

Tanganyika Territory.



ANNUAL MEDICAL REPORT.

**ANNUAL REPORT OF THE SANITARY
BRANCH OF THE MEDICAL
DEPARTMENT.**

**REPORT OF THE DAR-ES-SALAAM
LABORATORY.**



For the Year 1921.

Annual Medical Report.

CONTENTS.

SECTION I.

Administrative :—	PAGE
(a) Medical Staff	7
(b) Financial.	10

SECTION II.

Public Health :—	PAGE
(a) Vital Statistics	11
(b) General Remarks	11
Communicable Diseases :—	
(1) Mosquito or Insect Borne	20
(2) Infectious or Epidemic.	22
(3) Helminthic	23
(c) European Officials	31
(d) Asiatic Officials	33
(e) European Non-Officials	33
Report on the Health of the King's African Rifles	35
Report on the Health of the Police and Prisoners	37

SECTION III.

Hospitals and Dispensaries :—	PAGE
Table " D " showing Staff and Accommodation for each District	41
Buildings, Improvements Effected during the Year	42
Registration of Medical Practitioners and Dentists	44

TABLES.

1 and 1(a) European and Asiatic Staff	45
" A " Showing a Return of the Total Cases, In-Patients and Out-Patients of Infective Diseases Treated at the Various Hospitals and Dispensaries in the Territory	11A
" B " Showing the Sick, Invaliding and Death Rates of European Officials	32

SECTION III—*continued.*TABLES—*continued.*

	PAGE
" C " Shewing the Sick, Invalidings and Death Rates of Asiatic Officials	34
" D " Shewing Staff and Hospital Accommodation for each District	41
" E " Shewing Total Numbers In-Patients and Deaths and Total Numbers Out-Patients, of the Different Denominations Treated at the Various Stations in the Territory	49
" F " Table of Surgical Operations	50
" G " Shewing Total Numbers of In-Patients and Out-Patients for all Diseases returned from all Medical Stations	53A

APPENDICES.

1. Treatment of Yaws by Tartar Emetic, by C. B. B. Reid, M.B., Ch.B. (Edin.), District Medical Officer, Tukuyu	54
2. A Short Summary of, and Extracts from, the Government Dentist's Report	55
3. A Short Report on Lutindi Lunatic Asylum	56
4. Notes on the Treatment of Yaws with Bismutho—Sodium and Potassium Tartrate—by J. O. Shircore, Acting Principal Medical Officer	57

SECTION IV.

Sanitation	63
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SECTION V.

Laboratory	179
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TANGANYIKA TERRITORY.

Annual Medical Report For the Year ended 31st December, 1921.

SECTION I.

ADMINISTRATIVE.

(a)—MEDICAL STAFF.

(1) THE ESTABLISHMENT FOR 1921 WAS:—

European.

Principal Medical Officer.	2 Senior Nursing Sisters.
Deputy Principal Medical Officer.	14 Nursing Sisters.
Senior Sanitation Officer.	1 Laboratory Assistant.
Director of Laboratory.	1 Superintendent Lunatic Asylum.
3 Senior Medical Officers.	
23 Medical Officers.	1 Matron Lunatic Asylum.
1 Dental Surgeon.	7 Sanitary Superintendents.

Asiatic.

23 Sub-Assistant Surgeons.	26 Compounders.
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Native.

A varying number of Native Attendants:—

Hospital and Dispensary Attendants,
Isolation Hospital Attendants,
Clerks, Native Vaccinators,
Native Sanitary Inspectors,
Sleeping Sickness and Leper Guards, and
Epidemic Inspectors.

2) SHORTAGES OF ESTABLISHMENT :—

(a) *European*.—At the beginning of the year there were 13 Medical Officers on the Staff List instead of 23. There were 7 new arrivals—3 transfers and 2 terminated their appointments.

(b) *Asiatic*.—Sub-Assistant Surgeons. At the beginning of the year there were 18 Sub-Assistant Surgeons on the Staff List instead of 23. New arrivals 5. Termination of Appointments 2.

Compounders.—At the beginning of the year there were 23 Compounders on the Staff List instead of 26. New arrivals 5. Termination of Appointments 3.

(3) CLERICAL STAFF AT HEADQUARTERS :—

European.—Chief Clerk, Medical Storekeeper.

Asiatic.—Two Second Grade Clerks, one Third Grade Clerk (for Sanitation Section), one Fourth Grade Clerk (for Medical Officer of Health, Dar-es-Salaam).

African.—Four Native Clerks.

(4) APPOINTMENTS, CHANGES, ETC., IN STAFF.

<i>Appointments</i>	..	Dr. C. W. Breeks, Medical Officer	6/2/21
		Dr. J. Scott Byrne	26/2/21
		Dr. G. Maclean	1/4/21
		Dr. G. A. Williams	23/5/21
		Dr. C. F. Shelton	1/9/21
		Dr. R. Nixon	7/10/21
		(Acting as Medical Officer of Health.)	
		Dr. J. S. Macdonald, Medical Officer	10/12/21
		Miss M. E. Shearing, Nursing Sister	16/9/21
		Miss E. Walton	16/9/21
		Miss E. Bishop	12/12/21
		Miss W. R. Grant	5/11/21
		Miss N. Wells	30/12/21
		Mr. J. Spittles, Superintendent, Lunatic Asylum	1/9/21
		Mrs. C. M. Spittles, Matron, Lunatic Asylum	1/9/21
		Miss B. G. Allardes, Nursing Sister	28/11/21
		Patel, C. A., Fourth Grade Clerk (P.M.O.'s Office)	5/4/21
		Somvasi, D. B., Fourth Grade Clerk	1/6/21
		da Cunha, J. B., Third Grade Clerk (P.M.O.'s Office)	1/8/21

<i>Appointments— continued.</i>	Nanayakkara, V. A. D. A. S., Fourth Grade Clerk (M.O.H.'s Office, D'Salaam)	1/4/21
	Paranjpe, P. S., Sub-Asst. Surgeon	26/6/21
	Macedo, J. F.,	18/10/21
	Kelshiker, Y. B.,	21/9/21
	Chakko, C. K.,	21/11/21
	Thomas, M. C.,	21/11/21
	Din, Ahmed, Compounder	1/7/21
	Dasumal,	21/7/21
	Ram, P. Haweli,	19/9/21
	Singh, Mehtab,	26/6/21
	Ali, Barkat,	30/5/21
<i>Promotion</i>	Dr. C. L. Ievers, to be Senior Medical Officer.. .. .	1/1/21
<i>Temporary Medical Officer.</i>	Dr. N. L. Richards, from 11/8/21 up to end of year.	
<i>Transfers</i>	Dr. G. H. Gallagher to Nigeria	7/9/21
	Dr. A. J. M. Crichton to Nigeria	29/11/21
	Dr. E. A. C. Langton to Uganda	24/11/21
<i>Resignations</i>	Dr. J. Scott Byrne, Medical Officer	25/7/21
	Dr. W. V. Tothill,	1/9/21
	Miss C. Wotherspoon, Nursing Sister	9/11/21
	Miss S. Fichat, Probationary	30/7/21
	Hendricks, G., Third Grade Clerk (P.M.O.'s Office)	31/3/21
	Mr. N. Forster, Sanitary Superin- tendent (First Grade)	19/10/21
<i>Appointments Terminated.</i>	Mr. D. R. Ogilvie, Sanitary Superin- tendent (Second Grade)	30/9/21
	Patel, C. A., Fourth Grade Clerk (P.M.O.'s Office)	31/7/21
	Appadurai, V. P., Compounder	10/8/21
	Choudary, R. K.,	4/11/21
	Chitko, A. S., Sub-Assist. Surgeon	7/7/21
	Paul, A. D.,	22/1/21
	Rajwadker, Y. R., Compounder	28/5/21
	Ismael, Mohamed,	17/3/21
<i>Retirements</i>	Nil.	
<i>Invalidings</i>	Nil.	
<i>Deaths</i>	Nil.	

(b)—FINANCIAL.

Estimated Expenditure for period 1st January to 31st December, 1921

MEDICAL DIVISION.

<i>Personal Emoluments :—</i>	£
Principal Medical Officer and Deputy Principal Medical Officer	2,200
Clerical Staff, Medical Storekeeper, Packers, Messengers, etc.	2,254
Senior Medical Officers	2,483
Medical Officers	11,612
Dental Surgeon	719

SANITATION DIVISION.

Senior Sanitation Officer, Medical Officers of Health and Subordinate Staff for the suppression of Epidemic Diseases	4,645
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LABORATORY DIVISION.

Director of Laboratory and Laboratory Assistant	1,160
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TOTAL PERSONAL EMOLUMENTS	<u>£25,073</u>
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Other Charges :—

	£
Administrative Division Incidental Expenses	151
Medical Division—General—Miscellaneous	6,652
Maintenance Lepers, Lunatics and Incurables	4,267
For dealing with Venereal Diseases	288

SANITATION DIVISION.

Sanitary Labour and Upkeep of Quarantine and Infectious Diseases Hospital	10,243
Miscellaneous	1,379
Laboratory Division—Miscellaneous	365

TOTAL OTHER CHARGES	<u>£23,345</u>
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SPECIAL EXPENDITURE.

	£
Equipment for treatment of Venereal Diseases	100
Sanitary Equipment	918
Travelling Equipment	185
Medical Register and Books for Medical Library	110

	<u>£1,313</u>
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HOSPITALS AND DISPENSARIES.

<i>Personal Emoluments :—</i>		£
Nursing Staff	2,660
Superintendent and Matron Lunatic Asylum	377
Indian Medical Assistants .. .. .	.. .. .	7,158
Native Attendants .. .. .	.. .. .	3,294
Miscellaneous Allowances .. .. .	.. .. .	15
		<u>£13,504</u>
 <i>Other Charges :—</i>		£
Dressings, Drugs, Instruments, Medical Equipment and Furniture .. .. .	.. .. .	6,486
Upkeep of Hospitals .. .. .	.. .. .	9,240
Miscellaneous Charges .. .. .	.. .. .	300
		<u>£16,026</u>

STATEMENT OF REVENUE, 1921.

		£
From Hospital Fees and Sale of Drugs .. .. .	.. .. .	2,840
Fees collected by Port and Marine Department for Bills of Health .. .. .	.. .. .	402
Sale of Vaccine to Zanzibar Government .. .. .	.. .. .	335
		<u>335</u>
TOTAL .. .. .	.. .. .	<u>£3,577</u>

SECTION II.

PUBLIC HEALTH.

(a)—VITAL STATISTICS.

See Sanitation Report.—It is doubtful if the census returns are accurate enough to form a basis for Vital Statistics.

(b)—GENERAL REMARKS.

The total number of cases treated at Government Hospitals and Dispensaries was 112,336, with 421 deaths.

ANTHRAX.

No case recorded. It is, however, regarded as prevalent in the Singidda sub-district of Dodoma.

BERI BERI.

There was only one case reported. The natives in this Territory, except during famine years, are well provided for and deficiency diseases appear to be rare.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.

There were 11 cases and 7 deaths, a not unusual mortality. These cases are as a rule advanced, and admitted in a comatose state, and the high rate of mortality is not to be wondered at. The distribution is more or less limited to the colder climates which predispose to lowered vitality, catarrhal conditions and the occupation of ill-ventilated, over-crowded dwellings.

CHICKEN POX.

There were 167 cases and 3 deaths.

There is nothing of note regarding this disease except that there are a number of vague atypical febricula with mild rashes which may be mistaken for Chicken Pox and which indeed are difficult to separate from it.

DENGUE.

A solitary example was reported from Arusha. From the description it appears certain that this case was Dengue.

DYSENTERY.

There were 497 cases with 7 deaths. No data are available as to the class of disease. With the exception of Morogoro, showing 18 cases with 5 deaths, the rest were obviously mild, and there can be little doubt that the virulent types of dysentery met with in some of the neighbouring colonies are not experienced here. The water-supply of Morogoro is mainly from the river along which the town is built. The water contains mica in fine suspension, and is naturally polluted, during its course from the Township; but it is open to doubt if 18 cases of Dysentery out of a population of 2,500 natives points to infection from this source.

ENTERIC FEVER.

17 cases with 2 deaths recorded.

GONORRHOEA.

1,219 cases—see section on Venereal Diseases.

INFLUENZA.

There were 3,213 cases treated with 34 deaths. The disease has been widespread, and its progress has been along the main safari lines of communications. The more secluded areas such as Mahenge, Mohoro and Utete returned no cases. Districts of high altitude and cold climate, where the predisposing conditions of nasal and bronchial catarrh are common, suffered the most. Arusha, Iringa, Mbulu, Moshi, Tabora and Tukuyu, with altitudes varying from 3,000 to 5,600 feet above sea level, average 388 cases. The main sea and lake ports—Bagamoyo, Bukoba, Dar-es-Salaam, Kasanga, Pangani and Mwanza—average 107. The above facts appear to indicate that during this epidemic the mass of natives travelling from one district to another has been the chief disseminator, and that railway transport and shipping have had far less to do with the diffusion of the disease. As evidence of the latter there were no cases at Morogoro and Kilossa, and only one at Kigoma. Kigoma is a striking example in that it escaped infection both by rail from Dar-es-Salaam, Dodoma and Tabora, and by shipping from Kasanga. There were no cases at Musoma or Lindi; and although Moshi and Arusha were largely affected, Tanga also escaped infection both by rail and by sea. The epidemic was of a comparatively mild nature.

LEPROSY.

A total of 29 cases were diagnosed at the different hospitals during the year. The question, however, of the general distribution of Leprosy and the measures in force dealing with it call for further notice.

The lepers are segregated in 20 different districts comprising a total of 39 camps. Besides these there are 3 other districts—Arusha, Kondoa-Irangi and Pangani—in which no lepers have been segregated yet.

It has been our endeavour to follow closely on the policy developed by the Germans, *i.e.*, segregation of all lepers in suitable camps and the centralisation of these camps consistent with the varying conditions, local, tribal and economic, in each district. The actual conditions of life and the administration of the camps depend largely on the Political Officers, who operate on the allocations of money set aside for the purpose; and a great deal of help from them is acknowledged gratefully.

It has been impossible for Medical Officers to undertake more at present than periodic visits, and to distribute drugs and dressings to the dressers and guards at the various camps. The camps consist chiefly of wattle and daub huts. Others are better constructed and possess iron roofs and a few are masonry houses. The settlements with their surrounding cultivations in some instances extend over several square miles. An estimate based on returns from 11 stations indicates that at least 50 per cent. are self-supporting. The allocations from the Leper Vote are distributed for the purpose of sustaining the maimed and for providing clothing, blankets, hoes; etc., as demands arise. During 1921 £248 was expended for clothing and blankets, besides the quantities issued from the Medical Store.

Several of the camps are under close supervision by the various Missions established in the Territory, to the members of which we are indebted for their sympathetic ministrations to these unfortunate sufferers.

The estimate under the sub-head Lepers for 1921 was £5,600; of this sum £4,449 was allocated and £3,380 expended. It is now proposed to give a short account of the conditions in each district.

Arusha.

The Medical Officer reports that there are few lepers, and that none are segregated.

Bagamoyo.

The camp is at Nungwe at a distance of about three miles. There are 87 segregated, 30 per cent. of whom are able-bodied. They occupy stone houses with iron roofs. The Sub-Assistant Surgeon, Bagamoyo, supervises two dressers, who are resident.

Eighty blankets and seventy-one units of clothing were issued to this camp from the Medical Store.

It was suggested by the District Political Officer that the lepers might be transferred to Songa-Songa Island opposite Kilwa.

Bukoba.

Estimated numbers of lepers in the district 250, of which there were 113 segregated at the following camps during the early part of the year.

Kamachumo	..	..	..	..	79
Kabarai	..	..	..	..	12
Bushasha	..	..	..	..	6
Kibumbiro	..	..	..	..	16
Total	..	..	..	..	<u>113</u>

It has now been decided that three camps should be formed situated to the north, centre and south of the district respectively. The sites have been selected and the employment of a clerk and two guards has been sanctioned.

Dar-es-Salaam.

The camp is at Nunge, about half an hour away by motor boat. There were 96 inmates during the year, 70 per cent. of whom were able-bodied. The housing consists of twelve huts, of four rooms each, some of which have iron roofs. There are two attendants. Sixty-five units of clothing were supplied from the Medical Store.

Dodoma District.

The camp is situated five miles away from Makataporu, a station up the line from Dodoma. Inmates 81. New huts have been constructed and hoes supplied during the year. Mr. Hignell, the District Political Officer, has taken considerable interest in this camp and has permitted the keeping of a small herd of cattle for the milk-supply of the lepers.

Iringa.

The camp is at Madibira. Inmates 100, able-bodied 78 per cent. Reverend Father Ciravigna has taken considerable interest in this camp. A time-expired King's African Rifles Askari was appointed as a guard.

Kilwa.

There are seven camps with a total of 312 lepers distributed as follows:—

Kibata	..	..	..	113	Mariwe	..	..	41
Liwale	..	..	..	75	Madaba	..	..	37
Mavudji	..	..	..	22	Nakihu	..	..	4
				Kisiwani-Kiswere	..	..	20	

The inmates are mainly self-supporting, but salt, cloth and blankets have been purchased and supplied.

It has been decided to concentrate on three centres, *i.e.*, Liwale, Kibata and Mariwe.

Kondoa-Irangi.

Estimated leper population 150, chiefly in the Mkalama district. None segregated. £36 was allocated for possible eventualities.

Kasanga (on Lake Tanganyika.)

There are three camps. Mwene with 39 inmates, Kerenge Island with 38, and another containing 12 situated a mile away from Mwazy Mission.

The majority of these lepers are self-supporting, and there is a guard at each camp. It is estimated that another 300 lepers remain unisolated. Kerenge Island has been referred to in the Sanitation report, in which it was hinted that the leper population of the territory amounting to 4,000 lepers might be segregated on it. From a description of the island by one of the past District Political Officers one gathers that it is scarcely able to support the numbers already resident.

Lindi.

There are 24 lepers segregated at Masasi, which is the only camp at present. The estimated numbers and distribution of those still at large are as follows:—

Lindi Sub-district	..	..	..	48
Mikindani	..	..	..	67
Newala	..	..	..	105
Masasi	..	..	..	50
Tunduru	..	..	..	50
Total	..	..	..	<u>320</u>

Since enquiry was made as to their probable numbers, several lepers crossed the border into Portuguese territory. During the year clothing and blankets were issued to Masasi.

Mahenge.

This camp is situated two miles away near St. Raphael's Mission, and consists of small villages of wattle and daub huts. There are 394 inmates.

No less than 213 are crippled and have to be supported.

Morogoro.

Number of lepers 767 distributed over 14 camps.

Sub-district.	Morogoro.	Kissaki.	Kilossa.
Number of Camps	8	2	4
„ „ Attendants	3	2	3
Self-supporting	60%	70%	50%

During the forthcoming year it is proposed to concentrate the lepers of the Morogoro Sub-district into three camps. Two of the main camps will be at Makome and Segesse.

Lushoto.

The camp, containing 81 lepers, is at Malalo. There are 13 sun-dried brick buildings, of 3 to 5 rooms each, which can afford accommodation for 100 inmates.

This camp is one of the most expensive to administer. The surrounding country is unfertile and fuel difficult to obtain.

Mr. Watts, the District Political Officer, who was stationed at Lushoto during 1920, planted eight acres of wattle as a prospective source of fuel for the future.

There is a native superintendent in charge. As there is a scarcity of fresh food, the slaughter of one ox a week has been sanctioned. Eighty blankets were issued during 1921 from the Medical Store.

The annual allocation was £1,350.

Moshi.

There is only one settlement of 25 lepers, about five miles away from Moshi, at Uru. It is estimated that there are another 30 in the district. The lepers are well provided with clothing and blankets. The Roman Catholic Missionaries have been kind enough to undertake the supervision of this camp, and an annual sum of £72 has been allocated for this purpose.

Pangani.

The estimated number, not yet segregated, is 100.

Rufiji.

Sub-district.	Number segregated.	Self-supporting.
Utete ..	31 ..	90%
Mohoro ..	55 ..	30%

Songea.

Two camps, one at Peramiho, the other at Lunda Island. At Peramiho there are 240, of whom 173 are self-supporting. This camp consists of 146 huts and 2 brick huts. A small rental is paid to the Roman Catholic Mission for the latter. The members of this Mission have taken a keen interest in the welfare of the lepers. At Lunda Island on Lake Nyasa, two hours away by canoe, there are 114 lepers

This island is a barren rock with little suitable land for cultivation. There is an attendant in charge.

Dr. Wigan, of the Universities Mission Society, who has shewn great interest, has been good enough to permit two Nursing Sisters to visit the island twice monthly. A sum of £233 was allocated during the year for both the camps, a small portion of which has been placed at the disposal of Dr. Wigan for the supply of any immediate necessities required by the sick.

Tabora.

The leper population of this district is estimated at 782. There are two settlements. One at Mihambo in the Tabora Sub-district, containing 46 lepers, 40 of whom are able to work. The other in the Kahama Sub-district at Bwenda, containing 40 lepers, of whom only 12 are more or less able-bodied. It is proposed, and £306 has been allocated for the purpose, to segregate the remainder at settlements situated as follows:—

At Ndala, 38 miles away on the main road from Tabora, where they will be under the supervision of the White Fathers.

At Ibelomalundi and at Kinamazye.

The crippled will be segregated at Ndala. The able-bodied, at the two remaining camps, which should be self-supporting.

Tukuyu.

The settlement, which is a series of villages and cultivations, is situated about 11 miles away from Tukuyu; it is the largest in the territory and covers an extensive area. The total inmates are 803, male adults 375, female adults 378, and children 50. About 50 per cent. are self-supporting and grow enough produce to support the others; the demands on our funds therefore are small.

The annual allocation is £90, which is spent chiefly on clothing and hoes.

Tanga.

There are 23 lepers isolated in eight different small camps. The proposal is to concentrate them in one camp. A sum of £250 was allocated for the purpose of building eight large huts and for maintenance. It was considered that this should suffice, but we were informed that £370 was necessary. The question is still pending.

The above is a statement of the position as it stands. From the administrative point of view it is clear that the segregation of a known leper population of 3,920, situated in groups hundreds of miles apart,

on Kerenge Island in Lake Tanganyika, or on Songa-Songa Island off the sea coast of Kilwa, or even in half a dozen camps, are not practical propositions. Nevertheless it is considered that there is a distinct possibility of the able-bodied lepers, within reasonable distance of the railway line, being ultimately drained into one large camp. It must be remembered, however, that the well-watered and fertile areas are occupied already by large healthy populations who have nowhere else to go to. The problem is therefore one not to be approached lightly, but will demand serious consideration before any attempt to concentrate lepers on a large scale is undertaken. Apart from the time and organisation that would be required, the transport, food-supplies, temporary camps, the permanent camp and the maintenance of the lepers prior to the maturation of their crops, would be a matter of no little cost.

TREATMENT.

Hitherto little or nothing in the way of specific treatment has been undertaken. The Director of the Laboratory has, however, treated a small series of lepers with the Ethyl Esters of Chaulmoogra Oil with apparently encouraging results in the earlier cases. There is also little doubt but that most authorities are agreed as to the efficacy of the latest therapeutic agents, such as the Morrhuates, Soyates, Chaulmoogrates, etc., provided the treatment is persevered with over long periods of time. That being the case it must be conceded that the general adoption of any method which entails the whole time attention of a medical expert for months, if not years, before results may be expected, is impracticable at present.

Another aspect of the case which must not be lost sight of is that our control over the lepers in the various camps is merely a nominal and moral one. There is little to prevent these people from decamping. It is very unlikely that without greater control, which naturally would involve large expense, that the native would allow himself to be subject to extended series of injections, unless immediate and obvious amelioration of his condition becomes evident. The net result would be desertion on a large scale. This contingency must be avoided at all cost and treatment with injections, which might at times be painful, must not be adopted without the greatest caution.

Following on the results obtained by Cawston with Oscol Stibium, Dr. Wallace, the Medical Officer, Arusha, tried this preparation in one instance and reported that the patient "appeared to be cured and was discharged as improved." It is unfortunate that more detail is not to hand.

From the literature it certainly would appear that Oseol Stibium achieves equal success in a much shorter space of time than the Ethyl Esters and other derivates of Chaulmoogra, Cod-liver and oils of a similar structure, and holds out more hope of general application, bearing in mind the conditions in this Territory, than the latter.

MALARIA.

15,272 cases with 12 deaths were reported. With the exception of a few microscopical examinations by medical officers, and slides, from the cases shewn against the hospitals at Dar-es-Salaam, examined by the Director of Laboratory, and commented upon in his section of this report, no examinations were undertaken. The cases returned under the different sub-heads have all been shewn therefore as Malaria. While it is doubtful that all these cases are of Malarial origin, there can be none at all that the majority are. It is quite evident from the distribution of the returns that all the notoriously malarious stations are prominently represented, as might be expected.

BLACKWATER FEVER.

42 cases, with 7 deaths, which is a low death rate. The different classes affected are tabulated as follows:—

	European Officials.	European General Population.	Asiatic Officials.	Asiatic General Population.	African Officials.
Bukoba	—	—	1	1	—
Dar-es-Salaam					
European Hospital	2	—	1	1	—
„ Native Hospital	—	—	9	—	3
Kigoma	—	—	1	—	—
Lindi	1	—	—	—	—
Lushoto	—	—	1	—	—
Mafia	—	—	2	—	—
Morogoro	1	1	1	—	—
Mwanza	1	2	—	—	—
Pangani	—	1	—	—	—
Shinyanga	—	—	1	—	—
Tabora	1	—	—	—	—
Tanga	2	1	4	—	—
Tukuyu	—	1	—	1	—
Utete	—	1	—	—	—
	8	7	21	3	3

From this table it will be observed that the bulk of the cases, as is usual, has been among the Asiatic Staff. This class of officials is usually housed in the most malarious quarters of the town. He generally uses a mosquito net, but does not otherwise take any precaution to protect himself; and rarely, if ever, adopts systematic quinine prophylaxis. He avoids treatment as much as possible, and discontinues it shortly after the active symptoms of malaria subside, as a consequence he becomes a chronic carrier and a potential blackwater case.

While quinine prophylaxis is regarded by some authorities as of little value, nevertheless, under ordinary civil conditions, when systematically taken, it is, if the experience of observers extending over many years in Eastern Africa are of any account, a most valuable method.

During 1921 we issued 12,000 tabloids and 3 cwts. of quinine solution to the Railway Department alone.

MEASLES.

267 cases and 1 death. The epidemics appear to be very localised.

PARATYPHOID.

Two cases. The Director of the Laboratory has remarked on this group in his report.

PHLEBOTOMUS FEVER.

Six cases. This fever is occasionally observed and is of the three days' type. The common phlebotomus of Eastern Africa is *P. Africana* var. *Minutus*, and presumably it is the vector.

PLAGUE.

This has been fully dealt with in the Sanitation Section. It is in endemic form, and its epidemiology appears to be identical with South African experience. Its periodicity conforms with the meteorological conditions noted by Brooks, Dold, and others. It is prevalent chiefly during the cool moist season and dies down during the hot weather.

PNEUMONIA.

327 cases with 51 deaths. That some of these cases were of influenzal origin, rather than true Lobar Pneumonia, is more than probable—the death rate of the latter amongst natives is, as a rule, much higher.

RELAPSING FEVER.

29 cases and no deaths. More than a third of these cases were contracted on the Kilossa-Iringa road and are shewn under the returns opposite Iringa, The European Hospital, Dar-es-Salaam, and Tabora. It appears to be a rather milder infection than is seen elsewhere, and complications are rare. Neosalvarsan has given good results, but more than one, sometimes three, injections have been necessary in some instances. One case was treated satisfactorily with Sulfarsenol.

This disease is widespread throughout the Territory, but nowhere so bad as on the road mentioned. The vector, as in most places, is *Ornithodorus Moubata*. There is one other *Ornithodorus* recorded for this Territory, *i.e.*, *Ornithodorus Morbillosus*, which was discovered at Lake Jipe, in the Moshi district, in October, 1862; but of this species nothing has been heard since; it would be interesting to know whether it still exists.

Regarding prophylaxis a circular was issued containing the necessary recommendations. District Officers were requested to bring the circular to the notice of all intending travellers along infected routes.

SMALL POX.

See Sanitation Section.

SYPHILIS.

See Venereal Diseases.

TETANUS.

Three cases—apparently all recovered. It is a comparatively rare disease and by no means invariably fatal even without specific treatment.

TUBERCULOSIS.

202 cases with 34 deaths. With the exception of Moshi and certain of the smaller stations, regarding which I am inclined to the view that probably the diagnosis in some of the cases has been obscured by other pulmonary affections, such, for example, as those incident on influenza, one is obliged to conclude that lung tuberculosis is prevalent in the larger towns to an unpleasant degree.

The ordinary routine of work at native hospitals makes the discovery of early cases of Phthisis difficult. A native comes to a busy out-patients'

department, in charge of a sub-assistant surgeon or compounder, complaining of cough, and unless there is some other obvious reason leading to a suspicion that the patient is suffering from something other than an ordinary catarrhal bronchitis, he is almost certainly not shewn to the Medical Officer.

He returns sometime later in an advanced and generally hopeless condition, is admitted to hospital or isolated, and dies shortly after. The case mortality of the three towns, Dar-es-Salaam, Tabora and Tanga, is 27 per cent., that is over 1 in 4 of the admissions die.

I am in favour, entirely, of notification and treatment in isolation hospitals, but whether much can be done in the way of after care is a different matter and remains to be seen.

YAWS.

1,109 cases with 5 deaths. The returns of this disease are little indication of its actual prevalence. It is one of the most widespread diseases of Tropical Africa. There are some districts where it is rife, and would appear to assume epidemic proportions. Neokharsivan has been used with good results, but usually at least two injections have been necessary.

Dr. Reid, the Medical Officer of Tukuyu, and Mr. Kelkar, the Sub-Assistant Surgeon at Iringa, have, however, used intravenous injections of Tartar Emetic with some success. A short and interesting paper by Dr. Reid on this method is included in the appendix.

Bismuth Sodium and Potassium Tartrate has also been used for Yaws by intravenous injection, but although the treatment has not been carried out during the year under review the results obtained are of sufficient value to warrant the inclusion of a note in the appendix.

It will be seen that this salt is as efficacious as, if not even more so, than Neokharsivan, and at approximately three-hundredths of the cost.

HELMINTHIASIS.

A total number of 6,780 cases of Helminthiasis has been diagnosed, a fair proportion of them microscopically. This total is minute in comparison with the probable numbers of infections existent among a population of over 4,000,000 natives. It is well known that throughout Tropical Africa, as elsewhere, a high incidence of intestinal parasitism prevails. The different species have not been shewn separately, as there

is little interest attached to a mere record of cases. The Trematodes are comprised chiefly of Bilharzia, Cestodes of Taenia Saginata, the Nematodes of Ascaris Lumbricoides and a few of Ankylostomes. Table "G" shews the distribution for the various stations. In order, however, to bring to notice the importance of this subject some pre-war figures, which came into my possession during 1918, due to the courtesy of the Honourable Charles Dundas, the present District Political Officer, Moshi, of an investigation conducted by the Germans in the Moshi District, are enlightening. The sub-districts investigated were Uru, Kiboscho, Kindi, Namuru and Madshame. Thirty akidaships were examined, making a total of 24,510 examinations with an average of 36·8 per cent. of infections. Treatment as a prophylactic means against Helminthiasis is out of the question. The fundamental basis of prophylaxis, in this connection, is the improvement of rural sanitation by the employment of trained itinerant district native sanitary superintendents, working under the Political or Medical Officer, as the case happens to be. This proposed organisation is of prime importance for the welfare of the natives, and the reduction, generally, of various ills throughout the Territory.

TRYPANOSOMIASIS AND TSETSE FLY.

There were no cases of Trypanosomiasis reported during 1921, but there can be little doubt that, with the vast areas over which Tsetse Fly is prevalent in this Territory, cases of Trypanosomiasis exist. The shores of Lake Tanganyika and Victoria Nyanza are still fly infested, although the measures taken, before our occupation, in connection with *Glossina Palpalis* have materially reduced its area of distribution. *Glossina Morsitans*, the vector of *T. Rhodesiense*, occupies the greater proportion of the Territory, and although no cases of this form of Trypanosomiasis have been recorded hitherto as originating north of latitude 9 degrees south, there is no reason whatever to suppose that no such cases are occurring or may occur. *Glossina Pallidipes* also has a wide distribution, and the probability of this fly being a vector cannot be ignored. Of the other species recorded there are only two, *i.e.*, *Glossina Austeni* and *Glossina Brevipalpalis*, but they are of little or no practical importance. Provided we can receive early intimation of suspicious cases and deaths our position is secure; but it would be advisable to ascertain, by investigation, exactly how we stand. This can well be accomplished

by the addition of a small staff to the Game Department. This department carried out most interesting work in connection with tsetse during the year and initiated a vast scheme aimed at fly reduction by the organised burning of bush at the driest season of the year. The Game Warden himself is, in my opinion, second to none in his knowledge of the bionomics of *Glossina Morsitans* and no more suitable person than himself could be selected for the purpose of directing this organisation, which would resolve itself into a sub-division of his department. He has put forward, among other suggestions, that a veterinary pathologist and an ecological botanist should be appointed, and at my instigation a medical pathologist likewise. As regards sleeping sickness investigations, I have submitted elsewhere that at least three Medical Officers be appointed—one each for Lake Victoria Nyanza and Tanganyika and for the Rovuma area. These officers should take the ordinary course at one of the Tropical Schools, and an advanced course on Protozoology, devoting special attention to Trypanosomes. On arrival they should be seconded for tsetse work under the supervision and advice of the Game Warden, and when sufficiently expert should then proceed to the areas mentioned. They would be then be in a position to do independent investigation and research of immediate value.

VACCINE LYMPH AND VACCINATION.

In the annual report for 1920 the disappointing results obtained by the different preparations of vaccine lymph used, was commented upon.

In his section of this report the Director of the Laboratory has made detailed reference to the local manufacture of vaccine lymph, and the Senior Sanitation Officer has also remarked upon its efficacy. The reports received from Medical Officers and the Subordinate Medical Staff have been favourable. It might not be without interest therefore to make some observation on the financial side of this question.

During January, 1921, a definite scheme was evolved in conjunction with the Acting Chief Veterinary Officer, whose co-operation and that of the members of his staff have proved of the greatest value, and a sum of £400 was sanctioned for the purchase of cows and calves, which were obtained, as required, from the Dodoma district, and entrained to Dar-es-Salaam.

The Veterinary Department undertook the care of the cattle, supplied calves to the Director of the Laboratory from time to time, and we accepted debit against all expenditure. The cattle when useless for our

purpose were sold, the proceeds credited to us, and more cattle purchased. As the result of this procedure we issued 140,175 doses for our own consumption, supplied 33,500 doses to the Zanzibar Government, and came out £216 to the good over and above the £400 originally allocated.

Receipts.	Shs.	Expenditure.	Shs.
Proceeds of sales of cows and calves ..	3,637·50	Purchase price of cattle, herding, foodstuffs, and railway freights	6,013·44
Sale of vaccine to Zanzibar Government	6,700·00		
Total ..	<u>10,337·50</u>	Total	<u>6,013·44</u>

Credit balance between receipts and expenditure, Shs. 4,324·06.

With this satisfactory result may be contrasted the fact that hitherto we have spent £697 a year for 59,900 doses of poor quality imported lanolinated vaccine.

Table showing total number of vaccinations returned from the following stations :—

Arusha	500
Bagamoyo	2,815
Dar-es-Salaam	2,683
Dodoma	261
Iringa	22,114
Kondoa-Irangi	235
Lindi	154
Lushoto	10,872
Mwanza	4,000
”	10,000*
Songea	8,550
Tabora	4,763
Tanga	68,949
Tunduru	380
Tukuyu	2,268
	<u>138,544</u>

The Director of the Laboratory issued during the year 145,875 doses of lymph, including 140,175 doses of the lymph prepared by him and 5,700 doses of imported lanolinated lymph ; which means that of the total vaccinations a possible 5,700 were vaccinated with imported lymph, the rest numbering 121,844 with local lymph.

Of the 121,844 vaccinations with local lymph 20,651 were inspected, and 64·66 per cent. were returned as successful. Of vaccinations

*With lymph obtained from Uganda.

at Zanzibar with the same lymph the Medical Officer of Health reported 71.9 per cent. as successful.

It would appear, therefore, that 1 individual in 34 of the native population of this Territory was vaccinated with a high grade lymph during 1921, and that about 1 in 55 derived some immunity to small pox.

The Director of the Laboratory has stated that the production of vaccine could be largely increased by an addition of three extra stalls to the present accommodation. I consider, however, that the laboratory site is not suitable for further expansion, being situated as it is in the residential European Quarter and practically within the grounds of the European Hospital. My view is that we should have a new and up-to-date Vaccine Laboratory in charge of a whole-time worker, acting, of course, under the supervision of the Director of the Laboratory. As to whether the Vaccine Laboratory should be at Dar-es-Salaam or Mpapwa will have to be decided later. So long as Dar-es-Salaam remains the headquarters of the Medical Department, for administrative reasons it should have preference.

I am strongly in favour of a thoroughly organised system of district native sanitary superintendents, whose duties would include vaccinations, and of developing these branches of prophylaxis to their utmost limits.

VENEREAL DISEASES.

It is noted that the returns shewn under Gonorrhœa and Syphilis, for the six months April to September, 1920, in the annual report of that year, for the following ten stations, Arusha, Bagamoyo, European Hospital Dar-es-Salaam, Lindi, Lushoto, Moshi, Mwanza, Rufiji, Tabora and Tanga, give a total of 270 cases of the former and 471 of the latter.

Taking these same stations the figures for the whole of the year 1921 are, Gonorrhœa 325 and Syphilis 967 cases.

For the above mentioned 10 Stations.	Six months April to September, 1920.	Calendar Year, 1921.
Gonorrhœa	270	325
Syphilis	471	967

The sick rate, therefore, compares favourably with that of the previous year.

For the 31 stations from which returns were received the totals for venereal diseases during 1921 are :—

Gonorrhœa	1,219 cases.
Syphilis	2,446 ..

The figures with regard to Gonorrhœa are of little value as an indication of its prevalence. It is a common disease. The majority of African natives have suffered, or are suffering, from Gonorrhœa in its acute or chronic forms.

The African attaches little or no importance to the disease, and only applies for treatment when the attack is unusually severe, or for relief of one or more of the painful complications or sequelæ that might arise. Gonorrhœa is less frequently a generalised disease and does not incapacitate him to the same degree as does Syphilis, which in its primary stages is usually severe, apart from the rash and constitutional debility that develops later. It is still further unlike Syphilis in that a comparatively short course of treatment does not render the subject non-infective. That Venereal Treatment Centres, except as means of alleviating immediate suffering and the prevention of sequelæ, are likely to make any appreciable impression on the mass of this disease, appears doubtful, unless some more effective and less prolonged method of treatment is evolved. The psychology of the African is not such that one or even more attacks of Gonorrhœa are likely to deter him from promiscuous connection, or encourage him to exercise his powers of abstinence. Infection, and reinfection, is therefore merely a matter of time. While this is so and we have, at present, no institutional centres, yet measures have been taken to insure that all sufferers shall be treated at the various hospitals and dispensaries throughout the territory. That as far as possible venereal inspections of King's African Rifles and Police Askari shall be conducted periodically and adequate treatment rendered. For this purpose, besides the stocks left over from the previous year, we have distributed during 1921 for the treatment of both Gonorrhœa and Syphilis the following remedies, and the necessary appliances for their use :—

Neokharsivan .. .. .	..	1,401 doses.
Mercurial Cream, 2 oz. bottle	..	65
Calomel .. .. .	..	57
Mercurial Cream Hypoloids ..	..	568
Potassium Permanganate Soloids	..	9,400
Zinc .. .. .	..	1,800
Argenti proteinate Soloids ..	..	8,300
Blackwash Soloids .. .. .	..	400
914 Apparatus .. .. .	..	9 sets.
Stills .. .. .	..	12
Cripps Irrigators .. .. .	..	6
Nozzles .. .. .	..	8

Syringe All Glass (B. & W.)	20 mins.	40
" "	60 "	8
" "	3 c.c.	2
" "	5 "	12
" "	10 "	16
" Record, with peripheral nozzle ..	10 "	12

SYPHILIS.

There were 2,446 cases of this disease returned :—

Primary Syphilis	684
Secondary "	1,723
Congenital "	39

The general impression given by these figures is that the coastal towns suffer less from Syphilis than the inland towns. It is difficult, however, to arrive at definite conclusions without more precise data than are available at present. It would be interesting to know what the floating population of each of the towns has been during the year, what proportion of the raw native population of a large town such as Tabora, the greater part of which is practically under rural conditions, supplied the cases recorded, as opposed to those which originated among its more strictly urban population. One would like to have figures relating to the tribe, religion, marital state and occupation of each patient. If the supply of cases depended on venereal infection among the rural population one would expect Tabora, with a population of 18,299, to return a much larger number than 12·5 per 1,000. Arusha, with a population of 1,000, returned 288 cases of Syphilis, no less than 71 of which were among females. Bukoba, with a population of 1,150, returned 344, of which 47 were females; and Mwanza, with a population of 4,554, returned 268, of which 25 were females. All these females were town-dwelling prostitutes. The menace to the health of the community is obvious.

Bearing on the question of prophylaxis and legislation, extracts of references taken from the Annual Medical Reports are brought to notice.

Arusha.

The Medical Officer reports that such numbers of the King's African Rifles Detachment, in residence since the 15th July, 1921, reported sick during October, that an explanation was asked for by the Officer Commanding King's African Rifles, Dar-es-Salaam. Among other

reasons the ill-health was attributed to the numbers suffering from Venereal diseases.

Iringa.

The Sub-Assistant Surgeon found it necessary to put into operation the following measures:—

- (1) Venereal inspection twice every week.
- (2) Surprise inspection for venereal diseases every fortnight.
- (3) All females desirous of living with the Askari were thoroughly examined and a "fit" pass issued before they were allowed to take up residence in Government quarters and lines.
- (4) No stray females were allowed to wander in the lines without the permission of the Officer Commanding.

He also goes on to note: "A new and well built Tembe was prepared during the year for the reception and treatment of Venereal patients."

Bukoba.

The Medical Officer remarks, that "prostitution is common, and most, if not all, of the known prostitutes we see are infected." Bukoba, as will be observed from the table, holds the worst record in the territory for both Gonorrhœa and Syphilis.

Songea.

"Syphilis is very prevalent." "The presence of a Garrison with men and women continually on the move might account for the large percentage of the cases." The Medical Officer, remarking on the health of the Police, states: "During the year 1921 there were 24 Police cases admitted into the hospital—the majority of the cases were of Gonorrhœa and Syphilis."

"There are two Venereal Wards, one for males of 14, the other for females of 6, beds."

Tukuyu.

The Medical Officer notes: "Gonorrhœa is very uncommon in the district; the cases treated being chiefly imported from Nyasaland by King's African Rifles Askari returning from leave."

"Syphilis. Weekly examinations of the Askari of the King's African Rifles have been carried out at Massoko. The Police Constables and Prisoners have also been examined periodically, and any cases found have been treated."

It is clear that we must concentrate on towns. We have already provided, and can continue to provide, for treatment. Weekly inspections of King's African Rifles and Police Askari, by the Medical Officer or his deputy, must be established.

The repatriation of vagabond natives of the neighbouring colonies should be considered and if possible carried out. It is felt that the time is not yet ripe for legislation on the lines of the Uganda Venereal Diseases Rules, but the data that have emerged from the annual reports indicate that some powers for facilitating the compulsory examination and treatment, until discharged as non-infective, of individuals who are known carriers and disseminators of Syphilis, is required, which need only be applied if moral suasion fails.

(c)—EUROPEAN OFFICIALS.

Deaths.—The following deaths occurred :—

Chronic Nephritis	..	..	..	..	I
Malaria	..	..	..	..	I
Blackwater Fever	..	..	..	..	I
Cardiac Failure	..	..	..	..	I

Invalidings.—The number of invalidings shewn in the following table includes all Officials upon whom Medical Boards have been held, resulting in recommendations being made either (a) to be permanently invalidated, or (b) to proceed to England for treatment and reconsideration. The illnesses upon which these recommendations were made were as follows :

(a) To be permanently invalidated (3) :—

Gunshot Wound	..	..	..	..	I
Subtertian Malaria and Debility	..	..	..	..	I
Neurasthenia	..	..	..	..	I

(b) To proceed to England for treatment and reconsideration (6) :

Double Inguinal Hernia	..	..	..	..	I
Blackwater Fever	..	..	..	..	I
Debility	..	..	..	..	2
Malaria	..	..	..	..	I
Rheumatic Fever	..	..	..	..	I

TABLE "B."—TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES OF EUROPEAN OFFICIALS DURING 1921.

	Arusha.	Bagamoyo.	Bukoba.	D'Salaam.	Iringa.	Kigoma.	K-Irangi.	Lindi.	Mwanza.	Pangani.	Songea.	Shinyanga.	Tabora.	Tanga.	Tukuyu.
1. Total number of Officials Resident	24	4	13	300	10	18	11	41	27	5	17	1	55	—	33
2. Average number Resident ..	12·8	3	7	252	7·5	18	6·6	17	20	4	10·8	1	55	—	23
3. Total number on Sick List ..	9	3	2	274	14	11	1	24	17	4	4	—	129	23	16
4. Total number of days on Sick List	143	16	20	2,179	155	34	11	184	272	62	84	—	504	296	96
5. Average daily number on Sick List	·4	·04	·05	6	·42	·09	·03	·50	·79	·17	·23	—	0·75	0·81	·26
6. Percentage of Sick to average number Resident	70·3	100	28·5	108	186·6	61·1	15	141	85	100	37	—	234·5	—	69·5
7. Average number of days on Sick List for each patient.. .. .	15·8	5·3	10	7·9	11	3	11	7·6	16	15·5	21	—	3·9	12·8	6
8. Average Sick Time to each resident	11·1	5·3	2·8	8·6	20·6	1·9	1·6	10·8	13·6	15·5	7·6	—	9·1	—	4·1
9. Total number Invalided ..	—	—	—	2	1	—	—	1	—	—	—	—	—	—	1
10. Percentage of Invalidings to total Residents	—	—	—	·6	10	—	—	2·4	—	—	—	—	—	—	3
11. Total Deaths	—	—	—	3	—	—	—	—	—	—	—	—	1	1	—
12. Percentage of Deaths to total Residents	—	—	—	1	—	—	—	—	—	—	—	—	1·8	—	—
13. Percentage of Deaths to average number Resident	—	—	—	1·2	—	—	—	—	—	—	—	—	1·8	—	—
14. Number of Cases of Sickness contracted away from residence	—	—	—	—	12	—	—	—	—	—	—	—	1	—	—

Reports from the following Stations have either not been available or not complete enough for inclusion in the above table :—
 Dodoma, Kahama, Kasanga, Kilossa, Kilwa, Lushoto, Mafia, Mahenge, Mbulu, Morogoro, Mohoro, Moshi, Musoma, Singidda, Tunduru and Utete.

(d)—ASIATIC OFFICIALS.

Table showing deaths of Asiatic Government Officials during the year :—

Blackwater Fever	..	..	..	3
Heart Failure	..	..	..	2
Enteric	..	..	..	1
Pneumonia	..	..	..	2
Plague	..	..	..	1
				<hr/>
				9
				<hr/>

The following table shows the number of Asiatic Government Officials invalided in the year :—

Blackwater Fever	..	..	..	2
Tuberculosis	..	..	..	1
Chronic Rheumatism	..	..	..	1
Loss of Vision	..	..	..	1
				<hr/>
				5
				<hr/>

(e)—EUROPEAN NON-OFFICIALS.

There were 22 deaths among European Non-Officials from the following causes :—

Septicæmia	..	..	..	2	Typhoid Fever	..	..	1
Premature Birth	..	..	1		Myocarditis	..	..	1
Child Birth	..	..	1		Alcoholism	..	..	2
Abdominal Disease	..	..	1		Blackwater Fever	..	..	2
Dropsy	..	..	..	1	Syncope	..	..	1
Bronchitis	..	..	..	1	Cerebral Hæmorrhage	..	1	
Heart Failure	..	..	..	3	Pyrexia of uncertain origin	1		
Pneumonia	..	..	..	1	Tuberculosis	..	..	2

The total number of cases treated at Government Hospitals and Dispensaries during the year was 998.

TABLE "C."—TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES OF ASIATIC OFFICIALS DURING 1921.

	Arusha.	Bagamoyo.	Bukoba.	D'Salaam E.H.	Iringa.	Kigoma.	Lindi.	Mwanza.	Pangani.	Shinyanga.	Tabora.	Tanga.
1. Total number of Officials Resident ..	8	7	10	509	3	33	17	12	5	2	190	—
2. Average number Resident	5.1	7	8	425	2.1	—	9	10	5	2	172	—
3. Total number on Sick List	4	4	4	188	1	47	14	5	1	2	1,675	99
4. Total number of days on Sick List ..	24	24	24	1,231	34	150	127	37	22	10	5,321	1,219
5. Average daily number on Sick List ..	.06	.06	.06	3.3	.09	.41	.34	.1	.6	—	14.5	—
6. Percentage of Sick to average number resident	78.4	57	50	44.2	47.6	—	155.5	50	20	100	973.8	—
7. Average number of days on Sick List for each patient	6	6	6	6.6	34	3.9	9.07	7.4	22	5	30.9	12.31
8. Average Sick Time to each Resident..	4.7	3.4	—	2.9	16.1	—	14.1	3.7	4.4	5	3.1	—
9. Total number Invalided	—	—	—	1	—	—	1	—	—	—	—	—
10. Percentage of Invalidings to total Residents	—	—	—	.19	—	—	5.8	—	—	—	—	—
11. Total Deaths	—	—	—	1	—	—	—	—	—	—	—	—
12. Percentage of Deaths to total Residents	—	—	—	.19	—	—	—	—	—	—	—	—
13. Percentage of Deaths to average number Resident	—	—	—	.23	—	—	—	—	—	—	—	—
14. Number of Cases of Sickness contracted away from residence	—	—	—	—	—	—	—	—	—	—	—	—

Reports from the following Stations have either not been available or not complete enough for inclusion in the above table:—
Dodoma, Kahama, Kasanga, Kilossa, Kilwa, K.-Iringi, Lushoto, Mafia, Mahenge, Mbulu, Morogoro, Mohoro, Moshi, Musoma, Singidda, Tukuyu, Tunduru and Utete.

REPORT ON THE HEALTH OF THE KING'S AFRICAN RIFLES.

Sufficient data have not been received from all the Garrison towns to enable one to render a complete account, but points of interest extracted from the Medical Officers' annual reports are herewith noted.

DAR-ES-SALAAM.

The total average strength, native ranks and followers, was 573, with a daily average sick-rate of 12. The total admissions was 416, with 5 deaths.

Of these only one was an Askari, who died of Chronic Malaria. Two of the remaining deaths were of female followers and two of boys. The greater number of admissions was due to Malaria and Ulcers of the feet and legs. There were 14 cases of Syphilis and 7 of Gonorrhœa. The majority of the men have wives.

There were three cases of Blackwater Fever. Two of these were of the same platoon, and were admitted within a day of each other. They had previously both suffered from several attacks of Malaria at Lindi. The third case was one of an Askari, who on his return from Somaliland stayed at Tanga for three weeks prior to his departure for Kisumu. While at the latter place he suffered for ten days from fever. He later returned to Tanga and was stationed there for 28 months, during which time he had two severe attacks of pyrexia lasting five days each. Four months after his arrival at Dar-es-Salaam he was admitted for Blackwater.

The attack was severe and there was a relapse; the patient, however, made a good recovery.

A weekly inspection of all ranks and followers is carried out once a week.

A list of the more prevalent diseases is given below :—

Syphilis	14
Ulcers	94
Conjunctivitis	19
Gonorrhœa	7
Malaria	103
Bilharzia	3
Bubo	5
Yaws	2
Ankylostomyasis	6
Injury	7
Colic	14

Diarrhoea	9
Dysentery	15
Abscess	14
Epilepsy	1
Pneumonia	13
Paraphymosis	9
Tape Worm	20
Orchitis	5
Bronchitis	15
Blackwater Fever	3
Guinea Worm	1
Tuberculosis	2
Pregnancy	2

IRINGA.

The average daily strength was ..	200
The average daily number Sick ..	571
Deaths	<i>Nil.</i>

Venereal Diseases treated:—

Gonorrhœa	20
Syphilis	14
Soft Sores	4

LINDI.

The King's African Rifles strength is one Company. Admissions to hospital, 143, the chief complaints being diarrhoea and bowel troubles, conjunctivitis, corneal ulcers, ulcers, gonorrhœa, and local injuries.

The Out-patients attendances reached as high as 80 to 90 a month. Local injuries predominated.

MWANZA.

Average strength	175
Prevailing diseases—Malaria, Bronchitis, Diarrhoea and Conjunctivitis.	
Deaths	<i>Nil.</i>

SONGEA.

Average strength Askari	200
Average strength Followers	300
Admissions	179
Deaths among Askari	1
Deaths among Followers	3

Sickness was due chiefly to Venereal diseases.

The death of the Askari was due to Malaria.

TABORA.

Average daily strength	..	..	53c
Admissions	..	..	599
Death	..	..	1

Among others the following diseases were treated:—

Influenza	..	..	..	263	cases.
Syphilis, Primary	..	..	..	3	”
” Secondary	..	..	..	18	”
” Tertiary	..	..	..	4	”
Gonorrhœa	..	..	..	25	”
Dysentery	..	..	..	2	”
Malaria	..	..	..	45	”
Pneumonia	..	..	..	5	”
Tuberculosis	..	..	..	1	case.
Yaws	..	..	..	1	”

The single death was due to Influenza.

REPORT ON THE HEALTH OF THE POLICE AND PRISONERS.

POLICE.

IRINGA.

Average daily strength	..	..	70
Total number on Sick List	..	..	60
Invalided	..	..	1
Died	..	..	1

The following were the diseases treated:—

Malaria	..	..	..	15
Bronchitis	..	..	..	12
Venereal Diseases	..	..	..	9
Tick Fever	..	..	..	2
Minor Ailments	..	..	..	20

Total 58

KONDOA IRANGI.

Average daily strength	..	..	70
Total Admissions	..	..	15
Total number of days in Hospital	..	..	201
Average number in Hospital	..	..	0.6
Average stay in Hospital	..	..	13
Total Out-patients	..	..	66

There were 11 cases of Venereal Disease, 5 of Gonorrhœa and 6 of Syphilis.

LINDI.

Total admissions	..	..	..	21
Out-patients	..	..	..	214

The Medical Officer notes that the illnesses were due to "the usual native troubles."

SINGIDDA.

One police Askari died during the year.

SONGEA.

Average daily strength	..	..	38
Average daily Followers	..	..	40
Admissions	..	..	24
Deaths among Askari	..	..	1
Followers	..	..	2

Most of the cases of illness were due to Venereal Disease.

TABORA.

Average daily strength	..	..	174
Admissions	..	..	133
Deaths	..	..	2

The following diseases were treated :—

Malaria	..	..	..	21
Influenza	..	..	..	37
Syphilis—Primary	..	..	..	<i>Nil.</i>
" Secondary	..	..	..	5
" Tertiary	..	..	..	1
Gonorrhœa	..	..	..	2
Dysentery..	..	..	..	2
Cirrhosis Liver	..	..	..	1
Other Diseases	..	..	..	63
Total	..	..	..	<u>132</u>

Of the deaths, one was due to Malaria and the other to Cirrhosis of the Liver.

TUNDURU.

There were 58 cases treated. Among minor complaints the following were noted :—

Malaria	..	..	..	8
Phlebotomus Fever	..	..	..	3
Influenza	..	..	..	2
Dysentery..	..	..	..	2

TUKUYU.

Average daily strength	..	..	76
Total Out-patients	..	..	96
„ In-patients	..	..	21
Average stay of In-patients	..	..	11 days.
Deaths	..	..	Nil.

PRISONERS.

DAR-ES-SALAAM GAOL.

The general health has been good.

Daily average numbers in Gaol	..	160
Daily average numbers Sick Parade	..	5
Admitted to Sewa Hadji Hospital (Native Hospital—Dar-es-Salaam)	..	39
Admitted to Native Gaol Hospital	..	43

Those admitted to the Sewa Hadji Hospital included :—

Ankylostomiasis	..	..	..	8
Phthisis	..	..	..	5
Abcesses	..	..	..	3
Dysentery	..	..	..	1
Pneumonia	..	..	..	2
Injuries	..	..	..	3

The five deaths recorded were due to the following causes :—

1. Pyæmia, following operation.
Ischio-Rectal Abcess.
2. Phthisis.
3. Myocarditis.
4. Ankylostomiasis.
5. Pericarditis.

IRINGA GAOL.

Average daily strength	..	..	45
Average daily number Sick	..	..	69
Total Number treated as In-Patients	..	..	4
Deaths	..	..	Nil.

KONDOA-IRANGI.

There were 10 convicts admitted to hospital during the year, of whom one died of Pneumonia : a decided improvement over previous years.

LINDI.

Treated in gaol quarters as In-patients	27
Out-patients	180
No details as to disease are included.	

SONGEA.

Average daily strength	38
Deaths	Nil.

TABORA.

Average daily strength	135
Deaths	10

The following diseases were treated:—

Malaria	35
Dysentery.. .. .	3
Influenza	6
Gonorrhœa	8
Syphilis—Secondary	3
„ Tertiary	1
Yaws	1
Pneumonia	5
Pleurisy	4
Ankylostomiasis	1

Six of the 10 deaths were due to—Pneumonia 2, Pleurisy 2, Ankylostomiasis and Tuberculosis 1. Regarding the remaining 4 there is no record.

TUNDURU.

There were 71 cases treated; of these only the following merit notice:—

Malaria	5
Syphilis	1
Gonorrhœa	1

The other diseases recorded were of a minor nature. There were no cases of Dysentery or Influenza.

TUKUYU.

Average Daily Strength	108
Total Out-patients	429
Total In-patients.. .. .	153
Average Stay of In-patients	75 days.
Deaths	2

SECTION III.
HOSPITALS AND DISPENSARIES.

TABLE "D."

SHOWING STAFF AND HOSPITAL ACCOMMODATION FOR EACH DISTRICT, 1921
(MEDICAL AND SANITARY BRANCHES COMBINED).

	Population.	Senior Medical Officer.	Medical Officer.	Medical Officer of Health.	Government Dentist.	Nursing Sisters.	Sub-Assistant Surgeons.	Compounders.	Native Hospital Staff.	Beds—Medical, Surgical and Isolation.	Native Sanitary Inspectors.	Native Sanitary Staff.
Arusha	97,700	—	1	—	—	—	—	1	7	68	—	12
Mbulu	—	—	—	—	—	—	—	1	1	20	—	4
Bagamoyo	57,100	—	—	—	—	—	1	—	2	48	—	8
Bukoba	320,100	—	1	—	—	—	1	—	14	42	—	16
Biaramulo	—	—	—	—	—	—	—	—	1	—	—	—
Dar-es-Salaam	149,100	1	2	1	1	7	2	2	67	167	10	270
Dodoma	270,900	—	1	—	—	—	—	1	7	40	—	16
Mpapua	—	—	—	—	—	—	—	—	1	—	—	6
Singidda	—	—	—	—	—	—	—	1	1	13	—	5
Kilimatinde	—	—	—	—	—	—	—	1	1	12	—	6
Iringa	104,800	—	—	—	—	—	1	1	6	44	1	16
Malangali	—	—	—	—	—	—	—	—	1	—	—	2
Kilwa	84,000	—	—	—	—	—	1	—	4	—	—	15
Kondoa-Irangi	196,700	—	1	—	—	—	1	—	8	16	—	3
Mkalama	—	—	—	—	—	—	—	—	—	—	—	1
Lindi	243,400	—	1	—	—	—	1	—	11	36	1	27
Tunduru	—	—	—	—	—	—	—	1	1	4	—	5
Mafia	—	—	—	—	—	—	—	1	—	—	—	1
Mahenge	74,600	—	1	—	—	—	—	1	5	14	—	4
Mkasu	—	—	—	—	—	—	—	—	1	—	—	—
Morogoro	174,300	—	1	—	—	—	—	1	5	30	1	44
Kilossa	—	—	—	—	—	—	—	1	4	18	—	12
Moshi	158,200	—	1	—	—	—	—	1	13	30	1	20
Mwanza	702,300	—	1	—	—	—	1	1	26	62	—	73
Musoma	—	—	—	—	—	—	—	1	2	10	—	10
Pangani	74,900	—	—	—	—	—	1	—	3	27	—	9
Handeni	—	—	—	—	—	—	—	—	1	—	—	1
Rufiji	83,200	—	—	—	—	—	1	—	1	—	—	5
Mohoro	—	—	—	—	—	—	—	1	1	—	—	5
Rungwe	237,200	—	1	—	—	—	—	1	7	47	1	—
Mbeya	—	—	—	—	—	—	—	—	1	—	—	—
Songea	148,200	—	1	—	—	—	—	1	3	54	—	3
Milo	—	—	—	—	—	—	—	—	2	—	—	—
Lipumba	—	—	—	—	—	—	—	—	1	—	—	—
Tabora	502,100	1	—	—	—	2	2	2	24	120	2	138
Kahama	—	—	—	—	—	—	—	—	1	—	—	2
Shinyanga	—	—	—	—	—	—	—	1	1	40	—	8
Tanga	86,700	1	—	1	—	3	2	—	36	87	4	109
Ufipa	93,600	—	—	—	—	—	1	—	3	34	—	—
Namanyere	—	—	—	—	—	—	—	—	2	—	—	1
Ujiji (Kigoma)	139,500	—	1	—	—	—	—	—	16	32	2	68
Ujiji	—	—	—	—	—	—	—	—	3	—	—	31
Usambara (Lushoto)	107,400	—	—	—	—	—	—	1	2	—	1	—
Total	4,106,000	3	14	2	1	12	16	22	297	1,115	24	956

IMPROVEMENTS EFFECTED DURING THE YEAR AT THE
FOLLOWING STATIONS:—

ARUSHA.

Ventilators and fire-places were provided for the Asiatic and Native wards. A house was built for the Compounder in the Hospital grounds, also new latrines. Fire-places were built in the European wards and the hospital roof repaired. A new incinerator was constructed in the town.

IRINGA.

A new building was erected in the backyard of the Hospital Compound for the reception and treatment of Venereal Diseases. This building can accommodate 15 patients. An isolation ward with accommodation for four beds was erected at a distance of 200 yards from the town.

A sub-dispensary was established at Malangali and a Native Hospital Attendant stationed there. Two huts were built for this purpose, one for the dispensary, the other for the dresser's quarters. Two small Hospitals, one at Kitonga, the other at the Ruaha Camp, were open till November for the purpose of rendering medical aid to the sick Public Works labourers working at these Camps. The whole town drainage was systematically established.

The Hospital kitchen, a new bathroom and two latrines were built.

New Public Pan-System Latrines were erected. It may be mentioned here that the whole of these improvements have been largely due to the initiative of Sub-Assistant Surgeon Kelkar, who was throughout the year in Medical Charge of this station.

KIGOMA.

Two small isolation wards and one for the treatment of Asiatics have been built.

The Medical Officer reports that they are not sound structurally and will probably require rebuilding.

KONDOA-IRANGI.

The Police Inspectors' quarters have been completely mosquito-proofed.

LINDI.

A hut was built for out-patient work by the Hospital labourers, and a kitchen by the Public Works Department.

PANGANI.

Two public latrines were in the course of construction.

A portion of the meat market was covered with wire gauze.

TUKUYU.

During the year a new Hospital was built by Mr. Murrells, the Assistant Political Officer at Mbeya. This consists of a male ward of four beds and one for females of two beds, a dispensary and a kitchen. These are all built of burnt brick. At Tukuyu the foundations for the building of a dispensary and an office for the Medical Officer have been laid in the Hospital grounds.

Statement of Works put in hand for the Medical Department by the Public Works Department :—

	£
Dispensary, Mbulu	120
Repairs to Hospital, Bukoba	200
Indian and Native Hospital and Dispensary, Dodoma ..	500
Repairs to Native Hospital, Morogoro	200
Dispensary and Drug Store, Kilossa	500
Native Hospital, Moshi	200
Special Repairs to Hospital, Songea	300
Reconstruction of Drainage System, European Hospital, Dar-es-Salaam	800
Mosquito Proofing Maternity Wards, Dar-es-Salaam ..	100
Mosquito Proofing Tanga Hospital	500
General Repairs and Painting to Native Hospital, Dar-es- Salaam	200
Huts for Hospital Attendants, Bukoba	14
Lunatic Asylum, Tabora	100
Dental Surgery, Dar-es-Salaam	25
Total	<u>£3,759</u>

REGISTRATION OF MEDICAL PRACTITIONERS AND DENTISTS.

The Ordinance governing Registration came into force on August 1st, 1920, since when and up to December 31st, 1921, the following have been placed on the Register :—

Registered Medical Practitioners	..	38
Dentists	.. .. .	1
Licensed Medical Practitioners	..	21

The numbers actually on the Register on December 31st, 1921, were as follows :—

Registered Medical Practitioners	..	31
Dentists	.. .. .	1
Licensed Medical Practitioners	..	22

Of the above 31 Registered Medical Practitioners one belongs to the Church Missionary Society, one to the Livingstonia Mission of the Church of Scotland, and three Private Practitioners; the remainder are in Government Service.

The Board convened for the purpose of the Ordinance consisted of:—

Dr. J. B. Davey, President and Registrar.

Lt.-Col. D. S. Skelton, D.S.O.

Dr. C. L. Ievers.

In concluding this section it may be of interest to bring to notice the relationship and co-operation which exists between the Medical and the Sanitation branches of the service. It will be noted that there were only two whole-time Medical Officers of Health, one at Dar-es-Salaam, the other at Tanga. They are in fact Medical Officers seconded from the Medical Staff. A third Medical Officer was seconded for ten months of the year exclusively for Plague duty. One Sub-Assistant Surgeon was also permanently seconded for Dar-es-Salaam.

The remaining Medical Officers, Sub-Assistant Surgeons and Compounders in independent charge, perform health duties at all other stations and submit routine and other reports, some directly to the Senior Sanitation Officer, as occasion demands.

The Monthly and Annual Reports, from all stations, to the Principal Medical Officer include sections and data on sanitary matters, and have, of course, been available to, and utilised by, the Senior Sanitation Officer for the compilation of his report and for statistical purposes.

J. O. SHIRCORE,

Acting Principal Medical Officer, Tanganyika Territory.

TABLE I.—RETURN SHOWING THE MEDICAL STAFF AND THE PRINCIPAL MEMBERS OF THE SUBORDINATE STAFF.

Name and Qualifications.	Rank of Appointment.	Where stationed on 31st December, 1921.	Remarks.
J. B. Davey, M.B. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.T.M. (Liverpool).	P.M.O. ..	On leave	Leave from 18/8/21 to end of year.
J. O. Shircore, M.B., Ch.B. (Edin.), L.R.C.P., L.R.C.S., L.F.P.S. (Edin. & Glas.), M.R.C.P. (Edin.).	Deputy P.M.O.	Dar-es-Salaam.	Acting as P.M.O.
Lt.-Col. D. S. Skelton, D.S.O., R.A.M.C., M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.P.H. (Lond.).	Ś.S.O. ..	"	—
G. G. Butler, M.B.E., B.A., M.D., B.C.(Cantab.), M.R.C.S. (Eng.), L.R.C.P. (Lond.).	Director of Laboratory.	"	—
W. Owen-Prichard, L.R.C.S., L.R.C.P., L.F.P.S. (Edin. & Glas.), D.T.M. (Lond.).	S.M.O. ..	"	Acting as Deputy P.M.O.
T. H. Suffern, M.B., B.Ch., B.A.O. (R.U.I.).	" ..	Tanga ..	On leave from 1/1/21 to 5/7/21.
C. L. Ievers, L.R.C.P., L.R.C.S., L.F.P.S. (Edin. & Glas.), D.T.M. (Liverpool).	" ..	Tabora ..	On leave from 1/1/21 to 14/9/21.
J. McK. Clark, M.B., Ch.B. (Aberdeen), D.T.M. (Liverp.)	Medical Officer.	Lindi ..	—
C. R. H. Tichborne, L.A.H.I. (Dublin).	" ..	On leave ..	On leave 2/5/21 to 28/11/21.
C. R. Wallace, L.R.C.P., L.R.C.S., L.M. (Ireland).	" ..	Arusha ..	—
D. S. Scott, M.B., Ch.B. (Aberdeen), D.T.M. (London).	" ..	Mahenge	On leave 1/1/21 to 30/6/21.
G. R. C. Wilson, M.R.C.S.(Eng.), L.R.C.P. (London).	" ..	Moshi ..	—
C. B. B. Reid, M.B., Ch.B. (Edin.).	" ..	Tukuyu ..	—
R. R. Scott, M.C., M.R.C.S. (Eng.), L.R.C.P. (London).	" ..	Dar-es-Salaam.	Acting as M.O.H.
J. Hales Parry, B.A. (Cantab.) M.R.C.S. (Eng.), L.R.C.P. (Lond.).	" ..	"	—
A. McA. Blackwood, M.B., Ch.B. (Glas.).	" ..	Dodoma ..	On leave from 1/1/21 to 14/4/21.
W. E. Haworth, M.B., C.M. (Edin.), B. Sc. Public Health (Edin.).	" ..	Tanga ..	—
J. A. H. Van Derwert, L.R.C.P., L.R.C.S.(Edin.), L.R.F.P. & S. (Glas.).	" ..	Songea ..	—
J. G. McNaughton, M.D., C.M. (Edin.), M.R.C.P.(Edin.).	" ..	Dar-es-Salaam.	Acting as S.M.O.
C. H. Philips, L.M.S.S.A.(Lond.)	" ..	Singidda	On Plague Duty.

TABLE I.—RETURN SHOWING THE MEDICAL STAFF AND THE PRINCIPAL MEMBERS OF THE SUBORDINATE STAFF—*continued.*

Name and Qualifications.	Rank of Appointment.	Where stationed on 31st December, 1921.	Remarks.
C. W. Breeks, M.B., Ch.B. (Edin.), D.T.M., D.P.H. (Camb.).	Medical Officer	Kigoma ..	Temporary.
G. A. Williams, M.R.C.S.(Eng.), L.R.C.P.(Lond.).	" "	Bukoba ..	"
G. Maclean, M.B., Ch.B.(Glas.)	" "	Mwanza ..	—
C. F. Shelton, M.R.C.S.(Eng.), L.R.C.P.(Lond.), M.D.(Lond.) B.S.	" "	Kondoa- Irangi.	—
R. Nixon, M.B., Ch.B.(Livp.), D.T.M.(Livp.), D.P.H.(Livp.)	" "	Tanga ..	Acting as M.O.H.
J. S. Macdonald, L.R.C.P., L.R.C.S. (Edin.), L.F.P.S. (Glas.).	" "	Morogoro	—
N. L. Richards, M.R.C.S. and L.R.C.P. (Eng. & Lond.).	" "	"	—
H. M. Fisher, L.D.S., R.C.S. (Eng.).	Dental Surgeon.	Dar-es-Salaam.	On leave from 1/3/21 to 22/7/21.
Miss F. M. Plant	Senior Nursing Sister.	Tanga ..	—
Miss J. P. Stow, R.R.C. ..	" "	Dar-es-Salaam.	—
Miss E. L. Kemsley, R.R.C. ..	Nursing Sister	Tabora ..	On leave from 7/1/21 to 22/7/21.
Mrs. M. A. Cartlidge	" "	On leave ..	On leave from 18/8/21 to end of year.
Miss M. Donald	" "	" ..	On leave from 15/11/21 to end of year.
Miss F. Jaques	" "	" ..	On leave from 18/8/21 to 18/11/21.
Miss N. W. Evans	" "	" ..	On leave from 15/11/21 to end of year.
Miss J. Frazer	" "	Tanga ..	—
Miss S. Riordan	" "	" ..	—
Miss E. K. Lepp	" "	Dar-es-Salaam.	—
Miss E. M. Whitehouse ..	" "	" ..	—
Miss E. Walton	" "	" ..	—
Miss M. E. Shearing	" "	" ..	—
Miss E. Bishop	" "	" ..	—
Miss W. R. Grant	" "	" ..	—
Mr. C. D. Dovey	Nursing Sister	Tanga ..	—
	Medical Storekeeper.	Dar-es-Salaam.	—
Mr. J. L. Mason	Chief Clerk	" ..	—
Mr. H. Hammond	Laboratory Assistant.	" ..	On leave from 1/5/21 to 22/12/21.

TABLE I.—RETURN SHOWING THE MEDICAL STAFF AND THE PRINCIPAL MEMBERS OF THE SUBORDINATE STAFF—*continued.*

Name and Qualifications.	Rank of Appointment	Where stationed on 31st December, 1921.	Remarks.
Mr. J. Spittles	Superintendent Lunatic Asylum.	Lutindi ..	—
Mrs. C. M. Spittles	Matron, ditto	"	—
Mr. C. N. Rowe	1st Grade Sanitary Superintendent.	Dar-es-Salaam.	On leave from 1/1/21 to 1/5/21.
Mr. C. W. Strutt	Sanitary Superintendent	" ..	—
Mr. W. A. Moore	" ..	On leave	On leave from 27/6/21 to end of year.
Mr. R. E. Owen	" ..	Tabora ..	—
Mr. T. Bell	" ..	Tanga ..	..

TABLE I (a).—RETURN SHOWING THE ASIATIC MEDICAL AND CLERICAL STAFF.

Name.	Rank.	Where stationed on 31st December, 1921.	Remarks.
Gupta, J. N. Sen	Sub-Assistant Surgeon.	On leave ..	Seconded from Government of Bengal. On leave from 23/11/21 to end of year.
Diwan Chand	" ..	Bagamoyo	—
Kelkar, D. G.	" ..	Iringa ..	—
Lemos, J. C.	" ..	Pangani	—
Pandit, B. G.	" ..	Lindi ..	—
Moole, Y. L.	" ..	Kilwa ..	—
Oak, G. V.	" ..	Rufiji ..	—
Desai, M. S.	" ..	Kondoa-Irangi.	—
Khan, Abdulla	" ..	Tabora ..	—
Purandre, D. A.	" ..	Bukoba ..	—
Trividi, B. P.	" ..	Tanga ..	—
Kadhe, M. N.	" ..	Mwanza	—
Soni, Durgadas	" ..	Dar-es-Salaam.	—
Pantwaidya, S. V.	" ..	Tanga ..	—
Paranjpe, P. S.	" ..	Saranda	Plague Duty.
Kelshiker, Y. B.	" ..	Kondoa-Irangi.	—
Thomas, M. C.	" ..	Morogoro	—
Chakko, C. K.	" ..	Lindi ..	—

TABLE I(a).—RETURN SHOWING THE ASIATIC MEDICAL AND CLERICAL STAFF—*continued.*

Name.	Rank.	Where stationed on 31st December, 1921.	Remarks.
Macedo, J. F.	Sub-Assistant Surgeon.	Kilwa ..	—
Sen, S. C.	Compounder	Dar-es-Salaam.	—
Singh, Jai	" ..	Morogoro	—
Mazumdar, S. C.	" ..	Kilossa ..	—
Rodrigues, J. C. X.	" ..	On leave	On leave from 21/7/21 to end of year.
Dias, E.	" ..	" ..	On leave from 2/9/21 to end of year.
Ram, Bhagat	" ..	Iringa ..	—
Hakim, M. Abdul	" ..	Dodoma ..	—
Khan, Misri	" ..	Singidda ..	—
Khan, Mohamed Shaifullah	" ..	Mahenge	—
Khan, Kushal	" ..	Songea ..	—
Singh, Ujagar	" ..	Tukuyu ..	—
Ali, Barkat	" ..	Masoko	—
Mathew, P. V.	" ..	Tabora ..	On leave from 1/1/21 to 21/2/21.
Dasumal	" ..	" ..	—
Khan, Habibulah	" ..	Mohoro ..	—
Singh, Mehtab	" ..	Arusha ..	—
Ram, P. Haweli	" ..	Moshi ..	—
Singh, Bhagat	" ..	Shinyanga	—
Dass, L. Maria	" ..	Mwanza	—
Din, Ahmed	" ..	Musoma	—
Khan, Haji	" ..	Mafia ..	—
Khan, Abdul Sattar	" ..	Tanga ..	—
Dayaram	" ..	Tunduru ..	—
de Souza, Saluzinho	Sanitary Inspector.	Dar-es-Salaam.	—
de Souza, Joseph	Second Grade Clerk, P.M.O.'s Office.	On leave ..	On leave from 15/8/21 to end of year.
Fernandes, Acacio L. B.	" ..	Dar-es-Salaam.	—
Pereira, Eric S. H.	3rd Grade Clerk, S.S.O.'s Office.	" ..	—
da Cunha, J. B.	3rd Grade Clerk, P.M.O.'s Office.	" ..	—
Nanayakkara, V. A. D. A. S.	4th Grade Clerk, M.O.H.'s Office.	" ..	—
Somvasi, D. B.	4th Grade Clerk, P.M.O.'s Office.	" ..	—

TABLE "E."

RETURN SHOWING TOTAL NUMBERS IN-PATIENTS AND DEATHS, AND TOTAL NUMBERS OUT-PATIENTS OF THE DIFFERENT DENOMINATIONS TREATED AT THE VARIOUS STATIONS IN THE TERRITORY.

Stations.	In-Patients.				Deaths.	Out-Patients.				Total
	European Officials.	European General Population.	Native Officials.	Native General Population.		European Officials.	European General Population.	Native Officials.	Native General Population.	
Arusha ..	10	30	167	173	8	27	73	914	5,530	6,924
Bagamoyo	6	—	61	48	—	16	—	221	3,602	3,954
Bukoba ..	—	—	80	441	8	8	7	785	3,687	5,008
Dsm, E.H.	137	118	114	67	4	407	184	376	81	1,534
„ S.H.	—	—	786	400	38	—	—	5,745	1,331	8,262
Dodoma	—	—	36	353	10	5	6	307	1,133	1,840
Iringa ..	14	7	173	419	17	19	19	1,217	5,361	7,229
Kasanga	—	—	20	109	6	12	17	1,006	2,829	3,993
Kigoma ..	11	19	30	142	5	—	—	707	586	1,495
Kilossa ..	—	—	17	54	7	—	—	107	1,615	1,793
Kilwa ..	4	—	49	93	10	2	—	253	986	1,387
K-Irangi	1	—	23	238	5	—	2	247	1,272	1,783
Lindi ..	21	7	202	47	4	25	3	1,485	731	2,521
Lushoto ..	1	1	—	303	2	29	19	208	1,459	2,020
Mafia ..	—	—	13	59	4	—	—	115	208	395
Mahenge	2	—	40	275	14	—	—	338	3,827	4,482
Mbulu ..	—	—	46	176	8	17	1	309	1,027	1,576
Morogoro	5	11	157	125	18	3	25	992	894	2,212
Moshi ..	—	—	233	402	31	24	44	3,097	7,104	10,904
Mohoro ..	—	—	—	5	2	1	—	21	706	733
Musoma	—	—	17	34	1	—	—	275	456	782
Mwanza ..	32	2	257	410	39	42	75	1,679	2,292	4,789
Pangani ..	8	12	9	135	4	1	14	180	2,163	2,522
Shinyanga	—	—	85	12	—	5	12	666	824	1,604
Singidda	—	—	32	345	13	—	—	62	416	855
Songea ..	6	—	203	100	8	18	2	5,139	4,820	10,288
Tabora ..	23	22	936	764	53	107	80	5,879	1,275	9,086
Tanga ..	22	34	242	518	96	66	142	3,006	2,752	6,782
Tunduru	—	—	18	—	—	—	2	100	1,145	1,265
Tukuyu ..	16	7	288	435	16	—	—	712	2,272	3,730
Utete ..	—	1	2	—	1	—	—	—	585	588
Total ..	369	271	4,336	6,682	432	834	727	36,148	62,969	112,336

The totals include 44 Accouchements, not included in Table "G."

TABLE
TABLE OF SURGICAL

	Arusha.	Bagamoyo.	Pukuba.	European Hospital Dsm.	Seva Hadji Hospital Dsm.	Dodoma.	Iringa.	Kasanga.	Kigoma.
Abcess	1	3	1	—	34	—	7	—	5
" Alveolar .. .	—	—	—	—	—	—	—	—	—
" Ischio-Rectal .. .	—	—	—	—	2	—	—	—	—
" Liver .. .	—	—	—	—	—	—	—	—	—
" Parotid .. .	—	—	—	—	1	—	—	—	—
" Perineural .. .	—	—	—	—	1	—	—	—	—
" Retropharyngeal .. .	—	—	—	—	1	—	—	—	—
" Subperiosteal .. .	—	—	—	—	—	—	—	—	—
Amputation .. .	—	—	—	—	—	—	—	—	—
" Finger .. .	—	—	—	—	1	1	—	—	—
" Forearm .. .	—	—	—	—	—	—	—	—	—
" Arm .. .	2	—	—	—	—	—	—	—	—
" Toe .. .	—	—	—	—	1	—	—	—	—
" Foot .. .	—	—	—	—	1	—	—	—	—
" Leg .. .	2	—	—	—	3	—	—	—	—
" Thigh .. .	—	—	—	—	—	—	1	—	2
Atresia Vaginae .. .	1	—	—	—	—	—	—	—	—
Curettage .. .	—	—	—	2	—	—	—	—	—
Cyst of Jaw—scraped .. .	—	—	—	—	—	—	—	—	—
Cystotomy Supra-Pubic .. .	—	—	—	—	2	—	—	—	—
Circumcision .. .	7	1	1	—	11	—	21	—	1
Craniotomy .. .	—	—	—	—	—	—	—	—	—
Cellulitis—Free Incision .. .	—	—	—	1	3	—	6	—	—
Castration .. .	—	—	—	—	—	—	—	—	—
Elephantiasis of Clitoris .. .	—	—	—	—	—	—	—	—	—
" " Penis .. .	—	—	—	—	—	—	—	—	—
" " Scrotum .. .	—	—	—	—	1	—	—	—	—
Empyema—Drained .. .	—	—	—	—	—	—	—	—	1
Evisceration—Protracted Labour .. .	—	—	—	—	—	—	—	—	1
Fistula in Ano .. .	—	—	—	—	—	—	—	—	—
" Urinary .. .	—	—	—	—	—	—	—	—	—
" Perineal .. .	—	—	—	—	—	—	—	—	—
Fracture Malunited, Broken and Set .. .	—	—	—	—	—	—	—	—	—
" Compound, Removal of Bone .. .	—	—	—	—	—	—	—	—	—
" Wiring .. .	—	—	1	—	—	—	—	—	—
Glands—Excision .. .	—	—	—	1	2	—	—	—	—
Hæmorrhoids, Ligature and Excision .. .	—	—	—	1	—	—	—	—	—
Hernia Inguinal—Radical Cure .. .	—	—	7	—	4	—	—	—	—
" Strangulated .. .	—	—	1	—	2	—	—	—	—
Carried forward .. .	13	4	12	5	70	1	35	—	10

No operations were performed at the following Stations:—

'F.'

OPERATIONS FOR 1921.

K-Iraangi.	Lindi.	Mahenge.	Moregoro.	Moshi.	Mohoro.	Musoma.	Mwanza.	Pangani.	Shinyanga.	Songea.	Tabora.	Tanga.	Tukuyu.	Total.
		2					15	88			13	3	4	176
														1
														2
														2
														1
														1
														1
														1
														1
														4
														2
														4
														2
														4
														1
														2
														9
														3
														1
														4
														1
														2
							46							115
														1
														10
														1
														1
														1
														5
							33							52
														3
														1
														1
														2
														1
														1
														2
														1
														9
														3
							5							41
														5
														11
														1
4	2	4	1	—	1	—	103	90	—	1	62	51	10	479

Kilossa, Kilwa, Lushoto, Mafia, Mbulu, Singida, Tunduru and Utete.

TABLE
TABLE OF SURGICAL

	Arusha.	Bagamoyo.	Bukoba.	European Hospital Dsm.	Sewa Hadji Hospital Dsm.	Dodoma.	Iringa.	Kasanga.	Kigoma.
Brought forward	13	4	12	5	70	1	35	—	10
Hydroceles—Tapping	—	15	—	—	—	—	—	—	—
„ Radical Cure	—	—	—	—	1	—	—	—	—
Laparotomy for Wounds	—	—	—	—	2	—	—	—	—
„ Peritoneal Adhesions	—	—	—	—	—	—	—	—	—
„ Tabes Mesenterica	—	—	—	—	—	—	1	—	—
„ Exploratory for Neoplasm ..	—	—	—	—	—	—	—	—	—
„ Resection of Gangrenous Gut	—	—	2	—	—	—	—	—	—
„ „ Ruptured Intestine	—	—	—	—	—	—	—	—	—
Lumbar Puncture	—	1	—	—	—	—	—	—	—
Mastitis—Incision and Drainage ..	—	—	—	—	3	—	—	—	—
„ Schwartz Operation	—	—	—	—	—	—	—	—	—
Mycetoma—Scraping	1	—	—	—	—	—	—	—	—
Neoplasms—Excision	2	1	3	—	2	—	1	2	1
Necrosis of Bone	—	3	—	—	—	—	—	—	—
Omentum—Excision	—	—	—	—	—	—	—	—	—
Osteitis Hip with Abscess	—	—	—	—	—	—	—	—	—
Osteomyelitis—Scraped	—	—	1	—	—	—	—	—	1
Paracentesis Abdominis	—	2	—	—	—	—	—	—	—
Perineoplasty	—	—	—	—	—	—	—	—	1
Resection of Rib	—	—	—	1	—	—	—	—	—
Ruptured Tendo Achillis	—	—	—	—	—	—	—	—	—
Suppuration of Knee	—	—	—	—	—	—	—	—	—
Sequestrotomy	—	—	—	—	—	—	—	—	—
Sinus—Scraped	—	—	—	—	—	—	—	—	—
Stricture Urethra—Dilatation	—	2	5	—	—	—	—	—	—
„ „ External Urethrotomy	—	—	3	—	1	—	—	—	—
Thyroidectomy	—	—	—	—	—	—	—	—	—
„ attempted, but operation discontinued	—	—	—	—	—	—	—	—	—
Tonsils Removed	—	—	—	2	—	—	—	—	—
Tracheotomy	—	—	—	—	—	—	—	—	—
Ulcers—Curetting	4	1	—	—	19	—	15	—	—
„ Excised	—	—	—	—	—	—	—	—	—
„ Grafts	—	—	—	—	—	—	—	—	1
Varicose Veins—Excision	—	—	—	—	—	—	—	—	—
Veneral Papillomata—Excision ..	—	—	—	—	—	—	—	—	—
Wounds	1	—	—	—	—	—	—	—	—
Total	21	29	26	8	99	1	52	2	14

No operations were performed at the following Stations:—

APPENDIX No. 1.

TREATMENT OF YAWS BY TARTAR EMETIC

BY

DR. C. B. B. REID, M.B., CH.B. (Edin.).

A total of 201 cases of Yaws were treated, and of these, 182 were treated with Intravenous injections of Tartar Emetic.

The dosage was grs. $1\frac{1}{2}$ at from four to seven days intervals. The solution was grs. 24 to the ounce ; and minims 30 of this were injected for adults, and in proportion for children.

A solution of similar strength, but containing in addition 4 per cent. of Carbolic Acid, was used for Intramuscular injection in cases where a satisfactory vein could not be found.

Mercury and Potassium Iodide were given by the mouth daily during treatment.

Six patients left hospital without completing treatment.

Of the remaining 178, all were discharged free from all symptoms after an average stay in hospital of 35 days, and after an average of seven injections each.

Two cases were readmitted six and eight months respectively after having completed treatment. Both these were suffering from ulcerated throats, which quickly cleared up under Neo Kharsivan.

Forty-two of the remainder have reported periodically for periods ranging from two to nine months ; and these have all been found to have remained free from further symptoms.

1,180 injections were administered during the year ; 4.5 per cent. of the injections were followed by salivation and expectoration, lasting only for a few minutes. In only two instances did actual vomiting occur.

In four patients the injections were succeeded by Urticarial rashes, which disappeared on stopping the injections.

Whilst the action of Tartar Emetic is not to be compared to that of Salvarsan in Yaws, yet I think that, in the absence of Salvarsan, it is a valuable adjunct to Mercurial and Iodide treatment, and it has decreased the average stay in hospital by eighteen days, as compared with the records of this hospital for the previous two years.

TABLE "G."

TOTAL NUMBERS IN-PATIENTS AND OUT-PATIENTS FOR ALL DISEASES RETURNED FROM ALL MEDICAL STATIONS.

	Arusha.	Bagamoyo.	Bukoba.	European Hospital Dsm.	Native Hospital Dsm.	Dodoma.	Iringa.	Kasanga.	K-Irangi.	Kilossa.	Kilwa.	Kigoma.	Lindi.	Lushoto.	Mafia Island.	Mahenge.	Mbulu.	Morogoro.	Moshi.	Mohoro.	Musoma.	Mwanza.	Pangani.	Shinyanga.	Singidda.	Songea.	Tabora.	Tanga.	Tunduru.	Tukuyu.	Utete.	TOTAL.	
INFECTIVE DISEASES	1,167	1,073	1,331	551	2,197	309	1,202	868	562	99	214	283	426	452	84	548	387	369	4,009	88	166	1,457	400	416	371	1,116	2,506	1,238	148	1,180	52	25,269	
INTOXICATIONS	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	—	
GENERAL DISEASES	15	130	2	101	98	46	44	7	20	31	3	16	12	37	4	156	—	13	1	6	16	9	53	6	4	112	70	104	1	12	11	1,140	
LOCAL DISEASES—																																	
Diseases of Nervous System ..	24	62	45	45	287	35	171	69	33	55	34	31	34	43	3	197	97	2	15	—	22	2	34	39	11	12	316	289	22	20	18	2,067	
" Eye	304	209	184	17	389	66	329	220	58	27	51	42	92	17	11	70	34	51	143	31	24	109	44	45	27	384	416	178	22	102	45	3,741	
" Ear	42	88	89	60	195	13	117	63	42	15	17	40	31	4	4	81	9	—	—	5	16	83	23	22	4	262	65	97	12	58	3	1,691	
" Nose	—	17	—	1	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	65	—	—	—	8	79	
" Circulatory System ..	2	18	4	16	5	1	—	3	1	—	—	2	—	2	—	1	—	—	—	—	—	7	2	—	8	6	15	9	—	2	32	144	
" Respiratory System ..	454	493	496	122	685	218	1,068	624	147	132	—	132	266	531	10	743	325	188	826	57	78	536	251	190	63	1,164	989	878	55	262	55	12,038	
" Digestive System ..	489	638	763	190	959	177	1,127	530	125	171	117	160	438	335	81	487	285	419	1,014	264	170	486	415	297	65	1,716	1,060	967	152	537	149	14,786	
" Lymphatic System ..	132	48	37	12	95	7	30	56	14	2	133	10	14	—	18	2	—	9	42	—	6	105	19	10	1	13	54	54	7	15	5	950	
" Urinary System ..	4	25	1	14	1	—	16	—	17	1	5	—	2	—	—	—	—	—	17	—	—	3	1	1	2	3	4	62	1	8	—	188	
" Generative System—																																	
MALE ORGANS ..	80	45	85	2	89	16	48	11	43	8	32	17	18	14	4	3	15	14	36	10	7	151	62	27	9	47	78	113	5	13	12	1,114	
FEMALE ORGANS	13	30	10	23	12	1	21	29	—	—	2	4	—	1	2	—	2	2	4	—	4	3	21	15	7	49	27	7	6	5	—	298	
" Organs of Locomotion	141	158	118	49	111	28	209	102	87	4	22	35	89	23	16	102	2	27	272	—	13	42	25	79	4	347	144	106	68	44	4	2,471	
" Connective Tissue ..	100	90	886	61	374	565	123	78	279	1	442	419	499	286	38	1,192	192	710	770	3	86	496	526	50	136	4,140	553	911	466	841	4	15,317	
" Skin	369	115	176	86	360	215	577	199	135	52	77	56	114	114	16	424	141	85	386	19	90	325	165	75	81	702	245	124	190	280	58	6,111	
INJURIES	1,195	689	454	140	2,267	106	2,028	1,118	208	1,178	185	247	478	100	119	459	57	267	1,047	250	81	945	140	323	68	153	2,403	384	110	289	132	17,680	
SURGICAL OPERATIONS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TUMOURS	18	6	18	—	5	—	3	9	9	—	1	1	—	—	—	—	—	—	4	—	2	11	—	—	—	—	4	11	—	7	—	112	
MALFORMATIONS	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7
POISONS	—	1	6	—	3	—	—	1	—	—	1	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	34
ANIMAL PARASITES	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7
PROTOZOA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trematoda	1	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	28
Cestoda	43	14	138	1	46	35	73	1	—	6	—	—	—	21	—	2	—	1	231	—	—	—	—	—	—	1	15	3	—	—	—	692	
Nematoda	2,323	2	152	2	61	2	38	5	—	11	18	—	7	21	—	32	—	28	1,969	—	—	—	170	4	—	—	—	—	—	—	—	—	6,087
Insecta	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	197
Sarcopsyllidae	—	—	13	—	9	—	—	—	2	—	—	—	—	—	3	—	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	34
TOTAL	6,921	3,954	5,008	1,501	8,262	1,840	7,229	3,993	1,783	1,793	1,387	1,495*	2,521	2,020	395*	4,482	1,576	2,212	10,903	733	782	4,789	2,522	1,604	855	10,288	9,086	6,775	1,265	3,730	588	112,292	

* During 9 months of the year only.

APPENDIX No. II.

A SHORT SUMMARY OF, AND EXTRACTS FROM, THE GOVERNMENT DENTIST'S REPORT FOR 1921 IS GIVEN BELOW.

The writer was resident seven months, the rest of the year was spent on leave.

His Staff consists of two native attendants, he himself undertaking the duties of Dental Mechanic.

The Officials treated divide themselves into three classes—European, Asiatic and African.

EUROPEANS.

Consisting of the Officials and their families. Treatment for dental caries and chronic general periodontitis formed the bulk of the cases. Pyorrhœa is no commoner among Europeans in the Tropics than at home. The treatment of dead teeth which often give rise to Acute or Chronic Alveolar abscess is not so successful as in healthier climates.

ASIATICS.

Consisting of clerks, mechanics, etc., employed by the various Government Departments.

A large proportion suffer from Pyorrhœa.

AFRICANS.

Consisting of African employees of Government Departments; the servants of residents and all other natives desiring treatment are also attended free. The dental condition of the town natives is not as good as is generally supposed, but probably only a small proportion apply for treatment. Caries is common, but Pyorrhœa is rare.

The Government Dentist then goes on to state:—

“ At the request of the Medical Officer of Health, Dar-es-Salaam, about one hundred native school children have been treated and instructed in the use of their native tooth stick; the treatment consisted in the removal of the septic temporary teeth, and in a few cases the filling of permanent teeth. A small number required regulation owing to mis-placement of the teeth; some of these were treated by extraction with good results.

“ A marked improvement is noticed in the mouths of the children since treatment was commenced.

" It is difficult to understand why caries should be so common in these children, since their food consists almost entirely of rice and mealie meal coarsely ground ; the pappy nature of the food may have some influence on it, as very little mastication is required for this class of foodstuff.

" A number of Zanzibar Officials have attended here for treatment ; the alteration in the time of sailing of the Zanzibar Government steamer now enabling them to come and return by the same boat, a great saving in time for the Official concerned is thus effected."

Statement of work carried out for Europeans during the period stated in above report :—

Attendances	..	..	..	..	580
Fillings	..	..	..	..	278
Extractions	..	..	..	..	189
Scalings	..	..	..	..	90
Pulp treatment	..	..	..	..	53
Repairs to dentures	..	..	..	..	40
Dentures	..	..	..	..	36

APPENDIX No. III.

LUTINDI LUNATIC ASYLUM.

Mr. J. Spittles and Mrs. Spittles took over the charge of the Asylum as Superintendent and Matron respectively, as from the 9th October, 1921.

Patients admitted during the year	..	27
Discharged	.. .. .	9
Died	.. .. .	6
Average number maintained each month		83
Number maintained on December 31st		86

With the exception of thirteen men and six women, who are necessary as attendants, and to take charge of tools, stores, etc., all work was performed by patients.

Work undertaken was cultivation of fields, care of stock, making and repairing clothing, all necessary repairs to buildings and building new drains and latrines in male and female wards.

There was no serious casualty during the year. One patient required forcible feeding for three weeks. One man with hydrocele was

tapped four times during the year. One female suffering from Syphilis was sent to Tanga Hospital for injections. The treatment was successful.

The rate for each patient per day was cents 60 (Shg.) It has since been found that it can be reduced cents 10 per day, resulting in a saving of shillings 240/- per month.

Besides the above a small asylum sufficient to accommodate six lunatics has been erected at Tabora.

The building of a large Central Lunatic Asylum is contemplated in the near future.

APPENDIX No. IV.

NOTES ON THE TREATMENT OF YAWS WITH BISMUTHO-SODIUM AND POTASSIUM TARTRATE.

During the last week of December, 1921, the Governor, Sir Horace Byatt, showed me a cutting from the "Times" in which appeared a statement to the effect that Dr. Roux—the Director of the Pasteur Institute—at Paris, had discovered a salt, Bismutho-Potassium Sodium Tartrate, which on trial had given good results in the treatment of Syphilis. The subject of a Spirochaetocide is of such vast importance, perhaps more so in Africa than elsewhere, that I approached the local chemist, Mr. G. McGowan, who ultimately produced a similar salt, prepared from Bismuth Oxide. This salt was tested by me as regards toxicity on myself by swallowing first 1 grain, and after a few days 4 grains, thoroughly diluted in 10 ozs. of water, with no ill effect, and it was thereupon decided to give the salt a trial.

Sub-Assistant Surgeon Diwan Chand, attached to the Sewa Hadji Hospital, during the absence of Dr. J. Hales Parry on duty, brought to my notice an advanced case of Yaws, with multiple flat condylomatous like lesions extensively distributed all over the body, face, nostrils and extremities, and varying in size from a threepenny bit to a florin. To this case I administered $1\frac{1}{2}$ grains of the Salt in 2 c.c. of distilled water intravenously, and at the same sitting a similar quantity in the buttock. There was no apparent reaction of any kind during the injection, either on the pulse or the respiration. The patient was seen by me four days after, when most of the smaller plaques had dried up and portions of the larger ones. Another four days later the case had much improved, and except for a few scabs had all but cleared up. The patient, who was

emaciated, had now put on weight and looked fairly well nourished. At this juncture I had to proceed on tour, and the subsequent care of the case was undertaken by Dr. Parry, who reported, on my return, that the patient had been discharged a few days later apparently cured.

The salt prepared by Mr. McGowan in the first instance was insufficient in quantity for general distribution, but what was left of it was handed over to Dr. Parry for a more extended trial ; and his observations on the subject are given below.

Before my departure on tour, I arranged with Mr. McGowan that he should prepare a pound of the same preparation, but in view of the difficulty he experienced in turning out the first lot he adopted another method this time, using the carbonate. The salt now prepared was strongly acid, unlike the first, which was neutral, and somewhat insoluble unless neutralised with NaOH before boiling. It appeared to be less potent, and whereas three grains of the first gave satisfactory results, some 6 grains of the latter were required.

A quantity of this salt was supplied to Dr. Parry, and the balance of some 10 ozs. was distributed to several of the Medical Officers in districts where the prevalence of Yaws is common. A circular was issued containing directions for use and a request that, besides Yaws, it should be given a trial in other diseases such as Syphilis, Spirillum Fever, Small Pox and Trypanosomiasis. The quantities, unfortunately, were not sufficient for extended trial over any large series of cases, but quite a number have been treated.

Below are given Dr. Parry's report and extracts from other communications since received.

SOME OBSERVATIONS IN THE TREATMENT OF YAWS AND SYPHILIS BY BISMUTH.

By DR. J. H. PARRY,

Medical Officer, Sewa Hadji Hospital, Dar-es-Salaam.

"During the past two months Tartro-Bismuthate of Sodium, prepared locally, has been given to 42 African patients, 14 of which were Yaws, 9 were tertiary stages of Yaws and Syphilis, 15 were out-patients suffering from various conditions such as aricular pains, ulcers, etc., three were primary chancres and one a case of Spirillum Fever. In this country where Yaws and Syphilis co-exist it is not always possible in the tertiary stages to diagnose clinically between the two, therefore they

have been classified together. After a few preliminary measures to ensure that the preparation was safe to give, it was tried in a mild case of Yaws—an initial dose of 3 grains was given intravenously in 15 c.c. of distilled water, no reaction followed the dose, and after three days it was noticed that the papillomata were drying up and no further treatment was given. This patient was discharged in ten days.

“ Before the introduction of this preparation most of the severe cases of Yaws were treated by Salvarsan, and the results in this instance, and subsequent cases, proved that bismuth was equally as good and about one-hundredth the cost. During treatment of these cases various doses were tried varying from the minimum of 3 grains to a maximum of 8 grains, and between these two appears to be the optimum dose of 5-6 grains.

“ An interval of five days was allowed between the injections. In some cases a mild stomatitis appeared after the second injection, which was of a more temporary nature and milder in character than that produced by mercury. One case of Yaws covered all over with papillomata, varying in size from a pea to a shilling, required five injections to completely clear him, a total amount of 28 grains was given in 36 days. Immediately after the third injection this man stated his teeth ached, and they did also after the next two.

“ I consider that the action of this drug on cases of Yaws is remarkable, and is in every way as satisfactory as Salvarsan. The yaw papilloma cicatrises usually in 4-5 days after a dose of 5 grains, and in such cases as the above, when the papillomata are very numerous and very large, it requires more prolonged treatment, 20-30 grains over a period of a month. I think it depends more on the size of the papillomata than the numbers in determining how long the cure will take; multitudes of small papillomata will dry up very quickly, whereas large ones, the size of a shilling, are more resistant to treatment, and these cases, if left after an injection only of 6 grains, will not cicatrise beyond a certain point.

“ The articular pains, headaches and tiredness which accompany Yaws usually disappear after the first injection.

“ With regard to the action on primary chancres, bismuth was equally successful in causing the disappearance of the spirochæta in three cases under treatment, and the chancres healed in 7-14 days,

only one injection was given to each case, two had 4 grains and one 6 grains.

“ It is impossible in this short period to state how far it is necessary to proceed with the treatment, but in all the cases the course of the disease was definitely arrested. Bismuth shows a decided beneficial action on all tertiary conditions, whether of Yaws or Syphilis; it is particularly efficacious in gummatous ulcers, scabby ulcers of the body and bone affections.

“ One case of Spirillum Fever in a King's African Rifles askari was given 6 grains on the third day of his fever when the temperature was 103, the next morning the temperature was 99 and, so far, there has been no relapse after eleven days. This type of fever more often lasts for five days than four, and relapses with much regularity if untreated, so that there is the possibility that bismuth influenced the course of the disease, and further treatment in such cases will show whether it is so or not.

“ The following statistics may be of interest and help to bear out the foregoing remarks :—

“ Fourteen Yaw cases, all polypapillomatic, treated as in-patients.

“ Average stay in hospital 13 days.

“ Number of injections each 1·8

“ Number of grains per patient 9·2

“ Maximum number of injections given to

“ any one patient 5

“ Total quantity of grains given 28

“ Duration 36 days.

“ Nine cases of Tertiary Yaws and Syphilis treated as in-patients, these cases naturally occupied a larger period owing to gummatous lesions and ulcers.

“ Average stay 41 days.

“ Number of injections each 1·4

“ Number of grains per patient 5·5

“ Of the total 41 cases, the average dose was 6·8 grains, and the average number of injections per patient 1·56. Intramuscular injections in oil were not tried. African patients are not fond of being punctured in the buttock, yet they willingly come for intravenous injections. There has been no difficulty in getting out-patients to return for treatment since they realise the benefit therefrom.

"In conclusion, I would like to state that since it is impossible to draw any sweeping deductions owing to the small number and short space of time in which this treatment has been adopted, nevertheless, I am firmly convinced that bismuth can show equally as good results, and in tertiary conditions, possibly a little better than Salvarsan.

"What is required at the present time is a standard method of preparation of this locally made Bismuth Salt, in order to safeguard against possible accidents and to ensure even results."

DR. WILLIAMS, from Bukoba, telegraphed: "Further supply drug, circular 99, excellent result."

DR. D. S. SCOTT, from Dodoma, reported that "6 grains gives a rapid improvement and the disease clears entirely after a second injection given a week later. I give a third to make the cure permanent."

DR. REID, from Tukuyu, who has treated a large series of Yaws with Tartar Emetic, telegraphed for a further supply of 8 ozs.

DR. SHELTON, from Arusha, wrote applying for a further supply, and went on to say, "I have used this drug on seven cases of Yaws with very encouraging results, and am desirous of giving it a more extended trial."

Intramuscular injection.—In my experience intramuscular injection of 6 grains in 2 c.c. of distilled water, neutral solution, with 1 grain of Eucaine Hydrochloride, is painless and effective, leaving only a slight, tender swelling for a few days.

From the foregoing there can be little doubt that the results attained by the employment of the preparations made by Mr. McGowan, whatever their exact chemical nature may be, are of great value and certainly equal to, if not better than, those obtained by Neokharsivan in the treatment of Yaws, in all its stages.

J. O. SHIRCORE,

*Acting Principal Medical Officer,
Tanganyika Territory.*

Annual Report of the Sanitation
Branch of the Medical
Department.

CONTENTS.

	PAGE.
Introduction	67

SECTION I.

SANITARY PROGRESS.

Review of Sanitary Progress during the Year	69
---	----

SECTION II.

SANITARY ADMINISTRATION.

Sanitary Administration	72
Staff	72
Spheres of Action of Sanitation Branch	73
Finance	74
Legal	75
Sanitary Surveys and Inspections	79

SECTION III.

STATE OF THE PUBLIC HEALTH.

State of the Public Health	80
Vital Statistics	80
Population	80
Sex Distribution	81
Death Rate	82
Birth Rate	82
Infantile Mortality	82

SECTION IV.

GENERAL EPIDEMIOLOGY.

General Epidemiology	84
Incidence of Infectious Disease	84
Small Pox	85
Lymph Supply	86
Influenza	87
Plague	91
Ankylostomiasis	98
Bilharziosis	98
Cerebro-spinal Meningitis	99
Leprosy	99
Tuberculosis	102

SECTION IV—*continued.*

GENERAL EPIDEMIOLOGY— <i>continued.</i>		PAGE.
Malaria		103
„ Dar-es-Salaam		105
„ Anopheline Breeding Places		106
Enteric		109

SECTION V.

CLIMATE IN RELATION TO HEALTH.

Climate in Relation to Health	109
Hill Stations	111

SECTION VI.

URBAN SANITATION.

Urban Sanitation	113
Tanga—Report rendered by Dr. Nixon	113
Tabora	116
Mwanza	119
Kigoma	120
Ujiji	122
Dar-es-Salaam—Report rendered by Dr. R. R. Scott, M.C.	122
„ Climate	123
„ Vital Statistics	125
„ Notifiable Infectious Diseases	131
„ Vaccination	134
„ Mosquito-borne Diseases	136
„ Port Health	142
„ Water Supply	143
„ Disposal of Refuse and Drainage	145
„ Food Supply	150
„ Town Planning	151
„ Staff	152

SECTION VII.

TOWN PLANNING.

Town Planning	154
-------------------------	-----

SECTION VIII.

RAILWAY SANITATION.

Railway Sanitation	155
------------------------------	-----

SECTION IX.

SCHOOL MEDICAL SERVICE.

School Medical Service	158
Appendices	166, 168

TANGANYIKA TERRITORY.

Annual Report

Sanitation Branch of the Medical Department, 1921.

INTRODUCTION.

The following Report is the second that has been submitted to the Administration since the Sanitation Branch was organised in March, 1920.

In this report an attempt has been made to adhere generally to the lines of the model reports submitted by the Chief Medical Officer to the Ministry of Health. By following more or less the sections in those reports, so far as they apply to local conditions, it is hoped that little has been omitted which has a bearing on the maintenance of the Public Health of the Territory, whilst an attempt has been made to render a full account of the various activities of the Branch during the year under review.

The Sanitation Branch is concerned with the health or ill-health of the community in mass and with the individual only in so far as any condition of ill-health is prejudicial, or likely to be prejudicial, to the maintenance of the health of the public. If this premise is conceded, it will be realised that the line of demarcation between preventive and curative medicine is, at times, very finely drawn. For example, the treatment of a case of pulmonary tuberculosis comes entirely within the province of the parent department, but the after-care of the case should be within the responsibility of the sanitarian. In the same way, and the line of division is even finer here, the physician treats a patient who is suffering from malaria, but the sanitarian should rightly follow up the patient and see that the blood of the case remains sterilised. An incompletely cured case of malaria is as much a danger to the community in tropical Africa as the cook who is an enteric "carrier."

Unless these points are remembered it may seem that the Sanitation Branch is at times encroaching somewhat on the purely medical side of the Department. There is no real encroachment, however, though there may be, and in some instances must be, a slight overlapping. Any overlap that occurs is not a symptom of mal-administration; on the contrary, it is a double security for the prevention of disease.

GENERAL SCHEME OF THE REPORT.

The report is divided into the following sections :—

- I. Review of Sanitary Progress during the Year.
- II. Sanitary Administration.
- III. The State of the Public Health.
- IV. General Epidemiology.
- V. Climate in relation to Health in the Territory.
- VI. Urban Sanitation.
- VII. Town Planning.
- VIII. Railway Sanitation.
- IX. School Medical Service.

The Senior Sanitation Officer expresses his indebtedness and acknowledgment to the under-mentioned officers who have assisted him in drawing up this report, by contributing sections to it or by affording him the benefit of their advice and experience.

Mr. R. R. SCOTT, M.C., Medical Officer of Health, Dar-es-Salaam :—

- (1) Report on the Sanitation of Dar-es-Salaam.
- (2) Report on the School Medical Service.

Mr. R. NIXON, Medical Officer of Health, Tanga :—

- (1) Report on the Sanitation of Tanga.

Dr. G. G. BUTLER, Director of Laboratory :—

- (1) Report on Malaria in school children.
- (2) Valuable information in regard to the prevalence of Bilharzia among prisoners.

Mr. H. M. FISHER, Government Dental Surgeon :—

- (1) Report on dental condition of children in Government School.

Mr. C. W. BREEKS, Medical Officer, Kigoma :—

- (1) Report on Sanitation of Kigoma.

I. REVIEW OF SANITARY PROGRESS DURING THE YEAR.

In Africa the process of raising the sanitary ideal and of improving the sanitary environment is necessarily slow in view of the many different community-groups with whom we have to deal. Sanitarily, the population may be divided into :—

(a) THE EDUCATED EUROPEAN CLASS.

There has been an enormous advance in sanitary and health education among this group in the last half decade. The war has taught men the necessity of a high standard of personal and domestic sanitation in a way nothing else could have done ; for instance, practically every man or woman coming out to tropical Africa realises fully the value and necessity of being inoculated against the enteric group, and of being vaccinated against small pox. The methods of propagation of and means of protection against malaria, dysentery and relapsing fever are, roughly, as well understood by the educated lay public as by medical men. To the embarrassment of Government perhaps, this group is loud in its demands for better housing, improved water supply and drainage arrangements. The position may be summed up by saying that sanitary progress in this group has rapidly followed education in sanitation and tropical preventive medicine.

(b) " POOR WHITES."

This group has a natural low sanitary standard, and almost truly may be said to prefer insanitary surroundings to any other. It takes no care of itself. It depends on luck or chance to avoid disease and, often having been so fortunate as to escape for a period, considers itself highly immune to disease.

The sanitarian cannot get at this group by education and reason. Force must be used and force is the only thing it understands. This group will maintain a standard of sanitation provided it is watched by the health authorities and threatened with penalties for breaches of sanitary law.

(c) ASIATICS.

In general the group has no sanitary standard at all ; it has no knowledge of the causation or means of prevention of disease. It often considers that should a dangerous infectious disease be contracted, it has a perfect right to hide the sufferer, so that inconvenience to the family

may not result. It is difficult to get to the back of the mind of a member of this group, but, if one could, it might be found that it considered sanitation, sanitary ideals and all sanitary authorities as natural enemies and insufferable nuisances. The Indian community is a difficult one to deal with, but with understanding and sympathy, and the maintenance of a close touch with the "heads" of the various sub-communities a good deal can be done towards a general improvement of what may be termed the Indian Public Health.

The problem, though, even then presents special difficulties. For instance, the poorer class of Indian trader arrives in this country when his enterprise or his necessity compel him to live under conditions of "unhealthiness," in regard to which he possesses no natural immunity, nor any knowledge as to what precautions he must take. And it is not only the Indian petty trader who suffers from disease to an undue extent, it is also the better class Indian in Government or commercial employ, who is drawing good pay and whose health environment *can* be improved. The whole community must then be brought under those influences which will improve communal health. It must be brought more closely into touch :—

- (1) with the progress of sanitary reform and communal health,
- (2) with the necessity for advance in social well-being,
- (3) with a more complete knowledge of the contagiousness of disease,
- (4) with propaganda in respect of disease prevention.*

(d) NATIVE AFRICANS.

We may sub-divide this group into two :—

The Town Dweller.

The "shenzi."

The sanitary environment of the town dweller, considering his stage of development in the scale of civilisation, is, on the whole, good. He prefers his house to have clean surroundings. His women-folk are constantly sweeping and tidying up. He has a right regard for sanitary administration and a confidence in modern methods of checking the spread of disease.

* Sir G. Newman. Report 1920.

The "shenzi," on the other hand, except for the fact that he will purchase, when he can afford it, iron agricultural implements, is, one might say, but just emerging from a neolithic condition of affairs. We recall to mind H. G. Wells' description of his existence; how he goes on "cultivating his patch, loving his wives and children, beating his dog and tending his beasts, grumbling at hard times, fearing the magic of the priests and desiring little more than to be left alone by the powers above him. So he was 10,000 years ago . . . and so over the greater part of the world he remains to-day."

This is the man we find living in his *matembe* in company with his domestic animals—living a more or less exclusive life within his stake and thorn fence. The phenomena of life and death cause him neither much joy nor any great sorrow. A wave of disease passes over the land and leaves him less affected by it than by an outbreak of rinderpest among his cattle.

And yet, somehow, the sanitarian must "get at" this class of the community. He and his kind can only be approached through education, and let it be remembered that in this connection no exotic system of sanitary education is needed or contemplated. "Education is the adaptor which will made the nomadic spirit of freedom and self-reliance compatible with the co-operations and wealth and security of civilisation."

A district is known where the order has gone forth that, as from this year, Jumbes will be expected to live in decently constructed huts and must come out of their mud *matembe*. That is a beginning of a sanitary education for adults.

Sons of Jumbes and Headmen attend Government or Mission schools. A part of their teaching must be in the principles of elementary hygiene—in the why and the wherefore of things. A beginning in the teaching of this subject has already been made in the Dar-es-Salaam Government School. The subject matter is of the simplest. For instance, the pupil is asked:—

Why should I have a sanitary convenience in my hut courtyard?

Why must I not encourage flies to breed near my house? How can I stop them doing so?

Why should I not allow pools of stagnant water near my house? and so on.

It is hoped shortly to have a small booklet ready, which will be read in school, and to arrange for demonstrations on the life history

of the mosquito and the fly, and so on—Nature study in fact. No boy can fail to be interested in the changing processes of life when they are going on under his very eyes. He sees one morning a collection of mosquito eggs—and day by day in his class room he can watch the changes until the adult mosquito is found hanging to the gauze cover of the jar. It is all a question of propaganda. Propaganda helped materially to win the war. Propaganda will actually be the determining factor in the war against disease in uncivilised Africa.

It is for this reason that the Health Branch is working in the closest liaison with the Education Department. Without the assistance of the schools, the sanitarian will be hopelessly crippled in his efforts to raise the sanitary ideals of the African or the Asiatic.

The subject has been mentioned at some length, but it serves to show that something is actually being done and that greater efforts are contemplated. These are the principles underlying sanitary progress. Cleaner towns, better housing, drainage of swamps, provision of hospitals for the reception of cases of infectious disease are merely the details supporting the whole structure of modern hygiene. This report serves to show where and how the detail work has been applied. The results may not be apparent this year, or in twenty years time, yet, whilst steady progress has and is being made, the rate of progress, slow one year, faster another, is unfortunately dependent on financial conditions almost entirely.

II. SANITARY ADMINISTRATION.

STAFF.

Senior Sanitation Officer.—Lt.-Col. D. S. Skelton, D.S.O., R.A.M.C., M.R.C.S.(Eng.), L.R.C.P.(Lond.), D.P.H.(Lond.).

Medical Officers of Health.—Dar-es-Salaam : Capt. R. R. Scott, M.C. (late R.A.M.C., S.R.), M.R.C.S. (Eng.), L.R.C.P. (Lond.). Tanga : W. E. Haworth,* M.B., C.M. (Edin.), B.Sc. (Pub. Health) (Edin.), L.R.C.P. & S. (Edin.). Major R. Nixon (R.A.M.C., S.R.), M.B., Ch.B. (Liv.), D.T.M., D.P.H. (Liv.).

Sanitary Superintendents.—First Grade : C. N. Rowe, N. Forster (resigned October). Second Grade : W. A. Moore, D. R. Ogilvie (tour expired), R. E. Owen, C. W. Strutt, T. Bell.

Sub-Assistant Surgeon-in-Charge Infectious Diseases Hospital.—Durgadas Soni.

* Transferred December, 1921, to Laboratory Division.

RAILWAY SANITATION STAFF.

Sanitary Inspectors.—Dar-es-Salaam District : W. O. W. Hutton.
Morogoro District : H. J. I. Topal. Tabora District : J. O. Drinkald.
Tanga District : N. E. Whiting.

SPHERE OF ACTION OF THE SANITATION BRANCH.

No change has taken place during the year under review in the responsibilities of the Branch as were enumerated in last year's report. That is to say, and it is not out of place to repeat these duties, the Senior Sanitation Officer :—

(a) Receives reports and initiates action in cases and epidemics of

Chicken Pox,
Cerebro-spinal Meningitis,
Cholera,
Dysentery,
Enterica
Influenza,
Measles,
Mumps,
Plague,
Rose Measles,
Scarlet Fever,
Small Pox,
Whooping Cough.

(b) Is responsible for advising preventive measures in

Anthrax,
Ankylostomiasis,
Malaria,
Relapsing Fever (African).

(c) Is concerned with the sanitary equipment of all stations, the upkeep of Infectious Diseases Hospitals and with quarantine measures in all ports. The Sanitation Branch, however, has been ruled to have no direct or advisory concern with the great African scourges of :—

(a) Venereal disease in all its forms.

(b) Leprosy, which is possibly more prevalent in this Territory, if expressed as cases per thousand of inhabitants, than in any other part of the British Empire.

(c) Human trypanosomiasis (sleeping sickness), which happily is extremely rare, if not completely absent from the Territory.

(d) Tuberculosis.

The problem of the control of leprosy, however, is becoming so pressing and the disease is one that affects the public health so closely, that, even at the risk of intruding on the responsibilities of the purely executive Medical Branch, further reference is made to it under another section in the report (*See page 99.*)

(e) Statistical Section.

The Sanitation Branch is necessarily concerned very intimately with statistics of—

(1). Population in regard to births, deaths and, above all, to infantile mortality.

(2) Morbidity or sickness rates, not only of the indigenous population, but of Europeans, official and otherwise, and Indians. The latter community is becoming an increasingly important one, and its communal health constantly gives rise to anxiety.

(f) School Medical Service.

The Principal Medical Officer decided that this service should be a concern of the Sanitation Branch. The matter is further referred to under its appropriate section on page 58.

FINANCE.

The total authorised expenditure on Sanitation and Public Health in the Territory amounts to £22,600 for the financial year 1921-22. This sum represents 1·2 per cent. of the estimated expenditure for the whole country, as compared with 1·4 per cent. allowed for the financial year 1920-21, and 21·3 per cent. of the whole Medical Department's vote, compared with 23 per cent. for last year.

Per head of the population of the Territory the amount of money spent on looking after its Public Health is 1·5 pence.

Out of the total allocation to the Sanitation Branch, £8,600 is spent on Dar-es-Salaam township alone, and this excludes any share in the salary of the Senior Sanitation Officer, or rent of offices for the Medical Officer of Health. This equals an expenditure of just under 12s. per head of population per year.

The figures given above, it may be claimed, serve to show that the Branch is not what fairly may be described as "grasping" in its demands

on the financial resources of the Territory, and it is hoped that this report will show that the Branch has done its best with the penny-halfpenny allowed for each unit of population.

It may seem at first sight that an undue amount of money is devoted to the sanitation of the capital. That can only remain a matter of opinion. At the same time, it must be remembered that in Dar-es-Salaam the house tax is 5 per cent. of its rental value, in addition to which there are two further charges, viz., a tax of 40 per cent. of the house tax—known as the “Sanitation charge”—and a “street sweeping” charge for houses in the business area of 6s. per door.

But a realisation of the comparatively large sum of money which it is found necessary to spend on sanitation in the capital may also, perhaps, cause serious consideration on the part of those who urge that the time has come for a Dar-es-Salaam municipality to come into being, which would take over charge of its own sanitary affairs. Without a Government subsidy, if a municipality ran the sanitation of its district on the same scale as is given to the town at the present time, the item would prove a heavy burden on the rates. There is in fact considerable doubt whether the rates would be able to support it for many years to come on anything like the present scale.

Against this expenditure there is very little to be shown in the way of receipts. Small and really nominal charges are made for the cesspit emptying service, whilst Bills of Health for shipping produce a small but increasing revenue. However, these and other small items amount to so little that they are not shown separately in the General revenue. It is therefore suggested that both town and country gets its money back in the form of increased comfort in the standard of living, in having clean streets, flushed drains, clean and tidy towns and protection against imported and endemic disease.

LEGAL.

The following sanitary measures have become law during the year under review :—

- (a) The Township Ordinance (No. 10 of 1920) which appeared on the 29th December, 1920, *i.e.*, after last year's report had been submitted.

This Ordinance makes provision for the regulation of townships. Under its provisions :—

- (1) Any place may be declared a township.

(2) The Governor may make rules for the health, good order, etc., of the township.

(3) The rules made under the Peace and Good Order Regulations which were in force on 30th November, 1920, in a declared township, are to continue in force pending other provision being made. Otherwise the Regulations for Peace and Good Order are cancelled.

As far as these regulations were concerned, they affected the Sanitation Branch only in so far as District Political Officers were empowered, with the approval of the Administrator, to make local rules. And it was under Section 17, that the important sanitary sections of the Dar-es-Salaam Township Rules came into force. As noted in the 1920 Annual Sanitary Report, these rules :

- (a) Cover the suppression of nuisances.
- (b) Regulate the care of dairies, cowsheds and milkshops, butcheries and bakeries.
- (c) Control the sale of meat and milk.
- (d) Protect the public from infectious disease.

Further Sanitary Rules followed, made under the authority of the same Section 17 of the Peace and Good Order Regulations, and were embodied in Government Notice 59 of 5th August, 1920. The "Sanitary Rules for the Township of Dar-es-Salaam" go considerably further than the Dar-es-Salaam Township Rules just referred to and concern the Public Health only:

Following this thread up, under Government Notice 106 of 15th June, 1921, the following townships have adopted the Dar-es-Salaam Sanitary Rules :—

Arusha.	Kilwa.	Mwanza.
Bukoba.	Korogwe.	Songea.
Iringa.	Lushoto.	Tabora.
Kasulu.	Morogoro.	Tanga.
Kilossa.	Mbulu.	

Other townships, being under the opinion that the Dar-es-Salaam Township Rules are perhaps either too wide or not wide enough, have drawn up their own revised rules, among which appear certain important sanitary provisions.

There are two main groups of revised rules—what may be termed

(1) The Dodoma Rules and (2) The Songea Rules.

Government Notice 116 of 1st July, 1921, published the Dodoma Rules, which now apply to:—

Arusha.	Kikombo.	Mpapua.
Bahi.	Kilwa.	Namanyere.
Dodoma.	Kilimatinde.	Saranda.
Itigi.	Mbulu.	Singidda.
Kasanga.		

Government Notice 125 of 8th July, 1921, introduced the Songea Rules, which so far are applicable only to that township. It has also been mentioned in the foregoing that Songea has already adopted the Dar-es-Salaam Sanitary Rules as well. There remains yet another group of Township Rules containing sanitary provisions, and that is the Rufiji group; but they are much simpler than either the Dodoma or the Songea group.

Government Notice 176 of 2nd September, 1921, applies the Rufiji Rules to

Mohoro,
Utete.

The natural result of such a complicated piece of legal machinery is that, from the point of view of the Central Sanitary Administration, it is a little difficult, at times, to form an accurate appreciation of any given position. But this confusion, it is hoped, will not long continue, inasmuch as His Excellency the Governor has appointed a commission to go into the whole question of Township Rules and has instructed the commission to submit to him standard rules to be made applicable to various townships according to their local or particular necessities.

(b) The Births and Deaths Registration Ordinance (No. 12 of 1920), which is dated 15th December, 1920, appeared too late to be referred to in the last Sanitary Report. Important sections therein are to the effect that:—

- (1) A register is to be kept in each District in which the District Political Officer shall enter (a) every birth, (b) every death.
- (2) A Registrar General of Births and Deaths is appointed who must compile an annual summary.
- (3) Registration of Births shall be compulsory if one or both parents are of European or American origin or descent.

Government Notice No. 47 of 1st March, 1921, prescribes the Rules under the Ordinance and introduces the compulsory registration of births and deaths occurring on board ship in territorial waters.

Government Notice 64 of 1st April brings the Ordinance into force from this date. In practice only European and American births and deaths are registered, although the law quite definitely lays it down that every birth and death shall be registered whereof particulars are furnished.

The Native Authority Ordinance (No. 16 of 1921) of 1st May, 1921, contains some useful sanitary provisions. Under this Ordinance Headmen are empowered to make orders :—

- Section 7 (g) To prevent the pollution of water in any stream.
- (m) To prevent the spread of infectious disease.

Section 7 (g) is the only provision that exists in the legal machinery of this Territory (except under the Indian Penal Code) which in any way operates in a manner comparable to the English Rivers Pollution Prevention Act.

- (c) The Ports Ordinance (No. 18 of 1921), dated 16th May, administers the Port Sanitary and Quarantine work.

In Part II. under Section 6, the Governor may make rules for regulating action to be taken by any vessel on which is or has been infectious disease and provides for the segregation, quarantine and treatment of sick and disposal of the dead ; whilst Part III., Sections 15, 16 and 17, define the powers of a Health Officer in relation to shipping. This Ordinance was followed by Government Notice 137 of 22nd July, which contains rules made under the authority of the Ports Ordinance as affects :—

- The giving of pratique.
- Notification of deaths in port.
- Disposal of bodies.
- Control of infectious diseases on board ships in ports.

(d) Other sanitary legislation of an important, though possibly not of a first class, order is contained in the following notices and ordinances :—

- (a) Government Notice 54 of 15th March, 1921, prohibits the importation of condensed skimmed milks containing less than 9 per cent. of milk fat.

This order excludes from import various brands of tinned milk which may be intended to be used in undiluted or partially diluted form, and so places a premium on milks containing a very high percentage of

milk fat where considerable dilution is necessary before consumption. From a chemico-sanitation point of view the purport of the order is not quite clear.

- (b) Government Notice 85 of 16th May, 1921, brings the Infectious Diseases Ordinance (No. 3 of 1920) into force from that date.
- (c) Government Notice 118 of 1st July, prescribes a standard dietary for various classes of prisoners.
- (d) Government Notice 135 of 15th July, under the authority of the Cotton Ordinance of 1920, insists on certain sanitary requirements in connection with cotton ginneries.
- (e) The Prisons Ordinance No. 14 of 1921, contains a clause in Section 16, whereby the Medical Officer in charge of the jail shall have charge of the sanitary administration of a prison. It lays down that a complete sanitary inspection of a jail shall be carried out at least once a month. This section appears to define very clearly the responsible authority in a jail.

SANITARY SURVEYS AND INSPECTIONS.

The undermentioned stations have been inspected by the Senior Sanitation Officer or his representative during the year :—

Northern Area.—Moshi, Korogwe.

Central Area.—Tabora (twice), Manyoni, Dodoma, Morogoro (three times), Singida, Kilossa (twice), Mpapua.

Western Area.—Kigoma (twice), Ujiji (twice), Namanyere, Kirando and Kirengi Island, Kasanga, Tukuyu, Massoko, Mwaia, Tandala.

Southern Area.—Mkasu, Mahenge, Malangali.

Coastal Area.—Tanga, Pangani.

No opportunity, as yet, has occurred of visiting the important ports of Kilwa and Lindi, Bukoba or Mwanza, nor of any station in the Songea District.

III. THE STATE OF THE PUBLIC HEALTH.

VITAL STATISTICS.

In the Sanitation Report of 1920 it was mentioned, that owing to reliable figures not being available, deductions as to the general state of the Public Health from these sources were impossible. This year fairly elaborate figures are at the disposal of the statistician. There is no occasion to reproduce in this section anything like full figures, which will, no doubt, be published in their appropriate place. Nevertheless, certain extracts, such as are commonly to be found in sanitary reports, must be taken from the Census Officer's illuminating report.

POPULATION.

The population on which the Sanitary Branch is working is calculated as follows:—

	1921.	1912-13.
Europeans	2,447	5,336
Asiatics	14,991	13,541
Native Africans	4,106,900	4,145,000
	<u>4,124,338</u>	<u>4,163,877</u>

Examining the figure for native Africans only, the crude decennial decrease is 49,270. In the absence of anything like accurate knowledge it is possibly not very profitable to speculate as to what is happening to the population of this Territory. There are, however, certain outstanding factors affecting the decrease that must be considered:—

- (a) The war caused the death from disease of what may quite fairly be described as a great number of porters. We shall never know how heavy, even approximately, was the mortality.
- (b) Then came the 1918-19 influenza epidemics. So far as can be estimated, the mortality from this disease, including sequelæ, amounted to about 2 per cent. of all cases. As probably 50 per cent. of the population suffered from the disease at one time or another, it might not be over-estimating the total influenza deaths that occurred in 1918-19 at somewhere between 50,000 and 80,000.
- (c) In 1920, certain areas in the central plateau were badly affected by famine. This was so severe that before relief measures

could be instituted a number of deaths had occurred from starvation or malnutrition.

- (d) There is not a shadow of doubt that the infantile mortality rate in the Territory according to our ideas, influenced as they are by the recent fall in England to somewhere round 80 per 1,000, is appallingly high. There is evidence to show that it stands at somewhere near 300 per thousand.
- (e) A great deal is heard about the spread of venereal disease amongst native tribes, especially since the war. Here again accurate knowledge we do not possess, and no hospital statistics will give it. Any increase in the number of patients attending a venereal disease hospital clinic by no means denotes an increase in the actual amount of venereal disease among a population, and even less so among a native population. We know, however, that venereal disease is common among certain tribes, and more prevalent in certain localities than others, but we do not know, because no one has taken the trouble to find out, whether, as a disease, it is increasing or diminishing.
- (f) These are the main factors so far as disease is concerned ; there may be, and probably are, political and economic considerations affecting the problem, which, no doubt, will be dealt with by those concerned. But the disease-influences are sufficiently serious to make the subject one of some moment. The temptation is to suggest that if the monetary grant to the branch responsible for the Public Health were increased from a penny halfpenny to say even twopence per head of population, some small benefit might result. If, however, the population, as well as the rivers of this Territory, is to dry up as time goes on, posterity will be as fully occupied as the present generation in making both ends meet.

SEX DISTRIBUTION.

As regards sex distribution, among every 1,000 persons :—

286.6 are Men.
 312.8 „ Women.
 205.4 „ Boys.
 195.2 „ Girls.

That is to say that there are to every 100 males, 109 females. This is a fairly normally constituted population. More male than female children are born into the world in Tanganyika as in Europe, and then, later, owing to the stress of life and other factors adult females predominate. But, numerically, the disturbing fact remains that there are for each 698 men and women only 400 children. Roughly 350 couples produce 400 children.

DEATH RATE.

The uncorrected death rate for 1921 among Europeans is 11.8 per 1,000, but unfortunately no statistics of births or deaths for the whole population are available. As has been noted in the legal section, the Births and Deaths Registration Ordinance does not at present apply to natives. It is not a question of registration that the sanitarian is concerned over, but to be without any statistical information, even as to crude numbers of births and deaths is absolutely crippling to a really scientific survey of the Public Health. No statistics as to *population* compensate for the absence of this information; nevertheless, many Assistant Political Officers, who really have their fingers on the pulse of their Districts, generally have a fairly accurate idea of the actual numbers of deaths that occur in the area they administer. In some districts, Assistant Political Officers make their Jumbes keep a record of deaths by tying a knot in a string as each death comes to their notice, and from time to time the string is brought into headquarters and the knots counted. Even this information is infinitely better than none at all. Meanwhile all that can be done is to look forward to the time when the Administration decides that Political Officers shall arrange somehow to collect this information about births and deaths.

BIRTH RATE.

As regards Europeans in the Territory, the uncorrected birth rate for the year is 14.1 per 1,000 persons living. If, however, the number of births registered is correlated to the number of women aged 16 and over, the rate works out at 69 per thousand. This figure may be compared with the Kensington rate, which was 61.6 per 1,000. The correlated figure indicates really a fertility rate rather than a birth rate.

INFANTILE MORTALITY.

Major Hon. C. Dundas, District Political Officer, Moshi, was so kind as to furnish the writer with a small statistical table, which is not without

interest. He collected statistics from 34 chiefs, mainly of the Wa Chagga, who inhabit the Kilimanjaro area. These 34 chiefs had between them 285 women, *i.e.*, nearly 9 wives apiece. These 285 women had produced 707 children, *i.e.*, 2.45 children per woman. But, of the 707 children, only 405 survived to the limit of weaning (say 18 months to 2 years). Here then the infant mortality approximated 30 per cent. Now the Wa Chagga are a flourishing tribe. They have not been affected by serious pestilence nor by famine, and, as Major Dundas points out, these children had a naturally better chance of survival than those of less wealthy and less fortunately situated natives.

A further observation on infantile mortality has been made by Mr. Mitchell, Assistant Political Officer. From his figures, collected in the Ufipa District, it appears that the number of wives per man was 2.5, and the number of children born per wife was 3.42. Of these children only 48.2 per cent. survived, *i.e.*, grew up. Further confirmatory figures were obtained by this Officer from Kirando on Lake Tanganyika. Of 716 children, 287 died under 2 years of age and another 93 before the 10th year, *i.e.*, 53 per cent. do not grow up. In England, out of a standard million of both sexes born, 74.9 per cent. survive to the 10th year of life. That is to say, the death rate at Kirando in the first ten years of childhood is more than double that which obtains in England.

The Kirando example is not an isolated one. It is said that the Wabende are slowly being exterminated on account of the death rate in childhood.

An enquiry in regard to the probable causes of this mortality elicited the following suggestions :—

(1) The prevalence of syphilis among the parents. In the Ufipa part of the country a belief is entertained that if a sufferer from venereal disease can pass it on to someone else, a cure of the former will result. This horrible belief is not confined only to Central Africa.

(2) Prevalence of small-pox.

(3) Mal-feeding of infants.

(4) Chill and pneumonia.

As the women work in the shambas, the infant is taken out by the mother tied on to her back. Whilst at work the mother deposits the child on the ground and the infant is supposed to catch cold thereby.

(5) According to a missionary the custom of clitoridectomy among some tribes is supposed to be the cause of many deaths in child birth.

IV. GENERAL EPIDEMIOLOGY.

Under the Infectious Disease Ordinance (No. 3 of 1920) certain scheduled infectious diseases are notifiable and the Medical Officer of Health is given very ample powers in dealing with cases.

It is suggested that it would be desirable to make pulmonary tuberculosis and malaria notifiable in certain townships. Sooner or later, and the sooner the better, something must be done by Medical Officers of Health in the way of "after-care" of cases of tubercle and malaria following the discharge of such cases from hospital. This subject is further discussed on page 102; but until the health authorities know of the actual cases not even a beginning can be made.

From Table I. it will be seen that the prevailing communicable diseases in 1921 were:—

- (a) Small-pox.
- (b) Influenza.
- (c) Plague.

TABLE I.—INCIDENCE OF INFECTIOUS DISEASE.

	Smallpox.		Influenza.		Plague.		Cerebro Sp. Meningitis.	
	1920.	1921.	1920.	1921.	1920.	1921.	1920.	1921.
NORTHERN AREA—								
Bukoba	5	14	—	—	—	—	—	—
Mwanza	96	33	—	—	21	1	—	—
Arusha	4	3	Present	42	—	—	—	6
Moshi	88	—	—	—	—	—	11	6
Usambara	42	—	—	—	—	—	—	—
CENTRAL AREA—								
Tabora	7	21	2	261	—	—	—	1
Dodoma	1	—	—	Present	123	149	—	1
Kondoa-Irangi	—	—	—	—	—	—	—	—
Morogoro	—	10	—	—	—	—	—	—
WESTERN AREA—								
Ujiji	—	—	—	—	—	—	—	—
Ufipa	—	—	—	—	—	—	—	—
Rungwe	—	48	—	227	—	—	—	—
SOUTHERN AREA								
Iringa	65	—	—	12	—	—	—	—
Songea	—	802	—	73	—	—	—	—
Mahenge	—	—	—	—	—	—	—	—
COASTAL AREA—								
Tanga	498	281	23	—	—	—	—	—
Pangani	—	9	—	—	—	—	—	—
Bagamoyo	—	2	—	67	—	—	—	1
Dar-es-Salaam	1	3	418	31	—	—	—	—
Rufiji	—	—	—	—	—	—	—	—
Kilwa	—	—	—	Present	—	—	—	—
Lindi	45	41	—	6	—	—	—	—

SMALL-POX.

The districts mainly affected were :—

Songea.

Tanga.

Lindi.

Rungwe.

To understand the epidemiology of these outbreaks we must go back to 1920. It was found then, that small-pox was more prevalent in the northern parts of the Territory than in the south, more especially in Tanga (498 cases), Mwanza (95), Moshi (88), Usambara (42). Tabora (the Clapham Junction of the country) became infected from Mwanza and probably passed it on to Iringa (an important road junction for the south and west), where 65 cases were reported. It may seem rather far-fetched to attempt to trace an infection of Iringa from Mwanza or Moshi, each of which is some 350 to 400 miles away, until it is realised what a tremendous amount of road-travel goes on all over the country. A man from Mwanza literally thinks nothing of making a trip to Songea—some 500 miles away—on the smallest pretext. One is almost tempted to say that there is more long distance than short distance travel going on. The Songea men, again, are professional porters. There are always quantities of them in Kilossa and Tabora waiting for return loads. Kilossa is another junction for Tanga and the north, so that infection from the north could travel to Iringa and on to Songea either via Tabora or Kilossa. In 1920 also, it will be seen from the table, the coast ports were infected. Lindi reported 46 cases. It is, however, not thought that Songea became infected from the coast, as Tunduru did not get the disease until after it had reached Songea—that is to say, the direction of the infection was from west to east and not east to west. Any way in February, 1921, small-pox was reported as present in the Songea District, and by the beginning of March 683 cases had been recorded. The spread of the disease was not arrested until mid-July.

Small-pox has been prevalent practically the whole year in the Tanga District and in the Lindi area up to September. It broke out in epidemic form in the Rungwe District in July, and, though the disease has not been present to anything like the extent it has been at Tanga, it nevertheless has been reported steadily week by week, up to the

end of the year. Re-infection this year is supposed to have been brought by a Swahili attached to the Claims Commission which was touring the District at the time.

In view of the density of the population on the "Nyassa Flats" and the distance which vaccine lymph has to travel before it gets to its distributing point we have been fortunate here in that the epidemic has not been more severe. The District Political Officer instituted very rigorous quarantine measures both before and after supplies of reliable lymph began to arrive, so much so, in fact, that the writer who made a surprise visit to the infected area had some difficulty in getting a guide to lead him to an infected village.

Lymph Supply.

We are in a very much stronger position this year to deal with small-pox than we were in 1920. The Director of the Laboratory, Dr. Butler, is now turning out a very reliable lymph and if vaccinators, even in the distant stations, carry out the directions given to them, excellent results are to be obtained. Special precautions are taken in the despatch of the lymph. It travels by parcel post in the ordinary way, but it is packed in iced sawdust. At Kyambila, which is at least 14 days' journey by runner from the Laboratory, 83 per cent. of primary vaccinations were successful. The secret of success is (1) that the lymph is bottled in yellow tinted glass, (2) all vaccinations are ordered to be done in the deepest shade, preferably late in the evening, and (3) perfect operative technique.

Failure to obtain a high percentage of successful results with Dr. Butler's lymph means that (a) technique has been poor, or (b) that the lymph has been exposed to direct sunlight; (c) unsuitable selection of subject. There is evidence to show that two minutes' exposure of the lymph to direct light is sufficient to bring about a considerable deterioration and to affect very materially the results.

INFLUENZA.

The following table shows the distribution of the disease in 1921 as compared with 1920:—

TABLE II.

DISTRICTS.	1921.	1920.
NORTHERN AREA—		
Bukoba	Nil	Nil
Mwanza	Nil	Nil
Arusha	42	Present
Moshi	Nil	Nil
Usambara	Nil	Nil
CENTRAL AREA—		
Tabora	261	2
Dodoma	Present	Nil
Kondoa-Irangi	Nil	Present
Morogoro	Nil	Nil
WESTERN AREA—		
Ujiji	Present	Nil
Ufipa	Present	Nil
Rungwe	227	Nil
SOUTHERN AREA—		
Iringa	12	Nil
Mahenge	Nil	Nil
Songea	73	Nil
COASTAL AREA—		
Tanga	Nil	23
Pangani	Nil	Nil
Bagamoyo	67	Nil
Dar-es-Salaam	31	414
Rufiji	Present	Nil
Kilwa	Present	Nil
Lindi	6	Nil
Total reported cases	719	439
Deaths	113	6

General Considerations.

The districts in the foregoing table have been arranged geographically as far as possible from north to south and from west to east, in order to show in what group of districts the epidemic was chiefly prevalent. The figures, unfortunately, are purely relative and generally can only refer to the larger stations, where there is a Medical Officer or a Sub-Assistant Surgeon. Nevertheless the years under review are comparable in many respects.

The Lake Nyanza zone has escaped in both years. The Usambara Highlands, Morogoro and Mahenge likewise report no cases, but otherwise the disease has again been widespread. It looks very much as though influenza has established itself as one of the principal diseases of tropical Africa. There is also comparatively little individual or racial resistance established as yet, as the death rate for recorded cases works out at 15.7 per cent. for 1921 against 1.3 per cent. for 1920. Something like 2 per cent. is regarded as the normal influenza death rate for this part of the world.

The case mortality in the Rungwe District is reported as 25 per cent., and in Songea at first, as just under 30 per cent. These very high figures have, of course, brought up the average for the whole country. Dodoma and Kilwa both record the number of deaths, but give no estimate of the number of cases. The case mortality of 15.7 per cent. is therefore unreliable. The estimate of 2 per cent. mortality is based on various series of figures affecting localised epidemics which were handled by the Medical Officers and not by the subordinate Medical Staff.

But even with a case mortality of only 2 per cent., influenza is a very serious disease in Africa. The Assistant Political Officer, Singidde, reports with some truth and emphasis in December, 1921, that: "Influenza was responsible for far more deaths than plague, although the actual numbers cannot be ascertained."

The epidemic in the Rungwe District was, from all accounts, very severe, and this is accounted for by the fact that this area is supposed not to have been touched by the pandemic of 1918-19. The disease therefore in 1921 found virgin soil, and it certainly spread like wild fire through the villages between Lake Tanganyika and Lake Rukwa. The Senior Sanitation Officer visited most of the villages to the south and south

west of Lake Rukwa in November, 1921. By this time, however, the wave had passed. It proved very difficult to collect anything like accurate information as to the number of deaths. Every Jumbe protested that his village had not had many deaths or even any at all, but that numerous ones had occurred in the next village to his and so on.

From the Galula Mission information to this effect was gathered. In the District served by this Mission, the Father Superior estimated there had been 2,000 cases, whilst he knew of 80 deaths, *i.e.*, a case mortality of 4 per cent. When further cross-examined and tied down to his own village of some 400 inhabitants, he estimated an incidence of 100 cases, and he knew of one death only. Other stories were as follows: At Mkuyuni, 60 inhabitants, no death there, but 10 in the neighbourhood; at Manda, 400 inhabitants, many cases, no deaths; in the Mbeya sub-district of Tukuyu, 30 deaths reported in one week; in four small villages near Lake Rukwa, 18 cases, 4 deaths. And so on. It was quite impossible to get figures from these out of the way places.

The epidemic did not burst upon us unexpectedly. From reports received from neighbouring territories, it was possible, unfortunately, to watch two waves advancing slowly—one from the north—at first of a mild type—and the other coming up from the south, from north-east Rhodesia, more severe in character. Under the conditions in the Territory the sanitarian was almost helpless. From the South African figures and from experience elsewhere a combined vaccine such as is issued from the South African Institute for Medical Research, possesses some prophylactic properties when employed on natives of Africa. But it was quite impossible for the Department to inoculate practically the entire population—if only on the usual grounds of expense and lack of staff.

Northern Wave of Influenza.

In January, 1920, influenza was reported at Tanga, Pangani, Bagamoyo and at Tabora. In February there was a rise in the number of cases notified from Dar-es-Salaam and Tabora. In March the disease had reached Iringa and the coast infection had got as far south as Kilwa and Lindi. Dar-es-Salaam was now clear. In April it appeared in Dodoma and Kondoa-Irangi (it was moving back north a little), whilst 68 new cases came from Tabora. In July, Bagamoyo had a recrudescence
 a severe type with a case mortality of 20 per cent. for the last two

weeks of the month. The disease continued at Bagamoyo until October and had meanwhile broken back to Arusha, but elsewhere the northern wave seemed to be spent.

The monthly case incidence is of some importance in studying the epidemiology of influenza in Tanganyika. It is shown, as regards the northern wave in Table III.

TABLE III.

Month.	No. of Districts Affected.	Cases.
January	4	106
February	5	102
March	4	67
April	3	68
May	1	1
June	—	Nil
July	1	40
August	1	4
September	2	No
October	3	39
November	1	15
December	2	4

Southern Wave of Influenza.

The encroachment was by three routes :—

- (1) From Nyassaland and North-East Rhodesia.
- (2) From Portuguese East Africa.
- (3) Possibly across the Lake from the Congo.

In February, influenza was reported to be freely distributed throughout the Rungwe District. On 16th March, a draft of 600 men of the King's African Rifles with porters, women and children coming from Nyassaland to Tabora was held up by an outbreak at Rungwe Mission, eight miles from Tukuuyu, and there they had to stop until the 15th April. The draft was completely immobilised, as 101 askaris, 69 porters and 35 of the women and children went down with the disease. Fortunately there were no deaths.

The epidemic slowly spread north and west. Kasanga got it in July. It was reported to be very severe at the Kala Mission on Lake Tanganyika.

Between March and May influenza was reported from Songea. The infection may have spread from the north, but in view of the fact that Mahenge was spared, Iringa not yet infected, and as the Songea-Kilossa traffic passes either close to or through Mahenge it is more likely that the spread was from the south. From the health bulletins issued by the local Portuguese Government it was expected to come up this way.

In August it took hold of Ufipa and spread rapidly eastwards towards Lake Rukwa. Influenza was present in the Kigoma district in July. This was probably an extension westward of the northern wave, but the infection may also have come across from the Congo.

PLAGUE.

Plague outbreaks during 1920 have been limited strictly to two areas :—

- (1) The Shirati, Sub-district of Mwanza.
- (2) The Singidda, Sub-district of Dodoma.

The Shirati outbreak was relatively unimportant, but the Singidda epidemic has caused a good deal of anxiety.

The outbreak in Shirati was confined to a remote area near the Kenya Colony frontier, but cases of plague in the Singidda Sub-district were reported as near as 35 miles to the Central Railway.

The Singidda Outbreak.

In the Sanitation Report for 1920, the following passage occurs :
 " Cases of illness extraordinarily similar in symptomatology to plague continued to be reported from Singidda and Mbulu up to 1920"—as bacteriological confirmation, however, could not be obtained in spite of three officers having been sent to the district—" the disease, therefore whatever it was, is not regarded as having been plague."

That was the position up to the 30th April, 1921, when a specimen arrived at the Laboratory which confirmed the previous suspicion and the diagnosis of plague was definitely established. That being so, it is not out of place to review for future reference, as shortly as possible, the history of plague in the Territory.

Professor Simpson in his classical report on " Sanitary Matters in East Africa " (Afr. No. 1025, February, 1915), traces back a history of

plague among the Wahehe to 1886, when he says it was introduced to the Iringa district from the north in the course of inter-tribal fighting. In 1889 it decimated the Wahehe.

In 1904 it was reported by Greisert as being endemic in the Uhehe Highlands. It was present at Iringa and at Tosamaganga.

Plague has been known to exist at Port Florence on Lake Victoria since 1904, so that the subsequent infections of Bukoba and Mwanza are not to be wondered at. In German times it was also reported at Mpapua.

In 1914 there was a moderately severe outbreak beginning on 1st April in Dar-es-Salaam, and the Germans took very vigorous measures to try and get the town clear of the disease before the opening of their Colonial Exhibition. Plague was still present, however, in Dar-es-Salaam when war broke out.

We hear no more of plague until 1917, when Capt. Bagshaw, Assistant Political Officer at Mbulu in the Arusha District, reported that in his administrative area patients were dying of plague. This report apparently drew attention to the disease, because further enquiries showed that it was present far to the south of Mbulu. It was reported 16 miles north of the Busi country, and in December, 1917, it was at Ufana, Massagoloda and at Ufiome in the Kondoa-Irangi District. Lieut.-Colonel Currie, South African Medical Corps, was sent up in February, 1918, to report, and though he obtained no bacteriological confirmation of the presence of plague, he concluded that the epidemic was, on clinical evidence, plague. He pointed out in his report that plague has existed in this area since 1904. Between 1918 and 1920 the epidemic either died down or disappeared, and medical interest became centred in influenza and small-pox epidemics.

Plague, however, was present not only in the Arusha District, but during that time also in the Singidda Sub-district of Dodoma. Capt. Carpenter was sent up to this area and reported that he was dealing with plague. He remarked that he had come across 38 cases of undoubted plague. Capt. Wheat, South African Medical Corps succeeded Capt. Carpenter. He investigated the history of 130 deaths and concluded that they were all cases of plague. In March, 1920, the Assistant Political Officer, Singidda, reported an undue mortality among natives in the district. Mr. Scott of the Government Medical Service, was sent

up, but was unable to confirm the existence of plague. He therefore returned to Dar-es-Salaam. In April, 1920, a rather alarming wire was received from the Assistant Political Officer, Singidda, and the Senior Sanitation Officer, therefore, proceeded to the infected district, and the conclusion was arrived at, that on clinical grounds the cause of this undue mortality was plague. Unfortunately the smears that were made from both living and dead were found to be negative to plague on microscopical examination in the Laboratory at Dar-es-Salaam. It is difficult to explain why this should have been so, except it must be remembered that punctures frequently have to be made under the most remarkable conditions, often in a high wind with the atmosphere heavily charged with dust. The result is that the slides get covered with sporing organisms of every description, completely obscuring the expected picture.* But the cases seen were so characteristic of plague, that there seemed no doubt in the mind of the writer that the cases were plague itself. It was the same with Mr. Scott's smears. They were all negative to plague on examination in Dar-es-Salaam.

Dr. Butler, the Director of the Central Laboratory, next proceeded to the Singidda area, but he was unfortunate, as he arrived there during a quiescent period, so he did not come across a single case of anything like plague during his three weeks' tour.

In 1920, therefore, we had to rest content with the broad fact, that there was some curious disease present in the Singidda area, which was accounting for a heavy mortality, but which we could not, owing to the lack of laboratory confirmation, ascribe to plague.

This was the position up to 1921. Deaths continued to be reported during the early months of the year from the same areas as were affected in previous years. In April, however, the Compounder at Singidda sent in a Medical History Sheet of a case of illness that had come under

* The difficulty in getting confirmation at a distant laboratory would not seem to be confined to this Territory. Plague was reported in 1921 in the Karonga area of Northern Nyassaland. The Medical Officer who was dealing with the outbreak failed to get bacteriological confirmation on his slides being examined in Zomba. Every text book dealing with plague refers to the ease with which microscopical confirmation can be obtained. This may be so when the laboratory is near at hand, when the smear can be made under normal conditions; but it is quite another matter making smears from a corpse in a dark mud hut, or even outside in a dust-storm or when it is raining, or under the conditions which are commonly found in native African villages. Currie's, Carpenter's, Wheat's, Scott's, Skelton's and Saunderson's slides were all negative and yet they were dealing certainly with cases of bubonic plague.

his care, which from the story he told, made out his case to be very like one of anthrax. He was ordered to send in specimens of spleen in any other similar case he might come across. Such a specimen arrived shortly afterwards, and on 30th April, Dr. Butler reported he had found the long lost *b. pestis*.

Mr. Blackwood was therefore ordered to proceed to Singidda at once and initiate anti-plague measures. The Senior Sanitation Officer followed him in June. Perhaps we were better equipped this year, or it may be that, having a motor cycle available, one was able to arrive on the scene earlier than when dependant only on one's legs, but the fact remains that there was no difficulty in obtaining microscopical confirmation of plague from our cases. Dr. Blackwood's slides were classical in type, and the Senior Sanitation Officer obtained a growth on agar without difficulty.

Mr. Blackwood fell sick in June, and was succeeded as Plague Officer by Mr. Phillips, who has carried on preventive measures to the end of the year.

The number of deaths from plague in the district for the first six months of the year was 112, and for the last six months 37, a total of 149.

The population of the whole district is about 127,000, whilst the affected zones lie within an area of 40 miles by 20, although by road the distance from Kanoda to Gwao is at least 60 miles.

The 1921 Epidemics in the Singidda Area.

The 1921 outbreak began in the same bit of country in which the 1920 epidemic appeared to have ended, for a death occurred on or about 21st February, near Kanoda. Then the line of infection extended south to Minyara (Chume) and from there north and a little east to Ahungu. Fortunately, Kanoda is the end point of the thickly inhabited country. North of Kanoda is an area of sparsely, or uninhabited, country. To this region during the dry season the Wa-Mangati come down from the Dondobosch area with their cattle for the grazing, but they are a people who have little or no dealing with the natives round Kanoda. From the map it can be seen how easily Mwanga could be infected from Kijukia. Mbula had a little epidemic of its own. Its infected matembe were all close together—a square mile would cover them all.

Singidda, then, is an endemic plague area. The writer feels confident that if vigorous steps had not been taken this year, there was every reason to suppose that the disease might have spread to neighbouring districts, and no one could have foretold where it might have stopped. As it is, plague has been confined, so far as the central plateau is concerned, to the Singidda area. No case of plague has occurred in this Territory nearer the capital than Gwao; which is some 250 miles away. Neighbouring colonies, Kenya, Nyassaland and North-east Rhodesia, have been in no danger of infection from Tanganyika, and the same is true for the Congo.

Table IV. shows the locality incidence of cases in 1920 and 1921 in the Singidda sub-district.

TABLE IV.

Jumbiate	1920.	1921.
Ahungu	43	6
Chume	—	1
Dafi	—	1
Gwao	—	11
Kanoda	2	25
Kijukia	22	5
Kilongo	10	10
Magunga	—	1
Mbula	—	19
Mgori	—	5
Minyara	—	18
Mwanza	16	42
Pahi.. .. .	—	5
Total	93	149

PREVENTIVE MEASURES.

As soon as the diagnosis of plague was established, energetic measures were at once put in hand. Roughly, such fall under two heads :—

- (a) Inter-district prevention measures.
- (b) Intra-district measures.

(a) So far as we know, as has been said, the Singidda sub-district is the only one in this country, with the exception of Shirati (say 250 miles away) in which plague is reported. The importance of limiting its spread by travellers was very urgent. A system of inspection of

travellers was instituted at Mkalama to the north-west, Kondoa-Irangi to the east, Mbulu to the north and at Saranda, the station on the Central Railway. Up to now no infected traveller has succeeded in getting further than Mgori (30 miles) on the Kondoa-Irangi road, and Gwao on the main south road, some 35 miles from Singidda and about the same distance from the Central Railway. At Saranda, on the railway, a Sub-Assistant Surgeon is posted, who examines all Singidda travellers and ensures them being quarantined for six days before being allowed to purchase a ticket and proceed further. So far, then, it would seem that inter-district measures have been successful in limiting the spread of the disease.

(b) Intra-district measures, however, prove much more difficult. The Assistant Political Officer prohibits movement from an infected jumbiate to a clean one. But it is by no means easy to carry out this order. There are Wanyamwezi traders for instance, who slip away, and such have, without doubt, infected clean areas. Instances are afforded by those cases that have been reported from Mgori, Pahi, Gwao, and probably Ahungu.

We next have to deal with *matembe* to *matembe* infection. The social condition of the local tribes must be recalled.

By occupation they are great cattle breeders. Families live in thick mud huts surrounded by a "boma" or zariba of wooden stakes reinforced by a high hedge of *mnyara* or *irgin*. Inside this, all together, dwell humans, cattle, dogs, poultry and innumerable rats and fleas. It has often been suggested that when a case of Plague occurs in such a place the *matembe* should be evacuated and then burnt down. So it should be, but it cannot be done. These *matembe* will not burn—they are like "dug-outs." Then again, we should have nowhere to put the inmates, and, in particular, nowhere to put the cattle. The country abounds with leopard and lion, and if the cattle were left out or with no one to look after them, they would soon disappear.

All we can do is to order the roof of the *matembe* to be taken off, and as many of the rats to be slain as can be caught. At one time we tried smoking them out, but we came to the conclusion eventually that probably more harm than good was being done by this practice; so we stopped it. Probably free fleas were suffocated by the smoke, but the rats were driven out and infected other *matembe*. The ideal way to deal

with infected matembe would be to claytonise them, but the necessary machines are not available. In the end an intensive rat campaign was instituted, and between 5th July and 20th October, 831,953 rat tails were brought into headquarters and redeemed at the price of one cent. per tail.

Finally, considerable dependance was made on organised inoculation with Haffkine's vaccine. Since June, 14,000 inoculations have been performed. It would have been desirable to have inoculated the entire population, but neither that amount of vaccine nor the necessary trained staff was available to carry it out. It was decided, therefore, to inoculate the population at the two stations on the Central Line, Itigi and Saranda, which serve the district and then to throw a sort of barrage in the way of an inoculated population across the road leading from Singidda to the railway. This was done at Gwao, which is the last halt but one for most travellers.

In the result, the rat campaign plus the organised inoculation scheme appear to have been effective for the time, for the disease certainly abated after these two measures had got into full force, and no case has been reported between mid-October and the end of the year.

THE SHIRATI OUTBREAK.

Plague was reported to have broken out in the village of Shirati about the 19th of May. Mr. Maclean, Medical Officer at Mwanza, reached the infected area on the 3rd of June. He found that rats had been dying in numbers since the beginning of May or earlier, and that 16 deaths had occurred among the villages. A small detachment of the King's African Rifles is stationed at Shirati, and the Medical Officer advised the immediate evacuation of their camp and removal to a new one a mile away from the village as a preliminary measure to their being sent back to headquarters at Mwanza. After consultation with the Assistant Political Officer at Musoma, it was decided to set about putting up temporary dwellings for a new village on a new site and to burn down the old village. This was done. Steamer sailings were suspended, the whole area put into quarantine and all movement prohibited. A small temporary hospital was erected for the accommodation of sick.

A campaign against rats was at once instituted. Mr. Maclean returned to Mwanza, picked up the vaccine which by this time had

arrived and returned to Shirati on the 18th of June. He found that two days after the burning of the village there had been one case, but none since. In all there have been 21 cases with 14 deaths. 180 natives were inoculated.

Mr. Maclean thinks the disease also exists further in the interior. There is no definite information to show how the disease was brought to Shirati. It is possible that infected rats which could have come on board at any of the other infected lake ports were landed off the steamer. Mr. Maclean's prompt and energetic action in all probability had much to do in limiting the spread of the disease.

ANKYLOSTOMIASIS.

The time has not yet arrived when any mass treatment of the population by chenopodium or other means can be undertaken, prevalent though we know the disease to be.

At the same time, year by year an improvement is taking place in the sanitary condition, not only of the larger towns in which are stationed medical officers, but of the smaller villages and hamlets where the influence of the Political Service is beginning to be felt. There is not a Political Officer in the Territory who is not keenly interested in sanitation, and it is to that service that the Sanitation Branch must look at present for help in the campaign against ankylostomiasis.

BILHARZIASIS.

Infection with Bilharzia among the native population on the coast would appear to be much commoner than at one time there was reason to expect, although the disease is known to be prevalent on the West Coast, in Uganda and in the Sudan. The Director of the Laboratory, in an examination of Dar-es-Salaam prisoners, found Bilharzia in the urine of 20 per cent. of men examined. And yet in spite of this, the infection often seems to be present without symptoms. It will be necessary in the course of the year to examine the urine of all the school children with a view to ascertaining whether any appreciable proportion of the pupils are infected, because it is almost impossible to believe that Bilharziasis in the case of a child can have no ill effects, no matter how little it may interfere with the comfort or the efficiency of an adult.

Dr. Butler, by finding snails collected in Dar-es-Salaam to be infected with a variety of Bilharzia, has drawn attention to the potential danger

from the point of view of the Public Health. A great deal of washing of clothes and persons certainly goes on in or at the Bagamoyo pool for example, and it is possible that a considerable infection of the public is taking place from this source. If Dr. Butler's continued researches confirm his preliminary observations, then the Bagamoyo Pool must be closed to the public.

There is no information as to the prevalence of the disease in the country districts of the interior.

CEREBRO-SPINAL MENINGITIS.

The disease continues fortunately to be one seldom met with in the Territory. Such cases as do occur appear to be limited to the Arusha-Moshi high country. In 1920 eleven cases were reported, and against that, in 1921, twelve cases have been notified. In addition to these, three sporadic cases have been reported, one each from Bagamoyo (in July), Tabora (in October), and Dodoma (in November). Some doubt may be thrown on the diagnosis of these sporadic cases, especially as serological confirmation is lacking.

The seasonal incidence of the admitted cases was as follows :—

January	..	..	..	..	..	Moshi	1
February	..	..	..	..	..	Moshi	2
April	..	..	..	..	..	Moshi	1
June	..	..	..	..	..	Moshi	2
November	..	..	..	..	..	Arusha	3
December	..	..	..	..	..	Arusha	3
							<hr/>
							12
							<hr/>

LEPROSY.

As was noted in the last Sanitation Report, under the terms of a memorandum drawn up by the Principal Medical Officer, the Senior Sanitation Officer has no direct concern with this disease. The Medical and Sanitary Committee at the Colonial Office advised, however, that Leprosy, Tuberculosis, and Venereal Disease should properly come within the province of the Sanitation Branch of the Medical Department ; but no action, however, has yet been taken in regard to any alteration in responsibility. An apology is therefore called for if any reference is made to the problems that arise in connection with Leprosy and Tuberculosis ; at the same time it seems an excuse is to be found, in that any

review of the Public Health would be incomplete, if no mention were made in the Senior Sanitation Officer's Report of diseases so closely connected with the public health.

As was clearly brought out by the Principal Medical Officer in his last year's report, Leprosy is a sadly common disease in the Territory. Assuming that the numbers have remained stationary, the incidence of segregated lepers for the whole country is 70 per 10,000 of population,* whilst if those at large be included, the case incidence is probably nearly double that figure.

Some districts are more heavily affected than others; so that if it is recalled that in one district the ratio is (as much as) 1 Leper in 155 of population, it will be realised that the problem of trying to check the spread is not an easy one, whilst to supervise the control of those unfortunates who already have acquired the disease is completely beyond the present resources of the Medical Department.

The only known method of preventing the spread of Leprosy is by isolation and segregation of the sick. The war has probably been responsible for an increase in the number of lepers in the country, as, during operations, and before the country came under complete administrative control, many inmates of the old German settlements walked out and returned to their original villages. These deserters are now in process of being rounded up and sent back to their settlements, but the damage has been done, and we may now expect an increase in the leprosy incidence over a span of some years. Propaganda among Jumbes, Rugga-ruggas and Headmen must be pushed, and native officials should be made to understand, that they will be held responsible for the appearance and retention of any leper in their domain.

The Sanitation Branch next concerns itself with the answer to this question: Is the Public Health being sufficiently protected by the inclusion of all known lepers in settlements? Provided that the settlements are run as complete isolation settlements, the answer is probably in the affirmative. But it is felt, that under existing conditions the proviso does not hold good. So far as can be ascertained lepers are constantly either running away or temporarily quitting settlements to return to their villages to settle some "shauri," and so isolation is not complete. The principle of having a number of small settlements dotted

* Cf. Incidence :—B. India, 5 in 10,000; Burdwan, 19.5 in 10,000.

all over the country in preference to a few larger ones, properly organised and medically supervised, is open to question as being sound, whether regarded medically, epidemiologically or financially.*

A visit to a settlement is apt to upset one's balance of judgment. The conditions under which the inmates live appears at first sight pitiable in the extreme. The picture of the Leper Asylum given at the "Grand Guignol" was gruesome enough, but in an African settlement it is both sad and gruesome.

The present resources of the Medical Department do not permit of medical attention being given to leper settlements, but the time is surely approaching when the problem must be faced as to whether it is not imperative, on humane grounds, to do something more for lepers than simply confine them to a so-called settlement, and then to allow them merely to wait there for death. Dean's method of treatment by the employment of the ethyl esters of chaulmoogra oil is receiving considerable attention to-day. Under this line of treatment at the Molokai Leprosy Investigation Station in Hawaii, since 1st October, 1918, 78 patients have been discharged "on parole" as apparently cured. The Director of the Laboratory in Dar-es-Salaam has a certain number of patients under "ethyl ester" treatment at the Infectious Diseases Hospital. It will be left for him to describe with what results; but if confirmation of the good results of the Dean-MacDonald treatment is obtained, it would be positively inhumane if Government did not afford facilities for treatment in this Territory, in view of the fact that there exists strong reason to suppose that at last medicine possesses a drug of great remedial value in Leprosy.

The Senior Sanitation Officer, in the course of a tour, was enabled to visit the leper settlement on Kirengi Island, near Kirando, on Lake Tanganyika. This island lies at its nearest about half-a-mile from the mainland, and supports a population of some 800 souls in addition to 50 odd lepers. The island might prove a good site for a settlement on a large scale if the healthy inhabitants were removed elsewhere. Although not particularly fertile, yet a good crop of mohogo and bananas can be raised. If auxiliary foodstuffs were supplied, there is room on Kirengi Island for say 4,000 lepers. The possibilities in regard to the complete

* There is a difference of opinion about this among the members of the Colonial Office Medical and Sanitary Advisory Committee.

isolation and treatment of lepers on this island need only be hinted at here and at this stage.

There does not appear a shadow of doubt that in the course of a generation, the leprosy-incidence could be so reduced in Tanganyika by means of effective isolation, as to render the disease, to all intents and purposes, non-existent.* Meanwhile, if we go on as we do now, we are being committed to the expenditure of between four and five thousand pounds a year for which, apparently, we get no great public benefit and certainly obtain no individual relief.

TUBERCULOSIS.

As remarked in the Introduction to this Report, the form of Tuberculosis in which the sanitarian is particularly interested is the pulmonary form. Exact figures of its incidence are not available, as it is not a notifiable disease. In 1920 the cases of Tuberculosis (of all varieties presumably) treated in 10 hospitals in the Territory represent 1.1 per thousand patients. In addition to this, however, 115 patients per 1,000 were treated for disease of the respiratory system. A proportion of this latter figure may be regarded as suffering from, or entering upon, a phthisical condition which, at the time, was not diagnosed. If the information supplied by executive medical officers as to the prevalence of Tuberculosis among the Indian community is correct, then, either the greater number of Indians do not obtain treatment at Government Hospitals, or we must take out a proportion of the patients diagnosed as "disease of the respiratory system" and put them in the Tuberculosis class.

To obtain an accurate estimate of the prevalence of the disease notification is needed, and this notification might be made applicable in the first instance to Dar-es-Salaam and Tanga. It is in these two towns that something can be done, it is thought, towards prevention. For example, once a case is notified to the Medical Officer of Health, that Officer's duty should include periodical visits to the patient after his discharge from hospital. He would then be able to advise the patient as to means of improving his sanitary environment and would advise such steps being taken as were possible to prevent the spread of infection

* This view coincides with the opinion expressed at a Leper Conference held in India in 1920—"The disease of leprosy could be stamped out in India if all lepers were segregated."

to other members of the family. It is, therefore, the patient himself we must try to get at under local conditions. We must see that the Indian bunia does not continue to live in the dark hovels, and in the generally overcrowded condition which his soul delights in. As Sir G. Newman says, "we must educate." Until some rich, public-spirited Indian comes forward with the money little can be done in the way of treatment. No Government for years and years to come will be in a position to put up the money for special dispensary treatment, special hospital or colony accommodation, or even for that adequate after-care, which is such a feature of an anti-tuberculosis campaign in Europe.

MALARIA.

Unfortunately, a general survey of the position as regards the prevalence of Malaria in the Territory presents formidable difficulties. Reliable figures from hospitals are difficult to obtain, though the situation in this respect is improving. In the past all medical officers have not been making up their returns on similar lines. For instance, one medical officer will calculate his prisoner figures among "native officials" for one month, and then change over and include them among the "native general population" the next. Another medical officer may desire to return each attendance as a new case, a practice which, of course, absolutely defeats any statistical methods. Again, the need of exact diagnosis is felt, for the practice of examining the blood of every suspected Malaria case is not by any means universal. Some officers are still unskilled in thick film methods, and even when they succeed in staining the parasite by any method, they experience difficulty in differentiating the varieties. Another source of possible error lies in the fact that in the compilation of returns according to the methods prescribed, it would appear to be necessary to diagnose a patient as suffering from some definite disease. Recent research appears to show that in general, and taken all in all, 25 per cent. only of all diagnoses made by physicians are correct and something like 75 per cent. are wrong.

In tropical medicine the margin of error must be even greater. There is hardly a case comes before the practitioner in the tropics in which it is not essential to have a microscopist's opinion on the blood, stool and urine as a routine measure; and yet how often is this done? If the monthly hospital returns are searched it will be found that there are no patients left over at the end of the month undiagnosed; no case of

“N.Y.D.” appears to be allowed. There is no “pyrexia of uncertain origin.” Every case coming into hospital, say in the evening, with a little temperature, which may even have abated by the next day, must be labelled perfectly distinctly. And what is he labelled? As a rule, “Malaria”!! What sort of Malaria? “Aestivo-autumnal”—whatever that means! On the other hand, perhaps the physician is not a Malariologist—so the unfortunate patient is labelled “influenza.” It is among such difficulties that the bewildered statistical officer has to wade.

The relative sickness rates among the Europeans from Malaria at the various stations is shown in Table V., whilst Table VI. shows the rate among native officials. In the latter table the figures returned for Moshi, 3,687 per 1,000, and those for Bukoba, 2,394 per 1,000, are rejected as being unreliable. It is thought that at these stations attendances instead of cases may have been recorded. Even that would, as a matter

TABLE VI.

Station.	Malaria.					Blackwater Fever.			
	European Cases.	Native Official Cases.	Native General Population Cases.	Sick Rate per 1,000 (European).	Sick Rate per 1,000 Native Official.	European.		All Others.	
						Cases.	Deaths.	Cases.	Deaths.
Arusha ..	28	103	232	72	500	—	—	—	—
Bagamoyo ..	14	51	590	700	600	—	—	—	—
Bukoba ..	4	170	483	51	2,394	—	—	1	—
Dodoma ..	4	88	86	57	303	—	—	—	—
Dar-es-Salaam— Sewa Hadji Hospital	—	1,391	534	—	—	—	—	—	—
European ..	238	209	61	427	640	2	1	9	2
Iringa ..	13	59	185	464	210	—	—	—	—
Kondoa-Irangi	1	83	199	50	954	—	—	—	—
Kilwa ..	5	56	34	625	560	—	—	—	—
Lindi ..	28	144	145	437	400	1	—	—	—
Moshi ..	10	885	1,730	47	3,687	—	—	—	—
Mwanza ..	60	484	320	400	1,861	1	—	2	1
Morogoro ..	10	128	31	68	457	2	—	1	—
Mahenge ..	2	43	335	153	148	—	—	—	—
Pangani ..	6	26	185	240	260	—	—	—	—
Songea ..	7	141	335	260	509	1	—	—	—
Tabora ..	55	1,080	116	328	607	1	—	—	—
Tanga ..	48	606	58	217	758	3	1	4	—
Tukuyu ..	6	72	240	181	514	—	—	—	—

of fact, have been some sort of help, if it had been stuck to all the year round, because one has a rough idea of the number of attendances of each case during his attack and calculations could have been made accordingly.

Discarding these two stations then, Mwanza heads the list for sick native officials, followed by Tabora. Among stations that have relatively equal rates per mille of Malaria sick among Europeans and native officials are Bagamoyo (700 and 600), Lindi (437 and 400), Kilwa (625 and 560), Mahenge (153 and 148), Pangani (240 and 260), and Dar-es-Salaam (427 and 640).

MALARIA IN DAR-ES-SALAAM.

The total ratio per 1,000 Europeans, 427, and Native officials, 640, is, considering how much has been done in the capital in the endeavour to eradicate Malaria, a very disappointing result. In plain language it means that 2 out of every 5 Europeans in Dar-es-Salaam spend between them something like 24 days in the year incapacitated. As there are roughly 500 European adults in Dar-es-Salaam, the annual incapacity among them totals something over six-and-a-half years. The direct financial loss alone, either to the State or to commercial houses, is not less than £2,400 a year, and this figure takes no account of a diminished out-put of work following an attack of Malaria, the possibility of a shortened tour and a lengthened leave of absence to the sufferer.

In the total of 238 European cases and 2,200 Native officials we do not know the number of return or relapse cases. But experience in offices tells us that a fair proportion of this number are relapse cases. And relapses would be more frequent if the dominant type of Malaria were not malignant tertian, which reacts to quinine and to "anti-relapse" treatment more readily than benign tertian. The sterilisation of the blood of Malaria carriers is an important feature in Malaria prevention on a large scale. Executive Medical Officers will therefore be rendering great assistance if they urge very strongly on their patients the absolute necessity of their undergoing a thorough course of anti-relapse treatment, and advise them to continue this anti-relapse treatment for at least 74 days after discharge from hospital. The plan carried out with such

success in the Malaria concentration camps in France might well be given a trial out here, viz. :—

15 grains of quinine daily for 14 days	} After the attack has passed.
10 " " " 60 days	

TYPE OF MALARIA IN DAR-ES-SALAAM.

Of 508 cases of Malaria treated at the European Hospital
282 were diagnosed malignant tertian.

12 " " benign tertian.

3 " " quartan.

The ratio of benign to malignant tertian is, therefore, 1 to 23·5 for the whole year.

The monthly variation is :—

January 1 to 10·6	July 0 to 17
February 1 to 7·5	August 0 to 18
March 0 to 16	September 0 to 17
April 1 to 10	October 0 to 0
May 1 to 28	November 0 to 16
June 1 to 20·3	December 0 to 14

The difference between the cases actually classed (294) and the total cases treated is recorded in the returns as "Chronic Malaria"; that is, they were regarded as being cases of clinical Malaria in which the parasite could not be found. Parasites, therefore, on these figures were found in 57·8 per cent. of all bloods submitted to microscopical examination.

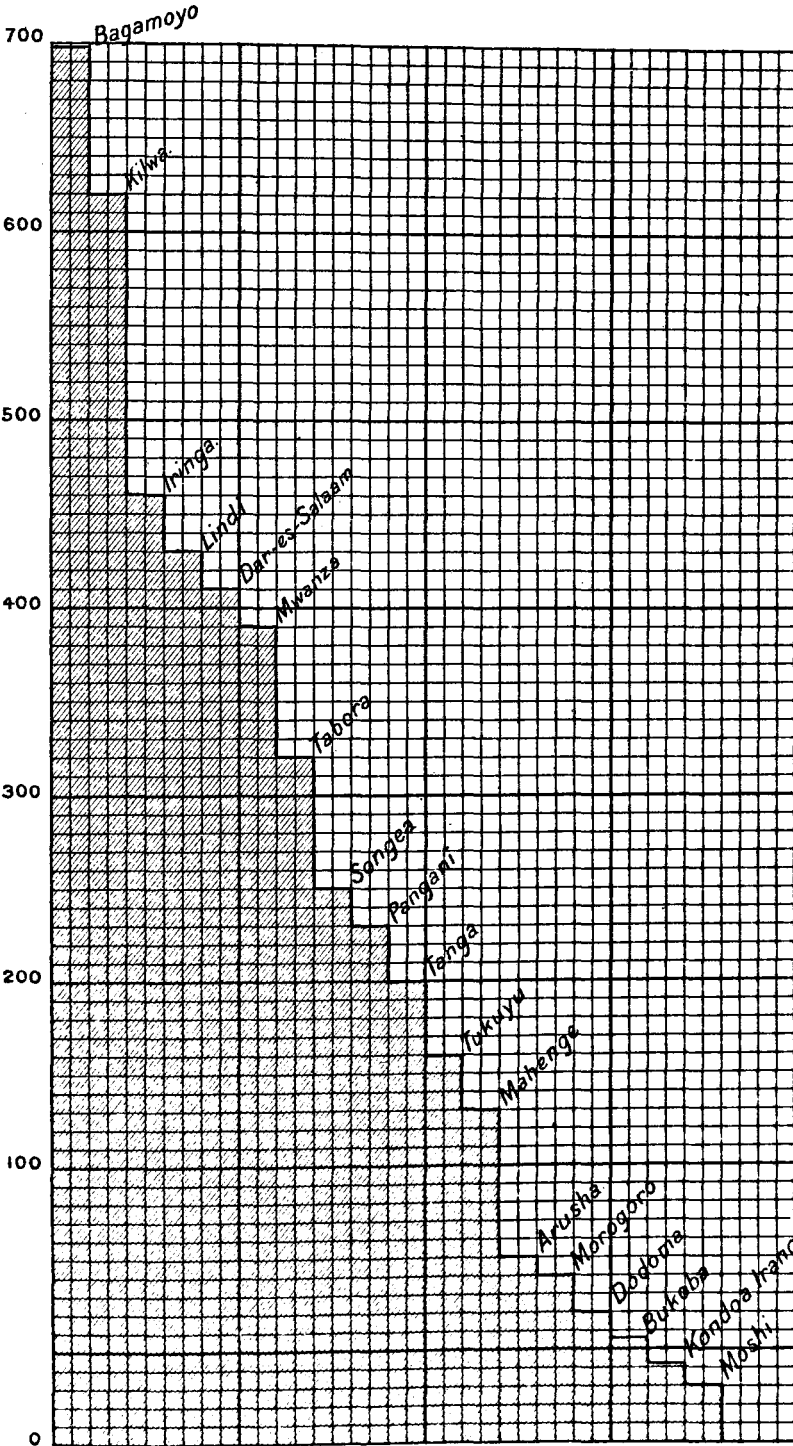
ANOPHELINE BREEDING PLACES IN OR NEAR TOWNSHIPS.

This subject is discussed by the Medical Officer of Health, Dar-es-Salaam, in his survey, but attention may well be directed at this stage to the very valuable work and observations carried out by Mr. Haworth, lately Medical Officer of Health at Tanga, and now engaged in the Laboratory in Dar-es-Salaam.

The conditions of discomfort under which Europeans live at Tanga on account of the swarms of mosquitoes, and the relatively few breeding places that could be found, caused Mr. Haworth to look upwards. He

MALARIA

ANNUAL COMPARATION SICKNESS RATES
PER 1000 (EUROPEANS BY STATIONS)



trained a tree climber to ascend palm trees and bring down samples of the water which he found collects between the bases of the fronds at the top of the tree. Time and again eminent authorities, entomologists, epidemiologists and sanitarians generally have declared that the tops of cocoanut trees cannot possibly afford breeding places for mosquitoes of any sort. The evidence in Tanga and Dar-es-Salaam is to the effect that this view cannot be sustained. Dr. Haworth has had 2,792 trees examined in Tanga, and has recorded larvæ in the contained water in 1,299 instances. Of trees examined, 59.5 per cent. held water and 46.2 per cent. of these trees contained mosquito larvæ.

Dr. Haworth, on transfer to Dar-es-Salaam, brought his trained tree examiner with him, and has already inculpated over 50 per cent. of the trees he has searched in the capital. It is not only that he recovers *stegomyia* and *culex*, but, unfortunately, he finds anophelines as well. Trees in front of and round about the Governor's new palace, and around His Excellency's present residence, are, at the moment, breeding out anophelines in some numbers.

There are houses, especially on the outskirts of the European residential zone in Dar-es-Salaam, in which, on account of the mosquito nuisance, the conditions of discomfort approximate those at Tanga, and yet no ground breeding place can be discovered. The palm trees all about are probably the key to the problem. Whether the palm tree top is the reservoir or the main mosquito breeding place is of no consequence. It may be that mosquitoes in towns with a satisfactory sanitary service are driven to the tree-tops *faute de mieux*, or it may be that the female specially selects the palm as being the safest place she can find for oviposition.

Mr. Haworth has demonstrated that there is water at the top of a palm tree all the year round—in the driest weather as well as in the wet season. Mr. Haworth started his work at the time of the heaviest rain, and in his first week his catch was 14 per cent. He worked up his catches week by week as the search technique improved until the middle of September, in the very driest month of the year, he was finding larvæ in nearly 80 per cent. of those trees he examined. Practically speaking, at this time there had been an absolute drought for three months. The ground breeding places were almost nil; at least few, if any, could be found. Mr. Haworth, therefore, has definitely shown that cocoanut trees in towns with an efficient sanitary service

are a source of mosquitoes—of anophelines, of culex, and of stegomyia, but chiefly of the stegomyia.

What is to be the remedy? From the lease of cocoanut trees in the European residential zone in Dar-es-Salaam Government derives an income of £110 a year. This fact has to be taken into consideration if it were recommended that all cocoanut trees in this quarter were to be cut down, as at first sight appears to be the obvious course to adopt. But before such a recommendation is put forward Government must be convinced that larvæ, undoubtedly to be found in the tree tops, actually come to maturity. The Government Entomologist is of opinion it must be shown that the water collections actually produce large larvæ or mosquitoes in the pupal stage of development, if it is to be believed that cocoanut trees are really a source of mosquitoes, inasmuch as many breeding places exist in which larvæ can be demonstrated, but from which further development does not take place.

This postulate, which is thoroughly sound, can be complied with. Large larvæ and pupæ have frequently been recovered. Dr. Haworth even goes further and has shown that between the time of collection and arrival at the Laboratory pupæ have matured.

There exists therefore no reasonable doubt that full development can and does take place in the cocoanut tree.

The answer therefore to the question at the head of the paragraph is that cocoanut trees *must* come out of the European residential areas, at least, if we are to live in comfort, to say nothing of health. Every breeding place of mosquitoes we dispose of improves the situation. It is no use our spending thousands of pounds on ground sanitation if the nuisance is far worse 60 feet above our heads. We have pulled the house gutters down because they afforded breeding places. Now it looks as if the trees must come down; and one can foresee a long and weary war between a Government, with its eye on a few thousand pounds, and sanitary idealists with definite views about health and comfort. There is no question which will win in the end.

“Palms on a surf-bound beach,” “palm-fringed lagoons,” and all the other attractions, held out by novelists to an admiring public; safe in zones where no palm grows, must now come out of the assets and be put among the liabilities of tropical residence. Mud, mangrove swamps and palm groves are now all equally deadly, potentially, to the resident in the tropics.

ENTERIC GROUP.

Between the date of submission of the 1920 Sanitary Report and the end of that year two further cases of Enterica were reported. One was in the case of a distinguished military officer, who was on a hunting expedition south of Iringa, in which district he must have contracted the disease; whilst the second case was notified from Tabora, though the infection in this instance must have been acquired in Dar-es-Salaam. The first case unfortunately proved fatal.

In March, 1921, a case in a European was reported from Tabora. The history showed that the patient had been transferred from Dar-es-Salaam 36 days before he reported sick at Tabora. The source of infection at the latter station could not be traced. The patient had been inoculated in 1914 and 1918.

A native police officer became infected at Morogoro and was transferred sick to Dar-es-Salaam, where he died. Two other cases at intervals have been reported in natives from the Sewa Hadji Hospital, Dar-es-Salaam.

During the year Tanga reported three cases, one in a European and two in Indians. It will thus be seen that seven cases of the Enteric group have been reported in the whole Territory during the year, as compared with 14 for 1920.

Although the number is small and the incidence almost insignificant, the ever-present danger of sporadic infection must not be lost sight of. The greater number of younger Europeans are possibly still protected in some slight measure by their war inoculation, but it must be constantly impressed on the whole European community, that protective inoculation is necessary, and that even an acquired immunity from previous inoculations will not last for ever.

V. CLIMATE IN RELATION TO HEALTH.

In the Chief Secretary's Report on Tanganyika for 1920, three types of climate are described:—

1. The Indian or trade-wind type.
2. The monsoon type.
3. The equatorial type.

This classification cannot very well be correlated to health considerations. In tropical Africa, *the* factors in climate, that affect the health of Europeans in any particular locality and make it habitable and pleasant to them to live in are :—

1. A marked daily difference in the maximum and minimum thermometric readings.

Longer residence can obviously be supported in a place, even though the maximum temperature be high, when the day is followed by a cool night, than in stations where the night brings small relief after the heat of the day.

2. Atmospheric humidity.

If the wet bulb thermometric reading approximates the dry bulb register, evaporation will proceed slowly and ordinary life will become merely an uncomfortable form of existence, particularly when the reading is anywhere near 80° F. ; so that relative humidity readings must be considered together with the mean air temperature.

3. Atmospheric pressure.

Continued residence at high altitudes is said to have considerable influence on the stability of the nervous system, though it is possible that this influence has been overrated. That irritability of temper, said to be so common among those who live at high elevations, is quite possibly due to other causes, which do not enter into consideration of climate *per se*. Some recent observations made in the Himalayas serve to show that the red blood corpuscular content is increased if the subject remains for any length of time at a high altitude. This change should be beneficial rather than otherwise, and indeed it is so, as many cases of anæmia do well in mountain climates. Firth says that "at altitudes under 6,000 to 7,000 feet the effect of mountain air is to cause a very marked improvement in digestion, sanguinification, and in nervous and muscular vigour." Whilst another writer, from observations made on European children living at 6,000 feet, found no detrimental effect on the heart.

The question of climate in Tanganyika has become no longer one of purely academic interest. As development takes place and Europeans arrive, intending to settle and farm, enquiries are bound to be made as to climatic conditions, and it is well that some records should be available. Views expressed now may, with greater experience, have to be modified. By a "settler's climate" is meant one in which an European can live

and expect a degree of good health, and one in which his wife can comfortably "carry on," and in which his children can be reared without frequent visits to Europe. It may be said here, that in the writer's view, based on observations made over a wide stretch of the Territory, such zones are few and far between. Apart altogether from the economic standpoint, suitable localities would include the following:—

Northern Area.—Certain selected parts on the slopes of Mount Kilimanjaro and Mount Meru.

Central Area.—Nil.

Western Area.—(1) The Ufipa Plateau. (2) The Elgon Plateau. (3) The Tandala and Bulongwa rifts and the down-like country in the neighbourhood of these places. (4) The Lupembe and Njombe (Ubena) plateaus.

Southern Area.—Certain areas between Songea and Tandala.

Coastal Area.—Nil.

Table X. is designed to show at a glance the general climatic conditions in districts as a whole. At the same time, districts, by which term is meant the "administrative districts," have, in some cases, wide climatic variations. For instance, Kasanga, the administrative headquarters of the Ufipa District, is to be graded as distinctly unhealthy, whilst the Ufipa plateau, beginning 20 miles away, having an average altitude of between 5,000 to 5,500 feet, has an excellent climate. The same consideration applies to Rungwe, where you find a wide distribution of malarial conditions on the "Nyassa Flats," and an almost perfect climate 50 miles away on the Elgon and Tandala plateaus.

Closely allied to considerations of climate is the question of Hill Stations.

In the early part of the year the question of finding some locality suitable for a hill station continued to be considered. It was sought to ascertain whether such a place could be found anywhere near the Central Line which would be more or less accessible to the capital. Unfortunately, no such place has been discovered, and it is unlikely that one will be found. The Central Railway runs through country which nowhere exceeds an altitude of 4,500 feet, and, although mountainous country is to be found on either side of the line, such as the Uluguru mountains, with peaks running up to 8,000 feet and the Kiboriani and Turiani ranges going up to 6,400 feet, yet, either on account of the absence of water, or of very steep slopes, and for various other reasons, none of these

TABLE X.

District.	1	2	3	4	5	6			7	8		
	Temperature, Mean Annual.	Considerable variation in Daily M. & M.	High Relative Humidity.	Low Relative Humidity.	Average Annual Rainfall in inches (2).	Altitude.			Malaria Prevalent.	Graded as		
						Sea Level,	1,600-4,000 ft.	Above 4,000 ft.		Healthy.	Moderate.	Unhealthy.
NORTHERN AREA												
Bukoba ..	—	—	x	—	74·7	—	x	—	—	—	x	—
Mwanza ..	7·16	—	x	x	41·3	—	x	—	—	x	x	—
Arusha ..	—	x	—	—	48·8	—	—	x	—	x	—	—
Moshi ..	64·0	x	—	x	46·6	—	x	—	—	x	—	—
Usambara ..	61·2	x	—	x	34·3	—	x	—	—	x	—	—
CENTRAL AREA												
Tabora ..	72·5	x	—	x	3·10	—	—	x	x	—	—	x
Dodoma ..	—	x	—	x	—	—	x	—	—	x	—	—
Kondoa-Irangi	—	x	—	x	22·0	—	x	—	—	x	—	—
Morogoro ..	—	x	—	x	44·1	—	x	—	x	—	x	—
WESTERN AREA												
Ujiji ..	—	x	x	—	33·4	—	x	—	x	—	x	—
Ufipa ..	—	x	—	x	28·4	—	—	x	—	x	—	—
Rungwe ..	57·7†	x	x	—	28·4	—	—	x	—	x	—	—
SOUTHERN AREA												
Iringa ..	—	x	—	x	—	—	—	x	x	—	x	—
Mahenge ..	—	x	—	x	70·3	—	x	—	—	x	—	—
Songea ..	—	x	—	x	48·1	—	x	—	—	x	—	—
COASTAL AREA												
Tanga ..	—	—	x	—	61·4	x	—	—	x	—	—	x
Pangani ..	—	—	x	—	47·2	x	—	—	—	—	x	—
Bagamoyo ..	—	—	x	—	42·0	x	—	—	x	—	—	x
Dar-es-Salaam	77·9	—	x	—	43·5	x	—	—	x	—	x	—
Rufiji ..	—	—	x	—	—	x	—	—	x	—	—	x
Kilwa ..	—	—	x	—	36·1	x	—	—	x	—	—	x
Lindi ..	—	—	x	—	32·2	x	—	—	x	—	—	x

† At Tandala, 6,700 feet.

(2) Rainfall taken at Administrative Centres.

mountainous regions were found to be suitable. The nearest healthy highland country to the capital would, so far as can be ascertained at present, appear to be the Ufipa Plateau, with its centre at about Naman-yere. Via Kigoma and Kirando, this station can be reached after a 90-hour rail-steamer-safari journey from Dar-es-Salaam. But to reach

Namanyere from Kirando entails a two days' march. The march, however, could quite easily be done in a day if there were a motor car service to the foot of the escarpment and on again from the edge into Namanyere. But the construction of a road over the escarpment presents very considerable engineering difficulties. An accelerated and more comfortable steamer service on Lake Tanganyika makes Namanyere a place well worth considering as a place very suitable for a man to send his family to for the period of the hot weather on the coast in March, April and early May. But before this can happen some concession in the railway fare would have to be made, as the present journey is most certainly a very expensive one.

Lushoto continues to be popular as a hot weather resort for ladies and children, but the irregular running of steamers from Dar-es-Salaam to Tanga puts it out of court as an accessible hill station for officials and others who only can get short leave. And it has to be carefully watched from a malaria standpoint. It is by no means mosquito free.

VI. URBAN SANITATION.

TANGA.*

ADMINISTRATIVE.

The following staff has been employed by this office during the year —

European.

Medical Officer of Health	..	..	..	..	1
Sanitary Superintendent	..	..	..	..	1
District Sanitary Inspector	..	..	..	..	1

African.

Clerk	..	..	..	..	..	..	1
Sanitary Inspectors (town)	..	..	..	..	..	..	3
„ „ (railway)	..	..	..	..	..	..	1
Vaccinators	..	..	..	..	..	..	4
Headmen (town)	..	..	..	..	..	..	3
„ (railway)	..	..	..	..	..	..	1
Sanitary Labourers (town)	..	..	..	..	..	..	97
„ „ (railway)	..	..	..	..	..	..	24
Convict Labourers	..	..	..	..	..	..	18

*Report rendered by Mr. R. Nixon, Medical Officer of Health, Tanga.

The town labour has been employed approximately as follows :—

Road sweeping	26
Sanitation of native village	20
Removal of refuse	16
Drain clearing	12
Care of incinerators	5
Mosquito work	3
Care of markets	2
Boat	2
Trolley	2
Grass cutting	6
Care of slaughter house	1
Latrine boy	1
Office boy	1

The convicts supplied have been employed as follows :—

Latrine work	10
Grass cutting	8

The work performed has consisted of anti-mosquito work, vaccination, port health work, food inspection, grass-cutting, drain-clearing, maintenance of cemeteries and general sanitation.

PREVENTIVE MEASURES.

Inspection of premises	35,114
„ „ areas by mosquito boys	1,285
„ and oiling of drains	3,151
„ „ „ „ cesspits	52,133
„ „ „ „ pools	132
„ „ „ „ wells	6,249
„ „ „ „ tanks, etc.	30,737
Linear feet of drains cleared	1,333,710
Square yards of grass cut	1,908,375
Prosecutions	24
Convictions	22

Dr. Haworth in an attempt to discover the origin of the plague of mosquitoes infesting the town of Tanga at certain seasons, has had a

systematic examination made of the tops of cocoanut trees, and reports the following results for the period June-December, 1921:—

Trees examined	2,792
Trees holding water in tops	1,612
Collections of water containing larvæ ..	1,299

i.e., 59.5 per cent. of the trees examined held water in the tops, and 46.2 per cent. of these trees held water containing mosquito larvæ.

Exclusive of those found in cocoanut trees, 263 collections of mosquito larvæ have been found during the year.

Incomparably the commonest local mosquito is *Culex fatigans*. *Stegomyia fasciata* is also common. Anophelinæ comprise less than 2 per cent. of the whole.

DRAINAGE AND WATER-SUPPLY.

These systems remain in the condition already reported.

PORT HEALTH WORK.

Steamers boarded during the year	122
Dhows	709

METEOROLOGY.

Total rainfall during the year	50.52 in.
Maximum monthly rainfall (April)	30.33 "
Maximum daily rainfall (April 29th)	5.31 "
Mean noon temperature, September	28.7 C.
" " " October	29.4 C.
" " " November	30.2 C.
" " " December	30.6 C.

INFECTIOUS DISEASE.

Small-Pox.

Cases reported in sub-districts	263
Deaths	94
Cases admitted to Tanga Hospital	149
Deaths in Tanga Hospital	41
Case mortality in sub-districts	36%
" " " Tanga Hospital	27%
Total case mortality	33%
African native deaths	130
Death rate of African natives	1.50

Vaccination.

From May–December, 1921, regular supplies of glycerinated vaccine lymph have been received from the Laboratory, Dar-es-Salaam. The vaccinations performed in town and sub-districts, including travellers, number 68,949. Of these 35,136 were inspected by the vaccinators, usually between the 10th and 20th day after vaccination. They report 28,904 successful, *i.e.*, 80 per cent. of those inspected.

On December 31st no cases remained in Tanga Hospital, and four only were reported remaining in the sub-districts.

Ankylostomiasis.

This remains a very vital problem for preventive medicine in this area. During the last nine months over 300 native deaths have been ascribed by the Akidas to this condition, *i.e.*, 28 per cent. of the total native deaths. The Ankylostomiasis death rate of local natives during the year is over 5 per 1,000 living. Staff cannot be spared from the town to wage a vigorous campaign in the sub-districts, but it is hoped that, by educational propaganda through the Akidas, Jumbes and Native Inspectors, the latrine system of the villages may be improved and some impression made on the prevalence of this disease. With this object lectures are being given to the Akidas and Inspectors.

TABORA.

STATISTICS.

The population of the township is estimated at 18,299, of which 158 are Europeans and 1,195 Asiatics.

THE HEALTH OF THE PEOPLE.

Although the town lies at an altitude of just over 4,000 feet above sea level, and has a prolonged dry period, it has earned for itself an unhealthy reputation. It certainly has had a high incidence of malaria in the past. There is, however, no particular reason why this state of affairs should continue, although a good deal of work requires to be done if matters are to be improved.

The special causes of so much malaria at Tabora appear to be as follows :—

- (1) Rice cultivation up till quite recently has been allowed within the township limits. This means that for a good part of the

- year water stands in the rice fields and these prove fertile grounds for anopheline breeding.
- (2) Contours in the lower lying parts of the town are such that effective drainage is a real problem ; consequently during the whole of the rainy season there exist actual swamps on at least two, if not three, sides of the town.
 - (3) Bad town planning in early days.

To understand how these three causes interact it is necessary to keep in mind the "lay-out" of the town. Imagine a triangle, of which the Boma area is at one angle, the native town at another, and the railway residential quarter at the third. The longest side of the triangle runs parallel with north.

The Boma angle rests on the 1,230 metre contour, the railway on the 1,195 metre and the native town at 1,205 metres. From this it is seen that the land falls away towards the south-west ; but where in the neighbourhood of the Boma the 5 metre contours occur at an average interval of every 33 metres, below the 1,210 metre contour the fall is only about 1 in 50 ; whilst just to the south-west of the native town the grade is as low as 1 in 100. North-east of the Boma just beyond the railway line, the fall in the valley is about 1 in 60 ; this low lying ground is only 500 yards from the Boma.

The railway residential area is round about Rufita Hill, the summit of which is 90 feet above the swampy ground all round. This is where the higher grade subordinates live. It obviously is not a good site, but these employes must live somewhere near their work, such as the machine and repair shops, railway depot and so on.

These facts serve to show that although the residential area drains itself into the lower lying ground about a quarter of a mile away in the direction of north and south-west, there arises some difficulty in getting anything like a good fall from the low lying areas themselves.

Nevertheless during the year attempts have been made to drain the swampy ground on both sides of the Boma by running furrows along the valley and "herring-boning" the land. In the result there has undoubtedly been some improvement, but all difficulties have not yet been overcome, because there is really nowhere to drain the drain into, and in consequence it can only be carried away some distance where a new swamp comes into existence.

The rice fields in the European quarter have this year at last been done away with. It was an amazing thing that "paddy fields" should ever have been permitted in the first instance so near European houses. Rice was actually being grown—an anopheline preserve in fact—within 100 yards of the Kaiserhof Hotel. That, however, is now all over and done with. The residential part of Tabora is now being cleared of economic crops and grass is being sown in their place.

The town planning in the early days was bad. No doubt it was dictated by strategic reasons. Here as in so many other stations it happens like this: a Boma Fort is erected, near by are placed Askari lines, a prison, a hospital and all the machinery of Government. Tabora is no exception to this plan. That area which is obviously marked down for a residential quarter now holds the barracks of the King's African Rifles, and the prison. Dotted about among the European houses we have the European hospital, with the native hospital—a perfect reservoir of malaria parasites—adjacent. Prison warders and Police lines must be near the prison, so they are not far away from the hospitals. A few native huts have crept into the reserved area and appear to be closely preserved. Surely there never was a tropical town so easy to town plan as Tabora, whilst equally surely there never was so poor a result.

INFECTIOUS DISEASE.

Allusion has already been made to the prevalence of small pox and influenza in the district. The town itself has been relatively free from both these diseases. A few cases of influenza of a mild type have been recorded among the European population.

MINOR WORKS CARRIED OUT.

(a) The old market has been thoroughly done up; the floor has been cemented and given a suitable camber so as to enable washings to drain off. The meat market has been rendered fly-proof with gauze.

(b) The water supply has in certain details been improved, but a piped supply to the market is still wanted.

(c) New public latrines near the market have been erected in place of the former makeshift.

(d) Drainage has been improved. The main drain from the Kaiserhof to the station has been cleared. A new temporary drain from the market place along the Ujiji road has been cut, and another one constructed from the old police brick pits to the main drain.

Swamp drainage has included the cutting and clearing of a drain, (1) from the triangle near the railway workshops for about a mile in the direction of the aerodrome, (2) along both sides of the railway in the direction of Kigoma and past the golf course, (3) re-opening and re-modelling of the Kidete drain.

STAFF.

The Sanitation staff at Tabora, including railway service, consists of :—

- (1) Medical Officer (acting as Medical Officer of Health in addition to his medical duties).
- (2) European Sanitary Superintendents.
- (2) Native Sanitary Inspectors.
- 125 General duty labourers (average).

The routine work for the year included :—

House inspections	15,777
General nuisances reported	233
Notices served	225
Convictions	4
Collections of mosquito larvæ found	388
Percentage of houses found breeding mosquitoes (larvæ index)	2.4 per cent.

MWANZA.

STAFF.

- 1 Native Sanitary Inspector.
- 73 Labourers.

THE STATE OF THE PUBLIC HEALTH.

(1) *Small Pox.*

During the year 33 cases of small pox have been reported. This is largely the aftermath of the 1920 epidemic. 14,000 vaccinations have been performed during the year. The result with the Dar-es-Salaam lymph has given a positive reaction in 35 per cent. to 40 per cent., against 15 per cent. with lymph obtained elsewhere.

(2) *Plague.*

Reference to the Shirati outbreak is made on page 97. Measures adopted to prevent infection of the town are :—

- (1) Examination of passengers arriving by Lake Victoria steamers.

- (2) Inspection of dhow crews.
 - (3) Dhows not allowed within 100 yards of the shore, except to load and unload.
 - (4) Concentration of rat traps on the pier.
- (3) *Relapsing Fever (African).*

One case only was reported during the year. The infection here is supposed to have been contracted on safari.

(4) *Malaria.*

This is the most prevalent disease. The average daily number on the sick list is European Officials, 7. Average sick time to each resident, 14 days. Asiatic Officials, 1. Average sick time to each resident, 7 days.

KIGOMA.

Population.

Europeans .. .. .	..	..	..	..	..	60
Asiatics and Natives .. .. .	..	..	..	..	..	3,030
King's African Rifles .. .. .	..	..	..	..	..	290

SANITARY STAFF.

Inspectors .. .. .	..	..	..	..	..	..	2
General Labour (including Railway Sanitary Service) .. .. .	..	..	..	..	..	..	88

WATER SUPPLY.

Two tanks of 10,500 gallons capacity, each placed behind the Kaiserhof, are connected to an electric pumping station on the lake shore. These tanks belong to the railway and a great deal of the water is used on railway work. On an estimate about 5,000 gallons is supplied daily to the European residents. Water is laid on to the Kaiserhof, political buildings and the railway station. The majority of European houses are supplied with a stand pipe which serves one or more houses. The King's African Rifles and the native hospital each have a stand pipe. Neither the Indian bazaar, market, nor any of the houses on the Ujiji road are on the supply. The water for all the Asiatics and natives, and some Europeans, is drawn from the lake. This water cannot be regarded as satisfactory as it is drawn from the foreshore of the harbour, about 400 yards in extent, in which area washing and bathing is also carried on. It is suggested that a separate and more comprehensive scheme for supplying all the inhabitants with water is required.

CONSERVANCY.

The Kaiserhof, political buildings and the railway station are supplied with W.C.'s, which drain into cesspits. Seventeen European houses and ten houses for Indian clerks are supplied with bucket latrines, the remainder are still on the cesspit system. The night soil is collected every morning and burnt in incinerators. The Indians and natives have cesspits in their compounds. Eventually the whole bazaar area should be converted into the bucket system as the area of ground in the compounds available for new cesspits will be insufficient.

REFUSE DISPOSAL.

There are three carts which daily collect the refuse and take it to the incinerators. Daily average number of carts of refuse removed is nine. There are six incinerators in the township area.

SLAUGHTER HOUSE.

The slaughter house is on the extreme border of the township by the lake shore. The floor is of cement and drains into a gutter running into the lake. There is an incinerator close beside it.

MARKET.

The market is a large square enclosed by a fence on the east side of the Ujiji road. In the centre is a large stone arched building supporting an iron roof. The butchers' shop, consisting of a reed and grass building at one corner of the square is not satisfactory. There is no fly-proof portion for keeping the meat in; the meat at present is kept tied up in calico. A portion of the centre building might be converted into a fly-proof quarter for the butchers.

ROADS.

There are about 8,000 yards of road to be kept clean with double that amount of ditches.

MOSQUITOES.

Mosquitoes are few, the majority being culex or stegomyia, some few anophelines have been found in dhows and in water collections in the Indian quarters.

INFECTIOUS DISEASES.

No cases of infectious diseases have been reported with the exception of five cases of Measles from the King's African Rifles lines.

VACCINATION.

The prisoners in the prison, the police and the native Government employees, both at Kigoma and Ujiji, have been vaccinated, with an average result of about 60 per cent. of successful cases.

UJIJI.

POPULATION.

Official Europeans..	..	..	..	..	2
Asiatics and Natives	..	..	..	..	7,815

STAFF.

Inspector	..	..	..	..	1
General Labourers	..	..	..	..	31

CONSERVANCY.

The jail and school are supplied with bucket latrines. Each house of the remainder of the town has its own cesspit.

REFUSE DISPOSAL.

There is one cart to remove the refuse, but the greater part of the refuse is thrown into large holes in different parts of the town. There are four incinerators and others are proposed to be built.

INFECTIOUS DISEASES.

There are a considerable number of cases of Yaws; Syphilis is very common, and there are a few cases of Leprosy. Spirillum Tick has been found in the jail and police lines, and is said to be common in a great many of the houses in the town.

MOSQUITOES.

These are very numerous, and Malaria appears to be very prevalent. Owing to the large cavities dotted over the town, and deep ditches caused by the rain, and the marshy nature of the ground towards the lake, nothing else can be expected.

DAR-ES-SALAAM.*

INTRODUCTION.

This report covers a more normal period of work than did the report for 1919-1920, which was necessarily influenced by the abnormal conditions persisting in 1919, as a result of the military evacuation, the

* This Report has been rendered by Mr. R. R. Scott, M.C., Medical Officer of Health, Dar-es-Salaam.

transfer of the sanitary authority to civil officials, and the gradual establishment of regulations, laws and machinery during 1920. Further, that report covered only the period March, 1919, to November, 1920, as far as sanitary matters in Dar-es-Salaam were concerned, and so did not include either calendar or financial years.

The year 1921 has seen some improvement in the sanitary condition of the town, while the health of the people on the whole has been good.

An estimate of the native population has been made which shows a considerable reduction on the German census returns.

Infectious disease has not been present in epidemic form. The rains were less in amount than normal, though considerably heavier than in 1920. Malaria, our chief enemy, though still accounting for more sickness than should be the case, is being brought more under control. Fly-borne intestinal disease is not present to any serious extent. Vaccination of a large number of persons with the lymph prepared by the Director of the Laboratory has been performed with vastly improved results as compared with those of other lymphs in use hitherto.

The abnormal depression in trade has curtailed the income of the Territory to such an extent that many essential public works have not been carried out—particularly in regard to water supply and drainage, but it is to be hoped that such abnormal conditions will before long be removed and enable such necessary works to be carried out.

The facts bearing on the health of the town may now be considered in detail.

GENERAL HEALTH OF TOWN.

CLIMATE AND METEOROLOGY.

Rainfall.

A total of 33.905 inches of which 13.46 inches fell in April, was recorded. The average annual fall recorded in German times was 42.60 inches. Although the total amount during 1921 was a considerable increase over that of 1920, yet the heavy fall of 13 inches in April left the rest of the year somewhat dry, while the bulk of the water in a heavy fall like that runs away to sea and fails to be absorbed for the benefit of the land and the shallow wells.

September was the driest month, .04 inch only being recorded.

	Total Fall.	No. of days on which rain fell.	Heaviest fall on a single day.
German Records. Average of 19 years	42.60	—	—
1919. Incomplete, partly computed	34.06	77	3.17
1920.	24.63	83	1.51
1921.	33.905	82	3.70

Recorded on Health Office Rain-gauge.

Temperature. (From records supplied by the Director of the Laboratory.)

Mean temperature 26.13° C. (79° F.).

Highest recorded temperature was 28.84° C. in February. Lowest 24.06° C. in August. Average humidity, 72.44 per cent., being the mean of the average monthly humidity, which varied between 65.5 per cent. in July and 81.5 per cent. in April.

Barometer.

No standard mercury barometer exists so far as is known in the town. Records kept by an aneroid barograph at 30 feet above sea level show a fairly level curve throughout the year, rising to its highest point in September, and falling to its lowest in January. The variation between these points is only .5 inch—(12.7 m.m.). No exact indication of pressure can be given, as the instrument is not corrected for index error:

The variation is therefore very slight throughout the year, as is to be expected at this latitude on the East African coast.

The influence of a high relative humidity in a tropical sea port on the health of the residents is especially to be seen in the European female and child population, and in its lowering effect on the powers of resistance to other diseases of all Europeans. The lack of a reasonably accessible hill station where people might go for their local leave, is especially to be

remarked. The healthy stations in Usambara which might be used for such a purpose, are rendered almost unusable owing to the irregular steamer service between this port and Tanga, while the high stations up the Central line either lack accommodation, present difficulties in the way of obtaining supplies, or are in themselves unhealthy.

The provision of adequate arrangements by which officials might reach the Usambara highlands, where a complete change of scenery, climate and diet may be obtained, is worthy of serious attention by Government, since it is felt that such facilities would be readily taken advantage of with benefit to the health of the official and to Government in the increased capacity of the official for work.

Long residence in a coastal town as compared with a hill station should also be taken into consideration when an official becomes due for leave.

Undoubtedly an individual working in a coastal town becomes less efficient in a shorter time than one who is stationed in the drier air of many of our up-country stations.

POPULATION.

Tables XI. and XII. show the latest available census (December, 1921), together with such earlier records as it has been possible to obtain.

TABLE XI.—POPULATION.

Year.	EUROPEAN AND AMERICAN.				ASIATIC (Non-Native).				AFRICAN.			
	M.	F.	C.	Total.	M.	F.	C.	Total.	M.	F.	C.	Total.
1913*	—	—	—	905	—	—	—	3,318	—	—	—	24,000
1914*	686	224	148	1,058	—	—	—	3,401	—	—	—	30,000
1919	148	34	43	225	1,322	483	839	2,644	8,131	6,349	1,959	16,439
1921	376	114	65	555	1,889	826	1,293	4,008	4,807	4,585	1,509	10,901

* From German Records.

TABLE XII.—AFRICAN TOTALS.

	M.	F.	C.	Total.
Civil Population	4,807	4,585	1,509	10,901
K. A. R.	573	382	191	1,146
Police	135	110	31	276
Total	5,515	5,077	1,731	12,323

It will be noticed that the European population has regained half its former figure; the Asiatic total has increased, while the African total has fallen to nearly a third of the estimated number in 1914. While it is not certain that the German figure for 1914 is reliable, a heavy decrease has certainly taken place since 1919, owing to the lack of work in the town, which causes large numbers of natives to go out to the country where food is more easily obtained and general expenses are reduced to a minimum; and, secondly, owing to the return to their own countries and districts of large numbers of natives of all sorts who formed the hangers-on of the military forces, and who elected to remain here rather than be repatriated immediately after the war.

BIRTHS AND DEATHS.

Owing to the fact that the registration of European and American births and deaths only is compulsory, no figures are available to show the native or Indian birth rate.

The necessity for the making compulsory in a large modern sea-port town of the registration of births and deaths in all classes of the community, cannot be too strongly emphasised; as things are at present we have no idea of the total number of births or of the infant mortality rate.

The difficulties in the way of such registration do not appear to be very great, while the importance of knowing the state of our population is self-evident. From what one knows of the town and its inhabitants, it would appear that the native birth rate is very low indeed, while the infant mortality rate is probably correspondingly high. The low birth rate may be ascribed to three main causes, viz., the unwillingness of the women to have children, since child bearing prevents their enjoying the pleasures of the town; the large number of natives who live together for a time but do not marry, and the practice of abortion, at which, one is told, the native woman is an expert. Probably also the fact of so many of the men having hydroceles and enlarged testes may have some influence on their procreative powers. It is not considered, from an inspection of such natives as have been examined medically for employment, that a large number suffer from gonorrhœa, which would account for sterility in either sex.

But the question is one of importance from an economic point of view and one which is worthy of consideration with a view to deciding what steps may be taken to raise the birth rate and diminish the loss of

infant life. The native woman in the bush can still produce and rear a family: why should not the town woman be made to do so?

It is necessary to point out that there is no trained midwife available for difficult cases of labour in natives, and the latter do not like to go into hospital for parturition. The writer is of opinion that a European nurse at the Sewa Hadji Hospital would do untold good to the native population of the town.

In the case of deaths there is a somewhat more accurate knowledge of the numbers, since it has been the custom since the German times for the relatives of all persons dying in the town to obtain a burial permit before disposing of the corpse. Though this is not compulsory, no burials have been caught taking place without permission, but it is known that many sick persons are conveyed outside the town for treatment by native medicines, and it is probable that a number of such persons die and are buried without permits, which tends to reduce still further the value of the returns of deaths within the township.

This practice becomes fraught with danger when infectious disease is present, and cases of such undoubtedly escape under cover of the dark during epidemics in order to avoid being put into hospital, in spite of guards placed on the main roads leading from the town for the purpose of preventing this.

BIRTHS.

The number of Europeans and American births recorded during 1921 is 11 (5 male and 6 female) giving a birth rate per thousand living of 19.8 (England and Wales for 1920 was 25.4 per thousand of population). The corrected birth rate, *i.e.*, the proportion of births per 1,000 women of conceptive age is 96 (England and Wales in 1913 was 95.9).

DEATHS.

Deaths included in Table XVI. are only in a small number of cases (46) those of persons who have received medical treatment before death. The remainder have been ascribed to the causes named after enquiry into the history of the illness and examination of the corpse by the Sub-Assistant Surgeon.

The figures, therefore, are not to be regarded as indicating accurately the cause of death, but rather as giving some idea of the probable fatal diseases in the township, while the external examination of the corpse satisfies us that the cause of death was not small pox, bubonic plague,

or gross violence. Again, the history of an illness is almost valueless in most cases of native deaths since it is found that natives are incapable of describing symptoms with any accuracy, more especially when the interrogation, which must consist largely of leading questions, is carried out among a crowd of mourning relatives who are in some cases incoherent with grief.

TABLE XIII.

	In European Hospital.	In Sewa Hadji Hospital.	Outside.	Total.	Death rate per 1,000 living.
Europeans ..	6	—	1	7	12·6
Asiatics	3	5	44	52	12·99
Africans ..	—	31	139	170	13·7

There is no outstanding cause of death in the above tables which gives one alarm: the death rates may be taken as normal when compared with those in England.

TABLE XIV.
DEATHS NOTIFIED BY S. M. O. EUROPEAN HOSPITAL.

CAUSE.	EUROPEAN.				ASIATIC.			
	M.	F.	C.	Total.	M.	F.	C.	Total.
Malaria	1	—	1	2	—	—	—	—
Blackwater Fever ..	1	—	—	1	—	—	—	—
Tuberculosis, General & Diarrhoea ..	—	—	—	—	—	1	—	1
" Pulmonary ..	—	—	—	—	—	1	—	1
" & Pneumonia ..	—	—	—	—	1	—	—	1
Heart Disease	*1	—	—	1	—	—	—	—
Nephritis	1	—	—	1	—	—	—	—
Premature Birth ..	—	—	1	1	—	—	—	—
Broncho-Pneumonia ..	—	—	†1	1	—	—	—	—
Total	4	—	3	7	1	2	—	3

* Imported from a ship.

† Died at parent's residence.

Phthisis, which is not yet a notifiable disease, heads the list of deaths of persons treated in the native hospital, while it is given as third in the list of those not treated in hospital. This appears to render the notification of the disease necessary.

Ankylostomiasis, which is shown as the second most frequent cause of deaths in hospital, is no doubt responsible indirectly for many others.

Malaria again is responsible for a great deal of invalidity and loss of time, and paves the way by which other diseases may become fatal.

Fly-borne Disease has not been prevalent to any serious extent.

TABLE XV.
DEATHS OCCURRING IN SEWA HADJI HOSPITAL.

CAUSE OF DEATH.	ASIATIC.				AFRICAN.				Total.
	M.	F.	C.	Total.	M.	F.	C.	Total.	
Tuberculosis, Pulmonary	—	—	—	—	9	1	—	10	10
Ankylostomiasis	—	—	—	—	7	—	—	7	7
Malaria	—	—	—	—	1	—	—	1	1
Blackwater Fever	4	—	—	4	—	—	—	—	4
Pneumonia	—	—	—	—	3	—	—	3	3
Heart Disease—									
Pericarditis	—	—	—	—	1	—	—	1	1
Myocarditis	—	—	—	—	1	—	—	1	1
Septic Infection—									
Pyæmia	—	—	—	—	1	—	—	1	1
Cancrum Oris	—	—	—	—	1	—	—	1	1
Septicæmia	1	—	—	1	—	—	—	—	1
Pregnancy—									
Sudden Death—									
(Cause not known)	—	—	—	—	—	1	—	1	1
Septicæmia—									
(Following Abortion)	—	—	—	—	—	1	—	1	1
Peritonitis	—	—	—	—	—	1	1	2	2
Acute Nephritis	—	—	—	—	1	—	—	1	1
Knife Wounds	—	—	—	—	—	1	—	1	1
Total	5	—	—	5	25	5	1	31	36

TABLE XVI.

DEATHS OF ASIATICS AND AFRICANS NOT TREATED IN HOSPITAL.

CAUSE OF DEATH.	ASIATIC.				AFRICAN.				Total.
	M.	F.	C.	Total.	M.	F.	C.	Total.	
Pneumonia	5	—	6	11	12	10	2	24	35
Old Age — Natural Causes	—	—	—	—	9	21	—	30	30
Phthisis	4	—	—	4	9	4	—	13	17
Acute Bronchitis	—	—	5	5	1	—	4	5	10
Chronic Asthma	—	—	—	—	1	2	—	3	3
Convulsions	—	—	4	4	—	—	3	3	7
Acute Dysentery	—	—	—	—	2	1	1	4	4
Chronic "	—	—	—	—	3	—	—	3	3
Chronic Diarrhoea	—	—	—	—	2	4	—	6	6
Intestinal Obstruction	—	—	—	—	1	—	—	1	1
" Tuberculosis	—	—	—	—	1	—	—	1	1
Hepatitis	—	—	1	1	—	—	—	—	1
Jaundice	—	—	—	—	—	1	—	1	1
Icterus Neonatorum	—	—	1	1	—	—	2	2	3
Enteritis	—	—	—	—	1	—	2	3	3
Pyrexia (unknown origin)	1	1	1	3	7	3	1	11	14
Malarial Cachexia	—	—	—	—	1	2	3	6	6
Chronic Malaria	—	—	1	1	1	1	2	4	5
Cerebral Malaria	1	1	1	3	—	—	—	—	3
Anæmia	—	—	—	—	1	6	—	7	7
Ankylostomiasis	—	—	—	—	1	1	—	2	2
Heart Failure	1	1	1	3	1	—	—	1	4
Heart Disease	—	1	—	1	—	2	—	2	3
Pain in Lumbar Region	—	—	—	—	—	1	—	1	1
Childbirth	—	—	—	—	—	1	—	1	1
Premature Birth	—	—	2	2	—	—	1	1	3
Hæmorrhage (post partum)	—	—	—	—	—	2	—	2	2
Debility	—	2	—	2	—	1	1	2	4
Diabetes	1	—	—	1	—	—	—	—	1
Chronic Nephritis	1	—	—	1	—	—	—	—	1
Congenital Syphilis	—	—	1	1	—	—	—	—	1
Total	14	6	24	44	54	63	22	139	183

NOTIFIABLE INFECTIOUS DISEASES.

It is satisfactory to report that a very small amount of notifiable infectious disease occurred in the town during the year, and that no deaths from the town were attributable to this cause. The following notifiable diseases occurring in natives were admitted to the Infectious Diseases Hospital :—

TABLE XVII.

	Remain- ing 1st January, 1921.	Admitted during 1921.	Total.	Died.	Dis- charged.	Remain- ing 31st December, 1921.
Measles ..	2	25	27	—	27	—
Chicken Pox	12	12	24	—	24	—
Small-pox ..	—	3	3	—	3	—
Leprosy ..	1	10	11	—	4	7
Yaws ..	—	3	3	—	3	—
Total ..	15	53	68	—	61	7

The following additional cases and contacts, etc., were admitted for treatment or observation to the Infectious Diseases Hospital :—

TABLE XVIII.

	Remain- ing 1/1/21.	Admitted 1921.	Total.	Died.	Dis- charged.	Remain- ing 31/12/21.
Contacts ..	—	6	6	—	6	—
Under Observation }	1	24	25	—	25	—
SCHOOL CHILDREN—						
Scabies ..	—	30	30	—	28	2
Ulceration due to Jiggers..	—	11	11	—	9	2
Ringworm ..	—	2	2	—	1	1
Total ..	1	73	74	—	69	5

The following cases of fevers of the Enteric Group and Dysentery were treated in the European and Native Hospitals. (See Tables XIX. and XX.)

Measles.

Of the notifiable diseases shown in Table XVII., 16 out of the total 25 cases of measles occurred in the King's African Rifles during the months February to May.

Chicken Pox.

Of the 12 cases of chicken pox, 5 were notified in January from among Police and prisoners, being the last of a series of cases which occurred in the Autumn of 1920.

Small Pox.

The three cases of small pox all occurred in the King's African Rifles arrived from Tanga. The first case was that of an askari who had felt ill on the boat and developed the rash on 17th June; he developed a severe confluent attack of small pox and was much scarred on discharge.

Two further cases developed among vaccinated contacts of the Tanga infection on 1st July, both being women, one of whom was nursing a baby. All three had been vaccinated after arrival here and had taken well. The baby did not develop small pox, while the two women had a very mild attack. One of these was painted with 5 per cent. solution of permanganate of potash; she was slightly less pitted than the control woman, but both cases being so mild, this observation is not of much value. The treatment will be tried again when cases are available.

One other case, apparently also infected in Tanga, occurred during October, in a native servant who had been through Zanzibar, Mombasa (where he was vaccinated), Moshi and Tanga with his master, and returned here on the 5th October. He felt ill soon after arrival and left the town on the 7th. He was nursed in a small hut outside the township boundary till he died on the 30th October. The first news received of this case was that he had been buried. Careful enquiry was convincing that he had really died of small pox. No case developed among the contacts.

Leprosy.

Of the cases of leprosy shown as admitted to the Infectious Diseases Hospital during the year, seven are under treatment by the Director of the Laboratory with Ethyl Ester of Chaulmoogra Oil. The other four were sent across to the Leper Settlement at Nungi.

TABLE XIX.,
ENTERIC GROUP.

Hospital	Disease.	Males.		Females.		Locally Contracted or not.	Confirmed by Laboratory or not.	Results.		Remarks.
		Adults.	Under 16	Adults.	Under 16			Re-covered.	Died.	
European ..	Enteric ..	1	—	—	—	Locally ..	Yes	Yes	—	Occurred in September.
" ..	Paratyphoid	1	—	—	—	Not stated	Yes	Yes	—	" .. January.
Sewa Hadji	Paratyphoid	1	—	—	—	Locally ..	Yes	Yes	—	" .. July.
" ..	Enteric ..	1	—	—	—	No ..	Yes	—	Yes	" .. August.
" ..	Paratyphoid	1	—	—	—	Locally ..	Yes	Yes	—	" .. December.

TABLE XX.
DYSENTERY.

Hospital.	Disease.	Males.		Females.		Locally Contracted or not.	Confirmed by Laboratory or not.	Results.		Remarks.
		Adults.	Under 16	Adults.	Under 16			Re-covered.	Died.	
European ..	Dysentery ..	—	—	1	—	Not stated	—	Yes	—	Occurred in May.
" ..	" ..	1	—	—	—	Yes ..	No	Yes	—	" .. December.
Sewa Hadji	" ..	32	—	—	—	Yes, but many relapsed cases.	—	Yes	—	All the year round.

It will be necessary for steps to be taken to arrange for treatment of all the cases of leprosy in the Settlement (90) if the results of the treatment which is being tried at present are as satisfactory as they promise to be.

Yaws.

Yaws is unduly prevalent among the native population: nine cases were noted among the school children between September and December. The prevalence of this disfiguring and destructive disease calls for further investigation into the matter of infection and actual incidence amongst the population.

Fly-borne Diseases.

Enteric and Paratyphoid. Only five cases of the Enteric group in all were notified from the two hospitals; one enteric which was contracted in Morogoro proving fatal.

Dysentery.

Thirty-four cases of dysentery in all were notified, none being fatal. Fifteen of these occurred in the King's African Rifles; many of these were old relapses.

Influenza.

Sporadic cases only were noted; no outbreak or serious cases occurred during the year.

VACCINATION.

2,683 persons have been vaccinated with the new lymph prepared at the Laboratory with most gratifying results; the results obtained after vaccinating 1,283 of these in different groups, where re-inspection on the seventh day was possible, are shown in Table XXI.

No vaccination of the general population of the town or district has been attempted; this should be carried out during 1922, since there are large numbers of unprotected persons, especially young children born during and since the war, who require vaccinating.

It has not been found advisable to allow the present native staff to vaccinate except under supervision: all the results recorded are those of persons vaccinated and observed by the Sub-Assistant Surgeon or Medical Officer of Health. It is hoped, however, that before long some of the native sanitary Inspectors may be trusted to perform the operation and record the results without supervision. Of course they can all

TABLE XXI.
VACCINATIONS IN DAR-ES-SALAAM.

	Total Vaccinated	CONDITION BEFORE VACCINATION.			RESULT OF VACCINATION.				
		Protected by Previous Vaccination.	No Marks of Previous Vaccination.	Marks of Previous Small-pox.	Taken.	Taken. Slightly.	Not Taken.	Percentage showing re-action of those examined on 7th day.	Did not return for inspection as ordered.
Government School, 29/7/21 ..	77	45	31	1	43	6	28	63%	—
Government School, 5/8/21	22	17	5	—	5	4	13	40%	—
Indian Communities, 27/7/21 and 3/9/21	820	479	303	38	238	33	215	55%	334
Police 10/9/21	200*	100	58	42	47	22	133	34%	—
K. A. R. Recruits and Women, 18/10/21	95	33	24	38	30	12	53	44%	—
Government Press Employees, 12/11/21	69	49	9	11	20	4	45	34%	—
Total	1,283	723	430	130	383	81	487	48%	—

* These were done with lymphs of different ages ; the percentage varied between 0 per cent. and 80 per cent. showing re-action.

scratch the arm and rub in lymph, but they cannot organise and sort out a pack of native women and babies into groups and afterwards, which is most important, state which case they consider to be protected from small pox.

MOSQUITO-BORNE DISEASE.

Malaria.

162 cases of malaria were *notified** from the European Hospital during the year.

This is the disease by which we are constantly being threatened. Dar-es-Salaam, situated as it is on a peninsula, with fresh water streams running into the tidal creeks on the north-west and south-west sides of the town, and with seepage outcrops at varying points along the cliffs, is exposed to a constant danger from anopheline invasion throughout the year.

Anti-mosquito measures occupy a very large proportion of time and funds, while a large permanent staff is occupied in inspection and drainage work, for which Sanitary Inspector Saluzinho D'Souza is responsible.

Reference to the chart appended (see diagram at end) will show that there has been a very considerable reduction in the total number of collections of larvæ found as compared with 1920, although the number of collections of anopheles has increased to more than double. This apparently retrograde step is explained by the fact that a much more thorough search is made in the Gerezani, Dockyard and Msimbazi areas than was the case in 1920, and, secondly, that the native larvæ finders are more efficient at their work.

Instead of a gang of finders searching these areas once weekly, each area now has its own finder permanently detailed for it alone, and so each man has a more thorough knowledge of his area.

The chief recorded breeding places of anopheles mosquitoes are :—

(1) Msimbazi valley	227 collections.
(2) Gerezani valley	206 ..
(3) Swampy places, road-pools and surface drains in town itself	196 ..
(4) Dockyard and Kurasini	102 ..
(5) Casual pools in town	54 ..
(6) Traps	45 ..

* The number notified does not agree with the number diagnosed.—D.S.S.

Traps.

Traps for encouraging female mosquitoes to lay their eggs, consisting of an artificial shady pool of water contained in an old barrel sunk level with the ground, have been greatly increased during the year. About 40 such are now distributed throughout the town.

The trap in which most anopheles larvæ were found is situated opposite the Bank of India, right in the heart of the commercial area. Possibly this was the nearest collection of fresh water in which a mosquito flying to the town from Gerezani might oviposit after her first feed of blood.

The traps next in order of choice were No. 6 and 16, situated at the junction of Upanga and Versailles Street, and on the Msimbazi cliff near the carrier corps. The traps have also accounted for the destruction of large numbers of culex and stegomyia larvæ.

Filling and Drainage.

A large amount of filling and drainage work has been carried out during the year, especially in Gerezani and Msimbazi valleys.

In addition to the permanent drainage staff, Fls. 5,123 were allocated during the months of January, March and December from Public Works Department funds for drainage of swamps. The lack of funds in the early part of the financial year, owing to the non-passing of the Estimates for Extraordinary Works, prevented the carrying out of much useful work during the dry season.

During December the amount of earth moved by the filling gang in Gerezani swamp has been calculated. It is found that the average labourer drawing Fls. 12 per month and working from 6.30 a.m. to 2.30 p.m. moved—

By headpan, 29.8 cubic feet of sand per working day.

By trolley 40.8 cubic feet of sand per working day.

The experiment is to be tried in January of giving the labourers a definite piece of ground to fill in their own time. It is believed that a larger amount of sand can be moved per man per day in this way, since all the men are anxious to get away earlier.

Gerezani.

The completion of the culvert and tidal door under Gerezani dam in 1920 has made a great difference to the area available for mosquito

breeding in the valley. The total fall of water in the creek is in the neighbourhood of 2 feet.

An unexpected complication has arisen, however, in that at neap tides, the low tide level outside the door is not sufficiently low to allow the valve to open for any length of time, causing the fresh water to rise in the creek. At spring tides, however, when a low low tide occurs, the valve is open for a much longer period every twelve hours, resulting in the water which was imprisoned during the previous neap tide escaping with force, and in the level of the water inside the creek returning to a height of six inches above the invert of the culvert. This variation in level at the different tides lies between six and eight inches, the maximum height being reached on the third day after neap tide and the minimum being restored again at the spring tide. The result of this was, that portions of the creek which were formerly under water altogether, and through shallowness and vegetation formed ideal anopheline breeding places, became dry at spring tides, but were again made wet at the neap tide, though not to the same extent as before. This is being remedied by filling up the low-lying areas with sandy earth and by shearing the banks all round, so as to allow the surface feeding fish to gain access to the whole of the creek. A large area of ground is being reclaimed in this way, while the catches of anopheles larvæ will certainly be reduced correspondingly. (See photographs Nos. 6, 7, 13 and 14 in Appendix.*)

Msimbazi.

This valley, though still a fruitful source of anopheles, is more under control than before. Some filling work and cutting of vegetation was done during March. (See photographs Nos. 8, 9 and 11 in Appendix.)

Leue Street.

This swamp has now been eliminated by filling and re-drainage. (See photograph No. 4 in Appendix.)

Upanga Golf Course.

This area becomes dangerous during the rains, owing to its clay bottom and level nature. (See photograph No. 1 in Appendix.)

Carrier Corps Swamps.

These areas have not yet been treated. Extensive filling is required, but they are only a source of mosquitoes in the rains.

* Photographs not reproduced.

Bagamoyo Pool.

This pool, which was practically dry during July, August and September, only becomes dangerous when it overflows its banks. During April, the water level rose to two to three feet above the outlet, and much inundation of the surrounding land occurred.

Until the surface water from Chafukoga is short-circuited from entering this pool, such flooding is likely to continue.

It is hoped that this may be accomplished by the cutting of a new drain in 1922. (See photographs Nos. 2 and 3 in Appendix.)

Mkongeni.

The worst area which has to be dealt with is that occupied by the King's African Rifles at Mkongeni; this is situated between Gerezani Valley and the Dockyard—Kurasini area in which there are six inlets in the cliff sides; all of these contain fresh water springs and seepage areas, in which anopheles larvæ are frequently found. (See photograph No. 17 in Appendix.)

The constant finding of anopheles adults in the King's African Rifles' Mess and Quarters led to the services of Dr. W. M. Aders, of Zanzibar, being loaned for a fortnight by the Zanzibar Government in order to obtain his advice on the question of the permanent source and elimination of this danger. His findings were of great value and are inserted as an appendix to this report.

Dr. Spurrier, of Zanzibar, who did pioneer mosquito work in Dar-es-Salaam during the war, has also visited the town on several occasions and has given much profitable advice.

Malarial Infection.

Attention has been drawn in the report on school children to the number of young town natives who are harbouring malaria parasites in their peripheral blood while showing no signs of malaria clinically.

These children constitute a serious danger to the other inhabitants and serve to indicate still further the necessity for the vigorous pursuit of anti-mosquito measures.

References.

An interesting account of anti-mosquito work in Dar-es-Salaam during the war is contained in the Royal Army Medical Corps Journal for July, 1920, Vol. XXXV., No. 1, page 44, by Lieut. A. W. J. Pomeroy, M.B.E., F.E.S.

SOURCES OF MOSQUITO LARVÆ.
MARCH—DECEMBER, 1921.

TABLE XXII.

	Drains.			Poo's.		
	Anoph.	Culex.	Steg.	Anoph.	Culex.	Steg.
Gerezani	133	80	0	73	107	1
Msimbazi	156	30	0	71	28	0
Town (Special Searcher) ..	20	12	2	176	56	0
Street Gullies	0	234	0	—	—	—
Town (Sectional Inspectors)	17	91	2	37	57	16
Dockyard and Kurasini ..	102	76	2	—	—	—
Total	428	523	6	357	248	17

	Drains.		
	Anoph.	Culex.	Steg.
Traps	45	258	152
Tanks, Jars and Barrels	1	95	266
Cesspits and Soakage Pits	0	85	1
Wells	2	27	0
Rubbish	0	10	6
Holes in Trees	0	1	0
Dhows	0	4	22
Crab Holes	0	0	91
Total	48	480	538

Filariasis.

This disease is present to some extent among the native population. No investigation has been made to determine its frequency, but anti-mosquito measures are pursued with equal vigour against culex as against anophelines.

The greatest number of culex larvæ has been obtained from mosquito traps, street gullies, and pools in Gerezani. These larvæ, however, together with those of stegomyia show a most gratifying reduction as

compared with 1920; in spite of double the rainfall in 1921, the total culex and stegomyia larvæ found, equal about half the number found in 1920.

TABLE XXIII.

SUMMARY OF ANTI-MOSQUITO WORK DONE.

Collections of Larvæ found :—							
Anopheles	..	..	..	..	..	..	902
Culex	..	..	..	..	..	..	1,694
Stegomyia	..	..	..	..	..	..	892
Adult Anopheles caught in Houses (7 months)	..	..					578
Drains Inspected	..	..	..	..	..	..	80,506
„ Oiled	..	..	..	..	..	..	13,081
Cesspits and Soakage Pits Inspected	..	..	..	..	..	..	125, 709
„ „ „ Oiled	..	..	..	..	..	..	15,849
Pools Inspected	..	..	..	..	..	..	17,181
„ Oiled	..	..	..	..	..	..	6,746
Wells Inspected	..	..	..	..	..	..	29,401
„ Oiled	..	..	..	..	..	..	5,679
Tanks, Jars and Barrels Inspected	..	..	..	..	..	..	306,462
„ „ „ „ Oiled	..	..	..	..	..	..	2,783
Ditches Cleaned	..	..	..	..	..	miles	239
New Ditches Cut	..	..	..	..	..	..	3
Pits, Excavations and Depressions filled, approximately						cubic yards	5,302
Mosquito Notices Served	..	..	..	..	..	..	135
Length of Surface Drains requiring regular cleaning	..					miles	21½

OTHER INSECT-BORNE DISEASES.

Plague.

No case of plague has occurred as yet. All railway passengers from the infected area in Singidda District have been examined on arrival here.

Rats.

Only 3,421 have been caught. It is proposed to pursue a more vigorous campaign against these vermin during 1922.

Tick Fever.

One case of Spirillum Fever has been notified : no ticks were found in the patient's house, and the offer of a reward has failed to produce any ticks from the town.

PORT HEALTH.

The port is exposed to infection from India, Mombasa, Zanzibar, Tanga and South Africa.

(1) Cases of small pox developed amongst passengers from s.s. "Tároba" in March in Zanzibar.

Sporadic cases continued to occur until November.

(2) The s.s. "Karagola" 31/1/21 to Zanzibar from Bombay.

" " " 8/4/21 " " " "

" " " Baroda " 28/2/21 " " " "

" " " Karoa " 10/10/21 " " " "

each had a single case of small pox on board.

Their deck passengers were quarantined in Zanzibar before being sent on.

(3) Three cases of small pox developed here as a result of infection in Tanga (see above under Notifiable Infectious Diseases).

(4) One European Officer on the "Llanstephan Castle" was found to be suffering from a mild attack of small pox on arrival here. He had already been isolated. The ship was sent to Zanzibar, where the patient was removed and the necessary measures for disinfection taken.

Arrivals.

The number of shipping arrivals was as follows :—

			Arrived.	Passengers landed.	Passengers Quarantined.
Steamers	..	..	186	7,716	—
Dhows	..	..	485	1,606	22

Quarantine.

Arrangements whereby quarantine and disinfection of ships and passengers for this port are performed in Zanzibar are working smoothly.

The motor boat "Molly" has been exchanged by the permission of the Red Cross Society for a smaller, more mobile craft, which has been running on and off, since October.

WATER SUPPLY.

The state of the town's water supply is extremely unsatisfactory. Little progress appears to have been made during the year in the improvement of the supply or its better distribution.

The three main sources of supply upon which the town depends consists of :—

1. A main from three deep bore holes (85 to 88 feet deep each) at Gerezani near the railway station, which supply is supplemented by the six bore-holes (about 30 feet deep each) at Kurasini ; this main supplies tanks in the native quarter for the sale of water at 3 hellers per 4 gallon tin : the gaol, various offices, fire tanks and private individuals, *e.g.* the Soda Water Factory, as far along as the Government Press.

2. A main from one deep bore-hole (64 feet) at the Brewery which supplies many houses in the residential quarter, the European Hospital, and Government House.

3. Wells in private compounds, which as can be seen on the map attached, are in a large number of cases rendered dangerous by the close proximity of cesspits.

Deep Bore-hole Water.

The water from sources one and two is probably uncontaminated, but it is unpleasantly saline, while the worn out condition of the pumping plant causes frequent cessation of the supply. At best the supply is intermittent, while many of the storage tanks in the houses are of insufficient size to allow of a reasonable supply of water being stored. Since practically all the European houses are fitted with water closets, the conditions may be imagined when the water has been cut off for a day or two.

Private Well Water.

There are 347 wells, of which 52 are disused, distributed throughout the township.

The water from this source is in many cases semi-filtered sewage from the adjoining cesspits, and is liable to further pollution owing to the ill-fitting wooden covers with which the wells are provided. Again, the hand-pumping machinery is worn out and is in constant need of repair, while the presence of these wells, which are more difficult to cover satisfactorily, affords breeding places for mosquitoes.

In one quarter occupied by ten Government Officials, notably the Mission, water is drawn from an open well in buckets, in spite of repeated requests for the installation of a hand pump.

A number of the houses which rely on these wells for their supply are provided with a certain amount of "main" water daily by means of ox-carts: still, that does not eliminate the danger from the presence of contaminated water in the house taps, in which glasses, etc., are washed, and with which tinned milk is frequently diluted.

Two deep bore-holes, 102 and 120 feet (cased for 80 feet) at the Carrier Corps, have been out of use since 1919. These might possibly be taken into use again and used for supplying the native quarter, which would render a certain amount of additional Gerezani water available for the residential quarter.

It is understood that tanks and a 3 inch main are on order; this will no doubt improve the distribution; but whether the amount of available water is sufficient remains to be investigated.

It would appear that the supply of water for Dar-es-Salaam should be carefully investigated by an expert: the matter is too serious to be relegated to a single Executive Engineer who has charge of the whole of the buildings, repairs and maintenance, roads, drainage, workshops and other engineering activity in a town of this size.

Native Quarter Water Supply.

The supply of water to the civil native population is quite inadequate for its needs.

Four Government standpipes at which water from the Gerezani Main is sold at 3 hellers for 4 gallons (.72 pence) exist in the native quarter.

The remainder of the population draws its supply from shallow open wells:—

1. Near Bagamoyo Pool.
2. Mchikichini (in valley below the Carrier Corps).
3. Gerezani.
4. Sultan Street (privately owned).
5. Selous Street (privately owned).
6. Various mosque wells.

In all these wells there is only water at the bottom of the well, and the drawer has to wait while his bucket fills up. There is an ample

amount of polluted water in Gerezani and Msimbazi streams (in the former 150,000 gallons per day in the dry season), for bathing purposes, but both of these are some distance from the native quarter, while indiscriminate stream bathing favours the spread of hook-worm and bilharziasis.

If such water could only be made use of either by tapping some of its sources by additional bore-holes or by filtration, the benefit to the towns-people would be undoubted.

No permits for the construction of wells in private compounds are given by this office, on account of the increase in mosquito breeding which is found to result from such wells.

A valuable report by two German geologists (Koert and Tornau) on the geology and hydrology of Dar-es-Salaam published in 1910, has been discovered ; this is now being translated by the Official Translator.

TABLE XXIV.
SUMMARY OF WELLS, ETC., IN THE TOWN.

District No.	Houses.	Wells.	Wells (Disused).	Cess Pits.	Soakage Pits.	Choos. (Native Pit Privies.)
1	408	4	1	—	308	299
2	850	12	1	—	583	658
3	725	27	2	—	439	680
4	347	32	2	—	252	316
5	335	10	1	—	190	261
6	249	48	—	—	129	216
7	55	37	9	—	37	47
8	35	25	13	15	35	23
9	125	58	8	—	52	122
10	77	31	10	—	88	71
11	80	2	—	—	8	20
12	22	9	5	2	20	15
Total ..	3,308	295	52	17	2,141	2,728

DISPOSAL OF REFUSE AND DRAINAGE, ETC.

1.—*House Refuse.*

This is still being disposed of in open incinerators at Chafukoga and in an old burrow pit in Kitumbini. The resultant ash forms quite a good hard surface free from nuisance. (See photographs Nos. 15 and 16 in Appendix.) The depression at Chafukoga is now quite filled up,

but a drain is badly needed to carry off the flood water which reaches it from seven converging roads. It is hoped to take this across Bagamoyo and Selous Streets into the Bagamoyo drain, so reducing to a large extent the amount of flood water which at present reaches the Bagamoyo pool.

21,683 ox-cart loads of house refuse were brought to the incinerators during the year. No trade refuse is removed by this department.

The problem will soon arise of where the refuse is to be burnt next. The further the incinerators are placed from the centre of the town the less efficient will become our already inadequate service of ox-drawn refuse carts, meaning that a smaller number of loads will be carried.

It is possible that some arrangement may be come to whereby this refuse may be utilised as boiler fuel; at present the whole of the heat generated by 15 tons per day (estimating an ox-cart load as $\frac{1}{4}$ ton) is being wasted, and indeed requires fuel to burn it. Such fuel is fortunately obtainable in the shape of cocoanut husks at the cost of transport only. In wet weather, however, a much larger quantity of this fuel is required and it will be impossible to provide this fuel in sufficient quantities during the rains by means of ox-cart transport. Unless some additional transport is provided at that time it will be necessary to reduce to a serious extent the number of loads of house refuse at present being removed, which will inevitably mean that opportunities for fly breeding in the rain-sodden accumulations remaining at the houses will be multiplied to a serious extent.

Night Soil.

Public latrines for natives are at present worked on the incinerator system, the fæces being burned near by and the urine emptied into a soakage pit.

All the public latrines were provided with concrete floors and repaired in the early part of the year, and there is consequently less opportunity for fly breeding than was the case when the floors were of porous earth, which had been in use in most cases for five years.

But the incinerators undoubtedly cause a certain amount of nuisance from the foul smoke emitted when fæces are being burnt, and it is hoped to replace these latrines by water flushed closets of Oriental pattern as soon as water and funds become available.

Sea Water.

A former suggestion for the provision of a supply of sea water for flushing the native latrines at the gaol, police barracks and native hospital has not been acted upon. Possibly this may be reconsidered in the financial year.

Native Hospital.

The latrines at the Sewa Hadji Hospital were entirely reconstructed in cement early in the year, together with a home-made slop sink for bed pans. No stoneware fittings were available, so masons traps were constructed. These have the effect of preventing the draught of foul air which used to blow up the drains, although constant attention is necessary to prevent them from becoming choked.

An additional latrine is required at the north end of the hospital, and a stoneware slop sink should be provided for the proper cleansing of the bed pans. (For details see Appendix III. and p. 172).

Police Barracks, Gaol and K.A.R. Dépôt.

The drainage systems at the Police Barracks, Gaol and K.A.R. Dépôt need only to be seen to be condemned. They consist of untrapped drains into which the user defæcates through a hole in the floor; they are flushed when sufficient water is available.

All three systems need entire reconstruction, and money has been requested for this purpose in the estimates for 1922-23.*

King's African Rifles Lines.

The latrines in the K.A.R. lines are all on the incinerator system. Improvements are also required in these, or their replacement by water flushed closets.

European Hospital.

The whole of the outside drains of this building have been relaid on English lines and discharge into a closed tank near the sea shore from which the effluent is led into the sea at some distance from the actual beach. The inside fittings, which are of the usual type installed by the Germans in this town, require replacement and alteration.

* For a variety of other reasons it would probably be found more economical to abandon the present gaol, build a new one and so start afresh.—D.S.S.

House Drainage.

The whole of the German system of draining their houses is so entirely foreign to the English ideas of house sanitation that it is worthy of a short description.

The bathroom and w.c. which were usually combined, contained a washout pan whose anti-syphonage connection was, on first inspection by this department, either uncovered or loosely covered, the cap having been fixed in with a piece of cloth and red lead. If the pan was not of the wash-out variety it was an ancient hopper attached to an iron "S"-trap, the water in the trap not being visible from above and soil dropping on to the dry surface of the pan. The flushing cisterns are in the majority of cases efficient.

The bath or shower discharge into a bell trap, or in other houses into a lead D-trap let into the floor. If there was a bell trap, the bell was in many cases missing.

The bath trap was invariably connected direct into the soil pipe; and even when the trap is complete it is frequently unsealed by syphonage when the w.c. is flushed.

Lavatory basins were almost unknown. When fitted, as in the Kaiserhof Hotel, they discharge into the soil pipe also.

Kitchen sinks, where fitted, discharged also into the soil pipe; they generally were fitted with bell traps.

No case of a ventilated soil pipe has been discovered up to now— one case of a ventilated drain is known, that is at the Kaiserhof Hotel. All soil pipes were laid inside the building or built into the walls.

Down pipes from rain-water gutters, now for the most part removed, discharged untrapped into the house drain and so acted as ventilating shafts.

The house drain, if the combined soil-pipe-bath waste-sink waste, may be dignified by such a name, discharged into a porous cesspit, preferably within 60 feet of the well; or if conveniently situated near a street drain which discharged into the sea, was connected thereto. No inspection chamber or interceptor was constructed.

The above is a true picture of the drainage of the average European house in Dar-es-Salaam.

The results of a sanitary survey of 50 European houses are given in the Appendix, and such are the conditions which the Public Works Department is called upon to remedy.

Servants' Latrines.

Water flushed latrines for native servants are known to have been installed in two private houses.

Provision is being made for all new European houses to be fitted with servants' latrines.

Indian and Native Houses.

These are provided with porous pit privies in all cases; they effectually pollute the ground water and the numerous shallow wells.

There are 2,728 of these privies in the town.

Drains and Sewers.

Since it was the practice to combine the surface water from the streets with sewage from the houses, pipes of large diameter were found necessary. These were more usually made of moulded concrete than of glazed stoneware, and owing to their large diameter and the small amount of water passing through them for the greater part of the year, are very easily choked. Moreover, owing to their weak joints they soon become leaky.

About fifteen of these sewers discharge on to the foreshore. Their outfalls are in all cases in need of extensive repairs, and in many cases soil is exposed on the beach at low tide owing to the broken condition of the pipes. (See photograph No. 12 in Appendix.)

Cesspit Emptying.

There are 2,158 cesspits and soakage pits in the town, almost all of which have been constructed with the intention of allowing the liquid sewage to be absorbed by the surrounding soil, which is fortunately very porous in most parts of the town.

Of these cesspits, about 139 are in the residential and commercial areas.

Many of these cesspits, however, have been in use so long that the surrounding ground cannot absorb as much water as is put into them, and they have to be pumped out. The liquid cess is then carried away in tanks mounted on Daimler 2-ton lorries.

2,447 such loads of cess were removed by the department during the year.

River Pollution.

One case only occurred and that at Ruvu, a station on the Central Railway, about 60 miles from Dar-es-Salaam.

The complaint from the inhabitants, which was received through the Political Department, was investigated by the Medical Officer of Health during September.

The pollution was due to a sisal factory discharging its waste cortex into the river above the town'; the inhabitants who drew their water from below the pollution naturally objected to the suspended sisal cortex which was present therein.

The water was sent to the Director of the Laboratory for examination. A report was furnished, with samples, to the Office of the Senior Sanitation Officer.

FOOD SUPPLY.

The state of the food supply is satisfactory as regards soundness of food exhibited for sale. Meat is examined after slaughter by the Veterinary Department and that showing signs of Cysticercosis, etc., is condemned, instead of being boiled and sold as "unsound cooked meat" as used to be done.

22 different lots of foodstuffs were examined and condemned during the year.

These consisted of :—

Foodstuffs.	Amount.	Reason.
Condensed Milk.. ..	5 consignments ..	Decomposed or curdled.
Oatmeal (tinned)	1	Weevils.
Olives	1 1 tin	Decomposed.
Biscuits	1 4 tins	"
Bacon	1	"
Onions	1 185 bags	Rotten.
Chocolates'	1 213 kilos	Damaged.
Flour and Mealie-meal ..	3	Weevils.
Eno's Fruit Salt	1 72 bot.	Inactive.
Paté de Foie Gras	1 92 tins	Decomposed.
Mustard Condiment	1 144 tins	"
Rice	1 3 tons	Weevils.
Tinned Fish	2	Decomposed.
Cigarettes	1	Considered injurious.
Various Army rations purchased by Railway Department from salvage	1 large amount	Unfit for human consumption.

The majority of the above foodstuffs were condemned in the Customs godown before they reached the general public. No instance of a trader selling or exposing unsound food has been reported.

Hawking. Market.

A communication from the Medical Officer of Health to the District Political Officer on the subject of the congested condition of the present market*, the multiplication of small shops for the retail of fresh produce and the practice of hawking is attached as an appendix, since it throws a light on the conditions obtaining. (Appendix II., p. 168.)

It is hoped that funds will be available for the construction of the proposed new markets early in the new financial year. The continuation of the present conditions is a menace to the town.

Milk Supply.

Regulations as to cow sheds, dairies, and milk shops are being prepared by the Veterinary Department in conjunction with the Health Department.

At present the milk supply is largely hawked about the town in kettles, from which it is poured into a bottle and sold as a "bottle-full." There is no protection against adulteration by the hawker from the nearest shallow well.

Most of the European residents purchase milk at one shilling and fourpence a quart from the Roman Catholic Mission or Goanese cow-keepers (whose premises and appliances are in reasonably good order) or else used tinned milk.

HOUSING AND TOWN PLANNING.

European Government Officials' Quarters.

The question of providing suitable and sufficient quarters is still a difficult one. Sanction has been obtained for the construction of four 4-roomed two-storied houses and five 2-roomed semi-detached bungalows. There is prospect of the early commencement of the four large houses in 1922, but work had not been commenced at the end of the year. The sites chosen for the four large houses are not those recommended by the District Town Planning and Building Committee.

A number of officials are not in occupation of Government quarters owing to their not being available, and these officers receive house allowance in lieu.

* See Sanitary Report for 1920.

Town Planning

The District Town Planning and Building Committee meets weekly to discuss applications for permission to build, mainly from Indians and natives. The policy of segregating portions of the community according to their sanitary standards is being followed, and it is hoped eventually to attain a neutral area, devoid of buildings, between the owners of pit privies and those whose means permit of their possessing a water-flushed closet.

The Deputy Director of Land and Surveys accompanies the Medical Officer of Health weekly on a round of inspection of proposed new buildings and alterations.

1,166 houses have been inspected for this purpose.

As a result, the style of native houses now being built is an improvement on the poor type of dwelling which was constructed during and after the war, when no supervision was exercised, while great care is taken in the alignment of houses and area built upon.

Considerable building activity is taking place near the Carrier Corps ; some very good native houses have been erected in this district which will leap into popularity if the removal of the market thither is decided upon.

STAFF, FINANCIAL, ETC.

Staff.

Sanitary Superintendent Rowe returned from leave in England on 2nd May, 1921. Sanitary Superintendent Bell arrived on first appointment on January 1st, and was transferred to Tanga on the 21st May, having obtained some working knowledge of sanitary practice in the tropics. Sanitary Superintendent Ogilvie left on termination of appointment on 23rd July, 1921. Sanitary Superintendent Strutt took over the Sanitation Store on departure of Superintendent Ogilvie. Sanitary Superintendent Forster returned from leave on 19th April, 1921, and left for Tabora on transfer on the 7th May, 1921. Sanitary Inspector S. D'Souza departed for leave in India on the 19th January and returned on 6th June. Motor-driver Nagalingan, with two African drivers, were transferred together with all motor transport to the Transport Department on April 1st.

Sanitary Engineer.

It would appear necessary again to draw attention to the pressing need for a whole time qualified Sanitary Engineer for Dar-es-Salaam.

The amount of constructional work which is going on at present, the repairs and alterations which are required to Government quarters and offices as indicated above under House Drainage, the condition of the street drains and their outfalls into the sea, together with the consideration of a scheme of sewerage which might be ultimately adopted, and towards which work might be directed, would fully justify the appointment.

The present position, wherein all repairs noted by this office are passed to the Executive Engineer, who in turn passes them to an Assistant Engineer or Foreman, leads to delay and inco-ordination.

The Sanitary Engineer might well come under the Executive Engineer's organisation, but he should work hand in glove with the Medical Officer of Health, and there should be direct correspondence between the two officials.

Costs.

An appendix showing the approximate cost of certain of the activities of the Health Office is attached. Complete figures are not obtainable. (Appendix I., p. 166.)

Tuition of Sanitary Inspectors.

An appendix giving particulars of the course which is being held for Native Sanitary Inspectors, is attached. (Appendix V., p. 175.)

Railway Sanitation.

The Railway Sanitary Superintendent is now attached to the Health Office though still paid from railway funds, and assists in the supervision of part of the town adjoining the railway area.

It is considered, for various reasons, that a more satisfactory arrangement, would be for the railway to pay a fixed sum to the Health Department which would then be entirely responsible for the sanitary condition of the railway area.

The railway does not employ a medical officer; why should it employ Sanitary Superintendents?

Transport.

The whole of the mechanical transport was handed over to the Transport Department on April 1st, 1921. This arrangement is working well at present, but the loss of the Malay motor mechanic who did much other repair work in addition to motor cars has caused some inconvenience.

An all-round Indian "fundi" who could do metal work as well as carpentering, painting, and odd jobs, is needed to replace him.

Such a man has been found invaluable at the Health Office at Zanzibar, and would save the Department money and time by doing much of the repair work which has to be sent out at present.

Conclusion.

An endeavour has been made to outline the activities of the Health Office during 1921.

A great deal of work has been accomplished, but a great deal more remains to be done, and that especially in the direction of increasing the efficiency of the existing machinery.

Of the many branches of Public Health work in Dar-es-Salaam, that which absorbs most attention is the problem of reducing the amount of malaria, and it is hoped that time will show the value of the work which is being done at present.

Acknowledgment is made to the members of the Health Office staff who have assisted in the collection and preparation of material for this report.

7. TOWN PLANNING.

During the year under review a very important forward step has been made in the direction of organised town planning. In a new country such as this, possessing great latent mineral resources, which on development, would lead to a very rapid expansion of any township near a deposit, it is essential to have plans prepared and considered to meet any such contingency. Not only that, but considered town planning is equally necessary to meet the steady growth and extension of small townships which is almost bound to occur everywhere. A third reason may be mentioned; it is being found that headquarters of districts are not always located in the most suitable spot available. The Germans in some instances, for strategic and other reasons which no longer obtain, were obliged to arrange for administrative headquarters to be put in places, which further experience shows to be perhaps unhealthy or otherwise inconvenient and unsuitable. Any day it may be decided to move the district capital, and when that happens the best part of the township moves with it.

The Administration therefore decided to appoint a Committee to which reference could be made in difficult cases and whose considered opinion might have weight. Accordingly Circular 44 of 1921 was issued

by the Hon. the Chief Secretary in May. Under the terms of this Circular it was decided to appoint a Central Town Planning and Building Committee for the whole Territory and District Town Planning and Building Committees for each district. The Central Committee sits at Dar-es-Salaam and meets weekly, or oftener, if found necessary. Its members consist of the Principal Medical Officer, the Director of Public Works, the Land Officer, with the Senior Sanitation Officer as Secretary and Executive Officer. The Solicitor General acts in an advisory capacity. District Committees consist of the District Political Officer and representatives of the Medical and Public Works Departments. District Committees were instructed to make rough outlines of the town plan proposed for each township, and to submit the same to the Central Committee for approval. The Central Committee at the same time was directed to issue such instructions to the District Committees as might be necessary. In compliance with this order, the Central Committee drafted certain proposals which were submitted for His Excellency's approval to serve as a general guide to District Committees.

The question of a Town Planning Ordinance was considered by the Central Committee, but as the Law Officers were of opinion that it was, at the moment, premature and unnecessary for Town Committees to ask for powers of compulsory acquisition of property, the subject was deferred. Actually such powers are the basis, not so much of the planning of new towns, but of re-planning old ones. No doubt as matters progress the subject will again be considered.

Since its inception the Central Committee has got through a considerable amount of work. Problems from many quarters have been submitted for an expression of its opinion in regard to building sites, house plans, "lay-outs" of new townships and cognate matters. It has drafted for the approval of the Administration, Building Rules for which it has sought to obtain legal force.

8. RAILWAY SANITATION.

The system organised at the request of the General Manager last year has continued. Under this scheme the Senior Sanitation Officer is responsible to the General Manager for the sanitation of the Central and Northern lines of the Tanganyika Railways. The Railway Sanitary Inspectors work under the general supervision of the Medical Officers of Health at Dar-es-Salaam and Tanga, so far as the sanitary condition

of the railway areas is concerned. At Tabora and Morogoro, where also Sanitary Inspectors are stationed, they work under the local medical officers. On the Central line there are three sections of responsibility :—

1. Dar-es-Salaam to Morogoro.
2. Morogoro to Itigi.
3. Itigi to Kigoma.

On the northern line the sanitary inspector at Tanga is responsible for the whole system. Until June, this official was resident at Buiko, but it was thought he would be more usefully employed if he were stationed at Tanga, where there is a good deal of work to be done in the railway area. He was in consequence transferred to Tanga.

DAR-ES-SALAAM SECTION.

The Sanitary Inspector reports a good deal of useful work as having been carried out during the year. Houses in the railway area are frequently inspected and sanitary defects brought to notice and repaired. Loco. workshops and the Loco. yard are kept under close observation with a view to keeping down collections of water in old wheels, drains, gutters, etc. The sanitary arrangements on the mail trains are inspected before the trains leave the terminus. Out-stations in the section have been inspected once a month, and station masters, where necessary, reminded of the importance of maintaining stations and station precincts in a sanitary condition.

MOROGORO SECTION.

The railway area is not so extensive, naturally, as at Dar-es-Salaam, but such as it is, it needs a good deal of watching. There is a certain amount of swamp land in the vicinity which has been dealt with and drained. In this section are Kilossa and Saranda, both very unhealthy stations owing to the prevalence of malaria.

TABORA SECTION.

The Tabora section extends from Itigi to Kigoma. A great deal of useful work has been put in at Tabora in the railway area, especially round Rufita Hill. The former Belgian section between Tabora and Kigoma was taken over in April, 1921, and a considerable alteration in the sanitary standard was found to be necessary. Kigoma has now been brought into line with other large railway stations in respect of its sanitation.

TANGA-MOSHI SECTION.

Owing to conditions over which the Railway Sanitation Branch has no control, the sanitary condition at the railway yards at Tanga leaves much to be desired. A number of loco. men are still housed in the old wooden sheds put up during the war as a temporary measure. Sanitary arrangements are extremely primitive and defective. Improvement is entirely conditional on the money available.

At Moshi improvements have been made in surface drainage. A good deal of clearing between the station and the Rau Forest has been effected.

HOUSING OF RAILWAY STAFF.

The Acting Chief Engineer and the Senior Sanitation Officer were instructed early in the year to draw up a report on existing conditions and present a scheme for the relief in the congestion and general inadequacy of the existing housing accommodation.

It was pointed out that on sanitary grounds it was desirable, and on financial, probably more economical, to set to work to build houses than to continue to pay away largesums in house allowance each year. A scheme was therefore produced. It proposed a building programme to be extended over two years requiring an average annual expenditure of £35,000. Unfortunately for the railway subordinates this scheme, as a whole, has proved to be beyond the resources of the railway finances.

In some instances the situation is in consequence becoming Gilbertian. The health authority should rightly obtain closing orders against many houses occupied by railway hands, *e.g.*, at Tanga and Kigoma. But it is no good inviting the Government to knock its own head against a wall, so the sanitary authority has to allow what, in the case of a private individual or corporation, it would instantly condemn.

Another housing problem that is giving rise to difficulties is one that concerns certain residences intended for occupation by the Railway superior staff. The railway is the unfortunate owner of three excellent houses built on the flat system with accommodation for six families and situated in Pugu Street, Dar-es-Salaam. These residences abut on the one side on the native town, and on the other are not far away from the remains of the Gerezani swamp. There is no doubt that few more unsuitable sites for European residences could possibly have been selected. In spite of every precaution, it is no exaggeration to say that hardly any railway official has succeeded in living for anything but a

short period in any of these houses without getting malaria or going sick. The actual figures are, between 1st January, 1921, and 21st December, 1921, out of 17 residents in the flats, 14 have been sick from one cause or another. The neighbourhood naturally swarms with flies as well as with mosquitoes. It is perfectly useless thinking of condemning the houses. As flats go they are excellent, but the policy of allowing European officials to live actually in the native town is one not worth discussing. In regard to this the Senior Sanitation Officer wrote as follows to the General Manager: "To house your Europeans in close proximity to the native town and to one of the most fertile sources of anopheline breeding places is asking for trouble. What must be kept in view is, that Europeans must be got out of these houses as soon as new and sufficient quarters have been put up in the 'clear area' I say it with a full sense of responsibility, if you house Europeans in the Pugu Street area, they stand, under ordinary common or garden circumstances, very little chance of escaping one or more attacks of malaria during their tour of service. The houses are good: we cannot condemn them—it is the neighbourhood that is bad."

If it is considered to be more economical to house important officials in an area in which illness will follow almost certainly, then there are two varying views as to what constitutes economy.

9. SCHOOL MEDICAL SERVICE.*

HEALTH OF SCHOLARS AT DAR-ES-SALAAM GOVERNMENT SCHOOL.

The school, which has had an average daily attendance of 144 pupils since medical inspection was begun, opened on May 1st, 1921, under an African head teacher; the pupils, with three or four exceptions, are Africans between the ages of 5 and 14. A few older natives attend also, and there is a class for pupil teachers. Medical inspection was commenced on September 1st. This consists of a weekly visit by the Medical Officer of Health accompanied by the Sub-Assistant Surgeon.

Medical inspection has not been carried out on the same lines as for European children; for instance, weighing and measuring and physical examination of the chest, eyesight and hearing tests have not been carried out. It will be readily seen from the table below that some of the more common diseases usually found in European school children have not been noted so far in the African children. Whether the diseases

* A Report written by Mr. R. R. Scott, M.C., M.O.H., Dar-es-Salaam.

of Indian children will show any closer resemblance to those of European children when the former come to be examined remains to be seen.

The weekly inspection is carried out as follows :—

The children are lined up in the shade and their clothing is examined for evidence of recent washing. Many of the children possess but the scantiest of coverings, often in rags, but so long as such are reasonably clean nothing is said. It is more important that the parents should spend what little money they have in the present bad times on feeding the children than on improving the appearance of their clothes. Discarded European clothing, such as old coats and waistcoats, is strongly discouraged, since such is more likely to become dirty and verminous than a strip of calico.

A "Mswaki" (native tooth brush) parade was instituted at the beginning of the inspections, for it was found that very many of the children were neglecting their mouths to a shocking extent. Every child who fails to produce his "Mswaki" is given some out-door manual work to perform after school hours.

The mouths of the whole school are examined for obvious caries and tartar once a month, while the Dental Surgeon has inspected the mouths each alternate month. A very marked general improvement is to be noted as a result of their receiving expert attention to their mouths and the institution of the "Mswaki" parade.

The children are next examined for skin diseases. The smaller children strip and are examined in line; the larger children only are examined individually inside the building. This examination has revealed a large amount of vermin (clothes lice), scabies, seborrhœa and ring-worm of the scalp.

When these *en masse* examinations have been completed, the children found to be suffering from any disease are card-indexed and marked for treatment either by the school dresser, at the Native Hospital or at the Infectious Diseases Hospital, where scabies and ring-worm are treated, or by the Dental Surgeon.

New children are at present examined especially for marks of vaccination, general nutrition, anæmia, dental caries and tartar and oral sepsis, discharging ears, skin diseases and enlarged spleen. It is hoped that it will be possible for a more thorough examination to be made as time goes on.

A small dispensary is being equipped and will be ready early in the New Year. This will enable all the minor treatment and dressings to be carried out at the school and save the hitherto unavoidable loss of

time entailed by the scholars being sent to the native hospital daily for even minor dressings.

As will be seen from the analysis of diseases noted which is appended hereto, there is room for investigation into several interesting problems which have not so far been touched upon in relation to children in Dar-es-Salaam, *e.g.* :—

- (1) Incidence of ankylostome infection and the relation of the number of children who show symptoms of the disease to those showing ova in the stools.
- (2) Incidence of other intestinal helminths, *e.g.* *Tænia Saginata* and *Ascaris*.
- (3) Incidence of Bilharzial urinary infection, which appears to be considerable, though not incapacitating.
- (4) Incidence of filaria in the blood.
- (5) Malaria.

(A). BLOOD EXAMINATION.

An examination of thick films of blood taken at mid-day from 58 children was made by the Director of the Laboratory on 28/10/21. Town children and children from the district where no anti-malarial measures are undertaken were grouped separately, and the accompanying table shows what a heavy percentage of apparently healthy native children are harbouring parasites. Admittedly the total number of bloods examined is a low one on which to form an opinion, but it would appear that the town children are more heavily infected than those living in the country. It must be remembered, however, that the so-called town children often go out in the evenings and at the week-ends to the "shamba" (country), where it is probable that many of them are heavily infected. However, a figure of 63 per cent. showing parasites, but no symptoms, out of all the children examined, indicates the presence in the town of a dangerous reservoir of infection, from which such anopheles as reach the town are extremely likely to be infected and so become dangerous to the non-immune population.

(B). EXAMINATION OF SPLEENS.

It has been found that out of 107 children whose spleens were examined in December and the first week in January, 1922, 26 showed enlargement, *i.e.*, 24 per cent. Of the 26 showing enlargement 11 were + + +, 7 were + +, and 8 were +.

Children showing enlargement of the spleen or parasites will be given quinine for a time and re-examined.

GENERAL HEALTH.

It will be seen from the tables that the health of the scholars is on the whole good. The number of children who are dirty as to their

clothes or verminous is decreasing month by month, while the number of poorly developed children is small.

Great importance is attached to the necessity for continuous dental treatment. The amount of caries, oral sepsis, and heavy deposits of tartar which have been seen during these four months is surprising, since it was believed that natives had such good teeth; moreover, this class of child does not live on bread and European food which one would expect to cause dental decay, but on ordinary native food such as their ancestors have used for centuries. Admittedly the diet is mainly starchy, but the starch is not nearly so finely ground as in the case of European flours, and should therefore be more easily removable.

A copy of a report by the Dental Surgeon is appended.

Ring-worm of the scalp is present in too great a number of cases, and cases of this disease, which are most resistant to treatment (there is no X-ray apparatus available for treatment as yet) are admitted to the Infectious Diseases Hospital, where they can be subjected to more intensive treatment than is possible as out-patients.

Yaws is present in quite a number of children, while others show severe scarring resulting from previous attacks of the disease.

VACCINATION.

Seventy-seven children were vaccinated on 29/7/21; of these 55 per cent. showed no previous marks of vaccination; 63 per cent. of all vaccinated showed either good or slight reaction.

Seventy-two children are considered to be unprotected from Small-pox and will be vaccinated early in 1922.

REPORT BY GOVERNMENT DENTAL SURGEON TO THE MEDICAL OFFICER OF HEALTH.

"Relative to the dental condition of the Government native school children, which on the whole is good; a distinct improvement is noticed in the cleanliness of their mouths since the septic temporary teeth were removed and the use of the native stick or 'Mswaki' insisted upon.

"The necessity for a clean mouth into which the permanent teeth have to erupt cannot be too strongly emphasised; the mal-development of the child if a septic condition of its mouth persists, should be remembered.

"A clean mouth is easily obtained in native children living on simple native foods by the daily use of the 'Mswaki,' especially before sleep.

"It is noticed that the maxillary and mandibular incisor teeth are frequently mis-placed and crowded in the children under question."

TABLE OF DISEASES, ETC., RECORDED IN SCHOOL CHILDREN DURING
THE MONTHS SEPTEMBER TO DECEMBER, 1921.

TABLE XXV.

System.	Condition.	Cases.	Remarks.
1. General Condition	(a) Poor development (Malnutrition)	7	—
2. Dental	(a) Caries	66	Many of these ex- tracted at school. See special remarks by the Dental Surgeon. Note "Mswaki" parade. Were punished for failing to bring "Mswaki."
	(b) Tartar	69	
	(c) Referred to D.S.	80	
	(d)	202	
3. Mouth and Throat.	(a) Glossitis or Pharyngitis	10	—
	(b) Enlarged Tonsils (Acute or Chronic)	8	—
4. Small-Pox	(a) Vaccinated	161	Considered to be pro- tected on first examination. Considered to be un- protected on first examination.
	(b) Not showing marks	72	
5. Skin	(a) Dirty	14	Noted as dirty when examined by M.O.H. Dirty clothing de- tected by teachers, etc., and sent to be washed at once. Noted by M.O.H. Complained volun- tarily. All lice are Pediculus vestimenti. All children who complained volun- tarily of lice have their clothing boiled at school. No home measures are attempted.
	(b) Vermin	12	
		144	

TABLE OF DISEASES, ETC.—*continued.*

System.	Condition.	Cases.	Remarks.
5. Skin— <i>contd.</i>	(c) Scabies	30	Of these 27 were admitted for sulphur treatment to I.D.H. Those not admitted were slight infections.
	(d) Seborrhœic condition of scalp.	19	—
	(e) Tinea Corporis ..	6	Known as "Mba" among natives, a scaly spreading, serpiginous, depigmenting condition very common in adult natives here, responds readily to treatment with Salicylic acid.
	(f) Tinea Circinata ..	13	Sent to I.D.H. for treatment.
	(g) Tinea Cruris .. (Dhobie's Itch)	4	These are marked cases; it is difficult to note on natives unless a heavy infection.
	(h) Herpes	1	Above iliac crests.
	(i) Dermatitis ..	1	—
	(j) Impetigo ..	1	—
	(k) Ulcers	27	No particular situation.
	(l) Jiggers and ulceration therefrom.	6	—
	(m) Abscess (superficial origin).	2	—
	(n) Septic vaccination marks.	1	—
	(o) Septic fingers and toes.	3	—
(p) Nævus	1	—	

TABLE OF DISEASES, ETC.—*continued.*

System.	Condition.	Cases.	Remarks.
6. Eyes	(a) Squint	1	—
	(b) Corneal Ulcer (Chronic)	1	—
	(c) Conjunctivitis Blepharitis Trachoma	5	—
7. Ears	(a) Discharging Ears	4	—
8. Helminthic In- fection.	(a) Elephantiasis ..	1	No nocturnal examina- tions of blood were undertaken.
	(b) Bilharziasis ..	12	Diagnosis based solely on seeing blood in urine; doubtless many more infections are present.
	(c) Intestinal Parasites	—	No fæces examined.
9. Blood	(a) Malaria Parasites	37	See remarks on Malaria and Special Table.
	(b) Anæmia	10	Diagnosed by appearance of con- junctivæ only.
	(c) Spleen, enlarge- ment of.	8	Up to end of Decem- ber only. See special remarks under Malaria.
10. Infective Granu- lomata.	(a) Yaws	9	These cases are all being treated at the Sewa Hadji Hospital.
11. Hernia ..	(a) Umbilical ..	12	No inguinal hernia seen.
12. Hydrocele ..	(a) Tunica Vaginalis	2	One adult.
OTHER CONDITIONS.			
Penile Discharge ..	—	1	In young boy about 14.
Adherent Prepuce	—	1	—

TABLE SHOWING MONTHLY ATTENDANCE AND DISPOSAL OF SICK, ETC.

TABLE XXVI.

1921.	Average Daily Attendance.	No "Mswaki."	Verminous.	Dirty Clothes.	Admitted to I.D.H. (Skin).	Referred to Native Hospital.	Referred to Dental Surgeon.
September	146	60	45	80	—	4	2
October ..	155	57	43	71	5	11	40
November	145	49	37	48	7	18	12
December	133	36	19	39	11	17	26

TABLE XXVII.—DISEASES, ETC., IN ORDER OF FREQUENCY.

Cases noted.				Cases noted.			
Dirty Clothes	252	Tinea Circinata	13				
Vermin	156	Bilharziasis (clinical diagnosis only)	12				
Dental Caries and Tartar	135	Hernia (umbilical)	12				
Not Vaccinated	72	Anaemia	10				
Scabies	30	Glossitis or Pharyngitis	10				
Ulcer	27	Yaws	9				
Seborrhœic Scalp	19						

TABLE XXVIII.

DAR-ES-SALAAM GOVERNMENT SCHOOL CHILDREN EXAMINED ON 28/10/21.

Approximate Ages.	Town Children living in Dar-es-Salaam for past two years.					Country Children living outside town now or recently, <i>i.e.</i> , infective areas for Malaria.				
	5, 6, 7.	8, 9, 10.	11, 12, 13.	14 and over.	Total.	5, 6, 7.	8, 9, 10.	11, 12, 13.	14 and over.	Total.
1. S.T. Rings ..	3	3	3	5	14	1	2	3	2	8
2. B.T. Rings ..	3	1	—	—	4	3	1	1	2	7
3. Crescents ..	—	1	—	—	1	—	1	—	—	1
4. B.T. and Crescents	—	1	—	—	1	—	—	—	—	—
5. S.T. and Crescents	—	—	1	—	1	—	—	—	—	—
6. Total showing Parasites ..	6	6	4	5	21	4	4	4	4	16
7. Negatives ..	1	4	3	2	10	—	5	3	3	11
8. Total examined ..	7	10	7	7	31	4	9	7	7	27
9. Percentage of those examined showing Parasites	85%	60%	57%	71%	67%	100%	44%	57%	57%	59%

Total percentage who showed Parasites over all examined 63 per cent.

Percentage of S.T. Forms in those showing rings:—Town 77 per cent. ; Country 53 per cent.

APPENDIX I.

COST OF CERTAIN SECTIONS OF SANITATION IN DAR-ES-SALAAM.

Quarantine and I.D.H.

Salary of S.A.S.	..	..	..	Fls.	3,000·00 (a)
Boat Boys	..	..	..	..	455·80 (b)
I.D.H. Labour and Ward Boys	..	..	..	..	1,077·93 (c)
Hospital Attendants	..	..	..	..	480·00 (c)
Vaccinators	..	..	..	..	235·53
Rat Catchers	..	..	..	..	248·12
(a) Plus cost of upkeep and petrol for motor boat.					Fls. 5,497·38
(b) Plus cost of upkeep of rowing boat.					
(c) Plus cost of food and drugs and equipment for I.D.H.					

Fees received by Port Officer for Bills of Health Fls. 1,406.

General Duty.

No. 1	..	..	..	..	Fls. 2,069·45 (d)
No. 2	..	..	..	..	1,585·60
No. 3	..	..	..	..	1,172·89
No. 4	..	..	..	..	1,033·78
No. 5	..	..	..	..	1,660·59 (e)
					Fls. 7,522·31
Government House Grounds	..	..	..	..	393·76
Cemetery	..	..	..	..	176·47
Botanical Gardens	..	..	..	..	932·35
Tree Cutters	..	..	..	..	1,005·11
Hedge Planters	..	..	..	..	491·00
Hedge Cutters	..	..	..	..	1,302·31
(d) Plus cost of tools.					
(e) Mainly grass cutting.					Fls. 11,823·31

Latrine and Market Sweepers.

Latrines	..	..	..	..	Fls. 2,281·32 (f)
European Hospital	..	..	..	..	139·28
Native Hospital	..	..	..	..	254·00
Market	..	..	..	..	1,224·10
(f) Plus tools and equipment.					Fls. 3,898·70

Office and Administrative.

M.O.H. (salary and allowance only)	Fls.	7,500·00 (g)
Sanitary Superintendent, 1st (salary only) .. .. .	.. .. .	3,650·00
Sanitary Superintendent, 2nd .. .. .	.. .. .	3,250·00
Clerk .. .. .	.. .. .	1,305·00
Office Boys .. .. .	.. .. .	685·50
Native Sanitary Inspectors .. .. .	.. .. .	3,516·84
Storekeeper (Native) .. .. .	.. .. .	20·32
Carpenter (Native) .. .. .	.. .. .	541·99
Yard Boys .. .. .	.. .. .	609·08
Overtime, etc. .. .. .	.. .. .	147·22
Laboratory .. .. .	.. .. .	171·00
		<hr/>
	Fls.	21,396·95
50% of M.O.H.'s and S.S.'s salary ..	..	7,200·00
(g) Plus upkeep of car.		<hr/>
	Fls.	28,596·95

Refuse Disposal.

Dump Boys	Fls.	2,302·64
Ox Cart Boys .. .. .	..	6,220·77
Ox Grazers .. .. .	..	324·00
(h) Cost of labour only. No interest on transport. No cost of oxen's food. No cost of petrol for conveying fuel. No cost of tools.	Fls.	8,847·41 (h)

Cart loads of refuse removed and burnt, Fls. 21,683 = Fls. 0·40 per cart-load. Cost of running one Autocar per day, Fls. 13·25.

Cess-pit Emptying.

Pump Boys	Fls.	1,258·01 (i)
Cess-pits emptied, 2,447 loads, i.e., cost of pumping labour per load ..	Fls.	0·52
Cost of one Daimler 2-ton lorry per day .. .. .	..	0·15
Fees charged for emptying private cess-pits .. .. .	..	1,677·00

(i) Does not include wages of Asiatic Driver 525/. Does not include wages of drivers for nine months. Does not include cost of petrol. Does not include interest on value of equipment.

Road Sweeping.

Residential Area	.. .. .	Fls. 2,652.30 (j)
Commercial	„	„ 2,280.66
Native Quarter	.. .. .	„ 940.60
(j) Does not include wear and tear of carts.		<u>Fls. 5,873.56</u>

Anti-Mosquito Measures.

Mosquito Clerks	.. .. .	Fls. 583.30 (k)
„ Finders and Oilers	.. .. .	„ 5,297.03
„ Drainers (permanent)	.. .. .	„ 10,833.33
Drainage and Swamps (P.W.D. Fund)	.. .. .	„ 5,123.04
Sanitary Inspector D'Souza	.. .. .	„ 2,011.66
Extra Drainers during Rains	.. .. .	„ 235.70
(k) Plus cost of kerosene, cresol, tools, uniforms.		<u>Fls. 24,084.06</u>

APPENDIX II.

[COPY.]

No. 24/I/4.

Health Office,

Dar-es-Salaam.

28th November, 1921.

THE DISTRICT POLITICAL OFFICER, DAR-ES-SALAAM.

I wish to draw your attention to the increasing number of small native shops which are selling fresh produce throughout the native quarter.

You are aware that I am anxious to encourage the small native trader in every possible way, but at the same time I must point out that the enormous increase of small retailers of fresh foodstuffs during the past year is causing me some uneasiness.

According to township rules all fresh produce should be sold in the public market, but owing to the congested state of the latter and the impossibility of any fruit sellers obtaining stalls therein we have allowed the continuance of the retail shops referred to in spite of the rules, so as not to place undue restrictions on trade.

But this practice cannot go on indefinitely; our rat population is greatly on the increase, and is without doubt fostered by the large

quantities of fresh food now being stored in the native houses. The retail sale of dried fish (shark, etc.) and the preparation and storage of fried fresh fish for hawking are two especially bad features. I am of opinion that the sale of these two latter items other than at the market should be stopped at once.

We must consider, therefore, what can be done to prevent this storage and retail of foodstuffs in unsuitable premises, and at the same time interfere as little as possible with the trade.

I understand that even the £750 estimated for commencing work at the new market has been cut out from this year's money, and I would therefore like to have your views on whether we could possibly commence the fruit, vegetable, and coffee-stall business there in its present state without prejudicing its future conversion into a proper market. I fancy that we could arrange for the provision of temporary latrines and incinerator there, while we might be able to pay for benches and staff a little later on out of revenue from the lease of stalls.

There are no doubt difficulties in the way, but something must be done to stop the present rapidly increasing number of rat breeding centres throughout the town whose owners will consider that they have a right to their shop if allowed to carry on indefinitely.

We must also bear in mind that two years ago the available market floor-space was much greater than at present, there being then two large bandas on the ground adjoining, which belongs to Suleman bin Nasor, in which were numerous coffee stalls and the entire cocoanut business. The latter trade has since been forced into the main market building to the exclusion of fruit sellers, owing to the collapse of the bandas during 1919.

Will you therefore think over this question and let me know what you think can be done?

I attach a copy of a recent report by Mr. Rowe, which bears on the same question.

(Sgd.) R. R. SCOTT,
Medical Officer of Health.

Copy to :—

SENIOR SANITATION OFFICER, DAR-ES-SALAAM.

APPENDIX III.

REMARKS ON NEW WORKS REQUIRED IN DAR-ES-SALAAM, 1922-23.

Water Supply.

Serious consideration of the existing unsatisfactory system is imperative.

The European and Asiatic population is increasing, and the annual rainfall would appear to be decreasing.

During the last dry season the supply of water became very short indeed, and a shortage again next season may be feared.

The average annual rainfall recorded by the Germans in Dar-es-Salaam over 16 years was 43 inches :

	The maximum in one year was	56 inches.
	„ minimum „ „ „ „	19 „
	In 1919 the rainfall was approximately	34 inches.
	„ 1920 „ „ „ „	24 „
	„ 1921 „ „ „ „	33.9 „

Thus we are getting a smaller rainfall with a population which consumes more water than before, and which expects a piped supply to its houses in lieu of the former system of shallow and unprotected wells.

The attention of the Government is directed to this most important question ; it would appear advisable to obtain the services of an expert water engineer, who could make thorough investigation of the possible sources of supply.

Such an investigation is necessary before any considerable sum of money is expended on patching up the present system.

Water must exist in considerable quantity derived from the thickly-wooded catchment area on the Pugu Hills ; it remains to be found.

(a) Sewage.

The initiation of a definite plan of sewage disposal is necessary : while realising that funds are not at present available for the carrying out of a full scheme, some end towards which to work should be laid down ; so that, when funds do become available, the work we are doing at present may not have to be undone, but may be incorporated in a final system.

The dangers and disadvantages of the present system of soakage pits were indicated at some length in a report on " new works " required in September, 1919.

The German plans of their proposals for disposal of sewage and surface water have since been found. These should be carefully considered, and their suitability or otherwise decided upon. If we continue to shelve this question, which it is admitted is a large one, we are only storing up for ourselves serious trouble and expense in the future.

(b) *Askari Barracks.*

The sewer leading from the Askari barracks to the sea requires re-laying in part. The water flushed closets drained by this sewer need replacing by a trapped automatically flushed system. A trough closet would be the most suitable form for this barracks, similar to Douulton's 4128. The cost of these to accommodate 400 persons would be £170 at 1920 prices, complete with flushing tank and without freight.

The present system is most insanitary, is completely untrapped and is inadequately flushed.

(c) *Gaol.*

The whole system of drainage at the gaol is unsatisfactory. It requires completely opening up, re-designing and re-laying with modern fittings, throughout the portion occupied by prisoners.

At present the gaol staff and patients in hospital use an untrapped, water-flushed closet adjoining and directly underneath the windows of the European Officers' quarters. The odour from this is at times most unpleasant.

These should be replaced by trapped automatically-flushed trough-closets similar to those at the Askari barracks, and the ventilation of the latrines should be improved.

Latrine accommodation is required here for four individuals at once (to allow for male and female prisoners and gaol staff).

The main latrine used by the prisoners is on the dry pan system with incineration.

The urine and sullage water are poured down an untrapped drain which leads out towards the sea from the exercise yard. This drain is unsuitable for the conduction of sewage, and should be reconstructed.

At the same time the incinerator might be dispensed with and a water-flushed system, connected by a covered escape-proof passage with the main gaol wards, installed.

Accommodation for six persons with a urinal would be required, on the lines of that described above.

(d) Sewa Hadji Hospital.

An additional latrine is required at the north end of the hospital, accommodation for two males and one female is necessary.

Slop sinks, one at each end of the hospital, are required for washing bed-pans. Doulton's No. 4235, costing about £40 each, is recommended.

(e) European Hospital.

The sanitary arrangements within the hospital, are far behind the standard of the rest of the building. The pans are of the washout type, and the soil pipes are indoors; there is no proper accommodation for washing out bed-pans. The outside drains of this building are being entirely relaid; when that is done a sanitary survey of the interior will be necessary to determine how best the existing arrangements can be modified to bring about a satisfactory result with a minimum of expense.

With regard to (b), (c), (d), above, it is still considered that a pump for supplying salt water for these three buildings is necessary in view of the present shortage of fresh water; when one of the hand pumps at present in use breaks down, as not infrequently occurs, the latrines are entirely unflushed until the pump can be repaired. Whereas a single mechanical pump, say on the wharf, could supply unlimited sea water for flushing the drains at each end of these three buildings, and also for flushing other drains and watering roads, at a less cost for the water, and with no very heavy outlay for pipe line, while the result would be much more satisfactory than at present is the case.

It is quite wrong to house these large numbers of natives, whether sick or well, in the commercial area of the town, while not providing proper means of disposal of their excreta.

Foreshore Drains.

These were reported on in 1919—all of them carry surface water; some carry sewage in addition. Nothing has yet been done towards their repair; their condition is disgraceful, and the longer they are left the more expensive their repair becomes.

SURFACE DRAINAGE.

(a) Chafukoga.

The construction of a concrete drain from Chafukoga to join the Bagamoyo drain beyond the pool has been estimated for by the Executive Engineer: this should be completed before next rains, in order to prevent the overflowing of the Bagamoyo Pool and lying up of rain water

which took place in the centre of the town last rains ; this is the most important drainage problem in the town at the moment, and its construction should be postponed no longer.

(b) *Bagamoyo Pool.*

This will become much more tractable after the completion of the Chafukoga drain mentioned above, but it will still receive the whole of the surface water of a very large area of the native town west of Bagamoyo Street, including the Mbuyuni swamp.

Cement inverts should be laid along the whole course of these main drains ; these, together with the provision of sand traps at suitable intervals, would prevent to a large extent the breaking away of banks and blocking of culverts which takes place during heavy rain.

(c) *Cement Culverts.*

These are required in the native quarter where road junctions are intersected by ditches. About 13 are required ; average size 1 foot in diameter by say 12 feet in breadth. These will have to be extended later as the roads in the native quarter are improved, but the sizes given will be sufficient to allow wheeled traffic to cross the ditches for the present.

(d) *Tidal Valve at European Cemetery.*

Culex mosquitoes continue to breed in the crab holes caused by the entry of sea water through this ineffectual valve. It is quite time that some work was done to determine whether the sea cannot be kept out without the entire rebuilding of the dam.

APPENDIX IV.

The following facts are the result of a sanitary survey of 50 European houses by Sanitary Superintendent C. W. Strutt :—

Total number of houses surveyed to December 31st, 50.

(a) *Cesspits.*

Cesspits	5 to 10 metres from well	14 per cent. of houses surveyed.
"	11 to 20 " " "	32 " " " "
"	21 to 30 " " "	14 " " " "
"	31 to 40 " " "	14 " " " "
"	41 to 50 " " "	0 " " " "
No cesspit, sewage running to sea		10 " " " "
No well, houses on water main ..		16 " " " "
		100 " " " "

(b) Number of cesspits draining away to earth, 100 per cent.

(c) Houses having wash places for clothing :—

With	Without
78 per cent.	22 per cent.

(d) Houses with kitchen sinks :—

Sinks where installed are small and of poor quality. Some houses have a sink in one flat, but the other flat is without one.

With Sinks.	Without Sinks.
72 per cent.	28 per cent.
Trapped.	Not Trapped.
64 per cent.	36 per cent.

The majority of those trapped are fitted with bell traps and therefore are not reliable. The bell is commonly removed by the house boys since they find that the water runs away more easily in its absence.

(e) Houses with lavatory basins :—

With Basins	Without Basins.
2 per cent.	98 per cent.

(f) Types of W.C. pans in use :—

Washout Pans.	Washdown.	Hopper.	Earth Closet.
84 per cent.	8 per cent.	6 per cent.	2 per cent.

(g) Ventilation of house drains :—

Ventilated.	Not.
18 per cent.	82 per cent.

(h) Houses with baths :—

With Bath.	Without Bath but with Shower.	Without Bath or Shower.
72 per cent.	26 per cent.	2 per cent.

(i) Houses with sanitary dustbins :—

With.	Without.
4 per cent.	96 per cent.

Houses have been provided with tarred boxes and barrels, but these are most insanitary. All houses are to be provided with sanitary bins in 1922.

(j) Houses with accessible cesspits :—

Accessible.	Not Accessible.
55 per cent.	45 per cent.

(k) Houses with bath and sinks wastes immediately connected to soil pipes and cesspits :—

Connected directly.	Not so connected.
88 per cent.	12 per cent.

A plan is attached showing the proximity of wells and cesspits in those houses in the European residential area which have been surveyed.

Since the cesspits are all nearly percolation pits, while the wells are in many cases undoubtedly shallow, the gross pollution which results may easily be estimated.

APPENDIX. V.

TUITION OF NATIVE SANITARY INSPECTORS.

Some progress has been made in the instruction of the Native Staff at the Health Office.

All Native Sanitary Inspectors and the most promising members of the Mosquito Brigade, all of whom could at least read and write Swahili, were formed into a class on September 1st. This class meets daily on week days from 7 to 8 a.m. and instruction is given in Swahili in Elementary Hygiene, Public Health and Sanitary Engineering.

The Medical Officer of Health lectures on three days a week, the Senior Sanitary Superintendent (Mr. Rowe) gives demonstrations in practical sanitation on two days, and one morning is devoted to elementary drawing by Sanitary Superintendent Strutt.

The lectures have covered the elementary facts of :—

- Water supply,
- Drainage and refuse disposal,
- Ventilation,
- House construction,
- Food supply,
- Communicable diseases.

The demonstrations have included :—

- Materials and fittings used in drainage and water supply, especially the trapping of drains.
- Demonstration of casting molten iron at dockyard.
- Disinfection by Thresh machine and Clayton apparatus.

Soda water manufacture and filtration and distillation.
 Elementary facts regarding composition of air and the
 physiology of respiration and circulation.
 Insects which carry disease in this country.
 Systematic inspection of houses.
 Simple calculation of areas and volumes.

The drawing class has considered :—

Drawing of common objects as seen,
 Plans,
 Sections,
 Elevations of buildings of simple form.

Much of the ground has to be gone over several times, since all such theoretical knowledge is entirely new to the East African native.

The classes are conducted by question and answer and endeavour is made to force the pupils to think for themselves and not to learn a series of facts which are of no earthly value unless they can be applied to every day work.

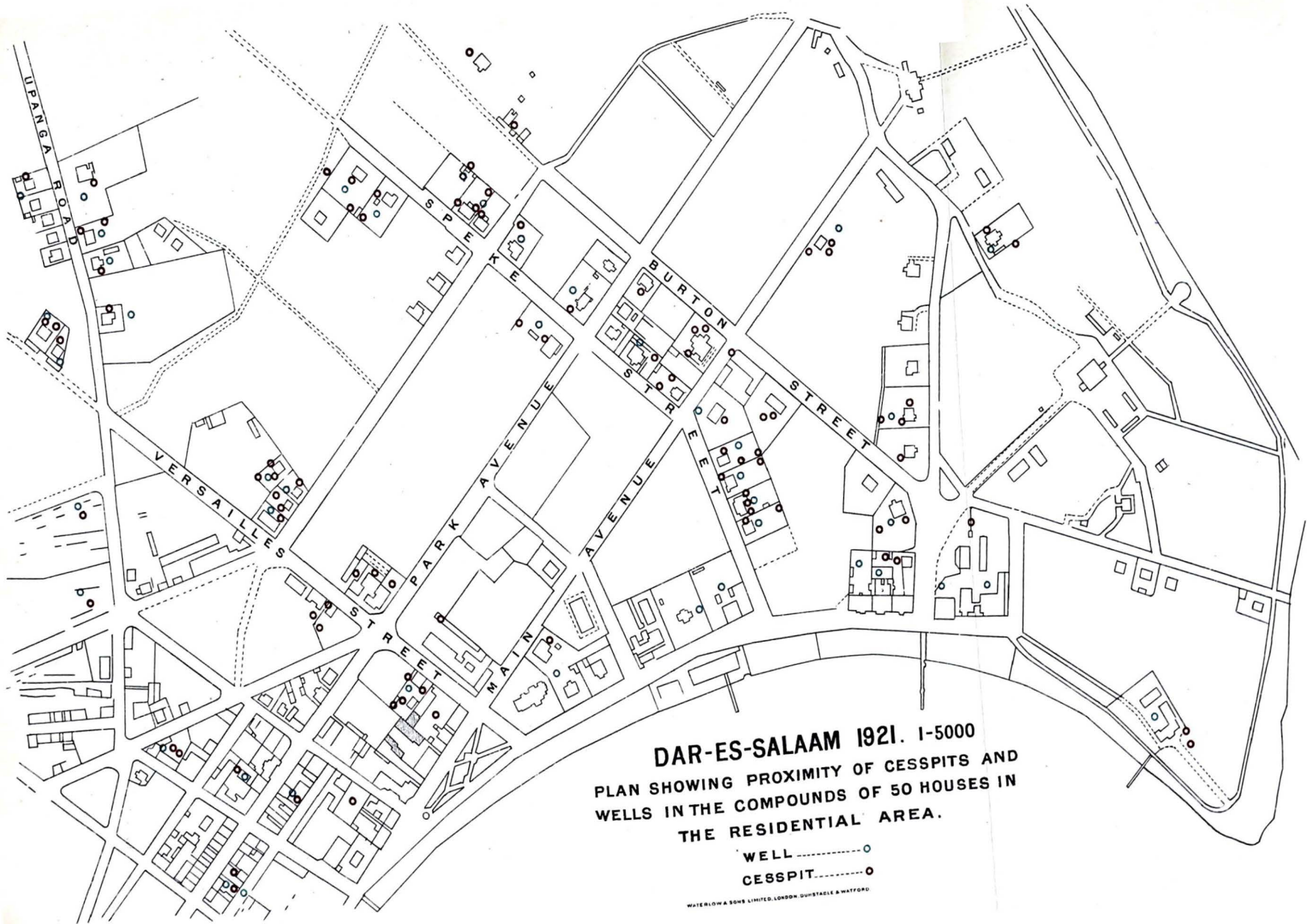
Copies of Knight's Hygiene Diagrams have been obtained and each pupil with a knowledge of English is supplied with a copy of the "diagramettes" of the same series.

A collection of sanitary and insanitary appliances has been formed and is continually being added to; a few models of pipes and constructional material have been obtained from England, but these are most difficult to obtain since the war.

A written examination was held in November after two months' tuition; some of the papers were remarkably good, the top native getting 93 per cent.

It is a matter for regret that the general education of most of the class of natives we get is of a low standard; most of them have left school long before they should have done owing to the war; as a result their knowledge of English is too little to enable them to profit by reading books in English.

On the whole, however, they are making progress, and the March examination will show how far they have profited by their tuition.



DAR-ES-SALAAM 1921. 1-5000
PLAN SHOWING PROXIMITY OF CESSPITS AND
WELLS IN THE COMPOUNDS OF 50 HOUSES IN
THE RESIDENTIAL AREA.

WELL○
 CESSPIT.....○

WATERLOW & SONS LIMITED, LONDON, DUNSTABLE & WATFORD

SANITARY SUMMARY FOR 1921.

	<i>Total</i>
Rainfall	33,905
1. Houses and Compounds visited	116,760
2. Nuisances recorded	5,651
3. Linear Feet New Drains cut	16,314
4. Collections of Fly Maggots found	192
5. Native Latrines ordered to be dug	472
6. Cart Loads of Refuse removed	21,683
7. Dumps of Rubbish removed	1,274
8. Notices served	310
9. Prosecutions	1
10. Samples to laboratory	17
11. Sick transported	32
12. Burials { European	7
{ Asiatic	2
{ African	19
13. Loads of Cess removed by Lorries { No. 1	1,865
{ No. 2	582
14. Rats Caught	3,421
15. Convicts supplied	8,716
17. Condemnation of Foodstuffs	22
18. School Children examined	50
19. Houses Examined for repairs	1,166

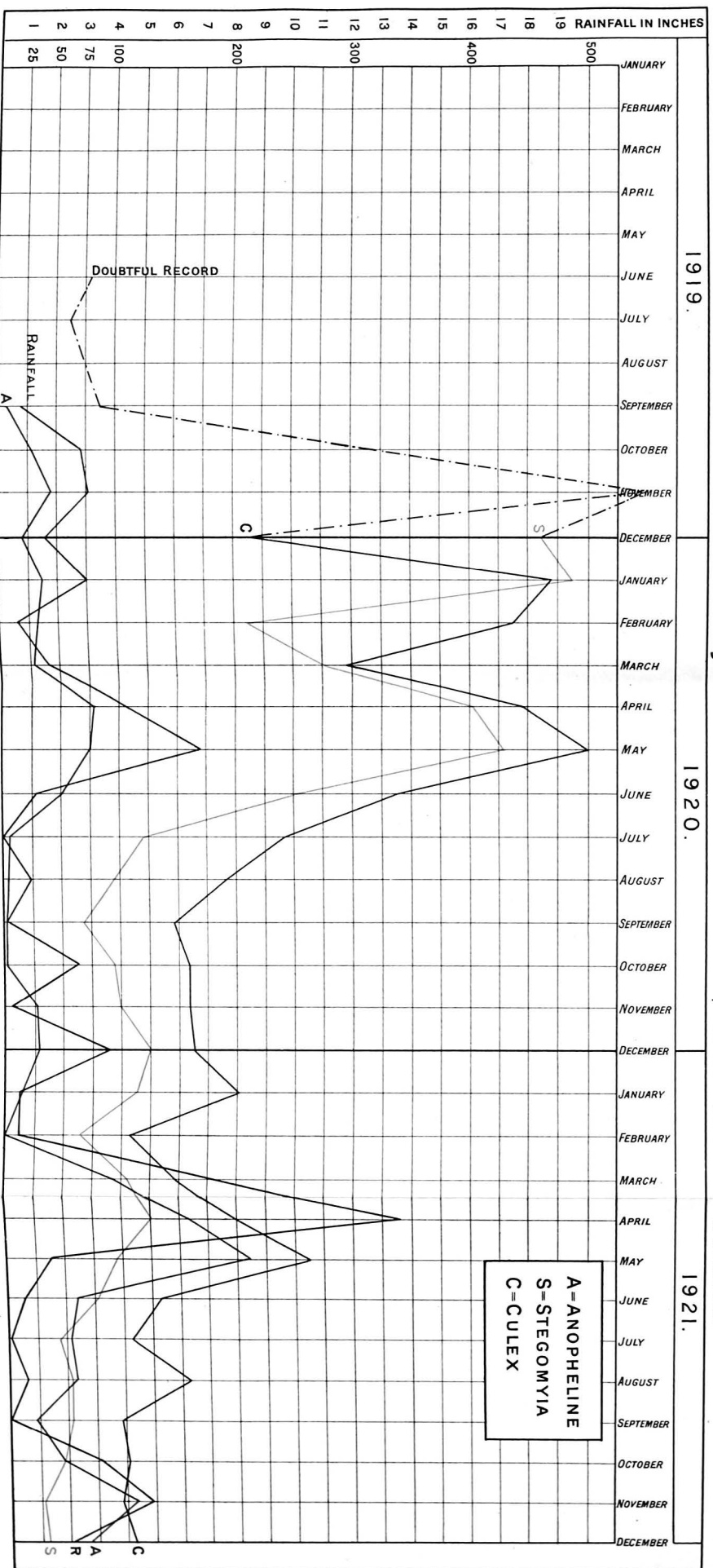
Report of the Dar-es-Salaam
Laboratory.

DAR-ES-SALAAM. Chart showing relation of collections of Mosquito Larvae found to Rainfall.

1919.

1920.

1921.

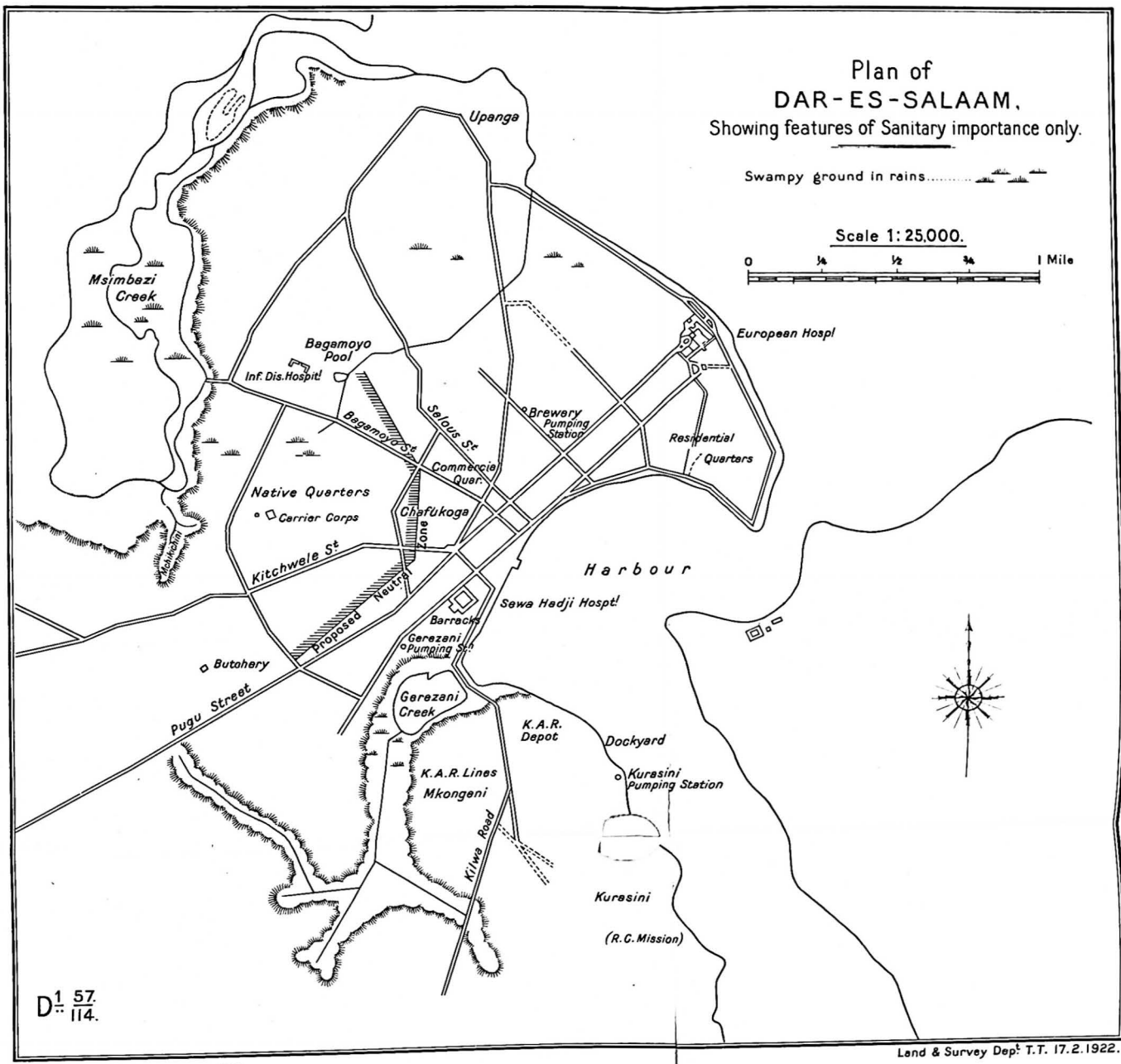
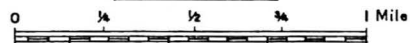


MANUSCRIPTS & BOOKS, UNITED STATES GEOLOGICAL SURVEY, WASHINGTON, D. C.

Plan of
DAR-ES-SALAAM,
 Showing features of Sanitary importance only.

Swampy ground in rains.....

Scale 1:25,000.



D 1 57
 114.

CONTENTS.

	PAGE.
A.—Introductory	183
1. Staff	183
2. Buildings	184
3. Equipment	185
4. Library	185
5. Media Making	186
6. Stock Cultures	186
7. Stock Sera and Vaccines	187
8. Animals and Animal Houses	187
9. Work and Scope of the Laboratory	189
B.—General Examinations	189
I. Blood	189
1. Blood Films	189
(a) Malaria in Europeans	190
(b) Malaria in Natives and Asiatics	190
(c) Relapsing Fever	190
(d) Microfilaria	190
(e) Differential Counts	190
(f) Blackwater Films	191
(g) Trypanosomiasis	191
(h) Malaria Index in Native Children	191
(i) Malaria and Meteorology	192
2. Agglutinations	193
3. Wassermann Reactions	194
4. Blood Culture	194
II. Faeces	195
(a) Microscopical	195
(b) Bacteriological	195

B.—General Examinations— <i>continued.</i>	PAGE.
III. Urines	196
(a) General	196
(b) Bacteriological	197
IV. Pus	197
V. Sputum	198
VI. Scrapings from Nodules and Ulcers	198
VII. Tumours	199
VIII. Vaccines	199
IX. Miscellaneous	199
 C.—Chemical Examinations	 200
(a) Milk	200
(b) Metals	200
(c) Acids	200
(d) Salt Deposits	200
 D.—Medico—Legal	 200
 E.—Water Analysis	 201
 F.—Rat Examinations	 203
 G.—Meteorological	 203
 H.—Anti-Variolous Lymph	 205
 I.—Special Investigations	 216
(a) Malaria in Children	217
(b) Intestinal Parasites of Prisoners	217
(c) Urinary Bilharzia	218
(d) Activity of Urine	219
(e) Leprosy	224

TANGANYIKA TERRITORY.

Report of the Dar-es-Salaam Laboratory, For the Year 1921.

A.—INTRODUCTORY.

This Report covers the period of January to December, 1921, inclusive, and is the first complete year's work in the Laboratory.

Of necessity the work has been of a preliminary character owing to the lack of knowledge of the normal conditions prevailing.

The inauguration of a small Calf Lymph Institute has taken up a major part of the time and has necessitated improvements in the animal houses in order to obtain more sanitary conditions for the manufacture of Anti-variolaous lymph.

I.—STAFF.

I have been in charge throughout the year, and have only had the assistance of Mr. Hammond—my laboratory assistant—for the first four months of the year, for he then proceeded on leave. Mr. Hammond's assistance and general knowledge have been a very great help, and the large stock of media that he made up before proceeding on leave very materially helped me to carry on the work single-handed.

Mr. Hammond's work consists of general supervision of the native staff, the making of media, all clerical work, and typing: the supervision of the calf stables, tubing of calf lymph, the despatching of lymph, sera and vaccines, and helping in the routine of the laboratory when necessary, and his time is very fully occupied. While on leave he attended the Hendon Government Lymph Establishment, and I propose to hand over all the actual work of the calf lymph production to him in future, reserving the inspection of the calves and bacteriology of the lymph to myself.

All this work has devolved on me during his absence, and has made anything but routine work almost an impossibility.

The native staff consists of five boys. One in charge of the media-making room, one employed in the laboratory, a third in charge of the calf stables, a fourth employed in looking after the laboratory animals and houses and in fetching fodder for the calves, and a fifth, a small boy employed in herding the few sheep that are kept on the premises for obtaining blood for the Wassermann Reaction.

II.—BUILDINGS.

These are the old German laboratory buildings, and their extent can be better appreciated from the plans at the end of the report than any detailed account.

The buildings are very satisfactory in many ways. A pipe-laid system of water is present, and though rather intermittent, is very useful. Rain-water tanks are present and help very materially, for the pipe-laid water is rather salt for laboratory purposes other than for cleaning. Water is distilled for our own use and for use in the European Hospital and Native Hospital whenever special drugs are required to be made up and for intravenous administration of drugs.

The main laboratory is tile-floored and is very free from dust, and the lighting is good.

An Entomological Laboratory and Museum are proposed for the rooms situated over the post-mortem room, and will be eminently suitable for that purpose—though very little progress has been made in that direction at present.

The buildings are situated beside the European Hospital and facing the sea. The only disadvantage is the long distance from the Native Hospital from which most of one's material ought to be obtained, and the only satisfactory solution would be for constant visits to be made to that hospital. At present our staff and time is too occupied to allow this.

Our complete isolation from intercourse with the Veterinary Department, to my mind, is a great disadvantage. I do not believe that a too close co-operation between the two laboratories is possible, and I believe that the borderland between human and veterinary pathology is one that will yield many additions to our knowledge, both human and veterinary.

The Germans had plans for extending this laboratory and for including the veterinary laboratory under the same roof.

The vision of a general scientific block is one that one likes to look to, but difficulties may arise as the result of our system of water-tight compartments.

III.—EQUIPMENT.

This in many ways is excellent. Electrically worked apparatus is chiefly present in the form of incubators, hot-air sterilizers, centrifuges, water bath and shaker.

At present the lymph machine is worked by hand, but an electrically worked machine is on order.

Spirit stoves and Primus stoves have to be employed for general heating.

A large amount of useful equipment undoubtedly disappeared during the military occupation, but a large number of eyepieces and objectives remain, the majority in not a very satisfactory condition, and only two useful 1/12 objectives are now here.

About a dozen microscopes in varying degrees of disrepair remain, and when funds become more abundant can be put into a state of usefulness.

A good Schanze's Microtome exists and will become more useful when we can obtain new razors for it. Two other microtomes in a state of disrepair are also here and can be made useful later on.

IV.—LIBRARY.

This consists almost entirely of German works, and chiefly out of date, to the extent of about 200 volumes and pamphlets.

The following periodicals are received with fair regularity :—

1. "Medical Science (Abstracts and Reviews)."
2. "Tropical Diseases Bulletin."
3. "Journal of Experimental Medicine."
4. "Journal of Pathology and Bacteriology."
5. "Journal of Infectious Diseases."
6. "Journal of Bacteriology."
7. "Journal of Hygiene."
8. "Quarterly Journal of Medicine."
9. "Parasitology."
10. "Indian Medical Gazette."

11. "Annals of Tropical Medicine and Parasitology."
12. "Journal American Medical Association."
13. "Indian Journal Medical Research."
14. "Bulletin of Entomological Research."
15. "Review of Applied Entomology."
16. "Archiv Schiffs und Tropen Hygiene."
17. "Centralblatt Bacteriologie."
18. "Bulletin Soc. Path. Exotique."

The following books have been added to the Library during the year:—

"Food and Water"	Savage.
"Tropical Medicine"	Castellani and Chambers.
"Animal Parasites of Man"	Fantham & Stephens.
"Clinical Pathology"	Panton.
"Bacteriological Technique"	Eyre.
"Micromotists Vade-Mecum"	Lee.
"Pathological Technique"	Mallory & Wright.
"Food, Water and Sewage"	Purvis.
"Tsetse Flies"	Austen.

V.—MEDIA-MAKING.

A special room is set up for this purpose equipped with autoclave and electrically controlled sterilizing apparatus. All media are locally made and ox-heart is found to be the best basis for media making. All general media are standardized to P.H. 7.3 with the apparatus commonly used for that purpose.

A great difference in the abundance of growth has been noticed since this improvement has been carried out.

VI.—STOCK CULTURES.

There were no stock cultures when I arrived, but fortunately I had brought some with me, though a few had died out during the course of the voyage. Fresh supplies have been obtained from the Lister Institute, the Clinical Research Laboratory in Johannesburg and from the Laboratory at Nairobi.

Several organisms isolated locally have been added to the collection.

There appears to be no difficulty in continuing sub-culturing the various organisms if they are sub-cultured fortnightly; this particularly applies during the hotter months of the year. The general rule has been to sub-culture into Agar and Broth alternately.

The following cultures are now kept permanently:—

B. Pestis-Parel, Nairobi and a local strain.

B. Typhosus, Para Typhosus, A. B. & C., and a sub-strain which does not appear to agree with any of the others.

Vibrio Cholerae, B. Dysenteriae, Flexner Y, and Shiga.

B. Proteus X19.

Agglutinating sera for most of these organisms are ordered in 1 c.c. phials each month from home and usually arrive satisfactorily if the shipping facilities are available.

VII.—STOCK SERA AND VACCINES.

These are obtained from home every three months in quantities that have been estimated as likely to be required. They consist of the following:—

Anti-Diphtheria Antitoxin.	Mixed T.A.B. Vaccine.
Anti-Tetanus Antitoxin.	Compound Influenza Vaccine.
Plague Vaccine.	Meningococcus Vaccine.
Cholera Vaccine.	Anti-Streptococcus Serum.
Anti-Dysentery Serum.	Gonococcus Vaccine.

Anti-Plague Vaccine, Antitetanic Serum and Antistreptococcus Serum are chiefly in demand.

These Sera and Vaccines are kept in ice safes and the ice obtained locally, but owing to the cost and the quantity of ice required the conditions are not good but probably suffice, and the advantage of obtaining a three monthly supply of these Sera and Vaccines obviates a heavier expenditure for ice.

VIII.—ANIMAL HOUSES AND EXPERIMENTAL ANIMALS.

These exist as they were in the military days, except for the alterations in the calf stables.

The general idea obtained from the plans will convey a good deal more than a short description.

The state of repair is not good and the building will have to be re-roofed as it is infested with white ants.

The floors are of concrete and fairly well drained.

(a) *Monkeys*.—There are twelve good monkey cages, and through the courtesy of the District Political Officer, a fairly regular supply of monkeys is obtained. They are of the common Cercopithecic type and are used chiefly for the passage of antivariolous lymph. These monkeys very commonly show a malaria type of parasite resembling a heavily pigmented Benign tertian.

During the year one monkey was inoculated direct from a small-pox patient and there resulted a local result similar to a very severe vaccination and the monkey would have undoubtedly died if it had not been chloroformed first. This vaccine has formed the source of all the antivariolous lymph made here since July.

Monkeys are also occasionally used in feeding experiments for detection of poisons.

(b) *Guinea Pigs*.—These are kept in open runs and have done quite well. Through the courtesy of Dr. Aders, of Zanzibar, I was able to increase our stock and the numbers now are sufficient for most purposes. Two females and a male were despatched up the line to start a brood for the Belgian Government.

The most satisfactory food has been found to be freshly cut grass and mohogo meal. No water is given at all. This food is supplemented by lettuces or native spinach when available.

Breeding has been quite satisfactory but the yield of complement is very low.

For experimental purposes they are removed from their open run into ordinary wire cages. Diseases have not been noticed amongst them, but recently they have been seen to be harbouring lice.

The rats in the building are a constant source of trouble, for they attack and kill the newly born guinea pigs and carry them off.

(c) *Sheep*.—A small pen of fat-tailed sheep are kept attached to the laboratory for supplying red cells for the Wassermann Test. They keep very healthy and have bred well, and several have been sold to the Veterinary Department.

(d) *Rabbits*.—Through Dr. Aders, of Zanzibar, I obtained a pair of half-bred rabbits, but conditions are quite unsuitable and they died off rapidly.

The wild rabbit has been also tried but they do not do well or breed. This is to be regretted, for I wished to prepare our own anti-hæmolytic serum here as well as to use them for passage of anti-variolous lymph.

(e) *White Rats*.—These have not been tried at all. But wild rats brought to the laboratory have been utilized when necessary, such as the occasional inoculation with *B. Pestis* in order to increase the virulence of the laboratory stock cultures.

Several feeding experiments for alleged poisons have also been performed on wild rats.

(f) Attached to the laboratory is a small room which has been labelled "Rat Room" in the plan. This room is used as an animal post-mortem room, and all the local catches of rats are dissected and examined there. Leading from this room is an incinerator, but fortunately there has been found no need to bring it into use and it will not be used unless an outbreak of plague is discovered amongst the rats.

IX.—WORK AND SCOPE OF THE LABORATORY.

All types of work are included in the laboratory.

General Laboratory routine.

Cultural investigations.

Chemical analysis of food and water, minerals and poisons.

Medico-legal examinations.

Preparation of anti-variolous lymph.

Special investigations as opportunity occurs.

An Entomologist and Chemist are required to carry out investigations that are beyond the scope of a bacteriological laboratory.

B.—GENERAL EXAMINATIONS.

I.—BLOOD.

1. *Blood Films*.—For the most part these are carried out by the thick film method, de hæmoglobinizing and staining simultaneously with Giemsa stain. Films are sent in in a routine fashion from the European and Native Hospitals, and occasionally from the up-country stations. The following numbers have been examined from these sources:—

European Hospital.	Native Hospital.	Out- Stations.	Other Medical Offices.
595	520	13	11

The usual examination required being that for parasites.

A total of 1,139 slides have been examined for parasites, and they are best considered under the following headings:—

(a) *Malaria in Europeans*.—In 473 slides, 181 were found to harbour:—

Malaria Parasites	=	38.5 per cent.
Spirillum of Relapsing Fever in 7	=	1.48 „
Negative in 284	=	60 „

As to the proportion of the various types of parasites of the 181 Malaria slides, these were:—

Subtertian in 154	=	85 per cent.
Benign Tertian „ 16	=	8.8 „
Crescents „ 10	=	5.5 „
Quartan „ 1	=	.5 „

(b) *Malaria in Natives and Asiatics*.—In 666 slides 233 showed Malaria Parasites = 34.9 per cent. The proportions of the various types of parasites were as follows:—

Subtertian in 201	=	86.2 per cent.
Benign Tertian „ 25	=	10.7 „
Crescents „ 7	=	3.0 „

(c) *Relapsing Fever*.—Spirilla have only been found in 10 cases—seven of which were in Europeans. The spirilla conformed with the usual type and the majority of the infections appear to have been acquired on the Kilossa-Iringa road. In no case have the infections been heavy.

(d) *Microfilaria*.—No particular examinations have been made to determine the percentage of infection in the population. The cases have been found during the routine examinations of bloods. One case in a European and three cases in Natives or Asiatics. In each case the microfilaria was very small and unshathed, and appeared to belong to the perstans group.

(e) *Differential Counts*.—These have usually been asked for as an aid to diagnosis. Eight in Europeans and three in Natives. Nothing very unusual was revealed in most of the cases except one native—an adult female, whose count showed a well-marked case of myelogenous leukæmia, the count being as follows:—

Polymorphs and Transitional Cells ..	46 per cent.
Lymphocytes	8.8 „
Large Mononuclears .. .	1.2 „
Myelocytes	41.6 „
Eosinophils .. .. .	.8 „
Mast Cells	1.6 „
Nucleated Reds, 2 per hundred leucocytes.	

(f) *Blackwater Films*.—The blood slides of eight blackwater cases were received during the year. They occurred during the months of June, July, August, November and December. Three occurred in Europeans, and the blood slides were all negative, though in one case subtertian parasites had been found three weeks previously. Five cases occurred in Natives or Asiatics and Subtertian parasites were only found scantily in one case.

It is usual to find a well-marked polymorph leucocytosis in the films.

(g) *Trypanosomiasis*.—Though this has constantly been kept in mind not a single case has been found.

The distance of the laboratory from any of the areas recognized by the Germans as being present in this territory renders the opportunity of doing any work on Trypanosomes or the Glossina rather remote, but promises have been made by the Chief Game Warden that collections of living flies will be sent down in suitable cages and it is proposed to carry out feeding experiments on experimental animals.

(h) *Malaria Index in Children*.—These examinations were performed separately from the routine examination of bloods. The films were sent to me by the Medical Officer of Health, and were taken during July, August and October, and consisted of children from Dar-es-Salaam itself, those living just outside Dar-es-Salaam and some twelve Indian children resident in Dar-es-Salaam. The period of the year in which these children were examined is probably the most healthy from the Malaria point of view.

The results are best tabulated into age groups.

Age Group.	Total Ex- amined.	Benign Tertian.	Sub- Tertian.	Crescents alone.	Neg.	% of Parasites.
0—4	21	1	16	3	4	95·2
5, 6 and 7 ..	39	7	19	4	12	77·
8, 9 and 10 ..	24	4	9	2	9	70·8
11, 12 and 13	15	1	8	—	6	60·
14 and over ..	18	2	8	—	8	55·
Total	117	15	60	9	39	
Per Cent. ..	—	12·8	51·2	7·6	—	71·6

Four of the cases showing Benign Tertian or Subtertian also showed crescents which raises the total find of crescents to eleven, and makes the percentage of crescents 11.1 per cent.

The thick film method was employed for diagnosis. No statement as to their health can be made, but the films were taken while the children were at school or when they came up for vaccination, and presumably their health was not particularly affected.

(i) *Malaria and Meteorology.*—There was a curious rise in the malarial incidence which continued well after the maximum rainfall. There was a marked rise in the rainfall in April and May and again in October and November, and yet the maximum incidence of Malaria did not occur until May and June in the one case and January in the second case, which month shows a very small rainfall.

A period thus occurs of at least five weeks after the maximum rain precipitation and before the malarial incidence is at its height. If any deductions can be made from one year's observations they would suggest that possibly prophylactic quinine should be taken during the periods March to June inclusive and during November to January, or perhaps this would be better stated as during the rainy months and for one month after a rainy month.

Whether these epidemic periods can be explained by a humidity above a certain figure cannot yet be demonstrated.

There does not appear to be any particular relationship with the humidity at 4 p.m. or 9 a.m., though probably those months in which there are long hours of high humidity during the 24 hours may be the ones favourable to the increase in the malarial incidence, for those months in which the humidity still remains at 75 per cent. or over at 9 a.m. correspond roughly with the epidemic periods of Malaria.

Amongst Europeans in January there was a marked rise which can be explained on the tail end of a small influenza epidemic that was prevailing at the end of 1920. A small rise occurred over the Malaria epidemic season, which probably is accounted for by missed Malaria cases.

In the curve for Natives and Asiatics a most marked rise occurred at the rainy season, and is probably explained by coughs and colds to which the native population is liable at this season.

2.—AGGLUTINATIONS.

These are performed for diagnosis of Enteric group cases as occasion requires, but an earlier diagnosis by blood culture is encouraged.

Only four samples of serum have been sent from out-stations, and in only one case was a suggestive result obtained with Paratyphoid B.

Agglutinations of organisms isolated from blood culture and stools are constantly being performed for clinching the diagnosis.

A series of agglutinations were made on an interesting organism belonging to the Paratyphoid group isolated from the urine of a patient who had a prolonged low fever, and had had a T.A.B. inoculation in July, 1919. This organism did not appear to me to correspond to any recognised member of the Paratyphoid group, and was therefore sent home to the Lister Institute to be verified. A report has since been received from the Lister Institute, who say that undoubtedly the organism belongs to the Paratyphoid B. group, though it does not quite conform to the Newport variety and may be hitherto unrecorded Para. B. type. The agglutination results were as follows :—

Patient's Serum		12/2/21.	22/2/21. •
		T.	1—80	1—80
A.	1—20	1—20	
B.	1—40	1—40	
Own organism	1—20	1—40	

	Sera.					Serum Normal.	
	T.	A.	B.	C.	Shiga.	1	2
Isolated organism..	1—40	1—80	1—80	1—160	0	0	0

Only one agglutination for Typhus was made with negative result. Garrow's Agglutinometer is chiefly used for agglutination tests, and is found eminently satisfactory.

3.—WASSERMANN REACTIONS.

The full technique recommended by the Medical Research Committee is invariably performed. Recently the Sachs-Georgi flocculation test has been used, but only a few records are available, and its reliability in the tropics cannot yet be stated. It is intended during the next year to largely employ this method. The Wassermann Antigen is made locally. Hæmolytic Serum is imported fresh every month in 1 cc. phials from the Lister Institute, and with the local sheep red corpuscles is found to work nearly full titre. The failure to rear rabbits has prevented us manufacturing our own hæmolytic serum against the local sheep's blood.

Our guinea-pigs yield our complement, but it is a very poor article compared with guinea-pigs' complement at home. No improvement in the complement was found in the guinea-pigs obtained from Zanzibar. Male guinea pigs are invariably killed and no attempt has been made to preserve the guinea pig by heart-bleeding. The cause of the deficiency of the complement is not clear.

An attempt at making an antigen from Yaws cases by scraping off the granuloma and extracting in the usual way has not yielded an antigen suitable for use in Yaws cases.

The frequency of Yaws infections very seriously hinders the diagnosis of Syphilis in natives, and it was hoped a special antigen would have proved useful.

The Wassermann Reaction has been performed in 37 cases—19 in Europeans, 18 in Natives and Asiatics. Amongst Europeans a positive result was obtained in 4 and negative in 15.

Amongst natives and Asiatics, positive in 9, and negative in 9.

Five Lepers were similarly examined, three giving positive results and two negative.

Sachs-Georgi test was made in five cases, all with negative results.

Some Gonococcal Antigen was obtained from home, and two cases were tried for Complement Fixation, and both yielded a negative result.

4.—BLOOD CULTURES.

This is encouraged in order to obtain an early diagnosis in the Enteric group, but I think the method is not sufficiently practised for all fevers that do not yield to quinine in three days.

It has been employed for the Enteric group on 11 occasions—5 in Europeans and 6 in Asiatics and natives.

Positive results have only been obtained on two occasions, and the organism proving to be *B. Typhosus* on both occasions, once in a European and once in a native. On one occasion blood culture was made on a case of Malignant Endocarditis in a native but only *Staphylococcus Albus* was obtained.

Ox bile and broth cultures are usually employed, but a few experiments were tried of taking blood into sterile distilled water.

II.—FÆCES.

(a) *Microscopical*.—This was made on 95 specimens of fæces, 50 from Europeans and 45 from Natives. The European cases were chiefly cases of diarrhœa, though in 9, slight Blood and Mucus was present, but nothing was found to account for it. Ankylostome ova were found on four occasions in European children.

Entamoeba Histolytica was only found on two occasions. *Lambliæ* on two occasions and *Flagellates* on four occasions were the only other interesting results. The *Flagellates* appeared to be *Tetramitus Mesnili*. The remaining 29 cases proved entirely negative and were probably only dietetic errors.

Amongst the 45 native cases 21 proved entirely negative, though three cases showed slight Blood and Mucus without a cause being found.

Of the remainder 20 showed Ankylostome ova, one showed lateral spined *Bilharzia* ova and three showed *Ascaris* ova.

Several stools from European children were sent for examination for Ankylostomes after treatment with Thymol and Oil of *Chenopodium*. Not a large number were recovered but all proved to be *Ankylostoma Duodenale*.

Necator Americanus—*Ankylostoma Ceylanicum* have not yet been met with.

Blastocystis is very commonly met with.

No case of *Coccidiosis* has been found.

Spirochætæ seem to be fairly common in stools.

(b) *Bacteriological*.—Under this heading cultural investigation for the Enteric and Dysentery Group are those chiefly required. Either direct plating on Conradi Drigalski medium or preliminary growing in

Bile medium is the method usually employed. The freshness of the specimen examined is the important factor if positive results are to be obtained. In Europeans cultural investigation has been performed on 21 occasions: on four occasions for the Enteric Group with one positive result, on seventeen occasions for Dysentery or Diarrhoeal diseases. The findings have been Flexner Y. Dysentery on six occasions, Morgan's No. 1 Bacillus in two cases, and negative in 9, though two of these were eventually explained on the finding of Subtertian Malaria and Lambliæ respectively. No suggestive Pathogenic organisms were found beyond these.

In Natives only 10 cases were investigated.

The Enteric Group was particularly searched for on four occasions, but they all proved negative.

Flexner Y. type of Dysentery were found on two occasions, and negative results in four, though Bilharzia ova were found in one of these latter.

The only positive finding in the Enteric Group was a case of B. Typhosus and it conformed to type.

A very different state of affairs occurred in the B. Dysentery Group, for though eight were isolated during the year, only two agglutinated in specific serum to a marked extent.

In all other ways the remainder resembled Flexner Y. type of Dysentery organism. Specimens of these in-agglutinable strains are being sent home to the Lister Institute for verification.

III.—URINES.

(a) *General Examination.*—This includes Microscopical, Chemical and Spectroscopical examinations.

64 specimens were sent, 40 from Europeans, and 24 from Natives or Asiatics.

Amongst the European cases, one of Glycosuria occurred and was fatal during the course of the year. Three cases showed evidence of Nephritis. No case of Bilharzia was found. Three cases of Blackwater were examined, one showing Methæmoglobin and two others Oxyhæmoglobin. Six cases showed the presence of much Pus and Baciluria, and the remaining 27 showed nothing of interest.

Amongst the Native cases, one well-marked case of Glycosuria occurred. Evidence of Chronic Nephritis was found in one case, Bilharzia ova were found on several occasions, four of them in children sent from the Government School in Dar-es-Salaam. Further remarks on the presence of Bilharzial Disease is reserved for another section.

Four cases of Hæmoglobinuria were submitted for examination. All were mild cases and each showed the presence of Oxyhæmoglobin.

Bile was found in one case only.

An interesting case of Chyluria was also sent; the first case I had ever seen. The urine was liquid when it arrived, had a specific gravity of 1018, and had the appearance of very diluted milk, though rather yellowish. A centrifuged specimen showed no Microfilaria. Unfortunately the patient proceeded to Zanzibar, and no further specimens of urine or blood could be obtained. During the night the specimen clotted into a jelly-like mass.

(b) *Bacteriological*.—Nine cases were submitted for examination, six from the European Hospital and three from the Native Hospital. All of them were primarily examined for the Enteric Group, and all proved negative except one from the European Hospital, which has been described under Agglutinations. It only remains to state that in all other particulars the organism conformed with the Paratyphoid Group.

It was owing to the isolation of this particular bacillus that the above series of bacteriological examinations was made, for it was hoped that other mild cases of fever might reveal their nature from this source, and it is hoped to be able to carry out a further series in the next year. It would appear to me probable that a good many mild attacks of fever might be explained by a B. Coli or other infection of the urinary tract, and that negative blood slides to Malaria need not necessarily mean a missed malaria.

IV.—Pus.

Nothing very much of interest has been found in this group, 24 specimens alone were received. Nine of these were sent for cultural investigation, seven of them were from skin infections and they all showed Staphylococcus Aureus. One was a culture from the middle

car and a pure growth of *B. Pyocyaneus* was obtained. Another was from a knee joint and turned out to be sterile.

Twelve films of Urethral Pus were also received, six from Europeans and six from Natives; two showed Intracellular Diplococci in each of these classes.

Three other specimens sent for various investigations included one case from a supposed Tubercular Spine. All proved negative.

Through the Senior Sanitation Officer several Agar slopes of Pus from plague cases were obtained, and the presence of *B. Pestis* proved morphologically, and by a passage through a wild rat, the culture obtained from the rat's spleen has given us the local strain of *B. Pestis*.

V.—SPUTUM.

A total of 80 specimens were sent to be examined, 12 from Europeans and 68 from Natives or Asiatics. Amongst the 12 European cases, 10 were negative and two showed Tubercle Bacilli. Both cases occurred in Greeks. Among the 68 Native cases, 22 showed the presence of Tubercle Bacilli and one showed Spirochaetes. Nothing else of pathological interest was found.

VI.—SCRAPINGS FROM NODULES AND ULCERS.

(a) *For Spirochaeta Pallidum*.—The patients to be examined are usually sent direct to the laboratory rather than having films sent.

Eight Europeans were examined and the Spirochaeta was found in six, in one case the ulcer was on the fauces and the remainder were penile.

Three Natives were examined with one positive result.

(b) *For Leprosy Bacilli*.—Eight Natives were examined and seven of them showed masses of acid fast Bacilli.

I have frequently noticed that in the early cases of Leprosy the acid fast Bacilli may be very short and show less beading than the more advanced cases.

(c) *Tropical Ulcer of Leg*.—A very interesting series of these, 10 in number, were sent by the Sub.-Asst.-Surgeon at Iringa, who also gives his opinion that the infection is spread by a fly. Five of these slides showed masses of Spirilla, but not always associated with Fusiform Bacilli. The Spirilla were of the type associated with Vincent's Angina.

The other five did not show the presence of Spirilla or Fusiform Bacilli, but this probably depends on the site from which the smears were taken.

VII.—TUMOURS AND POST MORTEM MATERIAL.

Seven specimens have been sent and have been sectioned with the following results :—

Growth of Penis	..	..	..	Epithelioma.
Heart	..	..	..	Fatty.
Pancreas	..	..	..	Normal.
Gland	..	..	..	Tubercular.
Brain	..	..	..	Gumma.
Ulcer of Intestine	..	..	..	Typhoid.
Spleen	..	..	..	Plague.

VIII.—VACCINES.

There has not been a great call for these. Ten Staphylococcus aureus vaccines were made from patient's skin lesions and were administered. Results have been extremely satisfactory in some cases, in others the results were quite disappointing. Boils are very prevalent during the hotter months of the year.

Plague vaccine has been prepared as far as we are able with insufficient equipment and staff, and can scarcely yet be prepared on a commercial scale. 1,760 doses have been made and despatched.

Dr. Blackwood reported most astounding success in two supposed dying cases of Plague into whom he injected 10 cc.s. each of the vaccine. The vaccine was prepared in the usual manner, except that it was not sterilized until it had been allowed to grow for six months.

IX.—MISCELLANEOUS.

These do not amount to very much, but cannot very well be classified elsewhere.

Five swabs from throats were sent, two made locally, one which showed the combination of organisms characteristic of Vincent's Angina, the second was negative.

Three slides were sent from the Iringa district from cases of illness which had caused some mortality and were suggested as being Diphtheria. All three cases showed the absence of Klebs-Loeffler's bacilli, and two of them showed fusiform bacilli and spirilla in large numbers.

A specimen from a Liver puncture was sent from the native hospital, but no evidence of Leishman-Donovan bodies could be found.

One Renal Calculus was sent from the native hospital, and its main constituent proved to be Calcium Oxalate.

The head of a *Tænia Saginata* was also received and identified. Three films from oxen suspected of dying from Anthrax were found to be negative.

Four films from cows or calves were examined for East Coast Fever, which was found in one case only.

A dog sent for examination showed a heavy infection with *Piroplasma Canis*.

The gland of a cow that died was examined and found to be tubercular.

C.—CHEMICAL EXAMINATIONS.

(a) *Milk*.—Thirteen samples of condensed milk were examined under Government Notice 54 of March, 1921, for estimation of fat content. Eight out of the thirteen were found to be up to standard and five failed to reach the standard of 9 per cent. fat. Two samples of natural milk were sent—one was well up to the standard, the other had been well diluted.

(b) *Metals*.—Two lumps of material were sent from the Public Works Department for analysis. One proved to be tin and the other zinc.

(c.) One sample of Sulphuric Acid was received from the Agricultural Department, and was found to be 83 per cent. pure sulphuric acid.

Two other samples of Sulphuric Acid were received from the Public Works Department. Both were found free from the ordinary impurities, and could be regarded as pure Commercial Acid.

(d) *Salt Deposits*.—Four samples were submitted during the course of the year; each was found to be largely Sodium Chloride.

D.—MEDICO-LEGAL.

Clothing was sent on two occasions for diagnosis of Seminal Stains. In the one case Spermatozoa were beautifully demonstrated, but the second case had been posted some distance away and did not arrive in a very satisfactory condition.

A series of alleged poisoning cases have occurred and post-mortem material has been sent for investigation. A total of five cases have

been investigated, and though metallic poisons can be probably stated not to be present, it is extremely doubtful that my results as regards alkaloid poisons are worth very much.

Having no training and no particular knowledge of this type of work has been my main difficulty, and in reporting on such cases it is stated that the investigation has been carried out in quite an amateurish manner.

Feeding experiments on monkeys and rats have been tried in these cases with invariable negative results.

E.—WATER ANALYSIS.

It has been a constant source of worry to decide what should be taken as a bacteriological standard whereby the potability of the Dar-es-Salaam water could be judged. Probably this can only be decided upon by a long series of observations. If one were to judge a water in the tropics strictly on the standard employed at home, there would be probably no water found fit to drink. Waters of this nature are being constantly drunk without ill-effects, and either the home standards are unsuitable as tropical standards, or their interpretation should be considerably modified. Escherich's true *B. Coli* I have not yet met with in tropical waters, but its variants are undoubtedly present in numbers that at home would be considered very serious. The standard that I have employed is one, I believe, commonly in use, and that is to regard Lactose fermenters (*Indol* formers) as the indicators of danger if present in 50 cc.s. of water—but it may eventually be found necessary to modify this again. The usual technique of sowing in McConkey's bile salt medium is employed and subsequent platings made in Conradi-Drigalski medium. Platings on gelatine are not employed owing to the difficulty of keeping the medium solid. Colonies from the various platings are picked out and followed out more carefully through the various sugar and other media that are considered suitable.

The waters that are usually sent for examination are the products of the local soda water and ice factory, and consist of plain soda water and sweet aerated beverages, such as lime-juice, raspberry-ade and gingerade. Occasionally the first washing and second washings of the bottles are sent as well. It would be too extensive to go into

details of each water analysed during the year, but they can be best classified as follows :—

Soda water as issued for consumption.

3	showed	Lactose	Fermenters	in	1/10 cc.	but	not	below.
2	”	”	”	”	1/2 cc.	”	”	”
1	”	”	”	”	1 cc.	”	”	”
1	”	”	”	”	2 ccs.	”	”	”
1	”	”	”	”	10 ccs.	”	”	”
4	”	”	”	”	absent	in	50	ccs.

A sudden improvement was noticed in May, when new filter candles were used, but this may have been only a coincidence. None of these samples showed Indol formers under 50 ccs.

Sweet Beverages.—Two only were examined and showed Lactose fermenters in 1/10 and 1/2 cc. respectively, but not below.

First Washings of Bottles.—Two were examined and showed Lactose fermenters in 1/10 cc. and 1/100 cc. each respectively, and in both cases Indol formers were present in these amounts and indicated danger on the standard I have adopted.

Second Washing of Bottles.—Two of these were submitted for examination. Lactose fermenters were found in 1/100 cc. in each case, but Indol formers were only found in one of the samples in 50 ccs., and were absent in the other samples.

A series of five waters were also submitted from various wells which were the main supplies of the town. They all showed Lactose fermenters in 1/10 cc., and all but two gave the Sporogenes test in 1/10 cc. Their salt content varied from 19 to 200 parts per hundred thousand, while the hardness varied from 6 to 9 parts per hundred thousand. The best samples were those that supplied the Soda Water Factory.

Two private well waters were examined, as they were suspected as being the cause of illness in the houses they supplied. Lactose fermenters were found present in 1/10 cc. and 1/2 cc. respectively, and this was the lowest dilution examined. As Lactose fermenters and Indol formers were also present in 1/10 cc. and 10 ccs. respectively, the water was reported as dangerous.

Out of the many organisms that have been examined, I submit a list of the usual type that are isolated, as they may be of interest :—

	<i>M.</i>	<i>G.</i>	<i>L.</i>	<i>S.</i>	<i>D.</i>	<i>Milk.</i>	<i>Indol.</i>	<i>V.P.</i>
1a.	—	AG	AG	AG	O	A.C.	O	+
1b.	+	AG	AG	AG	O	A.C.	O	+
2a.	—	AG	AG	AG	O	A.C.	O	O
2b.	+	AG	AG	AG	O	A.C.	O	O
3a.	—	AG	AG	AG	O	A	O	+
3b.	+	AG	AG	AG	O	A	O	+
4a.	—	AG	AG	AG	O	A.C.	+	O
4b.	+	AG	AG	AG	O	A.C.	+	O
5b.	+	AG	AG	O	O	A.C.	+	O
6a.	+	AG	AG	AG	AG	A.C.	O	+
6b.	—	AG	AG	AG	AG	A.C.	O	+
6c.	—	AG	AG	AG	AG	A.C.	+	O
7a.	+	AG	A	AG	O	A	O	+
7b.	—	AG	A	AG	O	A	O	+
8b.	+	AG	A	AG	O	A	O	O
9b.	+	A	A	A	O	A	O	+

M = Motility.

G. = Glucose.

L. † Lactose.

S. = Saccharose.

D. = Dulcite.

V.P. = Voges Proskauer.

F.—RAT EXAMINATIONS.

These are done in a routine manner almost daily. The examination is mainly directed to a search for Plague carriers. 3,148 rats have been examined; they are made up of 3,004 specimens *Mus Rattus*, under which head is also included *Mus Alexandrensis*. 144 specimens of *Mus Decumanus* made up the remainder. The rats are opened by a native boy and inspected macroscopically. Slides are prepared from the spleen or glands in cases that are regarded as suspicious, and I am glad to say that all results have proved negative.

Collections of Ecto-parasites have not been made. Quite a considerable number of rats seem to be infected with *Sarcocystis*.

Intestinal Parasites and *Cysticercus* of Liver are very common.

G.—METEOROLOGY.

The rainfall is recorded daily at 9 a.m. The gauge we have is of 5 inch diameter and the records are kept in millimeters, being converted to inches when required.

The thermometers in use are German ones and record in the Centigrade scale. Wet and Dry bulb readings are taken at 9 a.m. and 4 p.m. daily. The Maximum and Minimum thermometers are also read at 9 a.m. and 4 p.m.

The rainfall has two definite waves, the large fall occurring between March and May and the lesser fall about October to December. The monthly fall is recorded as follows :—

	Total Inches.	No. of Days on which Rain Fell.	Maximum on any One Day.
January	·76	2	·7
February	·2	4	·12
March	6·25	11	2·96
April	15·4	23	2·04
May	2·18	11	·62
June	·74	8	·25
July	·17	4	·08
August	·326	6	·1
September	·06	2	·02
October	3·18	3	3·04
November	4·46	11	2·07
December	2·04	9	·5
	35·766	94	3·04

The Temperature.

The cooler months of the year occur from June to October when the climate is extremely pleasant. The maximum and minimum and mean shade temperatures as recorded each month are as follows :—

	Mean.	Mean Maximum.	Mean Minimum.	Highest Recorded.	Lowest Recorded.
January ..	82·95	88·07	77·77	90·5	72·5
February ..	83·91	89·4	78·36	91·4	72·5
March ..	82·3	87·96	75·74	91·4	72·5
April ..	78·9	84·3	73·45	89·6	71·6
May ..	77·91	84·83	71·	86·9	66·2
June ..	75·6	83·48	67·82	86·9	64·4
July ..	75·18	83·26	67·1	86·9	62·6
August ..	75·3	83·44	67·17	87·8	64·4
September ..	75·65	83·33	67·78	88·7	64·4
October	77·82	85·56	70·08	86·9	64·4
November ..	79·93	85·83	74·62	88·7	70·7
December ..	83·13	88·46	77·81	90·5	73·4

	Humidity, 9.0 a.m.	Humidity, 4.0 p.m.	Mean Humidity.
January	76.12	73.5	74.58
February	73.6	72.4	73.
March	74.4	72.8	73.6
April	83.8	79.2	81.5
May	78.8	65.4	71.6
June	76.4	63.8	70.1
July	72.6	58.1	65.5
August	73.4	66.2	69.8
September	71.4	65.	68.2
October	71.6	69.8	70.7
November	76.8	76.	76.4
December	74.4	74.4	74.4

H.—PREPARATION OF ANTI-VARIOLOUS VACCINE.

This has been one of the main features of the year's work. The prevalence of Small-Pox, the lack of protective power given by all the varieties of imported lymph necessitated very vigorous efforts to deal with the disease by local effort. As early as April, 1920, the question was discussed and, after a great deal of delay due to alterations in the buildings, the first calf was inoculated on 25th October, 1920, and the work has progressed steadily ever since. The main object of a lymph establishment appears to me to be the manufacture of a reliable and safe lymph, and all the efforts of the laboratory have been concentrated on this point, and very little time for experimenting has been possible, and cannot be encouraged until the whole establishment is running smoothly and efficiently. I propose dealing with the whole subject rather in detail and under several headings, because it is the initial account of lymph production under British regime in Tanganyika Territory.

(a) *The Stables and Fittings.*—These, as they were used under military conditions, were distinctly insanitary. What they were like under the Germans I am not in a position to say; but as there were no additions or changes in the military days, the probability is they were not much better. The stables as they existed when I arrived

consisted of dungeon-like rooms with very little ventilation, practically no drainage, and no arrangements at all for controlling the calves, so that they could lie down on their faeces or their fodder as they chose.

The stables have been considerably altered, walls have been cut down from roof to floor to allow ventilation. The floors have been properly sloped and drained into a shallow trough which leads to a soakage pit some distance away. A number of tarred slats in a framework form the floor on which the calves stand. They allow drainage immediately on to the sloping concrete floor below. The plans at the end of the report give an idea of the general arrangement, but cannot depict the smaller details which are equally important. The whole series of stalls have also been rendered fly-proof. The calves are kept in place by a pair of gates, each bearing a bolt which fits down between the slats of the floor board. The gates were planned locally and are of metal, and are adjustable in height and breadth to a small extent. The gap between these iron gates therefore can be altered slightly to suit the size of the calf's neck. A halter is also applied to the calf's neck in order better to control the calf when it has to be removed daily for inspection and when the stables are washed down. No form of litter is allowed and the calves can lie down quite happily and comfortably on the slatted floor-boarding. The only restraint the calf has by this arrangement is that it cannot turn round and lick its abdomen. One native is responsible for the cleaning of the stables and general attention to the calves. This has been found sufficient, for never more than two calves have been housed at the same time. There are at present three calf stalls and an operating room; considering that there has been no re-building, but only alterations to existing stables, they may be regarded as fairly satisfactory for lymph production on a small scale. By further alterations of the buildings it would be possible to increase the number of the stalls to six. Taking the average yield per calf at 2,500 doses, by using two calves per week it should be possible to produce about 250,000 doses per year. Whether it is probable that this can be done, depends on whether there are no failures in the supply of calves and that all the calves take successfully. Allowing for these facts probably 200,000 doses can be produced with the stables in their existing state. The yield in this the first year has not come up to this mark, for there have been lengthy periods when calves were not obtainable, and owing to lack of knowledge of the best conditions to aim at. As the working conditions became better known and as the

the co-operation between ourselves and the Veterinary Department becomes more closely organised, I believe there will be no great difficulty in producing what we require in quantity. A calf collar as recommended in Col. King's book was used at first, but it has been found rather cumbersome and the boys manage the calves quite well by transferring them to a spare stall while the flooring is removed and cleaned and the floors washed down daily with cresol. The floor-boarding is re-tarred periodically and every Thursday the stalls are whitewashed. Aprons are fitted to the calves after inoculation and serve to protect the abdomen a good deal, occasionally they have to be left off when the calves object to them. The one operating table we have is of wood and is the one that was in use in the German days. It has been found quite satisfactory.

(b) *Calves*.—At the onset there were difficulties in obtaining calves. The Veterinary Department was approached, and my thanks are due to their whole staff for the way they gave their best efforts on our behalf. Calves were primarily obtained from local farmers, native or Indian, but difficulties soon arose and their calves were usually very ill-nourished and dirty, and usually covered with tick bites, and better arrangements seemed advisable so that a reliable supply of calves could be obtained. It was therefore suggested that the Medical Department should buy their own cows and calves through the good offices of the Veterinary Department. This suggestion appeared sound, for thereby the hospitals could be supplied with milk and the laboratory with calves. A vote of £400 was allocated to this end, and the Veterinary Department buys and looks after the cows and calves at their own establishment, replenishing and selling the cows as meets with our requirements. It would seem probable that the Medical Department should be able soon to own its own herd of cows and save money on the purchase of milk for the hospitals.

We have been very fortunate in obtaining this local co-operation of the Veterinary Department. The cows and calves are under their care and attention, are regularly dipped and sent to me at the laboratory, and we have the advantage of knowing we are dealing with calves in a healthy state. As far as possible only white cows and calves are bought, they are the local humped back Zebu cattle, and are obtained some considerable way up country. No Tuberculin test is carried out, and I understand from the Veterinary Department that tuberculosis in these cattle that live in the open is excessively rare, but I realise what an

important factor it is to have the veterinary behind us in selecting the calves for inoculation. As regards age, calves from 6 to 9 months are those most sought after, but calves up to 12 months are often used, and certainly up to this age, the skin of the abdomen is sufficiently soft. Calves of other colours than white seem to have appreciably tougher skins and do not yield as satisfactory or cleanly looking lymph. It is an impossibility to make use of calves of more tender age owing to the difficulties in feeding and owing to the local variety of cow refusing to yield milk after her calf has been removed from her; it would seem expedient to wait until the calf is 6 to 12 months old and have more opportunities of a good yield of milk from the mother. Female calves have the advantage over male calves owing to less risk of fouling by urine.

(c) *The Seed*.—This was originally obtained from Bombay and was quite satisfactory to begin with, but was soon found to die out. Our yield per calf with this seed was also fairly good, the best vesicles from calves were emulsified in glycerine and reserved as seed for future calves, and an occasional passage through a monkey was resorted to. Eventually this seed died out, and a second supply had to be obtained from Bombay. Before this had time to die out, we were fortunate in having a local case of small pox, and from this case, in June, 1921, a very good seed has been obtained, and has maintained its activity ever since. Lymph from this small pox case was transferred to one side of a calf whose other side had been inoculated with Bombay seed; the Bombay seed took fairly well, but the small pox lymph failed entirely to produce any result. Fortunately at the same time a monkey was inoculated in lines on the abdomen with the same small pox lymph, and a very virulent but local vesiculation was obtained. This monkey became very ill and was chloroformed and the vesicles removed after 96 hours and emulsified in the usual glycerine-clove oil mixture.

This lymph has proved the origin of all the seed that is now in use. This lymph from the monkey was kept 24 hours on ice and then transferred to a calf. A very marked vesiculation was obtained, and marked œdema was also present. These vesicles were collected after 120 hours, emulsified in glycerine in the usual way and after being kept on ice for two months were re-inoculated on to a monkey, and from this monkey the seed has descended with alternate generations through calf and monkey. The calves are inoculated direct with the emulsified vesicles from a monkey, and a monkey inoculated with the emulsified vesicles

from a calf, after it has been stored three or four weeks on ice. For ordinary paste purposes, prepared vaccine from one calf can be inoculated to another calf, but the lymph from this second passage through a calf is never used as a seed for a monkey, though it can be used and generally produces fair results. But in my opinion the seed is better preserved if an alternation of hosts is strictly adhered to. Even for paste purposes never more than two successive generations through calves is employed. Inoculation direct from calf to calf has been tried on several occasions and, whether our technique is unsatisfactory or not, it is found soon that the vesicles become less full and the yield promptly drops. If we had two tables it might be easier to transfer from calf to calf, and our results might be better, but our present method of preserving seed seems to be very satisfactory, and as a reliable lymph is the main object of this establishment, it would seem wise not to experiment too greatly at present. Vesicles collected from a monkey and emulsified in the glycerine-clove oil mixture in the usual proportions, can be kept and are quite as efficacious as using the monkey vesicles direct on to a calf. The length of time that this glycerinized monkey lymph remains active has not yet been determined, but it is quite active up to one month, if kept at 9° C., which is the usual temperature of our ice safe.

(d) *Technique employed.*—Every Friday morning two calves are sent to the laboratory by the Veterinary Department. These calves are washed and the abdomen shaved as far as the umbilicus, and then returned to their stalls and the aprons adjusted. The following morning the calves are inoculated with a suitable lymph after careful washing and the application of a mixture of equal parts of ether and alcohol.

Very light incisions, two to three inches long, are made in parallel series over the shaved area, but the folds of the groin are avoided. About 20 to 50 of these incisions are possible on the average calf, leaving a gap of about $\frac{3}{8}$ inch between each line.

The incisions are made extremely lightly, and the scalpel is dipped in the seed lymph so that the line of incision can be seen. Without this precaution very great difficulty may be encountered in seeing where the incision is if it is very light, and in my opinion best results are obtained with these light incisions. Oozing of blood is practically never seen. Having made several series of incisions, a stiff platinum wire loop is used to add further seed lymph and to rub gently along each line.

This operation completed, the calf is returned to its stall and allowed to wait one hour before its apron is applied. As the calf has not been fed before this there is no fear of the calf lying down and fouling the site of inoculation.

On the Monday morning and then daily the calves are re-strapped on the table and inspected, and the whole inoculated surface gently smeared over with a 50 per cent. glycerine solution in water. This application appears to me to keep the skin soft and keeps the surface clean by the gentle sponging that is done.

On Thursday morning, 120 hours after inoculation, the calf is again placed on the operation table and the whole abdominal surface very carefully washed with hot sterile water. Each line of inoculation is then extremely lightly touched with a wisp of cotton wool dampened with a mixture of alcohol and ether in equal parts: whether this application is of value is not definitely known, but it is the usual technique employed and may diminish the number of skin organisms. With a fairly sharp spoon each line of vesicles is removed with one sweep as far as possible, and the product placed in a weighed sterilized porcelain vessel with a lid. The abdomen of the calf is then heavily dusted with zinc oxide powder and the calf turned out to graze, and is returned to the Veterinary Department on the Friday morning, when the two fresh calves are brought. Occasionally there is a fair amount of bleeding when the vesicles are removed from the calf, but as a rule the better type of vesicles come off quite easily and do not cause any bleeding.

The Veterinary Department mark each calf when it returns from the laboratory, so that there is no risk of returning it for inoculation. Secondary crops are never made use of. With very few exceptions have calves entirely failed to take with a good seed, though there is a good deal of variation in the fullness of the vesicles. Occasionally the inoculated area becomes badly rubbed by a restless calf, and then the yield is very unsatisfactory, and the rubbed areas are avoided as far as possible when the vesicles are scraped off.

The technique employed for the monkeys is very similar to that for the calves. The monkey has the whole of his abdomen shaved carefully. After sterilizing the skin with a mixture of alcohol and ether, light incisions are made in parallel lines, first dipping the scalpel in the lymph to be used. About four lines can be made on either side of the abdomen below the umbilicus, and as a rule a similar number above the

umbilicus. The lymph is well rubbed in with the scalpel or with a platinum wire loop. The vaccinated area is allowed to dry well, and has usually done so in an hour, during which time the monkey is held by one of the laboratory boys. No dressing is applied, and the monkeys very rarely attempt to interfere with the vaccinated area, which is quite contrary to what one would expect. After 96 hours the monkey is chloroformed, gently cleaned, and the vesicles scraped off with a scalpel and rubbed up in a tapered tube with $\frac{1}{2}$ to 1 cc. of the glycerine-clove oil mixture; a glass rod is used for this purpose and the vesicle pulp can be emulsified in this fashion. This emulsified pulp is used direct on to the calf or can be stored in the ice-safe in the same way as the ordinary calf lymph.

(e) *Preparation of the Lymph.*—The vesicles as collected are weighed, and four times its weight in glycerine and clove oil mixture is noted down as the quantity required to be added to that particular yield of vesicle pulp—a portion of it is, however, added to the pulp in the porcelain dish and placed in the ice-safe for four or five hours; this seems to make the pulp rather softer and more suitable for grinding in the machine. The glycerine-clove oil mixture alluded to above, consists of a 50 per cent. solution of glycerine in distilled water with 1 in 1,000 of clove oil added and then sterilized. A few attempts at preparing Lanolinated Lymph have been made, but the Lanoline has proved unsatisfactory, and as the glycerinated preparation has yielded good results it seems unnecessary to try other means at present.

The grinding machine is made of porcelain and is worked by hand, and was the one in use by the Germans. It is sterilized in the steam sterilizer before use. It is quite unusual to find many hairs in the vesicle pulp and if present, they can be easily removed by sterilized forceps. The pulp is ground in the machine and the calculated quantity of glycerine-clove oil mixture added in small portions at a time. The resulting emulsion is allowed to drip through a very fine metal gauze strainer into a sterilized glass vessel and then it is passed again through the grinder into another sterilized glass vessel so that a very fine emulsion is obtained. Finally this emulsion is pipetted up by means of a rubber teat on a 1 cc. pipette and transferred to tubes in 1 cc. volumes—occasionally 5 ccs. are placed in larger tubes, but the most satisfactory method has been found to prepare 1 cc. phials. The little tubes in which Burroughs Wellcome supply their tabloid methylene blue are the best type that I have found,

though, perhaps, they are a little narrow from the point of view of the vaccinator. I believe there is a great advantage in having the tubes of yellow glass. Each tube has been sterilized with its cork and as soon as it is filled, it is dipped in melted paraffin wax so as just to cover the cork and a portion of the tube. In my opinion there is also an advantage in having the phials practically filled so that there is almost an anærobic condition when the phial is corked and sealed up by the paraffin. Finally these phials are stored in the ice-safe with their appropriate number and date.

This lymph is never issued until it has been stored for three weeks in the ice-safe and until it has been tested bacteriologically, one tube from each batch being removed at appropriate dates for this purpose. The calculation of dosage and the dilution of the lymph seems to vary with almost every establishment. Dilution with four times its weight with the glycerine mixture is the method invariably employed here and the dosage is calculated at 100 doses per cc. There is ample evidence that 100 patients can be inoculated successfully with two or three insertions with this volume of lymph, though the amount that some vaccinators, especially the native ones, can use in the process of vaccinating one individual is quite astounding, and is also quite unnecessary and wasteful. The yield of prepared vaccine from calves calculated in the above way has averaged about 1,900 doses over a series of 80 calves.

This compares very unfavourably with the yields in England, but compares well with those quoted by Col. King in India. The calves at home, of course, at the same age are very much bigger than our calves here, and therefore have correspondingly more inoculable area and the yield probably largely depends on this. I have not noticed at present any material difference in yield with the seasons, though I have had only a short experience, but I anticipated a falling off in the hotter months of the year.

(f) *Bacteriology of the Lymph*.—For the first 39 calves I have unfortunately not kept the record of the bacteriological examination as they did not yield very much interest, and I was chiefly concerned in excluding anthrax and tetanus. From the 40th calf onwards I have kept fairly full records of the results. A 2 mm. loop of each batch is cultured anærobically and ærobically on Agar and the colonies identified as far

as possible. I have classified the results according to the age of the lymph at the time of culturing.

	Number Cultured.	Ærobie Culture.	Anærobie Culture.
1st week ..	1	None sterile.	1 sterile.
2nd week	6	” ”	2 sterile = 33 per cent.
3rd week..	8	1 sterile = 12 per cent.	1 ” = 12 ”
4th week..	12	4 ” = 33 ”	11 ” = 91 ”
5th week..	19	4 ” = 21 ”	16 ” = 84 ”
6th week..	4	None sterile.	3 ” = 75 ”

The figures seem to be very variable and at present too scanty to make any deductions, but as far as they go it would appear that:—

- (1) 1st to 3rd week inclusive, approximately 7 per cent. sterile in ærobie culture.

1st to 3rd week inclusive, approximately 26 per cent. sterile in anærobie culture.

- (2) 4th to 6th week inclusive, approximately 23 per cent. sterile in ærobie culture.

4th to 6th week inclusive, approximately 85 per cent. sterile in anærobie culture.

After the third week by far the majority of the positive ærobie cultures yielded only from one to five colonies and these consist as a rule of only Staphylococcal types of organisms. Spore formers have also been very frequently met with, but there was no evidence that they were of pathological importance and their general reactions are recorded below.

In anærobie culture no organisms other than Staphylococcal types have ever been found—the growth on all occasions has been extremely poor.

Types of Organisms Isolated.

The common type of organisms isolated is the Staphylococcal group and they usually are aureus or albus. Spore formers have been isolated on 11 occasions. Non-sporing bacilli have been isolated on two occasions, anthrax, tetanus and streptococci have not been found on any occasion.

The following table gives the type of organisms that have been met with in aerobic cultures excluding the Staphylococcus.

	Motility.	Spores.	Gram.	G.	L.	Mn.	S.	D.	Isolated.
Type 1	+	Central	+	A.	—	A.	A.	—	7 times.
2	—	„	—	A.	—	A.	A.	—	3 „
3	+	„	+	A.	—	—	—	—	1 „
4	+	Absent	—	A.	—	A.	A.	—	1 „
5	+	„	—	—	—	—	—	—	1 „

(g) *Keeping Qualities.*—I have very little to say on this subject as it has been my endeavour to issue every batch within six weeks, but experiments will be started in the next year. On one occasion I found a tube of lymph that had been mislaid in the ice-safe for six months, but it failed to yield any results on three natives. As regards keeping qualities outside the ice-safe and under the conditions of travelling in the tropics, very few reliable statistics are yet available. Practically every important out-station in the territory has received lymph and obtained good results with it if they carried out my instructions to use it immediately and under the best conditions.

I often got bad reports from Mwanza, but on calling their attention to it and asking them to vaccinate picked cases, 80 per cent. successes were obtained on the 10 cases tried at once and then only 30 per cent. in 10 cases where the same lymph was used a week later.

I am not sufficiently informed as to the distances from headquarters of some of the stations to decide how far away we can send the lymph and obtain good results, but I hope to be able to deal with this in my next report.

(h) *Transport of Lymph.*—The present method is to pack up the lymph with crushed ice and sawdust, and place it in a wooden box such as is used for sera and other types of vaccines. Very few breakages have been reported.

No other means of packing is at present available though two thermos flasks have recently arrived, but they are totally unsuitable for the purpose.

(i) *Statistical Results.*—From November, 1920, to December 31st, 1921, 87 calves have been inoculated and only one calf has failed to take.

A total yield of 386.72 grammes of pulp has been obtained from these calves and this has yielded 169,250 doses of prepared anti-variola vaccine. An approximate average per calf is therefore: Pulp 4.5 grammes; Doses 1,968.

During the year, 145,875 doses have been actually issued for use consisting of 5,700 doses of Lanolinated lymph plus 140,175 doses of Glycerinated lymph.

Zanzibar have had 33,500 doses supplied to them and I have had a very kind letter from the Zanzibar Government thanking me for my services in this matter.

It is very gratifying to know that their results have been so successful and that their outbreak of small-pox was rapidly combated by our lymph.

(j) *Vaccination Returns.*—Out of the 145,875 doses issued during the year, returns have been received accounting for 34,256 vaccinations, though all these have not necessarily been inspected.

I have tabulated the results as follows :—

District.	Number Vaccinated.	Number Inspected.	Successes.	Remarks on & % of successes.
1. Arusha ..	329	329	71	21
2. Bagamoyo ..	100	100	50	50
3. Dar-es-Salaam	1,473	907	524	57
4. Dodoma ..	245	245	125	51
5. Handeni ..	1,400	1,352	820	60.6
6. Kasanga ..	230	230	127	53.7
7. Kilwa ..	110	110	78	74
8. Lushoto ..	9,458	?	?	86.5
9. Mahenge ..	315	315	265	84.1
10. Mbulu ..	300	300	190	63.3
11. Morogoro ..	506	?	?	?
12. Moshi ..	143	75	39	52
13. Musoma ..	66	66	45	68.1
14. Mwanza ..	20	20	11	55
15. Namanyere ..	412	?	?	?
16. Pangani ..	200	200	166	83
17. Shinyanga ..	400	400	238	59.5
18. Tabora ..	117	117	64	56.4
19. Tanga ..	14,511	12,154	10,744	88.3
20. Tukuyu ..	108	108	80	74
21. Tunduru ..	190	?	?	Most satisfactory.
22. Utete ..	52	52	43	82.6
23. Zanzibar ..	3,571	3,571	2,500	71.9
	34,256	20,651	16,240	64.66

Out of 20,651 inspected arms, 16,240 were reported as having taken successfully. This gives a percentage of 78.6 per cent. Personally I

take a good many of these as probably unreliable. Of Dr. Scott's results in Dar-es-Salaam I have seen a fair proportion, and his result of 57·7 per cent. successes among the inspected arms probably is a fair average. These are the results in an unselected group of individuals, many of whom may have been successfully vaccinated in some previous year.

The Zanzibar results can also be taken as correct, and they give a percentage success of 71·9 per cent.

I think it may be concluded that the lymph is active, and that if cases are chosen properly that a high percentage will show successful vaccination.

I have heard of no complaints as regards reaction.

(k) *Conclusion.*—If one is justified in coming to any conclusions after a year's work on the preparation of anti-variolous vaccine, they would seem to point to the following facts of importance, exclusive of general cleanliness :—

1. A good original seed preferably from a small pox case.
2. Alternate inoculation into monkey and calf.
3. White heifers up to 12 months of age.
4. Using the lymph as soon as possible after receipt at a station.

SPECIAL INVESTIGATIONS.

Owing to my being single-handed for eight months out of the year very little has been possible in this direction. It was thought advisable, however, that whatever was undertaken should consist in an attempt at finding out more or less what is the usual state of affairs in the population indigenous to this district. It is so easy to fall into a diagnosis by finding certain parasites harbouring in a native individual, but does it of necessity follow that that individual is suffering from any disability for acting in the capacity of host ?

It is so easy to pour quinine into a native because he is harbouring parasites and imagine that the diagnosis has been proved because he is well in a day or so. It is so easy to find *Ankylostome* ova in an individual and to explain some disturbance of health to them without looking further. A knowledge of what is practically normal in an individual should give us food for thought and possibly prevent us from rushing into a diagnosis. Are we doing any ultimate good to the native children by dosing them with quinine because they harbour a few parasites or have enlarged spleens ? Are we lessening their opportunities of acquiring a natural immunity, for they will require all their

natural immunity when they have to fend for themselves. From the point of view of the temporarily resident European, without doubt the less the chances of infections from the native the better for the European, but cannot we attain that end by other means such as segregation? In our eagerness to cinchonize the native children, what notice do we take of phthisis, a most fatal disease amongst natives?

(a) *Malaria in Children*.—This has already been considered under Malaria Index in children, and it is unnecessary to add any further details. There is ample evidence that a large percentage of the native children harbour malaria parasites without any very obvious detriment to their health or happiness. The fall in the parasite findings with increasing years suggests development of an immunity which is sufficient to keep the malaria parasite in check.

(b) *Intestinal Parasites of Prisoners*.—This was carried out amongst prisoners in the local jail, as being the most easily available group of individuals who are able to carry out fairly arduous tasks without ill-effect. The technique employed has always been one in which washing and centrifuging of about a teaspoonful of fresh fæces is carried out. An emulsion is made in saline and filtered through ordinary gauze dressing into a centrifuge tube; this is centrifuged three times, the supernatant fluid being discarded after each centrifuging. I may mention that Blastocysts and Iodinecysts are commonly met with, and have not been recorded for each case. No case of Coccidiosis has been found. A total of 305 prisoners have been examined, and they may be taken to be practically all adults.

1. *Ankylostome Infections*.—Out of a total of 305 prisoners, 198 instances have been recorded of the presence of ova. This gives a percentage of 65 per cent. No attempt has been made to decide whether the infection has been due to *Ankylostome duodenale* or *Necator Americanus*. As a rule the infections have been by no means heavy, and many would have been completely missed by simple direct examination under the microscope.

2. *Ascaris*.—Only 21 prisoners were found to harbour these nematodes, this gives a percentage of 7 per cent. The probability is that it is much higher in children.

3. *Tænia*.—Seven cases only were found, a percentage of 2·3 per cent. *Tænia saginata* was the only type found.

4. *Hymenolepis* was found on one occasion only.

5. *Tricocephalus* was found on 25 occasions, and gives a percentage of 8.2 per cent.

6. *Bilharzia*.—These lateral spined ova were found only on five occasions, that is, in 1.6 per cent. of cases. There was no evidence of dysentery in stools of these cases.

7. *Entamoeba Histolytica*.—On 39 occasions the cysts were found, giving a percentage of 12.7 per cent.

8. *Entamoeba Coli* is very common, occurring in 96 cases, giving a percentage of 31.4 per cent.

9. *Flagellates*, including lamblia, were found on 29 occasions, which is 9.5 per cent.

(c) *Urinary Bilharzia*.—The urines of 435 prisoners were examined. It was found that the appearance of a urine is no guide as to possibility of finding ova, for they were frequently found in a perfectly clear urine. All urines were centrifuged and the deposit examined. Out of 435 cases, 87 showed the presence of ova, that is 20 per cent. In 35 of the Bilharzia cases the urine was carefully examined with the following results:—

Negative .. .. .	..	6	} = 74.2 per cent.
Trace of Albumin ..	..	20	
Cloud of Albumin ..	..	8	} = 25.7 "
Blood and Pus present ..	..	1	

As only 25.7 per cent. of the cases at that time showed albumin in more than negligible amount, it would appear that there was no material damage to the urinary tract in about 75 per cent. of the cases. An attempt was made to obtain statistics from the jail as to the residence and previous history of these cases, but the results were so unsatisfactory, owing to a majority of the prisoners having left and their general movements being so varied, that no results could be stated. It was hoped that by questioning, one might discover probable sources of infection. I am very grateful to the prison authorities for the help they have given me.

There were eight cases who had been resident in Dar-es-Salaam for the following periods in years, 2, 2, 7, 10, 15, 15, 25 and 38 years, so that it looked possible that there was an area of infection in Dar-es-Salaam. Other cases had also been met with outside the prison who had not been out of Dar-es-Salaam for several years.

Owing to this state of affairs a search was made by Dr. Scott and myself at the usual watering places. These consisted of two shallow streams and the Bagamoyo Pool. Several types of snails have been

found, but I am not in a position to identify them definitely, though they appeared to me to belong to the following groups :—

- (1) Bullinus Bagamoyo pool only.
- (2) Physa or Physopsis Stream.
- (3) Planorbis Stream.

One other type was found but I cannot place it yet. I have to thank Dr. Aders, of Zanzibar, for lending me Dr. Leiper's paper, which has helped me a great deal. Dissection of these snails was carried out and in all the specimens of Physa, Cercaria were found which were thought to resemble the human bilharzial type. What was hoped to be a satisfactory solution of the problem has, however, unfortunately been found to fail, for the Cercaria found were probably derived from the Bilharzia of a bird. All the other types of snails gave entirely negative results. An attempt at infecting these different types of snails was made by hatching out miracidia from Bilharzia and immersing the snails in the fluid and though two months have elapsed since they were exposed to the first miracidia, no sign of infection has been found in the dissected snails.

Several deaths occurred amongst the snails and even these showed no evidence of infection.

The whole subject must be reserved until I return from leave.

(d) *Diastatic Activity of Urine*.—During the examination of fæces of natives one constantly notices the presence of undigested starch. It was this fact that led me to try and see if the diastatic activity of the natives was materially different from that of Europeans at home and to see if any of the tropical complaints that one usually meets with cause any alteration from the normal.

The technique employed has been as follows and the necessary equipment is given for using the method by the drop technique :—

1. Dropping pipettes calibrated to gauges No. 73 and 54 in Starett's wire and drill gauge.
2. Durham's tubes as used in ordinary sugar media.
3. Cork float with a series of holes perforating it, into which these Durham's tubes can be slipped.
4. Soluble starch powder.
5. An N/10 solution of Iodine.
6. A thermo-regulated water bath maintained at 37° C.
7. Normal saline solution.

Owing to the rapid decomposition of urine in the tropics, fresh specimens of urine are examined rather than any attempt with a 24 hour mixed specimen.

A stock solution of starch is prepared by dissolving two grams of soluble starch in 100 ccs. of 10 per cent. sodium chloride solution, the solution required in the test is made up fresh daily by diluting five ccs. of this stock solution in 100 ccs. of distilled water.

An N/50 solution of Iodine is made as required from the stock Iodine solution by diluting with distilled water. The urine is used undiluted and in a 1/10 dilution with normal saline.

The test is carried out as follows:—

A row of 10 Durham's test tubes are placed in the cork float, and the following proportions of saline and urine added so that the final volume is 10 volumes in each case, the drops being made from the No. 73 gauge pipette. The drops from the 73 gauge pipette measure 12.5 cubic millimeters each, that from the 54 gauge measure 25 cmm.

Tubes.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Drops of Saline ..	5	4	3	2	1	0	8	7	6	5
Drops of Urine, diluted 1/10 ..	5	6	7	8	9	10	—	—	—	—
Drops of undiluted Urine	—	—	—	—	—	—	2	3	4	5
Volume in Drops ..	10	10	10	10	10	10	10	10	10	10
Resulting dilution of Urine .. ..	.05	.06	.07	.08	.09	.1	.2	.3	.4	.5

From the No. 54 gauge now, 10 drops of the freshly prepared .1 per cent. starch solution are added to each tube, this volume is twice the volume of fluid already in each tube, so that we have two volumes of starch solution being acted on by one volume of diluted urine.

Each tube is inverted over a finger to mix the contents and the cork float with the tubes placed in the water bath for half an hour; after this interval two or three drops of iodine solution from a fine pipette are added to each tube and the tube inverted again. Occasionally it is found that extra drops of iodine are required and then they should be added to each tube. Tubes containing untouched starch will be quite blue and grade up to those at the other end which may be colourless or

yellowish. The tube showing no trace of a bluish tinge, but only a reddish brown one, gives the strength of urine that will digest two volumes of starch solution.

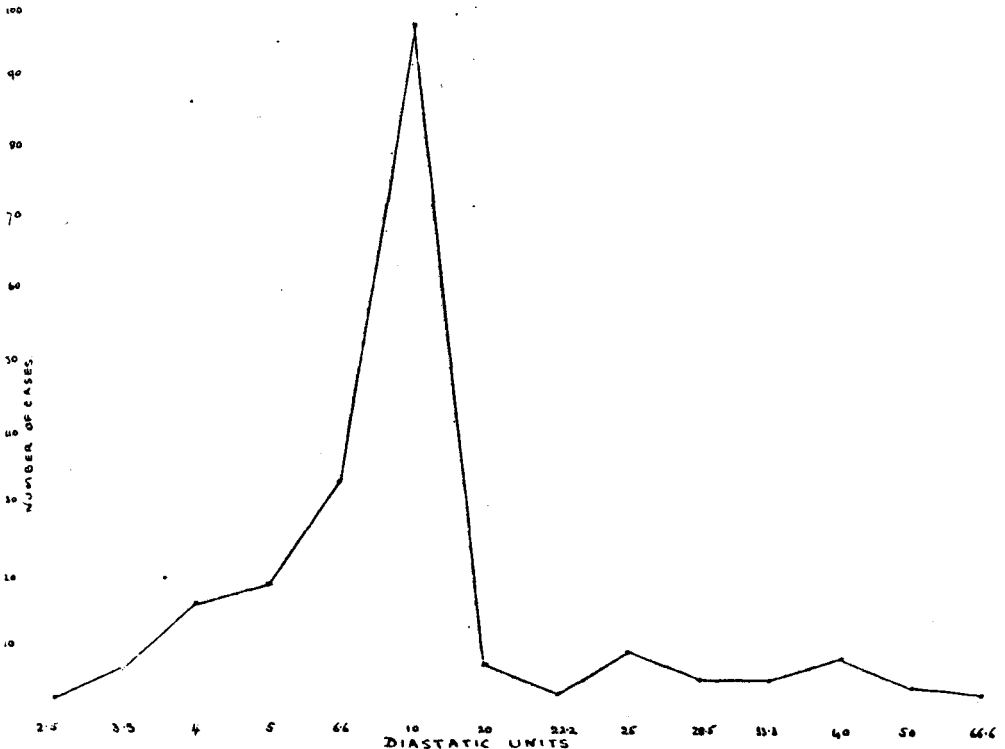
Two divided by the strength of urine just digesting the two volumes of starch in $\frac{1}{2}$ -hour gives the diastatic units.

Thus, if the urine in tube 6 just digested the two volumes of starch in $\frac{1}{2}$ -hour the diastatic units would be $\frac{2}{.1} = 20$.

In some cases the limit tube may not be found by this series of dilutions of urine, in which case further dilution and strengths of urine must be tried, but the above series of dilutions are usually the most useful.

(a) *Results in Apparently Healthy Natives.*—A series of 232 prisoners had their urines sent up fresh in batches of four each morning and the diastatic activity estimated in the manner described above.

The results without going into details are best depicted as a graph.



It will be seen that the vast majority (72·8 per cent.) of these urines gave a diastatic index of from 4 to 10 units, this is slightly below the normal given by normal individuals at home, which usually is between 10 and 20 units. The majority of the stools of these cases showed undigested starch, so that from these results one may assume that the undigested starch is not due to any pancreatic deficiency, for in that disease the diastatic index is always high.

In pure renal disease the diastatic units readings are usually low, but at present I have not sufficient evidence to interpret the low readings obtained as evidence of renal disease; it will be necessary to estimate the diastatic activity of the blood serum as well.

The readings given by my own urine during my stay in Tanganyika Territory have never been any but 10 units which is the commonest reading among the Native cases, but at the same time 34·9 per cent. of the cases gave readings below 10 units.

Actually none of the cases examined can be classed as absolutely normal, for only 60 were free from helminth infections of some kind or other; at the same time there was no evidence that the remainder were suffering from any disability thereby.

(b) *Diastatic Activity in Disease.*—Scarcely enough cases have been investigated at present to allow conclusions but I give the result of certain groups of cases.

I—MALARIA.

Figures below all represent Diastatic units.

Case.	Days of Illness.							Remarks.
	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	
1	—	40	—	—	—	—	—	B.T. European, Fever 2 days.
2	—	28·5	—	—	—	—	—	S.T. European, Fever 1 day.
3	30	—	—	—	—	—	—	S.T. & Hæmoglobinuria, European, Fever 1 day.
4	—	10	10	—	—	—	—	B.T. Goan, Fever 1 day.
5	—	—	33	40	—	—	—	S.T. " " "
6	—	4	10	—	—	—	—	B.T. " " "
7	—	10	6·6	5	5	—	—	S.T. " " 2 days.
8	—	—	50	33	40	10	28·5	B.T. " " "
9	—	6·6	—	—	—	—	—	S.T. " " 1 day.
10	—	33	—	—	—	—	—	S.T. " " "
11	100	66·6	40	40	25	10	—	S.T. and Crescents, European, Fever 2 days.

There is very little to remark here except that the Diastatic Index is nearly always raised and may remain up for a few days, which does not depend on the continuation of fever.

II.—INFLUENZA.

Observations again here are not sufficiently complete, but as a rule the Diastatic activity is high during the illness and may be prolonged after the temperature falls.

Case.	Days of Illness.							Remarks.
	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	
1	—	33·3	40	50	—	—	—	Goan, Fever 6 days.
2	—	40	20	50	—	—	—	" " 4 days.
3	—	—	—	—	—	—	66·6	" " 6 days.
4	—	66·6	—	—	—	—	—	" " 3 days.
5	—	40	10	10	—	—	—	" " 5 days.
6	—	—	33	20	50	50	—	" " 4 days.
7	—	—	—	—	—	20	—	" " 3 days.

III.—SCURVY.

An interesting series of five cases was obtained and the Diastatic index in these cases were as follows : 6·6, 25, 10, 66·6, 66·6. All were very well marked cases of the disease, never more than a mere trace of albumin was present in the urine.

IV.—HÆMOGLOBINURIA.

A native case showed 200 Diastatic units on the first day with well marked Hæmoglobinuria. On the third day, there was only a trace of albumin and the Diastatic units were 20. On the fourth day Hæmoglobinuria was present again and the Diastatic units went up to 50, dropping the next day to 10, by which time the Hæmoglobinuria had ceased.

V.—URINARY BILHARZIASIS.

This was done on 35 cases and the Diastatic units varied from 2·8 to 40, but as 20 of them had a Diastatic index of 10, it would appear therefore that Bilharzial disease does not cause any alteration from the normal.

VI.—CHRONIC NEPHRITIS.

One case in a European who had marked Albuminuria gave a Diastatic index of 6·6.

VII.—GLYCOSURIA.

One case found in a native showed only five units of Diastatic activity.

It is hoped to carry on this investigation during this year and to be able to report more satisfactory conclusions.

(e) Leprosy.

Through the courtesy of Dr. Davey, I was able to try a course of treatment with the Ethyl Ester of Chaulmoogra oil that the Burroughs Wellcome Institute had kindly sent out.

Helped by Dr. Davey we proceeded to the leper settlement near Dar-es-Salaam, and chose our cases and Dr. Scott kindly housed them at the Infectious Diseases Hospital. The cases were most marked and I think we made an error in choosing such, but latterly I have been fortunate in obtaining some early cases to treat at the same time. Dr. Davey photographed the cases and it is hoped to reproduce these and a second series of photographs of the same cases when we have completed at least a year's treatment. The cases were very carefully examined and measurements of outstanding features taken. Wassermann reactions and blood examinations have been made on the patients and at periodical intervals punctures of lepomatous nodules were made and stained in the usual way. Treatment was begun in April, 1921, by intramuscular injections of 1 cc. of the oily liquid into the muscles of the buttock. Two patients were put on the Ethyl Chaulmoogra X and two on the Ethyl Chaulmoogra Y, and the fifth had the X and Y Ester alternately. My time has only allowed me to carry out these injections on Sunday morning.

With a few intermissions these weekly intramuscular injections were given on alternate sides until the 17th of July, when I had worked up to a 3 or 4 cc. injection. I had had to drop the injection on a few occasions because a marked inflammatory mass was beginning to be formed at the site of the injection in some of the cases, so that it was thought advisable that some other method should be employed if possible. With this end in view, I attempted to inject an equal mixture of Ether and Ethyl Chaulmoogra into a vein in the upper part of the thigh of a monkey.

Though I succeeded in getting into the vein, a good deal escaped into the subcutaneous tissues and a most marked inflammatory reaction was obtained.

However, I decided to try the intravenous route in my cases and in fear and trepidation I gave 5 minims into each of my patients on the 24th July. The injection was given very slowly, some fifteen minutes being taken in giving five minims. Most distressing coughing occurred with each portion injected and patients complained of a good deal of pain in the head, which I took to be in the nature of throbbing. These intravenous injections were given weekly and had slowly worked up to 20 to 22 minims by October 23rd. The process was so slow that something had to be done. I decided to drop the Ether in the mixture. On the 30th of October, the injection consisted of 2 parts of the Ester and 1 part of Ether and the injections were taken much better. On November 20th, an injection of the pure product was administered very easily and comfortably and there was no resulting symptoms whatever. Since this date intravenous injections have been given weekly up to 26 minims of the unsterilized Ethyl Chaulmoogra X and Y. I have not tried bigger injections at present for that has been the limit capacity of the syringe I had in use. The injections cause no pain whatever unless some of the product escapes subcutaneously, when an inflammatory mass appears, but none have ever broken down and, as a rule, they clear up in a few days with hot fomentations.

If I had had the time I think it would have been better to have given the injections daily up to 20 minims; it is hoped to try this when I return from leave.

THE CASES.

1. Male, aged 61. A native of Mauritius. There is no history of leprosy in the family. He has been resident 10 years in E. Africa. Said to have had gout 11 years ago, otherwise very little trouble in the past history.

Six years ago he became destitute and was housed temporarily by some mission in a leper asylum for one month where he was attended to by a leper servant.

In 1919 he was given a series of injections of 606 by a Belgian doctor and he says this treatment was for gout and not leprosy. Leprosy definitely diagnosed in 1920. Health generally satisfactory.

Anaesthesia from about ankle to sole of foot on left side but not quite so marked on the right. No ulceration of toes. Hands scarcely anaesthetic except at tips of fingers, which are ulcerated away below

the nails which on some fingers have nearly disappeared. Says his ears were swollen along the edges at one time but are better now. Eyebrows present. Some swelling across the bridge of the nose and also slightly on the alae nasi.

Knee jerks present. Urine normal. Wassermann, negative. Blood count, normal.

I think this case has very largely a nerve element which may account for any lack of improvement, though he has had almost continuous treatment since April, 1921, with Ethyl Chaulmoogra X. Scrapings from the ulcers show acid fast bacilli in large numbers still.

There is certainly this improvement in that where previously the ulcers on his fingers were always broken down and discharging, they are now permanently dry and covered with a very thin atrophic skin—but beneath this, acid fast bacilli are still present in marked numbers.

2. Male, aged about 45. Native of this country. No family history of leprosy. His wife was a leper and one year after this was recognised he himself acquired the disease. The onset nine years ago was first noticed on his face and has spread over his body since.

He had very marked nodules on the forehead, alae nasi, below and on the lips. Broken down ulcers about the size of a florin scattered all over his body but covered with scabs.

Ears not markedly nodulated, though nodules are present. No eyebrows. Patchy anaesthesia. Right hand, one old ulcer and nails complete.

Left hand. Finger joints swollen and several ulcers. Slight Albuminuria. Wassermann strongly positive. Nothing to note in blood count. Scrapings from ulcer on wrist showed masses of acid fast bacilli.

This case I think is undoubtedly a mixed infection and he was given an injection of 914 in December to see if that would hurry on the Chaulmoogra treatment. This man has received almost continuous treatment with Ethyl Chaulmoogra X and Y alternately by the various methods and has undoubtedly improved, for practically all his ulcers are healed over. Acid fast bacilli can always be found below these old ulcers and there is no change in the appearance of the bacilli.

3. Female about 40. None of the family or children have leprosy. Apparently started in the lumbar region ten years ago, and was just

noticed on the face four years ago. Apparently there are large areas of anæsthesia, but this is very difficult to make out in a native.

Eyebrows gone, face extremely nodulated, consisting of nodules of all sizes and shapes, which extend all over the face, cutting up the face into an extraordinary appearance. The forehead and chin are involved. Most marked nodules on the arm and fore-arm. Ears are very large hard masses. Fingers on the right hand all swollen except the thumb, and the nails are missing. The same occurs on the left hand, except that the thumb and first finger nails are present, but partially gone on the others. Both legs are elephantoid. Trophic lesions, but not actual ulcerations on all the toes. The only open sores were on the hands. Faint traces of Albuminuria. Wassermann strongly positive. Nothing of note in the blood count. Scrapings from the ulcers showed masses of acid fast bacilli. This woman was treated with weekly injections of Ethyl Chaulmoogra X with only three intermissions.

She can now walk about with comfort as the legs have vastly improved. Her ears are becoming much softer and smaller. Outlying Lepromata are beginning to soften and disappear, but they still yield acid fast bacilli. She had one injection of 914 in December.

This case has probably improved more than most of the other advanced cases.

4. Female about 50. A native of this territory. Her father had leprosy. Outset of symptoms three years ago, beginning first on the alae nasi. There is no ulceration anywhere. Typical leonine face. Alae nasi are enormous and very hard, $2\frac{3}{8}$ inches in widest part. Ears also very big and hard. Eyebrows not quite entirely gone. Very marked nodules on forehead, eyelids, back and chest, but not elsewhere. Scraping from a puncture on the right ear showed masses of acid fast bacilli.

Faint trace of Albuminuria. Wassermann positive. The upper portion of the back had the appearance of a leathery cuirass. I particularly mention this, for after about four months' treatment it was noticed that native tattooing marks were visible where previously nothing was showing, and this gave great encouragement to the patients, as it was a very visible sign to them of an improved condition.

This woman has had practically continuous injections of Ethyl Chaulmoogra Y since April, 1921.

Her improvement is quite well marked, but she has a long way to go yet.

5. Male, aged about 45, a native of this territory. Quite a marked case. Much thickening of the alae nasi, forehead and ears. Eyebrows not quite gone. Patches of light areas on the chest and back. Lepromata in each nipple. Ulceration fairly well marked but small; is present on right little finger knuckle and middle finger knuckle. Left hand no ulceration. Ulceration of the ear margins, alae nasi and lips. Lepromata in eyelids. Much ulceration below scrotum. No ulceration of feet. Wassermann positive.

Scrapings from alae nasi showed masses of acid fast bacilli. After two months' treatment with Ethyl Chaulmoogra Y most of the ulcers showed signs of healing, and by the end of December, after six months treatment, all but the scrotum were practically healed. Acid fast bacilli can, however, still be found in masses.

6. Male, aged about 30. A native of this territory. The history is quite a short one, it being only two months since he noticed any symptoms. Thickened patches on both cheeks and over the left eyebrow; except for this and a few patches of light coloured areas on the back there is very little to see.

Puncture of the thickened-area over the left eyebrow showed many acid fast bacilli, but they were of a much shorter appearance than usually seen.

Intravenous injections of Ethyl Chaulmoogra X were commenced in October, and after one month there became visible over the left eyebrow the scars of native incisions that had been made when he first noticed the illness.

All the lepromatous patches have become much softer to feel. After 13 injections—intravenous—a fresh puncture over the left eyebrow yielded only a few acid fast bacilli. I have every hope of completely curing this man.

7. Male, aged about 25, a native of this territory. A very early case, his history only dating back about 14 days, though probably it only became obvious to him then.

Lesions only consist of two thickened areas, one over the inner part of the left eyebrow and another in the centre of his forehead. Both of these patches yield acid fast bacilli, but again of a very short type.

This man has had only six intravenous injections of Ethyl Chaulmoogra Y, and already there is a softening of the lepromatous patches and a diminution in the number of acid fast bacilli.

RESULTS OF THE INJECTION.

There is very little to note here. The injections of the pure Ethyl Chaulmoogra Esters are quite painless and unnoticed. They can be re-injected into the same veins time after time. There is no need to sterilize the product as received from Messrs. Burroughs Wellcome. The only change that the patients notice is apparently an itchininess of the skin and this may last three or four days, but usually not much more than one day. No untoward symptoms of any kind have been experienced.

I think I may state that there is definite improvement in the patients, but their progress is very slow. The treatment undoubtedly should be tried on all early cases, but whether it is worth while in the very advanced cases has not yet been settled.

INDEX.

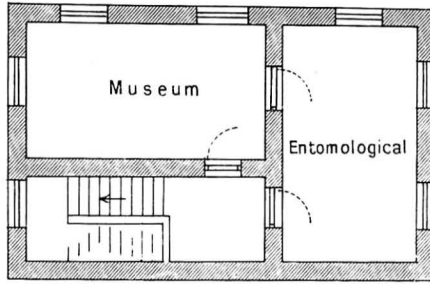
	PAGE
Accommodation, Hospitals and Dispensaries	41
Table showing present Staff and Accommodation in each District	41
Agglutinations	193
Ankylostomiasis	98
Anti-malarial Measures—	
(a) Major	114
(b) Minor	115
Anthrax	12
Appointments to Staff	8
Asiatic Officials, Health of	33
Table showing Invaliding, Sick and Death Rate	34
Beri-Beri	12
Birth Rate	82, 127
Blackwater Fever	20
Blood Culture	195
„ Films	160, 189
Buildings, repairs to	42, 184
Cerebro-Spinal Meningitis	99
Cestoda	53a
Chemical Examinations	200
Climate in relation to Health	109
Communicable Diseases	12
Death Rate	82, 127
Dental Surgeon, Report by. Appendix No. II.	55
Drainage, Work done	145
Dysentery	12
Enteric Fever	12, 109
Epidemic Diseases	84
Erysipelas	11a
European Officials, Health of	31
Table of Invalidings	31
Table of Sick, Invalidings and Death Rates	32
Fæces	195
Financial	74
Gonorrhœa	27
Helminthic Diseases	23
Hill Stations	111
Infantile Mortality	82
Infectious Diseases	84, 131
Influenza	13, 87
Intestinal Parasites of Prisoners	217
Invalidings	31
Laboratory—Introductory Remarks on :—	
Staff, Building, Equipment, etc.	183

Leprosy	13, 99, 224
Lunatic Asylum. Appendix No. III.	56
Lymph	88
Malarial Cases: Rainfall and Incidence of. Appendix No. V.	103, 111
Measles	21
Medical Staff	7
Medico-Legal	200
Meteorological	123, 203
Mosquito Borne Diseases	136
Nematoda	53a
Plague	21, 91
Pneumonia	21
Population	80, 125
Public Health: General Remarks	11
Vital Statistics	11
Pus	197
Pyrexia of Uncertain Origin	73
Railway Sanitation	155
Rainfall and Incidence of Malarial Cases. Appendix No. V.	103, 111
Rat Examinations	203
Registration of Medical Practitioners	44
Relapsing Fever	22, 190
Sanitation, Administration and Staff	72
Sanitary Progress, Review of	69
Sanitary Surveys and Inspections	79
School Medical Service	158
Scraping from Nodules and Ulcers	198
Sex Distribution	81
Sleeping Sickness	7
Smallpox	85
Special Investigations	216
Spheres of Action of Sanitation Branch	77
Spirillum Fever. <i>See</i> Relapsing Fever	
Sputum	198
Statistics, Vital	11
Syphilis, Cases Treated	29
Town Planning	154
Trypanosomiasis	24, 191
Tuberculosis	102
Tumours	199
Typhus	33
Urban Sanitation	113
Urine	196
Vaccination	25, 134, 161
Veneral Diseases	27
Wassermann Reactions	195
Water Analysis	201
Yaws. Appendices Nos. I. and IV.	23, 54, 58

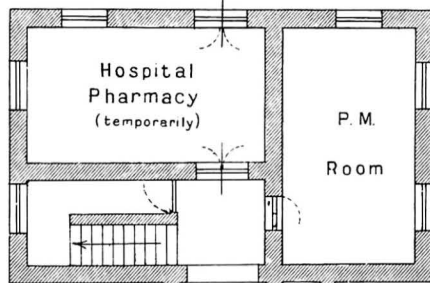
BACTERIOLOGICAL LABORATORY

Dar - es - Salaam.

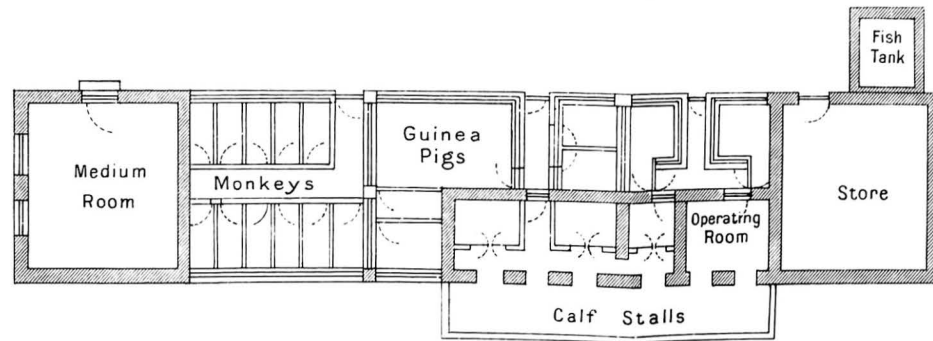
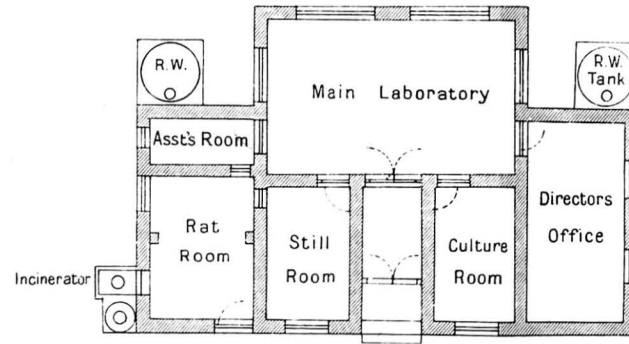
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— 1ST FLOOR —



— GROUND FLOOR —



— ANIMAL HOUSE —