned, even provided that the following conditions are present:—

- (1) A well flowing stream.
- (2) A location of both men's and women's latrines at a site down stream from the place where washing and bathing are done and the drinking water taken.
- (3) The absence of any village above them on the stream occupied by people who have similar habits.

But in fact usually not all and very frequently none of these conditions are present. The only stream or streams available may be sluggish near the village, the latrine places may be situated above the drinking water place, and there may be at a short distance above a village or collection of farms whose inhabitants naturally make use of the water as a latrine. Thus the drinking water supply is in some villages very heavily polluted by excreta, while in other villages more favourably situated on large and well running streams it is much less so at the drinking water place; in proportion as the river is rapid in its flow, however, the sewage from the village above is more likely to reach them before purification by sedimentation, agitation and other means has had time to occur.

THE CONDITION OF THE DRINKING WATER SUPPLY AT A VILLAGE HEAVILY AFFECTED BY GOITRE.—The village in which goitre was found to be most prevalent was Kaiyima, an important fair-sized village where the Paramount Chief resides. Here of seventy-five males examined thirty-one, that is 41·3 per cent., had goitre, while of seventy-three females fifty-three, that is 72·6 per cent., had goitre. If then the villagers of Kaiyima acquired their goitre by reason of drinking faecally-contaminated water, we should expect to find collateral evidence of this on examining the condition of their intestine as regards infection with parasites which are normally conveyed from infected to healthy by means of ingestion of faecally-contaminated material. Such evidence was obtained; it was found that of 144 persons examined eighty-six had ova of *Ascaris lumbricoides* in their faeces and 102 had cysts of *Entamoeba coli*; the figures indicate a serious amount of infection *via* the mouth. These two parasitic species were chosen as they seemed to afford a better indication of the particular kind of contamination which is to be correlated with the incidence of goitre than do the ancylostomes, strongyloides and bilharzia; these last three are capable of gaining their site in the intestine *via* the skin. The amount of infection with recognizable intestinal parasites in general was notably higher at Kaiyima than at any other place examined.

Before going on to the consideration of the water supply at Kaiyima some native beliefs deserve mention.

SOME SIERRA LEONE NATIVE IDEAS OF THE EPIDEMIOLOGY OF GOITRE.—In passing through the Mende country inquiries as to the presence of goitre were invariably received with amusement; it was at once pointed out that that disease was a Konno disease not a Mende disease. At Jiamia (Nimmi Yemma) while it was admitted that goitrous people undoubtedly lived there it was stated that they had acquired the disease at Kaiyima. The Jiamia story relating to its occurrence at Kaiyima was very circumstantial and was as follows:—In the old days certain intelligent men observed that the water of a certain stream at Kaiyima produced "big necks" in those who drank it. The intelligent men utilized this knowledge for the purpose of revenge, giving the water to their enemies to drink so that they developed big necks. After a time, however, other people got to know about this property of the water and as a result some of the intelligent men themselves developed big necks. When this stage was reached it was clearly time to take action, so the stream was put out of bounds very strictly. Even to-day, however, women who are jealous are in the habit of giving their rivals the water from this stream in palm wine and their victims get big necks; so short a period as a week's drinking of the water will produce goitre. This account of a water with goitrous properties at Kaiyima is accepted as correct by some of the villagers of Kaiyima itself, but others say that while it is true that the stream was long ago condemned for drinking purposes this was done solely because the stream had become so greatly polluted from use as a latrine that its water was not considered safe. In these two accounts it appears probable that there is more than merely an interesting coincidence.

It is believed by the majority of natives that:—

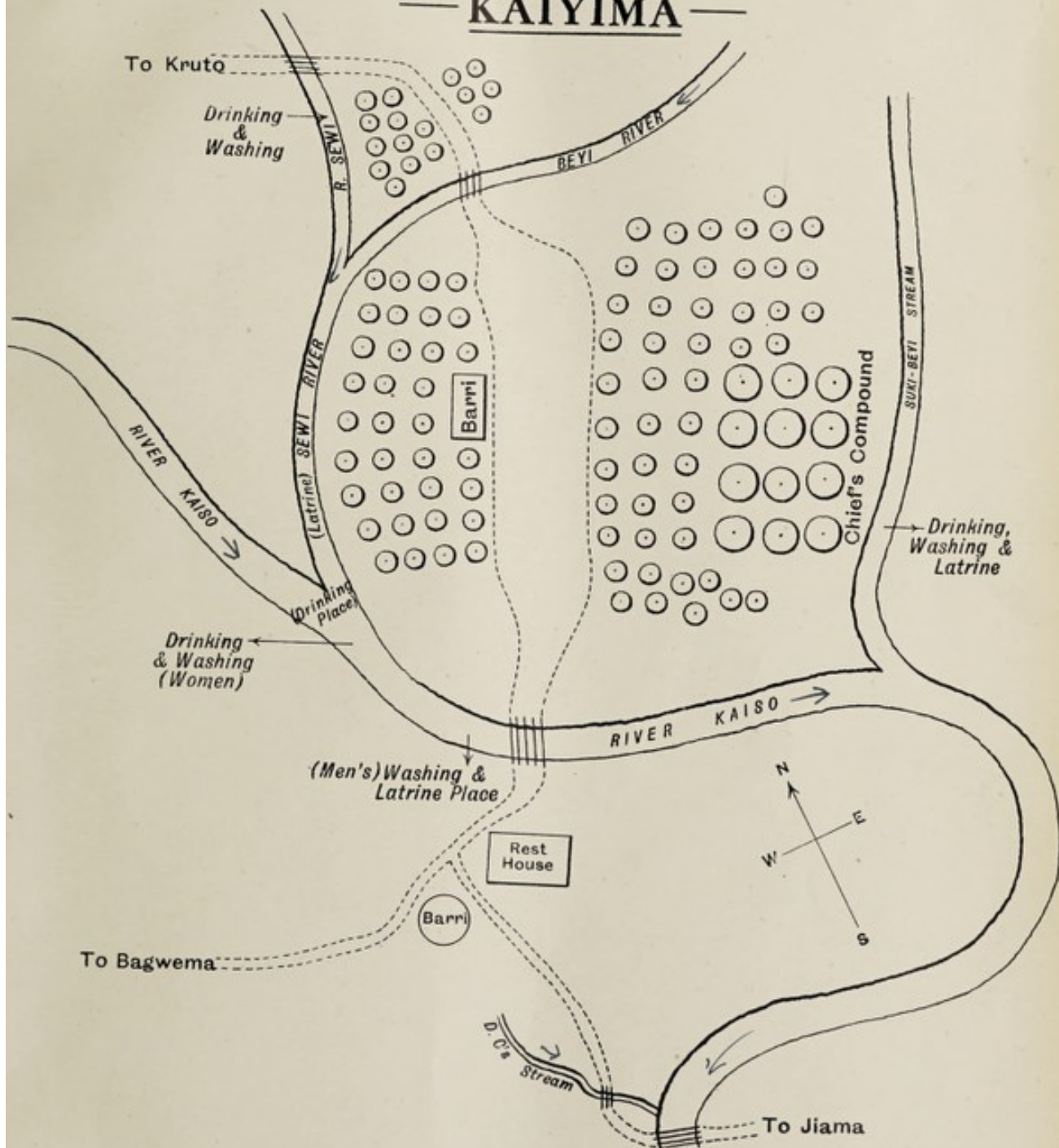
- (1) Goitre belongs to particular tribal districts or parts of districts.
- (2) Some goitres are hereditary and descend from either parent.
- (3) That goitre is curable by native methods of treatment when small (the method of treatment seen was incisions in the skin over the swelling.)
- (4) That once developed fully it never goes away.
- (5) That it is not a contagious disease from husband to wife.
- (6) That it comes originally from drinking certain waters.

THE WATER SUPPLY OF THE VILLAGE OF KAIYIMA.—The conditions of Kaiyima as regards water supply are as follows:—

- (1) The river Kaiso passes between the village and the present rest-house from north-west to south-east. It bends and passes behind rest-house.
- (2) Sewi river passes from north-east along the edge of the village to join the Kaiso at the south-west corner of the village.
- (3) The Beyi runs from east through the north end of the town to join the Sewi river.
- (4) Sukubeyi river runs from the north along east side of the village to join the Kaiso at the south-east corner of the town.
- (5) A small stream from a spring behind the rest-house goes south to join the Kaiso; this is the rest-house supply.

In the rough map are shown the relationship of those various streams with the town, and those points which are used for various purposes are marked. All the rivers, with the exception of the Kaiso, are in reality small weedy streams. It will be observed that at present the Sewi river, which is the one supposed to have been condemned because it was a latrine, is still openly used for drinking purposes above the town. Again it should be noted that just below where it joins the Kaiso is the women's place for obtaining drinking water, washing, bathing, and latrine. The Sukubeyi is used for drinking, washing and latrine, and the Kaiso just below the rest-house is the men's washing, bathing and latrine place. The condition of the Sewi river and its margins is such that no description could effectually convey an idea of its insanitary state. Above the town it is to-day considered perfectly permissible to use

KAIYIMA





its water for drinking; in all its length past the town it is used for washing clothes and bathing, especially by children. When we consider that women and children going to fetch water for drinking are supposed to cross it and to go much further for their supply, it will not be surprising if we find that frequently they save themselves the trouble of the longer journey; people seen actually taking water in vessels from the Sewi on being interrogated about it explained that they were taking it back to their houses for "building" purposes.

THE HABITS OF THE KORANKO TRIBE IN RELATION TO THEIR WATER SUPPLY.—As has been stated the Konnos use their water supply for latrine purposes. In the Koranko country this habit was not either a universal one nor an acknowledged one. It was frequently observed, however, that in many villages, although the water itself was not used, the edges of the rivers and streams were so used. The result in case of a very slight rise of the level of the water in the stream would be a condition of affairs only a degree removed from that found in the Konno country.

THE HABITS OF THE LIMBAS, MENDES AND TEMNES IN RELATION TO THEIR WATER SUPPLY.—Among these tribes, who use the land for latrine purposes, the direct contamination of the water naturally tends to be less. It is worthy of emphasis that the portions of these tribes seen were situated in a much less hilly country than the Konnos and Korankos. Variations in the contour of the country may make important differences when it comes to a question of contamination of water supplies with human and other excreta. Assuming that a tribe living in a hilly country had the habit of using as a dry land latrine a place 100 yards from a drinking stream, it might yet involve very serious contamination of the water supply; especially so if the land consisted, as in much of the Koranko country, of impermeable rock from the surface of which everything was quickly swept by a shower of rain into the stream. A similar habit among a tribe where the land was flat and permeable would be, relatively speaking, devoid of danger to the water supply. It appears clear that given similar habits in respect of the use of the land as a latrine, the population of a hilly country will usually suffer greater contamination in their water supply. But a consideration of water-sheds will show that the matter of contamination of water supplies is a complicated one. Near water-sheds, villages which obtain their water from springs or spring streams run less risk of pollution in the water. But the villages just below which use the river into which such spring-streams discharge will, in proportion to the slope, impermeableness of the ground, and the direct contamination of the water above them, receive a polluted water. Still lower down we have to deal with a rise in the level of the rivers during rains, a factor which becomes progressively more important as we go down stream. Such a rise of level might have two quite different effects according to the habits of the villagers. For example, in Koranko country where the dry margins of the rivers are used as a latrine, a rise in level of the water will mean increased pollution. In the Konno country where the water itself is used as a latrine, a rise of level would not add to the pollution; on the contrary, if accompanied by better flow, it would diminish local pollution.

PREVENTION AND TREATMENT.—The results recorded from the countries in which the prevention and treatment of endemic goitre are carried out by the supplying of iodine in some form are striking. Over a period of three years Drs. Maine and Kimball examined 10,000 girls in Akron, Ohio. Of those who had moderately enlarged thyroids and accepted treatment 79.7 per cent. showed a decrease in size of the glands; only 12.4 per cent. of those who did not accept treatment showed decrease; the totals accepting and refusing treatment being equal. In St. Gall, Switzerland, iodine prophylaxis was adopted for all the school children. In 1918 87 per cent. had thyroid; after a period of three years iodine prophylaxis in 1922 only 13 per cent. had enlarged thyroids.

THE EFFECTS OF GOITRE.—Even in so far as adolescent and adult goitre is concerned in this country, the condition produces a very evident impairment of usefulness of the individual. On exertion the persons affected with goitre show evidence of fatigue more rapidly than non-goitrous persons. As the enlargement progresses there ensue pressure effects which often prove severe or even fatal.

SUMMARY AND CONCLUSIONS.

- (1) Goitre is endemic in the Konno and Koinadugu districts of Sierra Leone. Of thirty-seven villages examined twenty-two were affected.
- (2) Of 534 Konnos the males were affected to the extent of 13 per cent., the females to the extent of 45 per cent. Of 1,166 Korankos (Koinadugu District) 15 per cent. of the males and 25 per cent. of the females had goitre.
- (3) Goitre here affects females more than males, and especially so at the age periods from 11–40.
- (4) Evidence is given that in so far as the goitre of certain areas is concerned, a *natural* iodine-deficiency in the water does not appear to explain the facts. The most heavily affected villages were not those at water-shed; some villages at the greatest altitudes were quite free from goitre.

- (5) Those tribal villages which showed the highest incidence of goitre showed also the greatest degree of pollution by human excreta of their drinking water supply.
- (6) If iodine-deficiency is accepted as the cause of goitre, the facts here would be best explained on the theory that the deficiency is either an artificially produced one, or else one produced by natural agencies not understood which fail to come into operation at the greatest altitudes.

RECOMMENDATIONS.

The recommendations made here are based on the acceptance of the facts :

- (a) That heavy faecal contamination of drinking water is associated in the areas studied, with a high goitre incidence.
- (b) That deficiency of iodine in the system is the cause of goitre.
- (a) (1) An effort should be made to produce a material and permanent change in the practices of the inhabitants of certain of the endemic centres with regard to their water supply.
- (2) The effort should be of such a nature as to ensure the active co-operation of the chiefs and the people.
- (3) A permanent sanitary demonstration is suggested for the education of the natives concerning the advantages to themselves of—
 - (i) ensuring that their water supply is kept free from pollution
 - (ii) adopting safe methods of disposal of human and animal excreta
 - (iii) utilizing for agricultural purposes excreta and other village refuse.
- (4) The villages chosen for this demonstration should be important ones, such as Kaiyima in the Konno country, where the most rapid results might be anticipated from an amelioration of the present conditions.
- (5) The existence of the demonstration should be brought to the knowledge of all chiefs, sub-chiefs and headmen of villages, and they should be familiarized with the advantages which would accrue to their people imitating the standard set up.
- (b) (1) Since the introduction of iodine in some form into salt is reported to have produced good results in some experimental areas, especially in Switzerland and America, an attempt along these lines might be initiated here; this would be facilitated by the fact that all the salt used by these tribes comes from Freetown.
- (2) It is suggested that if such an attempt is made it should be at first on a very restricted scale, and in such a place or places that the progress and results of the preventive measures may be carefully recorded. Adequate supervision appears to be particularly necessary in dealing with native races, where the highly organized control which exists in European countries is lacking.

ACKNOWLEDGMENTS.

I have to tender thanks—

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APPENDIX XI—REPORT ON AN INVESTIGATION INTO THE PREVALENCE AND TRANSMISSION OF HUMAN SCHISTOSOMIASIS IN SIERRA LEONE.

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INTRODUCTION.

The investigation was carried out during the months of December, 1923, and January and February, 1924, simultaneously with the enquiry into endemic goitre, of which a report has already been submitted. The major portion of the work was done in the hilly Konno and Koranko countries, the rest in the more level countries of the Mende and Limba tribes.

SCOPE OF THE INVESTIGATION.

It was desired to obtain information bearing on two questions :

- (a). The incidence and effects among the population of infection with rectal or urinary schistosomiasis.





KAIYIMA, SEWI RIVER.
Women and children at washing and latrine place.



KAIYIMA.
Snail breeding place, taken from Bridge to Mission Lukibey's
River C.M. at spot where snails found. Village behind.



KAIYIMA, JUNCTION OF SEWI RIVER RIGHT WITH KAISO.
Woman's washing, bathing and latrine.

- (b) The identification and bionomics of the snail or snails which act as intermediate hosts in this country.

A. THE INCIDENCE AND EFFECTS AMONG THE POPULATION OF INFECTION WITH RECTAL OR URINARY SCHISTOSOMIASIS.

1. RECTAL SCHISTOSOMIASIS.—The examination of the faeces for the purpose of diagnosing this disease is attended with some difficulty among these tribes, both pagan and moslem; to a less degree this applies also to the examination of urine. Great reluctance was shown by the natives throughout the investigation in allowing the examination of excreta. This is due chiefly to certain beliefs which these people hold concerning possible evil effects which may be produced by the person into whose possession such material comes. Fortunately, in some cases the chiefs and headmen were enlightened enough to assure their people that the white man did not possess sufficient knowledge to acquire evil power over them by such means. This assurance was effective usually to this extent that the older and more influential people sent their young relatives to be examined! The number of persons in whose cases the examination of faeces was possible was 188 of whom 134 were males and fifty-four females; of these 134 males twenty-one were Mendes and 113 were Konnos; of the fifty-four females all were Konnos. Only in one case—a female—were terminal-spined ova of *S. haematobium* found in the faeces, and this was possibly due to contamination from the urine which was heavily infected. The figures are sufficiently large to show that rectal Schistosomiasis, due to *S. mansoni*, if it exists at all in this region, is rare; some further evidence supporting this view will be produced in the section dealing with the snails.

2. URINARY SCHISTOSOMIASIS.—In thirty villages the urine of as many persons as possible was examined; any infected cases which had clearly acquired the disease in other localities were excluded from the figures. In Table I are given the figures for each village, the total examined, males and females, and the number affected; the names of those villages in which infection was found in the population are printed in dark type.

TABLE I.

Giving numbers of people infected with Schistosomes in the villages visited, as shown by presence of ova in urine.

No. of Village.	Name of Village.	Total examined.	Total Males.	Males' —Ova in Urine.	Total Females.	Females' —Ova in Urine.
1	Panguma	136	100	74	36	25
2	Dodo	13	13	9	...	...
3	Jockibu	19	19	3	...	...
4	Bambawuru	11	11	3	...	...
5	Jiama	80	66	26	14	12
6	Paya	21	11	6	10	6
7	Bendu	15	15	11	...	...
8	Bagwema	14	14	2*	...	...
9	Maiima	8	8	...	...	...
10	Kaiyima	155	75	49	80	63
11	Yaiya	29	29	1	...	...
12	Saywaia	6	6	...	...	...
13	Kruto	14	14	...	...	...
14	Banda Karafaia	9	9	...	...	...
15	Kimadugu	17	17	...	...	...
16	Bumbamkorro	18	18	...	...	...
17	Kurubunro	6	6	...	...	...
18	Sokurella	15	15	2	...	...
19	Sbirfe	18	18	...	...	...
20	Mamuria	15	15	...	...	...
21	Dankiwalli	21	21	...	...	...
22	Benikorro	16	16	12	...	...
23	Kaballa	40	40	...	...	...
24	Lengikorro	13	13	...	...	...
25	Kafogo	23	23	...	...	...
26	Kalinky	13	13	...	...	...
27	Kamabai	17	17	1	...	...
28	Bumban	31	31	...	...	...
29	Kadakhana	9	9	...	...	...
30	Bundoo	6	6	...	...	...
	Total	808	668	199	140	106

*Probably acquired elsewhere, but the cases could not be found for interrogation.

It is seen that in a total of 808 persons examined there were 668 males of whom 199, that is 29·7 per cent., were infected, while of 140 females 106, that is 75·7 per cent., had the disease, as shown by the presence of ova in the urine. The position of the various tribes in respect of urinary schistosomiasis is shown in Table II.

TABLE II.

Giving the number of persons examined in each tribe and the number of males and females infected.

Name of Tribe.	Total examined.	Males examined.	Males infected.	Females examined.	Females infected.	PERCENTAGE INFECTED.	
						Males.	Females.
Mende	179	143	89	36	25	62·2	69·4
Konno	322	218	95	104	81	43·5	77·8
Koranko	195	195	14	...	...	7·1	...
Limba	112	112	1	...	...	0·8	...
Total	808	668	199	140	106	...	...

The table shows that the disease was found present in greatest amount among the Mendes and Konnos, while the Korankos and Limbas were relatively free. Both in the Mende and Konno tribes females were more numerous infected than the males; a fact which is probably of some importance among these tribes is that women constantly experience greater contact with water than men. Brock (1893) pointed out that in the white population of Rustenburg in the Transvaal the disease was almost exclusively affecting males. This he attributed to the fact that only the boys were in the habit of bathing in certain streams where the infection was acquired. It should be noted that the figures include only those persons in whose urine ova were found present by the examination of the natural or centrifuged deposit. In addition to those cases which had ova in such a sample there were many others in which blood cells were present. It is highly probable that most of such cases suffered from infection and that repeated examination which was not possible in the circumstances, would have revealed the presence of ova. The incidence of the disease therefore may with safety be set at an appreciably higher figure than appears from the record given above of positive findings as regards ova in the urine.

THE AGE INCIDENCE OF URINARY SCHISTOSOMIASIS.—Owing to the facts mentioned most of the examinations were made in children; this is not, however, a disadvantage in this disease as it is one which is contracted by children when very young, owing to their being bathed by their mothers in infected water; of the total males examined namely 668, no less than 360 were at the age period 0–10. As the youngest child examined was three the age of the children may be more accurately stated as 3–10; in this age period eighty-one cases of infection were found in 360 children. The tribal incidence among these children is given in Table III.

TABLE III.

Giving the incidence of the disease among 360 male children aged 3–10 in the tribes examined.

Name of Tribe.	Total examined.	Total infected.	Percentage.
Mende	45	27	60·0
Konno	83	42	50·6
Koranko	145	11	7·5
Limba	87	1	1·1
Total	360	81	...

3. THE EFFECTS OF URINARY SCHISTOSOMIASIS ON THE POPULATION.—In many cases the disease was accompanied by definite severe symptoms, such as pain in the bladder region, in the back and over the liver; in most severe cases in adults there is an associated mental depression.

On the other hand in many cases the existence of the disease was unsuspected by the persons affected. This does not necessarily mean that the individuals in this case do not suffer; it may simply mean that the true cause of any symptoms experienced by them is overlooked because the

urine does not contain visible blood. Between the two extremes mentioned lies the vast bulk of the cases; these suffer from definite symptoms and the disease from time to time causes sufficient pain and inconvenience to prevent the infected persons from pursuing their usual avocations with any activity.

The best evidence that the disease is troublesome to them is their readiness to submit to treatment. As soon as the severely affected persons observed that the intravenous injection of antimony resulted in relief of symptoms as well as in the clearing up of blood in the urine, numerous applications for this treatment were received. Natives do not as a rule submit themselves readily to such a treatment unless they are suffering considerable discomfort. One unfortunate thing about the treatment of schistosomiasis by this means is that it relieves symptoms and signs rather too early. Its value as a means of general application for the eradication of the disease is thereby unexpectedly limited. For as soon as the native feels well he fails to present himself for further treatment, and no amount of explanation will convince him of the necessity for continuing the treatment. For this reason if, no other, it would undoubtedly be an unwise policy to entertain any serious hope of the eradication of schistosomiasis by this method in these large native populations. I would venture to go further and say that any attempt to eliminate the disease here on these lines is doomed to prove a very expensive failure. Certain facts will be mentioned in the section dealing with the snail host, which seem to point to methods at once more radical, more scientific and less costly of attacking the serious problem of the eradication of schistosomiasis.

NATIVE VIEWS ON SCHISTOSOMIASIS.—The native names for this disease are various each tribe having a name of its own for the condition; these names were invariably translated into English by the interpreters as "red gonorrhœa." It is recognized by the natives examined that there is a "white gonorrhœa" and a "red gonorrhœa." This has sometimes led to confusion in the minds of Europeans, when the word gonorrhœa has been used without the qualifying adjective: it has surprised them to be informed by the parents that a young child is suffering from "gonorrhœa." No adequate explanation could be offered by the natives of the causes which produce "red gonorrhœa"; the problem appears to be too profound for solution by their usually acute methods of observation.

B. THE IDENTIFICATION AND BIONOMICS OF THE SNAIL OR SNAILS WHICH ACT AS INTERMEDIATE HOST IN THIS COUNTRY.

1. **IDENTIFICATION.**—An extensive list of aquatic and non-aquatic snails was collected during the three months expedition; only the aquatic forms need be mentioned here. The collection as a whole will be dealt with by Major Connolly, to whom all material has been submitted and to whom I am indebted for the identifications. He informs me that he proposes to publish shortly in a separate paper an account of all the snails collected during this expedition and also to include all known species from Sierra Leone. Such a publication should prove of great service to future workers on the subject in this country.

The aquatic snails found were dissected and examined for the cercaria stage of the parasitic worm; the totals are given in Table IV.

TABLE IV.

Giving numbers of snails dissected and number infected with any kind of cercaria.

Name.	Number dissected.	Number infected with any kind of Cercaria.
<i>Ampullaria balanoidea</i> ...	225	...
<i>Planorbis (Hippentis)</i> ...	318	151
<i>Physopsis cf. globosa</i> ...	1,557	306

(1) *Ampullaria balanoidea* Gld was the commonest of the aquatic snails found; it was usually present in large numbers on the sandy bottom of streams and in relatively clean water. Dissection of it in various localities did not reveal infection with cercariae of any kind. It was found very widely in all districts visited.

(2) *Planorbis (Hippentis)*. This was found only at Jiana (Nimmi Yemma) Konno country:

a) at the men's washing place on the river.

(b) on a stream from a spring below and beyond that used for the rest-house. No cercariae of human schistosomiasis were found in it.

(3) *Physopsis* sp.—nearly allied to *globosa*, Morel. This was found at the following places,—Panguma, Jiamia (Nimmi Yemma), Paya, Jiamia (Nimmi Korro), Taiko, Bendu, Kaiyima, Sokurella and Benikorro. It was found to contain cercariae which morphologically appeared to be those of *S. haematobium* and which were subsequently proved to be so by means of infecting animals (guinea-pig and monkey) with them, and obtaining adult worms. This snail, as is seen, was present in the Mende, Konno and Koranko countries. It will be noted, however, that it was found in only two of the places visited in the Koranko country. The apparent reason of this is mentioned below.

2. BIONOMICS OF PHYSOPSIS.—Some observations which appear worthy of recording were made on this snail. The snail was found only in certain situations; in water which lay or ran slowly on a muddy bottom, where weed or grass grew in the water, and under shade; it appeared that these three factors—mud, weed and shade—were essential to it in the water of the localities in which it was found. It was never found by me in a stream which had a clean sandy bottom, even though weed and overhead shade were present. Further, it was often absent even in places which looked at first sight admirable sites for it, in water—that is to say—with shade, mud and weed; examination proved that the mud layer at the bottom of the water in these places was only a thin layer lying over sand. This snail likes mud, and this mud-living habit doubtless explains its distribution in the country traversed. In the hilly country the stream bottoms were covered with sand, and owing to the quick flow there was no silting of mud. Consequently, this snail was not found at the villages situated round the base of the Loma mountains. Indeed, in the Koranko country, it was only found on the route traversed at two places, Sokurella and Benikorro, both in relatively low-lying country. Its habitat is important from the point of view of prophylaxis against schistosome infection. It may be mentioned that it was found in large numbers in a wet rice field at Jiamia, which was practically marsh land; on the other hand it was never found in open quickly-flowing streams in the same locality.

INFECTION OF PHYSOPSIS WITH CERCARIAE OF HUMAN SCHISTOSOMES.—The figures given show that of 1,557 specimens of physopsis dissected 306 had cercariae of some kind present in their tissues. Out of the 306 there were 184 infected with the cercariae of *S. haematobium* which was, as shown above, the only schistosome parasite affecting the population examined. In some cases where cercariae of *S. haematobium* were found other cercariae were also present in the same snail. Again in snails from some localities, little or no infection of any kind was found; the variable rate of infection from different localities was a very striking phenomenon. Examples of this are given in Table V in order of increasing infection.

TABLE V.

Locality.	Number of Physopsis dissected.	Numbers infected with cercariae of <i>S. haematobium</i> .	Percentage.
Jiamia (Nimmi Yemma) ...	497	12	2.4
Jiamia (Nimmi Korro) ...	200	18	9.0
Bendu ...	160	18	11.2
Taiko ...	48	8	16.6
Kaiyima ...	373	112	30.0
Paya ...	50	21	42.0

On considering the factors which result in the production of a high rate of infection in these snails, it was found that the infection rate was directly proportional to the contamination of the water supply in a village by human excreta. The effect of even a small stream, if used for latrine purposes, in producing a high infection of physopsis with cercariae of human schistosomes is clearly seen on analysing the Jiamia (Nimmi Yemma) figures. One section of the village goes to a spring for its drinking water. The path to this spring passes through a shallow muddy pool into which comes the water from the men's latrine situated a few yards away. From the spring a stream runs towards the village and turns sharply into a wet rice field just before reaching the pool mentioned. The spring and the upper part of the stream from it yielded no physopsis; the water ran on a bed of coarse sand. Lower down towards the village a layer of mud had formed on the sand and a few physopsis were found here. On following this stream into the rice field, where it became lost in marshy ground, physopsis was easily found usually on weeds or on the underside of fallen leaves; many were in the mud and came to surface after the mud had been trampled down.

In the pool adjacent to the latrine physopsis was also found; the pool water did not enter the rice field but skirted alongside it for some distance. The result of dissection of snails from these different sources is illuminating, and is set out in Table VI.



RICE FIELD, to left of Path beyond No. 7.
JIAMA, NIMINI YEMMA, KONNO.
Snails, ~~infected~~, not infected.



JIAMA, NIMINI YEMMA, KONNO.
Breeding place of snails (infected) pool
below latrine.



TABLE VI.

Cercariae of *S. haematobium* found on dissection of physopsis at Jiamia (Nimmi Yemma).

Source.	Total Physopsis dissected.	Total infected.	Percentage.
Rice field	430	1	0.2
Pool adjacent to latrine ...	66	11	16.6

The present position at this corner of the village is that every one in going to fetch water from the spring has to wade through a pool of water which is a veritable sewer and contains highly infected snails. This pool is an ideal one for the dissemination of cercariae from infected snails and most children in passing through the water play about in it for some time. Situated in such favourable circumstances, the infected snail is able to do the greatest damage to the maximum number of people.

The facts noted here were confirmed almost immediately in the case of two villages in the vicinity, Paya and Taiko; from each of these villages people had come for treatment. As a return they were asked to collect snails. The instructions given were that they should go to the place where the men's latrine was and search the water there. The results were from Paya fifty physopsis, of which twenty-one that is 42.0 per cent., were infected with cercariae of *S. haematobium*; from Taiko forty-eight physopsis, of which eight, that is 16.6 per cent., were similarly infected. A messenger was next sent to Jiamia (Nimmi Korro) with identical instructions. He returned on the 29th December, 1923, with nearly 300 physopsis of which 200 dissected yielded eighteen infected with human cercariae, that is 9 per cent. It is of interest to note that the pool at Jiamia (Nimmi Korro) in which these snails were found dries up in the dry season. A messenger sent there in April found only six physopsis alive in the mud, at this particular spot.

Physopsis, then, in addition to being a mud snail here, is also quite definitely a sewage snail and to a marked degree. It was observed that those physopsis from the water latrines were the largest and most active of all found, as well as being the most heavily infected with human schistosome cercariae.

The fact that at Jiamia the latrine snails were relatively few but heavily infected while a few yards away the rice field snails were many and scantily infected is one which may prove of considerable importance from the practical point of view. It is evident that a comparatively simple modification of the latrine arrangements of such villages should result in a great diminution of human schistosomiasis.

The cercariae of *S. haematobium* found in physopsis will be fully described in a communication to the *Annals of Tropical Medicine and Parasitology*. At a later time a description of all other cercariae discovered will be given. For the purpose of this report such purely scientific details would hardly be suitable.

RESISTANCE OF THE PHYSOPSIS SP. TO DRYING.—Experiments were made in order to ascertain to what extent the snails could survive alterations in their environment, especially by drying. The appearance of the snails after comparatively short periods of drying is deceptive; the animal retracts very far into the shell and looks as if it were dead, but on immersion in water it expands slowly and resumes activity.

(1) **ALTERNATE DRYING AND SOAKING.**—Five snails were placed dry in a glass dish in the shade. They were kept thus for a period of twenty hours and then placed in water. After four hours in water the whole process was repeated. All five snails survived two days of such treatment and three survived over three days.

(2) **DRYING.**—Two snails glued on a card were exposed alternately to sun and shade for forty-eight hours. They were still alive and moved actively after soaking for an hour and a-half in water.

Three snails were tied in dry muslin and placed in the shade. After three days they were put in water. One was alive. This one was subjected to alternate drying and soaking as in the first experiment. It survived until the ninth day.

Five snails were tied in dry muslin in shade. After three days three were alive; dried and tested again on the fifth day, three were still alive; on testing on the seventh day they were dead.

(3) **GRADUAL DRYING ON MUD.**—Eighteen snails were placed on wet mud in shade and the water was gradually drained away from the vessel. The snails remained on the surface of the mud adhering to it and retracted within their shells. On the thirteenth day all the snails were placed in water. After a long period fourteen were alive and active. The first showed signs of life only after over an hour's immersion and the last only after ten hours immersion.

DEPTH IN SOFT MUD ATTAINED BY THE SNAILS.—Many experiments were made to see whether exposure to sun on wet mud or on drying mud would cause the snails to bury themselves. In only one case did a snail go so deep as an inch and a-half from the surface, in the vast majority of cases they remained either on or just under the surface. Direct sunlight was rapidly fatal to snails lying on dry mud.

These experiments proved that the resistance of this snail of various alterations in its environment is by no means negligible. The practical importance of the possession of such resistance by this *physopsis* sp. is that merely cutting off or diverting the water for a few days in infected areas will not ensure the death of all or probably even many of these snails.

METHODS OF PREVENTION OF THE DISEASE.—Enough has been said to show that the prevalence of the disease and the morbidity resulting from it are sufficiently great to deserve attention. It has been said that while we have in antimony a very powerful and efficient drug for the treatment of cases it would be unwise to attempt its use on a large scale here with the idea of eradicating the disease. It appears that other means than this must be adopted, as we know that if infected snails remain the people will become reinfected.

Sanitary education appears to me to be the true and practical solution of this problem here. It was my habit at every place where time permitted to explain very fully to the chiefs the exact objects of the investigation. The chiefs and their advisers were not slow to appreciate the various points which were discussed. In some villages, e.g. Kaiyima, the people were already prepared by tradition to believe in the possibility of goitre being due to the faecal contamination of the drinking water. In the case of schistosomiasis their interest was very keenly aroused and they were given an opportunity of following the life history of the worm, from the egg in the human urine to the penetration of the animal skin by the cercariae. They saw the snails which were collected in their village pools and were shown the cercariae which came out of them on dissection. They betrayed, it is true, some astonishment but no incredulity; on the contrary they expressed in their questions a very intelligent grasp of what they saw. Some of them, for example Paramount Chief Toto of Jima and Paramount Chief Fazuluku of Kaiyima, announced their willingness to put into immediate operation any law which might be made for them as regards the use of dry land latrines. They further stated that if such laws were made they would ensure that they were rigidly observed by their people. These facts are mentioned in order to show that these Paramount Chiefs do not regard their peoples' customs in these matters as by any means sacrosanct or immutable. The customs are simply what the people have been brought up to do, and the chiefs say they can be altered if the reasons for altering them are adequate and made quite plain to the people.

The tribal system can therefore be utilized as a means of educating these people in sanitary laws just as it can be used for educating them in laws relating to any subject. It is, however, essential that the first step in this direction should be by example; a single concrete example will do more to convince them than any amount of perfectly sound theoretical teaching. It is probable that the object lesson of a permanently improved village in their midst will be more rapid in its effect than any other form of education.

SUMMARY.

(1) This investigation into the prevalence of human schistosomiasis in Sierra Leone did not reveal the presence of *S. mansoni* either in faeces or urine.

(2) The fact that the only planorbis found, while harbouring many other cercariae, did not contain those of *S. mansoni* supports the conclusion that *S. mansoni* is not endemic in the regions examined.

(3) In some districts there is among the population a high infection rate with *S. haematobium*.

(4) Of the snails dissected the only one which contained cercariae of *S. haematobium* was *physopsis* sp., nearly akin to *globosa* (Morelet).

(5) This snail was found in all places in which the population was affected by schistosomiasis and in which it was possible to collect the snails.

(6) It was not found in any village where schistosomiasis was not also found in the population.

(7) This snail is here not only a mud-living but also a sewage-living snail.

(8) High infection rates with human cercariae in this snail were found when it was collected from water latrines, e.g. 42 per cent., in the village of Paya.

(9) Infected persons often come readily for treatment.

(10) Reasons are given, however, for refraining in Sierra Leone from embarking on any scheme for the eradication of the disease based on the treatment of infected persons: a scheme based on education is suggested.

RECOMMENDATIONS.

In the belief that no other means will prove so effective as example in inculcating satisfactory hygienic habits it is recommended :

(1) That a badly sanitated village of some importance should be selected and put in a state of thoroughly good sanitation and so maintained.

(2) That such a village as Kaiyima, which appears to fulfil the requirements (having a goitre rate of over 56 and a schistosomiasis rate of over 72 per cent.) should be the village selected.

(3) That the sanitary scheme should comprise—

- (a) provision of a pure drinking water supply
- (b) provision of a safe method of disposal of excreta and village refuse *away from water*
- (c) provision of snail-free bathing and washing places for all classes of the population
- (d) the treatment of such polluted waters as those of the Sewi and Sukubeyi streams
- (e) the effective control of the water supply and the bathing places.

(4) That when the sanitary improvements are finished and the Paramount Chief has the measures in operation, the chiefs, sub-chiefs and headmen of the adjacent districts should be made familiar with the scheme and should be invited to imitate it in their own villages as soon as possible.

(5) That the scheme, while satisfying rigidly the sanitary requirements, should involve the least possible departure from the simple mode of life of the people. The details of such a scheme will require very careful consideration.

APPENDIX XII—REPORT ON THE INVESTIGATION, BY MEANS OF EXPERIMENT ON FOWLS, OF CONSTITUENTS OF THE FREETOWN PRISON DIET.

BY D. B. BLACKLOCK, M.D., DIRECTOR, SIR ALFRED LEWIS JONES
RESEARCH LABORATORY.

Experiments on fowls were undertaken in order to determine, if possible, what relative influence the various factors mentioned in the previous report¹ exerted in the ultimate production of beri-beri in the prison population. The evidence obtained from these experiments corroborated many of the conclusions already reached. Since the clinical investigation had revealed the apparent effect of lack of exercise in determining the incidence of beri-beri in tailors, experiments to test this were made on fowls. These experiments, which are referred to in some detail below, showed that lack of exercise has an important effect in determining the early onset of polyneuritis in fowls.

EXPERIMENTS ON VARIOUS ARTICLES OF DIET.

Rice.—Experiments were done which were designed to show whether rice as supplied to the prison was capable of producing polyneuritis in fowls—

1. When newly harvested.
2. When old and infested with weevils, each treated in the following ways:—
 - (a) cooked for short periods
 - (b) cooked for long periods
 - (c) the water in which it had been boiled discarded
 - (d) pounded as then done in the prison.

It was found that rice as supplied to the prison, whether old or new, if unpounded and cooked for short periods and if given with the water in which it had been cooked, did not produce signs of polyneuritis in fowls in the period of the experiments (three months). When the water in which the rice had been boiled was discarded there was evidence of definite effects on the fowls. This effect was increased when prolonged cooking was carried out. Even the brief pounding of the rice which was usually given at the prison for the purpose of cleaning the rice, proved to have a greater individual effect than any of the other factors mentioned. This mechanical means of reducing vitamin, by the removal of pericarp and germ which it entails, is especially to be avoided in the case of a rice already partially polished.

1. Blacklock, D. B., Appendix V., Ann. Med. and San. Report, Sierra Leone, 1922.

The rice diet on which fowls develop polyneuritis with greatest certainty is a rice diet of highly polished rice. Such rice has long been recognized also as a beri-beri inducing rice. That the prison rice, though not a highly polished rice originally, is made to approximate more and more to this in vitamin deficiency, owing to the methods of treatment and cooking, is proved by the fowl experiments. Thus—

1. pounding before cooking removes pericarp and germ and with it vitamin B ;
2. prolonged cooking reduces vitamin content ;
3. discarding the cooking water is throwing away vitamin which is dissolved in the water.

The effects of age and weevils in rice on the vitamin content was not conclusively proved in these experiments. Further experiments would be required over a more prolonged period.

Ground-nuts.—Fowls fed on an exclusive diet of water and roasted ground-nuts lost weight and died ; they did not survive long enough to develop polyneuritis.

Split Peas.—Fowls fed on a diet of water and raw split peas lost weight, but did not develop polyneuritis nor die in the experimental period. The sample of split peas used therefore contained in the raw state some vitamin B.

The rice experiments on fowls pointed to a deficiency of vitamin B in the treated diet and were in accordance with the conclusion that "the diet is by the above-mentioned methods of preparation and cooking so reduced in vitamin that it affords a very small margin of safety."

During the course of the investigation by the committee appointed it was observed that prisoners employed as tailors suffered from beri-beri out of proportion to their numbers. After considering the factors which might affect tailors adversely it was concluded that the respect in which they differ from the rest of the prison population might be the sedentary nature of their occupation, or lack of sunlight. Experiments on fowls were made in order to prove what effects lack of sunlight and exercise would produce.

SUNLIGHT.—No effect could be traced as regards the effect of the presence or absence of sunlight. Fowls kept entirely in the dark or exposed to the sun for several hours daily did not develop polyneuritis earlier than controls kept in the normal conditions of light and dark.

EXERCISE.—Very definite effects were seen when fowls on a vitamin-deficient diet were subjected to conditions which prevented their having exercise. In the first experiment done all fowls deprived of exercise were dead in seventeen days, while of those having free movement none died in less than thirty-one days. This experiment was repeated under conditions which gave both sets of fowls somewhat more opportunity for movement. Of five fowls fed on polished rice and water none lived longer than twenty-six days when deprived of exercise ; of five fowls similarly fed all survived thirty-eight days or longer when allowed free exercise. The experiments have thus confirmed in somewhat definite manner the conclusion drawn from the clinical facts.

The observations and experiments made here on the influence of lack of exercise in the disease beri-beri are, so far as I am aware, new, and if confirmed will prove of considerable importance in dealing with beri-beri.

The experiments showed that the pounding of rice was the most important individual factor in reducing vitamin. The effects produced by overcooking, discarding of cooking water, and possibly the use of old weevily rice are accessory in reducing vitamin. Animals which are deprived of exercise are prone to develop polyneuritis when fed on a polished rice to a much greater extent than are animals which are having exercise.

The conclusions to be derived from these animal experiments are, that for the prison a rice which has been deprived of its vitamin either primarily by mechanical removal of pericarp and germ, or secondarily by the subsequent treatment it receives, is to be avoided.

The exercise factor as shown by the experiments is important and the practical bearing of this on the prison occupation is that any occupation which involves a sedentary habit, such as tailoring, mat weaving, basket making, and similar occupations is one which renders the person particularly prone to acquire beri-beri should vitamin deficiency in the diet occur.



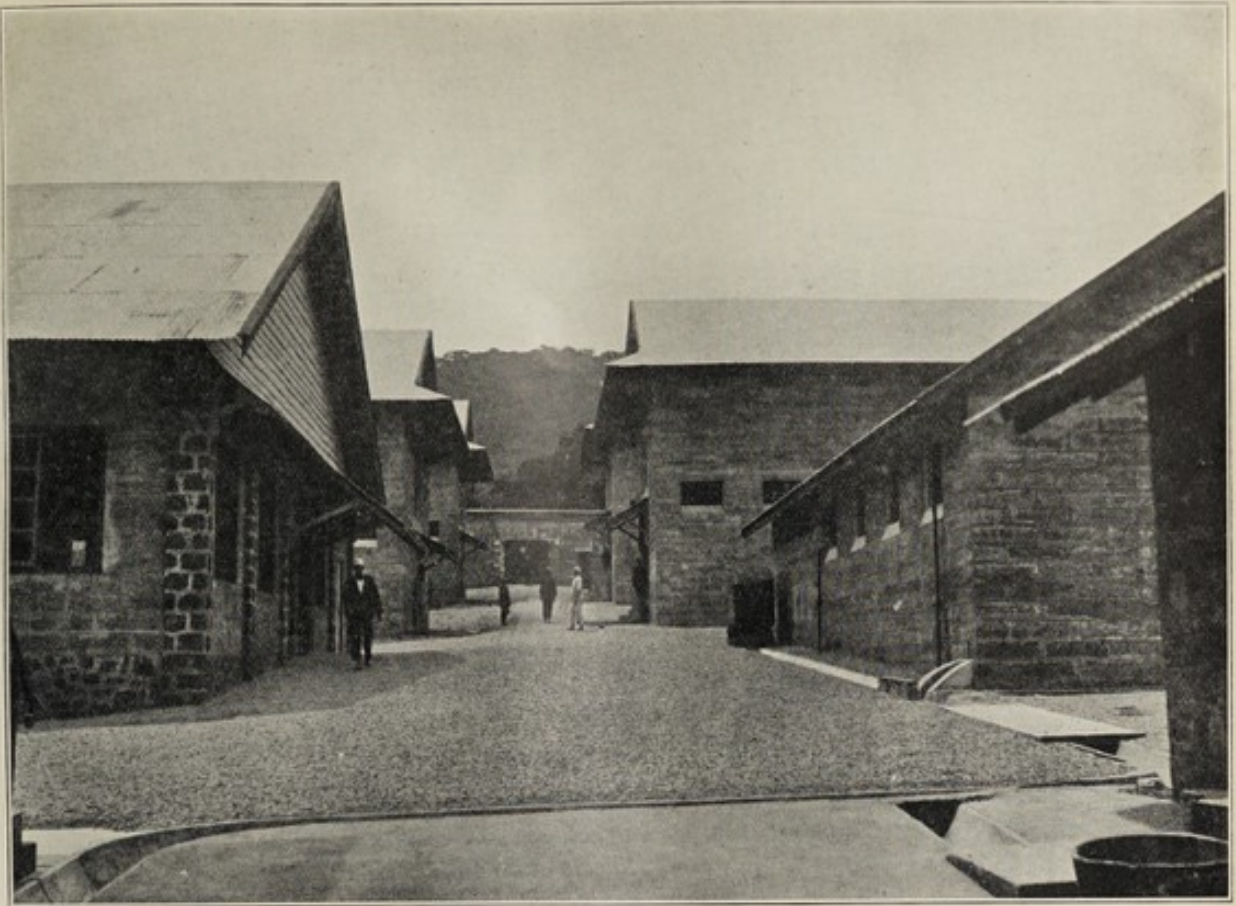


LAW COURTS, FREETOWN.



PRISON HOSPITAL.





PRISON YARD.



GOVERNMENT MODEL SCHOOL.





ENTRANCE GATE, OLD COLONIAL HOSPITAL.

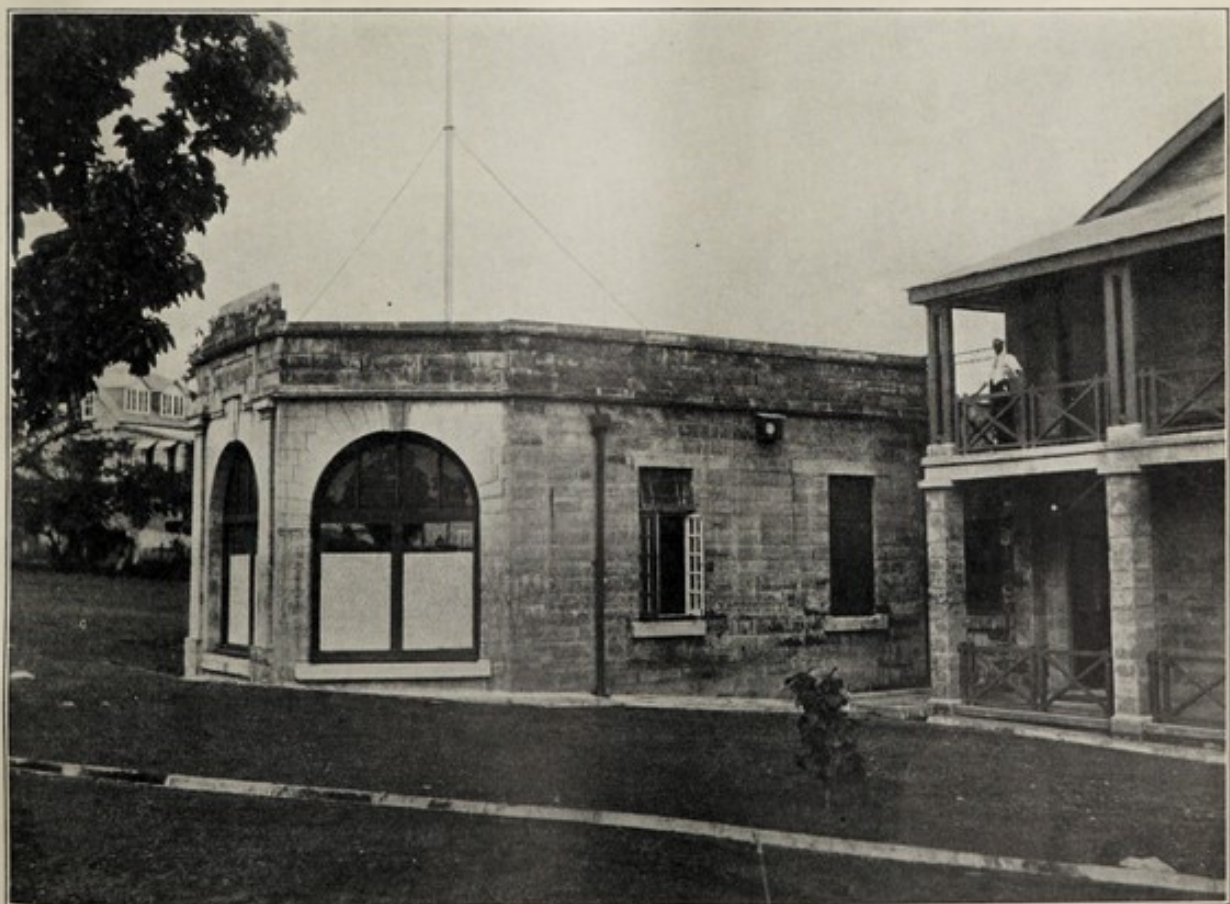


INSCRIPTION OVER ENTRANCE GATE, OLD COLONIAL HOSPITAL.





COLONIAL HOSPITAL, FREETOWN—VIEW OF WARD BLOCKS.



COLONIAL HOSPITAL, FREETOWN—OPERATING THEATRE.





COLONIAL HOSPITAL, FREETOWN—KITCHEN AND LAUNDRY.



COLONIAL HOSPITAL, FREETOWN—DISINFECTING CHAMBER.





SIR ALFRED LEWIS JONES' RESEARCH LABORATORY.



SANDERS STREET COLLECTING DRAIN.





FERGUSSON STREET OUTFALL DRAIN.



KING JIMMY OUTFALL DRAIN.





OLD SURFACE DRAIN, KISSY ROAD.



MODERN SURFACE DRAIN, KISSY ROAD.





SANDERS BROOK—OLD (1905) CANALISATION.

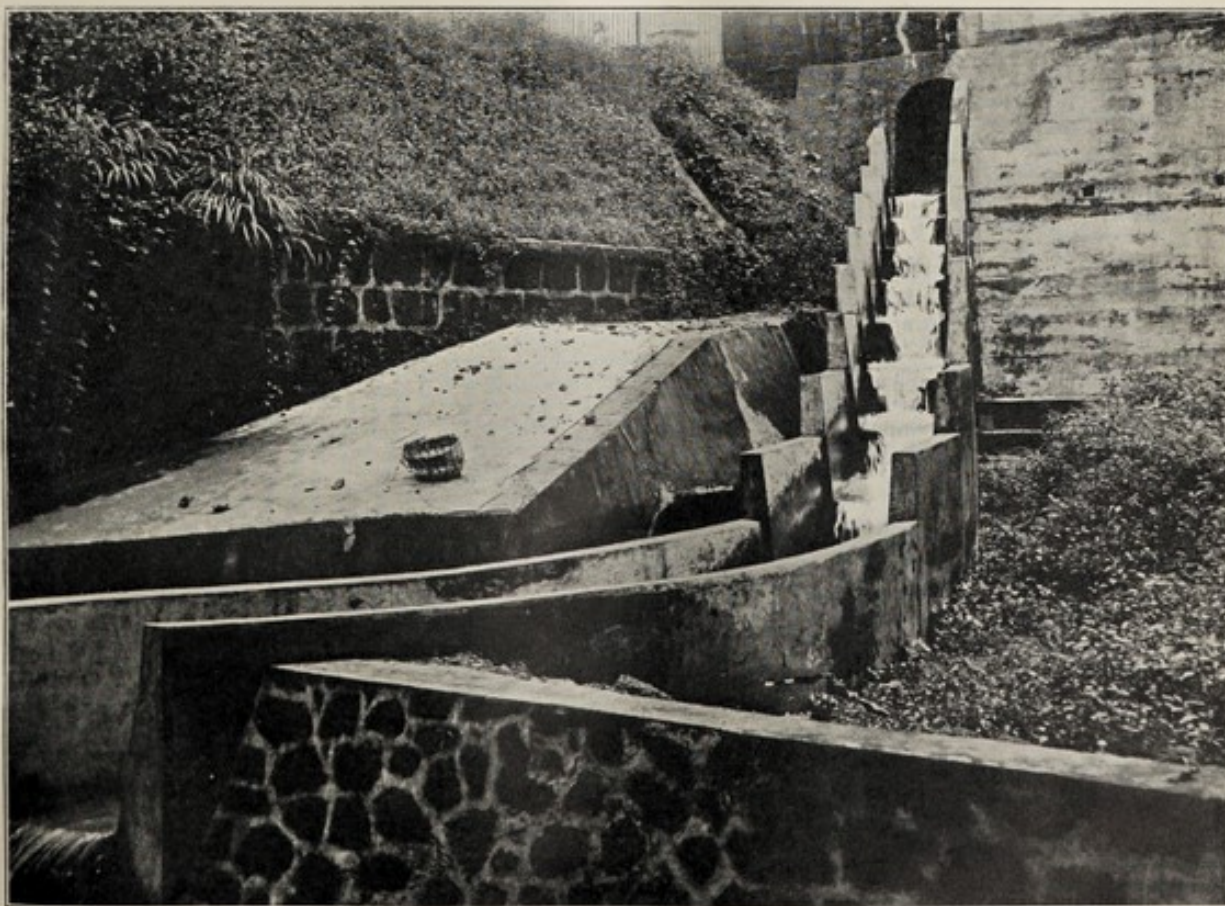


SANDERS BROOK—MODERN (1923) CANALISATION.





ADELAIDE STREET—SHOWING STREET IMPROVEMENT.

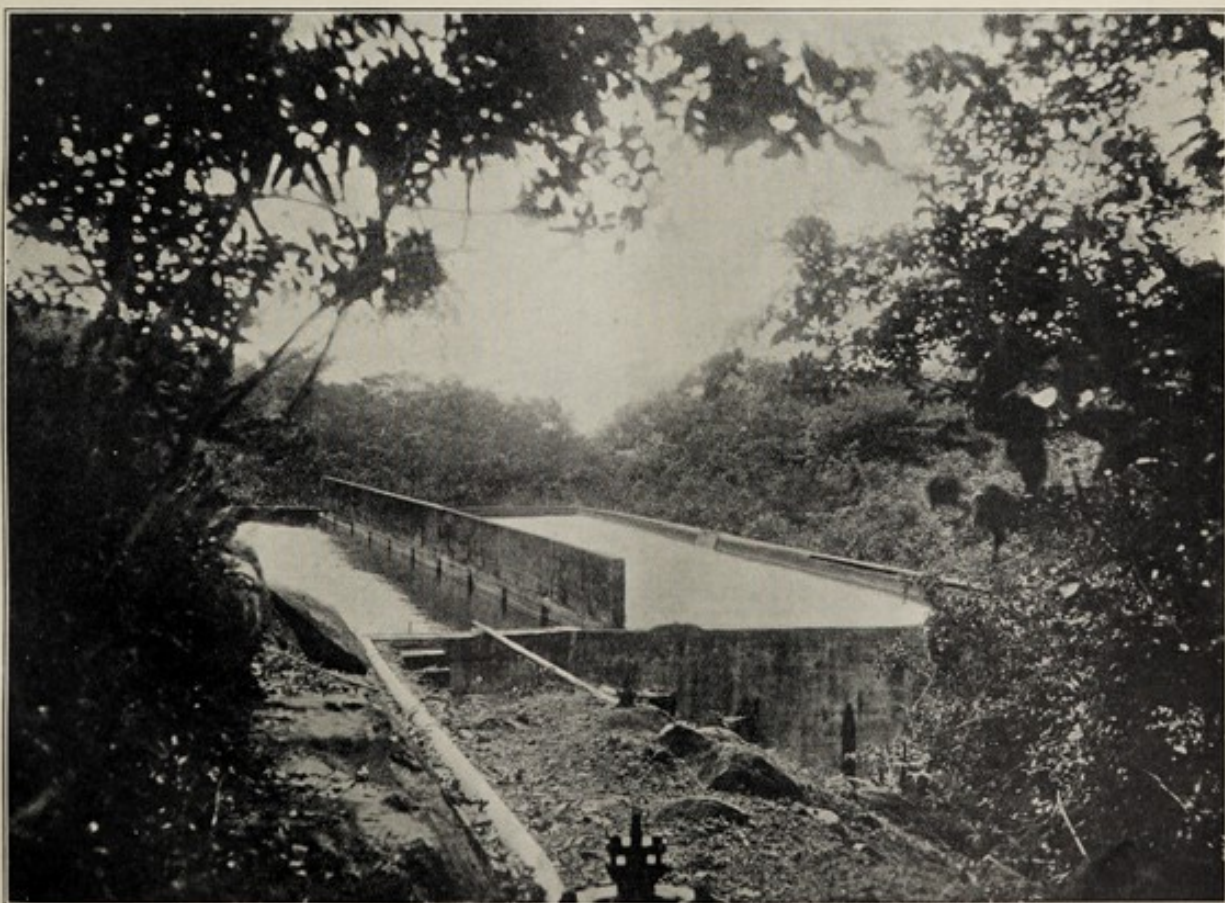


NICOL'S BROOK—SHOWING KISSY ROAD OUTFALL.





NICOL'S BROOK—SHOWING MODERN CANALISATION.



HILL STATION RESERVOIR.





PUMPING STATION, BABADORI VALLEY.



PUBLIC LAUNDRY, NICOL'S BROOK.





GOVERNMENT HOUSE.



STONE BUNGALOW, HILL STATION.





WOODEN BUNGALOW, HILL STATION.



NURSING SISTERS' BUNGALOW, FREETOWN.





VERANDAH OF NURSING HOME, FREETOWN.

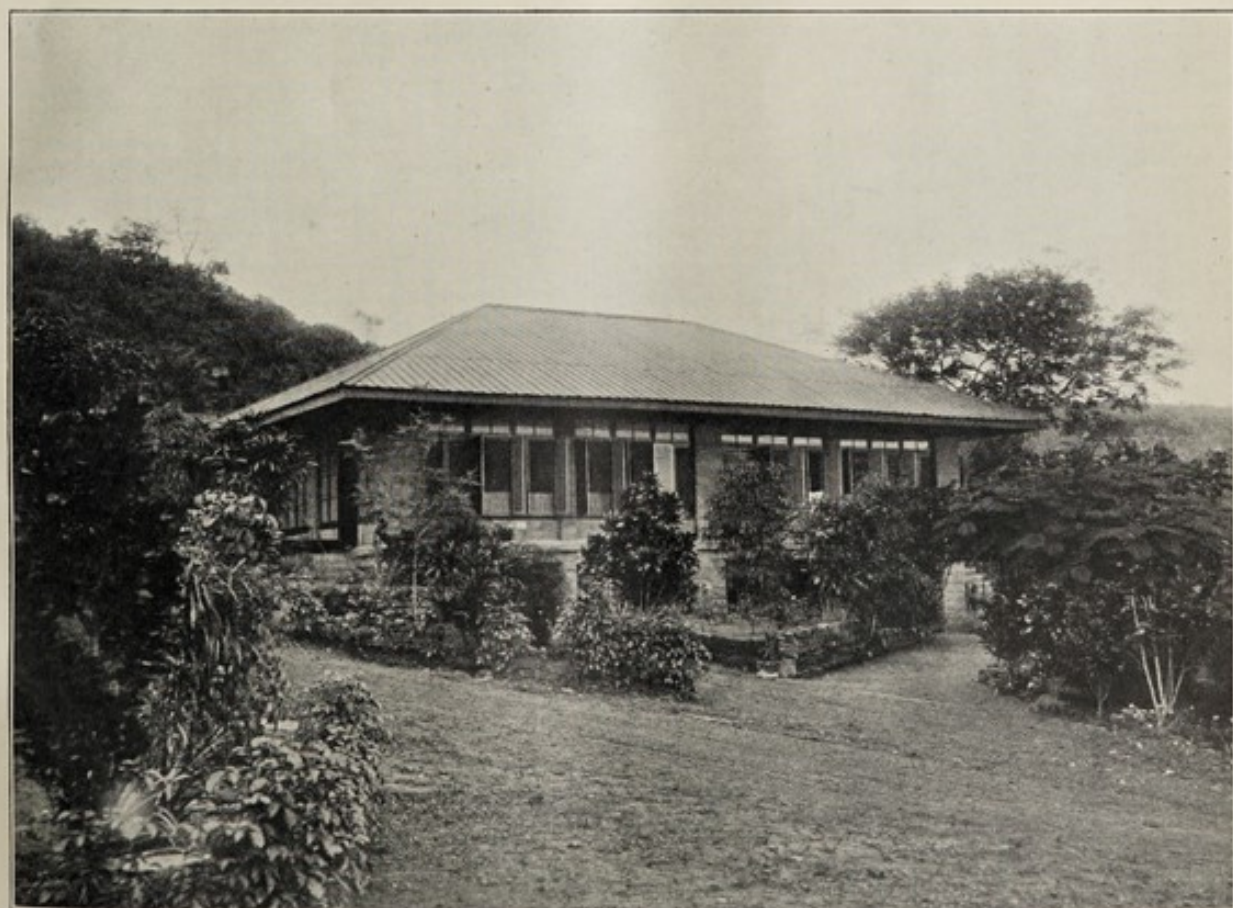


BUNGALOW OF MEDICAL OFFICER OF HEALTH, FREETOWN.





TRAFFIC MANAGER'S BUNGALOW, RAILWAY RESERVATION, CLINE TOWN.



DOUBLE BUNGALOW FOR CLASS B OFFICERS, PUBLIC WORKS DEPT., FREETOWN.





OLD TYPE PUBLIC LATRINE, SUSAN'S BAY, FREETOWN.



MODERN PUBLIC LATRINE, FREETOWN—SHOWING ALSO DUST-BIN AND INCINERATOR.





CATTLE MARKET, FREETOWN.



CORPORATION FISH MARKET, FREETOWN.





COURT MESSENGERS' LINES, KENNEMA—SHOWING OLD TYPE FLAT-BOTTOMED DRAIN.



COURT MESSENGERS' LINES, MOYAMBA.

