

EXECUTIVE BOARD

Twenty-third Session

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SMALLPOX ERADICATION

I. The Eleventh World Health Assembly, June 1958, passed the following resolution, WHA11.54:

"The Eleventh World Health Assembly,

Noting that smallpox still remains a very widespread and dangerous infectious disease and that in many regions of the world there exist endemic foci of this disease constituting a permanent threat of its propagation and consequently menacing the life and health of the population;

Having regard to the economic aspect of the question, which shows that the funds devoted to the control of and vaccination against smallpox throughout the world exceed those necessary for the eradication of smallpox in its endemic foci and consequently the destruction of the sources from which the infection arises and spreads, and clearly indicates that the eradication of smallpox might in future make vaccination and all expenditures involved in its application redundant;

Taking into account the level of development reached by medical science and the health services in the control of infectious diseases, and in particular of smallpox, and the manifest tendency of the morbidity of smallpox to diminish in recent years;

Having regard to the decisions and pertinent practical measures adopted by WHO for the control and intensification of antismallpox programmes, in particular resolutions WHA3.18; EB11.R58; WHA6.18; EB12.R13; EB13.R3; WHA7.5; WHA8.38; WHA9.49, and

Considering it opportune to raise the problem of the world-wide eradication of smallpox in the near future;

1. REQUESTS the Director-General to study and report to the Executive Board at its twenty-third session on the financial, administrative and technical implications of a programme having as its objective the eradication of smallpox, the study to include the various problems involved in carrying out the following activities:

(a) investigation of the means of ensuring the world-wide eradication of smallpox, taking into account the fact that smallpox persists in certain areas despite repeated vaccination campaigns;

(b) encouragement of the preparation during 1958-1960 of the necessary amount of smallpox vaccine in national laboratories and institutes;

(c) training of vaccinators among the local population in countries in which mass immunization campaigns will be conducted;

(d) the pooling of experience and the formulation of recommendations for the production of a sufficient amount of thermostabile smallpox vaccine suitable for prolonged storage and use in tropical and sub-tropical regions of the world, and

(e) study of the measures to be taken in order to avoid complications which might result from smallpox vaccination;

2. RECOMMENDS to all governments:

(a) that during 1959-1960 the population be vaccinated in countries in which principal endemic foci of smallpox exist, and

(b) that during 1961-1962 additional vaccination of the population should be carried out in foci where the disease persists, and that subsequently revaccinations be given to the extent it becomes necessary in accordance with the experience acquired in each country;

3. RECOMMENDS that all countries in which smallpox vaccination is compulsory continue to give smallpox vaccinations during the eradication of this disease throughout the world;

4. CALLS upon medical scientists and scientific institutions active in the field of microbiology and epidemiology to stimulate their efforts towards improving the quality and the technology of the production of satisfactory smallpox vaccine resistant to the influence of temperature, and

5. REQUESTS the Director-General to report to the Twelfth World Health Assembly on the progress made and "the results obtained."

II. OUTLINE OF PREVIOUS DECISIONS OF THE WORLD HEALTH ASSEMBLY AND THE EXECUTIVE BOARD

The Third World Health Assembly recommended (WHA3.18) that greater weight should be given to smallpox in the regular programme of the World Health Organization for 1952. The Executive Board at its eleventh session, noting a report submitted by the Director-General dealing with further action on general world health problems, considered that a campaign against smallpox would be suitable for a world-wide programme (EB11.R58). The Sixth World Health Assembly, after considering the resolution of the Executive Board, requested the Board to proceed with a detailed study of the means of implementing such a campaign (WHA6.18). At the request of the Executive Board (EB12.R13) the Director-General carried out with Member States, WHO regional committees, and members of expert advisory panels, consultations which were brought to the attention of the

Board at its thirteenth session. The Board requested the Director-General to urge health administrations to conduct wherever possible campaigns against smallpox as an integral part of public health programmes and to include where possible additional studies on smallpox in his future programme plans (EB13.R3). The Seventh World Health Assembly considered the results of the study carried out by the Executive Board and requested the Director-General:

- to continue studies on the most effective methods of smallpox control, particularly with reference to those countries where the disease is endemic;
- to urge health administrations to conduct, wherever possible and necessary, campaigns against smallpox as an integral part of the public health programmes;
- to provide within budgetary limitations the assistance requested by national administrations to further their smallpox control programmes (WHA7.5).

The Director-General called the attention of all Member States to these resolutions as a result of which new requests for assistance were received from twelve countries, many of which have been or are in the process of being implemented. The Eighth World Health Assembly again urged health administrations to conduct where necessary campaigns against smallpox as an integral part of their public health programme (WHA8.38).

III. THE PRESENT-DAY PROBLEM, BY REGIONS

Following the passage of resolution WHA11.54, the Director-General addressed a questionnaire on smallpox and vaccination to all Member countries. Up to the end of November 1958, replies had been received from 20 countries; these have been of great assistance in the preparation of this document.

1. Europe

Smallpox is not endemic in any country of the European Region. Cases are introduced from outside occasionally, but the resulting outbreaks are controlled by ring vaccination, and secondary cases are few. Full official information about some countries of eastern Europe is deficient, but at the Eleventh World Health Assembly Professor Boldyrev, USSR, stated that there is now no smallpox in the USSR, and in answer to the Director-General's questionnaire Czechoslovakia has stated that it is free from smallpox.

2. Americas

Eradication of smallpox from the American Region is proceeding satisfactorily.

Smallpox was mildly endemic in the United States of America before the war but, contrary to the usual tide of events, it was virtually eradicated there during the war. It was heavily endemic in several South American countries, but most of these, in the last few years, have given classic demonstrations of the efficacy of planned mass vaccination. In Central America and the Caribbean islands, smallpox never has been prevalent.

The report of the XV Pan-American Sanitary Conference (CSP 15/17 of 2.9.58) gives figures for Member countries, including the following

Country	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Mexico	1541	1060	762	27	-	-	-	-	-	-
Paraguay	1702	179	304	282	797	770	207	57	132	95
Peru	7105	6305	3612	1218	1360	172	115	-	-	-
Venezuela	6358	3951	2181	280	109	72	13	2	4	-
Colombia	7356	3040	4818	3844	3235	5526	7203	3404	2572	2107

In Colombia a nation-wide vaccination campaign was instituted in October 1955, the object being to vaccinate at least 80 per cent. of the population in five years. In Peru a campaign begun in 1950 covered 78.7 per cent. of the population (mostly in 1950-1953). In Mexico it is claimed that the whole country was vaccinated in 1950. In the last two countries, the local public health services are maintaining the vaccination level. In Chile, the local services have been mainly responsible for the vaccination campaign, and there has been no case of smallpox since 1953. There are still some endemic foci in Brazil.

The usual technique of campaigns has been house-to-house vaccination, but collection of the population at pre-arranged places and times is also used successfully. Each vaccinator is given a programme so detailed that his supervisor can find him at any time of any day, provided that he is adhering to his timetable.

3. South-East Asia

In order to investigate the factors responsible for the persistence of a high prevalence of smallpox in this region, and to advise governments on problems of

legislation, administration, technique and the vaccine used in campaigns, provision has been made in the South-East Asia Region for a short-term consultant for a period of three months in 1959.

It is proposed to appoint in 1960 a medical officer to work with the national personnel in a chosen area of a selected country in the region, in order to help organize and establish an efficient smallpox control service.

In January 1958 the Regional Office issued a questionnaire to all Member governments requesting information on forty points regarding the organization and methods of their vaccination services. This was to prepare the way for a further investigation, in the hope that a comparative analysis of the information thus received might pin-point the causes of epidemicity. It may be that smallpox control is primarily an administrative problem, and the replies to the questionnaire may help to confirm or to deny this.

In view of the close geographical connexion between India and East Pakistan, the latter is dealt with under the present heading although it belongs to the Eastern Mediterranean Region. These countries constitute by far the most important endemic focus of smallpox in the world, and with Burma, must be regarded as the most likely sources from which smallpox may be reimported into other (chiefly Asian and Middle East) countries. The Mecca pilgrimage, in which hundreds of thousands of persons drawn from most of the countries of the world converge on Saudi Arabia annually, is important in this respect, but so is ordinary migration. At Penang, deck passengers from India are quarantined and vaccinated on arrival. Between 1948 and 1953 smallpox was detected among Indian deck passengers on four occasions; in 1953, out of 31 000 immigrants (all of whom held international vaccination certificates) ten per cent. gave unequivocal vesicular responses on revaccination at the quarantine station. At Singapore - a longer voyage from India - between 1947 and 1954 smallpox was detected twice and six times in passengers from India and China respectively. Numerous international ports and airports, notably Calcutta, are endemic foci.

Rogers, who studied the epidemiology of smallpox in India for many years, reviewed (1945)¹ the relationship of vaccination and smallpox there, bringing out

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Rogers, L. (1945) Proc. roy. Soc. Med. 38, 135

some facts that do much to explain the persistence of endemic smallpox. By 1937 under half of the population were subject to compulsory vaccination. Even figures of incidence were not available from the princely states, which constituted a large part of the endemic area. That evasion of vaccination was not difficult is illustrated forcibly by the relative incidence of smallpox among certain groups in British India in 1939, where British N.C.O.'s and their families had a higher morbidity rate than the civil population around them.

	<u>Cases per 1000</u>
Indian civilians	0.24
British N.C.O.'s and other ranks	0.40
Wives of British N.C.O.'s and other ranks	0.70
Children of British N.C.O.'s and other ranks	0.20

Nevertheless, the annual incidence of smallpox declined steadily from 1.032 per 1000 in 1868-1877 to 0.290 per 1000 in 1928-1937, while annual vaccinations rose from a few to 19.1 millions. Over the same period, smallpox deaths per 1000 in epidemic years declined from 2.1 to 0.38.

In the last four years the incidence has shown no sign of decrease.

Year	1954	1955	1956	1957
India	46 629	41 932	45 166	74 416
E. Pakistan	446	1 879	5 170	24 621

It seems that the persistence of smallpox in India and East Pakistan is due mainly to the variable efficiency with which local authorities, whose responsibility it is, carry out vaccination. Nevertheless, in apparently well-vaccinated provinces such as Bombay and Madras the disease persists. In 1955 Professor C. H. Kempe wrote: "The administrative set-up is unique in Madras because vaccinators are well trained and informed and know their respective villages inside out." Yet Madras reported 2026 and 3418 cases in 1955 and 1956 respectively.

Lack of thermostability in the vaccine used must be suspected, which will be overcome by the use of dried vaccine. It has been proposed that this should be produced locally, with WHO assistance, at two institutes (to begin with) selected from

Nagpur (Bombay), Patwadangar (Uttar Pradesh), Guindy (Madras), and possibly an institute in West Bengal.

At the Eleventh World Health Assembly, India supported the smallpox eradication resolution, and "hoped that a time-limit would be set for its completion, because otherwise the necessary steps might not be taken as expeditiously as was desirable".

In the past, Burma was second only to India and East Pakistan as an endemic focus. The latest published figures suggest some recent improvement, but should be accepted with reserve.

In Thailand only two cases were reported in 1936, but in 1945 and 1946 there were 36 394 and 26 843 respectively. In the last four years, 1954-1957, annual reported incidence has been 21, 117, 4 and 3 cases. Despite this achievement, remembering the epidemics of 1945 and 1946, there can be no relaxation of precautions while the possibility of fresh importation of infection remains.

In Indonesia smallpox was virtually abolished before the war by intensive vaccination.

Year	1933	1934	1935	1936	1937	1938	1939	1940
Smallpox cases	7	4	10	1	1	9	1	0

It was reintroduced during the war, when vaccination was interrupted by the Japanese occupation, spread round the islands, and has been endemic ever since.

Since 1873 Indonesia has possessed a vaccination service, though vaccination never has been compulsory. The system is organized so that on every day of the year it should be possible to state where every one of the 500 vaccinators is working. (It will be noted that this is the system whereby certain American countries have eradicated serious endemic smallpox in three or four years.) Smallpox could be eradicated again, by the existing system, with improved supervision, and use might be made of the yaws campaign. In the resurvey phase, a full yaws team sees 6000 persons in four weeks, average attendance being 87.55 per cent. of the population. Supervision is all-important, and yaws campaigns have the power of generating enthusiasm in the supervisory staff. At the Eleventh World Health Assembly, Indonesia undertook to take part in a global eradication campaign.

In some of the island territories of South-East Asia smallpox has not re-established itself since dying out before the war. North Borneo and Sarawak are examples. Vaccination is not compulsory in either, and its practice appears to be confined to one or two main towns. Communications with the interior are slow, which doubtless militates against the introduction of smallpox.

4. Africa

Since the decline of smallpox in the Americas, Africa is second to South-East Asia as a smallpox focus. The main endemic foci are in Central and West Africa. For some years before the war there was little smallpox in Bechuanaland, Kenya, Nyasaland, Uganda, Northern and Southern Rhodesia, and as few as 90 cases in a year were reported from Tanganyika. It is possible, of course, that there was gross under-reporting; freedom from smallpox was not due to a full vaccination state. Since the war, all the Central African territories have consistently reported smallpox. Northern Rhodesia and Nyasaland have a fairly high incidence. In South Africa endemic smallpox has been reduced to nil since certain previously inaccessible areas were opened up: undoubtedly South Africa and Southern Rhodesia could eradicate it permanently but for presumably frequent importations.

The Belgian Congo is an important endemic focus, in spite of having an efficient field medical service. The Belgian Congo and French Equatorial Africa link West with Central and East Africa, and smallpox in the Congo constantly threatens the Rhodesias and Uganda.

In considering smallpox in West Africa, it is necessary to give a sketch of the epidemiology. Smallpox is a predominantly respiratory (droplet) infection, though living virus has been found in the dust of a room nine months after a case of smallpox had lain there, and the virus lives for some time in dry crusts even in daylight: survival of at least 417 days in dry crusts kept in the dark has been proved. Smallpox flourishes in conditions of low absolute humidity, and therefore tends to become epidemic in a spectacular manner during the dry season in dry places, typically in the arid countries bordering on the Sahara desert. In these countries, epidemics die out at the end of the dry season. Unlike the other great airborne epidemic disease of these countries, cerebro-spinal meningitis, smallpox can maintain itself in the humid forest areas nearer to the coast, almost regardless of season, provided that

there is a high population density. It is in fact an endemo-epidemic disease in the humid areas, but in the savannah and arid areas it occurs in epidemics with intervals of complete absence.

The main West African foci are Nigeria, in which recent epidemics have been occurring mainly in the densely populated forest areas; and French West Africa, in which the highest incidence has been reported in Dahomey and the Ivory Coast (which adjoin the coast and are at least partly forest areas) and Sudan and Niger (which adjoin the Sahara). In Ghana, there has not been an epidemic in the savannah area since 1947, but endemo-epidemic cases have been occurring in the forest country. All these countries have efficient field medical services, derived originally from sleeping sickness campaigns, and consequently focused on the savannah. These services carry out systematic vaccination. Though all are extending their orbits outside the old sleeping sickness areas of the savannah (roughly from 8° to 13° N), it is significant that the present areas of high smallpox incidence are those most remote from the field medical services.

From West Africa there is considerable migration eastwards, on the pilgrimage to Mecca. Many, perhaps most, of the pilgrims travel on foot. They have no respect for frontiers, and though the Sudan immigration authorities do their best, the latter country is constantly threatened with smallpox from this source. Egypt may be infected via the Sudan, or by travellers from India.

Egypt became reinfected during the war, from a source which may or may not be known. It illustrates the possible disastrous consequences of such an importation.

Year	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Cases	2	0	0	4 138	11 194	1 355	416	170	16	3

5. Eastern Mediterranean

East Pakistan, which belongs to this Region, has already been referred to in conjunction with India. Mention has already been made of the pilgrimage to Mecca, which is of vital concern to this Region being in the very centre of it. Because of the volume of international traffic, mainly by land, and the absence of quarantine barriers between many of the countries in this Region, smallpox may easily spread from endemic zones to countries that are free from the disease. WHO has provided equipment for the production of freeze-dried vaccine to six countries in the Region (Iran, Iraq, Israel, Pakistan, Sudan, United Arab Republic (Provinces of Egypt and Syria)), and equipment for Tunisia is to be shipped before the end of 1958. In order to ensure that satisfactory results are obtained, EMRO is planning to set up a team of laboratory expert and epidemiologist to carry out a survey of the countries in the Region. Action will be taken in the light of results of this. A seminar on smallpox control is planned for 1960.

In Syria a mass vaccination campaign was conducted in 1957 under the control of the national authorities and no difficulty is foreseen as far as an eradication programme is concerned. In Iran, endemic foci exist in the mountain areas with cool, dry climate. A mass vaccination campaign, under the direction of the Ministry of Health, has covered already an area where 13 million out of a total population of 19 million live. It is estimated that 67 per cent. of the population so far covered have actually been protected by successful vaccination, but that many others are immune from old infection or vaccination. The campaign is expected to be completed within six months; maintenance of immunity in the population is already planned, so that co-operation with a world-wide programme is assured, if that programme starts soon. (Iran has a long frontier with Afghanistan, in which smallpox has been heavily endemic.)

6. Western Pacific

In 1954, in the Western Pacific Region, smallpox was endemic mainly in Korea and in the Indo-Chinese peninsular countries, Cambodia, Laos, Viet Nam and Thailand. The last named, although belonging to the South-East Asia Region, is mentioned in this connexion because of its geographical proximity to Cambodia and Laos. Korea has reported that it now has no endemic foci. Incidence is decreasing in all the other countries.

At the Eleventh World Health Assembly, Viet Nam supported the smallpox eradication resolution and, in answer to the Director-General's questionnaire has stated that between 50 and 60 per cent. of its population are now vaccinated, and that its vaccination campaign should be completed in two years.

Professor Boldyrev, USSR, informed the Eleventh World Health Assembly that smallpox in Mainland China has been reduced to "some tens of cases" annually.

IV. TECHNICAL CONSIDERATIONS

1. It is generally agreed that eradication of smallpox from an endemic area can be accomplished by successfully vaccinating or revaccinating 80 per cent. of the population, within a period of four to five years.
2. The only acceptable criterion of successful vaccination is vesiculation; either primary vaccinia or the accelerated reaction. The precocious non-vesicular reaction known as the reaction of immunity or immediate reaction is not reliable evidence of actual immunity.
3. The amount of vaccine required annually for a country's smallpox eradication campaign is calculable in advance, and should be so calculated in order to plan the most economical use of vaccine producing institutions. Factors involved in the calculation are the population of the area to be covered, proportion already vaccinated, anticipated wastage of vaccine (usually surprisingly low, not more than 5 per cent. and often counterbalanced by the fact that an experienced vaccinator can vaccinate perhaps 40 persons with a 25 dose ampoule). Climate, communications and the proportions of population in rural and urban areas must all be considered in deciding in what proportions to use dried and glycerinated vaccine.

4. Full details of smallpox vaccines, their preparation, testing, suggested international standards, sources of seed virus, etc., are given in the Report of the Study Group on Recommended Requirements for Smallpox Vaccine, WHO/BS/IR/70 of 27 November 1958, submitted to the Board in Document EB23/60.
5. It is believed that for mass vaccination, especially in tropical and remote rural areas, freeze dried (lyophilized) vaccine prepared by the Lister Institute technique offers the best results, since it remains viable for at least three months at 37°C and at least eight weeks at 45°C. No difficulty is anticipated in teaching its use to semi-educated and uneducated vaccinators. Its preparation is described in Official Records No. 79, page 538.
6. The production of Lister type dried vaccine demands high standards of skill and responsibility in the professional and technical staff employed. Several important considerations arise, affecting decisions to give WHO assistance in setting up dried vaccine plants in individual countries.
 - 6.1 The professional and technical personnel must be carefully selected with due respect to qualifications and character. Some countries have experienced difficulty in finding suitable staff.
 - 6.2 The selected staff must be given fellowships for training. There are at present very few institutions where this training can be given.
 - 6.3 The services of a short-term consultant with the highest qualifications, for a total of two to three months, are required in setting up a freeze dried vaccine laboratory. Very few such men exist at present. Their time is heavily committed, and it will be unwise to anticipate there being unlimited periods of two to three consultant-months available annually.
 - 6.4 Although the thermostability of Lister type vaccine is outstanding, dried vaccines prepared by some other processes satisfy the minimal requirement of stability for four weeks at 37°C. WHO fellowships for training in the Lister Institute technique being necessarily limited to a small number, training in other satisfactory techniques must be considered. Most of the dried vaccine for the successful campaigns in Central and South America has been produced by techniques developed in the United States of America.

6.5 The quality of vaccine produced at every laboratory must be subject to continuous checking, to ensure that standards laid down by the Study Group on Recommended Requirements for Smallpox Vaccine are maintained. The testing procedure requires the expenditure of much skilled time.

6.6 One lyophilization unit produces, if all goes well, some 1 500 000 doses of vaccine annually. For this, it requires a full professional and technical staff, including a highly qualified director. In hot climates an air-conditioned laboratory is also necessary. Admittedly, veterinary and other vaccines may be produced in the same institution simultaneously, thus sharing the overheads. It is obvious that overhead costs per dose will be lower if several units are grouped together.

6.7 Everything in paragraphs 6.1 to 6.6 combines to suggest that it is desirable for WHO assistance to be devoted to setting up a few comparatively large, efficient institutions, rather than many small ones, the efficiency of which will be dubious. For a WHO-assisted institution to produce low standard vaccine may even be damaging to the Organization's reputation.

7. Glycerinated vaccine lymph will continue to have uses. When refrigerated storage and transport are available, it offers the advantage of being cheaper and easier to produce, and of being issuable in single dose containers.

8. Research into the complications of vaccination is proceeding in the Netherlands and in Germany. The most dreaded complication is postvaccinal encephalitis, which occurs most commonly after primary vaccination of adolescents and young adults. Reported incidence varies from as much as 1:3000 vaccinations down to Cuba's 2 or 3 cases since vaccination was started. It is not known if cases have occurred after vaccination with Lister type dried vaccine.

9. Human immune gamma globulin is under trial in the Netherlands for the prevention of postvaccinal encephalitis. The trial must be a protracted one, which may or may not produce significant results. The best prophylactic against postvaccinal encephalitis is primary vaccination carried out in infancy.

9.1 In the USSR hyperimmune gamma globulin of very high titre is being produced from lower animals. This offers a much freer supply, and the possibility of producing it elsewhere is being investigated. Apart from the prophylaxis of

postvaccination complications, it may be useful for aborting overt smallpox in unvaccinated contacts and for treating cases of smallpox. The Study Group on Recommended Requirements for Smallpox Vaccine has recommended that gamma globulin should be made subject to an international standard.

10. The laboratory diagnosis of smallpox is now a matter of routine in any institution with the staff and equipment required. Laboratory confirmation of the clinical diagnosis is of minor importance in a country with endemic smallpox, but becomes increasingly important as smallpox becomes rare and medical practitioners unfamiliar with its atypical forms. WHO may have to give assistance to some countries, in setting up facilities for laboratory diagnosis.

11. In countries free from smallpox, early recognition of imported cases is of the greatest importance. Apart from laboratory diagnosis, it may also be desirable to provide short fellowships to selected medical officers in such countries, to become familiar with the clinical aspects of smallpox in an endemic area, and thereafter to act as consultants in their own country.

12. The study group on Recommended Requirements for Smallpox Vaccine has drawn attention to aspects of smallpox and vaccination into which research, particularly research by modern virological methods, is still needed.

V. ADMINISTRATIVE CONSIDERATIONS

A. Headquarters

1. Creation of a list of short-term consultants with high qualifications, to assist in setting up freeze dried vaccine production in certain countries, and periodically to inspect WHO-assisted laboratories producing vaccine.

2. Listing of selected institutions where medical fellows can be trained in the techniques of freeze dried vaccine production.

3. Listing of selected institutions where the quality of freeze dried vaccine from WHO-assisted laboratories can be checked.

4. Items 1, 2 and 3 all involve the same very small cadre of men and institutions. Even with the most careful planning, it will not be easy to obtain all the facilities required without making excessive demands on their time.

5. Creation of a list of short-term epidemiological consultants.
6. Distribution of international vaccine supplies, e.g. contributions from USSR and Cuba.
7. Inter-regional conferences. A conference has already been planned for 1960, in which SEAR and contiguous areas of EMR and WPR will be concerned. Other conferences will probably follow.

B. Regional

1. Regional conferences. These serve important purposes.
 - 1.1 They form an outward and visible manifestation that the subject with which they are concerned is regarded as truly important.
 - 1.2 They provide participants from different countries with the opportunity to meet personally, to exchange information, and to co-ordinate programmes.
 - 1.3 The necessity to render up-to-date progress reports in public tends to act as a spur to countries whose campaigns might otherwise languish.
 - 1.4 Attendance at a WHO conference raises the status in their own countries of participants and consequently of the work they are doing.
2. Fellowships
 - 2.1 For medical laboratory workers. To study the production of dried vaccine, and laboratory diagnosis of smallpox.
 - 2.2 For technical laboratory workers. To study the working and maintenance of dried vaccine plant. Language difficulties are encountered frequently at this level.
 - 2.3 For epidemiologists. To study the administration and field work of established campaigns in other countries.
 - 2.4 For clinicians in countries in which smallpox is now rare, but liable to be reimported. To study the clinical aspects of smallpox, in order thereafter to act as consultants in their home countries.

3. Supply of plant for the production of dried vaccine to selected laboratories.
4. Vaccine programmes.
 - 4.1 Consolidation of countries' vaccine requirement programmes.
 - 4.2 Co-ordination of the work of vaccine-producing laboratories.
 - 4.3 Distribution of vaccine between countries.
5. Regional laboratory and epidemiological consultants have been proposed and, in some regions, already nominated.

C. Individual countries

1. Some countries, e.g. Indonesia, have a separate vaccination service, but in most countries vaccination and all other aspects of smallpox eradication will have to be integrated with the general public health service. Smallpox eradication must be directed or at least co-ordinated centrally.
 - 1.1 With this arrangement, it is essential that at medical headquarters, at country and provincial level, there shall be someone charged specifically with responsibility for smallpox eradication. If, as is possible, this director has other duties to perform in addition, he must have an assistant with ability and a positive personality, solely concerned with smallpox eradication. A clear line of command must exist from vaccinator in the field to director in the highest place in medical headquarters, who is responsible for information, finance, stores, transport, staff welfare and every other administrative factor. In its absence, it is usually found that the affairs of a remote field campaign get low priority as compared with those of interests closer at hand and more clamorous.
2. The work of the smallpox service will include the following items:
 - 2.1 The mass vaccination campaign.
 - 2.2 Health education, including explanations of the reason for the campaign, and a positive element of publicity.
 - 2.3 Diagnosis and isolation of cases of smallpox, and surveillance of contacts.
 - 2.4 All aspects of quarantine.

3. In some countries legislation regarding vaccination will have to be introduced. Smallpox Vaccination. A survey of recent legislation, reprinted by WHO, 1954, from International Digest of Health Legislation, 1954, 5, 221-262, gives adequate guidance on the subject.

4. Preparation of a programme, detailed geographically and by time period, of the campaign, including vaccine requirements and transport arrangements.

4.1 The time period to be taken by the campaign. Four years, the period envisaged in Resolution WHall.54, is probably ideal technically, being roughly the length of time for which successful vaccination confers full immunity. Administratively, it may be easier to plan for a rather longer time, say five years, in a country such as India, with a big population and much preparatory work involved. The time period should be co-ordinated as closely as possible between adjacent countries, and (as stressed by India at the Eleventh World Health Assembly) it should be laid down in advance.

5. Appointment of staff. The all-important consideration is that no campaign can possibly succeed unless the two qualities of ability and enthusiasm are equally present in the directing and supervisory staff. This principle has already been stressed by WHO in planning the global malaria eradication campaign.

Successful performance of the act of vaccination is extremely simple, and it is easy to train even illiterate workers to vaccinate satisfactorily. It is equally easy to vaccinate unsatisfactorily. Supervision, constant, strict, but sympathetic, is a necessity.

5.1 The first step in building up the smallpox eradication staff must be the recruitment of a directing cadre, which must supply throughout the initiative and drive to carry through the campaign.

5.2 The directing cadre must be drawn from countries' own nationals. WHO may second epidemiologists and/or laboratory workers as short-term consultants.

6. Setting up an organization for the planning and administration of smallpox eradication, and training of supervisors and vaccinators, will take time and must be regarded as matters of the utmost urgency.

7. Vaccination can be combined with the activities of other campaigns, provided that the component operations fit together in their timing. Yaws campaigns combine particularly well with vaccination, as has been found already in Haiti and Nigeria. Needless to say, the administration of vaccinators working with other campaigns must continue to be the responsibility of the smallpox eradication service.

VI. FINANCIAL CONSIDERATIONS

A. Headquarters

1. Emoluments and travel of short-term consultants. This item will be mainly a regional matter, but may fall partly on Headquarters services.

1.1 Laboratory consultants. Say 6 consultant/months yearly.

1.2 Epidemiological consultants. Say 12 consultant/months yearly.

2. Distribution of international vaccine supplies.

3. Inter-regional conferences.

B. Regional

1. Regional conferences

1.1 If attendance at regional conferences is to be fully representative, payment of travel expenses by WHO must be considered.

2. Fellowships

The number of fellowships will vary according to region and time period.

2.1 Medical fellowships for study of dried vaccine production and laboratory diagnosis of smallpox. Three months' fellowship plus travel.

2.2 Technical fellowships for study of dried vaccine and other laboratory plant. Three months' fellowship plus travel.

2.3 Epidemiological fellowships for study of campaigns in other countries. Three to six months' fellowship plus travel.

2.4 Clinical fellowships for study of smallpox and its diagnosis. One month fellowship plus travel.

3. Consultants

There is insufficient information on which to base an estimate of regional needs for consultants. In the Eastern Mediterranean Region it is planned to set up a team consisting of laboratory expert and epidemiologist to carry out a survey of the different countries in the Region.

In the South-East Asia Region provision is made for a short-term epidemiological consultant to advise governments, for three months in 1959. It is also proposed to appoint a medical officer to work in a selected country, in order to help organize an efficient smallpox-control service, (\$13 733). Provision is made for supplies and equipment for this service (\$500).

3.1 Laboratory consultants. In several regions there are many calls for 3-month assignments (some of which could be dovetailed into one combined assignment).

3.2 Epidemiological consultants. Although these appointments are entitled short-term, it has been necessary in countries of one region to continue the appointments of some epidemiological consultants for three years.

4. Vaccine

4.1 Supply and distribution of vaccine. There is insufficient information on which to base estimates of the amount of vaccine which will have to be supplied internationally. Most countries can produce more than sufficient glycerinated vaccine for their own needs.

4.2 Dried vaccine plant. Each unit costs \$5000 to \$7000 to purchase, deliver and install. Several have been supplied already. It has been pointed out above (technical considerations, 6.7) that economic considerations are all in favour of a few large laboratories rather than many small ones. It is hoped that it will be possible to establish on these grounds a dried vaccine production policy acceptable to individual countries.

C. Individual countries

1. Medical supervision and direction. Administrative staff.

Although a large part of these costs may be integrated with the general public health budget, provision must be made for full-time administrative staff at central

and regional headquarters, and for a cadre of medical officers, full or part-time, adequate to keep a check on supervisory work and deal with emergencies.

2. Vaccination

In working out the budget of a vaccination campaign, it should be possible, as in malaria eradication, to calculate a per capita cost figure and apply this to the whole country by cautious extrapolation.

Components of the per capita cost are:

2.1 Vaccine, averaging that produced in country's own laboratories at own expense, that bought from other countries, that donated through WHO. At present, the cost of vaccine from laboratories in different countries varies from \$0.0049 to \$0.067 per dose for dried vaccine, and \$0.002 to \$0.017 per dose for glycerinated lymph.

2.2 Vaccinators. The number of vaccinations performed by one vaccinator in a year's work varies according to circumstances, being obviously much greater in densely populated urban communities than scattered rural communities. Sample figures of wages and output are given below:

Country	Vaccinations per vaccinator	Predominant vaccination method on which (1) is based	Average pay of vaccinator US\$	Per capita cost of vaccination US\$
Iran	22 000/year	House to house	67/month	0.08
Fed. of Rhodesia) and Nyasaland)	(20/day (7000/year (dry season)	House to house	20-40/month	
Korea				0.08
Paraguay	200-250/day	Clinics, centres		0.03
Thailand				0.075
Tunisia	150/day	At clinics or centres	1.3/day plus allowances	0.024
U.A.R. (province of Syria)	(50/day (15 600/year	(Clinics and (house to house	Equal to nurses	
Venezuela	60-80/day	House to house	3/day	0.11

Vaccinators' conditions of service vary and, as usual, those in permanent employment draw lower wages than those on short-term contract.

2.3 Supervision. The number of vaccinators working under each inspector or supervisor varies from 4 in remote African rural districts to a more usual figure of 7 - 10. There is insufficient information on which to give guidance on their pay.

2.4 Transport

2.4.1 In many countries the bicycle suggests itself as the ideal transport for vaccinators. In some established field medical services it has been found most satisfactory to pay junior staff fairly generous allowances for maintaining their own cycles.

2.4.2 Provision must be made for staff to use the means of transport most appropriate to the local conditions, such as 'buses, riding animals and river transport.

2.4.3 In some cases supervisors may be able to do their work with bicycle transport. There are obvious advantages in providing jeep or other motor transport for as many supervisors as possible. They are thus enabled to supervise more vaccinators, and distribute the vaccine quickly. If ability to drive and maintain a motor vehicle is made an essential qualification for some or all supervisors (as it was, for example, for jaws campaign personnel in Haiti), a great saving can be effected in the wages of drivers.

2.4.4 Maintenance and depreciation of transport must be allowed for.

2.5 Miscellaneous provisions

2.5.1 Vaccination equipment.

2.5.2 Containers for transport of vaccine.

2.5.3 In some areas, it may be necessary to rent buildings, as local stores, etc.

2.5.4 Stationery.

2.5.5 Some form of uniform, even if only a badge or brassard, should be provided for staff.

3. Isolation

- 3.1 House isolation is to be condemned wherever it can possibly be avoided. It has its essential administrative expenses, for surveillance.
- 3.2 In many countries it may be desirable to provide additional isolation hospitals. Buildings do not necessarily need to be of an expensive type and can be of the cheapest description that provides the essentials of (a) isolation from other buildings, (b) shelter, according to climate, (c) easy cleansability, (d) sanitation and water.
- 3.3 Transport of patients to hospital must be allowed for.

4. Quarantine services

The costs of administering these must be known already in all countries. Their efficiency may need to be increased, at some extra cost. At long land frontiers, it is cheaper and more desirable in every way to canalize international traffic along main routes by ensuring the minimum of delay, than to attempt closure for any public health reason. Closed frontiers are invariably traversed by remote paths. If infection is carried along these, it is more costly and difficult to eradicate than if it occurs along main routes.

SUMMARY AND CONCLUSIONS

In this document, in accordance with resolution WHAll.54, the current status of the smallpox problem in the world has been reviewed and guiding lines are given on which an eradication programme may be based. Such financial implications as can be set down at the present time are included. A more detailed plan with financial details can only be prepared when further consultations with Member States and in some instances further investigations within countries are completed. These are in progress and the results achieved will be reported to the Twelfth World Health Assembly.

Smallpox. Number of reported cases and number of vaccinations registered in different countries. (Figures for 1957 and 1958 are provisional, and those for 1958 are incomplete.)

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AFRICA				
French Equatorial Africa	1956	4 824	57	1 701 245
	1957	...	57	...
	1958	...	26	...
French West Africa	1956	18 890	4 855	5 461 902
	1957	...	12 873	...
	1958	...	6 094	...
Algeria	1956	9 800	18	284 928
	1957	10 143	8	...
	1958	...	13	...
Angola	1956	4 317	106	...
	1957	4 355	11	...
	1958	4 392	62	...
Bechuanaland	1956	327	-	...
	1957	...	111	...
	1958	...	11	...
Cameroons (French)	1956	3 188	42	630 174
	1957	...	4	...
	1958	...	8	...
Belgian Congo	1956	12 811	4 663	4 741 476
	1957	...	2 032	...
	1958	...	1 192	...
Egypt	1956	23 520	-	4 050 673
	1957	24 026	1	...
	1958	...	-	...

- Nil

... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AFRICA (continued)				
Ethiopia	1956	...	555	...
	1957	...	403	...
	1958	...	550	...
Gambia	1956	285	15	...
	1957	...	33	...
	1958	...	20	...
Ghana	1956	4 691	259	...
	1957	4 763	184	...
	1958	4 836	139	...
Portuguese Guinea	1956	547	4	...
	1957	554	149	...
	1958	559	23	...
Kenya	1956	6 150	396	...
	1957	6 254	789	...
	1958	6 351	687	...
Liberia	1956	...	-	...
	1957	...	-	...
	1958	...	5 001	...
Libya	1956	1 118	-	...
	1957	...	2	...
	1958	...	-	...
Morocco	1956	8 580	-	...
	1957	...	2	...
	1958	...	-	...
Mozambique	1956	6 105	4	...
	1957	6 170	-	...
	1958	6 234	-	...

- Nil

... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AFRICA (continued)				
Nigeria	1956	31 834	4 614	...
	1957	32 433	9 733	...
	1958	...	1 757	...
Rhodesia and Nyasaland, (Federation)	(1956)	7 260	974	335 538
	(1957)	7 450	915	...
	(1958)	7 650	502	...
Ruanda-Urundi	1956	4 433	58	41 529
	1957	...	34	...
	1958	...	32	...
Sierra Leone	1956	2 100	946	...
	1957	...	4 845	...
	1958	...	480	...
Somaliland (British)	1956	640	-	...
	1957	...	3	...
	1958	...	-	...
Somaliland (Italian)	1956	1 300	84	...
	1957	...	-	...
	1958	...	-	...
Sudan	1956	10 226	438	...
	1957	...	285	...
	1958	...	34	...
Tanganyika	1956	8 605	605	...
	1957	8 760	856	...
	1958	8 916	888	...
Togoland (French)	1956	1 088	6	253 136
	1957	1 085	11	...
	1958	...	20	...

- Nil
... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AFRICA (continued)				
Tunisia	1956	3 783	2	...
	1957	3 815	-	...
	1958	...	-	...
Uganda	1956	5 593	231	248 000
	1957	5 680	481	...
	1958	5 767	331	...
Union of South Africa	1956	13 915	4	...
	1957	14 167	-	...
	1958	14 418	-	...
Zanzibar	1956	280	52	90 994
	1957	235	1	61 712
	1958	...	2	...

- Nil

... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AMERICA				
Argentina	1956	19 493	86	...
	1957	19 868	336	...
	1958	20 255	13	...
Bolivia	1956	3 235	481	270 948
	1957	3 273	1 310	...
	1958	3 311	145	...
Brazil (F.D. and State capitals)	1956		2 385	...
	1957		1 014	...
	1958		144	...
Chile	1956	6 944	-	783 188
	1957	7 121	-	1 273 506
	1958	...	-	...
Colombia	1956	12 939	2 572	1 799 193
	1957	13 227	2 107	1 510 703
	1958	...	1 412	...
Ecuador	1956	3 796	669	289 024
	1957	3 890	913	...
	1958	4 007	759	...
Mexico	1956	30 538	-	4 699 174
	1957	31 426	-	...
	1958	32 348	-	...
Panama	1956	...	-	...
	1957	...	-	...
	1958	...	8	...
Paraguay	1956	1 601	132	221 811
	1957	1 638	95	...
	1958	...	20	...

- Nil
... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
AMERICA (continued)				
Peru	1956	9 651	-	895 325
	1957	9 923	-	...
	1958	10 213	-	...
Uruguay	1956	2 650	42	96 635
	1957	...	2	...
	1958	...	-	...
Venezuela	1956	5 953	4	1 132 812
	1957	6 134	-	...
	1958	6 320	-	...

- Nil

... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
ASIA				
Aden Colony	1956	143	-	53 429
	1957	...	13	...
	1958	...	68	...
Aden Protectorate	1956	660	-	11 315
	1957	...	48	...
	1958	...	99	...
Afghanistan	1956	13 000	1 002	...
	1957	...	239	...
	1958	...	502	...
Bahrein	1956	122	61	...
	1957	124	7	...
	1958	...	-	...
Burma	1956	19 856	4 223	2 389 799
	1957	20 054	2 739	...
	1958	...	1 000	...
Cambodia	1956	4 400	525	...
	1957	...	111	...
	1958	520	18	...
Ceylon	1956	8 929	-	259 644
	1957	9 165	19	2 342 158
	1958	...	40	...
China: Taiwan	1956	9 240	-	...
	1957	9 506	-	...
	1958	...	-	...
Korea (South)	1956	21 956	9	3 563 721
	1957	22 303	7	...
	1958	22 655	8	...

- Nil
... Data not yet available

Annex

Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
ASIA (continued)				
India	1956	387 350	45 166	...
	1957	392 440	78 896	...
	1958	...	159 000	...
Portuguese India	1956	645	1	21 663
	1957	647	42	...
	1958	649	97	...
Iraq	1956	...	2 173	...
	1957	6 538	1 924	...
	1958	...	6	...
Indonesia	1956	83 200	2 817	...
	1957	85 100	1 550	...
	1958	...	83	...
Iran	1956	18 945	1 616	...
	1957	19 253	1 008	...
	1958	19 723	311	...
Japan	1956	90 000	-	4 311 000
	1957	90 900	-	...
	1958	91 600	-	...
Jordan	1956	1 482	-	65 500
	1957	1 527	2	...
	1958	...	-	...
Kuwait	1956	205	8	...
	1957	...	23	...
	1958	...	-	...
Lebanon	1956	1 450	84	...
	1957	1 525	108	...
	1958	...	-	...
Muscat and Oman	1956	550	22	...
	1957	...	4	...
	1958	...	9	...

- Nil

... Data not yet available

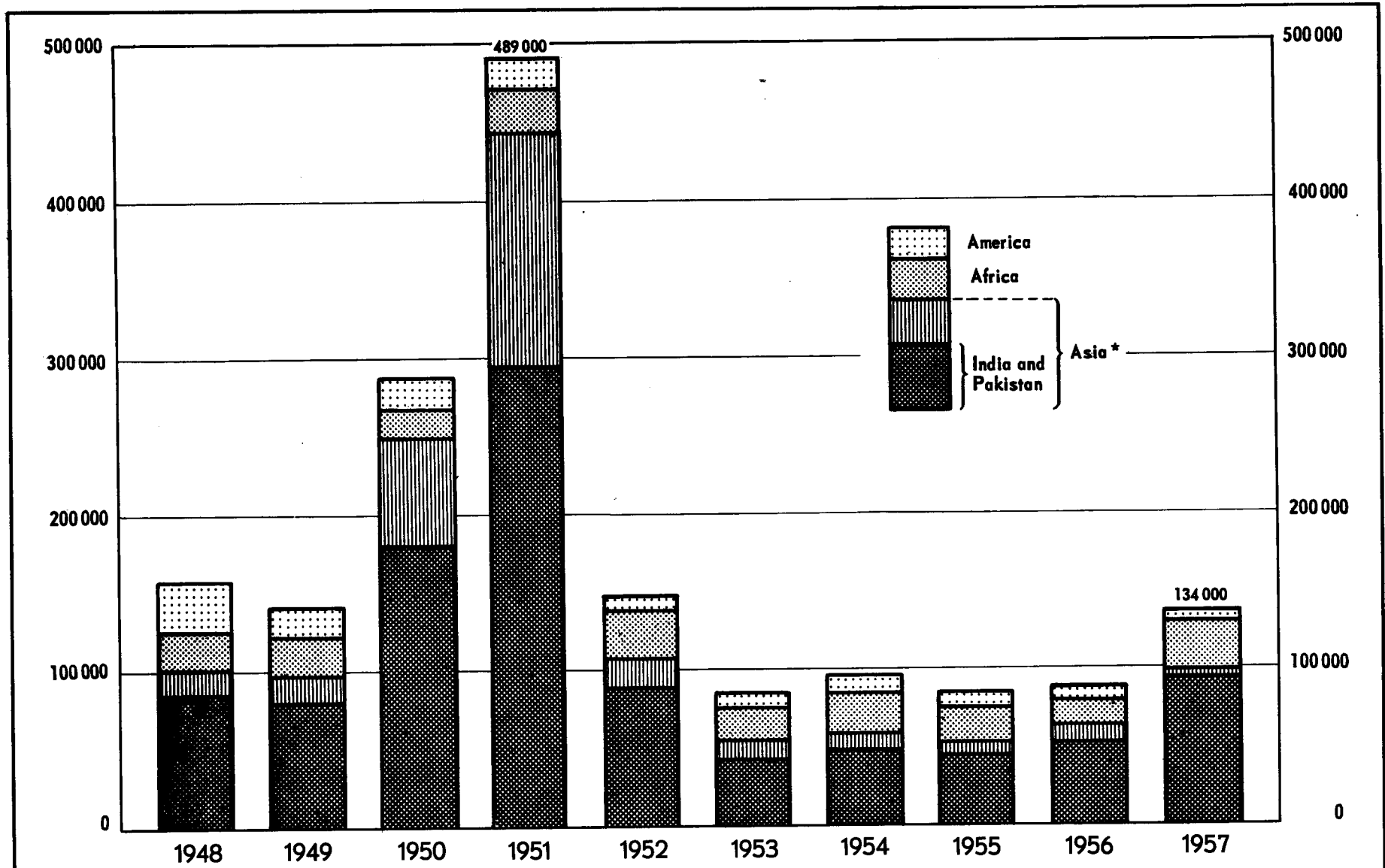
Country or Territory	Year	Population (1 000)	Smallpox cases	Smallpox vaccinations
ASIA (continued)				
Pakistan	1956	83 280	5 323 (5 170) ^a
	1957	84 450	25 770 (24 746) ^a
	1958	85 635	48 080 (47 210) ^a
Qatar	1956	40	4	...
	1957	40	2	...
	1958	...	-	...
Saudi Arabia	1956	6 036	-	...
	1957	...	65	...
	1958	...	138	...
Syria	1956	3 970	-	213 420
	1957	4 082	41	326 352
	1958	...	-	...
Thailand	1956	20 686	4	2 110 559
	1957	21 076	3	1 377 264
	1958	...	30	...
Turkey	1956	24 797	-	...
	1957	25 500	128	...
	1958	...	-	...
Trucial Oman	1956	80	3	...
	1957	80	-	...
	1958	...	-	...
Viet Nam (South)	1956	12 000	256	...
	1957	...	83	...
	1958	...	30	...
Yemen	1956	...	-	...
	1957	...	-	...
	1958	...	20	...

^a Figures applying to East Pakistan

- Nil

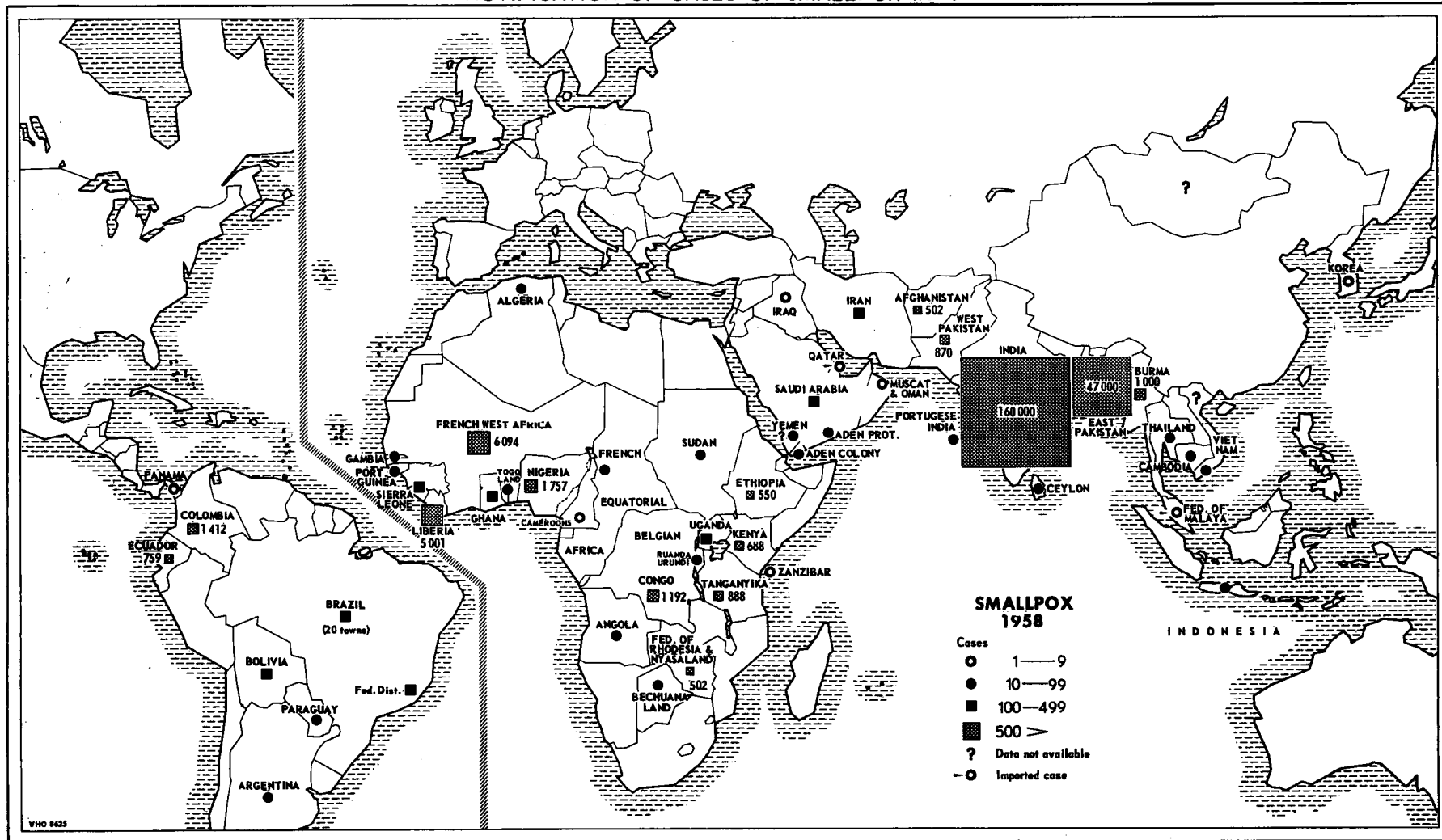
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NOTIFICATION OF SMALLPOX CASES BY CONTINENTS*, 1948-1957



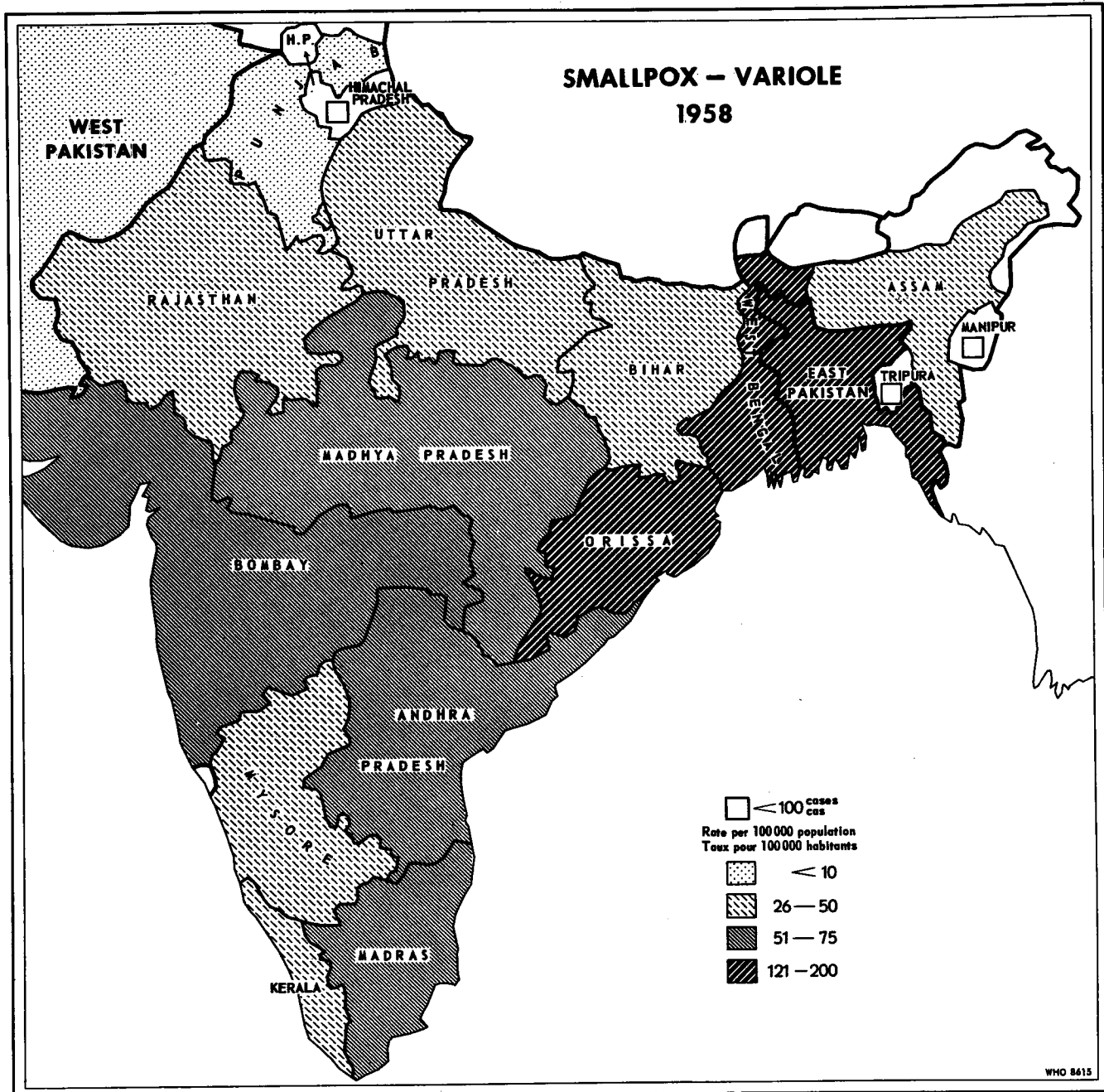
*Excl. USSR and Continental China

NOTIFICATION OF CASES OF SMALLPOX IN 1958

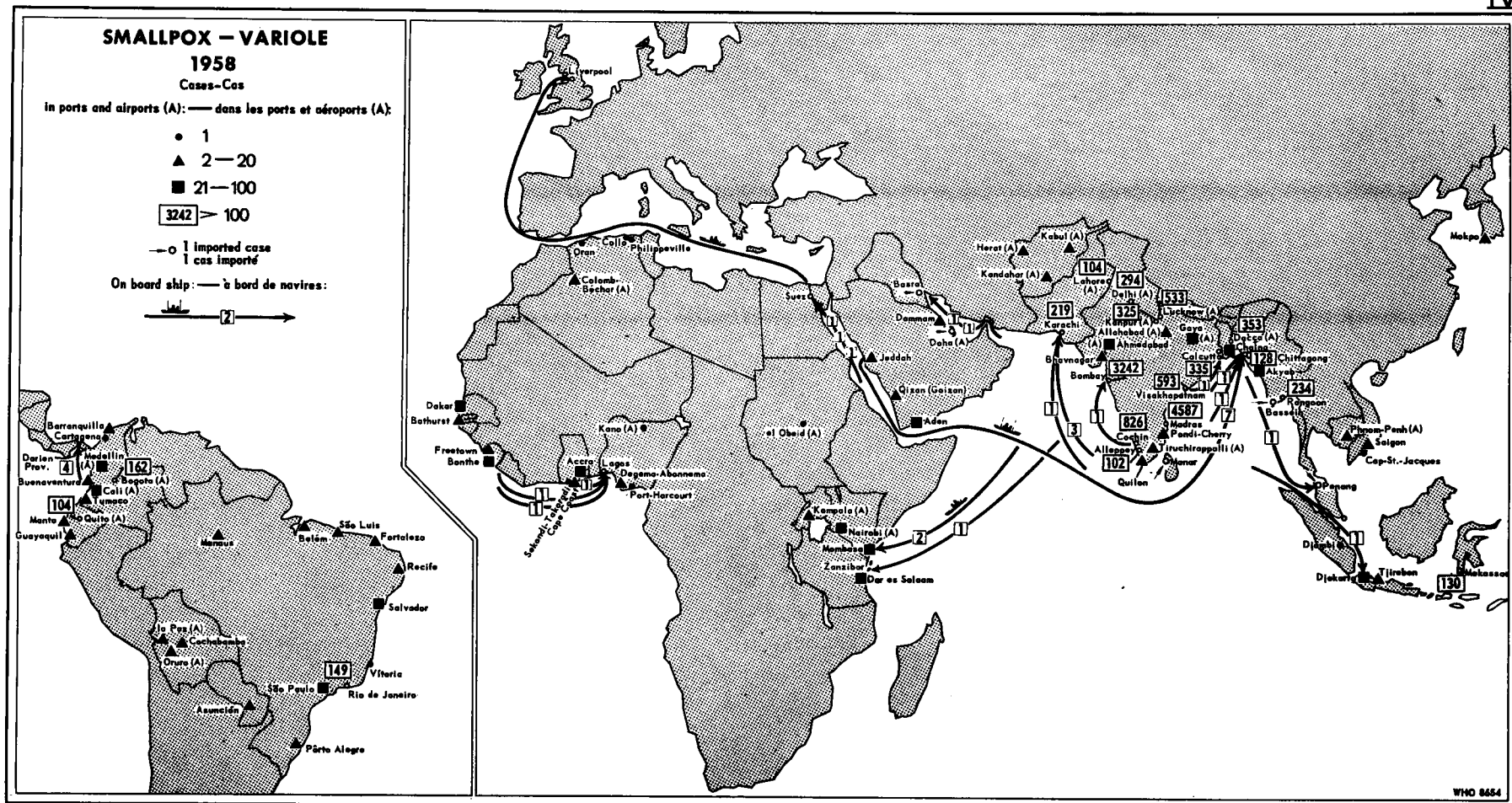


DISTRIBUTION OF SMALLPOX IN THE STATES OF INDIA AND IN E. AND W. PAKISTAN, 1958,
 ACCORDING TO PROVISIONALLY NOTIFIED CASES

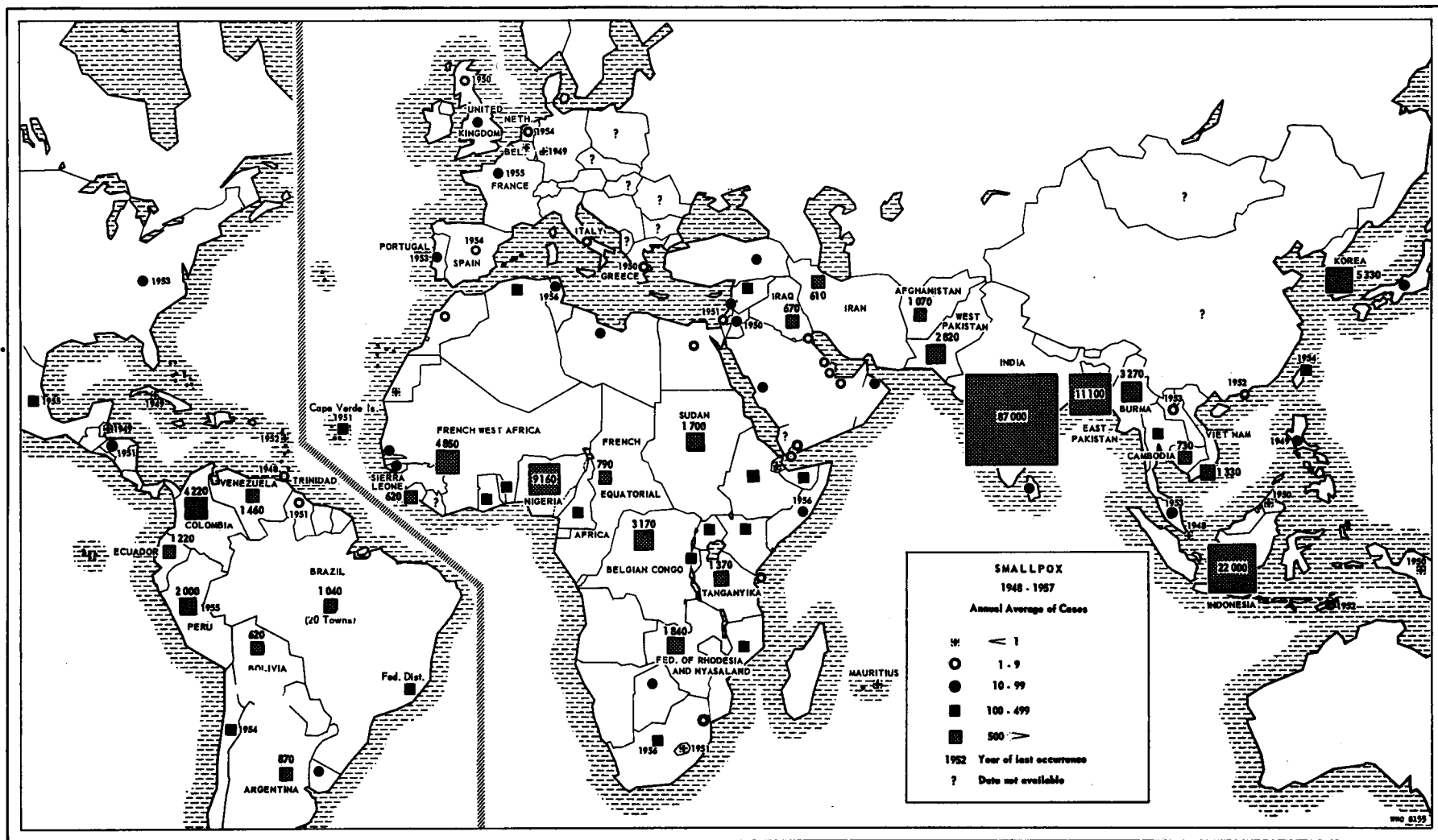
DISTRIBUTION DE LA VARIOLE DANS LES ÉTATS DE L'INDE ET AU PAKISTAN ORIENTAL
 ET OCCIDENTAL, 1958, D'APRÈS LES NOTIFICATIONS PROVISOIRES DES CAS



NOTIFICATION OF SMALLPOX CASES IN PORTS AND AIRPORTS, 1958
 NOTIFICATION DES CAS DE VARIOLE DANS LES PORTS ET AÉROPORTS, 1958



NOTIFICATION OF CASES OF SMALLPOX, 1948-1957



EXECUTIVE BOARD

Twenty-third Session

Provisional agenda item 2.4



EB23/43 Add.1 ✓
16 January 1959

ORIGINAL: ENGLISH

SMALLPOX ERADICATION

1. Document EB23/43, Smallpox Eradication states as concerns Europe:

"Smallpox is not endemic in any country of the European Region. Cases are introduced from outside occasionally, but the resulting outbreaks are controlled by ring vaccination, and secondary cases are few."

2. Isolated smallpox outbreaks have been reported in recent years in Europe in France (1955),¹ in Italy (1957)² and in the United Kingdom (1957)³ and (1958).⁴
3. Prior to December 1958, the last outbreak of smallpox in Western Germany was in 1949. One imported case occurred in Hamburg in April 1957, but was not followed by any secondary cases.⁵
4. In countries where smallpox has been absent for many years, it is usual that smallpox is first diagnosed only after the occurrence of one or more cases secondary to the imported case. The recent outbreak in Heidelberg followed this pattern.
5. A physician on the staff of the Heidelberg University Hospital visited India from 26 October to 23 November when he left for Ceylon. On 27 November he noted symptoms of what he believed to be grippe. On 3 December he left Colombo by KLM for Geneva, via Karachi, Abadan, Beirut and Rome. In Geneva he at once took a plane of Swissair for Zurich and proceeded by the next train to Heidelberg. On 5 December this physician was hospitalized in the Heidelberg University Hospital Medical Clinic with a pustule on his face.

¹ 37 cases, 18 deaths

² 8 cases, 1 death

³ 4 cases, 0 deaths

⁴ 6 cases, 1 death

⁵ Off. Rec. Wld Hlth Org. 87, 407

6. On 15 and 17 December two physicians of the Clinic became ill, were hospitalized, and a clinical diagnosis of varioloid was made on 18 December. A retrospective diagnosis of varioloid was made on the imported case. WHO was informed of the situation in Heidelberg by telegram on the next day, 19 December.
7. As of 15 January 1959, a total of 13 cases with two deaths have been reported. All are hospital contacts and the infection appears to have been confined to the clinical area. One of the deaths was a 70 year-old patient hospitalized for cirrhosis of the liver, the other a 26 year-old physician who had never been vaccinated because of a chronic skin condition.

8. Dissemination of Information

(a) WHO informed the health administration of Switzerland in Berne on 19 December and subsequently the health administrations of Italy and Ceylon.

(b) Information reading as follows was contained in the Geneva Weekly Epidemiological Record dated 24 December:

"Smallpox - Europe	C
Allemagne, Rép. Fédérale	
Germany, Fed. Republic	5-17 XII
Württemberg-Baden, Land	
Heidelberg	3*

*Physicians of the Universitätsklinik Heidelberg: including one imported, arrived from Colombo via Geneva and Zurich on 5.XII, one admitted on 15.XII and one suspected on 17.XII"

- (c) Subsequent information on the outbreak has appeared in issues of the Weekly Epidemiological Record dated 5, 9 and 16 January 1959.
- (d) The Heidelberg Public Health Office informed the Central Offices of KLM and Swissair on 18 December for purpose of disinfection of planes.
- (e) Certain countries in Europe were informed through a standing arrangement under Article 104 of the International Sanitary Regulations for exchange of information which has been in effect since 1951 (amended in June 1956) for the following countries: Belgium, France, the Federal Republic of Germany, the Irish Republic, Italy, Luxembourg, the Netherlands and the United Kingdom.

Information to be sent to the countries named above include the following:

- (i) the official address to which epidemiological information should be sent and of which any enquiries should be made;
- (ii) particulars of all diseases covered by international health regulations, or any epidemiological incident which would be of interest to the other countries participating in this arrangement with any necessary information on the origin and progress of outbreaks and the steps taken to deal with them;
- (iii) the names of contacts of any "quarantinable disease" under the International Sanitary Regulations (especially smallpox) who go from its territory to any of the other countries;
- (iv) a list of its main seaports and airports, specifying the telephone numbers, addresses and telegraphic addresses of the Medical Officers in charge, with any special "sanitary" information (e.g. whether it is a seaport designated to issue international Deratting Certificates, etc., or a sanitary airport, under the International Sanitary Regulations);
- (v) the names and addresses of passengers who have landed from an infected or suspected ship or aircraft or from a ship or an aircraft which has disembarked, during the voyage, a person suffering from one of the diseases covered by the International Health Regulations (smallpox, cholera, etc.) if the passengers are going on to any of the other countries. This information should be sent to the official address referred to in paragraph (i).