Report on medical & health work in the Sudan.

REPORT

ON

MEDICAL & HEALTH WORK

IN

THE SUDAN

FOR THE YEAR

1930

McCorquodale & Co. (Sudan) Limited Khartoum. 2778

THE ANGLO EGYPTIAN SUDAN

Scale 1:8,000,000

Miles 100 50 0 100 200 300 400 Miles

Reference.

RAILWAYS
TELEGRAPHS & TELEPHONES
INTERNATIONAL BOUNDARIES
PROVINCE BOUNDARIES
WIRELESS STATIONS
PROPOSED & EXISTING AIRWAYS
MOTOR ROADS
LANDING GROUND - IMPERIAL AIRWAYS
OTHER PRINCIPAL LANDING GROUNDS

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ANNUAL REPORT 1930.

SUDAN MEDICAL SERVICE.

(1) GENERAL REMARKS ON HEALTH AND PROGRESS.

The general health conditions in the Sudan were satisfactory.

(2) HEALTH OF OFFICIALS.

This shows further improvement on that of last year.

British Officials. The average number of days lost for each official was 1.7 as against 3 in 1929, 2.8 in 1928, and 4.7 in 1927.

Sudanese Officials. The number of days lost was 1.7 as against 1.8 in 1929, 1.9 in 1928, and 2.0 in 1927.

Egyptian and Syrian Officials. The number of days lost was 1.2 as against 1.2 in 1929, 1.9 in 1928 and 2.3 in 1927.

This steady improvement in the health of Government officials represents a large saving of Government time, and should result in increased efficiency or, in certain cases, in diminution of staff.

The following table shows the number of days lost for various categories to officials in 1930 :—

Nationality	No. of officials employed	Total		Average days sickness		Died	Invalided
		Placed on sick list	No. of days sickness	For all officials	For those who were sick		
British	1038	168	1730	1.7	13.0	3	4
Sudanese	2849	343	4729	1.7	13.8	9	3
Egyptians	1335	166	1618	1.2	9.8	3	6
Syrians	221	28	264	1.2	9.4	1	1
Other Europeans	96	12	87	0.9	7.2	2	1
Other non-Europeans ..	38	3	32	0.8	10.6	1	0

The following table shows the average number of days lost for officials of various nationalities in certain districts.

The figures are based on the total number of officials employed :—

	British	Sudanese	Egyptian & Syrians	Other Europeans	Other nationalities
Upper Nile Province ...	2.9	2.0	1.4	—	—
White Nile ,, ...	1.0	2.0	2.5	—	—
Kordofan ,, ...	1.0	0.2	0.9	—	—
Berber ,, ...	0.3	0.6	0.3	0.2	—
Southern Fung	3.0	2.3	—	—	—
Wad Medani	2.2	1.1	1.8	—	—
Port Sudan	0.8	0.6	0.7	5.0	14.5
Kassala	0.7	0.8	1.9	—	—
Makwar	0.3	7.37	7.1	—	—

MALARIA.

The absence of heavy rains and the character of the Nile flood resulted in a lower general incidence of Malaria throughout the Northern and Central Sudan, while in the Gezira irrigated area the improvement of the drainage facilities for rapid removal of rain flood water and the improvement in the organisation for early treatment of all Malaria cases resulted in a considerable reduction of Malaria in this area.

CEREBRO-SPINAL MENINGITIS.

This disease continued to be widely sporadic in Mongalla Province, and a sharp epidemic outbreak occurred in the Gedaref area of Kassala Province. This latter area has quite recently been opened up to free communication with the rest of the Sudan by rail and car, and an unimmune population has thus been exposed to infection (see p. 5).

RELAPSING FEVER.

Outbreaks of louse-borne Relapsing Fever have occurred in several parts of Darfur, in Kordofan, the White Nile Province, the Blue Nile Province and in Khartoum Province. The virulence of the disease and its infective power have very greatly decreased since it was first introduced into Darfur in 1926. It is interesting to note that so long as it was an extremely virulent, rapidly spreading disease, it was possible to prevent its spread from Darfur into the Central Sudan. The decline in virulence and infectivity has been accompanied by a new factor, the chronic carrier, and now, when it is no longer necessary, it has become impossible to limit the spread of the disease.

In the irrigated area, where the disease has continued in endemic form since August its incidence is limited to the Western immigrant population, who are principally from West Africa and Wadai. The local inhabitants, as a result of extensive propaganda, have avoided all physical contact with the immigrant population, and have thus escaped infection (see p. 8).

SMALL-POX.

The Small-Pox incidence throughout the Sudan was greatly diminished. In Darfur the disease was still widely sporadic, and in the Upper Nile there was a sharp epidemic outbreak among the Nuers. With these exceptions the Sudan was practically clear of the disease (see p. 12).

SLEEPING SICKNESS.

Mongalla Province remained clear of this disease in spite of epidemic conditions prevailing in the neighbourhood of Aringa, some 30 miles on the Uganda side of the boundary. The incidence of the disease in the Bahr-el-Ghazal Province rose from 18 to 36 (see p. 44).

LEPROSY.

The segregation of lepers in the heavily infected area adjacent to the Belgian Congo has made further progress. A total of 2977 lepers have been segregated in the course of the year in this area. This brings the number of lepers segregated in the Sudan to a total of 5,306. The cost of this segregation excluding medical staff and drugs and dressings is £E. 2,500 or approximately 10/—a year for each leper.

The great majority of these lepers, a total of 4,379, come from the area closely adjacent to the Belgian Congo Border and, of the remainder, 699 come from the area adjacent to the Uganda border.

It is interesting to note that the heavily infected areas are cattle-fly areas where milk and flesh can only be obtained with great difficulty. The inhabitants have a great craving for meat and to satisfy this craving will eat vermin or meat in any state of decomposition.

The neighbouring cattle-owning, milk-drinking tribes of the Upper Nile Province are very lightly infected, and this also applies to the cattle-owning tribes of the Bahr-el-Ghazal (see p. 29).

TUBERCULOSIS.

The position as regards Tuberculosis in the Northern and Central Sudan has received careful attention for several years. There is no evidence of any general increase of this disease in spite of the fact that it is frequently introduced from abroad. It is common for Sudanese from the northern provinces, who go to Egypt to work as servants, to return heavily infected with Pulmonary Tuberculosis. Similarly in the Red Sea Littoral and in Kassala Province a considerable number of foreigners enter the Sudan infected with this disease. It is encouraging to note that 23,349 school-children came under routine medical examinations and only one case found showing clinical evidence of infection, and that was a gland infection.

The incidence of this disease in the negroid races has not yet been investigated except for the Shilluk, Nuer and Dinka tribes of the Upper Nile Province and the Nubas of southern Kordofan. The incidence among these tribes has been found to be very low (see p. 46).

HEALTH CONDITION IN KHARTOUM, KHARTOUM NORTH AND OMDURMAN.

A noticeable improvement is again recorded in the health of these three towns. Reductions in the incidence of Diphtheria, Typhoid, Primary Malaria and Bacillary Dysentery are especially noticeable. Diphtheria after a 20% reduction last year, shows a further reduction from 112 to 31 cases, Typhoid shows a further reduction of 47 %, and Bacillary Dysentery shows a reduction in incidence of 50 % after a reduction of 18 % had taken place last year. In 1929 additional funds were granted to provide a much needed increase in sanitary staff. The good effect of this increase was already noticeable in 1929 and this further improvement in the general health points to the excellent use that has been made of these additional resources (see p. 65).

PROGRESS IN MEDICAL WORK.

A large, further increase of medical work has been recorded in 1930, as manifested both in admissions to hospitals and in operations, and still more in attendance at outlying dispensaries.

The percentage increases over the figures of 1929 were as follows :—

Inpatients	8.4 %
Outpatients	43.5 %
Operations	41.0 %

(see p. 51).

(3) EPIDEMIC DISEASES.

(1) CEREBRO-SPINAL MENINGITIS.

A total of 865 cases were recorded, with 665 deaths. This compares with 464 cases and 340 deaths in 1929, and 335 cases and 274 deaths in 1928.

Of this total, 362 cases occurred in Mongalla Province, where the disease has been epidemic or sub-epidemic for four years. 233 cases occurred in Kassala Province and 147 cases in the Upper Nile Province.

Mongalla Province.

The incidence in this Province was 362, with 276 deaths. The figures for the last four years are :—

1927	...	...	...	...	...	... 410 cases
1928	...	...	...	...	...	... 338 ,,
1929	...	...	...	...	...	... 446 ,,
1930	...	...	...	...	...	... 362 ,,

The heaviest incidence occurred during February and March. Sporadic cases occurred throughout the rains until the end of August, after which no further cases occurred until December when six cases were notified. This is in accordance with what is usually noted in other parts of the Sudan, i.e. that the heaviest incidence occurs in the two or three dry months immediately preceding the rains. An exception of this rule was noted in Mongalla Province in 1928, when the heaviest incidence was in July and August.

The reason for this very definite seasonal incidence is not clear, but it is suggested that three factors may play a part :—

(i) The increased flow of mucous secretion in the rainy season, rendering the mucous membrane less receptive to bacterial invasion.

(ii) The irritating effect of dust on the mucous membrane in the dry season predisposing to infection.

(iii) The diminution of intercommunication between villages as a result of the rains.

It is interesting to note that whereas in the central Sudan the onset of the rains usually effects a total cessation of the disease, in the southern Sudan where the rains are more prolonged, the cessation is only partial.

In 1927, Rejaf and the Ikotos regions were attacked ; in 1928 the Latuka tribe on the eastern bank was mainly affected. In 1929 Kajo-Kaji district and the eastern Juba district were heavily affected, and in 1930 Kajo-Kaji district, the western Juba district and Amadi district. Thus, each area of Mongalla Province has been affected in turn, and there is therefore some reason to hope that the epidemic will subside, and that next year only a few sporadic cases will occur throughout the province.

Predisposing Factors.

At the time of the heavy outbreak among the Latuka, these people were short of food, and this shortage no doubt tended to lower the resistance to disease, but in other parts of the province there has been no definite food shortage.

On the other hand, the standard of nutrition throughout the province is not a high one ; meat and milk are hard to come by except on the river, but where these are least obtainable grain and vegetables are plentiful. It is possible that this relative deficiency has an effect in lowering resistance to this and other diseases.

A more probable cause of the prevalence of Cerebro-Spinal Meningitis in this province during the last twelve years is bad housing. Speaking generally, the huts are small, ill-ventilated, overcrowded and too close together. Efforts are being made to improve housing conditions, not here only, but throughout the Sudan, but the process of altering the habits and standard of life of a people is a gradual one.

In the Kajo-Kaji district at the height of the epidemic the people were moved out of their huts and made to live in the open air. This was followed by an immediate decline and a gradual cessation of the infection.

Kassala Province.

The incidence in this province was 233 with 188 deaths.

The disease appeared in epidemic form among the troops at Gedaref in December 1929, and this outbreak had come to an end by February 20th, 1930. There had been 31 cases with 21 deaths. The troops affected—the Eastern Arab Corps—are recruited from hill-men unaccustomed to town or village life.

On February 20th a case occurred among the civil population of Gedaref town, and there was a steady increase of cases until the epidemic reached its peak in the second week of March with 14 cases. The disease spread to the six principal village centres of Gedaref district.

On February 15th cases began to occur in the Kassala and Butana districts : 22 cases occurring in Kassala town, and 24 at El-Fasher village at the commonly used ford across the Atbara river. A few other scattered cases occurred in these districts.

Prophylaxis.

All immediate contacts were isolated for seven days in roomy grass shelters open to the air, and were given daily naso-pharyngeal irrigation. No cases occurred in quarantine.

Vigorous propaganda was undertaken to persuade the people to live and sleep in the open air, the side walls of public meeting places, e.g. cafes, eating houses, beer shops, were removed.

This was the first outbreak of Cerebro-Spinal Meningitis that has occurred in this district since 1915, when 146 cases were reported.

Kassala Province has recently been brought into rapid and frequent communication with the rest of the Sudan by the completion of the railway and by motor traffic. As a result of this the population is exposed, in a far greater degree than before, to infection by epidemic diseases, and in order to meet this danger medical assistance has been brought within reach of the people by the institution of dispensaries at various village centres. In this way, the confidence of the people in medical help is being won to an increasing extent, and disease is more readily reported in its early stages. Thus, although the people will be increasingly exposed to infection by this and other diseases, cases of infection will be promptly dealt with as they occur, and the population will establish a degree of immunity corresponding to that already established in the other parts of the northern and central Sudan.

Upper Nile Province.

The incidence in this province was 147, with 107 deaths. The infection appears to have spread from the north-eastern part of Mongalla Province to the south-eastern part of Upper Nile Province, and for the most part it remained confined to this area of the province. Apart from this, it spread to Malakal where 22 cases occurred.

General Conclusions.

With regard to the incidence of the disease in the Sudan. In the northern and central provinces a network of dispensaries linked to larger hospitals and forming part of a provincial health administration exists throughout the provinces.

In these areas, owing to the freedom of communication, the people are frequently exposed to infection, but as soon as cases occur they are notified to the dispensaries and promptly dealt with. In this way, serious epidemics are avoided, while some degree of immunity appears to be maintained among the population whose habits of life render them liable to this infection.

In the more southern areas, owing to the increase of intercommunication between the tribes and the greatly increased facilities for travel, an unimmune population is being exposed to infection by this and other diseases to an ever-increasing extent, and this exposure to infection has not been accompanied by a corresponding development of a province health organisation based on a system of dispensaries linked to larger hospitals. In consequence disease remains unreported until it has reached epidemic proportions.

It would appear then that the best way to deal with these recurring epidemics is :—

(a) To take every possible means to improve the type of hut occupied by the people, to prevent over-crowding and dirt, and to raise the general standard of living. This is a gradual process.

(b) To increase the number of dispensaries in the affected areas, and so by gaining the confidence of the people, to obtain immediate information as to the occurrence of cases of this disease, and to ensure immediate measures being taken.

It would appear that moving the people out of their huts into the open is likely to be the most effective method of stemming an epidemic outbreak. The local conditions and the local customs will affect the degree to which this can be carried out in any district.

(2) DIPHTHERIA.

A total of 68 cases of Diphtheria were reported in 1930. This shows a very satisfactory diminution on the previous year when 177 cases were reported.

The number of cases reported over the last five years is as follows :—

1926	31
1927	145
1928	197
1929	177
1930	68

The principal decreases in 1930 are in Khartoum Province and Halfa Province.

In Khartoum only 31 cases were reported as against 112 in 1929 and 145 in 1928.

In Halfa Province, 12 cases were reported as against 30 cases last year.

In Halfa Province 450 children were given Toxoid anti-toxin prophylactic treatment.

(3) INFLUENZA.

This disease was prevalent during the winter months in most of the Provinces but the mortality rate was very low. A total of 702 cases were admitted to hospital.

(4) MEASLES.

A total of 510 cases were reported.

Small outbreaks of Measles occurred in most of the provinces during the winter months. An epidemic outbreak occurred in the Meridi district of Mongalla Province where 248 cases were reported with one death.

(5) RELAPSING FEVER.

The position with regard to this disease has completely altered during the year under report. At the end of 1929 the disease had ceased to exist in Darfur as a local infection, and only occurred as occasional isolated outbreaks, easily dealt with and in every case traceable to reintroduction from the west. No outbreak had occurred anywhere east of the Darfur boundary.

By the end of 1930 relapsing fever had established itself in an endemic form among the immigrant population of the Gezira irrigated area, and localised outbreaks had occurred and been stamped out in Kordofan and the White Nile Provinces, and in addition, isolated cases had occurred among western immigrants at Khartoum without however, giving rise to any outbreak of the disease.

Some recapitulation is needed to elucidate this change.

Louse-borne Relapsing Fever reached Darfur from the west in the autumn of 1926. At that time the disease was in acute epidemic form, it was very infectious and its mortality rate was very high. For four years its spread eastwards into Kordofan and the Central Sudan was prevented. During this time the virulence and infectivity of the disease steadily diminished and the widespread outbreaks that had decimated the population of Central Darfur died down and gave place to outbreaks of lesser virulence and infectivity.

In the meanwhile roads had been made, motor transport provided, and dispensaries established and, from July 1928 onwards, Darfur was clear of the disease as regards local infection. Small isolated outbreaks occurred from time to time, but these were in every case traced to fresh infections from the west.

But this decrease in virulence of the disease and its existence in subacute and chronic forms was accompanied by the appearance of chronic carriers who showed no symptoms of the disease, but who carried the spirochaete in their blood ; and as the stream of western immigrant labour continued to flow into the Gezira it was only a matter of time before such chronic carriers should find their way into the irrigated area and should transmit the disease. This happened in the summer of 1930. It is satisfactory that the decrease in virulence that has rendered it impossible longer to prevent the spread of the disease, has at the same time removed the danger of a serious epidemic.

Blue Nile Province.

In April, 1930,three cases of Relapsing Fever occurred in the Gezira irrigated area; all of them were westerners and one of them was a recent arrival. Similarly. single isolated cases occurred in June and July and in the first half of August. Up to this time the cases had been isolated cases occurring in westerners and there was no evidence of local infection. On August 30th however, six cases were reported in the irrigated area, in Medina block, and the infection soon spread to Tebub and Seleimi, neighbouring blocks. The epidemic was confined to westerners, and the infection was traced to one of their number recently arrived from the west.

From this time onwards fresh cases continued to occur. 55 cases occurred in September, 130 cases in October, 109 cases in November and 89 cases in December. Cases occurred all over the irrigated area, but the majority were in the central blocks which are nearest to Managil and the main western road.

Measures Taken.

(1) Quarantine and delousing stations were re-established on the main routes in Darfur, Kordofan, on the White Nile, and at Managil in the Blue Nile Province. These were closed in October because by then it had become quite clear that the main focus of infection was in the Gezira itself.

(2) When epidemic conditions were first established in Medina block, widespread delousing was carried out but, as the epidemic spread to other blocks, this became impossible.

(3) All cases and immediate contacts were removed to hospital. Less immediate contacts were deloused and given a prophylactic injection, at first, of Novarsenobenzol and later, of Grey Oil. It was found impossible to keep in touch with unisolated contacts owing to the wandering and elusive habits of the westerners, which was the class affected.

(4) Widespread propaganda was continuously carried out among the Omdas and Sheikhs in the irrigated area and the adjacent villages pointing out the method of transmission of the disease, the precautions to be taken and the importance of preventing contact between the villagers and the westerners.

As a result of these measures :—

(i) the weekly incidence of the disease—which rose to 42 in the week ending October 18th and to 35 and 34 in the weeks ending October 25th and November 1st—has been kept down to a weekly incidence of 21 cases, or below, for the rest of the year, excepting only the week ending December 13th when the weekly incidence rose to 30.

(ii) with the exception of a small outbreak that occurred among nomad Arabs from the west, the disease has been confined to westerners. Thus the scope of its incidence has been very much restricted.

A total of 386 cases occurred in the irrigated area up to the end of the year. Of these, 46 died, i.e. a mortality rate of 11.9 %. In Darfur, at the commencement of the epidemic, the mortality rate was 60 to 80 %. This affords some indication of the decrease in the virulence of the disease that had taken place in the four intervening years.

An analysis of the cases shows :—

(a) 98.2 % of the cases were westerners.

(b) 1.8 % only of the cases were natives of the Gezira.

(c) 23 % only of the westerners had been in the Gezira six months before they contracted the disease.

(d) Out of 1,317 westerners who passed through Managil quarantine between 3rd September, 1930 and 31st December, 1930, only one man of those detained as being unwell had blood positive for Relapsing Fever.

The Medical Inspector in charge of the irrigated area makes the following comments on the type of the disease as occurring in this area :—

" The disease was much milder in type than the 1926-1927 epidemic in Darfur from which it has been handed down. It was feared that if the hitherto immune population of the Blue Nile were attacked the disease might revert to its old virulence. This proved not to be the case, there being nothing to distinguish clinically between the local cases and the cases amongst westerners.

" A striking difference between this epidemic and the Darfur epidemic was the comparative ease with which, in this epidemic, the organisms can be demonstrated in blood films. Many positive blood films were obtained from contacts exhibiting no symptoms, whereas in the Darfur epidemic positive blood could only be obtained during the first day or two of a relapse and very infrequently even then.

" An interesting observation was made with regard to the incubation period ; a case occurred in Meringan on 18th August, 1930. He was removed to hospital and his contacts quarantined for 14 days. On 7th September, 1930, a second case occurred. The latter stated that he found the former on 18th. August, 1930, lying on the ground ill, and carried him to his house, since when he had lived alone in a separate house. This second case was deloused on 19th August, 1930. Presuming that number two was infected from number one, this places the incubation period at 16 days. Even if delousing had been ineffective and infected lice were still present, since the louse is compelled to have a blood feed or die within twenty-four hours, the incubation period is still placed at 15 days."

Forecast.

It has been found possible to eradicate this disease in Darfur, in Kordofan and in the White Nile Provinces, where outbreaks have occurred, but the irrigated area of the Gezira presents special difficulties. The disease has established a hold on a specialised population of western immigrants amounting, during the height of the cotton-picking season, to 30,000 or 35,000 persons. These immigrants have no settled dwelling place, but wander about among the villages of the Gezira in quest of work. They have no Sheikhs or tribal organisation and are very difficult to control. They are very dirty and very lousy.

After the cotton has been picked this population diminishes, the immigrants either returning to the west or leaving for the pilgrimage from Suakin or Massowah. It is reasonable to anticipate that renewed outbreaks of Relapsing Fever will occur on the eastern and western routes about this time, but as far as the Sudan is concerned these should be controlled and eradicated. As regards the Gezira irrigated area ; a considerable body of immigrants with a percentage of chronic carriers will remain ; the number of cases is likely to diminish during the summer months, but the disease will persist and fresh outbreaks are likely to occur as the immigrant population again increases during the next cotton-picking season. The immigrants who have gained knowledge of the cause of the disease and its prevention will return to their homes and be replaced by others ignorant of these facts and devoid of all discipline, control and clean-

liness. The progress towards the elimination of Relapsing Fever from this immigrant population is thus likely to be very slow and difficult, and it is probable that the disease will remain mildly endemic in this floating population for some years to come in spite of all efforts to eradicate it.

The disease up to the present has not caused any serious dislocation of economic conditions in the Gezira and unless its incidence increases considerably it is unlikely to do so. Should, however, the disease increase to such an extent as to cause serious alarm among the western population, labour conditions might be seriously affected. This it is hoped to avoid.

The encouraging fact in the situation is that the local population of this area (some 80,000 to 90,000 persons) have reacted well to propaganda and have avoided close contact with the western population and in consequence this far larger population have escaped infection almost completely.

The local population, like the westerners, are lousy but in this respect also they show some signs of reacting to propaganda and as the population is a permanent one the effect of propaganda in the comprehension of the cause of the disease and the measures necessary to its avoidance should be steadily, if slowly, progressive.

It is probable that occasional localised outbreaks will occur among the local population, but seeing that they are settled, disciplined and living under the authority of their Sheikhs, such outbreaks should speedily be eradicated. It is reasonable to hope, therefore, that Relapsing Fever will not become endemic among the local population.

Cases of Relpasing Fever occurred in the province, but outside the irrigated area as follows :—

	cases.
Sennar	15
Wad Medani and District	14
Wad Rabia	2
Wad Ashar	1
Wad el Haddad	1

Darfur Province.

Three outbreaks occurred during the year :—

	Cases.	Deaths.
(1) Taweisha (Eastern district) September 1930	44	15
(2) Kuttum (Northern district) September 1930	51	19
(3) Dar Masalit (Western district) October 1930	91	14

Numbers (1) and (2) were traced to infection by immigrants returning from the Gezira.

Number (3) was traced to infections brought from beyond the western border.

These outbreaks were easily dealt with as the people of Darfur now realise the necessity of quarantine and delousing measures and readily co-operate in their execution.

Delousing stations on the eastern routes were at first reinstituted, but were closed as soon as it was evident that the disease had become endemic in theGezira.

Kordofan Province.

Relapsing Fever was introduced into this province from Darfur by a man who entered the province from Taweisha in Darfur at the time of the outbreak there. The first cases occurred at Um Lebana on September 16th. Five villages were infected and a total of 45 cases occurred with 12 deaths, and of these 12 deaths seven occurred in westerners. At first delousing stations at important road junctions were instituted, but these were discontinued in October. Infected villages were quarantined and deloused and all infected cases treated. The outbreak was at an end by the first week in November.

Khartoum Province.

The first case of Relapsing Fever occurred in Khartoum in May. No further cases occurred till August, and then cases occurred in August, September and October. In all 17 cases occurred with one death. All cases occurred in western immigrants. No local infections occurred.

White Nile Province.

On August 2nd two cases of Relapsing Fever occurred in the Bilharzia Quarantine camp at El-Dueim and from that time cases have continued to occur from time to time among westerners, either in that camp or elsewhere in the province. These were for the most part separate infections from outside the province and not local infections. A total of 45 cases occurred up to the end of the year ; only one case occurred in a native of the province.

(6) SMALL-POX.

A total of 2,179 cases with 343 deaths occurred in the Sudan as against 6,467 cases in 1929 with 885 deaths. In 1929 Small-Pox was epidemic throughout Darfur and minor epidemics occurred in Kassala, Kordofan and the Fung Provinces. In 1930, with the exception of Darfur and the Upper Nile Provinces, the Sudan was free from epidemic Small-Pox.

The incidence in the affected provinces was as follows :—

	Cases.	Deaths.
(i) Darfur	941	138
(ii) Upper Nile	1,232	103
(iii) Bahr-el-Ghazal	5	1
(iv) Kassala	1	1
TOTAL	2,179	343

Darfur Province.

In the eastern and western districts the epidemic conditions of 1928 and 1929 were continued in an attenuated form into the first part of 1930 and then died down.

In the northern district, Kuttum area, where the epidemic was slight in 1930, there was a definite outbreak of 310 cases in the latter part of the year. In Zalingei district on the other hand, where epidemic conditions had been very severe in 1928 and 1929, no cases occurred in 1930. Similarly in Nyala only one case was reported.

A total of 33,730 vaccinations were carried out in the course of the year. Dried vaccine, obtained from INSTITUT de VACCINE ANIMALE in Paris, is now being used in this province with greatly improved results, as many as 80 to 90 % of the vaccinations being successful. Owing to the heat, the absence of ice and the difficulty of communications, great difficulty had been experienced in keeping the liquid lymph active.

It is believed that serious epidemics on the scale of the Relapsing Fever epidemic in 1926, 1927 and 1928 and of the Small-Pox in 1928 and 1929 are not likely to recur in this province or elsewhere in the Sudan.

This belief is based on :—

(i) the existence of dispensaries at important native centres,

(ii) the confidence of the native thus and otherwise gained in all medical matters,

(iii) greatly improved communications and increased rapidity of transport,

(iv) the ability to deal promptly with any outbreak of disease at first appearance as a result of (i) and (iii).

Darfur has suffered very severely from epidemic diseases during the last four years, but it is hoped that the period of widespread epidemics is now over and that the medical staff will be able to devote themselves to the steady development of medical work resulting in the gradual growth of a healthy population.

(4.) ENDEMIC DISEASES.

(1) ANKYLOSTOMA.

This disease is uncommon in the Sudan ; it is slightly endemic in northern Dongola where the infection is frequently renewed by natives of the district returning from work in Egypt. Examinations at Dongola hospital and Dongola school point to an infection rate of 3 %.

The southern part of the province appears to be free from this disease. Carbon Tetrachloride has been very freely administered for worm diseases at the dispensaries throughout the province, and this no doubt has done much to diminish the incidence of the disease.

In 1925, 4,338 persons were examined for this disease and 11.2 % were found to be infected, and this infection was evenly distributed throughout the province. It would appear then that as a result of treatment the disease has disappeared from the southern part of the province, but that in the northern part of the province a small number of cases still exist giving a percentage of incidence of about 3 %. It is possible that this persistence in the northern part of the province is due to the much closer contact with Egypt.

Small localised endemic areas also occur on the Kajo-Kaji plateau in Mongalla Province and in the Dilling district of the Nuba Mountains.

Up to the present no cases have been found in the irrigated area of the Blue Nile Province in spite of conditions more favourable to the transmission of this disease having been established by irrigation.

(2) ANTHRAX.

There were no cases of human Anthrax during the year. Two cases of animal Anthrax were reported from Kassala Province, one camel and one cow.

(3.) BILHARZIASIS.

Blue Nile Province. (Irrigated Area).

The position with regard to the infection of this area still gives rise to considerable anxiety. In spite of careful quarantine measures on the White Nile and measures taken to ensure treatment in the irrigated area a large number of westerners infected with this disease are at large in the area, and have every opportunity of infecting the canals. This infection has probably been largely counteracted by the annual destruction of snails with Sizolin, but the issue hangs in the balance. Experience elsewhere in the Sudan and in other countries indicates the impossibility of eradicating this disease from a large irrigated area when once infection is firmly established.

A survey carried out in the spring of this year shows that the actual number of persons infected, both immigrants and local inhabitants, has appreciably diminished, but there is still a large body of infected labourers in the area without fixed places of abode and without tribal organisation and therefore extremely difficult to control, and this is a continued potential source of infection.

More disquieting than this, however, is the fact that locally contracted cases, although few in number, continue to occur. In the spring of 1929, 37 children were found to be infected and these children were scattered over 22 blocks. In 1930, 20 children were found to be infected from six blocks. It is significant that nine of these children came from one block (Wad Saadalla) and that with one exception the other cases came from neighbouring blocks, eight of them coming from Tebub block which is immediately to the north of Wad Saadalla. A further examination in Wad Saadalla block carried out in December 1930 and January 1931 revealed nine additional cases.

There would appear, therefore, to be some reason to fear that this area around Wad Saadalla block has become definitely an endemic area and that it may be a very difficult matter to root out the infection. This area, in common with the rest of the irrigated area, was very carefully sizolined in 1929. No snails could be found immediately after the sizolining, but snails, some of them adults, were found two months later. It is possible that these adult snails had found their way into the canals from the main canal and were thus uninfected, but it is also possible that they were snails that had burrowed down into the mud and had thus escaped being poisoned by the Sizolin. In this latter case the snails may have been infected.

There is another possibility to account for these infections ; the whole of this area was heavily flooded in 1929 and, in spite of drainage some accumulations of water remained until after the new year. These lakes rapidly became infested with Bullinus snails, and infection under these circumstances, when stagnant ponds are drying up, is very easy. Assuming that the incubation period for Bilharzia in the human body may be as long as a year, it is possible thus to explain this crop of local re-infections.

It is proposed to deal with the situation as follows :—

(i) to restrict the use of Sizolin to the areas where definite local infection has occurred, i.e. according to present information to six blocks.

(ii) to repeat this sizolining during the non-watering season as often as snails re-appear in the canals.

(iii) to pay especial attention to the early removal of any accumulations of water in these areas, whether natural rain water lakes which are included in the existing drainage system or hafirs (village ponds).

It is hoped by these measures to prevent any further local infections.

Further knowledge is needed as to the life and habits of the snail under Gezira conditions.

Investigations are being carried out on the following lines :—

(i) Digging for snails in the beds of canals that have been sizolined, before they are refilled with water

(ii) Digging for snails in the beds of canals that have been dried out without having been sizolined.

(iii) Searching for snails in canals that have been cleared out by wet clearance.

It may be useful to recapitulate the measures taken to prevent the infection of the irrigated area with Bilharzia :—

(i) Quarantine at Wadi-Halfa of labour imported from Egypt.

(ii) Quarantine on the White Nile of immigrants entering the Gezira from Kordofan and the west.

(iii) Anti-Bilharzial work in the principal endemic areas in the Sudan.

(iv) Enforcement of regulations to prevent bathing in, and defaecation into, the canals.

(v) Propaganda among the natives.

(iv) Treatment of all infected cases that can be found in the irrigated area.

(vii) Destruction of snails in the distributary canals during the non-watering season.

It was pointed out last year that the measures enumerated under (i) to (vi) are partial in their action and cannot ensure the canals from becoming infected. In the final resort reliance must be placed on the destruction of snails in the infected canals with the double object in view of :—

(i) destroying all infected snails,

(ii) maintaining the distributary canals free of adult snails for two or three months.

In view of the continued local infections in the Wad Saadalla and neighbouring blocks the question arises as to whether it is possible by this means to kill even all the infected snails.

A further measure of protection is now being adopted, viz ; the establishment of a series of auger-bore latrines close to the canals at points near villages which are liable to fouling. Up to date 183 of these latrines have been made and are being freely used. The work is being pressed on as fast as possible, but it will be a year or two before an adequate provision has been made to meet the needs of the population throughout the area. At the same time the richer natives are being encouraged to instal auger-bore latrines in their compounds and it is hoped that eventually every house or hut throughout the irrigated area will have its own auger-bore latrine, but this will be a slow and gradual process.

The position with regard to the infection of the people living in the original 300,000 acres for the years 1926, 1929 and 1930 is shewn in the following table. The surveys were carried out in the spring of each year.

Year.	Local Natives.						Non-local natives.			Immigrants.		
	Adults.			Children.								
	No. examined	No. infected	%	No. examined	No. infected	%	No. examined	No. infected	%	No. examined	No. infected	%
1926	12,734	39	0,3	3,685	37	1,0	7,226	314	4.3	3,640	531	14.6
1929	9,431	71	0,75	2,341	37	1,6	6,976	281	4.0	2,691	312	11.6
1930	8,783	6	0,07	3,322	20	0,57	8,246	60	0,72	5,253	61	1.16

Berber Province.

There are 24 irrigated farms in Berber Province. Of these four are Government farms, and three of these are infected with Bilharzia.

It is interesting to note that the only irrigation farms infected are three of the four Government farms. The reason for this is that these farms were canalised by Egyptian labour, but it is not clear why the southernmost of these farms, Ganditu, with an area of 2,088 acres has escaped infection, nor is it clear why Zeidab, a private farm comprising an area of 5,164 acres and lying immediately to the north of Kitiab farm, an infected Government farm, has escaped infection.

Apart from these infected farms the riverain villages of the northern part of the province from about the 19th. parallel and northwards are infected with Bilharzia. The river in this part is broken up by cataracts and the population is sparse; the infection is from infected river pools. It is not practicable to undertake the systematic treatment of this portion of the river at present. Effort is being concentrated on the elimination of the disease from the infected farms where the population is concentrated and where, if untreated, the infection would become very heavy.

Anti-Bilharzial Measures at these farms, apart from propaganda and disciplinary measures, have been :—

(i) Improving conditions of irrigation as regards :

(a) providing adequate escapes,

(b) establishing a proper flow,

(c) eliminating as far as possible uncemented brickwork in bridges and regulators, as these provide ideal harbourage for snails.

(d) preventing fouling.

(ii) Destroying snails with Sizolin during the dry season just before the canals are quite dry, and when possible between the watering periods.

(iii) Treatment of infected persons.

It appears that during the last year definite progress has been made towards the elimination of Bilharzial infection from these farms. On the other hand work on these comparatively small irrigated areas in Berber and Dongola Provinces serves to illustrate how impossible it would be to eliminate Bilharzial infection from the canalised area of the Gezira should this area become infected, extending as it does over an area exceeding half a million acres.

The infection rate in the province schools was 8.7 % in 1930, 13.7. % in 192 9 and 26.4 % in 1928.

Darfur Province.

Bilharziasis is endemic in this Province and especially among the Baggara of the south, where the cattle are watered from fulas (rain water lakes that dry up in the early spring).

As the water becomes scarce in these lakes the infection of the snails becomes almost universal and the danger of infection to the herdsmen who enter the water with their cattle is very great. Out of a total of 149 boys examined for Bilharzia at the Baggara horse show, 80 % were positive.

The incidence of infection in the north and west is much lower.

All that can be done at present in this province is the treatment of boys in the village schools in the vicinity of dispensaries, and the spread of propaganda among the people as to the way in which infection takes place and as to how it can be avoided.

The negroid inhabitants of Darfur go in large numbers to work in the Gezira irrigated area ; they are examined, and if necessary treated at the White Nile quarantine stations. Some 18 % are found to be infected with Bilharzia.

Dongola Province.

The position with regard to Bilharzia infection in this province is encouraging. During the last two years there has been a marked and progressive decrease in the incidence of the disease. It is thought that this decrease in the number of infective cases, combined with the anti-snail and propaganda measures taken, will tend to decrease progressively the number of re-infections, and this diminution of re-infection will in its turn encourage the people to come forward for treatment, which indeed they are doing, to an increasing extent.

The measures adopted in this province are :—

(i) **Curative.**

Cases are treated at the hospitals and dispensaries throughout the year. Examination tours are made by Dispensary Hakims with the assistance of the local Sanitary Barbers (for nomenclature see p. 103). The names of all those examined are registered and they are treated as soon as possible.

(ii) **Anti-Snail Measures.**

(a) collecting snails on hurdles fixed in the water during pumping,

(b) between pumping, treating all residual pools with Sizolin,

(c) sizolining the canals before they are completely dry at the commencement of the non-watering period of one to three months so as to kill the snails before they take refuge in the mud.

There seems to be little doubt that as a result of these measures the snail population of the canals is being kept at a low level.

(iii) **Propaganda** with regard to the danger of bathing in, and of micturating or defaecating into canals and pools.

The following figures show the curative work carried out in this and previous years :—

Year	Number examined	Number found	Percentage infected	Number treated	Partial treatment
1926	20,400	3,550	17.0	3,300	—
1927	11,376	1,829	16.0	1,199	309
1928	12,213	2,259	18.0	1,480	221
1929	17,925	2,187	12.0	1,607	150
1930	26,094	2,443	9.3	1,969	65

In 1926 the examination and treatment was compulsory, since then it has been voluntary.

As a large number of these people present themselves for examination because they are infected, the infection rate of 9.3 % is probably considerably in excess of the true figure for the whole population, while it is definitely lower than the percentage figure for the village Koran schools, viz ; 12.9 %.

Infection Rate in Women.

The number of women examined is still very small, but they are coming forward for examination in increasing numbers. Those that come forward probably do so because they think that they may be infected, so that the percentage figure for women is probably in excess of the true figure.

Altogether 1,441 women were examined, giving a percentage of 3.2 infected as against 9.3 for the men.

A total of 771 women who had presented themselves for various reasons were examined at the two hospitals and the infection rate was found to be 1.25 %. This was probably a fairer sample of the female population.

At Gureir, a heavily infected pump scheme, fifty women and girls were examined and gave a percentage rate of 6 %, while the men gave a percentage rate of 26 %, and the Khalwa boys of 32 %. Further, 62 school-girls examined at Dongola showed one case of Bilharzia only, and in 64 school-girls examined at Merowe no case was detected.

It is clear from these figures that the women and girls are not a serious factor in the transmission of the disease.

Incidence in Village Schools.

In 135 village Koran schools 3,704 boys were examined giving a percentage rate of infection of 12.9 %.

Age Incidence.

Examinations were made in four groups :—
(a) up to 5 years,
(b) 5—10 years,
(c) 10—15 years,
(d) adults.
The results were as follows :—

	Group (a).	Group (b).	Group (c).	Group (d).
Number examined ...	3,116	1,972	2,121	1,103
Percentage of infection	6.4%	18%	17%	8%

These percentages compare as follows with those of similar groups in 1929:

13%	20%	23%	12%

Thus it would seem that the disease is most commonly contracted between the ages of 5 and 15.

Results of Treatment.

A total of 736 cases who were treated and cured in 1929 were re-examined in 1930 and 30% of these cases were found to have relapsed or to have been re-infected, most probably the latter. Satisfactory progress will not be made until this re-infection rate can be reduced.

Bilharzia, although prevalent throughout the greater part of the province, is particularly intense in the three pump schemes that were canalised by Egyptian labourers in 1918.

The following figures show the percentage of infection in these schemes in the years 1927—1930 inclusive :—

Year.	Nuri.		Gureir.		Ghaba.	
	Villages schools	General population	Villages schools	General population	Villages schools	General population
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1927 ...	40	30	33	40	75	36
1928 ...	—	32	39	47	34	23
1929 ...	9	15	36	18	40	23
1930 ...	8	14.4	32	26	40	12

It is seen from these figures how difficult it is to appreciably diminish the incidence of Bilharzia in the inhabitants of an irrigated area.

There is a fourth irrigation pump at Mansur-Koti. This area was canalised by Sudanese labourers in 1914, it is not yet infected.

It would seem then that as a result of systematic work carried out throughout the province since 1926 the disease has definitely diminished in it sincidence and unless the present staff is decreased there is reason to anticipate that this improvement will be progressive.

The Dongolawi travels all over the northern and central Sudan and he carries his infections with him. There is every reason, therefore, to rid him of these infections of which the most important is Bilharziasis.

White Nile Province.

The position with regard to Bilharzia in this province is that the riverain villages are infected with Bilharzia Mansoni from Gebel Aulia in the north to Gebelein in the south, and some of the southern villages are also infected with Bilharzia Haemotobium.

There is evidence, however, pointing to a diminished incidence. Twenty one villages which had been completely examined in 1926 were re-examined in 1930.

The table given below shows the result and it also shows villages where wells had been provided to obviate the people drawing their water from the river :—

Village.	Percentage Positive		Remarks.
	1926	1930	
Geteina	90	47	4 wells sunk 1928-30.
Garrassa ...	32	19	
Wad-Shalai ...	2	12	
Wad-el-Zaki ...	57	14	
Abu-Habeira ...	83	69	Well sunk in 1929.
Um-Gerr east ...	33	3	,, ,, ,, 1928.
Kawa	100	24	3 wells sunk 1928-30.
Kenuz	57	12	
Shawal	98	57	Well sunk in 1930.
Aba Island ...	54	14	,, ,, ,, 1929.
Zeinuba	65	45	
Khor Agwal ...	17	23	
Gebelein	90	54	
Mohamed Sherif	Not examined	58	
Abu-Duloh ...	97	53	
Rideis	Not examined	28	
Kosti	63	10	Well sunk in 1928.
Fashishoya ...	50	20	
El Dueim ..	93	25	3 wells sunk in 1928.
Um-Gerr west ...	82	—	Well sunk in 1928.
Shabasha ...	55	6	,, ,, ,, 1929.

It is seen that a considerable reduction in the percentage rate has taken place in nearly all these places.

Similarly the percentage infection rate in schools in 1926 was 84 % against 16.2 % in 1930.

Prophylaxis and Treatment.

The most hopeful line of action appears to be the provision of a sufficient number of wells in all the riverain villages so as to obviate the necessity of drawing water from the river. Fortunately, the water of the White Nile—unlike that of the Blue Nile—is not liked by the natives for drinking purposes, and they will use well water in preference. Four additional wells were dug in 1930, and it is hoped to continue the work in 1931.

Snail destruction is of very limited value in this province, as the Planorbis Boissyi breeds in the shallow water at the edge of the open river.

It has been found advisable to restrict treatment to towns and villages where permanent dispensaries are situated, and where it can be combined with other measures. Treatment by travelling treatment centres, unsupported by other measures, results in rapid re-infection, and consequent disappointment.

It is hoped to commence the installation of auger-bore latrines in the riverain villages in the course of the coming year, and this work will be commenced in the villages where permanent dispensaries and sufficient wells exist. It will be some time before these latrines can be made sufficiently numerous to affect the

situation seriously, but the combination of treatment, well-water supplies, and auger-bore latrines, assisted by the gradual improvement of the education and understanding of the people on these matters is likely to result at first in a diminution in the severity of the infection and later and more slowly a diminution in its incidence. Rectal Bilharzia has been, and to a less extent still is, a serious debilitating factor in this province.

WHITE NILE QUARANTINE.

(1) Kosti Quarantine.

A total of 20,759 persons were examined in the course of the year. Of these 3,740 or 18 % were found to be infected and 3,393 were cured and allowed to proceed to the irrigated area.

(2) El-Dueim Quarantine.

A total of 6,502 persons were examined in the course of the year. Of these 842 or 13 % were found to be infected and 682 were cured and allowed to proceed to the irrigated area.

GENERAL CONSIDERATIONS.

If it were not for the existence of the Blue Nile Province irrigated area with its 604,279 acres of irrigated land, this disease would be a matter of secondary importance. Excepting in the pumping schemes where the infection if unchecked is perennial, and in the White Nile Province where the infection is rectal and extending over a considerable part of the year, and where in either case the debilitating effect on the population is grave, Bilharzial infection in the Sudan is seasonal and therefore not a seriously debilitating factor.

The disease, however, is raised to one of primary and most urgent importance by the existence of this large irrigated area in the Gezira, with its thousands of miles of canals, infested with both Bullinus and Planorbis snails.

The importance of the issue is further emphasised by a consideration of the impossibility, with the means and knowledge at present at our disposal, of eliminating infection from such an area when once infected.

The problem is gravely complicated by the continued stream of pilgrims and labourers who come from Nigeria, French West Africa, Tchad and Wadai, and from Darfur and Kordofan in the western Sudan. Effective measures are taken to examine, and where necessary to treat, these westerners at quarantine stations on the White Nile, but a proportion avoid detection or subsequently relapse, and a large number of infected westerners had found their way into the Gezira before these measures were adopted, or rendered effective.

Examination of pilgrims at the Suakin quarantine station on their return from the pilgrimage shows that a considerable number (5.3 %) of these pilgrims are infected with Bilharzia. It is impossible at present to detain these infected pilgrims for treatment, and no doubt a considerable number of them return to work in the Gezira.

In addition to this diminishing source of infection by westerners there is an appreciable influx of infected natives from endemic areas in the northern Sudan, in the Fung Province and in the White Nile Province ; for geographical reasons

it is impossible to prevent this influx, and a diminution of this source of infection can only be expected from the progressive efficiency of the measures taken in these limited endemic areas.

Thus a large number of infected westerners found their way into the irrigated area before quarantine on the White Nile was established or rendered effective. This body has been largely diminished by treatment locally, but on the other hand it is replenished :—

(i) by a few westerners who still escape quarantine, or who relapse after treatment,

(ii) by returning pilgrims,

(iii) by infected natives from endemic areas in the northern Sudan, the White Nile Province and the Fung Province.

This considerable body of infected labourers who wander about the irrigated area working or in quest of work, remains a most serious problem, and every possible means has to be taken to prevent them from infecting the canals.

Action with regard to Bilharzia is guided by these considerations and takes the following order.

(i) Stringent quarantine action on the White Nile to limit as far as possible the influx of infected labourers into the Gezira.
(ii) Action in the Gezira by the treatment of infected labourers and by every other available means to prevent them from infecting the canals.
(iii) Systematic measures to diminish the incidence of Bilharzia in the endemic areas of the northern provinces and the White Nile and Fung Provinces, and particularly in the pumping schemes in these areas. This is important, as movement from these areas into the Gezira cannot be prevented.
(iv) Propaganda and the provision of easily available facilities for voluntary treatment in the western provinces. Effective action in these provinces is not at present feasible, nor is it called for as a protective measure for the Gezira, because adequate measures are being taken at the quarantine stations on the White Nile.

(4) BLACKWATER FEVER.

Twenty cases of Blackwater Fever were reported in 1930 with six deaths. This compares with 30 cases and eight deaths in 1929 and 21 cases and five deaths in 1928.

The 30 cases recorded in 1929 corresponded to a severe incidence of Malaria occuring as a result of very heavy rains in that year.

The race incidence in 1930 was as follows :—

	Cases.	Deaths.
British	3	—
Syrian	4	2
Greek	1	1
Egyptians	1	—
Sudanese	11	3
	20	6

Of the 11 Sudanese affected, seven were from the northern Sudan and were living away from their homes.

Of the four cases from Li-Rangu it is especially noted that in three cases an intravenous injection of quinine had been administered within a few hours of the onset of the symptoms, and the same note is made of a Greek patient at Roseires. Most of the other cases are noted to have been chronic Malaria cases with markedly enlarged spleens and to have been taking considerable quantities of quinine.

Of the three British cases — all recovered,
„ „ four Syrian „ — half died,
the one Greek died — it was his third attack.

The Syrian and Greek merchants seldom take leave and are apt to adopt a semi-native standard of life.

Of the 20 cases, 11, or over half, occurred north of the 12th. parallel, i.e. north of Roseires, Renk, Delami, Rashad and Muglad.

This is in accordance with last year's distribution when, out of 30 cases, 21 cases, or over two-thirds, occurred north of the 12th. parallel.

The cases were distributed as follows :—

Province.	Station.	Nationality.	Result.
Bahr-el-Ghazal	Li-Rangu	Dongolawi	Recovered
	„	Mahassi	„
	Meridi	British	„
	„	Muallid	„
Blue Nile	Wad-Medani	Berberi	„
	„	Abbadi	„
	„	Mahassi	„
	Sennar	British	„
	„	Gaali	„
	„	Egyptian	„
Fung	Singa	Syrian	„
	Roseires	Greek	Died.
Kordofan	El-Obeid.	Syrian	„
	El-Nahud	„	„
	„	„	Recovered
	Abu Zabad	Nubawi	Died.
	Rashad	Sudanese	„
	Kadugli	„	Recovered
Mongalla	Opari	British	„
Upper Nile	Malakal	Mahassi	Died.

(5) DYSENTERY.

A total of 1,522 cases were recorded in 1930. This compares with 1,735 in 1929 and 1,334 in 1928.

The percentage of dysentery admissions to total admissions in 1930 was 3.05 the lowest figure recorded since 1923.

The following table shows the number of cases admitted for Amoebic and Bacillary Dysentery respectively during each of the last ten years :—

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Amoebic ..	477	390	504	605	483	543	835	1086	1447	1339
Bacillary ..	89	48	27	111	326	271	337	248	288	183
TOTAL	566	438	531	716	809	814	1172	1334	1735	1522
Percentage of all dysentery admissions to total admissions	3.0	2.4	2.9	3.6	4.3	3.7	4.5	4.2	3.77	3.50

The diminution in the incidence of Bacillary Dysentery is very noticeable. This disease in the Sudan is particularly associated with the European population. Its proportional incidence is much higher among Europeans than natives and it is uncommon in areas where there are few or no Europeans. Amoebic Dysentery on the other hand is more particularly a disease of natives and affects Europeans who are living among natives.

(6) GUINEA WORM.

Cases are reported from six provinces. The most seriously affected are the three southern provinces, i.e. the Mongalla, Bahr-el-Ghazal and Upper Nile provinces and in that order of severity. Cases are reported from the southern part of Darfur Province and from the Ingessana in the southern Fung Province, but no details are available.

Kordofan Province.

From Kordofan Province 530 cases are reported—of these 81 cases are from Um-Ruaba, 59 from Rahad and 38 from Sugr-el-Gamal, all lying to the north of the 12th. parallel.

Upper Nile Province.

In the Upper Nile Province 387 cases are reported of which 311 cases are from two districts—Yirrol and Kongor—both in the south of the Province and adjacent to Mongalla Province.

Bahr-el-Ghazal Province.

In the Bahr-el-Ghazal Province the disease appears to affect chiefly the Dinkas living in the low-lying swampy areas. The Zande tribes living along the Nile-Congo watershed and drinking from perennial streams appear to be free from the disease.

Mongalla Province.

In Mongalla Province the disease is widespread except in the hilly districts where perennial streams are drunk from. The suffering and disability caused by this disease is very severe in this province. In one village in the central district 25 % of the population were found to be infected. An attempt has been made to poison the cyclops by treating the water with lime. This method is of limited application as though it can be used successfully in shallow wells it cannot be applied to sluggish streams widening into swamps. In such cases the difficulty could perhaps best be met by digging deep permanent wells with a protective rim around the mouth sufficient to prevent soiled water flowing back into the well.

The effect of this disease on the well-being and efficiency of the population is so serious that all reasonable preventive measures should be given the most careful consideration and, wherever possible, adopted.

(7) HYDATID DISEASE.

Six cases of this disease were reported from the Kapoeta district which lies close to the junction of the Sudan, Uganda, and Kenya borders and about 100 miles from the Abyssinian border. These are the first cases of this disease reported in the Sudan.

All with the exception of a child of four years were females. In five cases the liver was attacked and in one case the spleen. All were advanced cases showing large evident swellings. Sheep are numerous in the district. Women in this district make pets of their dogs ; the men on the other hand do not do so.

(8) KALA-AZAR.

Fifty nine cases of this disease were reported in 1930. This compares with 95 cases in 1929, 42 cases in 1928 and 21 cases in 1927. It is noteworthy that 14 of the 59 cases reported in 1930 came from Kapoeta, a newly discovered endemic area, that has only recently come under medical administration. The large increase of cases reported in 1929 was largely due to the closer medical administration instituted in the Fung and Gedaref areas.

The cases reported from the Fung area for 1928, 1929 and 1930 are respectively 18, 47 and 10, and for the Gedaref area for the same years, 14, 21 and 10. This sudden increase, followed by a drop below that of the year previous to the increase, is difficult to explain except on the supposition that the cases which came under observation in 1929 as a result of closer medical administration did not represent the annual crop of cases, but an accumulation of chronic cases persisting over from previous years, and that these having been treated and cured, the figures for 1930 represents more closely the annual new infections. The increase in 1929 cannot be attributed to an influx of infected Abyssinians, as the Fung cases only included two Abyssinians, and the Gedaref cases did not include any Abyssinians.

Blue Nile Province.

The new infections from the Sennar area are three as against six last year. On the other hand seven cases were reported from more northern parts of the province, five from Wad-Medani, one from Hag Abdulla and one from Rufaa. The Rufaa case was a native of that town, the others were all strangers to the province.

The 1929 returns show that out of 91 persons infected in the Sudan only 12 cases originated from the endemic areas and the other 79 cases originated from outside the endemic areas.

In 1930 out of 59 cases infected in the Sudan 32 were from the endemic areas and 27 from outside these areas.

Kapoeta.

This area, situated in the extreme south-eastern part of the Sudan territory close to the junction of the Sudan, Kenya and Uganda borders, is also not far from the Abyssinia border (about 100 miles). There is reason to believe that the Abyssinian border is infected from the Eritrean boundary as far as,and including, Beni Shaugul, and the existence of this isolated endemic area in the Sudan territory would seem to suggest that the Abyssinian border may be infected as far south as Lake Rudolf, and that the Kapoeta endemic area is an outlying branch of this larger endemic area.

Of the 14 cases reported, eight were children (ten or under).

This disease was found among the three tribes of the district :—

	cases.
Dodinga	1
Aboya	4
Taposa	9

Of these, the Dodinga and Aboya live on the sides of large hills.

All the cases were chronic. The incubation period appeared to be six months to a year. As the natives of this area are only beginning to become accustomed to medical treatment it is probable that this disease is more extensive than at present appears.

GENERAL REMARKS.

The lower number of cases reported this year after the heavy increase reported last year is reassuring.

The seven cases reported from the Blue Nile Province north of Hag Abdulla suggest that this important area is definitely infected with this disease, although to a very slight extent. Any serious lowering in the vitality and resisting power of the natives of this irrigated area might result in a serious increase in the endemicity of Kala-Azar. Four cases were reported from this area in 1927, no cases were reported in 1928 and 1929.

Under the present conditions of increasing medical penetration and a steady if slow improvement in the condition of the people this disease does not seem likely to become an important factor affecting the health of the Sudan.

The following table shows the cases reported in the Sudan during the year, their probable place of infection, nationality and place of origin:—

Probable source of Infection.	No.	Nationality and Origin.	Reported from.
Singa District	4	Shaigi from El-Obeid	Singa.
		Muallid from Omdurman	,,
		Greek from Singa	Khartoum.
		Furawi from El-Fasher	Nahud.
Roseires District	2	Hameg from Roseires	Roseires.
		Abyssinian	,,
Southern Fung	7	Masabatti	,,
		Gaali from Chaali	,,
		,, ,, ,,	Kurmuk.
		,, ,, ,,	,,
		,, ,, ,,	,,
		Abyssinian	Gedaref.
		Bidairi from Kurmuk	Kurmuk.
Gedaref District	11	Furawi from Gedaref	Kassala.
		Abyssinian	Gedaref.
		,,	,,
		Bidairi from Dongola	,,
		Muallid from Egypt	,,
		Egyptian	Sennar.
		Fellata from Dinder	,,
		Beni Amer from Khor Baraka	Gedaref.
		Tagalawi from Gedaref	,,
		Amrawi from Gedaref	Atbara.
		Nubawi from Gedaref	Kosti.
Kassala District	5	Gomzawi from Gallabat	Kassala.
		Rubatabi from Abu Hamed	Port Sudan.
		Beni Amer from Khor Baraka	Kassala.
		,, ,, ,, ,, ,,	Gedaref.
		,, ,, ,, Gedaref	,,
Wad Medani District	8	Dinkawi from Wad Medani	Wad Medani.
		Rufawi from Rufaa	Rufaa
		Bornawi from Bornu	Wad Medani.
		Hawri from El-Obeid	,,
		Rubatabi from Wad Medani	,,
		Borgawi from French Eq. Africa	,,
		Shaigi from Dongola	Hag Abdulla.
		Egyptian from Luxor	Khartoum.
Abyssinia	2	Abyssinian	Singa.
		,,	Gebelein.
Sennar District	3	Shilluk from El Keila	Sennar.
		Ruffai from Mafaza	Gedaref.
		Northerner from Masid	Malakal
Taposa District	10	9 Taposans	Kapoeta.
		1 Dodingan	Torit.
Aboya	4	Aboyans	Kapoeta.
Nyala	1	Bornawi from Fasher	Fasher.
Gebelein	1	Furawi from Fasher	Khartoum.
Atbara	1	Halfawi from Halfa	Atbara.
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NATIONALITIES.		SOURCES OF INFECTION.	
Greek	1	Singa District	4
Egyptians	2	Roseires District	2
Abyssinians	6	Southern Fung	7
Southerners	21	Kassala District	5
Northerners	21	Gedaref District	11
Westerners	7	Wad Medani District	8
Nubawis	1	Sennar District	3
		Taposa and Aboya	14
		Nyala, Gebelein and Atbara	3
		Abyssinia	2
	59		59

(9) LEPROSY.

Table " A " shows the admissions by years of lepers in the Sleeping Sickness areas of the Sudan.

Table " B " shows the admissions, discharges, etc. and those remaining under treatment in the Sleeping Sickness areas and other parts of the Sudan on 31st. December, 1930.

TABLE " A."

YEAR.	Mongalla.			Bahr-el-Ghazal.		
	Yei.	Kajo-Kaji.	Opari.	Meridi.	Source Yubo.	LiRangu
1927	57	50	12	50	140	55
1928	70	29	44	181	372	—
1929	248	212	151	119	524	867
1930	34	49	18	72	1111	1866
TOTAL ..	409	340	225	422	2,147	2,788

Total Mongalla	974
,, Bahr-el-Ghazal	5,357
TOTAL	6,331

TABLE " B."

Stations	Admissions	Readmissions	Ret. Deserters	Died	Discharged	Deserters	Remaining
Yei	34	—	—	16	34	17	298
Kajo-Kaji	49	—	—	17	46	—	249
Opari	18	—	—	7	44	2	152
Meridi	72	1	70	16	173	92	202
Source Yubo ..	1111	—	—	22	480	13	1590
Li-Rangu ..	1866	1	—	65	—	135	2587
Wau	144	—	—	3	35	—	213
Gedaref	6	2	—	3	1	—	15
Omdurman ..	9	—	—	6	3	2	48
TOTAL ..	3,309	4	70	155	816	261	5,354

The plan conceived in 1928 and put in operation in 1929, of forming self-supporting Leper Settlements in the Sleeping Sickness areas, reached fulfilment in 1930.

3,309 lepers were admitted during the year, more than the total admissions for all previous years together, 711 symptom free cases and 105 burnt out cases were discharged.

5,354 lepers remained under treatment in the settlements on 31st. December 1930.

These settlements, excluding Omdurman Colony, are being maintained at a cost, excluding drugs, dressings and medical staff, of £E. 2,500, or less than ten shillings a year per leper.

BAHR-EL-GHAZAL PROVINCE.

Li-Rangu Settlement.

The formation of this settlement was commenced in 1929. It is situated approximately 18 miles north of Yambio. A preliminary survey of the district early in 1930 revealed 1,556 lepers, but by the end of June the total admissions had reached 2,700. The medical staff was unable to cope with more and 150 cases which came seeking admission were turned away. The present number under treatment represents 4.3 % of the population of the district and it is estimated that 400 lepers still remain untreated in the district.

The administration of the settlement is conducted on native administration lines. An area is allotted for the followers of each paramount chief, where they settle under a headman of that chief. Relatives accompany their sick and settle with them. Leper orderlies give most of the injections and leper carpenters and blacksmiths are employed. The Chiefs' Court consisting of headmen who are lepers, settle cases and deal with petty offences.

The settlement is self-supporting. Those admitted during the first half of the rains live on their own cultivations, while the later admissions are fed from a communal cultivation.

135 cases deserted during the year.

Source Yubo Settlement.

This settlement is an extension of the old established Sleeping Sickness settlement and one thousand, one hundred and eleven cases were admitted during the year. 22 cases died, 13 deserted and 480 were discharged symptom free. There remained under treatment at the end of the year, 1590.

The administration of the settlement is almost identical with that of Li-Rangu. The chief difference is that, at Source Yubo, patients on admission choose for themselves under which headman they will settle.

In this settlement 105 highly infective cases are isolated in a camp from which relatives are excluded at night. No such isolation exists at Li-Rangu. A comparison of the number of cases contracted among the relatives of the two settlements will, therefore, be of interest in due course.

The estimated number of lepers in Tembura district is 4,000. The majority of these are early skin cases and it seems probable that many of them will undergo spontaneous cure. In order to ascertain the value of the measures adopted to arrest the spread of leprosy, all the lepers in the district who have not yet been admitted, have been, or are being charted. A proportion of early cases are left untreated in their homes, but observed at every Sleeping Sickness inspection; a proportion is kept similarly under observation, but without treatment, in the rather more hygienic conditions of the settlement; and a proportion of similar cases are treated in the settlement. By observation of these it is hoped to calculate the effect of treatment, the effect of improved conditions of living and the proportion of cases which undergo spontaneous cure. Cases in which the disease shows signs of spreading and all cases in children will be treated.

Meridi Settlement.

Meridi settlement is less satisfactory than the previous mentioned settlement, partly because it contains patients from two tribes, Moru and Zande, partly because of the predominance of severely mutilated and therefore helpless cases, and partly because the medical staff is insufficient to give the necessary supervision. With the abolition of Meridi as a station the difficulties will increase. One solution of the problem is to abandon the settlement and move the Zande lepers to Li-Rangu and the Moru lepers to Amadi.

105 old burnt out cases were discharged and 68 symptom free, and there remained under treatment at the end of the year, 202.

Wau Settlement.

There were 144 cases admitted during the year, 35 were discharged and 213 remained under treatment. These come from various tribes. They grow food for themselves and the settlement receives but little Government assistance.

MONGALLA PROVINCE.

In the Sleeping Sickness areas of Mongalla all lepers have been segregated into three colonies at Yei, Kajo-Kaji, and Opari, 101 fresh cases were detected and admitted during the year. 124 were discharged symptom free, 19 deserted 40 died and 699 remained under treatment at the end of the year. These three colonies are self-supporting and have ample food reserves.

DISTRIBUTION OF LEPROSY IN THE SUDAN.

Most of the lepers of the Sudan are to be found in Bahr-el-Ghazal and Mongalla Provinces and the majority of these are being dealt with in the settlements already mentioned in this report.

In the Western district of Bahr-el-Ghazal there are 340 registered lepers untreated and at large. It is hoped to form a settlement for these in due course. Similarly the formation of a settlement in Central Mongalla for some three or four hundred of the Bari tribe known to have leprosy is under contemplation. In the Amadi district of western Mongalla there are believed to be some four hundred cases of leprosy among the Baris and Morus. Dr. Fraser has offered to deal with these from Church Missionary Society funds with a small contribution from the Sudan Government ; 180 were treated in the settlement at Lui. It is believed that there are one or two hundred cases in the Central district of Mongalla, east of the Nile.

Outside these two provinces, Bahr-el-Ghazal and Mongalla, leprosy is comparatively a negligible factor in the Sudan. In the Upper Nile Province there are very few cases. 25 lepers are under treatment at Malek Mission. The tribes most heavily infected are the Atwot and Shish Dinkas. One survey revealed 30 lepers, but conversations with chiefs led to an estimate of 75. These tribes have poor physique and are subject to disease, especially Malaria, Yaws and Guinea Worm. The disease is rare among the Nuers. Of 7,500 inspected in 1929 only two cases were seen. Their physique is good. Among the Shilluks 30 cases were seen in 1928 and 16 in 1929 and the disease, though long established, appears to be definitely on the decrease through an improved standard of living.

Fifteen cases are under treatment at Gedaref and these constitute the majority of the cases in the eastern part of the northern Sudan.

Fifty inpatients and 19 outpatients were treated in the colony at Omdurman. Many of these inpatients were sent from outlying provinces. While the outpatient treatment was very satisfactory, the inpatients were mostly advanced cases with little chance of recovery. The colony is costly to maintain and it is being reduced to meet purely local needs.

In western Darfur there are known to be some lepers, but no survey has been made and no treatment given.

In the Nuba Mountains the natives automatically segregate cases as they occur.

In the most northerly provinces there are known to be some 25 cases.

It can be seen that the majority of the lepers of the Sudan are already under treatment and by the formation of three more comparatively small settlements, all lepers would be under treatment in those areas where the disease is prevalent.

STATISTICS.

Infectivity.

Of 882 lepers treated in Mongalla 12.5 % are connected by close family ties and have always lived together. But of 414 uninfected persons who have lived with their leper relatives for periods of from one and a half to three years while undergoing treatment, only three have contracted the disease or 0.7 %. This suggests that the infectivity of the treated leper is less than that of the untreated.

At Li-Rangu, of 1,644 cases investigated, 35 % were found to be connected by close family ties. In 65 % there was no family history. Figures showing the numbers who contracted the disease from lepers under treatment are not available.

Age Incidence.

Of 1,644 cases at Li-Rangu, the age incidence was as follows :—

1 to 10 years old	7.4 %
10 „ 20 „ „	13.5 %
20 „ 30 „ „	34.0 %
30 „ 40 „ „	33.5 %
Over 40 „ „	11.6 %

Virulence.

The virulence of leprosy varies much in different parts of the Sudan.

In the north, in the few cases that occur, the disease is virulent. Skin leprosy predominates.

In the southern districts the disease definitely increases in virulence from west to east. In the west the majority of the cases are early skin cases. Of the 1,590 cases under treatment at Source Yubo, only 105 were isolated as actually infective.

Proportionately for one mutilated nerve case in Tembura district there are two in Yambio and five in Meridi and the nodular cases are similarly proportioned, while in Amadi district the disease is more acute than in any other. South and south-east of Amadi in the Sleeping Sickness areas the disease is less noticeably virulent and 150 miles east of the Nile it is scarcely seen.

One explanation of this variation of virulence is that the disease has been longer established in the west and in the Sleeping Sickness areas of Mongalla

near the Congo frontier, whereby the people have acquired some immunity. An alternative explanation is that the west has been only recently invaded and the majority of cases are early infections. The course which the disease takes in those early cases under observation without treatment should elucidate this point.

It is remarkable that two thirds of the lepers of the whole Sudan are of the Zande tribe which numbers only about 140,000 persons, while the population of the Sudan is nearly 6,500,000.

The Zandes are a purely agricultural people, without flocks or herds of any sort. Milk is unobtainable. Their sole meat supply is that which is obtained by hunting, and for more than half the year is unobtainable. They are always craving for meat and will eat it in any stage of putrefaction. They are, nevertheless, a well nourished and sturdy people, for, though improvident and lazy, they can subsist on the abundant local forest foods during periods when their cultivations have proved temporarily inadequate.

Their general health is good. They suffer but little from the commoner African diseases, Yaws, Scabies, Malaria, Ankylostomiasis. Syphilis, though once prevalent, has been brought under control. They are almost naked ; the men wear a loin cloth made of bark and the women a similar covering of leaves. They are cleanly people who wash themselves frequently in the abundant streams. Their houses are less overcrowded than the average of the Sudan. The only obvious habit that could contribute to the spread of leprosy among them is that of promiscuous intercourse. They themselves attribute the cause of leprosy to eating red flesh, especially that of pig, leopard, giraffe, snake, monkey, and rat.

TREATMENT.

Alepol.

Treatment has been almost entirely by Alepol in doses which have reached as much as 8 c.c. of a 6 % solution. The concensus of opinion is that the dose originally recommended, i.e. 5 c.c. of 4 % solution is inadequate. The intravenous route has been that most commonly used. In Mongalla, intramuscular Alepol proved satisfactory. Subcutaneous Alepol, even with the addition of Novocain, has produced in all cases much pain. Results from intravenous Alepol appear as good as those from intramuscular or subcutaneous routes, the only obvious disadvantage is the common thrombosis of veins.

Course of weekly injections lasting three months followed by a rest has been the rule. This has entailed giving 400 injections at Li-Rangu every day of the week.

Trichloracetic Acid applied locally to patches has proved a useful adjunct and is popular. Hydnocarpus oil has proved to be the best dressing for ulcers.

Hydnocarin.

One nodular case was treated with this preparation. In three months many of the smaller nodules had completely disappeared, while the very large nodules were reduced to less than half their original size and were visibly scarring up. Further trial is needed with this drug which appears to be the best yet produced.

Solganol.

13 cases were treated with this drug with indifferent results.

THE SOLUTION OF THE LEPER PROBLEM IN THE SUDAN.

Almost five sixths of the lepers of the Sudan are being dealt with satisfactorily and at a very low cost by segregation in leper settlement in southern Bahr-el-Ghazal and southern Mongalla. In these settlements the patients lead their normal lives with their relatives. This course has been made possible by the measures previously adopted for Sleeping Sickness which familiarised the people with medical treatment and strict segregation. The tribes concerned are exceptionally tractable.

Nearly half the remaining lepers of these two provinces are under treatment in settlements at Wau and Amadi.

Three more settlements are required, one at Raga and two in the Central district of Mongalla east and west of the Nile, to provide treatment for the rest of the lepers of these provinces. The financial state of the country does not permit this at present, but an experiment is being tried in the Bari country of Mongalla whereby the local chief has been encouraged to form a colony of lepers in the neighbourhood of a dispensary where treatment can be obtained. That is possibly the solution of the problem of leprosy in the rest of the Sudan ; with the co-operation of the native administration to form clusters of lepers living their normal lives with their relatives round the nearest dispensaries, and in the bigger towns to encourage the people to attend hospital as outpatients.

The trouble in the past has been that leprosy has been regarded as an incurable disease. Patients seldom came for treatment till the disease was far advanced, partly through fear of segregation, partly through lack of confidence in treatment.

Alepol causes early cases to react to treatment quickly. At the Church Missionary Society hospital at Omdurman there are now 19 outpatients attending regularly with satisfactory results.

The outlook is more promising than it has ever been. The extirpation of leprosy appears to be possible, and to depend largely on the education of the native administration in its hygienic obligations.

(10.) MALARIA.

Malarial conditions may be considered to have been favourable during the year.

From the point of view of malaria the Sudan can be divided roughly into four zones :—

(i) A northern zone approximately north of the 18th. parallel where there is little rainfall and where any malaria that occurs is due to the rise and fall of the Nile. In ordinary years there is little serious malaria to anticipate beyond sporadic outbreaks that are liable to occur in certain places with the falling Nile generally in March and April. In years of exceptionally high Nile, however, general epidemic conditions may occur either at high Nile or on the falling Nile. During 1930 the Nile was moderate and only sporadic outbreaks occurred.

(ii) A north-central zone from the 18th. parallel south to the 15th. parallel where malaria conditions depend both on the river and the rains. In this zone there is generally a rise of malaria incidence in August and September due to the rains and in March and April due to the fall of the river. In 1930 both river and rains were moderate and epidemic conditions did not occur.

(iii) A central zone from 15th. parallel to the 12th. parallel where malarial conditions depend to a predominating extent on the rains. In this area malaria is usually epidemic or sub-epidemic in August and September, but if the rains are heavy, epidemic conditions may become widespread and severe, and extend to the end of the year. The characteristic of this zone is that malarial conditions, unless prolonged by irrigation or some other extraneous factor always die down by the end of the year and the population has eight non-malarial months in which to recover.
The rains in 1930 were moderate and malaria was only mildly epidemic.

(iv) A southern zone from the 12th. parallel south to the Uganda border where malarial conditions coincide with a prolonged rainy season and where in many areas owing to marshy conditions malaria may be said to extend throughout the year. In this area, although variations in intensity do occur from year to year, malarial conditions are always severe and such variations are rarely sufficiently noticeable to deserve record.

The Red Sea Littoral may be considered a non-malarial area. Any cases of malaria that occur there can almost always be traced to previous infection.

An attempt has been made to obtain figures as to the predominance of Benignant, Malignant and Quartan Malaria in different provinces and at various times of the year.

The statement given below shows the proportion in each month of infections with each of the three types of parasite :—

	January	February	March	April	May	June	July	August	September	October	November	December	Total
KHARTOUM PROVINCE.													
B.T.	3	3	—	1	2	—	—	—	3	1	—	—	13
M.T.	1	1	—	—	4	—	1	1	2	1	1	—	12
Q.	—	—	—	—	—	—	—	—	—	—	—	—	—
Mixed	—	1	2	1	2	—	—	—	—	—	—	—	6
BERBER PROVINCE.													
B.T.	4	—	2	5	3	3	4	7	3	3	1	1	36
M.T.	6	2	3	12	4	4	8	3	4	4	1	2	53
Q.	—	—	1	—	1	3	—	—	—	—	—	—	5
SENNAR MERKAZ													
B.T.	11	5	4	5	13	6	12	19	22	4	4	8	113
M.T.	6	6	7	13	17	11	5	8	25	5	10	7	120
Q.	1	2	—	—	—	—	—	1	—	—	—	—	4
WAD-MEDANI.													
B.T.	19	12	13	16	14	9	14	7	18	29	14	11	176
M.T.	16	3	2	4	4	2	3	—	2	8	12	19	75
Q.	1	—	—	—	—	—	1	—	—	—	—	—	2
UPPER NILE PROVINCE.													
B.T.	82	30	22	23	17	28	25	54	181	28	25	23	538
M.T.	8	3	3	2	1	—	2	2	4	2	7	18	52
Q.	—	—	1	1	—	—	3	4	—	—	—	—	9

The following additional information is given as to proportion of infections with the three types of malaria parasite, but without indication as to the time of year :—

El-Dueim. (White Nile Province).

789 blood examinations, positive 72.
B.T. 71
M.T. 1

The single M.T. case was from El-Dueim town, the rest from villages.

Kassala.

Out of 111 positive slides :—
B.T. 107
M.T. 4

Kordofan.

B.T. 64 %
M.T. 28 %
Q. 8 %

Mongalla.

A series of children under 5 years of age with enlarged spleen from the Bari, a riverain tribe, were examined, all the films were positive.

B. T. 64 %
M. T. 23 % (17 % crescents)
Mixed 13 %

It would be interesting to know if in an inland tribe which had been less in contact with the river traffic the proportion of Malignant infection would be lower.

Roseires. (Fung Province).

Just south of 12th. parallel, 70 positive slides showed :—

B. T. 70
M. T. 0

Upper Nile Province.

Examination at Malakal hospital throughout the year shows :—

B. T. 538
M. T. 52
Q. 9

Examinations at Malakal in August, September and October show :—

B. T. 36
M. T. 1
Q. 1

Examinations in February and March (dry season) in the Nuer Concentration area.

In 1930, 200 slides examined gave :—

B. T. 20
M. T. 0

In 1929, 200 slides examined gave :—

B. T. 50
M. T. 4
Q. 6

At Yirrol in December and January 556 slides from children from 1-12 years old with enlarged spleens showed :—

B. T. 470
M. T. 20

The Medical Inspector who carried out this and the other surveys in the Upper Nile Province points out that these 20 Malignant Tertian infections were almost in every case in peddlers or merchants from northern provinces. He suggests that the malignant parasite is very uncommon in the Upper Nile Province outside towns and Government stations and that this infection has been introduced from the north.

Quartan Malaria in the Upper Nile Province appears to be restricted to a limited area where the Zeraf and Sobat rivers empty themselves into the Upper Nile river and for a short distance up each of these first two rivers.

It is interesting to note that the highest proportion of malignant infections are found in Khartoum and Atbara, both with very mixed populations.

Khartoum :—

B. T.	27
M. T.	52
Mixed	1

Atbara :—

B. T.	36
M. T.	53
Q.	5

Sennar also shows a slight preponderance of malignant infections.

In the southern provinces there appears to be a very definite preponderance of benignant infections.

More numerous blood slide examinations throughout the year on persons coming from various parts of the province are needed to elucidate this matter.

It will be seen that except in the case of Wad-Medani and the Upper Nile there is no indication from these figures of any of the types occurring more frequently at one time of the year than the other. The Wad-Medani and Upper Nile figures would seem to indicate a preponderance of malignant parasites in November and December 1930 and January 1931.

The film examinations carried out in the Blue Nile Province at the end of 1929 and early in 1930 show considerable variation in the proportion of benignant and malignant infection, but they seem to depend on the place rather than the time of the year. It must be remembered that in Wad-Medani town and in the irrigated area the population is very mixed and the nature of malarial infections cannot be taken as characteristic of the locality.

The following are the parasite rates taken during the winter 1929-1930 :—

Locality.	Month.	B.T.	M.T.	Q.	Mixed.
Hillat Ibrahim	September, 1929	32.8	67.2	—	—
	October	44.44	44.44	—	11.11
	November	66.3	35.0	—	2.0
Shukharba el Shardini ...	,,	46.3	30.0	2.1	26.1
Wad-Mahmud	,,	58.0	36.0	—	26.0
Hamad-el-Nil	,,	62.0	31.0	—	7.0
Wad-el-Hindi	,,	53.5	38.2	—	6.8
Sureiba	December	22.0	34.1	3.0	21.2
Wad-el-Maak	,,	10.7	75.0	3.5	10.7
Wad-el-Khawala ...	,,	19.0	83.9	—	—
Wad-Mahmud	,,	13.0	56.0	8.7	21.7
Wad Ashae	January, 1930	14.2	62.0	—	23.8
Habbunea	February	33.0	33.3	33.3	—
Wad Bokhari-el-Gideed ...	,,	71.44	14.28	14.28	—

Malakal. (Upper Nile Province).

Mosquitoes.

In all catches made in this town in August and September, Culicine exceeded Anopheline varieties in the proportion of approximately ten to one.

Mansonia Uniformis was the predominating species of Culicine mosquito.

The following species of Anopheline mosquitoes were identified. They are given in the order of density :—

(i) Anopheles Pharoensis.
(ii) A. Funestis.
(iii) A. Costalis.
(iv) A. Wellcomei.
(v) A. Rhodesiensis.
(vi) A. Synamosus in small numbers.

A. Wellcomei is carried down on islands of sudd (densely-growing river reeds).

The Malaria carriers are probably the first three.

Repeated attempts to infect A. Wellcomei have so far failed.

Great difficulty was experienced in keeping mosquitoes alive in captivity in this province.

Malarial Infections.

Blood films from 101 cases of splenic enlargement in children were examined. 38 of these were positive ; four of these showed B. T. rings, 34 showed B. T. gametocytes, one showed M. T. gametocytes and one quartan gametocyte. In two cases only were B. T. rings and gametocytes found present in one film.

Many or most of these children had probably been taking quinine and this would account for the heavy preponderance of gametocytes over ring forms.

The average splenic index for children during August and September is 30 % and probably most of these harbour B. T. gametocytes.

Yirrol. (Upper Nile Province).

A survey of the malarial conditions at Yirrol was carried out by a Medical Inspector in the Upper Nile Province. Yirrol is an administrative centre situated on the edge of a small lake, it lies to the east of the Bahr-el-Jebel Nile some 40 miles from the river and its latitude is approximately 6.30 N. The investigation was carried out in December, 1930 and January, 1931.

The following points, aś being of more general interest, have been extracted from the report.

Splenic index and parasite infections.

These were taken in Yirrol itself and in 10 neighbouring villages. The villages can be divided in three classes :—

(A) Actually on the lake.
(B) Near to the lake or on a Khor.
(C) On higher ground at a distance of some miles from the lake.

The splenic count was carried out on all children from 1 to 12 years of age and blood slides were taken from all with enlarged spleens.

The second and third columns show the percentage of benignant and malignant infections in the slides examined.

The results were as follows :—

	Splenic Index.	B. T.	M. T.
	per cent.	per cent.	per cent.
(A) Yibi	80	45	—
Aromnyel	80	35	5
(B) Yali	60	45	10
Aborotet	60	45	—
Mallaise	60	55	—
(C) Magung	55	60	—
Ayam	40	30	—
Kilowan	35	50	—
Luilnyem	36	60	—
Gultoin	50	45	5
Yirrol :—Police lines	55	50	—
Reservists	70	50	10
Town population	60	40	10

The preponderance of benignant infections is striking.

A double infection with B. T. and M. T. was observed in 5 % of positive slides only.

Mosquito Density.

Catches of mosquitoes made at Yirrol showed the following percentages of Anopheline and Culicine species.

	per cent.
Anopheline Funestis	80
,, Costalis	2 or 3 only
Culicine species	20

On a visit to Yirrol in early September, 1930, Anopheline costalis was found to be as prevalent as Anopheline Funestis.

On dissection 4 per cent. of Anopheline Funestis were found to be infected. This was believed to be below the true infection rate.

Investigation of the habits of Anopheline Funestis indicated that the females were impregnated at the breeding ground, sought human habitation and remained there till ready for oviposition.

Indoors they bite freely all day, but they do not appear outside till dusk. In the open the feeding time seems to be restricted to the hours from dusk to dinner and again just before dawn.

(11) MALTA FEVER.

Twenty six cases of this disease were reported, against 27 cases in 1929, 12 cases in 1928 and 16 cases in 1927.

The distribution of the cases was as follows :—

Blue Nile Province	7
Darfur ,, ...	1
Khartoum ,, ...	2
Kordofan ,, ...	2
Kassala ,, ...	3
Red Sea Littoral	6
Upper Nile Province	3
White Nile ,, ...	2

It is possible that with increased laboratory facilities and improved diagnosis the number of cases reported will increase during the next ten years, but it is customary throughout the Sudan except among the Hamitic and Negroid tribes to boil all milk immediately after milking and this is likely to act as a deterrent to the spread of the infection. This habit is most likely to be transgressed by town dwellers who keep a goat on the premises which is liable to be milked in a hurry at irregular hours.

It is noticeable that in 1929 twelve cases occurred at Kassala where the population is Hamitic. In 1930 three cases occurred at Kassala and six in the Red Sea Littoral, where the population is also Hamitic.

(12) NEW GROWTHS.

A total of 438 cases were admitted for new growths. Of these 266 were simple and 172 were malignant.

The growths were classified as follows :—

(i)	Carcinoma...	34
(ii)	Sarcoma	21
(iii)	Unclassified	383

The following are the number of persons admitted with malignant growths compared with the total admissions to the fourteen most important hospitals during the last two years :—

Year.	No. of cases.	Total No. of admissions.	Per cent.
1929	86	28,238	0.304
1930	106	26,045	0.407

Carcinoma of the intestinal tract is rare among these cases while carcinoma of the breast and epithelioma are relatively common.

The tribe was recorded in 38 of the cases admitted for malignant disease to hospitals in the northern and central Sudan.

Of these 38, 24 were Arabs and 14 were negroid. The numbers are too small to draw any conclusion, but as the Arab population is greatly in the majority in this part of the Sudan the figures would seem to suggest that the disease is at least as common among negroids as among Arabs.

(13) RABIES.

The following provinces have been infected with canine Rabies during the year :—

Darfur.
Kassala.
Khartoum.
Kordofan.
White Nile.

Four cases died of Hydrophobia. They are as follows :—

(i) A native girl of six years who was sent to El-Obeid for treatment from Darfur. She died on arrival 42 days after infection.

(ii) and (iii) Two cases died in Darfur. A baby, a native of Darfur, was bitten by a rabid dog, she in turn bit her mother and both died of Hydrophobia.

(iv) The fourth case, a native of the White Nile Province, was bitten in the face on November 27th. He was sent into Khartoum for treatment ; but on December 20th. after he had returned to his village he developed Hydrophobia.

Precautions.

Every effort is being made to keep down the number of uncared for or unneeded dogs and of hyenas and jackals. The transport of dogs by train and steamer is being carefully regulated. Officials and others have been informed as to the early symptoms of rabies and instructed to keep their animals under careful observation for these symptoms.

Treatment.

Treatment is by Glycerinated vaccine and supplies of vaccine are stocked wherever ice is available.

An ice machine has been installed at El Fasher hospital so that treatment can now be given there and the long journey to El-Obeid is thus obviated.

Protective treatment was given to 104 persons who had been bitten by or had been in close contact with rabid dogs.

(14) RHEUMATISM.

Ten cases of this disease are reported from Omdurman. The Medical Inspector in charge makes the following observation :—

" As it has frequently been stated that Rheumatism is rare or unknown in the tropics the following list of cases may be of interest. Unfortunately, no specific test for the disease exists, but the cases reported as acute articular Rheumatism were carefully examined to exclude Gonorrhoea infection and their condition was improved by Salicylates in the usual way. All the cases were Sudanese except one of the cardiac cases who was a Syrian girl born and brought up in Omdurman. The series is too small to form the basis of any useful statistical study."

	cases.
Acute Articular Rheumatism	7
Chorea	1
Mitral disease	2

(15) SCURVY.

A total of 83 cases of this disease occurred in the course of the year.

Twenty nine cases occurred in Kassala between August and October among the Abyssinian population at this place. This is a floating population of Abyssinian immigrants who come across the border in Kassala to earn money and return to their own country. Their standard of life and nutrition is in any case extremely low and if any scarcity occurs they are the first to suffer. At this period their diet was restricted to unleavened bread of millet and water.

Sixteen cases occurred at Kai Bui on the Zeraf river among Nuer hostages repatriated from Malakal. This was due to shortage of milk, and an addition of milk to the diet of affected persons relieved the condition. This is reminiscent of a more severe outbreak among Nomads in the southern part of the Red Sea

Littoral in 1929 which was due to shortage of milk due to a severe drought. These nomadic tribes eat little or no green vegetables and are dependent on milk for anti-scorbutic vitamin ; if their milk supply is interfered with they readily fall victims to this disease.

Twenty five cases occurred in the Blue Nile Province. These cases were almost entirely among westerners, chiefly from Darfur and Kordofan. These westerners live very largely on millet and for vegetables depend on the wild vegetables that are lacking towards the latter part of the dry season.

The other 13 cases were sporadic cases scattered over the Sudan and due to individual deprivation and not to local conditions of life.

(16.) SLEEPING SICKNESS.

BAHR-EL-GHAZAL.

Tembura District.

Major J. R. N. Warburton, M.C., relinquished the post of Senior Medical Officer, Sleeping Sickness, Source Yubo, and was succeeded by Dr. A. Cruickshank.

The admissions for the past thirteen years are shewn below:—

	Source Yubo	Yambio.	West. Dist.
1918	255	—	—
1919	621	—	—
1920	192	—	10
1921	656	—	2
1922	434	—	3
1923	839	4	—
1924	276	14	—
1925	203	6	1
1926	79	—	3
1927	49	3	—
1928	26	2	1
1929	18	—	—
1930	37	1	—
TOTAL	3,685	30	20

The increase in the admissions for 1930 demonstrates the importance of maintaining thorough inspections of the people.

In 1929 owing to a re-organisation of the Southern districts for administrative reasons, a situation arose which caused many people for the time being to absent themselves from inspections. A number of cases, therefore, remained undetected and in due course infected "fly." If inspections had not been restored to their former efficiency there can be little doubt but that a serious outbreak would have resulted.

Source Yubo Settlement.

There were 71 deaths from sleeping sickness in the settlement during the year.

882 patients remained under treatment on 31st December, 1930.

Of the first 1,000 cases admitted during the years 1918 to 1920, 41.5 per cent. are still living.

The chronicity of the disease is exemplified by the re-admission rate. Of 334 cases discharged in 1923 with no symptoms after 3 to 5 years' treatment, 36.7 per cent. had to be re-admitted, and of 593 cases discharged under the same conditions in 1928, 11.3 per cent. have been re-admitted with symptoms.

Yambio District.

There were no indigenous cases in Yambio district. The one case found had deserted to the Congo and returned.

When the people of southern Bahr-el-Ghazal were concentrated on to the roads for sleeping sickness control, those of Tembura district were spaced out along the roads, while those of Yambio district were put into villages of 1,000 people or more. This concentration into villages appeared to cause a high incidence of dysentery ; therefore a number of villages were broken up during 1930 and the people spaced out along the roads. The roads were not cut with the intention of inhabiting them. The drinking places, therefore, in many cases cannot be rendered fly-free without great labour, but since the incidence of the disease both in and adjoining the district is almost negligible, these new drinking places have in many cases been left uncleared. If an outbreak occurs the roads will need to be adjusted.

Western District.

There were no cases in the Western district.

MONGALLA PROVINCE.

In spite of the heavy infection along the southern boundary of the Province both in Uganda and the Belgian Congo, no indigenous cases were found in any district. Seven cases were detected and admitted, two to Kiripi Camp, five to Kajo-Kaji. These seven cases were sent back from Aringa in Uganda where they contracted the disease, and were of those Madi, Kakwa and Kuku who ran away to Uganda about two years ago.

To prevent the disease from again becoming indigenous and epidemic in the Sudan, it is essential to maintain an adequate medical staff to catch the cases which filter in from Uganda before they have time to infect the local fly.

Statistics.

During 1930, 29 cases were discharged cured and six died.
There remain under treatment on 31st December, 1930 :—

Yei	3
Kajo-Kaji	46
Opari	23
TOTAL	72

Of the 1,705 cases found in Mongalla Province since 1911, 996 died and 575 were discharged as cured after five or more years treatment, of whom 29 had to be re-admitted with signs of the disease.

The relapses after treatment have been very much fewer in Mongalla than in Bahr-el-Ghazal. This appears to be due to three causes :—

(i) Owing to the smaller numbers in Mongalla, greater attention could be given to treatment of individuals.

(ii) Mongalla was administratively in advance of Bahr-el-Ghazal and therefore cases were found in an earlier stage of the disease.

(iii) The initial period of treatment before discharge was longer in Mongalla than in Bahr-el-Ghazal.

The total admissions for the Sudan since 1911 number 5,493.

The outstanding facts which emerge from a study of Sleeping Sickness in the Sudan over a period of twenty years are :—

(a) The disease is extremely chronic with a tendency to relapse after a period of more than five years' treatment with apparent cure.
(b) There is a mortality rate of 60 per cent.
(c) The average life of treated patients who died is four years.
(d) When conditions prevail which prevent the early detection of cases, there is a rapid increase in the incidence of the disease.
(e) The disease can be completely eradicated and the conditions of the people improved in the process.

(17.) TUBERCULOSIS.

A total of 708 persons were admitted to hospital for this disease. Of these 66 were not natives of the Sudan.

Of the total, 408 were suffering from Pulmonary Tuberculosis and of these 68 died, *i.e.*, 16 per cent. of Pulmonary cases died within a year of first attendance ; the remaining 300 were suffering from other forms of the disease.

Table " A " shows the total number of admissions for Tuberculous disease of all kinds for each of the years 1918 to 1930 and the percentage rate of Tuberculous cases in relation to the total admissions for each of these years :—

TABLE " A."

1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
216	191	219	220	234	251	290	292	371	404	397	624	708
Percentage of total admissions rate.												
1.5	1.4	1.3	1.35	1.38	1.46	1.46	1.46	1.71	1.55	1.57	1.35	1.42

Table „ B " shows the total number of Pulmonary and non-Pulmonary Tuberculosis, separately, since 1922, and their percentage incidence relative to total admissions :—

Table " B."

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Pulmonary	140	123	159	135	175	226	260	302	408
Non-Pulmonary	94	128	131	157	196	178	237	322	300
Percentage of total admissions.									
Pulmonary	.82	.72	.80	.62	.80	.86	.82	.65	.81
Non-Pulmonary	.56	.74	.66	.84	.91	.69	.75	.70	.61
TOTAL	1.38	1.46	1.46	1.46	1.71	1.55	1.57	1.35	1.42

A study of the percentage rates in the various provinces shows Dongola as most heavily infected with 4.30 and Halfa next with 4.02. Both these provinces send many emigrants to work as servants or office messengers in Cairo and Alexandria and many of them return with Tuberculosis.

In the case of Halfa, out of 23 cases of Pulmonary Tuberculosis, 12 were contracted in Egypt and of these, four were removed from the ship on which they had returned direct to the hospital where they died. Two other cases caught the disease living in houses with the Egyptian cases.

The next most heavily infected province was Khartoum with a percentage of 2.95 but, out of a total of 83 Khartoum cases, 41 contracted the disease in other provinces of the Sudan and 5 were foreigners. 30 of the Khartoum cases died in the same year they were notified.

More detailed returns have called attention to the large number of foreigners affected with this disease, *i.e.*, 66. This is particularly the case in Kassala Province where, out of a total of 39 cases, 22 were foreigners, most of them from Eritrean and Abyssinian territory. The milk drinking Nomad Arabs of Kassala Province—the Hadendoa, Shukria and Rasheida—seem to be singularly free from this disease.

Speaking generally it is seldom the local cultivator or the nomad herdsman who suffers from Pulmonary Tuberculosis but rather the casual labourer or peddler, often from some other part of the Sudan and not uncommonly a foreigner. Such persons are often in receipt of good wages, but they keep them to send home or else spend them on drink. They are, for the most part, badly nourished and badly lodged.

At Omdurman efforts have been made to keep in touch with 95 cases of Pulmonary Tuberculosis that have been notified during the last four years. The results are shown below :—

TABLE " C."

Year.	Cases notified.	Lost trace of.	Died.	Remaining.
1927	24	8	8	8
1928	22	10	8	4
1929	16	6	5	5
1930	33	4	15	14

In all 67 cases have been followed up and of these 36 have died, five are " cured," 15 are in fairly good condition and in 11 the disease is active and the prognosis bad. " Cured " must be interpreted with some caution as one of the five cases reported as " cured " in last year's report, died six months later.

The Medical Inspector of Omdurman Hospital reports a series of 50 cases of Pulmonary Tuberculosis treated by Phrenic Evulsion during the last four years. It was only possible to follow up 29 of the cases and of these 13 have improved, nine have died and seven are worse. These figures are included in Table " C" above. They are more favourable then the amalgamated figures given above.

TUBERCULOSIS IN THE SOUTHERN SUDAN.

Upper Nile Province.

Two sections of the Nuer tribe were again concentrated in a definite area between the Pibor, Sobat and Zeraf rivers. A population of 23,700 were thus concentrated. They were all within easy reach of medical assistance and this was freely made use of. All persons seeking medical assistance were systematically examined.

The result of this examination, as regard Pulmonary Tuberculosis, for the two sections was as follows :—

	Pulmonary.	Glandular.	Bones and Joints.
Mor	9	4	1
Gaweir	—	—	1

The disproportion of the infection in the two sections is marked. It is interesting to note that the nine cases of Pulmonary Tuberculosis all occurred in one Shyeng (a tribal subdivision) and three cases occurred in one family. This Shyeng had recently been reconstituted from elements that had been hangers on at Akobo station and this was probably the source of infection.

The total infection rate appears to be very low. This is confirmatory of the observation made last year when, in a total of 5,900 Nuers examined, no cases of Pulmonary Tuberculosis, and eight cases only of bone and joint disease were found. It is probable that this freedom is due to lack of exposure to infection and not to any immunity. This view is supported by the occurrence of nine cases of Pulmonary Tuberculosis in one subdivision while the rest of the two sections were free from Pulmonary infection, and this is also in accordance with the occurrence of ten cases of Pulmonary Tuberculosis among 404 Nuer prisoners who were detained in a camp outside Malakal (see last year's report.)

Observations carried out among the Shish-Dinkas and the Shulluk,mentioned in last year's report, show that among 30,000 Shish-Dinkas, two cases of Pulmonary Tuberculosis were found and that among 90,000 Shilluks, 23 cases of Pulmonary Tuberculosis and 22 cases of non-pulmonary Tuberculosis were found.

The Shish-Dinkas have been little exposed to infection but the Shilluk tribe, lying further north and of more settled habits, has come more in contact with infection and with regard to this latter tribe cases of Pulmonary infection could generally be attributed to close contact with a town or Government station.

The admissions to Malakal Hospital show 17 cases of Pulmonary Tuberculosis with seven deaths. They were apportioned among the various tribes as follows :-

Tribe.	Cases.	Deaths.
Shilluk	7	3
Dinka	5	2
Nuer	3	2
Anuak	1	—
Nubawi	1	—

Eleven cases of non-pulmonary Tuberculosis were also admitted to Malakal Hospital.

It would appear then that the natives of the Upper Nile Province are at present very slightly infected with this disease. The Shilluks have been most

exposed to infection and show the heaviest infection rate. The Nuers, and to a less extent the Dinkas, owing to their isolation and their nomadic life as essentially pastoral people, are little exposed to infection and any infection is unlikely to spread outside the tribal subdivision infected. There is evidence, on the other hand, to indicate that the Nuers fall victims to infection when exposed to it under devitalising or depressing circumstances.

The question as to the spread of Tuberculosis among these tribes calls for further careful inquiry. The von Pirquet test is being carried out on all admissions to Malakal Hospital and it is hoped that in this way some indication as to the susceptibility of the various tribes will be obtained.

Mongalla and Bahr-el-Ghazal.

Only one case of Pulmonary Tuberculosis and eight non-pulmonary cases have been reported from Mongalla Province and four pulmonary and sixteen non-pulmonary cases are reported from the Bahr-el-Ghazal Province. No systematic search for this disease has been carried out in these provinces, but in the Sleeping Sickness areas the population has come under close scrutiny over a period of 12 years and it is difficult to believe that a large number of cases of Tuberculosis would have escaped observation in these areas. It is reasonable to believe that up to the present the natives of these provinces, at any rate in the Sleeping Sickness areas, have escaped any wide infection with this disease. There is no indication to show what resistance to this disease they will display when exposed to infection.

No cases of Bovine Tuberculosis in cattle have been reported in these three southern provinces nor, indeed, in the rest of the Sudan.

Kordofan (Nuba Mountains District).

The hills in this district are inhabited by the Nubas, a negroid race about 12,000 in number while the plains are inhabited by cattle-owning Arabs. The two races, as a result of the peaceful conditions established tend to mix to an increasing extent.

The Senior Medical Inspector of the province comments on the almost complete freedom of the Nubas from Tuberculous disease while their Arab neighbours, more resistant to all other diseases, are not exempt from Tuberculous infection.

GENERAL REMARKS.

It is thought that much could be done to prevent the spread of this disease by continued insistent propaganda among the tribal leaders great and small as to the infectious nature of the disease and the need for relative isolation, *i.e.*, no one to share a hut, to eat, or to smoke with an infected person ; a prohibition which should also apply to leprosy.

Speaking more generally. The preservation of these negroid races from becoming seriously infected with Tuberculosis would seem to depend on the preservation intact of their tribal organisation and on the strengthening of tribal authority and control. The detribalised native who becomes a casual labourer or a hanger-on in a town or Government station readily falls a victim to this disease, and if such a man can easily rejoin his tribe and become reabsorbed into the tribal life he is likely to become a serious focus of infection. The case referred to above of the infection of a Shyeng (a tribal subdivision or group) reconstituted from detribalised elements at Akobo station is an illustration of the danger of such detribalisation and reabsorption.

(18) TYPHOID FEVER.

A total of 73 cases of Typhoid and Para-typhoid fevers were reported as against 86 in 1929, 132 cases in 1928 and 52 cases in 1927.

The principal decrease was in Khartoum Province where 32 cases occurred as against 56 cases in 1929.

The following list shows the distribution of the cases :—

	Cases.
Berber Province	2
Blue Nile ,, ...	9
Dongola ,, ...	2
Fung ,, ...	1
Halfa ,, ...	1
Kassala ,, ...	3
Khartoum ,, ...	32
Kordofan ,, ...	2
Red Sea Littoral	6
Upper Nile Province	8
White Nile ,, ...	7
TOTAL	73

(5.) PROGRESS IN MEDICAL WORK.

(a) GENERAL.

Marked progress has been made in the further development of medical work. This is indicated by an increase of :—

Inpatients	3,878
Outpatients	1,165,833
Operations	1,173

This increase is due to :—

(i) Increased confidence on the part of the natives and a consequent increase of attendances at existing hospitals and dispensaries.
(ii) The establishment of new hospitals and dispensaries in regions where the natives had been out of reach of medical assistance.

Progress has also been made in certain areas in the alteration of the character of the work performed. In the southern areas a large number of the patients treated at dispensaries and hospitals have been cases of Yaws and, Syphilis, and Tropical Ulcers with their manifold consequent deformities.

The cases of Yaws requiring treatment have, and will continue to decrease as the result of the systematic work carried out to ensure the treatment of all infectious cases, and thus to prevent the spread of the disease. This is most noticeable in the Upper Nile Province where in spite of increasing medical penetration the Yaws cases treated have decreased by nearly 1,900. Similarly with regard to Tropical Ulcers, the institution of Chiefs' dressers, ensuring as it does the early treatment of abrasions and wounds, is beginning to make itself felt in this respect. This is particularly noticeable at Dilling hospital where the character of the work has completely changed. The large number of ulcer cases which used to form the main part of the work have largely disappeared and their place is being taken by other classes of cases which have not previously come for treatment in this district.

(b) ESPECIAL PROGRESS IN CERTAIN PROVINCES.

It is interesting to notice that the greatest increase in out-patient work is shown in two of the provinces of the northern and central Sudan. The Blue Nile and Berber Provinces which have both considerably more than doubled their outpatient work (see Table IX page 125). Other large increases are recorded by Dongola, Kassala and Kordofan Provinces in the northern and central Sudan and by Mongalla Province in the southern Sudan.

In Darfur there has been a definite consolidation of work. The epidemics of Relapsing Fever and Small-Pox which have caused such heavy losses of life have been brought under control and the hospitals and dispensaries which have been largely occupied by epidemic work are free now to devote themselves to the routine medical work of the province. The province is now provided with one central hospital, two smaller subordinate hospitals and 12 dispensaries, and

a further three dispensaries have been approved for construction. When these three additional dispensaries have been provided medical assistance will have been placed within reasonable reach of all the natives of this province.

A special development in this province is the number of inpatients that are treated at the dispensaries. Grass wards have been erected by the Local Authorities and in some of the dispensaries as many as 20 or 30 inpatients are accommodated in these wards. These are patients who need regular treatment and who are too far from, or are unable to make frequent journeys to, the dispensaries.

Kordofan.

With the exception of Dongola in the northern and the Blue Nile Province in the central Sudan, in both of which the system of central hospitals, secondary hospitals and dependent dispensaries is highly organised, Kordofan with an area of 147,000 square miles and with a population of over a million shows the most complete organisation of hospitals and dependent dispensaries. There is a central hospital at El-Obeid, subordinate hospitals at El-Nahud, Dilling, Kadugli and Talodi, and 14 dispensaries dependent on the central or on the subordinate hospitals, and also reporting to these dispensaries are a number of Sheikhs' dressers and Chiefs' dressers. As a result of this organised network of hospitals, dispensaries and dressers few cases that need and desire treatment fail to obtain it at the hand of a dresser, at a dispensary, or at a hospital, according to the needs of the case. Similarly, any case of infectious disease is immediately reported and at one and the same time dealt with. It is a striking fact that, although continually exposed to infection from the epidemics that have ravaged the neighbouring province, these diseases as soon as they have established a foothold have been discovered and immediately dealt with and eradicated. It is noteworthy that the organisation that has been so successful in Kordofan and other Sudan provinces is now nearing completion in Darfur.

(c) BUILDINGS.

The following additions were made to buildings during 1930 :—

Bahr-el-Ghazal Province :—

Li-Rangu.

New hospital in red brick consisting of operating theatre, sterilizing room dressing room, surgical ward, dispensary, office, outpatient room, drug store and equipment store.

House for Senior Medical Inspector in granite and red brick.

Meridi.

Three brick wards.

Wau.

Administrative block.
Operating theatre and storeroom block.
24 bedded ward.
House for Medical Officer.

Berber Province :—

Zeidab.

Two tukls, quarters for the Dispensary Hakim (built by the Sudan Plantations Syndicate).

Fadlab.

Garage for sanitary van.

Darfur Province :—

El-Fasher.

Six red brick tukl wards (each 6 beds)
Operating theatre block (Theatre, anaesthetic and preparation rooms).
Disinfector and Incinerator.
Ice Plant.
Improvements to 2nd. class ward.
(Verandah and Mustaba).
Conversion of bath house to pack store.
Tiled floors in military wards in defended area.
Conversion of old theatre to bacteriological laboratory.

Geneina.

New hospital consisting of operating theatre, office and store block.
Outpatient Department.
Six red brick tukl wards (each 6 beds).

Geneina Town.

Red brick dispensary (built from Native Administration Funds).

Nyala.

Four red brick tukl wards (each 6 beds).

Zalingei.

New dispensary consisting of operating room, office and store block.
Three red brick tukl wards (each 6 beds).
Kitchen and wash-house.
House for Medical Officer.

Um-Buru.

Mud brick dispensary and Dispensary Hakim's house.

Mellit.

Mud brick dispensary.

Abu Mataric.

Mud brick dispensary and Dispensary Hakim's house.

Korringer. (Gebel Marra).

Stone dispensary and Dispensary Hakim's house.

Buram.

Red brick dispensary.

Kas.

Mud brick dispensary and Dispensary Hakim's house.

Kebkebia.

Three red brick tukl wards (each 6 beds).

Grass tukl wards giving accommodation for up to 50 patients were erected by District Commissioners at the following dispensaries .

Zalingei — Kas
Kubbum — Buram
Um Buru

Blue Nile Province :—

Wad-Medani.

Quarters for three Nursing Sisters.
Ward for Syrian and Egyptian patients.
Offices, Laboratory and Men's outpatient department block.

Makwar. (Sennar).

Two male wards.
One female ward.
Hospital store room.
Six brick tukl wards.

Fung Province :—

Dar Agil.

New dispensary.

Fazogli.

New dispensary.

Chali.

New Dispensary.

Wisko.

Dispensary rebuilt.

Kassala Province :—

Permanent brick tukl dispensaries were constructed as follows :—

Metatib.

Three tukls.

Degein.

Three tukls.

Mekali.

Three tukls.

Hadaliya.

Three tukls

Galaat-en-Nahl.

Four tukls.

Kassala.

Store rooms were added to four wards.

Khartoum Province :—

Khartoum.

New hospital block of 14 beds for 1st. class patients.

Khartoum North.

New Kitchen.

White Nile Province :—

Kosti.

Operating theatre.
Outpatient tukl.
Drug store.

Upper Nile Province :—

Malakal.

Two tukl quarters for staff.
Mortuary.
Equipment store.
Boundary fence to hospital.
Improvement to hospital wards. (New verandah and ventilators).

Abwong.

New dispensary.

Bor.

New dispensary.

Kordofan Province :—

El-Obeid.

New 20 bedded 3rd. class surgical ward complete with annexes.

El-Nahud.

New 30 bedded 3rd. class ward.
Zeer house.
Four large square tukls.
New roof to administrative block.

Kadugli.

Operating theatre block.
Administrative and outpatient block.
Permanent tukl wards.
Laundry and kitchen.
New well with an Evans pump installation.

Talodi.

Outpatient block.

Dilling.

Four tukl wards.
Fence round hospital.

Mongalla Province :—

Juba.

New hospital with accommodation for :—

4 1st class.
4 2nd class.
77 3rd class.

Torit.

Administrative block
Operating theatre
Five tukl wards
} in stone.

Kapoeta.

Office.
Dispensary.
Three tukl wards.
} in stone.

Chukudun.

Dispensary of mud and grass.

Terrakeka.

Hospital and dispensary of mud and grass.

Amadi.

New dispensary.

(6.) MEDICAL WORK CARRIED OUT BY MISSIONS.

HOSPITALS :—

Omdurman (Church Missionary Society).

This hospital continued to carry out very useful medical work.
The staff consists of :—

2 male doctors.
1 woman doctor.
3 nurses.
1 house-keeper.

Bed capacity 35. Of which 18 female and 17 male beds.

A grant has been made from the Sir Lee Stack Indemnity Fund to build a new outpatient department.

Inpatients admitted during the year 1,091.
Outpatients :—
New cases ... ... 4,987 Total Attendances 20,483.
Operations :—
Major 107
Minor 190

There is a dispensary at Abu Rouf some two miles from the hospital at which 16,274 outpatients were seen by the medical staff.

The staff of this hospital has for several years carried out the administration and medical care of the Government Leper Hospital at Omdurman. The Government is very indebted to the staff for this work (see note on leprosy p. 29).

Lui (Mongalla Province) Church Missionary Society.

This hospital continues to carry on most useful work under Dr. Fraser.
A total of 4,069 cases were treated during the year.
The number of major operations was 96.
The number of Yaws and Syphilis cases treated by injection was 700.
Early in the year water was laid on to the hospital and leper settlement and in May a new ward for women and children was opened.

A leper settlement for the treatment of lepers is adjacent to the hospital. The number of lepers living in the settlement varied from 120—130. Five cases were discharged from the settlement as cured in the course of the year.

Melut (Upper Nile Province) Sudan United Mission.

Staff :—

1 doctor.
1 nurse for first 9 months only.

Total inpatients 280.
Total outpatients 1,300 with 3,757 attendances.
Major operations 44.

DISPENSARIES :—

Khartoum Province :—

Khartoum North (in connection with Girls Boarding School). **The American Mission.**

One nursing sister.

The work is carried on with the collaboration of the Government doctor at Khartoum North.

Inpatients 70.
Outpatients 5,000 attendances.
The older girls at the school are given training in the care of the sick.

Kordofan (The Sudan United Mission).

This mission maintains three dispensaries :—

	Outpatients.
Heiban	14,401
Abri	4,311
Tabanya	676

A Mission doctor is stationed at Tabanya.

Mongalla Province. (The Church Missionary Society).

This Society maintains three dispensaries :—
Loka.
Luloa.
Loa.
but no particulars are forthcoming.

Upper Nile Province :—

Akot (Church Missionary Society).

One doctor.
Inpatients 268 — Outpatients 14,037.

Doleib Hill (The American Mission).

No European staff.
One trained native assistant.
1,869 patients treated.

Nasser (The American Mission) :—

Staff :—
No doctor during 1930.
Two Nursing sisters.
Ward of 4 beds and native huts.
A total of 10,566 patients received treatment.
These included :—

Nuers	9,931
Anuaks	332
Arabs	299
Abyssinians	2
Europeans	2

Detwok, Tonga and Yoynyang (Italian Mission).

These three dispensaries are staffed by Mission boys who have received a medical training of six months to one year at the Government hospital.

Drugs, dressings and equipment are supplied by the Government, the dispensaries are carried on similarly to Government dispensaries and the same returns of work carried out are forwarded by them every month to the Government hospital at Malakal. A total of 5,671 outpatients and 53 inpatients received treatment.

(7.) PRIVATE PRACTITIONERS.

The following private practitioners other than Missionaries were practising in the Sudan at the end of 1930 :—

Physicians.		Dentists.		Pharmacists.	
Greek	6	British	1	Greek	1
Syrian	2	Greek	2	Syrian	3
Indian	1	Syrian	2	Armenian	1
		Armenian	3		

The following list shows where they were practising :—

KHARTOUM.

Physicians :—

Greek	4
Syrian	2
Indian	1

Dentists :—

British...	1
Greek	2
Syrian	2
Armenian	2

Pharmacists :—

Greek	1
Syrian	3
Armenian	1

PORT SUDAN.

Dentists :—

Armenian	1

WAD-MEDANI.

Physicians :—

Greek	2

(8.) HEALTH OF THE IRRIGATED AREA OF THE GEZIRA.

Two additional blocks, comprising an area of approximately 40,000 acres, were brought under irrigation during 1930. This raises the total area under irrigation to 604,000 acres. Seven new blocks were added in 1929 and three in 1928, so that twelve new blocks, comprising a total of 246,753 acres, have been added to the irrigated area during the last three years. This rapid expansion has thrown a heavy strain on the medical and sanitary staff of the province.

MALARIA.

The malarial incidence in this area in 1930 was that of an average year. The severe epidemic conditions that had followed the heavy rains in 1929 had left a large number of parasite carriers, but this adverse factor had been combated by widespread treatment at the block dispensaries and in the villages and, as a result of these measures and partly, no doubt, of the tendency to natural improvement under non-malarial conditions, the spleen rate had diminished by half between January and June, 1930.

The rainfall in 1930 was rather above the average. It was registered at the Gezira Farm, which is approximately at the centre of this area, as 17 inches while the average at the same place for the last nine years was 15 inches.

The following table gives the rainfall figures for the northern, central and southern areas during the last four years :—

Year.	Northern Area.	Central Area.	Southern Area.
	Inches.	Inches.	Inches.
1927	14.7	14.6	17.7
1928	8.9	11.2	10.0
1929	18.0	21.2	25.9
1930	11.5	17.0	17.3

Owing to the administrative change, by which the Sanitary Hakims (for nomenclature see p. 102) were relieved of all sanitary duties and were set entirely free for treatment work, both at the dispensaries and in the villages, and in particular for intensive Malaria treatment, the numbers of Malaria cases recorded were greatly in excess of previous years of the same degree of malarial intensity. On the other hand the result of this treatment, as manifested in the rapid recovery of the population from the 1929 epidemic, was most satisfactory.

Incidence of the Disease.

A secondary rise of malarial incidence occurred in January, 1930, and lasted till March. This was due to relapses of cases, which had contracted the disease in the 1929 epidemic, caused by the colder weather.

The annual epidemic of 1930 commenced in August, rose to a peak in October and gradually declined to reach normal conditions towards the end of the year.

Type of Infection.

Benign tertian infections were considerably in the majority excepting during the months of November and December, 1930 and January, 1931 when the Malignant and Benignant infections were practically equal. Only two Quartan infections are recorded occurring in January—July respectively.

Administration of Plasmochine as a Preventive Measure.

Quinine and Plasmochine tabloids containing 0.01 grm. of Plasmochine were issued to British officials and Syndicate Inspectors for weekly administration to their servants and to other natives in immediate proximity to their houses. This used in conjunction with the other recognised precautions, *i.e.*, careful repair of mosquito wiring, morning and evening destruction of mosquitoes inside the houses, use of nets and mosquito boots, issue of nets to servants and other neighbouring natives, appears to have had a beneficial effect in the reduction of the incidence of Malaria on those officials and Inspectors.

The British admissions for Malaria for the last four years are as follows :—

1927	...	...	...	...	...	...	61
1928	...	...	...	...	...	...	29
1929	...	...	...	...	...	...	41 (year of severe epidemic)
1930	...	...	...	...	...	...	15

Mosquito Infestations.

Light rains commenced to fall in the middle of June and infestations of mosquito larvae began to be found in the villages in the third week of July. Anopheline tended to precede Culex infestations. Heavy infestations of larvae were found in the Gezira villages in the beginning of September. All water had dried up by October 15th. except in a few rain-water lakes in the southern area.

The main sites of breeding were :—in village borrow-pits, in natural depressions, and in the field canals of the fallow land. The percentage of Culex infestations was only about 1 per cent.

Anti-Malarial Measures.

The most pressing problem is to prevent the annual epidemics of Malaria that occur during and subsequent to the rainy season. These annual epidemics have the following effect :—

(i) they weaken the population and render them unfit for routine baling operations at the beginning of the watering season,

(ii) they establish human malarial reservoirs in every village,

(iii) they are accompanied by a great increase of mosquitoes which resort to the irrigation field channels as the flood water dries up.

If these epidemics could be reduced to a minimum the prevention of malarial infection during the dry season, as a result of mosquito breeding in the irrigation channels, would be very greatly facilitated.

Drainage.

These widespread outbreaks of epidemic Malaria, which occur annually as a result of the rains, can only be effectively reduced by the establishment of adequate surface drainage. This is not an easy engineering problem. The watershed of the Gezira, a low ridge a few metres above the Blue Nile level, runs parallel to the Blue Nile and only a few miles from it, and from this ridge the

land slopes eastwards sharply to the Blue Nile and very gently westwards to the White Nile, a distance of some 70 miles. It is along this ridge that the main canal runs and the greater part of the irrigated land is to the west of this ridge. Thus the drainage water from the irrigated area in any complete system of drainage by gravity would have to be taken through this ridge to the Blue Nile. Such a drainage channel could only conveniently be taken out to the Blue Nile at the northern end of the scheme, but no attempt is being made at present to establish drainage in the northern part of the scheme as in this area the rainfall is not high enough to make this a matter of urgency.

The problem was first attacked in the winter of 1928 when drainage channels were cut leading the water from the low-lying areas to points where it could be pumped into the main canal or the main branch canals, or in the case of areas to the east of the ridge drainage channels were taken into the irrigation escapes. The system was by no means completed by the rainy season of 1929, but it proved of great assistance in removing the extensive floods that occurred as a result of that exceptionally heavy rainy season. In the winter 1929-1930 the system was considerably improved and developed, and a spill channel was cut so as to lead the water from a series of depressions in the southern part of the area out into low-lying land some 15 miles to the west of the western border of the irrigated area. Some delay occurred in completing this spill channel and in consequence the flood water in this southernmost part of the scheme was not drained away promptly and a considerable amount of mosquito breeding occurred Work is now being carried on with a view to improving this spillway and it is hoped that, whatever amount of rain falls in 1931, the flood water will be promptly drained away. The northern part (approximately one third) of the irrigated area is not subject to any widespread flooding and the establishment of a drainage system is not a matter of urgency.

The establishment of adequate drainage, although the most important factor, does not solve the whole question of epidemic Malaria in the rainy season. One of the main difficulties in preventing or dealing with epidemic conditions is the difficulty of communications owing to the impassability of the roads after heavy rains.

A great deal of mosquito breeding takes place in borrow-pits, in irrigation channels in fallow land and in similar places. Such breeding places can be dealt with at once if a Sanitary Inspector is able to make his inspection rounds, but he is often prevented from doing this for considerable periods by the state of the roads. Even the daily rounds of the Sanitary Hakim through the villages of his block to administer quinine to sick people is rendered difficult by the rains and the inspection of the work of these dispensaries by the Medical Inspector is often prevented for considerable periods. The completion of the drainage scheme outlined above will also improve transport conditions during the rains, but it will not meet the whole difficulty, and steady, progressive work on the improvement of the roads is needed.

When the drainage arrangements have been perfected so that flood water is removed from the land without delay, and when the roads are so rendered that it is possible to carry out necessary anti-malarial work throughout the rainy season then it should be possible to reduce these malarial epidemics to negligible proportions and, in the absence of the deleterious factors that these epidemics introduce, it should be possible with the existing organisation for anti-mosquito work to keep the irrigated area practically free of Malaria throughout the dry season and so to reduce the spleen rate and the parasite rate to negligible proportions.

Conservancy.

Before this area came under irrigation the population was grouped in villages scattered over the plain. There was no cultivation except in the rainy season when millet was grown and there was no water supply except the village wells and an occasional village pond (hafir). No latrine accommodation existed or was seriously needed, the villages were small and the people, young and old, wandered outside the villages for purposes of evacuation.

At the present time conditions have completely altered, but this primitive system of conservancy still has to serve an enormously increased population. The old villages have increased in size, new villages have sprung up and huts have been built along the roads bounding the 30 feddan holdings. Canals run within easy reach of the villages and are used for drinking purposes and also—in spite of prohibition and punishment—for bathing, defaecation and urination. The village wells for the most part have fallen into disuse.

It has been clear for some time that latrine accommodation would have to be provided both in the villages and along the canals, but in the face of so many pressing needs the matter had to be allowed to stand over.

Early in 1930 experiments were carried out with auger-bore latrines and it was found that they could be installed at a reasonable price and that they worked successfully under Gezira conditions. In consequence work was proceeded with and installations, each consisting of several auger-bore latrines, with a covered superstructure, were placed close to the canals at places where the people from the villages came to draw water and to wash. The number of seats in each installation varied with the size of the villages.

Up to date 183 auger-bores have been sunk and the work is being pushed forward steadily.

This is primarily a measure to prevent the fouling of the canals and is directed against the spread of Bilharziasis, Typhoid and Dysentery, but it will not by itself meet the needs of village sanitation which will not be adequately ensured until each house in every village has its own latrine. There are certain grave difficulties in the way of achieving this solution:-

(i) in the press of other work and of more immediate needs for supervision, the villages have been allowed to expand in their original form without properly defined streets or regular and adequate compounds. Before it is justifiable to encourage the expenditure of money on the installation of these latrines it is necessary to be sure that the installations conform to the ultimate lay-out of the villages,

(ii) under the present circumstances of economic depression it would be impossible to expect the people of the villages to move their compounds, and in many cases their huts, to conform to an ultimate alignment of streets and compounds, nor if this difficulty could be overcome, would it be easy to persuade any considerable proportion of the villages to spend the money needed to instal a bore-hole latrine together with the necessary superstructure.

In view of these circumstances the limited action at present taken is as follows :—

(i) to undertake a systematic survey of every village, marking out with permanent marks, the ultimate " lay-out " which is to be conformed to in any new building or reconstruction,

(ii) to encourage the Omdas and Sheikhs and richer cultivators, who already possess good compounds, to instal bore-hole latrines and thus popularise the idea among the less sophisticated natives.

Thus the attainment of a complete system of village sanitation is likely to be delayed for several years,—the demarcation of the villages in itself is likely to take over a year—but the installation of latrines in the larger houses in various villages will be commenced at once and steadily pursued and by the time their popularity is ensured and a steadily increasing demand established it is hoped that a return of prosperity will enable more rapid action to be taken.

WATERBORNE DISEASES.

Bilharzia. See under Endemic Diseases—Bilharzia p. 14).

Dysentery.

A statement is given below showing the incidence of Dysentery in this area during the last five years :—

Cases admitted to hospital.

Year.	Amoebic.				Bacillary.				Total.				Cases treated at dispensaries.
	Admitted.		Died.		Admitted.		Died.		Admitted.		Died.		
	British	Non-British	British	Non-British	British	Non-British	British	Non-British	British	Non-British	British	Non-British	
1926	—	91	—	9	—	91	—	—	—	182	—	9	179
1927	7	220	—	13	9	13	—	2	16	233	—	15	208
1928	9	279	—	30	16	37	—	2	25	316	—	32	616
1929	2	228	—	25	4	71	—	—	6	299	—	25	523
1930	1	245	—	3	12	3	—	—	13	248	—	3	1017

The following points call for comment :—

(i) The high incidence of this disease.

(ii) Its greater intensity during the summer months—May 1st to October 30th—and particularly during the months of June, July, August and September. Two factors may be concerned :—

(a) no irrigation takes place from April 16th until July 16th and no water is discharged from the Dam during this period, but a limited supply is pumped into the canals for drinking purposes for man and beast. The water is renewed at intervals of ten days, but in the meanwhile it is stagnant and liable to contamination,

(b) the rains usually commence in June and end in September and, from July to the end of October the fly incidence is greatly increased.

(iii) There was a considerable increase in the area under irrigation and therefore in the population dealt with in the years 1928 and 1929. This was practicularly the case in 1929 when 111,000 additional acres came under irrigation.

(iv) In 1930, owing to altered division of work, the dispensaries were able to treat a larger proportion of the population,

Taking these facts into consideration it is improbable that Dysentery has greatly increased during this period, but its incidence on the native population is a great deal too heavy. Whether the infection is waterborne or flyborne–and it is almost certainly both—in either case it is attributable to the absence of latrines and every effort should be made to remedy this state of affairs as soon as possible.

TYPHOID FEVER.

The following statement shows the admissions for Typhoid and Paratyphoid " A " and " B " during the last four years. It is possible that a number of mild cases occur among the natives of the irrigated area that are not brought to hospital. It is noteworthy that the reduction in the incidence of this disease that has taken place in Khartoum Province and other large centres of population during the last two years is absent in this area.

The houses of British Inspectors living in the irrigated area are fitted with Berkefeld filters and all drinking water is boiled and filtered.

Year.	Cases.	Deaths.	
1926	8	3	
1927	13	—	
1928	5	1	
1929	10	2	(1 British) (1 Native)
1930	9	2	(1 British) (1 Native)

(9) HEALTH OF KHARTOUM PROVINCE.

GENERAL.

During 1930 the general health of the population in this province has been very good. There has been a general lowering in the incidence of all communicable diseases.

As usual there has been a large number of anopheline infections in river pools, but owing to the efforts of an enlarged mosquito brigade, supervised by a British Sanitary Inspector with a motor-lorry, there have been very few infections which reached the pupal stage in the vicinity of Khartoum city.

In the Rural District, the number of anopheline infections found during 1930 was 3,327 as against 2,733 in 1929.

In spite of this, the number of primary cases of malaria notified in the three towns was only 31 in 1930 as compared with 106 in the previous year.

The rains this year were poor and the Nile flood level was only moderate.

In Khartoum the housing question is becoming increasingly difficult. This is largely owing to the number of better class houses which are being built in place of small native houses which accommodated many more people, but under unwholesome conditions. The need for a new building area for poorer class natives is becoming very urgent.

Further steps have been taken in the development of the eastern part of the city as an area for European-type houses and an endeavour is being made to ensure that buildings erected in that area shall conform to European standards as regards buildings, materials, accommodation, etc.

The Belgravia Dairy has now installed a new type of cow byre for milking and a considerable improvement in cleanliness has resulted.

The rain water drainage system in Khartoum, though still inadequate, has been improved, and additional brick-lined drains have been constructed both in Khartoum and Omdurman.

The area surrounding the food markets has been put under grass and this has considerably reduced the amount of dust which used to blow round these markets. The streets in between the markets are to be tarred and this should make conditions even better.

The number of trees in the streets has been increased and it is hoped to put down trees or hedges in the shop area of the town in the coming year. This should assist in the disposal of waste water which is at present such a problem.

The additional staff, approved about the middle of 1929, has undoubtedly made its effect felt and this may be seen by the reduction of primary cases of malaria from 106 to 31, bacillary dysentery from 56 to 22 and in the general improvement in cleanliness of the town, houses and hoshes.

CONSERVANCY SYSTEM AND REFUSE COLLECTION.

The conservancy system has worked satisfactorily this year in the three towns.

In Omdurman the improved type pit latrines with which experiments were made last year, have justified their adoption, and in the area in which they have been built the number of flies has decreased considerably.

It is hoped in the near future to extend the use of this type especially in the area adjacent to the markets.

In the native lodging area and commercial stables area outside Khartoum, auger bore pit latrines are being installed. The diameter of these bores is 16 inches and the depth from 5 to 7 metres. For the introduction of this type of pit latrine and the specially designed slab covering it we are indebted to the Rockefeller Institute who very kindly lent Mr. J. Carter from Cairo to demonstrate the construction. It has proved very satisfactory and cheap, it being possible to bore the pit and complete it, except for the superstructure, for the sum of P.T. 100. When the use of these latrines is more general the sanitation of the native lodging area should be vastly better. At present it is thoroughly unsatisfactory.

Unfortunately, the use of this type of latrine is impossible in Omdurman owing to the rocky nature of the soil, through which the augers cannot penetrate.

The addition of a number of extra refuse bins has improved the condition of the streets of the three towns, but the problem of garden refuse in still with us.

FOOD SUPPLIES.

The abattoir is now completed and has a high wall round it, concrete floor, wash down arrangements and electric light. This is a great improvement on previous abattoirs.

It now remains for us to achieve similar advances in the transport of meat from the abattoir to the market. The present arrangements are far from satisfactory.

MARKETS.

The new live stock market is now completed and the all-metal cages for pigeons and chickens provide clean accommodation for them.

The concrete counters in the fish markets have been tiled. The slabs used for cutting up the fish still remain concrete as it was found that the surface of the tiles was destroyed by constant use of heavy knives.

The cold storage business remains very satisfactory.

In Omdurman, the fly nuisance has not abated, but it is hoped that improvements in pit latrines in the surrounding area will lessen it to a great extent.

DRAINAGE.

The addition of a number of brick-lined drains has improved the drainage system of Khartoum. The extension and regrading of the Burri drain had considerable effect in draining the water from the area near the Race Course and east of the Medani line. In time to come this will have to be made a permanent drain with a number of branches leading to it. Actually this drain deals with a large quantity of water from the area south of the Deims which is held up by the protecting wall, and reaches the Race Course through a culvert.

It is probable that protection will have to be provided for the Commercial Stables Area and the new railway line to Gordon's Tree has altered the direction of flow of water with the result that with heavy rains this area may become flooded.

In Omdurman the drainage of the hamla area is unsatisfactory and the hamla hosh itself held a lot of water ; proper access to this hosh across the khor is essential during the rains.

HOUSING.

The development of the east end of the city is proceeding and it is hoped in time that only houses of European standards will be erected in this area.

There still remain in this area a considerable number of poor type native houses. Many of these have recently been condemned as unfit for inhabitation.

Unfortunately it is very difficult to find a new area for the owners of these premises to build on. I believe that careful drainage of the area to the west of the Deims would make a large part of that land suitable for building. Up to the present the drainage of that area has only been rudimentary. Until some fresh building area is found it will not be possible to insist on owners of insanitary premises demolishing them unless they are allowed to rebuild native type houses.

The erection of usher hedges in the area west of the Deims has made a start towards the raising of the level of the ground in this area. These hedges catch drifting sands blown up from the south. If the system is extended it should before very long provide more room for housing for natives.

As a result to erection of the new tank for garden water in the east end of Khartoum, this water should be available over a larger area and it is hoped that many of the houses which now rely on tap water for their gardens will be supplied with river water. This will reduce the amount of blown dust and will improve the general amenities immensely.

In Khartoum North, Hillet Khogali is now nearly completed. The double bucket conservancy system is in use throughout.

In a new village which is going to be built in Khartoum North it is intended to instal auger bore latrines.

On the out-skirts of Khartoum, the Commercial Stables Area is now built and buildings are rapidly going up in the new Noxious Trades Area to the south west of the city.

In Omdurman it is satisfactory to note that many good type houses are now being erected, many of them in red brick or kishra work.

LEGISLATION.

The Employment of Children Ordinance, 1929, which came into force from 1.1.1930 prohibits the employment in factories or workshops of children under 12 years of age, and restricts the employment of children between the ages of 12 and 15.

STAFF.

The attached table shows the distribution of staff in the Sanitary Service for this province.

PROVINCE GENERAL.

Distribution of Staff.

	Headquarters and Khartoum	Omdurman.	Khartoum North.	Rural District.	Totals.
British Sanitary Inspectors	4	2	2	1	8
Native Overseers	10	6	1	—	17
Mosquito Men	43	6	7	8	64
Conservancy	158	28	42	1	229
Refuse	103	86	29	1	219
Workshops	39x	2	8	—	49
Clerical	6	2	1	—	9
Other Staff	31*	30	3	1	65

* Includes Light Railway Squad.

x Includes British Mechanical Foreman.

WATER SUPPLY.

The Company's water supply to Khartoum and Omdurman maintains its excellent standard. Tests are made periodically by the Wellcome Tropical Research Laboratories and in every case the reports have been thoroughly satisfactory.

As regards wells in Omdurman, Khartoum North and the native lodging area outside Khartoum, the position is far from satisfactory. Tests were made to see if the effect of the proximity of pit latrines to wells could be estimated. Unfortunately in practically every case the water in the wells tested was so heavily contaminated that it was impossible to say that wells which were near pit latrines were worse than those far removed from them. In every case B. Coli were present in 0.1 c.c.

Many of the wells were properly looked after, covered and in good condition. It is thought that such wells which are in areas where there are no pit latrines become contaminated by dust blown in under the covers and by the ropes and buckets which are lowered to draw the water. Very few of the wells have a winch for the rope. It is usual to pull the rope up by hand laying it on the ground as the bucket reaches the top. Needless to say that the rope takes with it on its next journey dust and mud from the surface and distributes some of it in the water.

Of 11 samples taken, 8 gave the following results :—

Bacterial Count 37 per cc.	Minimum amount containing B. Coli.	B. Welchii in 25 cc. of water.
1000++	0.1 cc	Present.

The other samples were little better.

It is difficult to see how this state of affairs can be improved. Ordinary hand pumps will not give the required lift and would be too expensive for individual well owners. Mechanically operated pumps are out of the question.

The total number of wells in the three towns is :—Khartoum District 240, Omdurman 432 and Khartoum North 522.

In Khartoum 19 wells were opened while 1 was closed and 7 opened in Khartoum North. In Omdurman 34 privately owned wells were closed down *i.e.*, boarded and covered over with approximately ½ a metre of earth.

POPULATION.

The population of the province is estimated at 261,852 made up as follows :—

	Men	Women	Children	Total
Khartoum	14,656	17,954	17,853	50,463
Khartoum North	6,437	7,587	8,108	22,132
Omdurman	29,447	40,117	34,105	103,669
Rural District	25,417	32,596	27,575	85,588
Total	75,957	98,254	87,641	261,852

Of the above, the following are non-natives of the Sudan :—

	Khartoum	Khartoum North	Omdurman	Rural District	Total
Indians.					
Men	30	—	20	—	50
Women	24	—	4	—	28
Children	35	—	8	—	43
Egyptians					
Men	570	136	245	1	952
Women	530	110	376	—	1,016
Children	1,000	172	166	—	1,338
Europeans and Americans ..					
Men	1,596	129	26		1,751
Women	650	48	29		727
Children	868	88	4		960
Other non-Natives ..					
Men	460	82	271	4	817
Women	250	31	67	3	351
Children	459	50	82	3	585
Total	6,463	846	1,298	11	8,618

BIRTHS AND DEATHS.

4,631 births and 2,336 deaths were registered during the year, shewing an excess of births over deaths of 2,295.

The total number of births shows an increase of 396 over 1929 while the total number of deaths shews a decrease of 207 as compared with 1929.

The following table shows the relationship of birth and death rates to the population of each locality per 1,000.

	Population	Births	Birth Rate	Deaths	Death Rate
Khartoum	50,463	926	18.3	460	9.1
Khartoum North ..	22,132	547	24.7	260	11.7
Omdurman ..	103,669	1,570	15.1	934	9.0
Rural District ..	85,588	1,588	18.5	682	7.9
Total ..	261,852	4,631	17.6	2,336	8.9

The infantile mortality in the province was lower in all districts than last year and a very considerable improvement on 1928. The figures are :—

	Per 1,000 births.
Khartoum	49.6
Khartoum North	65.8
Omdurman	66.8
Rural District	32.1

For the whole province, this works out at 57.3 per 1,000 births.

In 1928 the infantile mortality was 75.7 per 1,000 births, in 1929 it was 66.3 and in 1930 57.3 per 1,000 births.

BIRTHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month	Khartoum		Khartoum North		Omdurman		Rural District		TOTAL		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January	28	31	27	14	68	60	78	68	201	173	13	10
February	17	20	23	28	71	41	56	46	167	135	8	8
March	45	39	28	23	75	63	64	48	212	173	10	5
April	37	32	27	20	64	66	74	58	202	176	8	11
May	45	38	12	23	59	62	51	66	167	189	6	7
June	34	30	13	15	60	80	44	45	151	170	7	4
July...	52	38	22	23	68	57	96	90	238	208	13	9
August	41	53	27	33	66	64	60	59	194	209	11	2
September	47	48	25	22	74	69	56	58	202	197	7	7
October	37	44	29	23	66	74	67	90	199	231	12	4
November	49	39	21	28	75	61	67	75	212	203	16	11
December	46	36	12	29	63	64	95	77	216	206	15	6
Total	478	448	266	281	809	761	808	780	2361	2270	126	84
	926		547		1,570		1,588		4,631		210	

	Births		Total	Still Births	
	M.	F.		M.	F.
Khartoum	478	448	926	26	15
Khartoum North	266	281	547	4	8
Omdurman	809	761	1,570	46	16
Rural District	808	780	1,588	50	45
Total ...	2,361	2,270	4,631	126	84

BIRTHS RECORDED BY NATIONALITIES, LOCALITIES AND SEXES

Nationality	Khartoum		Khartoum North		Omdurman		Rural District		Total		Still Births	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
British	5	5	—	—	—	—	—	—	5	5	—	—
Greek	12	8	—	—	—	1	—	—	12	9	—	—
Other Europeans	7	10	—	—	3		—	—	10	10	—	—
Egyptians & Syrians	61	76	24	24	33	28	1	—	119	128	5	5
Natives of the Sudan	385	345	242	257	766	729	807	780	2200	2111	120	81
All Others... ...	8	4	—	—	7	3	—	—	15	7	1	—
Total ...	478	448	266	281	809	761	808	780	2,361	2,270	126	84
	926		547		1,570		1,588		4,631		210	

DEATHS RECORDED BY MONTHS, LOCALITIES AND SEXES.

Month	Khartoum		Khartoum North		Omdurman		Rural District		Total	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January	13	18	12	14	39	44	38	41	102	117
February	22	14	8	13	34	38	27	20	91	85
March	25	18	18	13	41	45	40	30	124	106
April	20	15	12	11	36	21	34	34	102	81
May	30	21	10	11	48	47	36	26	124	105
June	17	16	14	7	58	58	28	25	117	106
July	19	18	7	6	35	31	34	19	95	74
August	21	22	8	19	37	42	18	28	84	111
September	12	16	12	6	38	45	22	24	84	91
October	24	23	6	16	28	36	30	39	88	114
November	19	17	6	10	26	40	21	20	72	87
December	27	13	10	11	23	44	22	26	82	94
Total ...	249	211	123	137	443	491	350	332	1165	1171
	460		260		934		682		2336	

DEATHS RECORDED BY NATIONALITIES, AGE PERIODS AND SEXES.

Khartoum, Khartoum North, Omdurman, and Rural District.

NATIONALITY.	Under 1 Year	1 to 5	5 to 10	10 to 20	20 to 40	40 to 60	over 60	Total	
								M.	F.
British	—	—	—	—	4	—	—	4	—
Greek	2	2	—	—	4	3	2	8	5
Other Europeans	2	—	—	—	—	3	—	2	3
Egyptians and Syrians	12	6	2	2	4	6	13	31	14
Natives of the Sudan	221	348	73	113	359	262	864	1,100	1,140
All others	1	3	—	3	11	5	6	20	9
Total	238	359	75	118	382	279	885	1,165	1,171
								2,336	

DEATHS RECORDED BY NATIONALITIES, LOCALITIES AND MONTHS IN CHILDREN UNDER FIVE YEARS.

Month	Khartoum					Khartoum North		Omdurman					Rural District	Total
	Greek	Other Europeans	Egyptians and Syrians	Natives of the Sudan	All Others	Egyptians and Syrians	Natives of the Sudan	Greek	Other European	Egyptians and Syrians	Natives of the Sudan	All Other	Natives of the Sudan	
	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	0-1 : 1-5	
January ...	—	—	—	2	—	1	3 6	—	—	—	13 6	—	2 9	42
February	—	—	—	4 5	—	—	5 5	—	—	—	11 6	—	5 2	43
March ...	—	—	1	2 6	—	—	6 9	—	—	1	10 16	—	11 11	73
April ...	—	—	1	4 1	—	—	1 3	—	—	1	6 12	1	8 9	47
May	—	—	2	7 10	—	—	3 3	—	—	—	12 21	—	3 13	74
June ...	—	—	—	1 4	1	1 1	3 4	1 1	—	—	17 30	—	3 5	72
July	1	—	—	2 2	—	—	1 2	—	—	—	6 14	—	4 8	40
August ...	—	1	1	2 4	—	1	5 7	—	—	—	4 13	—	6 4	48
September	1	—	2	1 3	—	—	1 3	—	—	—	7 18	—	2 9	47
October ...	—	—	1	5 6	—	—	5 5	—	—	1	9 12	—	2 13	59
November	—	—	1	5 1	1	1	1 3	—	1	1	3 7	1	3	29
December	—	—	—	1 2	—	—	5	—	—	—	2 3	—	5 5	23
Total ...	1 : 1	1 : —	7 : 2	36 : 44	1 : 1	2 : 3	34 : 55	1 1	1 : —	3 : 1	100 : 158	— : 2	51 : 91	597

	Under one year	From one to five years	Total
Khartoum	46	48	94
Khartoum North ...	36	58	94
Omdurman	105	162	267
Rural District	51	91	142
Total ...	238	359	597

COMMUNICABLE DISEASES.

The number of cases notified of communicable diseases during 1930 has in nearly every disease been reduced.

In particular, the number of cases of malaria in Khartoum have been reduced from 86 in 1929 to 12 in 1930 while typhoid fever has been reduced by 47 per cent. in the three towns.

The figures given below include the Rural District, but these figures are unreliable as they represent only those cases which have been notified by three dispensaries at Gebel Aulia, Geili and Khileila.

The figures for the three towns are those notified by hospitals and private practitioners.

TABLE I.

SHOWING NUMBER OF CASES NOTIFIED.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chicken Pox	40	17	7	64	10	5	—	79
Diphtheria	7	6	15	28	1	2	—	31
Meningitis, Acute ...	1	—	—	1	—	1	—	2
Meningitis, Cerebro-spinal	1	—	6	7	—	1	—	8
Relapsing Fever ...	—	—	1	1	—	15	—	16
Bilharzia	8	4	27	39	10	5	—	54
Amoebic Dysentery ...	27	16	83	126	4	10	31	171
Bacillary Dysentery	9	9	4	22	—	9	2	33
Typhoid Fever ...	4	6	15	25	—	7	—	32
Leprosy	—	—	2	2	1	5	—	8
Malaria	12	9	10	31	1689	56	654	2430
Black Water Fever ...	1	—	—	1	—	1	—	2
Mumps	51	28	43	122	8	1	—	131
Puerperal Fever ...	—	1	4	5	—	—	—	5
Pulm. Tuberculosis ...	11	10	20	41	1	41	—	83

In addition to the above, 75 clinical cases of malaria were notified during the year.

COMMUNICABLE DISEASES.

TABLE II.

Key:— K: Khartoum, K.N.: Khartoum North, O.: Omdurman, R.D.: Rural District, I.: Imported, R.: Relapsed.

Disease	Place	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Chicken Pox	K.	—	2	12	18	6	2	—	—	—	—	—	—	40	
	K.N	—	—	2	5	7	2	—	1	—	—	—	—	17	
	O.	—	1	1	1	3	—	—	1	—	—	—	—	7	
	R.D.	—	9	1	—	—	—	—	—	—	—	—	—	10	
	I.	—	1	1	—	1	1	—	—	1	—	—	—	5	79
Diphtheria	K.	—	—	1	—	—	—	—	1	—	2	1	2	7	
	K.N.	—	—	—	—	1	—	—	—	5	—	—	—	6	
	O.	—	—	5	1	—	—	—	4	2	—	—	3	15	
	R.D.	—	—	—	—	—	1	—	—	—	—	—	—	1	
	I.	—	—	—	—	—	—	—	—	—	—	1	1	2	31
Meningitis, Acute	K.	—	1	—	—	—	—	—	—	—	—	—	—	1	
	I.	—	—	—	—	—	—	—	1	—	—	—	—	1	2
Meningitis, Cerebro spinal	K.	—	—	—	1	—	—	—	—	—	—	—	—	1	
	O.	—	—	—	1	3	2	—	—	—	—	—	—	6	
	I.	—	—	—	—	—	1	—	—	—	—	—	—	1	8
Relapsing Fever	O.	—	—	—	—	—	—	—	—	—	1	—	—	1	
	I.	—	—	—	—	1	—	—	2	9	3	—	—	15	16
Bilharzia...	K.	—	—	—	2	1	1	4	—	—	—	—	—	8	
	K.N.	—	1	—	—	1	—	—	—	2	—	—	—	4	
	O.	5	1	1	5	2	5	1	2	1	2	—	2	27	
	R.D.	—	—	1	—	—	—	3	—	1	4	—	1	10	
	I.	—	—	—	—	2	1	2	—	—	—	—	—	5	54

(Contd.)

COMMUNICABLE DISEASES.

TABLE II —(*Continued*).

Disease	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Amoebic Dysentery	K.	1	2	1	1	1	1	4	3	2	5	4	2	27	
	K.N.	3	—	3	2	—	—	2	—	—	4	2	—	16	
	O.	5	3	7	4	3	5	10	11	11	7	11	6	83	
	R.D.	—	1	—	—	1	—	2	—	—	—	—	—	4	
	I.	1	2	1	1	1	—	—	3	—	—	1	—	10	
	R.	3	2	1	4	1	3	4	1	2	2	6	2	31	171
Bacillary Dysentery	K.	—	2	—	—	1	1	—	—	—	3	2	—	9	
	K.N.	—	—	3	2	—	—	—	1	2	1	—	—	9	
	O.	—	—	—	1	—	—	1	—	1	1	—	—	4	
	I.	2	—	—	—	—	1	1	1	—	4	—	—	9	
	R.	—	—	—	—	—	—	—	—	—	2	—	—	2	33
Typhoid Fever..	K.	—	—	—	—	2	—	—	—	—	—	1	1	4	
	K.N.	—	1	1	—	1	—	—	—	1	1	1	—	6	
	O.	1	2	1	2	—	1	1	3	1	1	1	1	15	
	I.	—	—	2	—	—	—	2	—	1	2	—	—	7	32
Leprosy	O.	—	1	—	—	—	—	—	—	—	—	—	1	2	
	R.D	—	—	—	1	—	—	—	—	—	—	—	—	1	
	I.	—	—	—	—	—	—	2	—	—	—	2	1	5	
															8

(*Contd.*)

COMMUNICABLE DISEASES.

TABLE II—(*Continued*).

Disease.	Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Grand Total
Malaria	K.	2	3	—	1	4	—	—	—	—	2	—	—	12	
	K.N.	2	—	—	—	1	—	1	1	4	—	—	—	9	
	O.	—	2	2	1	3	—	—	—	1	—	1	—	10	
	R.D.	140	105	91	92	102	86	439	24	234	167	38	171	1689	
	I.	7	7	4	2	2	4	3	3	13	7	3	1	56	
	R.	79	60	69	70	59	43	53	46	29	62	39	45	654	2430
Mumps	K.	2	5	12	14	5	8	1	—	3	1	—	—	51	
	K.N.	11	3	2	2	2	4	—	2	—	2	—	—	28	
	O.	1	13	13	8	3	1	1	—	—	—	2	1	43	
	R.D.	—	7	—	—	—	—		1					8	
	I.	—	1	—	—	—	—	—	—	—	—	—	—	1	131
Puerporal Fever	K.N.	—	—	1	—	—	—	—	—	—	—	—	—	1	
	O.	—	—	—	—	1	1	1	—	—	—	—	1	4	5
Pulmonary Tuberculosis	K.	—	1	—	3	—	2	—	2	1	1	1	—	11	
	K.N.	—	—	—	5	—	1	1	1	—	1	—	—	9	
	O.	—	3	1	—	3	3	—	1	1	1	3	4	20	
	R.D.	—	—	—	—	—	1	—	—	—	—	—	1	2	
	I.	5	2	—	5	—	4	7	3	6	1	6	2	41	83
Blackwater Fever	K.	1	—	—	—	—	—	—	—	—	—	—	—	1	
	I.	—	1	—	—	—	—	—	—	—	—	—	—	1	
															2

MALARIA.

The rainfall for 1930 was not heavy, only 223.1 m/ms. being recorded. The level of the Nile was approximately normal.

The total number of infections found of all species was 10,122.

The number of anopheline infections found in the Rural District was greater than in 1929, being 3,327 against 2,733. This is partly due to the increased efficiency of the inspections which are carried out by a British Sanitary Inspector and a mosquito staff with a motor lorry transport. This efficiency could be increased still further if another lorry or car were available so that the British Sanitary Inspector could put his men on some work and then himself go on and make inspections, etc. As it is, the lorry cannot be taken away, for the area to be treated may be of considerable length and the lorry must be there to transport the larvicide, etc.

The number of anopheline infections found inside Khartoum city during the year was 177. Very few pupal infections were found, and Khartoum has been singularly free from adult mosquitoes.

The inspection of trains coming from the South has been continued.

The number of cases reported from the Rural District has increased by 514. This is almost certainly due to the increased area covered by dispensaries. A new dispensary was opened in June at Khileila and in the seven months during which it was opened reported no less than 672 cases of malaria.

As pointed out above, these figures are not really reliable as the patients were not seen by a qualified doctor nor were blood slides examined.

Among the civilian British population there were no primary cases of malaria while among the British troops there were 10 cases reported. It should be noted, however, that these troops had recently come from India and may have been infected there though undiagnosed or latent. Among the primary cases, the incidence of Benign Tertian and Malignant Tertian types was approximately the same.

The following tables show the incidence of primary malaria by sexes, nationalities and age periods and also cases amongst British troops and types of parasites.

Sexes :—

Males	76
Females	11

Nationalities :—

British	23
Egyptians and Syrians	2
Natives	62

Age Periods :—

0–1	1–5	5–10	10–20	20–40	40–60	Undefined.
1	7	13	20	36	5	5

Type of Parasites :—

	Civil.	Br. Troops	Total
Malignant Tertian	42	10	52
Benign „	17	10	27
M.T. and B.T.	—	1	1
Undefined	7	—	7
TOTAL	66	21	87

Cases amongst British Troops :—

Khartoum	6
Khartoum North	4
Imported	11

Central Prison Cases :—

I case Benign Tertian.

No cases of primary malaria occurred among Sudan Defence Force troops.

Deaths :—

Amongst all cases of malaria notified during the year, three deaths occurred, and two additional deaths were said to be attributed to malaria.

ANTI MOSQUITO WORK.

The total cost of this part of the Service within the Province was £E. 3,006 *i.e.*, labour £E. 2,338, larvicide £E. 668.

Of the total infections found, 157 were in the pupal stage and 667 were eggs. The pupal infections, the majority of which were located in the Rural District, show an increase of 93 compared with 1929.

DIPHTHERIA

The number of local cases of diphtheria has been considerably reduced this year. The epidemic which occurred in Khartoum and Omdurman between 1927 and 1929 appears to have finished. Only 31 cases were reported as against 112 last year and 145 in 1928.

Sexes :—

Males	17
Females	14

Nationalities :—

British	Nil
Greek	2
Other Europeans	1
Egyptians and Syrians	9
Natives	19

Age Periods :—

0–1	1–5	5–10	10–20	20–30	30–40
1	9	11	6	2	2

Carriers or contacts :— 9.

Deaths :—

	Males.	Females.
Khartoum	1	—
Khartoum North	1	—
Omdurman	2	1

No cases occurred amongst British Troops, Sudan Defence Force troops or in the Central Prison.

TYPHOID FEVER.

During 1930 there was a reduction of 47 per cent. in the number of cases of typhoid fever notified. In Omdurman the decrease was approximately the same. In this town the opportunities for spread of this disease by flies is considerable owing to their prevalence. At the moment an attempt is being made to improve the pit latrines in Omdurman and thereby to reduce the fly menace. There is, however, a great deal to be done before the position can be said to be reasonably satisfactory.

In Khartoum each latrine bucket has in it a certain quantity of coal tar disinfectant and this certainly seems to deter the flies.

Sexes :—

Males	18
Females	14

Nationalities :—

British	1
Egyptians and Syrians	3
Natives	28

Age Periods :—

1–5	5–10	10–20	20–30	30–40	40–60	Over 60	Undefined.
3	5	9	7	4	2	1	1

Cases amongst S.D.F. Troops :—

Khartoum	1 para. A died.
Imported	1 Typhosus.

No cases occurred amongst British troops or in the Central Prison.

Types of Typhoid :—

Para. A	5
Para. B.	4
Para. A and Para. B	1
Typhosus	22

Deaths :—

	M.	F.	
Khartoum	1	—	para. A.
Khartoum North	1	—	para. A and para. B.
Omdurman	—	2	1 para. A and 1 typhosus.

DYSENTERIES.

With regard to bacillary dysentery a still further improvement is noticed. In 1929 there was a decrease in the number of cases of 18 per cent. and this year there is a further reduction of over 50 per cent. The figures for the three towns show that the number of cases has dropped from 56 to 22. Undoubtedly this may in part be attributed to the use throughout the year of disinfectant in the conservancy buckets.

Amoebic Dysentery has decreased though not to the same extent. In the three towns a 20 per cent. reduction has occurred, the principal reduction has been in Khartoum city.

Bacillary Dysentery :—

Sexes :—

Males	27
Females	6

Nationalities :—

British	8
Other Europeans	1
Egyptians and Syrians	2
Natives	22

Age Periods :—

1–10	3
10–20	8
20–30	10
30–40	4
40–50	3
Undefined	5

Types of Organism :—

	Civil.	British troops.	S.D.F troops.	Central Prison
Flexner	12	2	1	2
Shiga	7	1	2	—
Schmitz	5	—	—	—
Undefined	1	—	—	—

Deaths :—

1 male.

This death occurred at Khartoum of a pilgrim who was returning from the Hedjaz.

With regard to the five cases of Schmitz type, mentioned above, four of these occurred in British passengers on arrival at Khartoum from Port Sudan ex. S.S. " City of London " who travelled to Khartoum by a special train. Two of them had had amoebic dysentery. The fifth case occurred in a native who was employed in the Wellcome Tropical Research Laboratories Khartoum.

British Troops Cases :—

	Flexner.	Shiga.	Total.
Khartoum	1	1	2
Khartoum North	1	—	1

S.D.F. Troops cases.

Khartoum	1	—	1
Omdurman	—	2	2

Central Prison Cases :— 2 all locally contracted.

AMOEBIC DYSENTERY :—

Sexes :—

Males	136
Females	25
Undefined	10

Nationalities :—

British	6
Egyptians and Syrians	2
Natives	153
Undefined	10

Age Periods :—

0–1	1–10	10–20	20–30	30–40	40–50	50–60	Over 60	Undefined
2	16	29	69	22	8	4	1	20

Cases amongst British Troops :—

Khartoum	1 had bacillary flexner also.
Relapses	2

S.D.F. Troops :—

Khartoum	3
Khartoum North	2
Omdurman	2

No cases were notified from the Central Prison.

Deaths :—

6 deaths occurred among the cases notified from Omdurman and 4 more deaths were presumed as caused from dysentery ; 3 of these were in Khartoum and I in Omdurman.

PULMONARY TUBERCULOSIS.

The number of locally contracted cases of pulmonary tuberculosis remains approximately the same, though the number of imported cases has increased slightly.

All those cases which have left hospital but which are still in the district either attend regularly for examination and, if necessary, treatment or are visited in their own homes.

Attempts are made to prevent infectious cases living in close contact with healthy persons but conditions are such that this is seldom rigidly carried out Undoubtedly, the patients are very much better off when they are in hospital.

Cases who have reasonable facilities for living apart, in the main do so, for they realise that they are infectious. The poorer type have, whether they like it or not, to live in contact with others.

The case incidence in the three towns was as follows :—

	Cases per 1,000.
Khartoum	0.2
Khartoum North	0.4
Omdurman	0.2

Sexes :—

Males	66
Females	17

Nationalities :—

Greek	1
Syrian	1
Natives	78
All others	3

Age Periods :—

10–20	20–30	30–40	40–50	50–60	Undefined.
15	39	15	8	4	2

Cases amongst S.D.F. Troops :— 1.

Cases in Central Prison :— 5.

No cases occurred amongst British troops.

Of the 41 cases contracted outside the province, 39 were contracted in the following provinces :—

Halfa	1
Berber	9
Dongola	6
Kassala	3
Red Sea	3
Blue Nile	11
Fung	1
Upper Nile	1
Kordofan	4

All cases notified during the year were followed up and the following result was obtained :—

	Khartoum	Khartoum North.	Omdurman	Rural Dist.	Total.
Died	14	2	14	—	30
Left District	13	2	3	—	18
Still in Hospital ...	6	1	4	1	12
Still in District... ...	2	5	11	—	18
Untraced	3	1	—	1	5
Total ...	38	11	32	2	83

The 47 cases remaining from those notified during the period from 1/10/24 to 31/12/29 were also followed up with the following result :—

	Khartoum	Khartoum North.	Omdurman	Rural Dist.	Total.
Died	5	1	4	—	10
Left District	5	2	3	1	11
Still in District... ...	5	4	14	—	23
Untraced	—	2	—	1	3

RELAPSING FEVER.

During August and September, cases came into the native lodging area of Khartoum from the Blue Nile Province. As there were rumours from the White Nile Province that westerners were avoiding the quarantine there by coming in to Omdurman, a delousing station was set up there as well as in Khartoum, but was removed at the end of September. Only cases and contacts were deloused.

In all 16 cases occurred, only one being locally contracted.

Sexes :—Males	... 16 all natives.		
Females	... Nil.		
Age Periods :—	... 10-20	7	
	20-30	9	

Deaths :—2 including the locally contracted case.

SMALL-POX AND VACCINATION.

No case of Small-pox was reported during the year.

The following table shows the number of vaccinations done in the province during the year.

	Successful.	Failed.	Unknown	Total.
Khartoum Hospital	1,000	264	98	1,362
British Military Hospital ...	653	278	56	987
S.D.F. Hospital	217	368	—	585
Khartoum North Dispensary ...	1,942	130	65	2,137
Omdurman Hospital	2,642	47	137	2,826
C.M.S. Hospital	2	—	—	2
Geili Dispensary	515	51	22	588
Gebel Aulia Dispensary ...	130	18	16	164
Rural District	—	—	3,041	3,041
TOTAL	7,101	1,156	3,435	11,692

DISPENSARIES.

A new dispensary was opened in June at Khileila, between Geili and Khartoum. The buildings have been lent by Dr. Malouf until money is forthcoming for the erection of a proper dispensary.

This dispensary is popular and has done a considerable amount of work in the District. Since it was opened 5,717 out-patients have received treatment Of these attendances 672 were for malaria and 686 for trachoma.

Geili dispensary had 10,500 attendances during the year of which 849 were for malaria.

At Gebel Aulia there is at present not a great deal of work, for there is no activity on irrigation work and many of the natives spend much of their time on cultivation far removed from the dispensary. About 1,500 attendances were recorded.

SCHOOLS AND SCHOOL CHILDREN.

The Gordon College and Primary Schools in the three towns are from the hygienic point of view good. They are well ventilated, well lit and clean.

The Native Khalwas do not in most cases reach this standard and generally tend to be overcrowded. In certain cases some of the children are taught under a shelter in the open but those taught in rooms have a very limited floor space. The rooms are in many cases poorly ventilated and lit.

Annual medical examinations of the boys attending the Gordon College and Primary Schools are made. When entering the Gordon College boys are examined to see if they reach a standard of fitness required for Government service. If they do not a note is made of this at the time and the school authorities informed.

It is noteworthy that some 10 per cent. of boys at the Gordon College examined during the past three years have suffered from defective vision while dental caries is commoner than would be expected.

The standard of general physique is difficult to estimate. A very large number of boys do not produce birth certificates when they enter the Gordon College and their ages are assessed. Actually their build, size and general physique influence the assessors and a well grown boy of 12 may be estimated as 14. When later these boys are measured, weighed, etc., their ages are taken as they assessed and this obviously may give false results.

It is early yet to say what effect physical training is having on the boys but undoubtedly the football they play has a beneficial effect both physically and mentally.

OMDURMAN HOUSE-TO-HOUSE INSPECTION.

This was the first complete year of work of the house-to-house inspectors in Omdurman, and it may be noted that the work on the whole has proceeded smoothly and has produced good results. The improvement in cleanliness and general condition of the hoshes is particularly noticeable. No work which would incur heavy expense to owners has been asked for; the tendency has been to aim for a gradual but steady improvement of premises.

Prosecutions were undertaken by house-to-house inspectors in 76 instances, and only after the owners had been warned by letter.

MOTOR TRANSPORT.

Two additional motor refuse vans of the new Ford type were brought into use during the early part of the year, one of which is in Khartoum and the other in Omdurman, bringing the total number of vehicles up to 6 *i.e.*, 4 in Khartoum and 2 in Omdurman.

This form of transport has now been fairly tried out and it is found, for purely house-to-house collection, it has not come up to expectations and has little or no advantage over the mule drawn vehicles for this class of work. The time taken for collection in the district is much the same as that of the mule drawn cart, the only great advantage being a saving of time in going to and returning from the main dump.

FLY PREVENTION.

To endeavour as far as possible to control the making of zibla, 4,074 permits were issued in the three towns, *i.e.*, Khartoum 1,707, Omdurman 1,114 and Khartoum North 1,253.

This figure shows an increase of 310 compared with the year 1929.

In Khartoum special attention has as usual been directed to daily collection and disposal of stable manure.

MINERAL WATER FACTORIES.

The number of mineral water factories in use in the three towns is 7 *i.e.*, Khartoum 5, Omdurman 2, Khartoum North nil.

This shows an increase of one in Khartoum compared with last year.

The standard of cleanliness has improved and fewer complaints were received regarding the dirty condition of minerals.

BAKERIES.

The total number of European bakeries is as follows:—Khartoum 19, Omdurman 12, Khartoum North 5, while the number of native bakeries is 7, 29 and 5 respectively.

In certain instances in Khartoum, proceedings had to be taken against European bakery proprietors for dirty condition of premises and bread.

RESTAURANTS, NATIVE EATING-HOUSES AND COFFEE-SHOPS.

The total number of premises under this heading in Khartoum is 115, *i.e.*

Restaurants, European	14
Coffee-Shops ,, ...	20
Eating-Houses, Native	25
Coffee-Shops ,, ...	56

The European restaurants and coffee-shops have been maintained on the whole in a good sanitary condition.

The standard of the native eating-houses and coffee-shops may be classed as fair.

Considerable improvement in this class of shop is desired and I think the time has now come when an effort should be made to raise the standard by carefully weeding out the premises which are considered the least suitable.

Until recently, only European restaurants and cafes were allowed north of Block D. in Khartoum. Of late this distinction has not been enforced with the result that native premises are allowed to intermix in this area.

UNSOUND FOOD.

The undermentioned is a note of unsound food destroyed during the year :—

Khartoum.	lbs.
Fruit and vegetables (tinned)	5,401
Meat (tinned)	104 1/2
Butcher meat	857
Fish (tinned)	648
Cheese (tinned)	285 1/2
Milk (tinned)	19
Sauces	1,269
Jams	166
Miscellaneous	23
TOTAL	8,773

Omdurman.	lbs.
Fruit and vegetables (tinned)	191
Fish	17
Butcher meat	80
Vegetables	495
TOTAL	783

MILK SUPPLY.

There are 410 milk vendors in the three towns, *i.e.*, Khartoum 213, Omdurman 131 and Khartoum North 66.

These figures show an increase of 24 in Khartoum and an increase of 15 and 6 in Omdurman and Khartoum North respectively, compared with 1929.

The following milk samples were taken during the year:—

Khartoum	172
Omdurman	100
Khartoum North	58
TOTAL	330

which is an increase of 42 compared with 1929.

Of the samples taken in Khartoum 37 or 21.5 per cent. were below standard, and the average presumed extent of adulteration was 4.9 per cent. added water.

The Omdurman figures are 10 or 10 per cent. and 4 per cent. respectively while those of Khartoum North are 15 or 25.89 per cent. and 2.2 per cent.

The following is a comparison of percentages of adulterated samples in the three towns compared with 1929:—

	1929 Per cent.	1930 Per cent.	
Khartoum	12.96	21.5	increase of 8.54 per cent.
Omdurman	18.56	10	decrease of 8.56 per cent.
Khartoum North	25	25.89	increase of 0.89 per cent.

Proceedings were instituted in 37 cases of adulteration. Warnings were issued in the remaining 25 cases as they were only slightly below standard. The total amount of fines inflicted for adulteration was £E. 10.700 m/ms.

Four vendors were prosecuted in Khartoum for selling milk without licenses, and 31 for using unnumbered or wrongly numbered milk vessels. Fines amounting £E. 7.350 m/ms. were inflicted.

RAT CATCHING.

589 rats were trapped and destroyed in Khartoum during the year, *i.e.*, 347 (Rattus Norvegicus) and 164 (Arvicanthus Testicularis) and 78 (Rattus Alexandrinus).

CONCLUSION.

This year has been satisfactory in most ways and I feel that definite headway has been made and is still being made though the progress is slow. This is inevitable when dealing with natives and also when money for various schemes is not forthcoming.

It is most important, however, that once a scheme has been started and found satisfactory, it should not be allowed to lapse, for the rate of retrogression is considerably more rapid than that of progression.

Adequate staff to carry out and supervise the work is essential and as the sphere of the work is extended so must the staff be increased.

In Omdurman, in particular, there is an immense amount of work to be done which with the present staff cannot be touched.

It is to be hoped that every assistance will be forthcoming to enable the Khartoum Sanitary Service not only to maintain its present standard but to extend its sphere of influence and action steadily and as rapidly as possible.

The work done has only been made possible by the co-operation and energy of the staff and the assistance of the provincial administration.

METEOROLOGICAL OBSERVATIONS AT GORDON COLLEGE, KHARTOUM FOR THE YEAR 1930.

Month	Temperature in Degrees Fahrenheit				Average Relative Humidity % at 8.00 a.m.	Average Evaporation in m/ms	Rains in m/ms.	Haboobs
	Highest Maximum	Average Maximum	Lowest Minimum	Average Minimum				
January ..	95.0	81.1	44.8	54.0	30	13.1	Nil	—
February ..	105.4	91.5	50.3	61.9	23	17.2	,,	—
March ..	105.4	90.5	52.5	64.2	18	18.7	Drops	1
April ..	110.6	102.0	60.1	72.0	12	19.2	,,	—
May .	114.2	108.8	69.6	78.8	22	18.5	3.2	5
June ..	114.0	106.4	68.9	79.0	45	15 8	17.9	6
July ..	107.0	101.1	72.3	77.5	58	12.0	20.1	5
August ..	106.2	98.4	68.6	76.5	63	10.1	152.1	5
September ..	109.4	102.8	67.0	78.8	51	11.8	28.9	2
October ..	107.6	103.3	69.5	76.8	33	15.1	0.9	1
November ..	100.6	91.9	62.4	69.3	29	15.4	Drops	—
December ..	104.4	91.7	50.7	63.0	36	12.5	Nil	—
						Total ...	223.1	25

I am indebted to Mr. R. Cottam, the Meteorological Observer, for the above table which he kindly supplied.

(10.) HEALTH OF MOR AND GAWEIR SECTIONS OF THE NUER TRIBE.

In accordance with the procedure adopted in 1929, certain sections of the Nuer tribe were concentrated during the dry season in defined areas between the Sobat river and the Zeraf river, so as to bring these sections under closer administrative control. The opportunity thus afforded for medical observation and treatment was again made use of, as far as possible.

In 1929, three sections—the Gun, Mor and Gaweir—were concentrated, whereas in 1930 only two sections were concentrated viz ; the Mor and Gaweir.

The total population thus concentrated was 23,700 and all of these were within easy reach of medical treatment, and most of them availed themselves of this treatment.

The date of concentration was delayed by outbreaks of Small-Pox occurring in some of the permanent villages. 7,000 persons were vaccinated, and then the concentration took place. As a result of this delay, the period under which the concentrated tribes came under medical observation was shorter than last year.

GENERAL HEALTH.

The general health of the Mor section had much improved since last year, the sick rate having fallen from 34.9 to 17.7.

The sick rate of the Gaweir, on the other hand, had considerably increased, but this was probably due to increased confidence, as most of the sick reported for minor ailments. The fine physique of the Gaweir was again commented on by the Medical Inspector in his report.

BIRTHS AND DEATHS.

Further observation confirms the conclusion arrived at least year i.e.

(i) the average woman bears six to eight children,

(ii) 50 per cent. of these children die before they reach puberty,

(iii) the chief causes of death are Malaria, Infantile Diarrhoea and Broncho-Pneumonia.

Leprosy. No cases of leprosy were discovered.

Tuberculosis.

The following cases came under observation :—

Pulmonary	9
Glandular	4
Bones and Joints	2

In 1929 the figures were :—

Pulmonary	0
Glandular	3
Bones and Joints	8

These figures would seem to confirm former indications as to the rarity of this disease among the Nuers.

The nine cases of Pulmonary Tuberculosis all occurred in one Shyeng (a minor tribal subdivision) and three of these cases were in one family.

Malaria.

This was the season of relative freedom from Malaria. Eleven cases came under treatment; all were Benign tertian.

Observation on the splenic index gave the following result :—

	Per cent.
Men	0.02
Women	0.07
Boys	17.00
Girls	16.40

Two hundred blood smears were examined microscopically, but in only 10 per cent. of them could parasites be found. Only Benign Tertian parasites were seen.

In 1929 sixty slides were positive as follows :—

Benign tertian	50
Malignant tertian	4
Quartan	6

Yaws.

As was the case in 1929, this was found to be the most prevalent disease. The cases were as follows :—

Primary and Secondary	182
Tertiary	240

Of the primary and secondary cases, 70 occurred in children.

Gastro-Enteritis of children is rare, but is more commonly met with during the rainy season.

Cardiac Disease is very rare ; only one case (congenital heart) was treated.

Bronchitis was not uncommon, 16 acute and 8 chronic cases were treated.

Scurvy.

An outbreak of this disease occurred among the Nuer hostages. 16 cases occurred. An addition of two pints of fresh milk to the diet promoted gradual recovery.

The Medical Inspector comments on the results attained as follows :—

" The Nuer concentration of 1929 and 1930 enabled us to obtain a very good estimate of the state of health of the whole Nuer country between the Sobat-Pibor rivers and the Zeraf valley, with a population of approximately 35,000.

" Medically these people have derived great benefit from the concentration.

" In the Mor country in particular the benefit of the intensive treatment of Yaws in 1929 was already shown in 1930. If the treatment of this disease could be energetically pursued for the next few years, the sickness rate in the whole area would be reduced by approximately 50 per cent.

" Medical work in the concentration area has demonstrated to the Natives collectively the benefit they may derive from the logical treatment of their ailments and has gone far in allaying the fear inherent in all of the Government "kugur."

(11.) VITAL STATISTICS.

The returns of births and deaths can only be considered to be in any way correct in Khartoum, Berber and Dongola Provinces and in Wadi-Halfa district. The returns for the Blue Nile Province are still very incomplete; they are included in the list given below, but it would not be safe to draw any conclusions from them :—

NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1926		1927		1928		1929		1930	
	Total.	Rate.	Total.	Rate.	Total	Rate.	Total.	Rate.	Total.	Rate.
KHARTOUM :—										
Births	3,709	18.9	3,542	17.6	3,646	15.3	4,189	17.2	4,574	18.5
Deaths	2,115	10.8	2,567	12.8	2,646	11.1	2,519	10.7	2,316	9.3
Still births	115	31.5	114	31.7	133	38.7	157	37.1	203	44.3
Infantile mortality	216	60.0	310	86.1	274	79.8	281	66.4	238	52.0
BERBER :—										
Births	4,178	27.6	4,271	28.2	4,343	28.7	4,721	31.2	5,284	34.9
Deaths	2,952	19.5	2,509	16.6	3,453	22.8	3,707	24.5	2,557	16.8
Still births	52	12.4	71	16.6	102	23.5	103	21.8	127	24.0
Infantile mortality	297	71.0	333	77.9	373	85.9	341	72.2	282	53.4
DONGOLA :—										
Births	5,476	33.5	5,539	33.9	5,678	34.8	5,481	33.6	5,935	36.4
Deaths	2,385	14.6	2,323	14.2	2,628	16.1	2,451	15.0	2,637	16.4
Still births	235	42.9	228	41.1	262	46.1	309	52.7	273	46.0
Infantile mortality	455	83.1	430	77.6	458	78.9	464	84.6	433	73.0
BLUE NILE :—										
Births	10,331	31.7	12,952	42.9	12,449	38.2	11,000	31.5	15,328	43.5
Deaths	6,026	18.5	8,562	26.3	9,599	29.5	7,784	22.1	9,668	27.4
Still births	151	14.6	182	13.0	169	13.5	171	15.5	241	15.6
Infantile mortality	473	45.8	471	43.8	572	45.9	432	39.3	385	25.1
WADI-HALFA MERKAZ: —										
Births	688	15.2	776	17.2	688	15.2	746	16.5	828	20.1
Deaths	521	11.5	519	11.5	448	9.9	490	10.8	451	10.8
Still births	8	11.7	—	—	4	5.8	6	8.0	6	7.2
Infantile mortality	104	151.2	99	127.5	50	72.6	70	93.8	79	95.4

(12.) MEDICAL EXAMINATION OF SCHOOLS.

The types of school in the Sudan are :—

(i) Village schools.

(ii) Elementary vernacular schools.

(iii) Primary schools.

(iv) The Gordon College, which is a secondary school.

23,349 children were examined in 1930, compared with 12,008 in 1929. This increase is due to the fact that 358 village schools were dealt with in 1930 as against 106 in 1929. These schools are situated in small villages throughout the provinces and are a more accurate indication of the state of public health than the elementary or primary schools which are usually in towns.

The appended table shows the result of the medical examination of pupils in one secondary, 11 primary, 59 elementary and 358 village schools in 1930.

The following points call for comment :—

(i) The high trachoma rate in all village schools in the northern and central Sudan. There is little evidence of reduction of this percentage incidence over a series of years, but on the other hand many of the cases recorded are very mild and the really severe cases that used to be frequently seen some years ago are now rare.

(ii) The high bilharzia rate in Halfa, Dongola and Kordofan Provinces.

The incidence in the Dongola schools has been very considerably reduced in the course of the last four years.

(iii) The fact that the spleen rate in the Gezirah schools, which are for the most part situated in the irrigated area, is much lower than that of Berber and Kordofan Provinces and distinctly lower than that of the Fung and Kassala Provinces.

(iv) The low tuberculosis incidence and the absence of cases of pulmonary infection.

The following table shows the result of the medical examination of pupils in one secondary, 11 primary, 59 elementary and 358 villages schools during 1930 :—

Province	Number Examined	% Trachoma	% Bilharzia	% Spleen	% Tuberculosis	% Ankylostoma
Khartoum.						
Gordon College ..	273	45.8	2.2	2.9	—	—
Gordon College Workshops ..	40	12.5	—	—	—	—
Khartoum Primary..	219	28.3	—	10.0	—	—
Omdurman Primary	310	39.0	—	6.0	0.3	—
Berber.						
3 Primary	257	48.2	6.6	3.5	—	0.8
8 Elementary ..	1291	56.6	11.8	6.5	—	—
60 Village	2071	63.5	3.1	46.3	—	—
Blue Nile.						
2 Primary	212	4.2	—	22.2	—	—
6 Elementary ..	611	23.9	—	25.4	—	—
116 Village	4135	41.0	—	23.0	—	—
Kordofan.						
1 Primary	105	16.2	—	11.4	0.9	0.9
11 Elementary ..	896	15.9	6.9	26.5	—	0.1
14 Village	1329	12.1	12.4	40.1	—	0.2
Kassala.						
3 Elementary ..	234	9.0	0.4	21.8	—	—
29 Village	835	26.2	0.6	27.8	—	—
Fung :—						
6 Elementary ..	265	21.1	2.6	22.6	—	—
10 Village	411	18.0	4.4	33.3	—	—
Halfa.						
1 Primary	58	34.5	20.7	3.4	—	6.9
4 Elementary ..	398	68.3	19.3	0.5	—	4.0
61 Village	1854	57.7	34.9	8.3	—	7.4
Bahr-El-Ghazal.						
Wau Mission	150	—	3.3	9.3	—	—
Dongola.						
7 Elementary ..	614	71.3	7.2	7.1	—	0.3
136 Village	3756	46.4	12.9	3.7	—	—

(13.) QUARANTINE.

(a) WADI HALFA QUARANTINE.

The primary object of this station is to prevent the introduction of Ankylostoma and Bilharzia infection into the Sudan by Egyptian labourers who come to the Sudan for short periods of navvy work.

These labourers are detained at Wadi-Halfa for 36-48 hours. They are medically examined and any, who by reason of age, infirmity or disease, are unfitted for hard work or who are suffering from an infectious disease such as Secondary Syphilis or Favus are set aside for repatriation. The remainder are given a purge followed by a dose of Carbon Tetrachloride ; they are then bathed, shaved and their clothes are disinfected ; their stools are examined for worms and the worm infections are recorded ; their urine is examined for Bilharzia. All persons suffering from Bilharzia are repatriated.

The remainder are allowed to proceed to their places of destination and lists are sent to the Medical Inspectors in charge, showing the results of examination in each case, so as to permit of further observation and treatment.

A total of 4,079 passed through the quarantine in 1930, as against 6,072 in 1929, and 7,743 in 1928. Of the 4,079, 475 were rejected and repatriated.

The causes of rejection were as follows :—

Bilharzia	461
Anaemia	4
Favus	3
Youth	3
Blindness	2
Pleurisy	1
Emaciation...	1
TOTAL	475

The percentage of rejections was 11.64 as compared with 11.03 in 1929.

Attempts to arrange for effective preliminary examination at Luxor were not successful. Without a careful organisation it is very difficult to prevent substitution of specimens and impersonation.

The following list shows the percentage rates of certain infections as compared with the two previous years.

PERCENTAGES.

	Haematuria.	Bilhar. ova	Oxyuris	Ankylostoma.	Ascaris	Taenia	Enlarged spleen.
1930	11.1	11.1	11.2	14.7	4.3	1.8	0.7
1929	10.5	10.5	6.6	9.2	3.2	3.0	0.2
1928	12.0	11.9	18.2	18.0	5.8	3.6	0.6

The following list shows the Districts of origin and the destination of the various batches :—

No. in Batch.	Date of arrival at Quarantine.	District	Destination.
408	17. 3.30	Luxor, Esna and Deshna	Barakat
63	21. 3.30	Luxor	Khartoum
61	30. 3.30	Luxor	Barakat
369	17. 4.30	Sohag	Barakat
599	6.10.30	Luxor and Deshna	Barakat, Turabi, Heseira, Meilig.
600	13.10.30	Luxor and Deshna	Turabi
562	26.10.30	Luxor	Turabi
600	6.11.30	Luxor	Barakat and Turabi
601	12.11.30	Luxor and Deshna	Hadaleiya
216	10.12.30	Luxor	Barakat and Ogda
4,079			

(b) PORT SUDAN QUARANTINE.

Health of Port.

Beyond small outbreaks of Chicken-pox and measles in the early part of the year, there have been no epidemic outbreaks in Port Sudan or its neighbourhood. No abnormal mortality of rats has been discovered either on shore or in ships visiting the port.

Several cases of a disease diagnosed as Beri-beri were seen in December on a ship visiting the port. The crew of the ship were Chinamen and their feeding was undertaken by a Chinese contractor. The necessary instructions were given to the Captain together with a supply of Marmite. Two similar cases were seen on the same ship in July and at that time the same Chinese contractor was in charge of the feeding arrangements.

Fumigation of Cargo.

Two barges with air-tight hatches have been provided for the fumigation of cargo discharged from infected or suspected ships. In this way cargo can be discharged at a distance from the quays and can be effectively fumigated before it is landed. The total cargo capacity of these barges is 200 tons so that an infected cargo of a greater capacity would have to be fumigated on board ship. The average capacity of cargo discharged per ship in Port Sudan is as follows :—

Cargo from the West.

Average of 650 tons, with a maximum of 2,000 tons, and a minimum of 100 tons.

Cargo from the East.

Average of 200 tons, with a maximum of 500 tons, and a minimum of 50 tons.

The necessity for fumigation is more likely to occur in ships coming from the East.

Fumigation is carried out as at the port of Liverpool by burning Flowers of Sulphur after having carefully sealed up all openings.

The following table shows the number of ships entering the port in 1930 and in the four preceding years :—

	1926.	1927.	1928.	1929.	1930.
Ships arriving	820	845	932	885	944
Sambuks	393	562	633	526	529
Men of War-British	20	21	12	17	20
French	—	5	4	5	9
Italian	—	1	4	6	3
Ships quarantined	—	2	12	—	—
Patients isolated from ships ...	—	5	2	—	2

No charge is made for Bills of Health and visas.

Sambuks (Native sailing vessels).

The places from which these vessels came from are as follows :—

	1929.	1930.
Sudan Coast	502	453
Egyptian Coast	6	38
Arabian Coast	18	38
TOTAL	526	529

Passengers travelling in sailing vessels were as follows :—

	1929.	1930.
Sudan Coast	151	183
Egyptian Coast	5	3
Arabian Coast	—	—
TOTAL	156	186

Quarantine Hospital.

Two cases were admitted into this hospital :—

(i) An Indian from s.s. " Elysia " with Small-Pox.

(ii) A Sudanese from Port Sudan with Cerebro-spinal Meningitis.

Water Supply.

The fresh water supply for Port Sudan is from a natural subsoil reservoir in the hills, at a distance of twenty miles from the town. The duplication of the pipe line from the head works to the town was completed early in the year by the laying of a further 1,500 metres of 9½ inch pipe. Before this further installation there had been a single 8 inch pipe for the first 1,500 metres from the head works and this connected with a 6 inch pipe and an 8½ inch pipe for the rest of the distance. It is now possible to deliver 3,000 tons of water per day to Port Sudan provided that this amount is available at the head works.

The average daily consumption of water for the whole year was 1,460 tons. This includes 290 tons supplied daily to gardens and 34 tons to ships.

Bacteriological examinations showed no Bacillus Enteriditis, Sporogenes or Bacillus Coli in 50 c.c. of water.

Mosquitoes.

The following table shows the number of infestations of mosquito larvae found throughout the year.

It will be noticed that Stegomyia infestations predominated.

No cases of Malaria were contracted in Port Sudan.

A—Anopheline.	S—Stegomyia.		C—Culex.			
Month.	No. of Infections of larvae.	No. of Infections of pupae.	Species. A.	Species. S.	Species. C.	Total.
January	4	1	—	5	—	5
February	8	—	—	5	3	8
March	9	4	—	8	5	13
April	24	6	—	19	11	30
May	31	12	2	25	16	43
June	17	4	1	14	6	21
July	13	2	1	8	6	15
August	5	1	—	5	1	6
September	10	2	—	11	1	12
October	9	3	—	3	9	12
November	10	3	1	7	5	13
December	19	3	5	4	13	22
Total	159	41	10	114	76	200

Rats.

The total number of rats caught shows an increase of over a thousand on last year's figure, but the latter was lower than would have been expected. A comparison of the number of rats caught in the last five years is as follows:—

In	1926	there	were	1,884	rats	caught.
,,	1927	,,	,,	3,731	,,	,,
,,	1928	,,	,,	4,807	,,	,,
,,	1929	,,	,,	3,791	,,	,,
,,	1930	,,	,,	5,184	,,	,,

Distribution of Main Town and East Side.

Month.	West Town				East Town.				Grand Total.
	Shops etc.	Villages	Other places.	Total.	Quays encl.	Deim Hashish	Other places	Total.	
January	122	62	—	184	62	47	108	217	401
February	82	81	—	163	29	59	105	193	356
March	101	42	81	224	53	79	118	250	474
April	145	63	47	255	69	72	107	248	503
May	148	55	18	221	95	80	106	281	502
June	109	102	9	220	41	41	59	141	361
July	76	39	7	122	31	35	64	130	252
August	113	76	4	193	49	41	66	156	349
September	84	60	29	173	52	71	81	204	377
October	112	56	31	199	64	56	67	187	386
November	93	35	35	163	46	61	54	161	324
December	104	23	35	162	30	26	38	94	256
Total	1289	694	296	2279	621	668	973	2262	4541
Percentage	28.3%	15.3%	6.5%	50.1%	13.7%	14.7%	21.4%	49.8%	100%

In addition 641 rats have been caught in and around the market (Suk) area on the south side. All the above are black rats Rattus Rattus, but two rats of the type Arvicanthus Testicularis were also caught on the east side this bringing the total to 5,184 for the year.

In 1929 only 26 rats were caught on the south side and all in the last two months of the year.

Rat Fleas.

The same methods have been used for making the flea census as were followed in 1929 and the results are very similar for the two years. The seasonal diminution again occurred from June to October (inclusive) but was not quite as low as it was last year.

Flea Census.

(Showing prevailing atmospheric conditions) :—

Month.	Fleas per rat.	Average Temperature (Shade) Max. °F.	Min.°F.	Average relative humidity.
January	2.9	79.0	63.1	54
February	2.0	81.7	66.4	66
March	2.8	83.7	66.0	63
April	3.7	87.8	70.7	58
May	4.2	97.5	73.2	38
June	2.6	104.4	78.8	34
July	2.2	107.8	81.5	33
August	1.0	107.2	85.1	36
September	1.1	102.0	80.2	42
October	0.9	92.7	77.2	62
November	2.5	88.5	76.1	65
December	2.9	88.5	70.9	63

(c) SUAKIN QUARANTINE.

A total of 4,791 pilgrims left Suakin for the 1930 Pilgrimage. The totals of departing pilgrims since 1926, the year before the administration of the pilgrim quarantine was handed over to the Sudan, are as follows :—

1926.	1927.	1928.	1929.	1930.
1,559	1,732	3,237	3,866	4,791

During these years there has been a steady increase both in Sudanese and West African pilgrims, but the greater increase has been in the West African pilgrims.

All pilgrims were vaccinated against Small-Pox and received a single inoculation against Cholera. They all paid for a return ticket by steamship and paid a deposit to meet quarantine charges in the Hedjaz and on their return to Suakin. No pilgrims left or returned by sailing vessel.

Yom Arafat fell on May 8th and the last ship carrying pilgrims to the 1930 Pilgrimage left on May 5th carrying 23 Sudanese and 22 West African pilgrims. In order to reach Mount Arafat by May 8th part of the journey from Mecca to Arafat must have been made by car. This is interesting in connection with the apparent poverty of the West African pilgrims.

On May 22nd the International Quarantine Board of Egypt declared the pilgrimage infected. This decision was taken as a result of the discovery at Tor of agglutinating choleriform vibrios in the stools of a woman pilgrim, who did not

herself present any symptoms of Cholera. This discovery was made as a result of the routine examination of stools of all pilgrims landed from the first steamship to arrive at Tor with pilgrims returning from the Hedjaz. The ship arrived at Tor on the 17th May.

Although this in itself, in the absence of any clinical manifestations of the disease, either in the Hedjaz or among returning pilgrims, did not suggest grounds for serious anxiety, precautionary measures were at once enforced. The need for such measures was emphasised by the occurrence of a case of Cholera at Massowah. The case in question, a male pilgrim, was landed at Massowah on May 27th. He presented all the signs of clinical Cholera and the diagnosis was confirmed bacteriologically.

The following measures were put in force at Suakin when the pilgrimage was declared infected :—

(i) A careful search was made for any pilgrims who had not left for the pilgrimage via Suakin, and who had thus escaped inoculation against Cholera, and any such persons were isolated in separate compounds.

(ii) The number of pilgrims isolated in any one compound was reduced as much as possible.

(iii) Immediate bacteriological examination was carried out on any case presenting symptoms of alimentary disturbance.

(iv) All pilgrims were re-inoculated against Cholera.

(v) After warning had been given to the Shipping Agents at Jeddah, all pilgrims who had not left for the pilgrimage via Suakin were refused permission to land so as to avoid the reception of pilgrims who had not been inoculated against Cholera at the time of departure.

The health of the pilgrims was good. There were 47 admissions to hospital with nine deaths.

Bilharzia.

3,790 pilgrims were examined for urinary Bilharzia. 5.9 per cent. of the men and 4.4 per cent. of the women were found to be infected. Of those infected 17 per cent. were Sudanese and 83 per cent. were West Africans. The almost equal distribution between the two sexes is of interest as in the villages in the Sudan the proportion of women and female children infected is very small. The explanation no doubt is the equal exposure of women to sources of infection on the journey, as the great majority of infected pilgrims were West Africans.

A Telegraph Office was established in the camp. It was freely used by the Sudanese pilgrims, but less so by the West Africans.

The following tables show the number of pilgrims leaving from and returning to Suakin in the last four years :—

Outgoing Pilgrims.			Returning Pilgrims.		
1927	...	1,732	1927	...	2,727
1928	...	3,237	1928	...	2,804
1929	...	3,866	1929	...	3,682
1930	...	4,791	1930	...	4,089

The following table shows the difference between the number of pilgrims that left Suakin and returned to Suakin during the last three years separately for Sudanese and West Africans :—

	1928		1929		1930		Total.	
	Dep.	Arr.	Dep.	Arr.	Dep.	Arr.	Dep.	Arr.
Sudanese	932	948	1,324	1,369	1,436	1,218	3,692	3,535
West Africans	2,305	1,856	2,542	2,313	3,355	2,871	8,202	7,040

It is seen from these figures that whereas in 1928 and 1929 more Sudanese pilgrims had returned by the end of each year than had left in the same year—in 1930, 218 pilgrims had not returned by the end of the year.

It is also seen that during each of these three years fewer West African pilgrims returned than had left in the same year and that this deficient return was especially marked in 1930, reaching a total of 484. The total deficiency of West Africans during these three years is 1,162.

From May onwards a record was kept of pilgrims who had left in previous years and returned this year together with a note on their occupation whilst in the Hedjaz. Thus between May and December, 1930—55 pilgrims who had left on previous years returned as follows :—

Year of departure.	Men.	Women.	Total.	Unemployed.
1927	7	1	8	1
1928	11	10	21	4
1929	18	8	26	10
Total ...	36	19	55	15

Out of the 55, 15 had been unemployed and most of these on account of illness. Their principal occupations were studying (generally in Mecca) masons, water carriers, and porters.

The following list shows the number of pilgrims who left via Massowah and returned to Suakin :—

1927	1,055
1928	97
1929	33
1930	8

Payment of quarantine dues by West African pilgrims

Year.	Number Paying.			
	Full dues.	Half dues.	No. dues.	Total.
1928	1,789	2	65	1,856
1929	1,839	216	258	2,313
1930	2,252	220	399	2,871

Total quarantine dues paid.

	£E.
1928	1,400
1929	1,692
1930	1,707

A free ration of durra was issued to 60 indigent pilgrims.

(14.) STAFF AND ORGANISATION.

(A) BRITISH STAFF.

The staff employed by the Sudan Medical Service consists of :—

1. (a) A Director, who is responsible for the Medical and Public Health work throughout the Sudan,

   (b) An Assistant Director,

   (c) An Assistant Director for the health of the Sudan Defence Force for the three Border Provinces (Mongalla, Bahr-el-Ghazal and Darfur) and for Sleeping Sickness and Leprosy work.

2. A Medical Specialist and a Surgical Specialist posted to Khartoum Hospital and teaching Medicine and Surgery at the Kitchener School of Medicine.

3. Medical Officer of Health, Khartoum.

4. Thirty one Medical Inspectors and Senior Medical Inspectors.

5. In addition there are at present ten British Medical Officers seconded from the R.A.M.C. for work in connection with the Sudan Defence Force and for civil medical work.

6. Twenty one British Sanitary Inspectors who work under the direction of the Medical Officer of Health of Khartoum Province and the Medical Officers of Health of the other provinces where they are employed.

7. A Matron, Khartoum Civil Hospital.

A Charge Sister, Omdurman Civil Hospital (in charge of the Nurses Training School).

Ten nursing sisters.

An Inspectress of Midwives who is in charge of the Midwives Training School at Omdurman and who inspects midwives throughout the northern and central Sudan.

A Matron, Midwives Training School.

(B) SYRIAN AND SUDANESE MEDICAL OFFICERS.

Sixty-six Syrian Medical Officers employed in civil medical work and in connection with the Sudan Defence Force.

Nineteen Sudanese Medical Officers trained at the Kitchener School of Medicine and carrying out similar duties to the Syrian Medical Officers.

(C) SUDANESE SUBORDINATE STAFF.

1. Dispensary Hakims (in charge of "A" Dispensaries).

Dispensary Hakims are men selected from the more able and more reliable Sanitary Hakims (see below) and given one year's further training. Their training is largely a repetition of that given to the Sanitary Hakims except that

it is somewhat wider in scope. They receive further instruction in the use of the stethoscope, dispensing, in simple microscopic work and in minor surgery.

2. Sanitary Hakims (in charge of "B" Dispensaries).

These men are selected from the most intelligent and trustworthy hospital orderlies. They can all read and write well. They receive a year's intensive training. They are taught very elementary anatomy and physiology, to recognise the common diseases of the country, to give simple treatment with stock mixtures and to become proficient in intravenous injections. They also receive instruction in simple sanitary work and, in particular, anti-malarial work.

3. Sanitary Barbers.

A Sanitary Barber is a man who has received a very simple surgical and medical training in his province hospital. His duties are to dress wounds and ulcers and to attend criminal cases to view dead bodies (where no higher medical authority is available), to report outbreaks of disease and to vaccinate. They are especially used to carry out anti-trachoma work in the villages. Sanitary Barbers are confined to the riverain districts of the northern and central Sudan and are attached to an Omodiyeh (a collection of villages under an Omda) or frequently to a group of Omodiyehs.

4. Sheikhs' Dressers and Chiefs' Dressers.

To meet the need for treatment among the pagan tribes of the south, and among the nomad Arabs of the northern and central Sudan where the Sanitary Barber of the settled Arab would be out of place, a system of sheikhs, and chiefs' dressers has been instituted. The chief or sheikh is invited to send a limited number of youths for training. These, if they meet with the approval of the Medical Inspector, are given a three months' course of training at the nearest dispensary. They are taught to dress wounds, to treat inflammatory conditions of the eye, to treat ulcers, to vaccinate and to administer simple stock mixtures. They send or bring more serious cases to their local dispensary.

These dressers are under the chief or sheikh for discipline, and are sent up to their local dispensary every year for a short "refresher" course.

5. Laboratory Assistants.

These are youths of some intelligence and education who receive a course of instruction at the Wellcome Tropical Research Laboratories in simple laboratory work. They are taught to prepare and examine blood films for Malaria, to examine for urinary and intestinal parasites, to carry out various urinary tests and other simple laboratory work. They have proved themselves most useful in carrying out this work at the provincial hospitals and at the quarantine stations, for the most part under the supervision of a Medical Inspector.

6. Sanitary Overseers.

These are natives who have received some elementary education, who are trained for the most part by British Sanitary Inspectors and who work under their supervision. In the towns, under the British Sanitary Inspectors, they supervise conservancy work, inspect for nuisances and do anti-malarial work in and around the towns. In the irrigated areas they inspect for and report mosquito breeding and leakages from the canals, and are in charge of oiling parties.

HEALTH ORGANISATION.

Public health work in Khartoum Province, which includes the towns of Khartoum, Khartoum North and Omdurman, is under the control of the Medical Officer of Health of Khartoum. The population of the three towns is estimated at 176,264, that of the rest of the province at 86,588.

In the other provinces the Medical Officer of Health is the Senior Medical Inspector of the province. In these provinces it is necessary, in order to ensure economy of effort and the maximum efficiency in the use of personnel, that the administration, both of preventive and curative medical work, should be combined under a single head. This is not only the case in the less developed provinces, but is felt to be even more important in a thickly populated area such as the Gezira irrigated area.

THE NURSING SERVICE.

Sisters serve under one of two categories :—

(i) Sisters serving for a period of two years, commonly extended to four years, and leaving with a gratuity at the end of this period.

(ii) Sisters selected from these as possessing certain special qualifications, including knowledge of the Arabic language and aptitude for work among native women, who are invited to stay on for a further period of six years.

Sisters are now stationed as follows :—

KHARTOUM :—	Matron.
	Outpatient Sister.
	4 Sisters.
ATBARA :—	1 Sister.
PORT SUDAN :—	1 Sister.
WAD MEDANI :—	2 Sisters.
OMDURMAN :—	1 Charge Sister (In charge of Nurses Training School).
	1 Sister.

SUDAN MEDICAL SERVICE STAFF.
1930.

Appointment	Establishment
Medical Staff :—	
Director	1
Senior Surgeon	1
Senior Physician	1
Assistant Director	1
Medical Officer of Health, Khartoum	1
Senior Medical Inspectors	5
Medical Inspectors	22
Medical Officers (Syrians)	41
Medical Officers (Sudanese)	14
Dispensary Hakims (Sudanese)	70
Sanitary Hakims (Sudanese)	98
Dispensers	7
Radiographer	1
Assistant Radiographer	2
Laboratory Assistants	10
Midwife	1
Nursing Staff :—	
Matron, Khartoum Hospital	1
Matron, Omdurman Hospital	1
Inspectress of Midwives	1
Nursing Sisters	11
Sanitary Staff :—	
Chief Sanitary Inspector	1
Senior Sanitary Inspectors	5
Sanitary Inspectors	16
Native Sanitary Inspectors	3
Sanitary Overseers (Sudanese)	1
Clerical Staff :—	
Superintendent	1
Chief Clerk	1
Translator (Grade V)	1
Translators (Grade VI)	3
Translators (Grade VII)	8
Translators (Grade VIII)	4
Clerks (Grade VII)	11
Clerks (Grade VIII)	24
Chief Accountant (Grade V)	1
Accountant (Grade VI)	1
Accountants (Grade VII)	5
Accountants (Grade VIII)	3
Stores Staff :—	
Medical Storekeeper	1
Asst. Medical Storekeepers	2
Storemen (Sudanese)	8
Tailors	1
Carpenter	1

CHANGES IN PERSONNEL.

The following changes in personnel occurred during 1930 :—

Medical Inspectors :—

Mr. D. O. Richards	Resigned	7.1.30
Mr. J. Duncan	,,	17.1.30
Mr. H. M. Woodman	Appointed	6.4.30
Mr. A. P. Farmer	,,	6.4.30
Dr. T. F. R. Hewer	,,	3.5.30
Mr. N. L. Corkill	,,	21.9.30

Medical Officers (non-Sudanese).

Sagh. Emile Eff. Naim	to S.D.F.	8.1.30

Medical Officers (Sudanese).

NIL.

Medical Officers (Sleeping Sickness).

Yuzb. Kamel Eff. Abu Seoud	from S.D.F.	1.3.30
Yuzb. Habib Eff. Nabaa	to S.D.F.	12.10.30
M. A. Kratchia B. Papasian	to S.D.F.	4.12.30
M. A. Yervant Nakachian	from S.D.F.	4.12.30

Sanitary Inspectors.

Mr. H. Claassen	Discharged	18.4.30
Mr. E. H. Scrivener	Appointed	27.1.30
Mr. R. A. Over	Appointed	18.5.30
Mr. A. M. Birrell	Appointed	1.6.30
Mr. G. M. Robb	Appointed	10.8.30

Dispensary Hakims.

Seven were appointed.

Sanitary Hakims.

Eight were appointed—Three were discharged.

NOMINAL ROLL OF BRITISH MEDICAL STAFF
SUDAN MEDICAL SERVICE
1930.

Director	Mr. O. F. H. Atkey, C.M.G., M.B., F.R.C.S.
Assistant Director and M.O.H., Khartoum ...	Dr. J. C. N. Harris, M.D., D.P.H.
Senior Surgeon	Mr. C. G. Hill, M.B., F.R.C.S.E.
Senior Physician ...	Mr. R. M. Humphreys, M.B., B.Ch.
Senior Medical Inspector	Mr. E. A. H. Grylls, M.B., B.Ch.
,, ,,	Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S., L.R.C.P.
,, ,,	Mr. A. Cruickshank, M.B., B.Ch.
,, ,,	Mr. E. D. Pridie, D.S.O., M.B., B.S.
Medical Inspector ...	Mr. L. F. O'Shaughnessy, M.B., F.R.C.S.
,, ,, ...	Mr. A. E. Lorenzen, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. J. A. Simons, M.C., M.R.C.S., L.R.C.P.
,, ,, ...	Mr. T. W. MacDowell, M.B., B.Ch.
,, ,, ...	Mr. F. E. Anderson, M.B., B.Ch.
,, ,, ...	Mr. F. S. Mayne, M.B., F.R.C.S.E.
,, ,, ...	Mr. F. H. Goss, M.C., M.B., B.Ch.
,, ,, ...	Mr. N. Macleod, M.B., Ch.B.
,, ,, ...	Dr. L. H. Henderson, M.D., Ch.B., D.T.M. and H.
,, ,, ...	Mr. J. S. Hovell, M.B., F.R.C.S.E.
,, ,, ...	Mr. D. R. Macdonald, M.B., Ch.B.
,, ,, ...	Mr. E. P. Pratt, M.B., B.S.
,, ,, ...	Mr. J. W. Wallace, M.B., B.Ch.
,, ,, ...	Mr. G. D. Rankin, M.B., B.Ch.
,, ,, ...	Mr. H. M. Elliott, B.Ch., L.R.C.P.
,, ,, ...	Mr. F. K. Wilson, M.B., Ch.B.
,, ,, ...	Mr. A. R. McKelvie, M.B., Ch.B.
,, ,, ...	Mr. J. Bryant, M.B., Ch.B., M.R.C.P.E., D.T.M. and H.
,, ,, ...	Mr. F. B. Turner, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. E. W. T. Morris, M.R.C.S., L.R.C.P.
,, ,, ...	Mr. H. M. Woodman, M.B., B.Ch.
,, ,, ...	Mr. A. P. Farmer, M.B., B.S., D.T.M. and H.
,, ,, ...	Dr. T. F. R. Hewer, M.D., Ch.B.
,, ,, ...	Mr. N. L. Corkill, M.B., Ch.B.

(15.) TRAINING.

(a) MEDICAL.

Kitchener School of Medicine.

In 1930, for the first time since the opening of the School in 1924, there was a full establishment of four classes. The full complement of classes was not reached before owing to the fact that no students were admitted to the School in 1926. The classes were composed as follows :—

	Students.
First Year	9
Second Year	8
Third Year	6
Fourth Year	6
TOTAL	29

The First year was smaller than in 1929 owing to the lack of really suitable candidates in the Senior Scientific section of the Gordon College. On the other hand owing to the closer liaison established between the Scientific section at the Gordon College and the School of Medicine it is now possible to make a better selection and so to decrease the number of rejections at the end of each year at the School of Medicine.

Teaching Staff.

Dr. H. C. Squires who had been a Member of the School Council since the opening of the School of Medicine in 1924, and who had been responsible for the lectures and clinical teaching in Medicine, retired from service in the Sudan in January, 1930.

He had devoted a great deal of thought to the method and scope of instruction in this and other subjects, and was chiefly responsible for the detailed elaboration of the Medical Syllabus. He has been, and will continue to be very much missed both as a personality and as a teacher. Mr. R. M. Humphreys took over his duties and is now responsible for the teaching of Medicine.

Mr. Marshall Holmes, Lecturer in Chemistry and Physics, was transferred to Atbara in August, 1930. His place has been taken by Mr. A. J. Henry of the Wellcome Tropical Research Laboratories.

Progress of Work.

The school year is divided into two terms—January 1st to April 30th and September 1st to December 20th thus providing a four months' vacation.

The two final year classes are each divided into two sections. The first two sections stay in Khartoum for the first two months of the vacation and the second two sections return to Khartoum for the second two months. During this time the students carry out their work of clinical dressing and clerking at the hospital and assist with outpatient work and at operations.

The half-yearly examination for the First and Second year classes are held on the return of the students from their long vacation thus ensuring that revision work is done during the vacation.

Examination in the First Year Subjects.

This examination in Chemistry, Physics and Biology was conducted by outside examiners selected from among the Government staff of Chemists and Biologists engaged in Agricultural research.

Eight students out of the class of nine satisfied the examiners that they had reached the required standard and will form the 1931 Second year class. As regards the unsuccessful candidate, it was decided by the School Council that it would not be advisable for him to continue his medical studies and work was found for him elsewhere.

Second Year Examination.

A class of eight students was examined in Anatomy and Physiology. They all satisfied the examiners that they had attained the necessary standard. They will form the Third year class of 1931.

The Final Examination.

Two assessors, Major Biggam, Lecturer in Clinical Medicine at the Egyptian University, Cairo and Dr. Cruikshank, Professor of Surgery at the American University, Beirut were appointed to supervise the final examination.

The examination included the following subjects:—

Medicine.
Surgery.
Midwifery and Gynaecology.
Public Health.
Forensic Medicine.
Lunacy, and
Pharmacology.

A class of six students came up for examination. Of these five satisfied the examiners that they had attained the necessary standard of knowledge and proficiency to enable them to practise their profession. These five graduates will be posted as house-surgeons and house-physicians at five of the larger hospitals, and at the end of this year's probation, if they have shown the necessary qualities of industry, trustworthiness and professional ability, they will be appointed to be Sudanese Medical Officers in the Sudan Medical Service. The unsuccessful candidate was referred for a year's further study in all the subjects. He will join the new fourth year class.

Progress of Doctors after Graduation.

No doctors were passed out in January, 1930, so that the only graduate on probation during 1930 was the doctor who graduated with six others in January, 1929, and who was deferred for a further year's work as a House officer. This graduate had improved to an extent that fully justified his promotion and he has been appointed to the rank of Sudanese Medical Officer.

Seven doctors graduated in January, 1928 and seven in January, 1929. All of these have now been promoted to be Sudanese Medical Officers, twelve on the expiration of a year's probation and two after the expiration of an additional year's probation. They are all now occupying posts previously held by Syrian Medical Officers, some being in sole charge of small hospitals, and others having been posted to larger hospitals. They are all carrying out their duties to the complete satisfaction of the British Medical Inspectors under whom they are serving. In addition to this five other doctors graduated in January, 1931, and are serving a year's probation as House-Surgeons and House-Physicians.

REPORTS OF ASSESSORS ON THE FINAL EXAMINATION.

At the request of the Director of Medical Services of the Sudan Government we have acted as Assessors in the recent examination of Medical Students completing their undergraduate course in the Kitchener School of Medicine.

The examinations have consisted of written, clinical and viva voce tests and we have endeavoured to maintain a standard approximating to that of the Conjoint Board of London.

We prepared and examined the written papers in Medicine and Surgery, we presided at the clinical and viva voce examinations in Medicine, Surgery, Gynaecology, Obstetrics and Clinical Pathology and we reviewed the papers previously completed in Gynaecology, Obstetrics, Pathology and Public Health

Six students presented themselves for examination and with one exception created a very favourable impression upon the assessors. In the written examinations we were impressed by the facility with which these students used the English language and by the orderliness and unity of their answers. Answers were systematic and exact and there was no evidence of a desire to conceal ignorance by ambiguity or loose statement.

In the clinical and viva voce examinations we were impressed by the courteous, straightforward and modest bearing of the successful candidates, by their serious and intelligent interest in their cases and by the frank acknowledgment of deficient information when such existed.

The students showed very little evidence of the strain under which they were probably working. The quiet atmosphere of confidence on the part of the students suggested to the assessors that the relationship between students and teachers had been a very frank and intimate one and the necessary discipline one of mutual trust and respect.

The medical world at large is embarrassed by problems arising from the great increase of medical knowledge and the consequent lengthening of the course of medical instruction. The Medical Authorities of the Sudan are shortening the period of academic instruction and emphasizing practical experience in close association with broad-minded and highly trained clinical teachers. For several reasons it would seem possible to do this successfully in the Sudan. In the first place the Medical Faculty are able to select prospective students from the Gordon College much as a clinical professor selects his assistants, bearing in mind qualities of character as well as those of academic excellence. This we believe has been well done and the students graduating this year appear to be distinguished by qualities of honour, trustworthiness and modesty in addition to reasonable academic excellence. In the second place each graduate will spend at least one year after graduation under the supervision of a well-qualified medical man from Great Britain, and the graduate's further instruction and responsibility will depend upon an assessment of his work made by this superior officer.

In order to see this graduate supervision in operation we visited several graduates working in hospitals in the Gezirah and were favourably impressed by their keen and intelligent interest in their hospital cases, by their apparent enthusiasm for the work and by favourable reports from the men with whom they were working.

A problem that is always a difficult one in the early phases of medical instruction is that of providing adequate clinical experience in Gynaecology and Obstetrics. The development of a School for Midwives in the Sudan makes this problem more urgent for the Medical School. At the same time the School of Midwives should assist in solving the problem.

In addition to improved clinical facilities for Gynaecology and Obstetrics we would also suggest the advisability of making the senior students responsible, under supervision, for the routine work in Clinical Pathology on the cases that they study.

Our visit has been all too short to satisfy our interest or to enable us to thoroughly understand the professional requirements of the Sudan. We have, however, been profoundly impressed by the understanding of their own problems possessed by the officers of the Sudan Medical Service, we believe that the medical students whom they are training will meet the requirements and we feel confident that the five men who have graduated as a result of this examination will be a credit to the profession.

We wish to congratulate the graduating students upon the successful completion of an arduous course of study and upon the future thereby opened to them for even more arduous work in the health development of their vast country. We wish also to thank the Director and Officers of the Sudan Medical Service for their generous assistance and hospitality. Most heartily and sincerely would we congratulate them upon the work of the Kitchener School of Medicine.

(Sgd.) W. D. CRUIKSHANK.

(Sgd.) A. G. BIGGAM.

ADDITIONS TO BUILDINGS AND EQUIPMENT.

Hostel.

The School Council considered it advisable that the House-Surgeon on duty at Khartoum Civil Hospital should reside at the School of Medicine hostel This decision was arrived at for the following reasons :—

(i) There is no living accommodation for a House-Surgeon at the hospital, while the hostel is near and in telephonic communication with the hospital.

(ii) The House-Surgeon forms a useful link between the students and hospital work, and is able to keep them in touch with all that is going on at the hospital and to bring them up for casualties and emergency operations.

In view of this decision a room has been built on to the hostel to accommodate the House-Surgeon.

Gas Plant.

The existing plant had proved unsatisfactory and a new "Silverlite" electrically driven plant has been installed in its stead.

(b) MIDWIFERY TRAINING SCHOOL.

As foreshadowed in the last report, Miss G. Wolff was posted to the Midwifery Training School as Matron, to assist her sister, Miss M. Wolff, the Inspectress of Midwives, in carrying on this work. This appointment was necessitated by the increased number of midwives admitted for training, and the increased supervision required by the extension of the work into the outlying Arabic-speaking provinces.

As a result of this appointment the Inspectress and Matron were both able to carry out inspection work during the months of November and December and the area inspected was thus greatly increased. The following provinces came under inspection during the year :—

Berber	Dongola	Kassala
Blue Nile	Fung	Kordofan
Darfur	Halfa	Port Sudan and Suakin

This inspection work is of the greatest importance. These midwives before training are ordinary untrained midwives or their daughters, ignorant, dirty, illiterate and with all the superstitious prejudices of the uneducated native woman of the village or the desert.

They are brought to Omdurman for a six-months' training and under the influence of superior education and a strong personality they are taught to carry out the routine of their profession with cleanliness and in accordance with European methods, but the background of ignorance, prejudice and superstition remains. They return to their villages often with no other trained midwife within several days' journey, and have to struggle against the criticisms of their untrained colleagues and the prejudices and conservatism of the women of the villages, prejudices which find an echo in their own superstitious minds. Such women, if they are to carry on their work loyally and faithfully against so many distracting forces, need frequent supervision, and this can only be ensured by the Inspectress and Matron both travelling for two to three months in the year.

Twenty midwives successfully completed their course of training. They had each personally delivered at least 20 cases and had assisted at double that number of deliveries. At the final examination they satisfied the examiners that they had attained the necessary standard of proficiency.

On completion of their course they returned to their villages of origin. One died and one was struck off as suffering from a disabling illness.

Their distribution by provinces was as follows :—

Darfur Province	5
Kordofan ,, ...	8
White Nile ,, ...	3
Blue Nile ,, ...	1
Khartoum ,, ...	3

Up to the present a total of 133 midwives have been trained, of these 109 are alive and practising their profession.

They are distributed as follows :—

Berber Province	12
Blue Nile ,, ...	9
Darfur ,, ...	5
Dongola ,, ...	10
The Fung ,, ...	3
Kassala ,, ...	3
Halfa ,, ...	1
Khartoum ,, ...	39
Kordofan ,, ...	11
Port Sudan and Suakin	3
White Nile Province	13
TOTAL	109

Omdurman is now entirely served by trained midwives. Among 1,632 births registered in 1930 no deaths due to puerperal sepsis, haemorrhage or obstructed labour were reported. There has been a continued diminution of the infantile death rate in Omdurman during recent years.

Kordofan and the Red Sea littoral remain especial strongholds of bad and ignorant midwifery and it is a matter of urgent importance to increase the number of trained midwives in these provinces.

(c) NURSES TRAINING SCHOOL.

During the year, twenty one nurses were under training at this school. Of these, six completed their training and satisfied the examiners as to their proficiency, four were discharged as unsuitable and eleven are continuing their training for another year.

Of the six who completed their training four were posted to provincial hospitals.

Less difficulty is now experienced in obtaining candidates for training and it should soon be possible to raise the standard of selection.

The following is an extract from the report of the Sister in charge of the Training School :—

" They seem more eager to learn and more ready to submit to the necessary discipline. There is a marked kindness, forethought and consideration in their treatment of patients. Their native indolence is slowly being supplanted by an interest in their work and a wish to acquire information. We now carry out Gynaecological work in the theatre with only women nurses ; heretofore male attendants in the theatre were necessary. The patients appear to appreciate this."

So much difficulty has been experienced heretofore in obtaining a suitable type of woman for training and in persuading those engaged, to submit to the discipline of a nurse's life, that this modified success is a source of great encouragement.

Until this problem of finding and training suitable nurses on an adequate scale can be solved the nursing of women and children in the provincial hospitals cannot be placed on a satisfactory basis.

(Sgd.) O. F. H. ATKEY,
Director, Sudan Medical Service.

Khartoum.
9.4.1931.

TABLE I.

Shows the admissions and deaths by disease.

DISEASE.	TOTAL.							
	Europeans.				Natives.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table "A"								
Tubercular								
1. Disease of lung	4	1	—	—	327	57	77	10
2. All other tubercular diseases ...	—	—	1	—	218	16	81	2
Venereal								
3. Syphilis	4	—	—	—	2,852	17	1,414	3
4. Gonorrhoea	13	—	—	—	1,752	—	200	—
5. Soft Sore	2	—	—	—	119	—	1	—
Eye.								
6. Trachoma...	3	—	—	—	260	—	76	—
7. All other eye diseases	5	—	—	—	1,213	—	517	—
8. **Ear**	7	—	—	—	190	1	38	—
9. **Skin**	6	—	—	—	956	—	369	—
10. **Wounds and other injuries** ...	88	1	8	—	10,179	143	1,933	40
Tumours.								
11. Malignant	—	—	1	—	105	17	66	14
12. Non-Malignant	2	—	1	—	183	—	80	—
Of Women.								
13. Gynaecological	—	—	16	—	—	—	348	4
14. Confinements	—	—	31	1	—	—	190	7
15. **Poisoning**	—	—	—	—	20	4	6	1
Total Table "A" ...	134	2	58	1	18,374	255	5,396	81
Table "B" (Tropical).								
1. Ankylostomiasis	—	—	—	—	93	—	49	—
2. Bilharziasis	1	—	—	—	334	—	20	—
3. Blackwater Fever	4	1	—	—	10	4	2	—
4. Dysentery, Amoebic	13	—	—	—	1,104	26	222	8
5. Dysentery, Bacillary	20	—	3	—	142	5	18	—
6. Filariasis	—	—	—	—	53	3	2	—
7. Madura disease	—	—	—	—	229	1	51	—
8. Malaria	61	1	2	—	5,362	79	466	11
9. Leishmaniasis (Kala-Azar) ...	1	—	—	—	45	10	—	—
10. Trypanosomiasis...	—	—	—	—	—	—	—	—
11. Yaws	—	—	—	—	298	1	245	—
12. Sunstroke...	1	—	—	—	1	1	—	—
13. Heatstroke	—	—	1	—	2	1	3	—
14. Guinea Worm	—	—	—	—	444	—	68	—
Total Table "B"	101	2	6	—	8,117	131	1,146	19

TABLE I. (*Continued*).

Disease.	TOTAL.							
	Europeans.				Natives.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table "C" (Infective).								
1. Anthrax	—	—	—	—	—	—	—	—
2. Beri-Beri	—	—	—	—	—	—	—	—
3. Cerebrospinal Meningitis	—	—	—	—	157	109	42	23
4. Chicken Pox	—	—	—	—	364	2	16	—
5. Cholera	—	—	—	—	—	—	—	—
6. Dengue	—	—	—	—	10	—	—	—
7. Diphtheria	—	—	2	—	30	7	24	2
8. Enteric (Including Paratyphoid)	4	—	1	1	45	4	19	1
9. Erysipelas	—	—	—	—	9	—	4	—
10. Gastro-enteritis of children	1	—	—	—	6	3	3	—
11. German Measles	—	—	—	—	2	—	—	—
12. Influenza	24	—	3	—	638	2	37	—
13. Leprosy	—	—	—	—	295	1	10	—
14. Malta Fever	1	—	—	—	25	4	—	—
15. Measles	1	—	—	—	356	1	76	—
16. Mumps	—	—	—	—	348	—	24	—
17. Pellagra	—	—	—	—	—	—	—	—
18. Puerperal Fever	—	—	1	—	—	—	10	4
19. Phlebotomus	—	—	—	—	33	—	3	—
20. Plague	—	—	—	—	—	—	—	—
21. Pneumonia (Epidemic)	4	—	3	—	719	113	76	12
22. Rabies *	—	—	—	—	6	1	2	—
23. Relapsing Fever	—	—	—	—	475	47	6	—
24. Rheumatic Fever	1	—	—	—	198	5	29	—
25. Scarlet Fever	—	—	—	—	—	—	—	—
26. Small Pox	—	—	—	—	3	—	2	1
27. Tetanus	—	—	—	—	29	8	26	8
28. Typhus	—	—	—	—	—	—	—	—
29. Whooping Cough	—	—	—	—	9	2	13	—
Total Table "C"	36	—	10	1	3,757	309	422	51
Table "D."								
1. Circulatory System	8	2	2	—	487	61	162	25
2. Respiratory System	23	—	1	—	1,924	102	386	24
3. Alimentary System	89	—	11	—	2,237	101	474	35
4. Genito-Urinary System	23	1	2	—	1,160	43	94	3
5. Nervous System	5	2	2	—	417	15	104	6
6. Scurvy	—	—	—	—	60	2	2	—
7. Diabetes	2	—	—	—	52	3	17	—
8. Fever of uncertain origin	38	1	6	—	1,572	39	971	6
9. All other diseases	37	—	6	—	1,701	24	279	5
Total Table "D"	225	6	30	—	9,610	390	2,489	104
" " "A"	134	2	58	1	18,374	255	5,396	81
" " "B"	101	2	6	—	8,117	131	1,146	19
" " "C"	36	—	10	1	3,757	309	422	51
Grand Total	496	10	104	2	39,858	1,085	9,453	255

*Includes cases admitted for Anti-rabic treatment.

TABLE II.

Shows admissions and deaths in hospitals during 1930.

	EUROPEAN.			NATIVE.		
	Adm.	Died	%	Adm.	Died.	%
Bahr el Ghazal :—						
Wau	5	—	—	1,997	25	1.5
Rumbek	—	—	—	911	10	1·5
Tembura	—	—	—	1,257	5	0.4
Yambio	—	—	—	383	11	2.9
Meridi	1	—	—	381	8	2.1
Berber Province :—						
Atbara	59	1	0.6	1,866	54	3.0
Abu Hamed	—	—	—	214	—	—
Shendi	—	—	—	514	—	—
Berber	—	—	—	2	—	—
Blue Nile Province :—						
Wad Medani	132	1	0.75	5,519	207	3.7
Sennar	8	—	—	1,767	62	3.5
Dongola Province :—						
Merowe	—	—	—	765	16	2·1
Dongola	1	—	—	565	11	1·9
Darfur Province :—						
El Fasher	1	—	—	1,602	48	3.0
Geneina	1	—	—	629	29	4.6
Nyala	—	—	—	405	15	3.7
Fung Province :—						
Singa	—	—	—	463	10	2.1
Roseires	3	—	—	415	10	2.4
Kurmuk	—	—	—	201	3	1.4
Wisko	—	—	—	42	—	—
Halfa Province :—						
Wadi Halfa	2	—	—	640	22	3.4
Kassala Province :—						
Kassala	4	—	—	1,512	106	7.0
Gedaref	—	—	—	919	102	11.0
Galaat-el-Nahl	—	—	—	48	3	6.2
Abu Deleig	—	—	—	63	1	1.6
Aroma	—	—	—	67	1	1.5
Derudeib	—	—	—	165	1	0.6
Goz Rageb	—	—	—	55	—	—
Khashm el Girba ..	—	—	—	110	7	6.3
Gallabat	—	—	—	62	4	6.4
Hawata	—	—	—	104	—	—
Kassala Station	—	—	—	184	—	—
Doka	—	—	—	31	3	9.6
Showak	—	—	—	44	—	—
Khartoum Province :—						
Khartoum	196	3	1.5	2,632	110	4.2
Khartoum North ..	—	—	—	1,145	8	0.7
Central Prison	—	—	—	227	4	1.7
Omdurman	—	—	—	2,273	96	4.2

TABLE II—(*Continued*)

	EUROPEAN.			NATIVE.		
	Adm.	Died.	%	Adm.	Died.	%
Kordofan Province:—						
El Obeid	25	1	4	1,551	40	2.5
Nahud	1	—	—	969	33	3.4
Bara	—	—	—	72	4	5.5
Talodi	—	—	—	527	6	1.1
Dilling	—	—	—	706	7	1.0
Rashad	—	—	—	147	2	1.4
Kadugli	—	—	—	542	4	0.7
Delami	—	—	—	55	3	5.4
El Liri	—	—	—	115	—	—
Kaka	—	—	—	17	—	—
Sodari	—	—	—	51	—	—
Rahad	—	—	—	156	—	—
Um Ruaba	—	—	—	158	—	—
Abu Zabad	—	—	—	160	—	—
Mongalla Province:—						
Mongalla	—	—	—	412	10	2.4
Juba	6	2	33.3	783	36	4.5
Ikotos	—	—	—	321	4	1.2
Yei	5	—	—	818	5	0.6
Kapoeta	—	—	—	316	12	3.8
Torit	—	—	—	682	5	0.7
Opari	3	—	—	854	14	1.6
Taali	—	—	—	159	—	—
Amadi	—	—	—	263	—	—
Port Sudan and Suakin:—						
Port Sudan	130	4	3.1	2,364	43	1.8
Port Sudan Prison ..	—	—	—	110	1	0.9
Suakin	—	—	—	74	3	4.0
Suakin Quarantine ..	—	—	—	57	6	10.5
Upper Nile Province:—						
Malakal	14	—	—	2,783	94	3.3
Renk	—	—	—	28	—	—
Kodok	—	—	—	195	—	—
Melut	—	—	—	286	—	—
Akobo	—	—	—	71	—	—
Abwong	—	—	—	23	—	—
Nasser	—	—	—	11	—	—
Gambeila	—	—	—	36	—	—
Bor	—	—	—	402	—	—
Kongor	—	—	—	142	—	—
Yirrol	—	—	—	382	—	—
Yoynyang	—	—	—	24	—	—
Akot	—	—	—	268	—	—
Nuer Settlement	—	—	—	268	—	—
S.S. Lady Baker	—	—	—	176	—	—
Fungak	—	—	—	80	—	—
White Nile Province:—						
Dueim	3	—	—	1,023	10	0.9
Kosti	—	—	—	555	6	1.0
TOTAL	600	12	2.0	49,311	1,340	2.7

Grand Total .. .. 49,911 admissions, with 1,352 deaths.

TABLE III.

Vaccinations Performed during the Year 1930.

Province.	Primary.			Re-vaccination.			Total.		
	Success.	Failed.	Unknown.	Success.	Failed.	Unknown	Success.	Failed.	Unknown.
Blue Nile	24,008	5,636	7,913	—	—	—	24,008	5,636	7,913
Bahr-El-Ghazal	5,154	454	—	—	—	—	5,154	454	—
Berber	5,367	2,761	490	—	—	—	5,367	2,761	490
Darfur	350	545	30,023	91	1,209	1,312	441	1,754	31,335
Dongola	6,557	1,376	459	—	—	—	6,557	1,376	459
Fung	302	101	145	71	124	52	373	225	197
Halfa	445	157	5,304	—	—	—	445	157	5,304
Kassala	4,690	868	2,402	—	—	—	4,690	868	2,402
Khartoum	7,101	1,156	3,435	—	—	—	7,101	1,156	3,435
Kordofan	1,980	1,362	1,655	137	137	91	2,117	1,499	1,746
Mongalla	982	15	4	—	—	—	982	15	4
Port Sudan and Suakin	189	16	5,756	240	10	7,953	429	26	13,709
Upper Nile	1,391	893	27,209	7	—	1,225	1,398	893	28,434
White Nile	5,580	881	5,023	112	179	376	5,692	1,060	5,399
Total ...	64,096	16,221	89,818	658	1,659	11,009	64,754	17,880	100,827

Total of all vaccinations = 183,461

TABLE IV.

Registration of births and deaths by Provinces, 1930.

Province.	BIRTHS.				STILL-BIRTHS				DEATHS.				DEATHS Under One Year of Age	
	European.		Native.		European.		Native.		European.		Native.			
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	No.	Per 1,000
Khartoum	24	22	2,328	2,246	—	—	122	81	13	6	1,152	1,164	238	52.8
Halfa	—	—	945	879	—	—	9	7	—	—	422	430	111	60.9
Port Sudan & Suakin ...	13	8	249	229	1	—	16	9	11	3	389	289	81	162.3
Berber	3	4	2,847	2,437	—	—	72	55	2	—	1,363	1,194	282	53.3
Dongola	—	—	3,068	2,867	—	—	164	109	—	—	1,256	1,381	433	72.9
Kassala	2	2	760	669	—	—	9	9	—	—	893	478	24	16.7
Blue Nile	—	—	8,537	6,791	—	—	138	103	2	—	5,629	4,039	385	25.1
Fung	—	—	1,647	1,419	—	—	31	20	—	—	1,122	886	63	20.5
White Nile	—	—	1,846	1,682	—	—	65	41	—	—	1,073	939	155	43.9
Kordofan	1	2	5,638	4,903	—	—	120	79	2	—	2,351	1,824	196	18.6
Bahr-El-Ghazal	—	—	23	9	—	—	—	—	—	—	32	16	1	32.1
Upper Nile	—	—	54	41	—	—	—	—	—	—	92	57	6	63.1
Darfur	—	—	120	90	—	—	4	1	—	—	255	197	16	76.2
Mongalla	—	—	—	1	—	—	—	—	2	—	1	1	1	—
Total ..	43	38	28,062	24,263	1	—	750	514	32	9	16,030	12,895	1,992	38.0
Total ...	81		52,325		1		1,264		41		28,925			
Grand Total ...	52,406				1,265				28,966					

Percentage of Still-births = 2.41.

TABLE V.

Shows the births, deaths by ages and still-births of Khartoum, Berber, Blue Nile and Dongola Provinces, and of Wadi Halfa Merkaz, which are considered to be correct.

Nationality.	Births.		Deaths by ages.							Total deaths.		Total still-births	
	Male.	Female.	Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60	Male	Female	Male	Female
British	4	6	—	—	—	1	5	—	—	6	—	—	—
Greek	16	11	1	1	—	—	7	2	2	9	4	—	—
Other Europeans	7	9	1	—	—	—	—	3	—	2	2	—	—
Egyptians & Syrians	295	279	38	19	6	7	25	22	33	83	67	14	8
Natives of Sudan	16,890	14,427	1,376	2,926	1,001	1,771	3,699	2,932	3,725	9,473	7,957	483	345
All others ...	34	24	1	1	1	8	23	7	8	39	10	—	—
Total	17,246	14,756	1,417	2,947	1,008	1,787	3,759	2,966	3,768	9,612	8,040	497	353
Grand Total...	32,002		17,652							17,652		850	
% deaths by ages..			8.1	16.7	5.7	10.1	21.3	16.8	21.3				

TABLE VI.

Shows number of out-patients during 1930.

	Total.	%	Free.	%	On Payment.	%
Government Employees ...	389,480	10.13	382,523	9.95	6,957	0.18
School Children	337,482	8.79	337,291	8.78	191	0.01
Prisoners	127,342	3.31	127,342	3.31	—	—
All others	2,986,619	77.77	2,929,071	76.26	57,548	1.51
Grand Total	3,840,923	100.00	3,776,227	98.30	64,696	1.70

TABLE VII.

Shows Medical Boards and Examinations held during the year 1930.

PLACE.	Sick Leave.		Service South.		Invaliding		Pensionable Service.		Permanent Service.		Temporary Service.		Check Examination.	Various	Grand Total.
	Recd.	Not Recd.	Fit	Unfit	Recd.	Not Recd.	Fit	Unfit	Fit.	Unfit.	Fit.	Unfit.			
Sudan	34	6	37	28	409	114	170	43	427	89	3337	459	89	256	5,498
London *	29	13	—	—	1	—	—	—	106	—	—	—	—	—	149
Egypt *	90	3	—	—	1	1	—	—	1	—	21	1	—	—	118
Syria *	8	1	—	—	—	—	—	—	5	—	1	—	—	—	15
	161	23	37	28	411	115	170	43	539	89	3359	460	89	256	5,780

* By Sudan Government Representatives.

TABLE VIII.

List showing hospitals and dispensaries during 1930.

Hospitals and Dispensaries.	Beds equipped
Bahr el Ghazal Province.	
Wau	76
Rumbek	30
Li Rangu	14
Tembura	12
Raga	12
Aweil	4
Kafia Kingi	—
Travelling Hospital	—
Berber Province.	
Atbara	103
Abu Hamed	8
Berber	4
Shendi	12
Bouga	—
El Damer	—
Kabushia	—
Kitiab	—
Metemma	—
Mikilab	—
Mograt Island	—
Zeidab	—
Blue Nile Province.	
Wad Medani	231
Makwar	114
Abdel Galil	—
Abdel Hakam	—
Abdel Rahman	—
Amara Kasir	—
Derwish	—
Dolga	—
Efaina	—
Futais	—
Ghubsl an	—
Hamad El Nil	—
Hosh	—
Hassa Heissa	—
Hag Abdulla	—
Istarihna	—
Kamlin	—
Kab El Gidad	—
Komor	—
Keteir	—
Managil	—
Medina	—
Meatig	—
Nidiana	—
Rufaa	—
Rufaa Trav. Dispensary	—
Radma	—
Remeitab	—
Sabi Deleib	—
Seleima	—
Tabat	—
Tayiba	—
Blue Nile Province.—*Contd.*	
Tebub	—
Um Degarsi	—
Wad El Atia	—
Wad El Bur	—
Wad Hussein	—
Wad Naaman	—
Wad Saadalla	—
Wad Sulfab	—
Darfur Province.	
El Fasher	124
Geneina	35
Nyala	20
Abu Mataric	—
Buram	—
Dar Lewing	—
Kas	—
Kebkebia	—
Kubbe	—
Kubbum	—
Kuttum	—
Mellit	—
Um Buru	—
Um Keddada	—
Zalingei	—
Dongola Province.	
Merowe	53
Dongola	25
Argo	—
Debba	—
El Seir	—
Ghaba	—
Gureir	—
Kareima	—
Khandak	—
Mansurkoti	—
Nuri	—
Fung Province.	
Singa	40
Roseires	35
Kurmuk	2
Wisko	2
Chaali	—
Abu Hashim	—
Dar Agil	—
Fazogli	—
Karkoj	—
El Sukki	—
Halfa Province.	
Wadi Halfa	28
Abri	—
Delgo	—
Kassala Province.	
Kassala	109
Gedaref	36
Gebeit	13
Tokar	18
Abu Deleig	—
Akik	—
Aroma	—
Northern Butana T.D.	—
Southern Butana T.D.	—
Derudeib	—
Derudeib—Makwar T.D.	—
Doka	—
Dongonab	—
Degein	—
Gallabat	—
Goz Regeb	—
Galaat en Nahl	—
Hawata	—
Hadaliya	—
Halaib	—
Kassala Station	—
Khashm El Girba	—
Mekali	—
Metatib	—
Musmar	—
Shawak	—
Sinkat	—
Tenilai	—
Oyo	—
Khartoum Province.	
Khartoum	136
Khartoum North	30
„ „ Prison	31
Omdurman	121
Gebel Aulia	—
Geili	—
Kheleila	—
Murada	—
Wad Nubawi	—
Kordofan Province.	
El Obeid	60
Nahud	60
Dilling	33
Talodi	25
Um Ruaba	11
Rahad	7
Abu Zabad	—
Bara	—
Delami	—
El Odaiya	—
El Sa'ata	—
Kadugli	—
Kaka	—
Muglad	—
Kordofan Province (*Contd*).	
Rashad	—
Sugr El Gamel	—
Soderi	—
Mongalla Province.	
Juba	77
Kajo Kaji	47
Yei	38
Meridi	36
Mongalla	33
Torit	23
Kapoeta	10
Amadi	6
Ikotos	14
Taali	—
Port Sudan and Suakin.	
Port Sudan	89
„ „ Prison	13
Suakin	10
„ Quarantine	21
Port Sudan East Side	—
Port Sudan South Side	—
Upper Nile Province.	
Malakal	170
Akobo	6
Abwong	6
Bor	6
Kodok	12
Kongor	8
Nasser	6
Renk	8
S.S. Lady Baker	5
Shambe	13
Yirrol	—
Ajwong	—
Fathai	—
Fungak	—
Gow Gowl	—
Gambeila	—
Kai Bui	—
Lai Kai	—
S.S. Kerreri	—
Torakit	
White Nile Province.	
El Dueim	28
Kosti	24
Aba Island	—
Gebelein	—
Geteina	—
Fachishoya	—
Kawa	—
Maatuk	—
Tendelti	—

TABLE IX.

Shows In-patients, Out-patients, Endemic Diseases and Operations during 1929 and 1930.

Province.	Hospitals	Dispensaries	In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ankylostomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930
Bahr-el-Ghazal ...	6	—	3,588	4,935	262,143	251,978	7	9	140	6	29	—	444	446	7,873	6,462	151	373
Berber	2	10	2,448	2,655	145,651	305,977	663	1,338	12,534	11,261	20	142	5,112	7,262	973	1,893	190	229
Blue Nile ...	3	39	7,973	7,426	180,735	432,161	908	434	6,025	26,589	18	168	20,786	20,670	2,931	5,417	508	905
Darfur	3	12	1,522	2,638	115,642	158,146	1,537	1,100	2,062	3,350	—	66	4,225	3,074	18,212	2,049	206	225
Dongola	2	9	1,164	1,331	290,381	401,084	1,881	2,614	18,153	23,809	752	598	2,801	5,226	1,005	1,034	291	337
Fung	2	7	1,073	1,124	39,359	64,699	18	59	1,205	861	—	2	4,839	2,638	892	342	24	67
Halfa	1	2	503	642	52,090	60,855	248	495	5,044	6,863	36	127	238	599	209	129	48	116
Kassala	2	19	5,539	3,368	186,478	233,563	46	59	6,067	7,204	19	3	25,142	19,941	2,419	3,575	528	414
Khartoum ...	4	5	6,936	6,473	238,614	298,262	361	277	3,054	4,762	32	16	2,931	4,429	1,984	2,165	921	1,456
Kordofan	5	14	4,148	5,192	369,015	500,301	1,965	2,789	4,320	15,815	154	26	19,077	58,977	11,254	10,906	501	723
Mongalla	11	1	3,681	4,622	400,760	695,782	37	2	264	1,042	82	726	1,281	5,417	4,317	3,423	159	186
P. Sudan & Suakin...	3	3	2,577	2,735	121,650	96,627	94	50	2,434	1,858	18	10	633	235	1,509	705	361	511
Upper Nile ...	1	17	3,305	5,189	180,143	191,886	74	63	4,187	3,039	24	9	9,096	6,098	24,702	15,515	310	391
White Nile ...	2	8	1,576	1,581	92,424	149,602	4,072	7,790	3,679	7,158	180	212	7,371	5,109	4,149	5,583	139	177
TOTALS	47	146	46,033	49,911	2,675,085	3,840,923	11,911	17,079	69,168	113,617	1,364	2,105	103,976	140,121	82,429	59,198	4,337	6,110

TABLE X.

Statement of expenditure during the year 1930 and budgetary estimates for 1931.

Item.	1930 Actual Expenses. £E.	£E.	1931 Budget Estimates. £E.	£E.
(1) **Headquarters.**				
Personnel	11,421	—	12,600	—
Allowances and Services	7,457	18,878	12,727	25,327
(2) **Bahr-el-Ghazal Province** :—				
Personnel	2,091	—	634	—
Allowances and Services	5,036	7,127	8,795	9,429
(3) **Berber Province** :—				
Personnel	7,650	—	8,345	—
Allowances and Services	5,865	13,515	6,731	15,076
(4) **Blue Nile Province** :—				
Personnel	16,917	—	18,246	—
Allowances and Services	19,112	36,029	18,351	36,597
(5) **Darfur Province** :—				
Personnel	1,919	—	2,045	—
Allowances and Services	4,007	5,926	8,324	10,369
(6) **Dongola Province** :—				
Personnel	4,350	—	4,576	—
Allowances and Services	5,063	9,413	4,990	9,566
(7) **Fung Province** :—				
Personnel	2,196	—	2,598	—
Allowances and Services	2,588	4,784	2,508	5,106
(8) **Halfa Province** :—				
Personnel	1,620	—	2,152	—
Allowances and Services	1,310	2,930	1,790	3,942
(9) **Kassala Province** :—				
Personnel	6,765	—	6,575	—
Allowances and Services	9,034	15,799	8,053	14,628
(10) **Khartoum Province** :—				
Personnel	18,589	—	21,446	—
Allowances and Services	26,650	45,239	28,166	49,612
(11) **Kordofan Province** :—				
Personnel	10,084	—	10,618	—
Allowances and Services	10,879	20,963	11,221	21,839
(12) **Mongalla Province** :—				
Personnel	1,172	—	1,603	—
Allowances and Services	4,979	6,151	4,699	6,302
(13) **Port Sudan and Suakin** :—				
Personnel	5,898	—	6,375	—
Allowances and Services	6,986	12,884	6,159	12,534
(14) **Upper Nile Province** :—				
Personnel	6,692	—	6,660	—
Alowances and Services	9,910	16,602	8,722	15,382
(15) **White Nile Province** :—				
Personnel	3,363	—	3,318	—
Allowances and Services	3,735	7,098	4,230	7,548
(16) **Sleeping Sickness** :—				
Personnel	9,577	—	10,093	—
Allowances and Services	6,636	16,213	4,725	14,818
(17) **Quarantine Service** :—				
Personnel	4,530	—	3,139	—
Allowances and Services	3,453	7,983	2,843	5,982
(18) **Sudan Defence Force** :—				
Personnel	—	—	24,350	—
Allowances and Services	—	—	9,057	33,407
Total ...	—	247,534	—	297,464

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