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SMALLPOX OUTBREAK IN SUDAN *

by

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I STATISTICAL DATA AND EPIDEMIOLOGICAL INFORMATION

1. Background Information on 1968 Outbreak

The number of registered patients in 1968 outbreak amounted to 102, and that in Upper Nile Province 75, in Kassala 9, in Blue Nile North 8, and in Blue Nile South 10 patients. The first case occurred in Renk on 27 March after he had arrived via Malakal from village Welding in Nassir District. The epidemiological investigation proved that smallpox cases had been occurring in the region along the Sudan-Ethiopia border at least two months before the first case got to knowledge of the health services. The import of infection from Gambela Province in Ethiopia in which smallpox patients had been notified in December 1967 was made responsible for the 1968 outbreak in the Sudan. The last case from Upper Nile Province was reported on 3 June, and from Blue Nile Province the last two cases on 16 June 1968. The containment vaccinations performed on a large scale during May 1968 amounted to:

- in Upper Nile Province, 452 256 (out of them 61 per cent primary)
- in Blue Nile North, 131 247 (out of them 12 per cent primary)
- in Blue Nile South, 506 768 (out of them 19 per cent primary)

The containment vaccinations performed on large scale and other implemented measures (isolation of patients and quarantine of contacts) stopped the outbreak at the beginning of rainy season.

2. Smallpox Outbreak in 1969

2.1 General on Registered Patients

Table 1 gives the total number of registered smallpox patients according to Provinces. As in the preceding year the hardest stricken province was once more Upper Nile with 72 cases and no death. The above province is followed by Blue Nile North with 18 cases out of them 2 fatal, and by Blue Nile South with 14 cases out of them one fatal. Only two more provinces registered some smallpox patients: Khartoum Province 7 patients and Equatoria Province 4 patients. In all the other provinces no cases were registered. The per cent distribution of registered patients by provinces is also given on Table 1.

Table 1 - Total Number of Smallpox Cases and Deaths in the Sudan in 1969 by Provinces

Province	Number of Cases	Deaths out of Cases	% to Total
Upper Nile	72	0	62.6
Blue Nile North	18	2	15.6
Blue Nile South	14	1	12.2
Khartoum	7	0	6.1
Equatoria	4	0	3.5
Total	115	3	100.0

2.2 Time Distribution of Registered Patients

Table 2 below shows the distribution of registered smallpox patients by weeks. There was a wave of patients in January which was followed by another wave in April.

Table 2 - Distribution of Registered Smallpox Patients by Weeks in the Sudan in 1969

Week	Number of Registered Patients
December 1968	2
5-11 January	8
12-18 January	6
19-25 January	10
26 January - 1 February	11
2- 8 February	1
9-15 February	3
16-22 February	4
23 February - 1 March	8
2- 8 March	6
9-15 March	2
16-22 March	5
23-29 March	6
30 March - 5 April	15
6-12 April	7
13-19 April	14
20-26 April	6
27 April - 3 May	1
Total	115

The first registered patient, a male child, 2 years of age, fell ill on 27 December 1968 after he had arrived on 25 December with his mother from Kanjbek to Adong, both villages being located in the Sobat Rural Council, Upper Nile Province (see Annex VII). He was covered with very old smallpox scars. More or less at the same time another patient fell ill and was admitted to Ed Dueim Hospital on 8 January 1969 after he had travelled and passed several villages along the Sobat River. The original place from which he started his travel was a village called Kowt in Nassir District.

There are some indications that in December 1968 there was another patient who had come from Bor and was suffering from smallpox, in a camp of seasonal workers called Tambul, near Rufaa, in Blue Nile Province, North.

The last registered patient was a 5 years old girl detected by routine checkup at Hillat El Denka, a residential quarter in Malakal City. Her infection most probably occurred at Cowboy Village near Akobo.

2.3 Age and Sex Distribution

The total of 115 patients registered in four provinces discloses the age and sex distribution as given on Table 3. The age and sex distribution of patients by provinces is given in Annex II.

Table 3 - Age and Sex Distribution in Registered Smallpox Patients in the Sudan in 1969

Age in Years	Male	Female	Total	% Out of Total
Below 1	2	1	3	2.6
1-4	14	13	27	23.5
5-9	7	7	14	12.2
10-14	5	7	12	10.4
15 and +	38	21	59	51.3
Total	66	49	115	100.0

The age group 1-4 contributed nearly to the same number of patients (27 patients or 23.5 per cent) as two other age groups together, namely 5-9 and 10-14 (26 patients or 22.6 per cent). This finding is surprising if the large number of containment and preventive

vaccinations performed in the same regions as in the past year is taken into consideration, and during which no doubt the largest attention had to be paid to young children. The age 15 years and more contributed to 59 patients out of the total, or to 51.3 per cent.

The sex distribution shows that out of 115 patients, 66 or 57.4 per cent were males and 49 patients or 42.6 per cent were females. The male and female patients are equally represented in the age groups 1-4 and 5-9, i.e. at the age at which the local customs do not influence this distribution. Due to local customs the females in higher age have less outlooks to go for medical examination. In addition they are tied to home and they do not travel as their husbands do. Hence they are less often detected by medical examination and they are not so much exposed to infection unless it is imported into household by their husbands.

The age and sex distribution of patients by provinces (see Annex II) more or less conforms with the results obtained in the total. The exception is Upper Nile Province in which females prevail over males (42:30). The reason for this inconsistency with general finding is unknown. It may be the fact that in Upper Nile Province the outbreak involved many villages in which the attacked communities had the usual relation between both sexes, or even a prevalence of females because of abscence of male seasonal workers. The age distribution, however, shows again a considerable number of patients in the youngest age group 1-4 (18 patients), and is nearly the same as in two other age groups together, namely 5-9 and 10-14 (20 patients).

In Blue Nile Province, North and South, the sex and age distribution was under the strong influence of contact outbreaks in the seasonal workers' camps which do not represent a normal community as judged from the sex and age point of view. The prevalence of grown-up men in such camps is usual.

In Khartoum Province in which all 7 patients must be considered imported the absolute prevalence of men and absence of women among patients is understandable.

The registered patients in Equatoria Province are considered only a fraction of the actual number. Any comments on the sex and age distribution would be displaced.

2.4 Geographic Distribution

Taking into account the fact that all the Khartoum cases have been imported and that the number of registered patients in Equatoria

Province is too small for analysis, there are only two provinces left in which the information on geographic distribution of patients is of considerable epidemiological interest.

In Upper Nile Province (see Annex I) there were two regions hard hit by the outbreak: the Sobat Region on both banks of the river of the same name, and the Bor Region which extends from Bor to Malakal along the road connecting the above two towns. The former region contributed 16, and the last 49 patients. The difference of 7 patients to the total of 72 covers the patients who were imported to Malakal and other places from the above two regions. Annex III gives the details on the infected villages in both regions. It is interesting to mention that in 1969 in the Sobat Region, so far as it is known, quite a number of other villages were involved as in 1968. In addition, the Bor Region was hard hit, which had not been the case in 1968.

In Blue Nile Province, North (see Annex IV) eighteen cases in total occurred with the following geographic distribution: Kilo 65 Village near Managil - 9 patients; Managil town - 2 patients; Ed Dueim - 3 patients; Rufaa - 3 patients, and Wad Medani - 1 patient.

In Blue Nile South 14 patients were registered, 10 at Kilo 11 Village near Sennar, and 4 at Sennar town.

Annex V shows the distribution of all registered patients by provinces and at the same time their distribution by weeks as arranged according to the date of onset. The graph shows the dynamics of the outbreak in Upper Nile and Blue Nile Provinces.

2.5 Vaccination Status of Patients

Table 4 gives the summary on vaccination status of patients who fell ill during the 1969 smallpox outbreak in the Sudan. In total only two patients out of 115 gave a history on previously effected vaccination. A 30 years old taxi driver had been vaccinated many years ago. His vaccination scar, however, was not checked. A 5 years old female child was claimed by her mother to have been vaccinated early in 1968. A large and keloid scar was found on her left upper arm where smallpox vaccination is usually performed.

Table 4 - Vaccination Status in Registered Smallpox Patients in 1969 Outbreak in the Sudan

Province	No. of Cases	Number of	
		Vaccinated	Unvaccinated
Upper Nile	72	0	72
Blue Nile North	18	0	18
Blue Nile South	14	2	12
Khartoum	7	0	7
Equatoria	4	0	4
Total	115	2	113

3. Surveillance and Containment Activities

According to the Plan of Operation signed by the Government of the Sudan and by WHO, surveillance and containment activities in the country are the responsibility of the permanent staff of the existing health services except in three provinces (Darfur, Kordofan, and Blue Nile) which are at present under the attack phase of the Smallpox Eradication Programme. The latter have had special staff assigned to the attack phase. About 50 per cent of the same staff will be later responsible for the maintenance phase. At present the above staff is also in charge of smallpox emergency. The above arrangement did not provide good facilities in containment activities in Upper Nile Province which is not under attack phase but was stricken by the hardest outbreak in two consecutive years (75 patients in 1968 and 72 patients in 1969).

At the Smallpox Eradication Unit in the Ministry of Health, Khartoum, a special team in charge of epidemiological investigation has not been established yet.

As long as the smallpox situation was considered normal the surveillance in the field was mainly based on a network of medical services institutions at which patients call for treatment. When the first cases were diagnosed the checkpoints along communications and at entrance gates to towns were established, at which medical examination and vaccination of passengers were carried out. In Bor Region for example five times more patients (41) were detected by checking points and vaccination teams than by the routine channels provided by health services. When a smallpox patient was detected his history was taken as the guideline for directing vaccination teams to villages suspected of having been infected.

Among the implemented containment measures the following must be mentioned: isolation of patient, quarantine of contacts, containment vaccination of permanent inhabitants and passengers discovered at infected villages.

Isolation of patients and contacts was carried out in shelters built of material at hand or in tents in the vicinity of infected villages. This practice proved to be much better than isolation at hospital wards which do not enjoy isolation facilities and hence may cause intra-hospital infections (Ed Dueim).

Annex VI reviews the summary on vaccinations performed in the Sudan during the first quarter of 1969. In Upper Nile Province, in the mentioned period, 388 037 vaccinations were performed partly in infected regions (containment vaccinations) partly at different checkpoints (preventive vaccinations). The number of vaccinations performed in 1968 and 1969 approaches the total number of population of that province. However, in this figure the passengers from other provinces are also included and not only the permanent inhabitants. So a nearly 100 per cent coverage is facticious.

In the Blue Nile Province North and South the figures on containment vaccinations and of vaccinations performed in the attack phase of the Smallpox Eradication Programme are given as summary. For that reason no opinion can be made on the extent of containment vaccinations and their coverage.

II COMMENTS AND DISCUSSION

1. The 1969 Outbreak - General

There is no doubt that the notified patients - who have either called at health centres for treatment themselves or have been detected at different checkpoints or by vaccinating units during containment activities in the field - represent only a fraction of the actual patients who fell ill with smallpox within the first four months of 1969. This particularly applies to Bor Region, Upper Nile Province in which five times more patients have been detected by the mentioned unconventional methods (checkpoints along communication channels and at entrance gates to towns) than by the routine channels provided by the health services institutions. The above finding in Bor Region may be an exception or perhaps not. The epidemiological investigation so far possible and performed did not supply a reliable clue on the fraction of missed patients. Nevertheless, there is no doubt about their existence.

The large territory stricken by the outbreak does not speak in favour of the supposition that the outbreak spread from a single epidemiological centre, in spite of the fact that the distribution of known patients by the date of onset could make such an impression at first sight. It must be stressed once more that only a fraction of patients was dealt with. The late detection of outbreak in Bor Region was due to administrative reasons which interfered hard with regular surveillance.

The towns and villages at which the first patients fell ill, and according to which they were registered, in many instances do not correspond to the places at which the infection had taken place. Later only, when the first case caused some additional contact patients, the official registration provided a more reliable geographical distribution.

Two smallpox outbreaks in the Sudan which took place in two consecutive years (1968 and 1969) and which partly involved the same region along the Sobat River in addition to Bor Region stricken in 1969, open an interesting question on possible connexion between them.

It is not by chance that two successive outbreaks started more or less at the same time of the year which marks the start of the dry season and which coincides with large shifting of population from the South to the North, particularly to the Blue Nile Province, for seasonal works. Two main communication channels are used by seasonal workers: the valley along the Sobat River from the South-East and the less defined and more splitted communication from Bor to Malakal used by workers coming from the South (see Annexes VII and VIII). At Malakal these two communication channels merge. All possible means of transportation, e.g. steamers on the Nile, cars on roads and trucks, and even walking on foot are under use. From Sennar onward the railway is available too. The geographic and time distribution of registered patients strongly speak in favour of the supposition that the shifting crowds from the South of the country imported the smallpox virus from the regions they were coming from.

The first known patients in the Sobat Region fell ill at the end of December 1968, which marks the beginning of the dry season. The contact outbreaks at Kilo 65 Village near Managil and at Kilo 11 Village near Sennar, and the suspected but not proved outbreak at Camp Tambul near Rufaa, all of them in Blue Nile Province, give quite a reliable clue that the first cases in all provisional camps set up for seasonal workers by the Irrigation or another Administration took place in December 1968 or early in January 1969, and among seasonal workers who had come from the South of the Sudan mainly from Bor Region.

When the rainy season approaches and the seasonal works in Blue Nile Province are coming to their end, the same crowds shift in the opposite direction to reach their villages of origin before the start of the rainy season during which they cultivate their land and get stuck by mud. Any contact between their villages in the bush and towns is cut down due to mud which makes travelling by any kind of vehicle and even on foot impossible. It means that the health services are also cut off and any surveillance is not feasible.

The typical settlements in the bush are small, consisting of a few houses or enclosures, and they are scattered. They are not permanent and their inhabitants often shift to another place at which they build a new settlement with material at hand. Even during the dry season the scattered bush settlements cannot be efficiently or completely surveyed. The smallpox virus, however, if and when present in such communities, has no doubt good outlooks for survival in both the dry and rainy season. The firm family ties support such survival because the family must be considered according to much larger tribes' feelings which includes all the relatives.

The above comments have shed more light on the reasons for which two consecutive outbreaks started at the beginning of the dry season and for which they extinguished with the start of the rainy season. The containment measures no doubt stopped a further spread of the smallpox virus in the communities under permanent and good surveillance of the health services. However, it is more difficult if not impossible to claim the same result in the remote bush regions which are completely out of the reach of the health services during all the rainy season and most probably also during the dry season. The administrative reasons which in the same regions, interfere hard with epidemiological investigation and permanent surveillance delay the final answer to this question.

2. Contact Outbreaks

When the smallpox virus had been imported into crowded communities not protected by vaccination, the contact outbreaks took place. The number of patients and duration of such outbreaks depended on the time at which the patients were detected for the first time and on implemented containment measures. It is clear that the provisional camps of seasonal workers in Blue Nile Province built by different administrations for people from the South were in this respect the most suitable communities, since their inhabitants were not protected by vaccination and the probability of import of smallpox virus was the largest (see Annex IV).

Kilo 65 Village near Managil set up by the Irrigation Administration was stricken by such a contact outbreak which resulted in nine patients out of them two fatal. The infection was imported by a visitor from

Bor Region who arrived to Kilo 65 Village on 2 January and who was already ill upon his arrival suffering from prodromal symptoms. He died on 26 January and the diagnosis of smallpox was set up after his death. His contacts in the same enclosure consisted of three houses of relatives who started falling ill in the period from 10 to 28 January. The main wave from 26 to 28 of January contributed seven patients. The containment vaccination performed upon his death and the isolation of contact patients from the same enclosure in provisional shelters outside the camp stopped the further spread of the infection.

Kilo 11 Village at Sennar was the scene of a similar outbreak due to contact infection which contributed ten patients with one death. The above camp had been built recently by the Irrigation Administration as an extension of the permanent Camp Yuboster. This camp was not occupied till the arrival of the seasonal workers with their families from the similar Camp Tambul near Rufaa. This happened some time in the middle of January 1969. The first checking of Kilo 11 Village was done on 9 March when a worker who called for treatment at the out-patient station of Sennar Hospital was diagnosed a clear cut smallpox case. The first checking of Kilo 11 Village detected an additional patient in the same stage of disease, further a 10 years old girl with more advanced disease who called for treatment at the same out-patient station on 27 February and was returned to camp, and her 19 years old sister as a cured case in the scar stage. She was most probably the first missed patient in that camp. Her history incriminated Camp Tambul near Rufaa as the place of infection in which she admitted to have had in December 1968 very close contact with a man who had paid a visit to that camp, and who according to her opinion suffered from the same disease. He had come from Bor Region. The repeated checking on 12 March detected three concealed patients in addition. The containment vaccination completed on 11 March and isolation of detected patients and their contacts at provisional hospital in tents near the camp did not prevent four additional patients with one death. All of them fell ill from 12 to 21 March.

The epidemiological investigation done at Camp Tambul near Rufaa could neither confirm nor reject the supposed connexion based on history of the first missed case detected in late scar stage. This investigation, however, was done after four months when the original workers were no longer present there. In addition the official information on departure of workers to Kilo 11 Village differed from the one supplied by the Kilo 11 Village Office for about six weeks in spite of the fact that the workers on their way from Camp Tambul to Kilo 11 Village did not stop anywhere and spent two days only on travel.

At the Ed Dueim Hospital two additional contact cases due to intra-hospital infection happened after the index case had been admitted on

8 January. His history disclosed a journey during which he had passed several villages in the Sobat Region at which at that time the infection was already present, and from there he proceeded to Malakal, Renk and Kosti. Another patient who had been treated at the same ward and a visitor to his father, both of them having fallen ill about 20 January, were victims of intra-hospital infection.

3. Regional Outbreaks

The name "regional outbreak" has been selected intentionally to avoid boundaries of the administrative units. The spread of smallpox as of any other communicable disease follows available communications along which natural resources and marketing places supply passengers with necessary living facilities and utensils in the broadest sense of the word. The marketing places along communications offer people the opportunity for selling products and articles of their socio-economic activities.

Two regional outbreaks, in Sobat Region and in Bor Region both in Upper Nile Province, will be discussed in this section of the report. They contributed for the largest number of patients. At Malakal both the regions in question merge, while in the South of it they touch each other and no firm demarcation can be set between them (Annex I).

3.1 Sobat Regional Outbreak

Under Sobat Region, for the purpose of this report, is understood the part of the Upper Nile Province which extends from the Sudan-Ethiopia border to Malakal on both banks along the Sobat River. While in the 1968 outbreak the Nassir Rural Council was considered the main source from which the spread of infection took place, this was not the case in the present outbreak. The main flare-up has stricken this time the Sobat Rural Council which extends to the North-West from the former one in the Malakal Direction.

In the short span of one month only (from 27 December 1968 to 29 January 1969) eight villages were involved (Kanjbek, Adong, Manyang, Malijock, Diak, Urur, Koro, and Nagar) and in total sixteen patients were registered with none fatal (see Annex I).

The first known and registered case was a male child of 2 years of age who arrived from Kanjbek to Adong with his mother on 25 December. Only two days later he was brought to Adong dressing station for treatment. The ill child was staying with his mother at Adong in a shelter and the next patient at the same village was a man of 18 years of age who stayed next door to that shelter. He fell ill on 10 January.

If the mentioned child is supposed to be the index case in the Sobat Region outbreak, then the infection spread very fast from Adong which is a known marketing place to neighbouring villages. Such a role of the first known patient, however, was neither confirmed nor rejected due to lack of epidemiological investigation. A close contact of the other patients who fell ill in the outbreak with a 2 years old child who alone could have contributed to such a fast spread of infection, is hardly to be supposed. The village Kanjbek must be considered the place at which the infection of that male child took place. Hence there is no firm reason against speculation that the infection of other patients from different villages also took place at Kanjbek or at any other village close to it. So the first known patient in the Sobat Region outbreak who came from Kanjbek and was diagnosed at Adong Dressing Station, most probably cannot be considered as the index case. It is possible that the infection had existed at Kanjbek or at nearly villages close some time before it went to the knowledge of the health services.

3.2 Bor Regional Outbreak

For the purpose of this report under Bor Region is understood the large part of the Upper Nile Province which extends from Bor to Malakal. Two means of transportation exist for travelling in this region: steamers on the White Nile and cars which regularly operate on the Bor Malakal road either via Mogogh or via Waat. Particularly the last mode of communication is of interest for our discussion because it gets very closely to some villages in the Sobat Region.

In the above region forty-nine patients were registered with no fatality so far known. Out of these patients only eight called on their own initiation at health centres for treatment. The large majority amounting to forty-one was detected at checkpoints set up at the entrance gate to Malakal and Bor, or were detected by vaccination teams when they came to villages for containment vaccination. The patients detected by both mentioned approaches were at the time of detection old cases in convalescence. It has to be mentioned that the above region cannot be efficiently surveyed by the health services due to administrative reasons.

The time and geographic distribution of registered patients over the above region is very interesting. The earliest known cases took place in the northern part of Bor Region in the villages of Fidiad, Mogogh, Janet, and Duk Fadiat, while late in March and April the Central and the Southern parts of the Region were more involved as judged on available information (Kongor, Palew, Jalet,

Anghoi, Makwak, Bor). From this information one could form the opinion that the infection had spread from the Sobat Region and had first stricken the Northern part of Bor Region, and only later moved closer to Bor. This opinion, however, does not comply with the findings in the Blue Nile Province in which the index cases in the camp contact outbreaks (Kilo 65 Village at Managil, Kilo 11 Village at Sennar, and probably Camp Tambul near Rufaa) were workers who had come from Bor and its surroundings late in December 1968 or early in January 1969. So it is more likely that the outbreak in the Southern part of Bor Region was detected with considerable delay when checkpoints at entrance to Bor were set up. The infection, however, had been present in poorly surveyed villages since long before. As already mentioned, administrative reasons interfered hard with a reasonable surveillance.

4. Apparently Isolated Single Patients

The shifting crowds of seasonal workers from the South carrying smallpox infection with them during their travel or later when settled down at final destination came no doubt in contact with the permanent inhabitants of villages and towns along communications and with the inhabitants of towns in the vicinity of which the provisional camps for seasonal workers had been built. Larger villages with marketing places, towns at road and railway crossings, river ports along the White Nile were no doubt the points at which, during travel, a few hours or days' stops were made for different reasons (rest, change of mean of transport, shopping, visits paid to relatives etc.). These stops during which a short contact with the indigenous population occurred are no doubt responsible for the first cases which happened in some towns along communications (Malakal, Sennar, Wad Medani, Kosti, Ed Dueim etc.), and perhaps also in some villages (Kongor, Duk Fadiat, Mogogh, Waat etc.). In cities and towns which enjoy good health services facilities the containment measures implemented on time prevented the further spread of the infection. The same cannot be said about villages in which first cases could have caused contact outbreaks that have come to the knowledge of health services with delay. Later, when the infection was already present, visits paid to such villages by permanent inhabitants of towns could have also contributed to spread the infection.

It is clear that epidemiological investigation, or better said the history given by apparently isolated single patients, did not give always a reliable information on the source of their infection. During their journey, such patients usually visited, within a fortnight before the onset of their disease, several places known to have been infected at that time.

So it was not possible to detect the village at which the infection had been contracted. The same applies to visitors from infected villages about whom the information was continually changing in the history. Such visitors have sometimes even been denied. Nevertheless, the source of infection in such patients had to be in infected villages, or the infection was imported by visitors from there.

III SUMMARY

In 1969 the Sudan was stricken by another consecutive smallpox outbreak after a similar outbreak in 1968. The total number of patients amounted to 115 with three fatal.

The Upper Nile Province was repeatedly stricken the hardest and the number of patients in that province was seventy-two with no fatality so far known. The region along the Sobat River and the region between Bor and Malakal, both of them being main communication channels from the South and from the South-East to the Northern parts of the country, were the main scene of the outbreak. In December, at the beginning of dry season, the above communication channels are every year used by crowds of seasonal workers coming from the South and South-East on their way to the North, particularly to Blue Nile Province for cotton crop, sugar cane works, clearance of irrigation canals etc. The coincidence of outbreak with their travel in spite of its late detection strongly speaks in favour of the supposition that the crowds of seasonal workers spread along communications the smallpox virus brought with them from bush villages. The outlooks for its survival at villages in the bush and the reasons for usual stop of outbreak at the beginning of the rainy season were discussed.

Smallpox patients detected and registered in all the other provinces must be considered imported. This particularly applies to Blue Nile Province in which the large majority of seasonal workers is engaged. The total number of patients in that province amounted to thirty-two (Blue Nile North 18 patients and Blue Nile South 14 patients) with three fatal cases. The contact outbreaks which took place in provisional camps of seasonal workers immediately upon their arrival support the above supposition of virus importation. Only a few cases were detected among permanent inhabitants.

To Khartoum Province seven patients were imported either from Blue Nile or Upper Nile Province. The same cannot be claimed with certainty for the four patients registered in Juba, Equatoria Province.

IV RECOMMENDATIONS

1. It is advised to establish at the Central Smallpox Eradication Unit, Ministry of Health a special team that will be in charge of surveillance, epidemiological investigation, active case detection, and containment

activities from the methodology point of view. The routine activities concerning smallpox infection should continue also in the future to be the responsibility of the existing health services trained and supported by the above special team.

2. The registration of smallpox patients including forms does not serve its purpose at present. The forms under use should be abolished and replaced by the "Investigation Form" used by Smallpox Eradication projects in other countries. The weekly and monthly reports on smallpox incidence are recommended to be processed and compiled by the Central Office on the basis of individual investigations forms submitted from the field.

3. The information on performed smallpox vaccination in the country should be differentiated and submitted according to the following categories:

Category I: Vaccinations performed in the attack phase of Smallpox Eradication Programme,

Category II: Containment vaccinations arranged by localities in which they have been performed because of detected smallpox infection,

Category III: Preventive vaccinations performed in the routine national vaccination programme, at checkpoints along communications and at entrance gates to cities and towns.

4. Passengers from the South of the country should be in the possession of a valid certificate on smallpox vaccination, and if feasible the purchase of tickets for any public mean of transport should be bound to and conditioned by such a certificate.

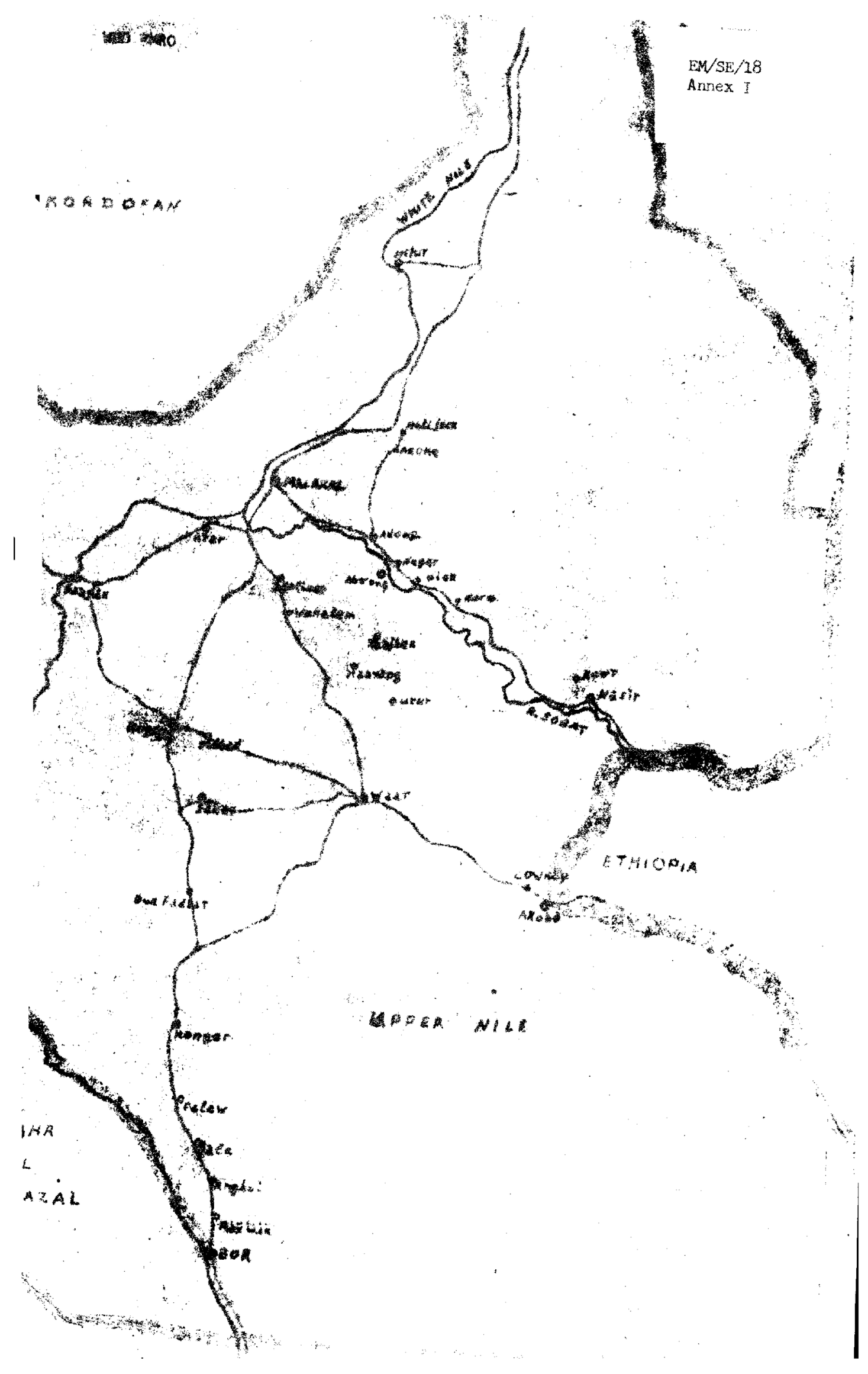
5. Any Administration that uses to appoint seasonal workers must check smallpox vaccination certificate in workers and their family members before they are permitted to work and are admitted to provisional camps. The local Administration Office is fully responsible to comply with the above request.

6. Health institutions and medical services are recommended to perform a weekly checkup in all provisional camps of seasonal workers on their territory with the objective to establish vaccination status in inhabitants (scar survey) and to detect smallpox patients soon enough to implement containment measures on time.

7. The isolation of patients and quarantine of contacts should continue in shelters, huts, in tents etc. near infected villages. Hospital wards are not recommended for this purpose because of limited isolation facilities and risk of intra-hospital infections.

8. Experience in two consecutive years collected in Upper Nile Province has proved that the surveillance and containment activities far exceed the facilities made available by the existing health and medical services. For that reason it is recommended to appoint special staff to be in charge of these activities in that Province, or at least to reinforce the permanent set-up of staff with the approach of dry season.

EM/SE/18
Annex I



ANNEX II

DISTRIBUTION CASES OF SMALLPOX BY AGE AND SEX BY PROVINCES

UPPER NILE

Age	Male	Female	Total
Below 1	1	1	2
1-4	8	10	18
5-9	3	6	9
10-14	5	6	11
15 +	13	19	32
Total	30	42	72

BLUE NILE SOUTH

Age	Male	Female	Total
Below 1	0	0	0
1-4	2	0	2
5-9	3	1	4
10-14	0	1	1
15 +	7	0	7
Total	12	2	14

BLUE NILE NORTH

Age	Male	Female	Total
Below 1	1	0	1
1-4	4	3	7
5-9	0	0	0
10-14	0	0	0
15 +	8	2	10
Total	13	5	18

EQUATORIA

Age	Male	Female	Total
Below 1	0	0	0
1-4	0	0	0
5-9	1	0	1
10-14	0	0	0
15 +	3	0	3
Total	4	0	4

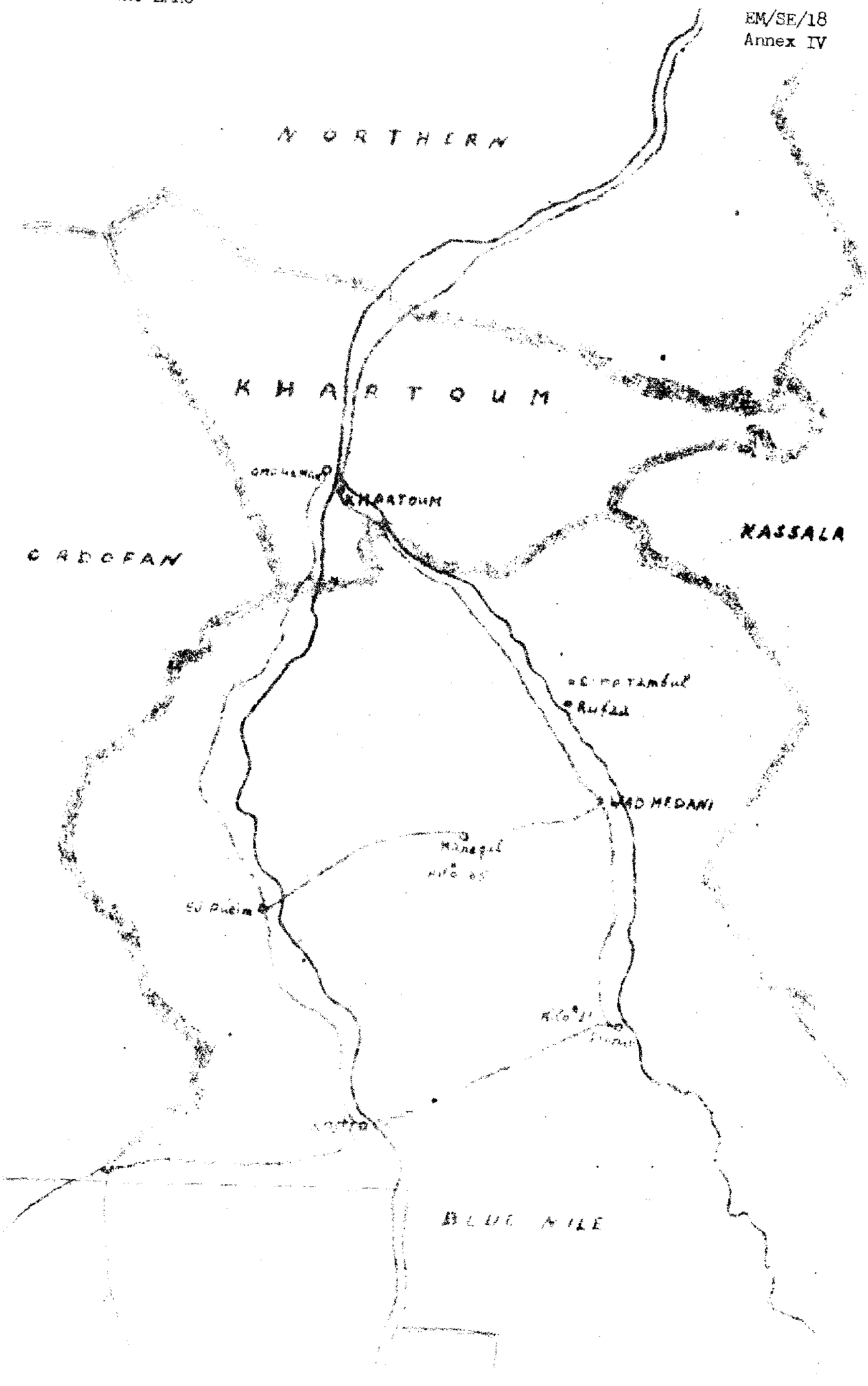
KHARTOUM

Age	Male	Female	Total
Below 1	0	0	0
1-4	0	0	0
5-9	0	0	0
10-14	0	0	0
15 +	7	0	7
Total	7	0	7

ANNEX III

DISTRIBUTION CASES OF SMALLPOX BY REGIONS IN UPPER NILE PROVINCE

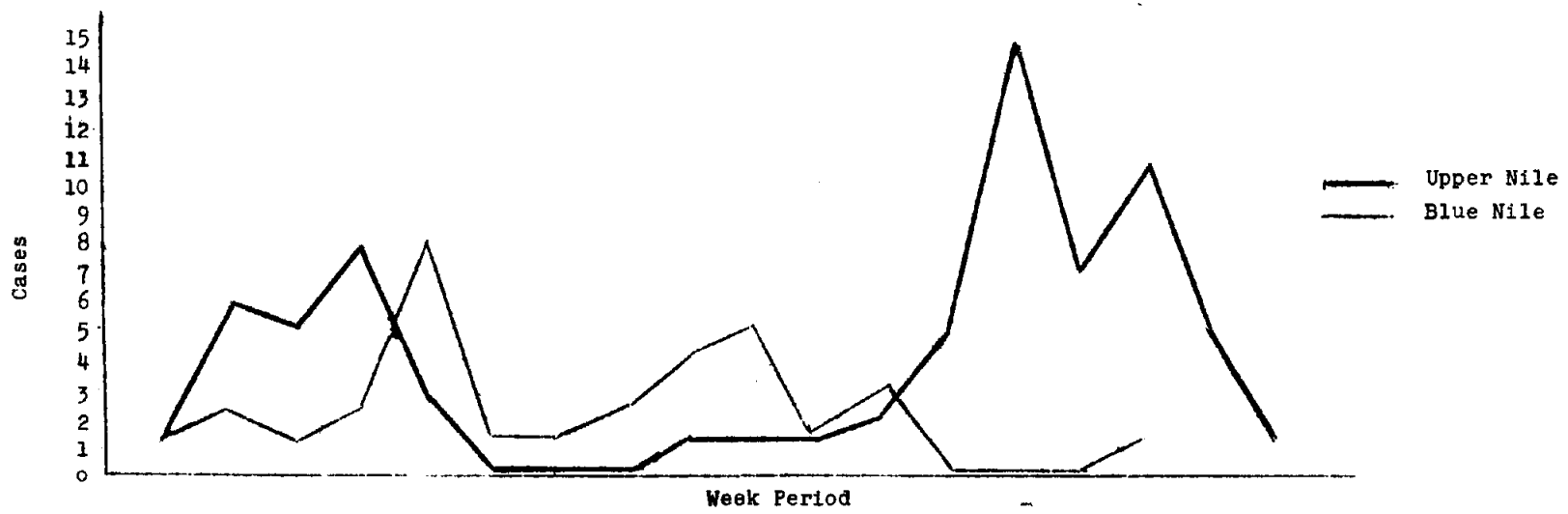
NN.	Place	Male	Female	Total
	SOBAT REGION			
1	Nagar	1	0	1
2	Adong	1	0	1
3	Diak	1	2	3
4	Kanjbek	1	0	1
5	Urur	1	0	1
6	Mouli Jock	1	0	1
7	Manyang	3	0	3
8	Koro	3	2	5
TOTAL		12	4	16
	BOR REGION			
1	Atar	0	1	1
2	Fangak	0	1	1
3	Duk Fadiat	3	7	10
4	Koliner	2	0	2
5	Janet	2	0	2
6	Anghoi	1	0	1
7	Wunalam	1	0	1
8	Fidiad	1	0	1
9	Mogogh	1	1	2
10	Kongor	2	10	12
11	Makwak	0	2	2
12	Bor	2	6	8
13	Jale	0	5	5
14	Palew	0	1	1
TOTAL		15	34	49
1	Malakal	2	3	5
2	Melut	1	0	1
3	Cowboy	0	1	1
TOTAL		30	42	72


NORTHERN
KHARTOUM
KHARTOUM
KASSALA
KORDOFAN
WAD MEDANI
BLUE NILE

ANNEX V

CASES OF SMALLPOX BY WEEK PERIOD

Province	December 1968	January				February				March				April					Total
		5-11	12-18	19-25	26-1	2-8	9-15	16-22	23-1	2-8	9-15	16-22	23-29	30-5	6-12	13-19	20-26	27	
Upper Nile	1	6	5	8	3				1	1	1	2	5	15	7	11	5	1	72
Blue Nile South					1		1	1	3	3	1	3				1			14
Blue Nile North	1	2	1	2	7	1		1	1	2									18
Equatoria													1			2	1		4
Khartoum							2	2	3										7
Total	2	8	6	10	11	1	3	4	8	6	2	5	6	15	7	14	6	1	115



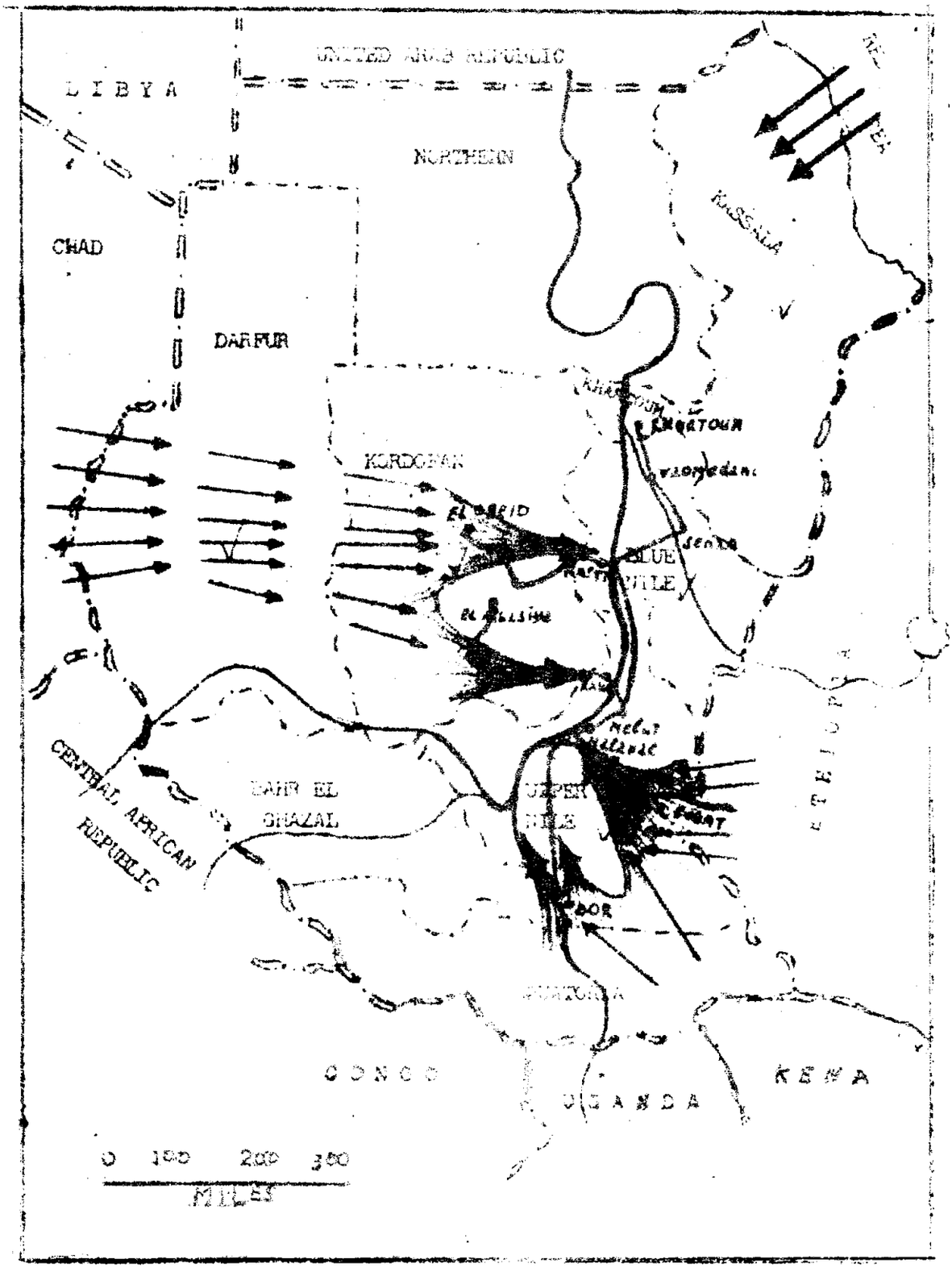
ANNEX VI

SUMMARY ON PERFORMED SMALLPOX VACCINATIONS DURING
FIRST QUARTER 1969 IN THE SUDAN BY PROVINCES

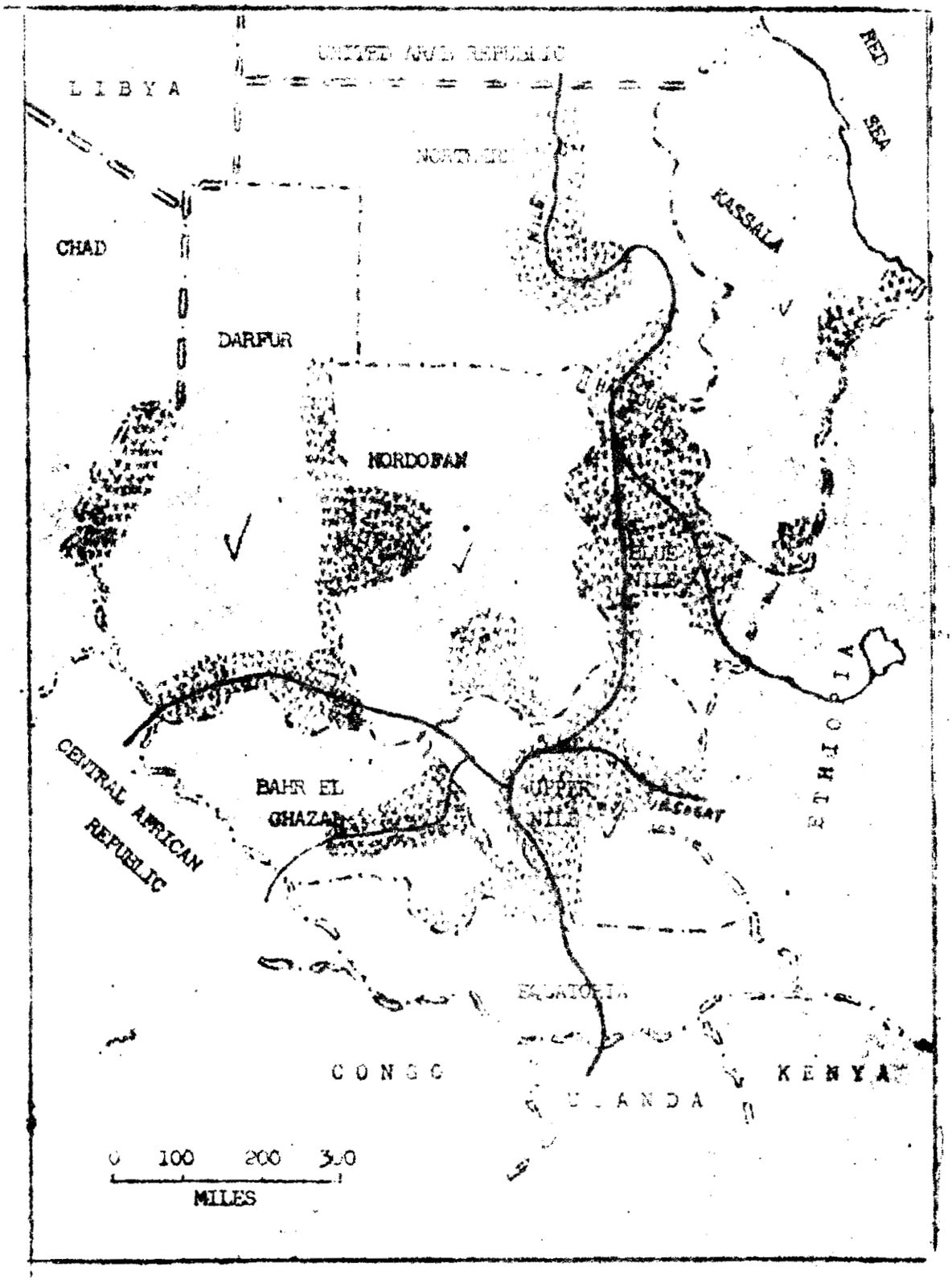
Province	January			February			March			Total
	Primary	Revacci-nation	Total	Primary	Revacci-nation	Total	Primary	Revacci-nation	Total	
Blue Nile North*	4 969	24 240	29 209	12 989	43 752	56 741	61 770	179 692	241 462	327 412
Blue Nile South*	966	1 370	2 336	7 453	18 752	26 205	11 924	20 189	32 113	60 654
Darfur*	Nil	Nil	Nil	50 168	Nil	50 168	77 524	Nil	77 524	127 692
Kordofan*	16 971	88 756	105 727	15 058	47 749	62 807	27 074	88 742	115 816	284 350
Northern	617	Nil	617	279	Nil	279	1 407	10	1 417	2 313
Kassala South	167	425	592	19	500	519	222	2 118	2 340	3 451
Upper Nile	74 990	45 481	120 471	103 269	43 777	147 046	71 944	48 576	120 520	388 037
Bahr el Ghazal	5 710	3 855	9 565	2 491	1 734	4 225	15 723	8 143	23 866	37 656
Equatoria	143	Nil	143	27 522	291	27 813	1 956	559	2 515	30 471
Khartoum	687	18	705	18 219	5 276	23 495	18 654	59 881	78 535	102 735
TOTAL	105 220	164 145	269 365	237 467	161 831	399 298	288 198	407 910	696 108	1 364 771

*Provinces under Attack Phase of SE Programme.
Other Provinces Containment and Routine Vaccinations only.
Total in Provinces under Attack Phase amounted to 800 108 Vaccinations.

Common routes of population movements from within and from neighbouring countries



Distribution of population in the SUDAN.



N° 29

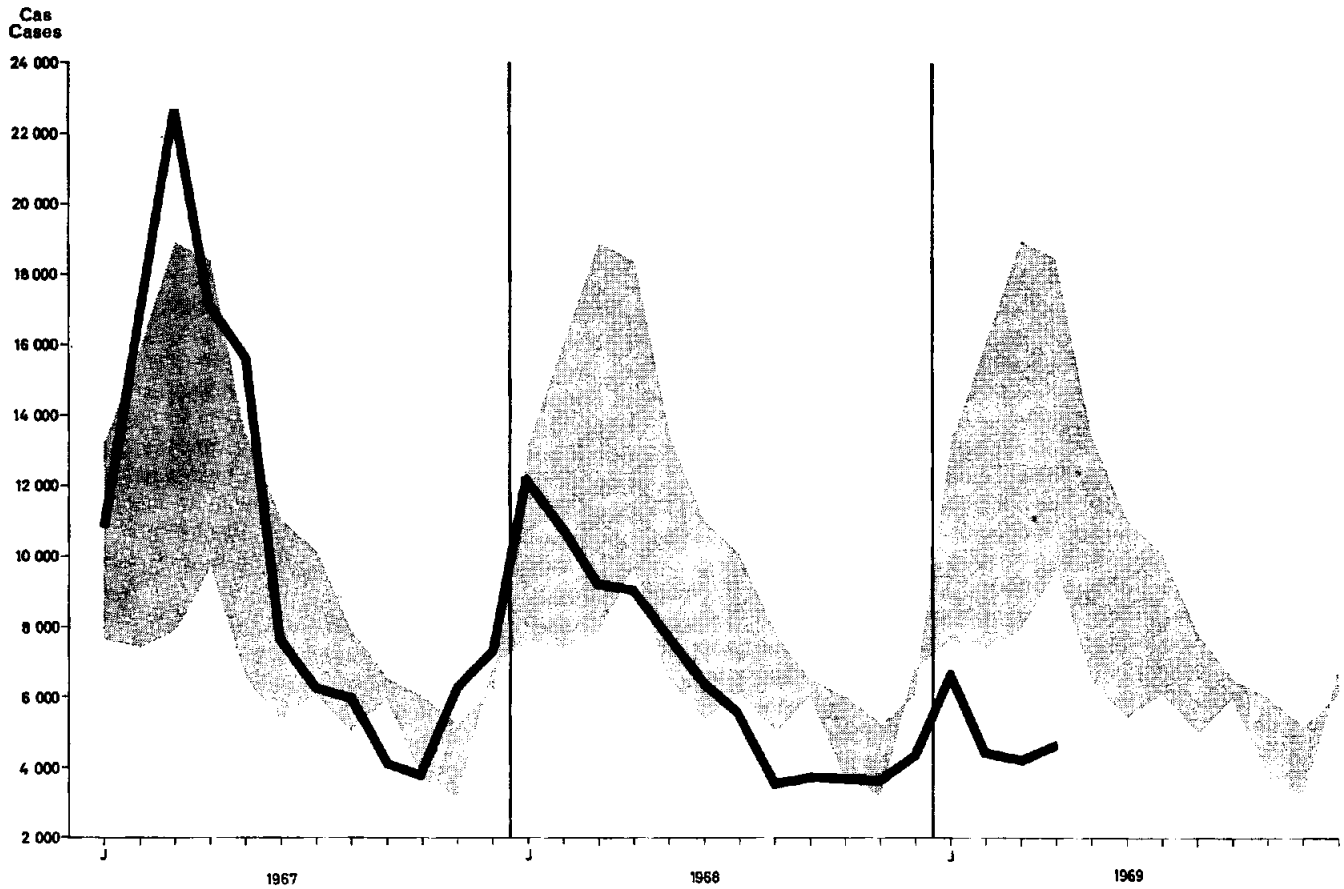
15 août — August 1969

SURVEILLANCE DE LA VARIOLE

SMALLPOX SURVEILLANCE

Fig. 1

Incidence de la variole dans le monde, 1967-1969 — Worldwide Smallpox Incidence, 1967-1969



Note. — La zone en gris représente l'écart entre les incidences maximales et minimales observées au cours de la période 1962-1966 — The grey area represents the range between the highest and lowest incidence reported during the five-year period 1962-1966.

Tiré à part du *Relevé épidém. hebd.*, N° 33, 1969, pp. 497-502.

Reprinted from *Wkly Epidem. Rec.*, No. 33, 1969, pp. 497-502.

Tableau 1 **SURVEILLANCE DE LA VARIOLE — SMALLPOX SURVEILLANCE** *Table 1*

Nombre provisoire de cas par semaine (y compris cas suspects et importés) — Provisional number of cases by week (including suspected and imported cases)
Rapports reçus jusqu'au 13 août 1969 — Reports received by 13 August 1969

Pays — Country	1969																	TOTAL à ce jour to date	1968	
	Janv. Jan.	Fév. Feb.	Mars March	Avril April	Mai — May				Juin — June				Juillet — July						TOTAL même période same period	TOTAL pour l'année for year
	1-5	6-9	10-13	14-18	19	20	21	22	23	24	25	26	27	28	29	30	31			
AFRIQUE (occidentale et centrale)																				
AFRICA (West and Central)																		458	4 018	5 407
Cameroun — Cameroon	11	3	1	—	—	—	—	—	—	—	—	—	—	—				15	84	87
Dahomey	3	—	—	—	—	—	—	—	—	—	—	—	—	31	—	—		34	317	359
Ghana	3	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	24	26
Guinée — Guinea	12	—	—	4	—	—	—	—	—	—	—	—						16	270	330
Haute Volta — Upper Volta	—	—	—	—	—	—	—	—	—	—	—	—	—	—				—	40	100
Libéria — Liberia	—	—	—	—	—	—	—	—	—	—	—	—	—	—				—	5	5
Mali	—	1	—	—	—	—	—	—	—	—	—	—	—					1	57	58
Niger	2	5	14	1	—	—	—	—	—	—	—	6	—	—	—	—	—	28	664	678
Nigéria — Nigeria	60	81	11	13	—	1	1	4	1	—	21	3						196	1 676	1 832
Sierra Leone	23	30	3	14	2	8	—	—	—									80	515	1 143
Tchad — Chad	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	5	5
Togo	13	6	3	51	1	2	—	7	—	—	—	—	—	—	—	—		83	361	784
AFRIQUE (orientale et méridionale)																				
AFRICA (East and South)																		1 337	2 838	5 544
Afrique du Sud — South Africa	8	18	10	7	3	3	—	—	1	3	21	71	—	—	—	4	16	165	55	81
Burundi	1	3	—	—	—	—	—	—	10	1	1		2					18	196	270
Congo, Rép. dém. — Dem. Rep.	155	183	104	82	24	10	76	10	7	8	9	10						678	1 772	3 800
Ethiopie — Ethiopia	68	14	44	23	—	2	1	4		2								158	140	426
Kenya	5	3	5	—	—	—	—	—	—	—	—	—	—	—	—	1	—	14	75	85
Malawi	1	10	17	17	—	4	—	—	—	—	—	—	1	—	—	2	2	54	38	61
Mozambique	9	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	48	145
Ouganda — Uganda	3	1	—	2	—	—	—	1	—	—	—	—	—	...	—	—		7	37	55
Rép.-Unie de Tanzanie — United Rep. of Tanzania	12	14	5	12	2	1	2	6	1	3	2	1	2	6	3	1	—	73	332	455
Rhodésie du Sud — Southern Rhodesia	1	2	1	—	—	—	—	—	—	—	—	—	1	4	—	—	—	9	9	12
Rwanda	—	—	—	—	—	—	—	—	—	—	—	—	—	11	16			27	—	—
Souaziland — Swaziland	—	—	—	—	—	—	—	—	—	—	—							—	14	15
Soudan — Sudan	35	16	19	49	2	2	—	—	—	—	—	—	—	—				123	104	106
Zambie — Zambia	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—	18	33
AMÉRIQUE DU SUD																				
SOUTH AMERICA																		1 465	1 595[a]	3 847[a]
Brésil — Brazil	169	298	152	210	8	11	51	30	23	164	202	122	15	10	—	—		1 465	1 592	3 844
ASIE — ASIA																		23 762	39 017[b]	64 739[b]
Afghanistan	18	14	19	23	—	—	—	4	—	2	2	5	—	—	2	—	—	89	361	739
Birmanie — Burma	—	2	58	8	—	—	—	—	1	—	—	—	—					69	166	181
Inde — India	3 137	2 464	2 255	2 084	←		1 420	→	←		857	→	19	25	5			12 266	19 354	35 165
Indonésie — Indonesia	2 403	1 126	1 317	1 580	266	300	256	182	291	362	156	124	85	189	101	43		8 781	8 804	17 311
Népal — Nepal	21	24	7	6	21	—	—	—	—	—	—	—						79	142	249
Pakistan oriental — East Pakistan	277	103	125	226	21	24	22	36	25	18	22	11						910	8 990	9 255
Pakistan occidental — West Pakistan	294	187	281	400	105	44	42	35	35	28	32	28	17	8	3			1 539	1 197	1 836
Yémen — Yemen	—	—	1	5	6	6	6	5										29	—	—
EUROPE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2
Total	6 744	4 612	4 452	4 817	3 080				2 692									27 022	47 469	79 539

[a] Comprend Guyane française (1 cas) et Uruguay (2 cas) — Includes French Guiana (1 case) and Uruguay (2 cases).
[b] Comprend Oman sous régime de traité (2 cas) et Yémen du Sud (1 cas?) — Includes Trucial Oman (2 cases) and Southern Yemen (1 case?). — Zéro — Nil. ... Donnée non disponible ... Data not available

Au 13 août 1969, 27 022 cas de variole avaient été notifiés à l'Organisation. Le nombre de cas enregistrés en 1968 pour la même période était de 47 469, soit une diminution de 43 % en 1969 par rapport à 1968. Ce taux de régression s'est maintenu depuis le début de l'année malgré les progrès réalisés en matière de notification dans tous les pays à endémicité variolique.

Si l'on compare le nombre de cas signalés en 1969 au chiffre correspondant de 1967, la baisse est encore plus marquée. 1967 est l'une des deux années de la dernière décennie où l'incidence a été la plus élevée (128 185 cas).

La *figure 1* montre l'incidence de la variole dans le monde au cours des dernières années. La situation en 1967-1969 est comparée à celle de l'année de plus haute incidence (1963) et de plus faible incidence (1964) enregistrées au cours de la période de cinq ans qui a précédé la décision d'intensifier la campagne mondiale d'éradication de la variole. Le recul constant observé depuis trois ans est encourageant, mais, étant donné les variations cycliques constatées dans le passé sur des périodes de plusieurs années, il convient d'être prudent dans l'établissement de projections pour l'avenir.

Soudan

Au début de 1969, des épidémies de variole importantes ont été signalées au Soudan pour la seconde année consécutive. Comme ce pays avait été considéré provisoirement comme non-endémique, ces épidémies ont revêtu une importance toute particulière.

La variole a été endémique au Soudan jusqu'en 1963. Aucun cas n'a été signalé cette année-là, ni l'année suivante. En 1965, 69 cas ont été rapportés qui tous, pense-t-on, étaient importés. Aucun cas n'a plus été notifié jusqu'en 1967 où 9 cas, probablement encore importés de régions d'endémie limitrophes, ont été enregistrés. Dès 1968 le Soudan n'était donc plus considéré comme un pays d'endémie.

De mars à juin 1968, 102 cas ont été signalés.[1] La source de l'infection paraissait être Gambela dans la Province d'Ilubabor en Ethiopie. Trois provinces étaient touchées: Haut-Nil: 75 cas; Nil Bleu: 18 cas; et Kassala: 9 cas *(figure 2)*. La vaccination et les mesures prises ont paru endiguer l'épidémie vers la mi-juin 1968.

Toutefois, en décembre 1968, la variole a réapparu dans les Provinces du Haut-Nil et du Nil Bleu. A la mi-mai, 125 cas avaient été signalés, pour la plupart dans les mêmes régions qu'en 1968 *(figure 3)*. Les provinces affectées étaient les suivantes: Haut-Nil: 73 cas; Nil Bleu: 33 cas; Khartoum: 7 cas; Equatoria: 12 cas. Trois décès ont été enregistrés. Les cas étaient répartis sur une période de cinq mois, avec un premier sommet en janvier et un autre à fin mars *(figure 4)*. Le second sommet était principalement dû aux cas originaires de la Province du Haut-Nil.

Le *tableau 2* montre la répartition des cas par âge et par sexe. La première correspond étroitement à la répartition par groupe d'âge de la population. La proportion des sexes varie beaucoup du sud au nord. Dans les Provinces méridionales du Haut-Nil et d'Equatoria, on a relevé 40 cas chez les personnes du sexe masculin et 44 chez celles du sexe féminin. En revanche, dans les Provinces septentrionales du Nil Bleu et de Khartoum, on a relevé 32 cas chez les personnes du sexe masculin et 8 seulement chez celles du sexe féminin.

Through 13 August 1969, 27 022 cases of smallpox had been reported to the Organization. During the same period in 1968 47 469 cases were recorded. At this time in 1969 there is thus a decrease of 43 % compared with 1968, a level of decrease that has been quite consistent since the beginning of the year in spite of continually improved reporting from all of the endemic countries.

A comparison of the cases reported at this same period in 1967 obviously shows an even greater decrease, as 1967, with 128 185 reported cases, was one of the two highest years of smallpox incidence during the past decade.

The global pattern of reported smallpox incidence in more recent years is noted in *Figure 1* where the incidence for 1967-1969 is plotted against the range between the highest year (1963) and the lowest year (1964) during the five-year period before commencement of the intensified programme of global smallpox eradication. The consistent decrease noted during the past three years is encouraging but, in view of the past record of cyclical variations over periods of several years, should be viewed cautiously as a basis for future projections.

Sudan

During early 1969, significant outbreaks of smallpox were reported from Sudan for the second successive year. As Sudan had been provisionally considered to be non-endemic, these outbreaks were of particular concern.

Smallpox had been endemic in Sudan through 1962. No cases were reported in 1963 or during the following year. In 1965, 69 cases occurred which were attributed to importation. No cases were reported subsequently until 1967, when 9 cases occurred, again presumably due to importation from neighbouring endemic areas. Consequently, by 1968, Sudan was regarded as no longer being an endemic country.

In 1968, between March and June, 102 cases were reported.[1] The source was believed to have been Gambela in Ilubabor Province in Ethiopia. Cases occurred in three provinces: Upper Nile: 75 cases; Blue Nile: 18 cases; and Kassala: 9 cases *(Figure 2)*. Vaccination and containment measures appeared to have terminated the epidemic by mid-June 1968.

However, in December of 1968 smallpox re-appeared in Upper Nile and Blue Nile Provinces. By the middle of May, 125 cases had been reported, for the most part in the same areas as in 1968 *(Figure 3)*. The affected provinces were: Upper Nile: 73 cases; Blue Nile: 33 cases; Khartoum: 7 cases; and Equatoria: 12 cases. There were three recorded deaths. Cases were distributed over a five-month period, with an early peak in January and a late one at the end of March *(Figure 4)*. The second peak was due mainly to cases in Upper Nile Province.

The distribution of cases by age and sex is shown in *Table 2*. The age distribution corresponded closely to the overall age distribution of the population. The ratio of the number of cases in males to the number of cases in females differed widely from South to North. In the more southerly Provinces of Upper Nile and Equatoria there were 40 cases in males and 44 in females. In contrast, in the more northerly Provinces of Blue Nile and Khartoum, there were 32 cases in males and only 8 reported in females.

Tableau 2. **Répartition par âge et par sexe des 125 cas signalés au Soudan en 1969**
Table 2. **Age and Sex Distribution of 125 Reported Cases, Sudan 1969**

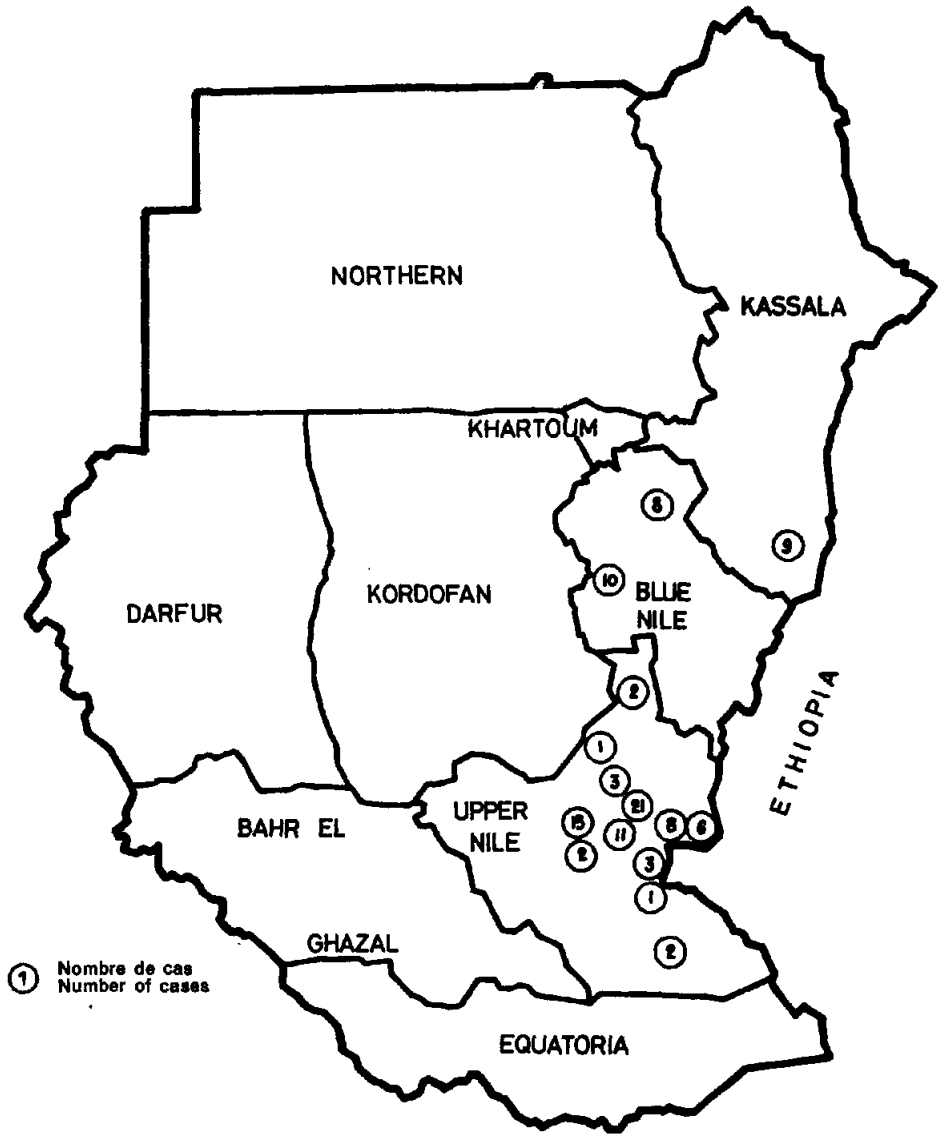
Groupe d'âge — Age group	Nombre de cas — Number of cases			Pourcentage du total Percent of total
	M	F	Total	
Moins d'un an — Less than one year	2	1	3	2.4
1-4 ans/years	15	13	28	22.6
5-9 ans/years	8	8	16	12.9
10-14 ans/years	6	7	13	10.5
15 +	41	23	64	51.6
Total	**72**	**52**	**125** *	

* Y compris 1 cas (âge et sexe inconnus) à Atar, Province du Haut-Nil — Includes 1 case in Atar, Upper Nile Province, age and sex unknown.

[1] Voir N° 39, 1968, pp. 497-499.

[1] See No. 39, 1968, pp. 497-499.

Fig. 2
Soudan, 1968: Distribution géographique des cas — Sudan, 1968: Geographic Distribution of Cases



Des 125 malades, deux seulement avaient été vaccinés; l'un plusieurs années auparavant et l'autre, une fillette de cinq ans, en 1968; elle avait une grande cicatrice au point de vaccination.

Les deux premiers cas ont été identifiés en décembre 1968, l'un dans le Haut-Nil, l'autre dans le nord de la Province du Nil Bleu *(tableau 3)*. Des cas ont continué à se produire dans une large région du Haut-Nil jusqu'à mi-mai. Dans le nord de la Province du Nil Bleu, aucun cas n'a été signalé après la première semaine de mars. Dans le sud de la province, la maladie a été observée dès la dernière semaine de janvier jusqu'à la première semaine de mai. La Province d'Equatoria n'a signalé des cas que vers la fin de l'épidémie, de fin mars à mi-mai, mais on considère que les rapports provenant de cette province sont incomplets.

Comme en 1968, la poussée épidémique a commencé en même temps que la saison sèche, coïncidant avec les grands mouvements migratoires des travailleurs agricoles du sud vers le centre. Il y a deux voies principales de migration: l'une, dans la Province du Haut-Nil, de la ville de Bor se dirige vers le nord en suivant le Nil Blanc par voie terrestre ou par voie fluviale; l'autre suit le fleuve Sobat. Ces deux courants de population se rejoignent à Malakal dans la Province du Haut-Nil et continuent vers le nord jusqu'à Khartoum. Les travailleurs emmènent leurs familles et sont logés dans des constructions provisoires ou dans de grands camps amé-

Among the 125 patients, only two gave a history of previous vaccination, one of whom had been vaccinated many years before and the other, a five-year-old girl, who was said to have been vaccinated in 1968 and had a large scar at the vaccination site.

The first two cases identified occurred in December 1968, one in Upper Nile and the other in Blue Nile Province North *(Table 3)*. Cases continued to occur over a wide area in Upper Nile until the middle of May; in Blue Nile North cases continued only until the first week of March, but in Blue Nile South, cases occurred from the last week of January until the beginning of May. Equatoria reported cases towards the end of the outbreak, from the latter part of March until mid-May, but reporting from that province was considered to be incomplete.

The outbreak, as in 1968, coincided with the beginning of the dry season when large numbers of agricultural workers migrate from southern to central Sudan. They follow two main routes: one in Upper Nile Province from the city of Bor northward by highway or boat along the White Nile River; the other along the Sobat River. These streams of people merge in the city of Malakal in Upper Nile Province and continue to move northward as far as Khartoum. The workers come with their families and reside in temporary homes or large government-built camps, in several of which outbreaks occurred. Vaccination coverage was poor in the migratory popula-

Fig. 3

Soudan, 1969: Distribution géographique des cas — Sudan, 1969: Geographic Distribution of Cases

nagés par l'Etat; dans plusieurs d'entre eux des poussées épidémiques se sont produites. La couverture vaccinale de cette population migrante était faible et la maladie s'est beaucoup plus manifestée chez elle que parmi la population sédentaire. Les migrants rentrent chez eux en juin avant le début de la saison pluvieuse. Pendant la saison des pluies, les déplacements sont beaucoup plus rares et les activités de surveillance deviennent pratiquement impossibles.

Les particularités de l'épidémie étaient les suivantes: elle a touché une vaste zone et a duré pendant au moins cinq mois. Un très grand nombre de villages ont été touchés; dans le Haut-Nil, par exemple, les 73 cas signalés étaient répartis entre 25 villages, avec un cas unique dans 12 d'entre eux. Ce tableau épidémiologique paraissant insolite pour la variole, on s'est efforcé de savoir jusqu'à quel point les rapports étaient complets. C'est ainsi que dans la région de Bor, Haut-Nil, 59 cas ont été découverts dont 8 seulement avaient été signalés par les voies normales. Les 41 autres cas ont été dépistés en des points de contrôle établis le long des voies de circulation ou par des équipes de vaccination qui ont visité les villages pendant l'application des mesures d'endiguement. La plupart de ces malades étaient en convalescence et le repérage des contacts était difficile. Il est probable que des situations analogues ont existé ailleurs et qu'un grand nombre de cas n'ont pas été signalés.

Les mesures d'endiguement ont consisté à isoler les malades, en général dans une habitation spécialement construite à cette fin hors

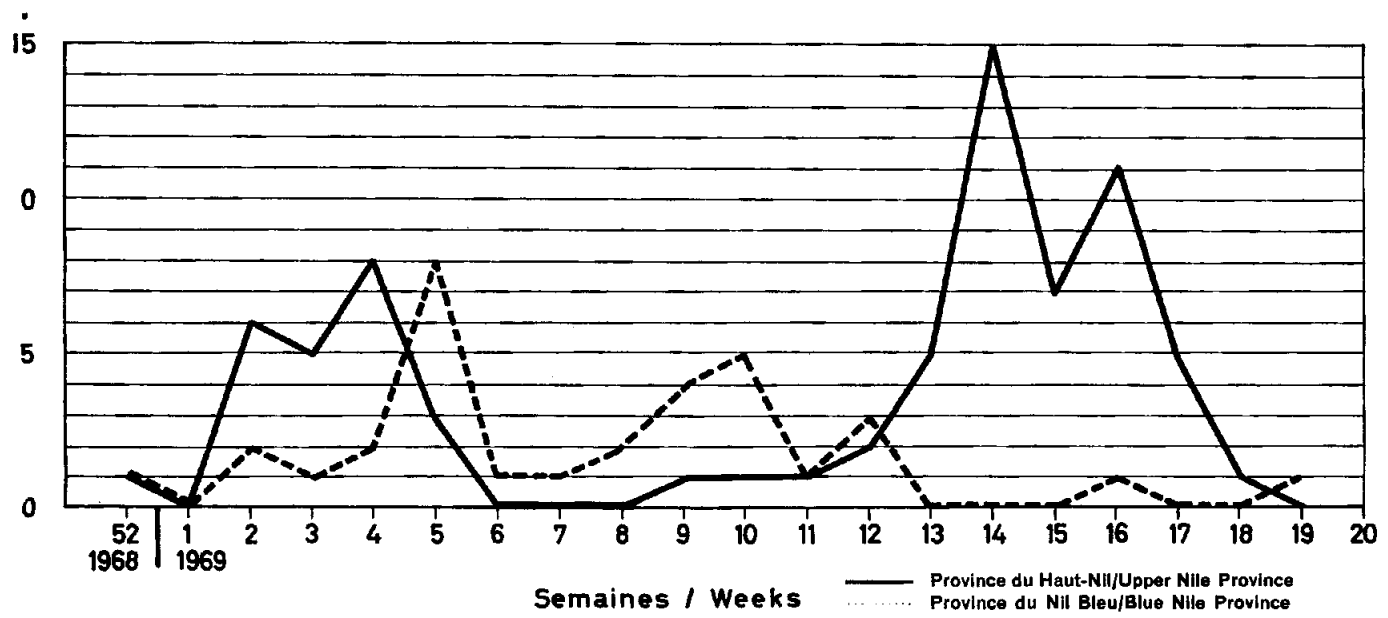
tion and most of the cases occurred in migrants rather than in the sedentary population. Before the rainy season begins in June, the migratory population moves back to their permanent homes. During the rainy season, movements are much restricted and surveillance activities become virtually impossible.

The striking features of the outbreak were its widespread occurrence over a large area and its continuation over a period of at least five months. A very large number of villages were involved; in Upper Nile, for example, the 73 reported cases were distributed through 25 villages. Twelve of these villages reported single cases. As this seemed to be an unusual pattern of occurrence for smallpox, efforts were made to determine the completeness of reporting. In the Bor region of Upper Nile, for example, 49 cases were found of which only 8 were reported through normal reporting channels. The other 41 cases were detected at check points set up along travel routes or by vaccination teams visiting villages during containment actions. Most of the patients found in these operations were convalescent, and the tracing of contacts was difficult. It is probable that similar conditions prevailed elsewhere and that large number of cases were not reported.

Containment measures consisted of patient isolation, usually in special houses built outside villages, and of vaccination programmes

Fig. 4

Soudan, 1969: Distribution des cas par semaine — Sudan, 1969: Distribution of Cases by Week



du village, et à mettre en œuvre un programme de vaccination dans les villages touchés et leurs environs. Des postes de vaccination ont en outre été établis en trois points principaux le long des voies de circulation. Les villages construits pour les ouvriers agricoles ont particulièrement retenu l'attention. En mai, la poussée épidémique commençait à décliner et les saisonniers rentraient chez eux.

Ces grandes épidémies survenant dans de vastes zones pendant les années consécutives donnent à penser que la variole pourrait être redevenue endémique dans le sud du Soudan. Le programme d'éradication de la variole exigera des efforts particuliers et une surveillance intensive, notamment vers la fin de l'année, afin d'éviter une nouvelle épidémie en 1970.

in and around the affected villages. In addition, vaccination posts were set up at three main points along the travel routes. The villages built for the agricultural workers received special attention. By May the outbreak was subsiding, and the migrants were returning to their homes.

The appearance of large epidemics over a wide area in consecutive years suggests that smallpox may have again established itself in endemic form in the southern part of Sudan. Special efforts by the Smallpox Eradication Programme, with intensive surveillance, particularly during the latter part of the year, will be necessary if another outbreak is to be prevented in 1970.

Tableau 3. **Soudan, cas de variole par province et par semaine, décembre 1968 - mai 1969**

Table 3. **Sudan, Cases of Smallpox by Province and Week, December 1968 - May 1969**

Province	1968	1969																			Total
	Déc. — Dec.	Janv. — Jan.					Fév. — Feb.				Mars — March				Avril — April					Mai-May		
	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Haut-Nil — Upper Nile	1		6	5	8	3				1	1	1	2	5	15	7	11	5	1			73 *
Nil Bleu — Blue Nile																						
Sud — South. . . .						1		1	1	3	3	1	3				1			1		15
Nord — North . . .	1		2	1	2	7	1		1	1	2											18
Equatoria														1	1		3	3	1	1	2	12
Khartoum								2	2	3												7
Total	**2**		**8**	**6**	**10**	**11**	**1**	**3**	**4**	**8**	**6**	**2**	**5**	**6**	**16**	**7**	**15**	**8**	**2**	**2**	**2**	**125 ***

* Y compris 1 cas (date d'apparition de la maladie, inconnue) à Atar, Province du Haut-Nil — Includes 1 case in Atar, Upper Nile Province, date of onset unknown.