CHAPTER 24

THE CERTIFICATION OF ERADICATION: CONCEPTS, STRATEGY AND TACTICS

Contents

INTRODUCTION

On 8 May 1980 delegates to the Thirty-third World Health Assembly, representing all 155 Member States of the World Health Organization, unanimously accepted the conclusions of the Global Commission for the Certification of Smallpox Eradication (World Health Organization, 1980), namely that:

(1) Smallpox eradication had been achieved throughout the world.

(2) There was no evidence that smallpox would return as an endemic disease.

The first conclusion was based on the findings of a series of independent international assessments, undertaken under WHO's auspices, of the efficacy of smallpox eradication programmes and surveillance in countries throughout the world, especially those in which smallpox had been endemic in 1967 and others at special risk. These activities constituted the programme for the "certification" of smallpox eradication. The second conclusion was founded on epidemiological investigations and research studies carried out during the course of the Intensified Smallpox Eradication Programme and summarized in Chapter 30.

Certification of the eradication of smallpox was possible because the virus had no animal reservoir, subclinical infections were rare and did not result in subsequent transmission, and latent infections did not occur. Just as the strategies and tactics used in the eradication of smallpox in different countries evolved over time (see Chapters 9 and 10), so also did the strategies adopted for certification increase in rigour and sophistication.

The present chapter describes these changing strategies and tactics, culminating with the declaration of global smallpox eradication at the World Health Assembly in 1980. The actual operations involved in the 79 countries in which special measures were taken are described in the following three chapters, which deal in turn with the activities of international commissions for the certification of smallpox eradication between 1973 and 1977 (Chapter 25), the varied activities outlined by the Consultation on the Worldwide Certification of Smallpox Eradication in 1977 and supervised by the Global Commission for the Certification of Smallpox Eradication (Chapter 26), and the final certification operations in the world's last stronghold of smallpox, the Horn of Africa, and in the world's most heavily populated country, China (Chapter 27).

HISTORICAL DEVELOPMENT OF THE CONCEPT OF CERTIFICATION

As outlined in Chapter 9, programmes to eradicate specified human diseases from particular localities, and eventually globally, date from the early years of the 20th century. Apart from Jenner's prophetic but hardly practical pronouncement in 1801 (see Chapter 6, Plate 6.8), the first explicit statement about the possible large-scale eradication of a human disease was a comment by Gorgas (1911a) on the eradication of yellow fever, a disease later (1915) nominated for global eradication by the International Health Commission of the Rockefeller Foundation (see Chapter 9). With the realization in the mid-1930s that there was an animal reservoir of the yellow fever virus (Soper, 1936), global eradication of that disease ceased to be a tenable objective. It was replaced by the idea of eradicating its urban vector, *Aedes aegypti*, from countries in the Americas, a concept that gained acceptance in 1942 partly because of the successful eradication of the imported African malaria vector, *Anopheles gambiae*, from Brazil in 1940 (Soper & Wilson, 1943). With these programmes of vector eradication came the need for some means of assessing whether the mosquito in question had indeed been eliminated from particular localities, regions and countries. The first "certification" procedures for *Aedes aegypti* eradication were developed by the Pan American Health Organization in 1954, revised in 1960, and issued in a definitive form in 1971 (Pan American Health Organization, 1971b). The criteria called for the absence of *Aedes aegypti* from a region for a period of at least 1 year, during which 3 surveys confirming the absence of the mosquito had been made. The final survey had to be carried out with the cooperation of the Pan American Health Organization, which provided the technical personnel needed for the task. If the survey confirmed the absence of *Aedes aegypti* mosquitos, the country was entered on the Pan American Health Organization's registry of countries considered free of this species.

When the malaria eradication programme was begun by WHO in 1955, it was realized that some mechanism was needed for convincing those outside the regions and coun-

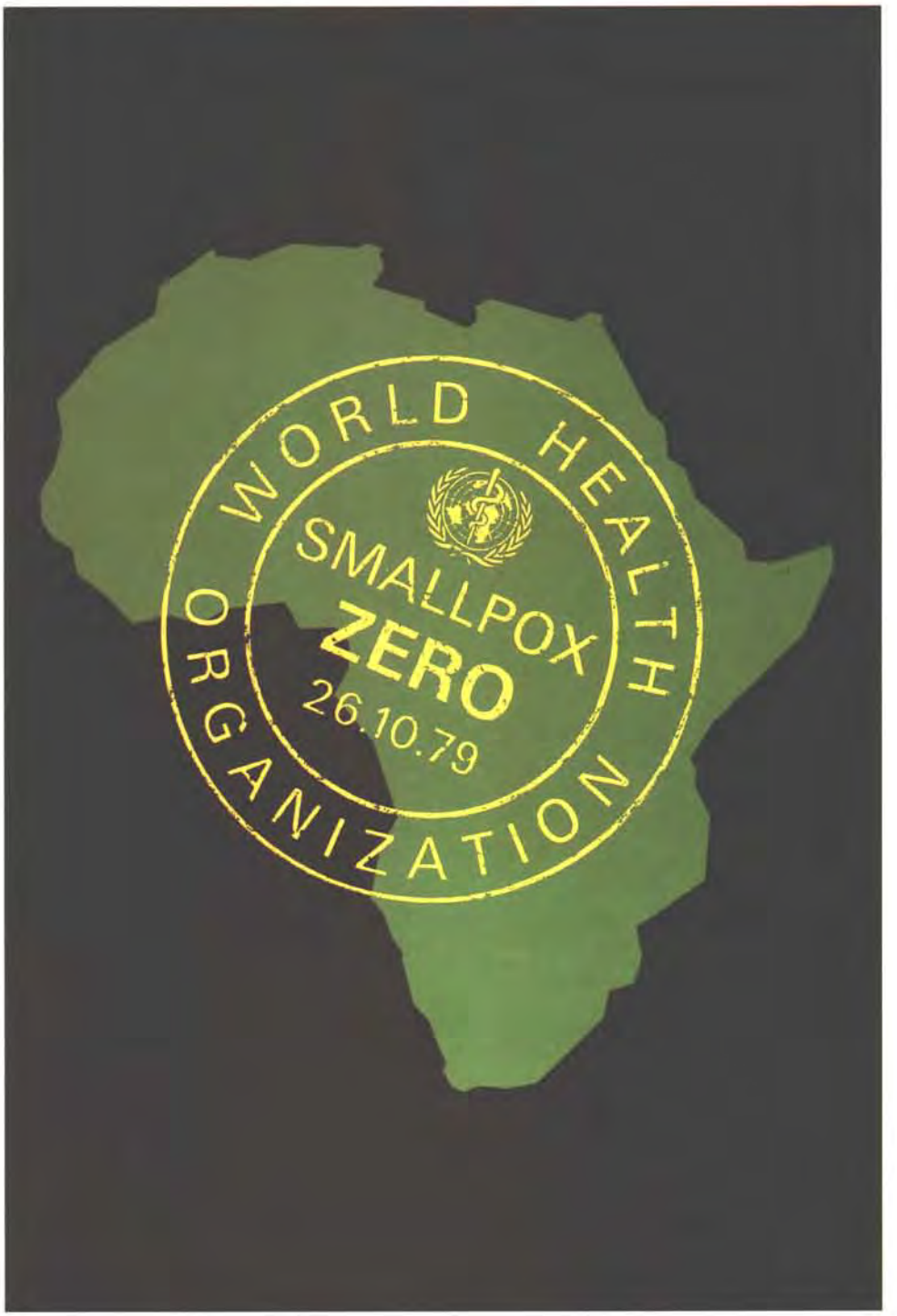


Plate 24.1. Poster produced in the 6 official languages of WHO on the occasion of the certification of the eradication of smallpox from the Horn of Africa on 26 October 1979, exactly 2 years after the world's last case of endemic smallpox occurred in Somalia.

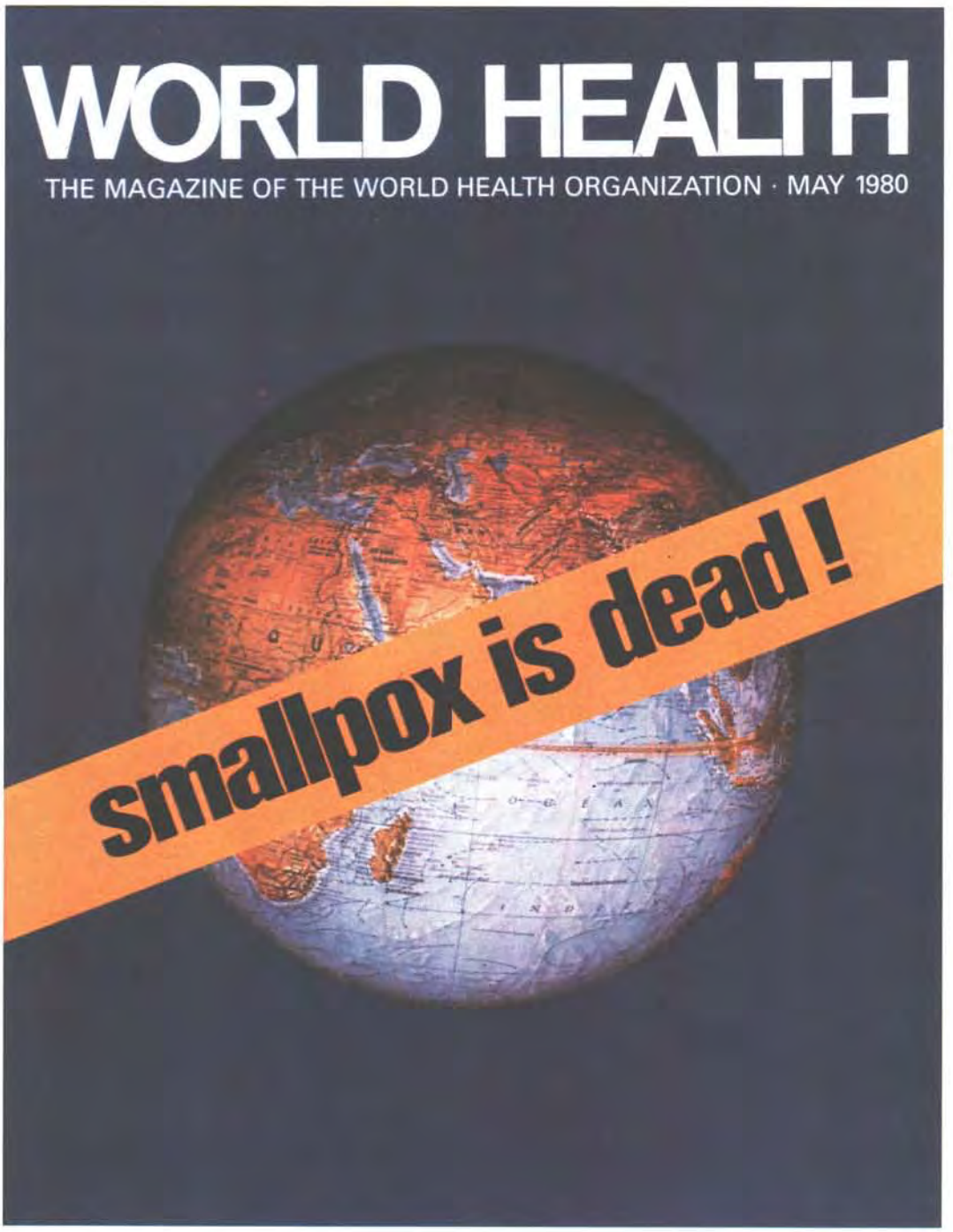


Plate 24.2. A complete issue of the WHO magazine *World health* was devoted to smallpox eradication at the time of the Thirty-third World Health Assembly's formal declaration that eradication had been achieved.

tries concerned that they were free of the disease. In 1960, the Thirteenth World Health Assembly requested the Director-General of WHO "to establish an official register listing areas where malaria eradication had been achieved, after inspection and evaluation by a WHO evaluation team". The methodology and procedures for certification were laid down in 1961 (WHO Expert Committee on Malaria, 1961) and amplified in 1966 and 1974. The essential feature of the assessment procedure was that a regional WHO evaluation team would visit the area for which registration had been requested by a government, analyse the epidemiological and operational data collected during the consolidation phase (a period of 3 consecutive years, during which no evidence of transmission had been found and during the last two of which no general measures of anopheline control had been practised), and examine the organization, methodology and quality of the surveillance operations and the plans for their maintenance. Each WHO evaluation team included at least one member of the WHO Expert Committee on Malaria, together with staff from the relevant WHO regional office or short-term consultants appointed by it. National experts from the country being assessed were not included, but the team relied heavily on briefing by them. The team's report was first reviewed at the WHO regional office and later by the WHO Expert Committee on Malaria, and on the latter's recommendation the area was entered in the official register.

With the imminent eradication of smallpox from South America in 1971, it became necessary for WHO, through its Smallpox Eradication unit, to develop procedures for the assessment of the claim that smallpox had been eradicated from the Americas. The earlier eradication programmes had established the important principle that it was not possible for any independent authority, such as a team of WHO experts, acting entirely on its own, completely to confirm the status of a country or region in respect of *Aedes aegypti* or malaria for any definite period of time. Instead, it was necessary for it to depend on records compiled by the national authorities, the quality of which could then be determined by field appraisal undertaken by a team of experts from outside the country.

The global eradication of smallpox, if it could be achieved, would be uniquely different from that of *Aedes aegypti* or malaria since two valuable but expensive public health measures could then be abolished: routine vaccination of populations in all countries and the requirement that international travellers had to be vaccinated. For this to be possible, however, the world community of public health officials and medical scientists would have to be convinced that global eradication had really been achieved. Assessment of the situation in each country therefore needed to be carried out by teams of highly respected scientists and health officials, independent both of the national authorities of the country being assessed and of WHO, which might be regarded as having a vested interest in the results. Having established the goal of global eradication—never a realistic objective in the case either of *Aedes aegypti* or of malaria—the Smallpox Eradication unit saw that the independence of the assessment teams needed to be placed beyond all possible doubt.

With these requirements in mind, a strategy for the certification of smallpox eradication was developed by the unit. This consisted first of the preparation of detailed "country reports" by the national health authorities of the countries concerned, assisted by WHO staff and consultants. The reports outlined the procedures by which it was believed that smallpox had been eliminated and described the capability of the surveillance system to detect cases of suspected smallpox. When the Smallpox Eradication unit judged that these preparations had reached an appropriate stage, arrangements were made for a group of independent international experts, who constituted what came to be called an "international commission for the certification of smallpox eradication", to visit the country or countries concerned. Their task was to study the country report, make visits wherever they thought necessary, assess carefully the capability of the surveillance system to detect cases of smallpox should they have occurred, and make recommendations about public health activities relevant to smallpox. This was a new strategy designed to solve the novel problem of convincing the international community that smallpox, formerly a universal disease, had been eradicated from particular countries, regions, continents and finally the world. On the basis of experience of the best tactics for particular situations, the certification process was modified and improved, but the essential features—adequate preparations and detailed documentation of the evidence of freedom

from smallpox for at least 2 years, and the independence and authority of the certification team—remained unchanged throughout.

ERADICATION: DEFINITION AND CRITERIA

To understand the way in which certification of smallpox eradication evolved, it is necessary to examine the definition of, and criteria for, eradication developed in 1967 by the WHO Scientific Group on Smallpox Eradication (1968) and ratified and slightly elaborated in 1971 by the WHO Expert Committee on Smallpox Eradication (1972).

From the time of WHO's foundation in 1948, the control of smallpox had been a matter of concern both to the World Health Assembly and to the WHO Secretariat. The concept of the global eradication of smallpox, as distinct from control within Member States, was first enunciated by WHO in 1958 and accepted as WHO policy by the Twelfth World Health Assembly in 1959 (see Chapter 9). The Intensified Smallpox Eradication Programme was launched in 1967 (see Chapter 10). Between these two dates, 1959 and 1967, the concept of the way in which eradication could be achieved underwent a very important change.

Definition in Terms of Vaccination Programmes (1962)

In 1962, in his report on smallpox eradication to the Fifteenth World Health Assembly (document A15/P&B/18; unpublished), the Director-General of WHO defined eradication by stating that: "From a practical viewpoint, countries in which smallpox has recently been persistently present may consider the disease to be eradicated when no cases of smallpox occur during the three years following the end of a satisfactory vaccination programme." In suggesting a period of 3 years, the Director-General was probably influenced by the use of this period in certification procedures for malaria eradication.

Definition in Terms of the Interruption of Transmission (1968–1980)

The first meeting of the WHO Expert Committee on Smallpox was held in Geneva in 1964. The WHO smallpox eradication programme was discussed (WHO Expert Committee on Smallpox, 1964), but no attempt was made to define specific criteria for eradication. However, in 1967 a meeting of the WHO Scientific Group on Smallpox Eradication (1968) specified the basic definition of, and the criteria for, eradication. Meeting in 1971, with 4 years' experience of the Intensified Smallpox Eradication Programme, the WHO Expert Committee on Smallpox Eradication (1972) confirmed both the definition and the criteria, although it stated them in slightly different terms.

The definition produced by the Expert Committee was subsequently endorsed without change by the Consultation on the Worldwide Certification of Smallpox Eradication in 1977 and by successive meetings of the Global Commission for the Certification of Smallpox Eradication in 1978 and 1979. Because they were formulated later, we shall use the 1971 definition of the criteria for eradication (WHO Expert Committee on Smallpox Eradication, 1972) as the basis for discussion:

> "Eradication of smallpox is defined as the elimination of clinical illness caused by variola virus. Since smallpox is transferred direct from man to man in a continuing chain of transmission, and since there is no human carrier state of epidemiological importance and no recognized animal reservoir of the disease, the absence of clinically apparent cases in man may be assumed to signify the absence of naturally occurring smallpox.
>
> "In order to be able to confirm the interruption of smallpox transmission an effective surveillance is needed so that clinical infections can be detected. Recent experience indicates that, in all countries with a reasonably effective surveillance programme, residual foci can be detected within 12 months of apparent interruption. Thus, in countries with active surveillance programmes, at least 2 years should have elapsed after the last known case—excluding well-defined and contained importations—before it is considered probable that smallpox transmission has been interrupted.
>
> "Because of the ease with which smallpox can be transmitted from one country to another, the concept of 'eradication' can apply only to a continent. Thus, although smallpox may be considered to have been eradicated from certain continents, it cannot yet be said to have been eradicated from Africa, Asia, or South America.
>
> "On the basis of epidemiological and technical considerations and the considerable experience

acquired so far, the Committee believes that the global eradication of smallpox, as defined above, is possible."

Since the foregoing formulation of "eradication" became the basis of the whole certification process, several aspects of it warrant comment and explanation.

Disease or virus

In the first paragraph the phrase "Eradication of smallpox is defined as the elimination of clinical illness..." provides the most important criterion; this could be used because, as already pointed out, there was no animal reservoir, subclinical infections were rare and epidemiologically unimportant, and latent infections did not occur. It was therefore logical to base a certification programme on the results of campaigns of active surveillance, which could detect only manifest disease. It would be impossible to use such a criterion for diseases such as plague or tuberculosis.

Furthermore, this criterion took into account the difference between interrupting person-to-person transmission of smallpox and supplementing this by the destruction of all variola virus stocks, as some experts had urged. Achievement of the interruption of human transmission throughout the world was a practical and verifiable goal; ensuring the destruction of all variola virus stocks, in the deep-freeze cabinets of every laboratory in every country of the world, was impracticable and unenforceable.

Period of freedom from smallpox

In the second paragraph, the stipulation that "... in countries with active surveillance programmes, at least 2 years should have elapsed" before certification could be undertaken, proved to be a conservative but manageable criterion for determining the timing of certification activities, although the choice of a period of 2 years was an arbitrary one. It had been adopted by the 1967 meeting without much discussion, and by 1971 further experience of eradication programmes suggested that it was realistic. In all countries in which WHO-assisted programmes were implemented, the surveillance systems improved greatly during such programmes and, in the great majority of countries, no outbreaks of smallpox had occurred after transmission was thought to have been interrupted. There were, however, a few exceptions. In Brazil, Indonesia and Nigeria, outbreaks were discovered 10–34 weeks after transmission was thought to have been interrupted, but in no case was the stipulated period of 104 weeks even remotely approached. After these incidents, countries in which national eradication programmes were still in progress further strengthened their surveillance systems. The effectiveness of such systems was always evaluated by WHO before a date was fixed for the visit of an international commission.

In a practical sense, the reliability of certification was related to two factors—namely, the lapse of time since the last known case and the intensity of surveillance. If the intensive surveillance in operation during the eradication campaign had been maintained for 2 years thereafter, this period was more than long enough to judge whether or not eradication of the disease had been achieved. Where longer periods had elapsed, a less sensitive surveillance system was sufficient to detect the serial transmission of smallpox since many hundreds of cases would need to occur to maintain the chains of transmission. Because the supply of susceptible subjects would soon be exhausted, smallpox could not persist for prolonged periods in sparsely populated inaccessible regions; and in towns and cities, in which the population density was high enough to support continued transmission, large numbers of cases could not go unobserved. After eradication had been achieved in the Indian subcontinent, the Smallpox Eradication unit believed that, in countries in which active surveillance had been maintained after an energetic eradication campaign had been successfully completed, the interval could well be reduced from 2 years to 1. However, to make assurance doubly sure, it was decided to adhere to the earlier decision.

Importations and laboratory-associated outbreaks

The second paragraph of the definition of eradication excludes "well-defined and contained importations". Apart from importations by travellers from endemic countries into countries in which transmission had been interrupted, as occurred in Europe, the Americas, Africa and Asia (see Chapter 23), this exclusion was used by the Global Commission as a basis for its decision regarding the status of the last cases of smallpox in the world. This outbreak, which occurred in

Birmingham, England, in August–September 1978, was associated with variola virus being used for experimental work in the virology laboratory of the University of Birmingham (see Chapter 23). The United Kingdom had been free of endemic smallpox since 1934, although there had been a number of importations from the Indian subcontinent after that date. This event, like the well-contained laboratory-associated outbreak in London in 1973, was regarded in the same manner as an importation into a country that had long been free of endemic smallpox. It was a tragic and potent reminder of the risks of working with variola virus with anything except the strictest containment facilities (see Chapter 30), but it was in no way a threat to the eradication programme.

The outbreaks in China in the mid-1960s, which resulted from the activities of variolators but were not reported to WHO until 1984 (see Chapter 27), could be regarded in the same light as a laboratory-associated outbreak.

Eradication as a "continental" concept

In the third paragraph, the statement that "the concept of 'eradication' can apply only to a continent" meant that the eradication of smallpox should not be certified when the endemic disease was absent in a single country or even a group of adjacent countries, but only on a continental or global basis. The practice developed of using the terms "interruption of transmission of smallpox" or "elimination of smallpox" to signify the achievement of smallpox-free status by individual countries.

In fact, the certification of eradication in an entire continent was possible only in the Americas. In Asia and Africa it proved impracticable to delay national certification until smallpox was eradicated throughout these continents. Thus in Asia, since there had not been a recorded importation of smallpox into Indonesia since 1949, certification was arranged in 1974, 2 years after the last reported case but before other Asian countries were smallpox-free. Certification of eradication in Africa posed special problems because of the persistence of smallpox in Ethiopia long after freedom from the disease had been achieved in western Africa. Certification activities were therefore not started in western Africa until 1976 and certification in other areas was undertaken in stages, both because of the shortage of personnel and time and because of the differing eradication programmes of African countries.

DEVELOPMENT OF STRATEGIES FOR CERTIFICATION

The occurrence of what was believed to be the last case of smallpox in Brazil (and thus in the Americas) in April 1971 forced the Smallpox Eradication unit to plan immediately the steps to be taken before eradication of smallpox from the Americas (in practice from South America) could be certified for acceptance by the international community, in 1973, 2 years after the last case. Two operations new to the unit needed to be planned and implemented: (1) the collection in South America of basic data for the assessment of the smallpox status of each country; and (2) the selection and mode of operation of the international assessment team, which in 1973 would examine the evidence collected during the preceding 2 years. The way in which these operations developed can best be appreciated by a consideration of certification procedures in 3 areas of the world—South America, Indonesia and western Africa.

South America

National preparations

In 1971 a general plan of work was outlined by agreement between WHO Headquarters and the Regional Office for the Americas. It called for specific reports on the smallpox status of all countries in South America except Chile, which, because of its geographical isolation, was judged to be at only slight risk of importations from Brazil or elsewhere, following its last case in 1954. WHO staff and consultants were assigned to visit the various countries, for most of which little information had previously been available, and were instructed to prepare detailed reports in line with requirements specified prior to their visits. While these assessments were being made, it became apparent that the surveillance systems in some of the countries were improving, and the data gathered became increasingly valuable as time progressed. Special programmes were undertaken for the

areas of greatest concern—e.g., the Amazon basin.

Because of the paucity of established health units in the Amazon basin and the inaccessibility of many of the areas of interest, special investigations were undertaken in parts of the basin within Bolivia, Colombia, Ecuador, Peru and Venezuela. The Brazilian parts of the basin were systematically and thoroughly searched by smallpox teams working with the malaria service; these teams progressed systematically through the entire area, vaccinating people wherever they were found and inquiring about smallpox. Other measures, outlined in Chapter 25, were also taken. Because only variola minor had been present in South America in recent decades, pockmark surveys would have been of little assistance, and none was attempted.

A mechanism of international assessment

Drawing primarily on the precedent of assessment of the malaria status of countries in which that disease was thought to be eradicated, the Smallpox Eradication unit proposed that the results of the reports provided by national authorities and WHO consultants should be evaluated by what came to be called an "International Commission for the Certification of Smallpox Eradication". The first such commission to be established, that for South America, suffered from defects in both its composition and its performance, which were largely remedied when the next one (for Indonesia) was set up and did not recur. In the first place, the Commission for South America included several persons who had been involved in the eradication programme in South America including as chairman, at the insistence of the Brazilian government, Dr Alfredo Bica, Secretary of Public Health of Brazil and formerly Director of the Communicable Diseases Division of the Pan American Sanitary Bureau/WHO Regional Office for the Americas. The Smallpox Eradication unit, for its part, failed to provide a detailed plan of action for the Commission. As a consequence, procedures and records and the history of smallpox eradication programmes in various countries were examined in a rather cursory and superficial manner. Finally, when the Commission framed its recommendations, it showed little appreciation of the significance of the eradication of smallpox from the Americas, calling for continued routine vaccination throughout the continent, as before. Fortunately for the reputation of the Commission, the Smallpox Eradication unit and WHO as a whole, subsequent history showed that smallpox had indeed been eradicated from South America.

Indonesia

The last case of smallpox in Indonesia occurred on 23 January 1972. Since there was no record of a case of smallpox having been introduced from the nearby endemic countries in Asia since 1949, it was judged appropriate to proceed with arrangements to certify eradication in Indonesia (as an isolated country) in 1974. In the light of the experience in South America, the methods of preparation for certification and for field activities by the members of the International Commission were strengthened.

National preparations

Like many other governments, that of Indonesia was not enthusiastic about continuing active surveillance after it was believed that smallpox had been eliminated and had to be persuaded of its importance. Then, sufficient data would need to be collected to satisfy the Commission that smallpox had been eradicated. Dr Paul Wehrle, an experienced smallpox consultant, therefore visited Indonesia in order both to identify weaknesses in the surveillance system, and to work with the government and WHO advisers to develop a plan which in his opinion would provide such data. Subsequently, health staff carried out intensive precertification activities, including an active search in high-risk areas and the collection of separate written declarations by the chiefs of tens of thousands of villages, stating that they had searched for smallpox throughout the area under their authority and had failed to find any cases.

Two factors which facilitated the preparations in Indonesia, compared with those in South America, were that pockmark surveys were useful because the prevailing variety of smallpox had been variola major, and that a reward was offered to anyone reporting a case of smallpox.

Selection of members of the International Commission

Profiting from the experience in South America, the Smallpox Eradication unit

modified the procedure for the selection of members of the International Commission, adopting an approach that was applied in the formation of all subsequent commissions. The major problem with the constitution of the South American Commission was that a national of the major country under examination, Brazil, was appointed chairman. This mistake was never repeated, but after a good deal of debate Dr Julie Sulianti Saroso, Director-General for the Control and Prevention of Communicable Diseases in the Indonesian Ministry of Health, was made a member of the Indonesian Commission. Subsequently nationals of the country concerned were appointed to an international commission only in special circumstances—as in India, where this was necessary to enable the Commission to have access to Bhutan. Governments of neighbouring countries (Australia and Malaysia) were asked to nominate representatives, on the grounds that these countries were most at risk of importations should smallpox still be present in Indonesia so their nationals might be expected to be especially critical of the material presented. In general, the Smallpox Eradication unit took the view that the certification process would be best served by the appointment to each commission of individuals (whether from governments or universities) respected by their own governments so that their opinions on smallpox eradication would also be respected. Great care was exercised in the appointment of the chairman, and the precedent set in Indonesia, whereby Dr Wehrle visited the country during the preparatory period and subsequently acted as chairman of the International Commission, was followed in other countries in which certification was of great importance—e.g., Ethiopia and India. After eradication had been certified in Indonesia, the Smallpox Eradication unit tried to include in each new international commission one or two members who had already had experience with an earlier commission.

This Commission and all subsequent commissions were asked to reach one of two conclusions: either that they were satisfied that eradication had been achieved, or that they would be satisfied that eradication had been achieved if certain specific measures were undertaken. At the initial briefing session in Jakarta, the Australian and Malaysian members of the Commission were extremely doubtful whether eradication had been achieved in Indonesia. One observed that he had recently heard rumours of cases in northern Sumatra and the other believed that cases were almost certainly occurring in the slum areas of Jakarta itself. Such scepticism was welcomed by the Smallpox Eradication unit since, if these members were persuaded by the evidence presented in the course of the activities undertaken by the Commission itself, their conclusions would be more convincing to the international community.

A feature of the work of the Indonesian Commission was that Dr Sulianti Saroso, speaking as Director-General for the Control and Prevention of Communicable Diseases in the Indonesian Ministry of Health, concluded her opening remarks at the first session by saying that Indonesia was convinced that it was free of smallpox. Consequently, she invited members of the Commission to feel free to "go anywhere, with anyone, and make any inquiries" they chose to. This statement was honoured and provided an important precedent for other international commissions.

Western Africa

The last case of smallpox in western Africa occurred in Nigeria in May 1970 and United States bilateral assistance was terminated in 1972. At that time, however, smallpox was still endemic in many other parts of Africa and certification was therefore postponed. Smallpox was progressively eliminated from one African country after another, but the stipulation that eradication was a continental concept made the Smallpox Eradication unit reluctant to undertake certification in Africa. However, by 1975 endemic smallpox appeared to be limited to the Horn of Africa, and it was decided to initiate the certification process in the African continent in phased groups of countries so as to reduce logistic and administrative problems. The epidemiological situation in different parts of the African continent was nevertheless borne in mind. A group of 15 countries in western Africa was certified first because transmission had first been interrupted there and because they were furthest away from the areas in which smallpox was still endemic. Surveillance had been intensive in these countries for 2 years after the presumed elimination of smallpox, but had then very largely declined. Documentation on activities carried out since 1972 was comparatively sparse in most countries in the region. On the other hand, the long period of

time that had elapsed since smallpox had been seen in any country of western Africa provided good grounds for believing that the disease had been eliminated and had not been reintroduced. While notification systems were not as well developed as might have been desired, they had been capable of detecting cases of monkeypox in human beings in 1970 and succeeding years, as well as outbreaks of unusual and extremely serious diseases, such as Lassa fever or Ebola virus disease, which had come to the notice of local health staff within 6 months and of central health personnel within 12 months of their occurrence. If smallpox, especially variola major, had occurred in western Africa after 1970, it seemed reasonable to expect that the health staff of the country concerned would have known about it within a year. The 6-year interval since the last case thus provided a very large safety margin.

Because the Commission's visit took place so long after the last known case, many national smallpox eradication staff, as well as United States epidemiologists who had worked in the programme, had long since left and taken up other employment. Moreover, the Commission had to deal with 15 countries covering a vast area—almost two-thirds of the size of the USA—in which the health services infrastructure was much less well developed than in South America or Indonesia. To cope with this situation, WHO regional staff and consultants made frequent visits to these countries and two important changes were made in the procedure. First, preparations for certification were simplified, compared with the elaborate precertification searches and detailed documentation that were used in Indonesia and subsequently in the Indian subcontinent. Preparation of the country reports was based on a standardized questionnaire developed by the Smallpox Eradication unit; when completed, this provided essential information about the national eradication campaign. Secondly, a new method of active search was developed for use in all areas in which variola major had occurred—namely, large-scale facial pockmark surveys in children (see later in this chapter). It was reasoned that, if these surveys included all children up to 15 years of age, there would be some who had had smallpox when it was still endemic and would have pockmarks which the teams should detect. This served as an internal control in the survey, in that failure to detect any individuals with pockmarks would call into question the work of the team concerned. When children with pockmarks were detected, efforts were made to find out in which year they had contracted the disease that had caused the scarring. Such information was surprisingly easily obtained from most villagers. The age of the youngest pockmarked child also provided objective evidence as to when smallpox had last occurred.

Western Africa was certified to be free of smallpox on 15 April 1976, and in May 1976 the Twenty-ninth World Health Assembly, commenting for the first time on the certification process, endorsed "the procedures developed by the Director-General in the use of groups of international experts in the certification of eradication and [asked] for the full cooperation of all countries concerned in carrying out these procedures, so that countries throughout the world may have confidence that eradication has been achieved" (resolution WHA29.54). The successful carrying out of certification in western Africa provided the experience necessary for the staff of WHO and various national health authorities to proceed with certification in other areas of Africa as well as in south-western Asia.

Coordination of Certification Activities

In consultation with staff from the appropriate regional office and the national smallpox eradication programme, the Smallpox Eradication unit was responsible for deciding whether a particular country was ready to receive an international commission and, if so, when. This obviously required frequent visits by WHO smallpox eradication staff and, on occasion, by WHO consultants, to countries preparing for certification. Thus, even though smallpox had been eliminated from all countries except Somalia by the end of 1976, a number of WHO smallpox eradication staff were retained or recruited to assist in the certification process. From 1977 onwards, the Smallpox Eradication unit in Geneva consisted of Arita, who replaced Henderson after his departure in February 1977, Dr Joel G. Breman, an epidemiologist from the Center for Disease Control, Atlanta, USA, with extensive experience in smallpox and tropical diseases, Dr Alexander Gromyko, Dr James Tulloch and Mr John Wickett. Dr Celal Algan, Dr Ziaul Islam, Ježek, Dr Daniel Tarantola and Dr Lev Khodakevich assisted

the programme as WHO staff members in the regional offices.

Certification of smallpox eradication was not solely a technical matter but also involved many managerial and political questions. Ladnyi, who had acted as WHO intercountry smallpox adviser in eastern Africa from 1965 to 1971, returned to WHO Headquarters in 1976 as an Assistant Director-General and remained in this post until 1983. In this capacity he was able to help to solve some of the political problems that inevitably arose during the organization of certification activities.

The support provided by WHO staff and consultants was of two types. First, in a country in which an eradication campaign had been developed and executed with the active participation of WHO staff epidemiologists or consultants, some international personnel continued to work with national staff after eradication in organizing and assessing the active searches for unreported cases of smallpox, as well as in pockmark surveys or in the surveillance of chickenpox cases. The last-named activity was carried out in a number of countries, being of special importance where variola minor had been endemic, since this disease rarely left pockmarks and was readily confused with chickenpox. Secondly, in countries of western, central and southern Africa, in which the eradication campaign had been organized many years before certification and in which WHO or outside epidemiologists were not involved in continued surveillance, special arrangements were made to assign experienced WHO consultants or staff epidemiologists from either inside or outside the country to assist the health services in precertification activities.

In countries from which smallpox had recently been eradicated great interest was shown in certification, whereas in those in which the disease had been eliminated many years before, certification was not considered by the national health administrators to be of high priority. In some countries, national health officials who had taken part in the national smallpox eradication campaign had risen in the local health service hierarchy and were important in persuading senior government administrators of the importance of certification. The assignment of special WHO consultants and epidemiologists also helped to promote certification activities.

To persuade governments to mobilize adequate numbers of staff to prepare properly for certification, several approaches were used: (1) WHO regional office and Headquarters staff communicated with countries by letter or memorandum, emphasizing the importance of certification if the final achievement of smallpox eradication was to be accepted by the world community; (2) further encouragement was provided through coordination meetings with representatives of the countries concerned and through visits by staff of the Smallpox Eradication unit; and (3) WHO funds were frequently provided to cover fuel and vehicle repair costs and the living expenses of national surveillance teams.

J. KUMAZAWA, 1980

Plate 24.3. Joel G. Breman (b. 1936) was a medical officer with the WHO Smallpox Eradication unit, 1977–1980, during the most active part of the certification programme, and participated in monkeypox surveys in western and central Africa. He also worked as an epidemiologist in the eradication campaign in western Africa, 1967–1969.

NATIONAL PREPARATIONS FOR CERTIFICATION

The methodologies employed in national preparations for certification (precertification activities) differed according to the variety of smallpox present in the countries concerned and whether eradication was followed immediately by post-eradication surveillance and preparation for certification, or precertification activities were carried out many years after the occurrence of the last known case of smallpox. In most cases the final product was a "country report" that was

assessed by the appropriate international commission or the Global Commission.

The WHO Scientific Group on Smallpox Eradication (1968) had pointed out the need for an effective surveillance system capable of detecting and investigating suspected smallpox cases in order to demonstrate that smallpox transmission had been interrupted. Although all countries in which smallpox had been endemic continued some form of smallpox surveillance after the date of onset of what they considered to be the last case, its intensity differed substantially from country to country. In the last countries to be affected by smallpox, such as Bangladesh, Ethiopia, India and Somalia, the national programmes continued active post-eradication surveillance that was even more intensive than during the eradication campaign itself. The documentation in such countries was more complete than that available elsewhere and these countries could be visited by international commissions just 2 years after they had reported their last case. On the other hand, in most countries of Africa, special surveillance programmes had ceased long before certification was undertaken. In all cases, country reports covered the following items, which are described more fully later:

(1) a description of the routine reporting system;

(2) an account of special active searches, both in high-risk areas and throughout the country, including the methods of assessing the quality of the searches;

(3) the results of pockmark surveys, if appropriate;

(4) a description of chickenpox surveillance, wherever it was undertaken;

(5) the status of rumour registers, in which all suspected cases of smallpox were recorded, and sometimes also cases with fever and rash;

(6) a list of specimens sent for laboratory investigation and the test results;

(7) an account of the publicity given to the need for reporting smallpox cases, the rewards offered for finding a case (where appropriate), and public awareness of such rewards;

(8) documentation on other precertification activities.

Effectiveness of the Routine Reporting System

Each country provided data on the number and distribution of health units, including the number and types of hospitals, health centres or stations and peripheral health units, with maps showing their distribution throughout the country, and on the regularity and completeness with which they reported. The number of monthly or other periodic reports called for was compared with the number actually received. Data were also supplied on the reporting of cases of chickenpox, especially those with a fatal outcome. Finally, records of the action taken when a suspected smallpox case was reported were examined. During visits by WHO consultants in preparation for certification, action was taken to increase awareness among health personnel of the need to report immediately any cases where smallpox was suspected.

Active Searches for Unreported Cases

In most countries, specially organized mobile teams conducted field surveys in order to obtain up-to-date information regarding activities in connection with smallpox. The teams were organized and directed by the national smallpox eradication programme (when still operative), by those who had been involved in the eradication programme during its active phase, or by those responsible for the communicable diseases programme.

Special investigations were carried out in localities in which the risk of unreported smallpox was thought to be greatest. These included areas in which the last known outbreaks had been notified, those in which suspected smallpox cases or chickenpox deaths had been reported after the last known outbreak of smallpox, and those in which health coverage and communications were poor. Areas bordering on countries in which smallpox had recently been endemic, or in which there had been recent extensive population movements, were also included. Special attention was given to the villages in which the last known cases had occurred. Such investigations provided information as to the effectiveness of control measures and case detection during the concluding phase of the programme in the country. If it was found that all cases in an outbreak had been detected and containment was satisfactory, this increased confidence in the efficacy of the surveillance–containment activities.

A general survey was usually planned for cities, towns, and larger villages, since experience had shown that, if smallpox had per-

The Absence of Evidence is not Evidence of Absence

From the beginning of the global eradication programme, steps were taken to encourage the submission of all reports of smallpox in any country thought to be free of the disease and to investigate all such reports. There had always been serious doubts with smallpox, as with cholera, whether the absence of reported cases really meant that the disease was absent from the country concerned. Reports of suspected cases of smallpox in non-endemic countries had been queried by the Smallpox Eradication unit since the Intensified Smallpox Eradication Programme began, in order to determine definitely whether or not they were imported cases or whether they represented continuing endemic transmission. As the campaign progressed, such reports took on a greater significance and eventually in 1978 an international rumour register was established in Geneva (see Chapter 28). Rumours were very important. Thus, although no cases were officially reported from Iran after 1963, information that smallpox might be occurring there in 1971 was drawn to the attention of WHO by a WHO consultant as well as by a number of international staff working with other health agencies. Reports of imported cases in Somalia before 1976 were also received from embassies long before being notified officially by the government. Similarly, the serious outbreaks which occurred in the Salt Lake refugee camp in West Bengal in 1971 were unknown to the government and to WHO until reported by an American epidemiologist who had observed cases of smallpox in a television news film taken at the camp (see Chapter 15).

sisted in smaller villages or nomadic groups, it would ultimately reach the larger population centres. The localities to be visited were selected so as to include communities with health units and primary schools, since these attracted people from a large area who might report suspected cases. The usual objective was to reach a sufficient number of communities to ensure that at least 20–25% of the entire population of the country was covered by the survey.

In the countries which were the last to become free of smallpox—Bangladesh, Ethiopia, India, Nepal, Pakistan and Somalia—country-wide house-to-house searches to discover possible cases were conducted on several occasions. A large number of health staff, volunteers and temporarily recruited searchers were deployed so that the search could be completed within a period of 3–4 weeks.

Search teams were organized in order to obtain information about cases of smallpox and chickenpox, actual or rumoured, in primary schools, health units, markets and other places at which people congregated, from nomadic and other migratory groups, and on some occasions from all households in selected villages or urban areas. Their training covered the following aspects:

(1) The status of smallpox eradication in the country, including details of the last outbreaks, suspected cases, and deaths from chickenpox, and an indication of particular localities requiring special investigations and field surveys.

(2) The characteristic features whereby facial pockmarks caused by smallpox could be distinguished from scars caused by other conditions. In this connection, it was emphasized that only persons with facial pockmarks caused by smallpox or suspected smallpox were to be investigated and the findings documented.

(3) Techniques for the epidemiological investigation of suspected cases, including the collection of specimens for laboratory investigation.

(4) Methods to be used in selecting the itinerary for field visits and the recording and reporting of data.

The organization of active searches in various countries is described in detail in subsequent chapters. One universal and important feature on which WHO consultants and staff preparing for certification insisted, however, was that the effectiveness of the searchers themselves should be properly assessed by follow-up staff whose task was to

Plate 24.4. Facial pockmarks. **A**: Moderately severe in a Nigerian girl 7 years after an attack of smallpox. **B**: Severe, in an Afghan who had suffered from smallpox many years before.

evaluate the work done by visiting houses and villages selected at random from among those previously visited by the search teams. Special assessment teams directed by national programme staff were organized for this purpose and each month visited up to 10% of the places previously visited in the course of the searches.

Pockmark Surveys

Permanent facial pockmarks were found in about 70% of those who survived Asian variola major, the rates being slightly lower after infection with the somewhat less virulent forms of variola major virus found in some parts of Africa. Heavy diffuse facial scarring, readily observed at a distance of 5 metres, was seen on the faces of many victims, but others had lesser degrees of scarring that could be detected only by close inspection. Residual pockmarks, which tended to flatten out over time, were found less frequently among those infected during the first few years of life. The presence of 5 or more depressed facial scars 2 mm or more in diameter at the base was accepted as indicating a probable previous attack of smallpox (see Plate 24.4) and such persons were carefully interrogated to determine the time of occurrence of the illness and its cause. Contrary to what might be expected, it was found that, as mentioned before, most villagers generally remembered precisely when an individual had acquired the disease which caused the scars. Chickenpox also sometimes leaves residual scars, but it was unusual to find 5 or more scars on the face. Facial scarring or pitting resulting from other causes, such as burns and acne and other skin diseases, could usually be distinguished by experienced observers, but these cases too were investigated by interrogation and, where possible, by review of the medical records.

Variola minor, which was prevalent in Brazil and in several parts of Africa during the period of the Intensified Smallpox Eradication Programme, caused far less scarring. A careful follow-up study in Somalia (Ježek & Hardjotanojo, 1980) showed that 5 or more facial pockmarks could be detected in only 7% of patients seen 1 year after recovery. Pockmark surveys were of little use and were not carried out in countries such as Brazil, Ethiopia and Somalia, in which only variola minor had occurred in recent years. A number of African countries had experienced both

variola major and variola minor and in many the pockmark surveys were supplemented by surveillance of cases of chickenpox (see below).

When a pockmarked person was found, the dating of his illness became a matter of importance; if it was more recent than the last known case of smallpox, the adequacy of the surveillance system was open to question. The surveys concentrated on the examination of children, as their illnesses were usually more recent than those of adults. Failure to find pockmarks in any children born since the occurrence of the last known case in the country provided important evidence that transmission of variola major had been interrupted.

A widely varying incidence of pockmarks was observed in pockmark surveys carried out by national teams in 34 African and 5 Asian countries. A relatively high incidence was found in schoolchildren in some countries, particularly where large outbreaks of variola major had occurred a few years before transmission had been interrupted. However, when the date of illness of each case was carefully investigated, no children were found whose illness was more recent than the last reported case.

In many countries the members of the international commission also carried out pockmark surveys during their field visits. The prevalence of facial pockmarks which they observed was often higher than that recorded during the national surveys, since they tended to focus on high-risk areas, such as those in which the last known cases of smallpox had occurred.

Chickenpox Surveillance

Where variola minor was prevalent and residual pockmarks were uncommon, emphasis was placed on the surveillance of chickenpox cases, which were sometimes clinically confused with smallpox. It was thought that a surveillance system sensitive enough to detect a large proportion of chickenpox cases would, in all likelihood, detect smallpox, if it were present. Efforts were made to verify the diagnosis of a number of such cases, especially those which were severe or fatal, by the examination of scabs or vesicular fluid in the laboratories of WHO collaborating centres.

Both the fixed and the mobile health units sought to discover and report chickenpox cases. In addition, some countries introduced the notification of chickenpox during the post-eradication period where previously this had not been required. The taking of specimens from at least one case in each outbreak, especially if a death had occurred, was requested and specimens were also obtained from patients who had not been vaccinated against smallpox and those with an extensive rash involving the palms and soles. In a few countries, a small reward was offered for the discovery of the first case of chickenpox in a previously unrecognized outbreak.

Rumour Register

In 1974, a new device was introduced in India—a register in which all cases of smallpox were recorded, and later all cases of fever with rash. It was particularly effective in countries in which smallpox was then endemic—namely, certain Asian countries and in the Horn of Africa. Rumour registers (Plate 24.5) were maintained at both national and lower levels. At the regional level, health officials kept a record of all patients, including the full name, age, sex, village or locality, presence or absence of a vaccination scar, date, and data relevant to the illness. All cases entered in the register were investigated by qualified personnel. If there was any doubt regarding the diagnosis, a consultation was sought through the national surveillance organization and specimens were collected. All the information supplied by the regions was recorded in national registers.

Specimens for Laboratory Diagnosis

Relatively few specimens were collected when smallpox was widespread because the diagnosis was usually obvious; if there was any doubt, cases were treated as smallpox. As the incidence fell to low levels, increasing numbers of specimens were taken and, as transmission came closer to being interrupted, specimens were collected from each suspected case.

In countries in which variola minor had been endemic, preparing for certification required the collection of large numbers of specimens from patients with chickenpox and with other types of fever with rash, and from other patients in whom smallpox was suspected. They were sought over a wide geographical area and especially in population

Form 'B'

Weeks 5 to 8

Ending _____ _____ _____
(day) (Month) (Year)

MONTHLY RASH WITH FEVER REPORT

To : The District Health Officer From : PHC/Municipality

	Chickenpox	Measles	Other rash with fever
1. Number of villages (mohallas) found during past 4 weeks having an active case (or cases)			
2. Number of villages (mohalla) where diagnoses were personally verified by (a) Med.Co. Officer			
(b) Other staff			
3. Number of cases of rash with fever (entered into rumour register) during report period			
4. Number of rash with fever deaths in past 4 weeks (give complete details on reverse side or on an attached sheet)			

5. Number of rash with fever cases detected in the month :	Total	By health staff	By other means (secondary surveillance)

Signed : _____ _____
(PHC/Municipality M.O.) (Date)

NOTE : One copy of this report is to be submitted to the District Health Officer every last week of the month by the Medical Officer I/C, PHC(Block) or Municipal Health Officer and a duplicate copy should be maintained at the PHC or Municipality Health Office for inspection.

A

GOVERNMENT OF INDIA
National Smallpox Eradication Programme

WORLD HEALTH ORGANIZATION
Global Smallpox Eradication Programme

DISTRICT MONTHLY REPORT OF FEVER WITH RASH CASES

DISTRICT_____ STATE_____ MONTH_____ 197 WEEK NO :____ TO NO : _____

REPORTING OFFICER, NAME_____ POSITION_____

TOTAL NUMBER OF REPORTING UNITS :_____ NUMBER OF REPORTS RECEIVED : _____

BASIC REPORTING UNITS (PHC, Municipality, Hospitals, etc.)	NUMBER OF CASES OF RASH WITH FEVER ENTERED INTO RUMOUR REGISTER				SMALL-POX	NUMBER OF CHICKENPOX					NUMBER OF MEASLES					NUMBER OF OTHER RASH WITH FEVER				
	Total	Through Market Searches	During Search Week	Other means (Secondary Surveillance)	Suspected cases (containment initiated)	Outbreaks	Cases	Deaths	Outbreak verified By MOs	Outbreak verified By Others	Outbreaks	Cases	Deaths	Outbreak verified By MOs	Outbreak verified By Others	Outbreaks	Cases	Deaths	Outbreak verified By MOs	Outbreak verified By Others
TOTAL																				

NOTE: Month should include the weeks according to international allocation of weeks (inside of front cover of the yellow reporting booklet).

Within five days after the last day of month, send a copy of this report to State NSEP Office.

B

Plate 24.5. Forms (rumour registers) used for reporting cases of fever with rash in India. **A:** At primary health centres. **B:** At district offices; the district reports were consolidated at the state level on similar forms.

Table 24.1 Country of origin and number of specimens tested by the WHO collaborating centres in Atlanta and Moscow between 1969 and 1979[a]

Country	Number of specimens received (and number positive for smallpox)										
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Africa											
Angola	0	0	0	0	0	0	0	0	1	98	23
Botswana	0	0	18 (14)	107 (56)	14 (5)	9	8	2	41	211	54
Burundi	0	3 (2)	0	5	4	3	1	0	0	0	0
Cameroon	0	6	3	0	21	12	9	19	10	1	14[b]
Central African Republic	0	0	0	3	0	0	0	0	0	0	5
Chad	0	6	4	0	0	0	0	0	0	0	0
Congo	0	0	0	70	0	0	0	0	2	1	0
Côte d'Ivoire	0	0	10[b]	4	32	5	4	1	0	0	0
Dahomey (Benin)	30	1	2	1	0	0	0	2	0	12[b]	0
Djibouti	0	0	0	0	13 (9)	7 (2)	0	0	17	67	75
Ethiopia	0	0	0	24 (23)	22 (5)	39 (9)	113 (33)	434 (60)	582	1 153	1 042
Ghana	30	15	15	12	0	0	0	0	0	0	0
Guinea	4 (1)	1	0	0	0	0	0	0	0	0	0
Kenya	0	0	12 (12)	6	2	9 (3)	2	1	147 (5)	126	1 473
Lesotho	0	0	0	0	0	0	0	0	0	32	27
Liberia	1	32[b]	143	5	0	1	1	3	0	0	0
Malawi	0	0	0	0	2	2	0	3	295	24	1
Mali	0	2	1	1	0	0	0	0	0	0	0
Mauritania	0	0	0	0	0	0	1	2	1	2	0
Mozambique	0	0	0	0	0	0	4	0	62	14	1
Namibia	0	0	0	0	0	0	0	0	0	9	9
Niger	22 (11)	8	8	4	2	0	0	1	0	0	0
Nigeria	250 (87)	108 (54)	187[b]	21	4	2	1	3	0	0	0
Rwanda	5 (5)	10 (9)	0	0	2	0	0	0	3	0	0
Senegal	0	0	0	0	0	0	0	1	0	0	0
Sierra Leone	5	24[b]	0	0	0	0	1	3	1	0	1
Somalia	0	0	0	0	0	0	0	56 (32)	865 (265)	1 623	1 271
South Africa	0	0	0	0	0	0	0	0	0	48	103
Southern Rhodesia (Zimbabwe)	0	0	0	0	0	0	0	0	0	23	0
Sudan	0	0	2 (1)	2 (1)	9	22	9	18	15	34	5
Swaziland	0	0	0	0	0	0	0	0	1	38	3
Togo	14 (2)	2	2	0	0	0	0	0	0	0	0
Uganda	0	0	0	5 (3)	0	0	1	1	0	119	0
United Republic of Tanzania	2 (1)	12 (5)	0	0	1	0	2	0	3	75	0
Upper Volta (Burkina Faso)	4	5	24	3	72	5	1	0	1	0	0
Zaire	0	23[b] (9)	167 (4)	142[b]	78[b]	63[b]	136[b]	104[b]	98[b]	101[b]	125[b]
Zambia	0	0	0	0	0	0	1	0	50	42	0

Americas											
Bolivia	1	0	4	0	0	0	0	0	0	0	0
Guyana	0	1	0	0	0	0	0	0	0	0	0
Nicaragua	0	0	0	0	1	0	0	0	0	0	0
Venezuela	0	0	4	1	0	0	1	0	1	0	0
Asia											
Afghanistan	0	0	0	0	4 (1)	0	1	0	4	0	0
Bahrain	0	0	0	0	0	0	0	0	0	51	1
Bangladesh	0	0	0	2 (1)	9	1 (1)	18 (3)	162	625	0	0
Burma	0	0	6	18	0	0	0	11	0	0	0
Democratic Yemen	0	0	0	1	0	0	0	1	0	30	7
Dubai	0	0	9 (7)	1	0	0	0	0	0	1	0
India	0	0	7 (5)	20 (15)	24 (14)	27 (20)	395 (126)	354	904	1	0
Indonesia	0	12	8 (6)	22 (9)	3	3	0	1	0	0	0
Iran	0	0	0	0	0	0	0	0	0	347	0
Iraq	0	0	0	0	0	0	0	0	0	13	1
Kuwait	0	0	0	0	0	0	0	0	0	78	4
Lebanon	0	0	0	0	1	0	0	0	0	0	0
Malaysia	0	0	1	0	0	0	0	0	0	0	0
Nepal	0	0	0	4 (1)	37 (27)	48 (40)	16 (8)	5	3	0	0
Oman	0	0	0	0	0	0	0	0	0	57	5
Pakistan	0	6 (5)	1	7 (6)	10 (5)	22 (11)	49	109	7	2	2
Qatar	0	0	0	0	0	0	0	0	0	23	0
Saudi Arabia	0	0	7	0	1 (1)	0	0	0	24	105	0
Sri Lanka	0	0	0	0	1 (1)	0	0	0	0	0	0
Syrian Arab Republic	0	0	0	3 (3)	0	1	0	0	0	9	4
United Arab Emirates	0	0	0	0	0	0	0	0	0	52	1
Viet Nam	0	0	0	0	0	1	0	0	0	0	0
Yemen	0	0	1	2	7	6	3	2	2	28	22
Europe											
Belgium	0	0	0	0	0	0	0	0	0	0	1
Italy	0	0	0	0	0	0	0	0	1	0	0
Switzerland	0	0	0	0	0	0	0	1	0	0	0
Total	368 (107)	277 (84)	646 (49)	496 (118)	376 (68)	288 (86)	778 (170)	1 300 (92)	3 766 (270)	4 650	4 280

[a] Recorded by date of receipt in Geneva. Includes only specimens for which testing results were reported. Includes multiple specimens from the same individual if taken. Excludes serum, animal, variolation and other specimens associated with special studies.

[b] Of which positives for monkeypox by year numbered: 1970 (Zaire 1, Liberia 4, Sierra Leone 1), 1971 (Côte d'Ivoire 1, Nigeria 2), 1972(5), 1973(3), 1974(1), 1975(3), 1976(3), 1977(7), 1978 (Zaire 8, Benin 1), 1979 (Zaire 4, Cameroon 2).

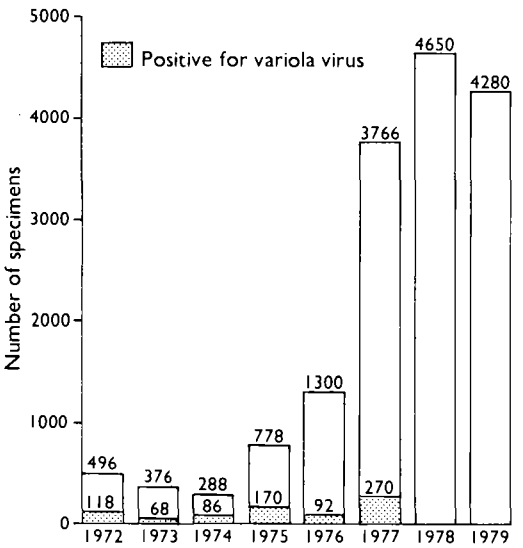


Fig. 24.1. Number of specimens collected from cases of smallpox, suspected smallpox, chickenpox, or suspected monkeypox and tested by WHO collaborating centres, 1972–1979.

groups and regions considered most likely to harbour smallpox. Specimens were forwarded to Geneva and from there sent either to the WHO collaborating centre in Atlanta or to that in Moscow. The specimens were shipped and tested with the least possible delay and those given priority were dealt with immediately, the results being cabled to the field.

Table 24.1 shows the national origin of specimens tested between 1969 and the end of 1979. The number tested rose from 288 in 1974 to over 4200 in 1978 and 1979 (Fig. 24.1). The percentage of specimens in which variola virus was found was relatively large during the earlier years, but none was positive after October 1977. About three-quarters of the specimens collected in 1978 and 1979 came from Ethiopia, Kenya and Somalia, which had reported their last cases (of variola minor) in 1976 and 1977 and were preparing for certification in 1979. Most specimens came from cases of chickenpox, the virus of which does not grow on the chorioallantoic membrane of the chick embryo. However, electron microscopy showed that many of them contained herpesvirus particles (varicella virus).

Publicity Campaigns and Rewards

Publicity campaigns aimed at encouraging people to report suspected cases and informing them that they would receive a reward if any of the cases turned out to be positive had been a feature of the eradication campaigns in the Indian subcontinent and the Horn of Africa and they continued until formal certification had occurred. In large urban centres, use was made of radio, newspapers, and television. In smaller villages and remote areas, leaflets and posters showing pictures of smallpox patients were more frequently used. Health unit personnel were encouraged to inquire about smallpox and other illnesses with fever and rash, and mobile teams repeatedly visited schools, markets and other places, where they informed the public about the disease, either in conversation or by loud hailer. In several countries so many posters and signs were fixed to walls that the smallpox teams were asked to desist because they were defacing the buildings.

The rewards were initially small but were gradually increased until they ultimately reached the sum of US$1000, offered by WHO in 1978 (Plates 24.6 and 24.7). In their contacts with schoolchildren or other segments of the population, active search teams showed the smallpox recognition card, asked people what the disease was, when cases had last been seen, and whether there were any reports or rumours of smallpox or chickenpox in the area. The teams also inquired whether people knew where to report if they did know of such a case and also whether they knew about the reward and its value. Since the value of the reward was changed at intervals, the replies provided an indication of how recently information had been received about the campaign.

The reward system was not readily accepted in all countries, since some national health authorities feared that it would establish a precedent with regard to the reporting of other diseases, although in fact no evidence of this was subsequently found. In western Africa, for example, the offering of rewards was discussed at the coordination meeting in 1975, during preparations for certification, but was finally rejected. However, rewards became an important method of surveillance, especially in Asian countries.

For smallpox transmission to have continued without detection when a large proportion of the population knew about the disease and the reward appeared highly unlikely. Thus, many countries conducted surveys to assess what proportion of the population knew about smallpox and where to report a

Rewards for Reporting Smallpox

The idea of offering a reward for information on cases that were proved to be smallpox originated in Indonesia, following the discovery that information on known smallpox cases had been suppressed by local officials because they feared punishment for failure to control the disease. It was taken up in most Asian countries in which smallpox was still endemic, and in some African countries. The reward was important in several areas of India, in which the reporting of cases by a health officer was taken as prima facie evidence that the vaccination campaign for which he was responsible had not been sufficiently thorough and he was punished for this by transfer or other means. By announcing that a reward would be given for reporting a case, the government made it quite clear that it wanted cases to be reported. Moreover, if health officers continued to suppress reports, lower-level staff anxious to receive the money bypassed them and reported the cases.

The size of the reward increased as the likelihood of finding a case of smallpox declined. The existence of a reward proved to be most effective in two ways: it increased the reporting of suspected cases of smallpox and, during active searches, questions aimed at discovering whether people knew of the reward proved an excellent method of assessing the effectiveness of search teams.

In April 1978, a coordination meeting was held in Nairobi, Kenya, to discuss preparations for the certification of the Horn of Africa. At that time 5 months had elapsed without a reported case of smallpox despite continuing surveillance in the Horn of Africa, as well as elsewhere in the world. One of the proposals discussed during the meeting was that a global WHO reward should be established to promote the reporting of smallpox. Reporters covering the meeting enthusiastically supported this idea. As a result of a recommendation from this meeting, the Thirty-first World Health Assembly in May 1978, in its resolution on smallpox (WHA31.54), requested the Director-General

"... to establish a reward of US$1000 for the first person who, in the period preceding final certification of global eradication, reports an active case of smallpox resulting from person-to-person transmission and confirmed by laboratory tests, in the belief that such a reward will strengthen worldwide vigilance for smallpox as well as national surveillance in priority countries".

Thereafter, the reward was widely publicized through radio, newspapers, television, etc., and a specially designed poster (Plate 24.7) was distributed to all countries. Immediately after the announcement of the award, many suspected cases were reported to WHO Headquarters, not only from developing but also from developed countries, including France and the USA. All proved to be false alarms. The reward was never collected.

case, or had heard about the reward. The surveys were often combined with active searches for cases of unreported smallpox. In the more populous and more recently endemic countries these campaigns reached a very high proportion of the people.

Documentation

Each country expecting to be visited by a commission was asked by WHO to prepare a comprehensive report ("country report") containing demographic data, information on its notification and surveillance system, a description of its smallpox eradication programme, information about the most recent outbreaks and data on precertification surveillance activities. These reports were submitted to the international commission at the beginning of its visit and provided the basic information needed for the planning of its field trips.

OPERATION OF INTERNATIONAL COMMISSIONS

The membership of all the international commissions is set out in Annex 24.1 and their operation is described in Chapters 25–27. General features of the method of selecting commission members, as developed after the certification of Indonesia, and their usual mode of operation, are outlined below.

Wkly Epidem. Rec. - Relevé épidém. hebd.: 1978, 53, 221-228

No. 30

WORLD HEALTH ORGANIZATION
GENEVA

ORGANISATION MONDIALE DE LA SANTÉ
GENÈVE

WEEKLY EPIDEMIOLOGICAL RECORD
RELEVÉ ÉPIDÉMIOLOGIQUE HEBDOMADAIRE

Epidemiological Surveillance of Communicable Diseases
Telegraphic Address: EPIDNATIONS GENEVA *Telex 27821*

Service de la Surveillance épidémiologique des Maladies transmissibles
Adresse télégraphique: EPIDNATIONS GENÈVE *Télex 27821*

Automatic Telex Reply Service
Telex 28150 Geneva with ZCZC and ENGL for a reply in English

Service automatique de réponse
Télex 28150 Genève suivi de ZCZC et FRAN pour une réponse en français

28 JULY 1978 — 53rd YEAR — 53e ANNÉE — 28 JUILLET 1978

SMALLPOX SURVEILLANCE — SURVEILLANCE DE LA VARIOLE

REWARD US$ 1 000 — RÉCOMPENSE

A reward has been established by the Director-General of WHO for the first person who, in the period preceding final certification of global eradication, reports an active case of smallpox resulting from person-to-person transmission and confirmed by laboratory tests.

(Resolution WHA31.54, World Health Assembly, 1978)

Le Directeur général de l'OMS a institué une récompense à attribuer à la première personne qui, au cours de la période précédant la certification définitive de l'éradication mondiale, signalerait un cas actif de variole résultant de la transmission d'un être humain à l'autre et confirmé par des essais de laboratoire.

(Résolution WHA31.54, Assemblée mondiale de la Santé, 1978)

SMALLPOX-FREE WEEKS WORLDWIDE **39** SEMAINES SANS CAS DE VARIOLE DANS LE MONDE

LABORATORIES RETAINING VARIOLA VIRUS

With the interruption of transmission of smallpox in the world population, the only remaining possible source of infection will be laboratories still retaining stocks of the causative virus.

Accordingly, the Thirty-first World Health Assembly (1978) has requested that all laboratories retaining variola virus, except WHO Collaborating Centres, destroy their stocks or transfer them to a WHO Collaborating Centre. Of at least 76 laboratories identified by WHO to have variola virus since all countries and areas were polled from 1975 to 1977, 57 had voluntarily transferred or destroyed their strains by the end of 1977. In 1978 five additional laboratories have disposed of their strains:

Instituto Adolfo Lutz, São Paulo (Brazil)
Laboratoire national de la Santé publique, Paris (France)
Microbiological Research Establishment, Porton Down, Salisbury (United Kingdom)
Virus Instituto Salud Pública, Lima (Peru)
Walter Reed Army Institute of Research, Washington (USA)

Currently there are at least 14 laboratories with variola virus *(Table 1)*. China reports that more than one laboratory has this virus.

Security measures for such laboratories were recommended by a "Workshop Meeting on Safety Measures in Laboratories Retaining Variola Virus", convened by WHO in August 1977. With continued cooperation the number of laboratories retaining variola virus will be further reduced to not more than four WHO Collaborating Centres by 1980.

LABORATOIRES DÉTENANT ENCORE DU VIRUS VARIOLIQUE

Avec l'arrêt de la transmission de la variole dans la population mondiale, la seule source possible d'infection sera constituée par les laboratoires détenant encore des stocks de virus pathogène.

Aussi la Trente et Unième Assemblée mondiale de la Santé (1978) a-t-elle demandé à tous les laboratoires, autres que les centres collaborateurs de l'OMS, détenant du virus variolique de détruire leurs stocks ou de les transférer à un centre collaborateur. Sur au moins 76 laboratoires identifiés par l'OMS comme détenant du virus variolique depuis l'enquête conduite de 1975 à 1977 sur tous les pays et circonscriptions, 57 avaient volontairement transféré ou détruit leurs souches à la fin de 1977. En 1978, cinq autres laboratoires se sont défaits de leurs souches, soit:

Instituto Adolfo Lutz, São Paulo (Brésil)
Laboratoire national de la Santé publique, Paris (France)
Microbiological Research Establishment, Porton Down, Salisbury (Royaume-Uni)
Virus Instituto Salud Pública, Lima (Pérou)
Walter Reed Army Institute of Research, Washington (EUA)

Actuellement, il existe au moins 14 laboratoires qui possèdent du virus variolique *(Tableau 1)*. La Chine signale que plus d'un laboratoire de ce pays détient le virus en question.

Un atelier sur les mesures de sécurité à appliquer dans les laboratoires conservant des stocks de virus variolique réuni par l'OMS en août 1977 a recommandé les mesures de sécurité à appliquer dans les laboratoires en cause. Grâce à un esprit de collaboration de toutes les parties, il n'y aura plus en 1980 que quatre laboratoires qui conserveront des stocks de virus variolique, il s'agira dans les quatre cas de centres collaborateurs de l'OMS.

Plate 24.6. The *Weekly epidemiological record* was used extensively to promote the certification activities by publishing pertinent information. The front page of the issue for 28 July 1978 announced the offer of a reward of US$1000 for reporting an active case of smallpox and recorded that 39 weeks had passed since the last case in the world. The front-page article reported on laboratories that had disposed of their stocks of variola virus; such stocks were by then considered the only possible remaining source of infection.

Plate 24.7. Poster produced by WHO in mid-1978, publicizing the reward of US$1000 for finding a confirmed case of smallpox.

Membership

The timing of the visits to the countries by international commissions and their membership were decided by WHO in the course of discussions with national health authorities. Individuals were selected who would be critical in their assessments and whose views as experts would be respected both nationally and internationally. Some of those selected were experts in communicable disease control, others in virology or health management. On each commission, one or two members were appointed from the countries most at risk of importation of smallpox from the country or countries to be certified. As time passed a deliberate effort was also made to include in the international commissions experts from as many different countries as possible, so that the nature and extent of the efforts made to document the interruption of transmission would be widely known. Special care was taken in the selection of the chairman. Apart from the first international commission, in South America, the chairman was not a national of any country under review and, after the certification of Indonesia, officials from the country concerned were, with few exceptions, excluded from the international commissions. Exceptions were made for the single group of experts who, as members of separate international commissions, certified Bangladesh and Burma respectively, by including a Burmese member in the commission assessing the adjacent country of Bangladesh and a Bangladeshi as a member of the commission assessing Burma. In addition, a senior Indian military medical officer was included in the Indian commission, so that visits could be made to areas to which foreigners did not have access at that time.

After the appointment of the Global Commission for the Certification of Smallpox Eradication early in 1978, its members served as chairmen or members of almost all of the international commissions. In this way members of the Global Commission became familiar with the certification process at the country and regional levels. In all, 76 experts from 48 countries served on international commissions (see Annex 24.1).

D. HENRIOUD, 1979

Plate 24.8. Holger B. Lundbeck (b. 1924), Director of the National Bacteriological Laboratory, Stockholm, participated in several international commissions for the certification of smallpox eradication and was an influential member of the Global Commission. He is shown here signing the scroll certifying eradication which is reproduced as the frontispiece of this book.

Mode of Operation

The principal aim of a commission's visit to a country was to evaluate the reliability of that country's report by interviewing health personnel and examining records at both central and peripheral levels, so as to ascertain whether smallpox transmission had been interrupted as claimed. It was recognized that no commission could expect to examine even a small proportion of the population of a country in order to confirm that none had smallpox. Moreover, if experts of the right calibre were to participate, it was appreciated that they would be unable to spend more than 3–4 weeks away from their normal place of work. The objective of an international commission was to assess the quality of the local surveillance programme and to determine whether cases of smallpox would have been detected if transmission had occurred during the preceding 2 years. In doing so, commission members themselves usually carried out their own, rather limited surveys.

In most instances preliminary visits by one or two of the commission's members (often

the chairman) were arranged by WHO so that they could examine the state of the documentation and recommend any additional measures which they thought were indicated.

After arrival in the country to be certified, the commission usually spent 2–3 days in the capital reviewing the country report. If several countries were involved, the commission selected a conveniently situated capital city for its initial meeting, during which it scrutinized all the country reports; it then divided up into several groups to visit individual countries, and finally reassembled to assess the findings and prepare a report. In each country, in order to visit as many areas as possible, the commissions usually divided themselves up into teams consisting of one or two members, the areas selected being those identified as having the least satisfactory documentation or as being at unusual risk. Members of the commission had both the right and the responsibility to decide exactly which areas, villages and health units they would visit each day. The teams travelled extensively in the field for 1–3 weeks before reconvening.

PROCEDURES FOR GLOBAL CERTIFICATION

By June 1977, international commissions had already visited or were preparing to visit all the previously endemic countries and countries at special risk. However, there were other countries in which there was a need to determine what measures should be taken in order to certify that the transmission of smallpox had been interrupted for at least 2 years. Furthermore, there were several countries—China, Democratic Kampuchea, Iran, Iraq, Madagascar, Namibia, South Africa, Southern Rhodesia (Zimbabwe), the Syrian Arab Republic, Thailand and Viet Nam—for which the staff of the Smallpox Eradication unit needed outside advice on how best to deal with the situation. Clearly, countries such as Madagascar and Thailand would not be expected to undertake the same kind of precertification activities as had been carried out in the countries of western Africa, yet they could not be ignored. Others, such as Democratic Kampuchea, Namibia, South Africa and Southern Rhodesia (Zimbabwe), were not readily accessible to WHO staff.

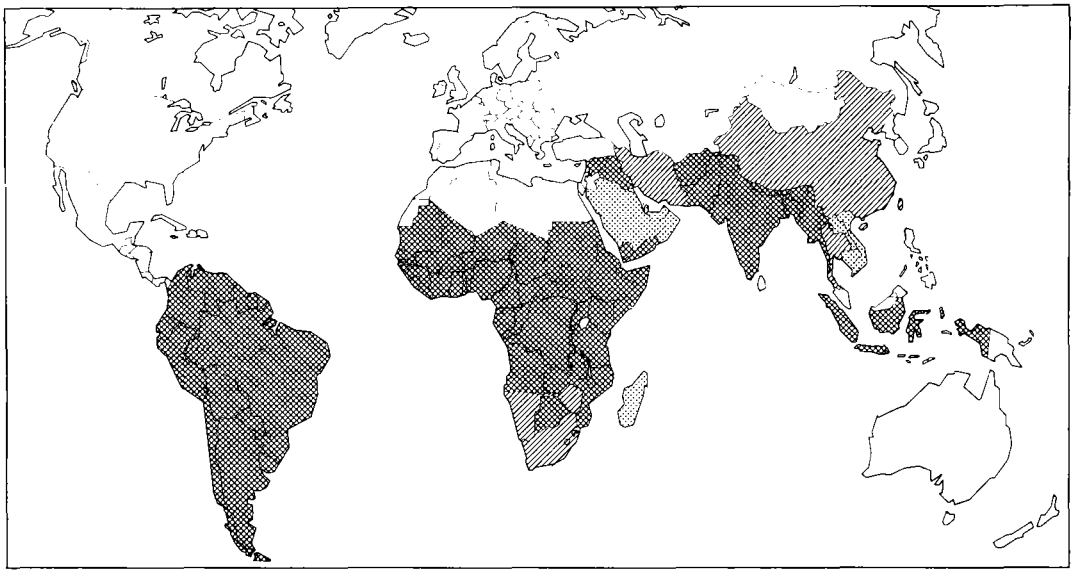
Another important matter was the international credibility of a claim that smallpox had been eradicated throughout the world. The problem was that, if the staff of the Smallpox Eradication unit themselves were to decide as to the data to be provided in confirmation of eradication, such a decision was open to criticism by government officials and health professionals around the world, since those responsible for a programme obviously have a stake in its success. However objective their judgements might be, other scientists would be justified in questioning that objectivity.

As has already been pointed out, the practical implications of the global eradication of smallpox were substantial. If the World Health Assembly were to accept that smallpox had been eradicated, this would mean that all preventive measures against the disease, including routine vaccination and international certificates of smallpox vaccination, could be abandoned. However, it was clear that these changes in well-established public health practices and the consequent financial savings would materialize only if the international community confidently accepted the assertion that smallpox had indeed been eradicated, first from countries, regions and continents and, finally, from the world. To gain such acceptance would not be a simple matter, for disbelief in the feasibility of smallpox eradication was common throughout the duration of the Intensified Smallpox Eradication Programme.

Consultation on the Worldwide Certification of Smallpox Eradication

The practical solution to the problems described above was to set up a global commission of respected scientists which, as one of its functions, could advise WHO as to what data should be collected, for clearly this was a matter of judgement. Eventually, when such outside experts were fully satisfied that global eradication had been achieved, this conclusion would have been reached, not by WHO itself or by putting together the reports of a series of international commissions each dealing with one or a few countries, but by an international group of senior scientists and administrators capable of taking a global view of the problem.

To obtain advice on how best to achieve the certification of global eradication, the Director-General of WHO convened a consultation which was held in Geneva on 11–13



Category 1 – **Formal certification by international commissions** of experts visiting the countries concerned and assessing their smallpox-free status by examining records and making field visits to determine whether surveillance activities would have been adequate to detect a case of smallpox if one had occurred during the previous 2 years.

Category 2 – **Certification by the visit of selected experts** to verify and document the smallpox incidence since 1960, the last known outbreak and control measures employed, and procedures for handling suspected cases.

Category 3 – **Certification through submission of detailed country reports.**

Category 4 – **Official statements by countries** declaring their smallpox-free status during the previous 2 years and signed by government health authorities.

Fig. 24.2. Methodologies used for the certification of smallpox eradication in various categories of countries.

October 1977. The participants (Annex 24.2) included 17 experts on epidemiology, virology and public health administration from 15 countries: 3 from Africa, 3 from the Americas, 4 from Asia, 6 from Europe and 1 from Oceania. During the succeeding 2 years, most of the participants in the consultation served on the Global Commission for the Certification of Smallpox Eradication. Documentation for the meeting had been prepared by the staff of the Smallpox Eradication unit, and the consultation made important recommendations (WHO/SE/77.98) as to how certification should proceed so that the stage could be reached, as quickly as possible, at which it could be certified that smallpox had been eradicated globally. For this purpose, the countries of the world were divided into three categories; a fourth was subsequently added by the Global Commission (Fig. 24.2). The various categories are discussed below.

Category 1—Formal certification by international commissions

The most stringent assessment was required in countries in which smallpox was endemic at the inception of the Intensified Smallpox Eradication Programme in 1967, or had become endemic since then. For such countries, the consultation recommended that the established procedure of formal certification by designated international commissions should be carried out. In October 1977, when the consultation met, this formal certification had already been performed in South America (1973), Indonesia (1974), 15 countries in western Africa (1976),

Afghanistan and Pakistan (1976), 5 countries in south-eastern Asia (1977) and 9 countries in central Africa (1977) (see Plate 24.11). The additional countries scheduled for formal certification from November 1977 onwards were:

South-eastern Asia: Bangladesh and Burma (scheduled for November–December 1977).

South-eastern Africa: Malawi, Mozambique, the United Republic of Tanzania and Zambia (scheduled for March 1978).

Eastern-central Africa: Sudan and Uganda.

Southern Africa, group I: Angola, Botswana, Lesotho and Swaziland.

Southern Africa, group II: Namibia, South Africa and Southern Rhodesia (Zimbabwe). Because of political complexities (see Chapter 26) it was apparent by 1978 that it would be both difficult and time-consuming to organize the certification of these countries by international commissions. Instead they were investigated as set out for Category 2 countries (see below) and certified by the Global Commission.

The Horn of Africa and neighbouring countries: Democratic Yemen, Djibouti, Ethiopia, Kenya, Somalia and Yemen.

Category 2 — Certification by the visit of selected experts

The consultation considered that some countries in which smallpox was not endemic in 1967 required special consideration, short of a visit by an international commission, because of the inadequacy of surveillance and/or their proximity to areas in which smallpox had recently been endemic. For such countries, it was suggested that visits by international experts (subsequently Global Commission members or WHO consultants) and/or WHO epidemiologists should be arranged during 1978 in order to verify and document their smallpox eradication status. The countries in this category are discussed below.

China. Although it was widely believed that smallpox transmission had been interrupted in China in about 1960, the country did not become a member of WHO until 1972. Even as late as 1977, little information was available to WHO as to what had been achieved, or how, or when, except that smallpox had been eradicated in China in 1960 or thereabouts. Since it was the most populous country on earth, and one in which smallpox had been widespread for over 1800 years, the consultation believed that special investigations were needed to assure the international community that smallpox was no longer endemic there.

Iran, Iraq and the Syrian Arab Republic. Although endemic smallpox had been eliminated from these countries in 1963, 1959 and 1957 respectively, variola major had become established again in all of them between 1970 and 1972. Smallpox was first reintroduced into Iran from Afghanistan and subsequently spread into Iraq and the Syrian Arab Republic (see Chapter 23). Because of the extent and duration of the outbreak, the consultation suggested that each of these countries should be asked to submit a detailed report of its surveillance programme and smallpox eradication activities during at least the past 5 years, after which members of the consultation or its successor, the Global Commission, would visit each country to review the situation.

Thailand. Although smallpox had ceased to be endemic in Thailand in 1962, the good communications with Bangladesh and India indicated the need for special evaluation, particularly in the border area of Thailand, Burma and the Lao People's Democratic Republic, which was notoriously inaccessible.

Category 3—Certification through submission of detailed country reports

WHO was requested by the consultation to ask certain countries to provide detailed reports, including but not limited to data on the incidence of smallpox since 1960, an account of the last known outbreak and the control measures employed, and the method of approach to be adopted should a suspected case of smallpox be found. Several countries about which detailed information was not available to the Global Commission fell into this category and are discussed below.

Gulf States: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. These countries had been free of endemic smallpox since 1963 but had experienced sporadic importations up to 1971. The Secretariat-General for the Ministers of Health of the Arab States of the Gulf was asked to coordinate the preparation of special country reports from these States.

South-east Asian countries. Because fighting had been going on for so long, detailed information was lacking from Democratic Kampuchea, the Lao People's Democratic Republic and Viet Nam. A special report was

also requested from China (Province of Taiwan).

Madagascar. Although the last reported case of smallpox in Madagascar occurred in 1934, rumours had reached the consultation of outbreaks of a disease that might have been smallpox. A special report was therefore requested.

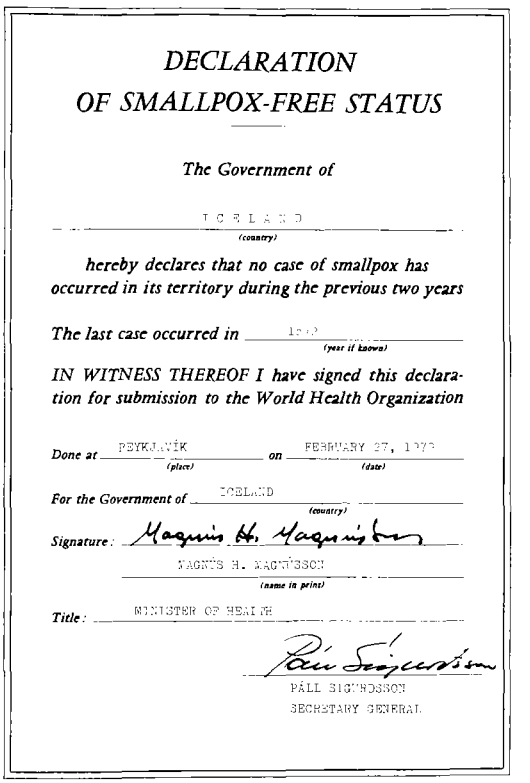
Category 4—Official statements by countries

In addition to these more stringent requirements, it was decided that every country and area should provide WHO with a signed statement that smallpox had not been present in that country or area during at least the preceding 2 years. Certification of freedom from smallpox by an international commission was considered to constitute such a statement.

Establishment and Responsibilities of the Global Commission

Finally, the consultation recommended that, since smallpox eradication was an unprecedented achievement, it should be promptly certified and appropriately recognized. For that reason, "... To assist in this effort and to provide authoritative endorsement, a formally constituted International Commission for the Global Certification of Smallpox Eradication (Global Commission) should be established by WHO to provide consultative assistance and verification of this event" (WHO/SE/77.98). Early in 1978 most of the participants in the consultation were designated by the Director-General of WHO as constituting the Global Commission for the Certification of Smallpox Eradication and at the same time a few new members were introduced (Annex 24.2; Plate 24.10).

Fenner, who had been Chairman of the consultation, was elected Chairman of the Global Commission, and acted in this capacity at the meetings in 1978 and 1979 (see below). Dr W. Koinange of Kenya was the Vice-Chairman at the 1977 consultation and Dr Jan Kostrzewski of Poland was Vice-Chairman at both meetings of the Global Commission. Arita, as Chief of the Smallpox Eradication unit, served as secretary both of the consultation and of the Global Commission. As has already been mentioned, Global Commission members were included in almost all of the 11 international commissions which met in 1978



DECLARATION
OF SMALLPOX-FREE STATUS

The Government of

ICELAND
(country)

hereby declares that no case of smallpox has occurred in its territory during the previous two years

The last case occurred in 1972
(year if known)

IN WITNESS THEREOF I have signed this declaration for submission to the World Health Organization

Done at REYKJAVÍK *(place)* *on* FEBRUARY 27, 1979 *(date)*

For the Government of ICELAND *(country)*

Signature: Magnús H. Magnússon

MAGNÚS H. MAGNÚSSON
(name in print)

Title: MINISTER OF HEALTH

Páll Sigurðsson

PÁLL SIGURÐSSON
SECRETARY GENERAL

Plate 24.9. Official statements, like this one from Iceland, were received from 121 countries and territories declaring they had not had a case of smallpox for at least 2 years. They were accepted by the Global Commission for all countries other than the 79 where special measures were deemed necessary.

and 1979 to deal with specific geographical areas, an experience which further strengthened the assessment by the Global Commission of the progress of eradication as a whole.

The Global Commission met in Geneva in December 1978 and again in December 1979 to review certification activities in various countries in the four categories defined by the consultation and to consider other issues relevant to global certification. At the 1979 meeting, the Global Commission debated and approved its final report (World Health Organization, 1980), which was submitted to the Thirty-third World Health Assembly.

CHRONOLOGY OF CERTIFICATION

As has previously been noted, special measures had to be taken in 79 countries before the declaration of global smallpox eradication could be made. Between 1973 and 1979,

L. BIANCO

Plate 24.10. Participants at the meeting of the Global Commission for the Certification of Smallpox Eradication, 6–9 December 1979. *Left to right, front row:* Yemane Tekeste (Ethiopia), Z. Ježek (WHO), I. D. Ladnyi (WHO), I. Arita (WHO), Z. Islam (WHO), S. E. Woolnough (WHO), C. I. Sands (WHO); *second row:* **S. S. Marennikova (USSR), J. Azurin (Philippines), P. N. Burgasov (USSR), F. Fenner (Australia), J. Kostrzewski (Poland), D. A. Henderson (USA), W. Koinange (Kenya)**, Jiang Yutu (China); *third row:* A. I. Gromyko (WHO), **R. N. Basu (India), J. M. Aashi (Saudi Arabia), B. A. Rodrigues (Brazil), R. Netter (France), J. S. Moeti (Botswana), Kalisa Ruti (Zaire), P. N. Shrestha (Nepal)**, B. C. Dazo (WHO), M. C. de Souza (WHO), **Zhang Yihao (China)**, J. Magee (WHO); *back row:* G. Meiklejohn (USA), **P. F. Wehrle (USA)**, J. G. Breman (USA), **H. B. Lundbeck (Sweden), K. R. Dumbell (United Kingdom), I. Tagaya (Japan), A. Deria (Somalia)**, J. L. Tulloch (WHO), R. N. Evans (WHO), J. F. Wickett (WHO). The names of the Commission members are in bold type.

therefore, the status of smallpox in these countries was assessed by WHO and by independent groups convened by the WHO Secretariat (Fig. 24.3). The eradication of smallpox in 63 of these countries was certified by international commissions; the situation in the other 16 (No. 53–64, 66–67 and 78–79) was evaluated by other means.

Of the 79 countries concerned, 31 had been certified by international commissions between 1973 and 1976 (see Plate 24.11), but from 1977 onwards certification activities were much accelerated in view of the fact that global eradication was imminent. The 1977 Consultation on the Worldwide Certification of Smallpox Eradication and the establishment of a Global Commission substantially promoted the prompt completion of these activities, since these bodies were a source of advice and recommendations.

In May 1978, when 49 of the 79 countries had already been certified, a document entitled *Methodology for Preparation of Appropriate Data for the [30] Countries Remaining to be Certified Free of Smallpox* (SME/78.6) was prepared by the staff of the Smallpox Eradication unit. On the basis of experience gained with previous certifications, the document set out the minimum requirements for the country reports, guidelines and standard forms for field activities such as pockmark surveys and chickenpox surveillance, and procedures for the collection and dispatch of laboratory specimens. It was distributed to all countries still to be certified and proved to be extremely useful for both health planners and field workers in their preparations for certification.

Despite the existence of many politically insecure areas in the late 1970s and the large

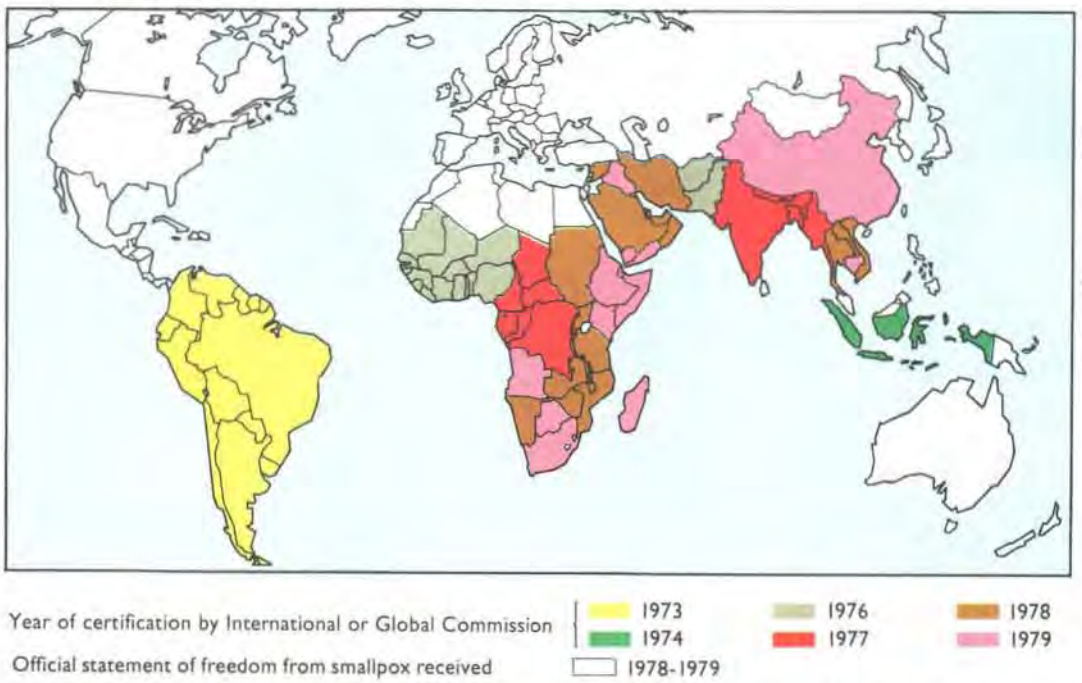


Plate 24.11. Chronological progress of certification in the 79 countries where special measures were necessary. All other countries provided an official statement that smallpox had not occurred in their country during the preceding 2 years.

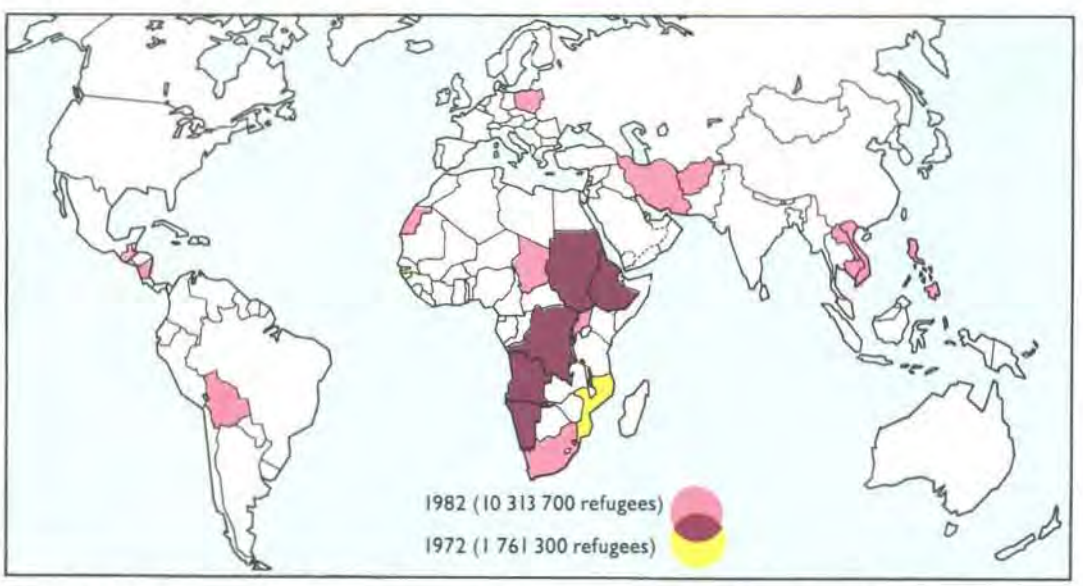


Plate 24.12. Smallpox eradication, and its certification between 1973 and 1979, were conducted when the numbers of refugees in the world were growing constantly. This map shows the country of origin of refugees assisted by the Office of the United Nations High Commissioner for Refugees in 1972 and in 1982 (the purple shading indicates countries common to both years). Although it clearly depicts the magnitude of this distressing problem, it does not show some areas in which, before or between those years, the conditions that caused people to become refugees also made eradication work particularly difficult — e.g., Nigeria (1967–1968), Bangladesh (1970–1971), and the Horn of Africa (1974–1978).

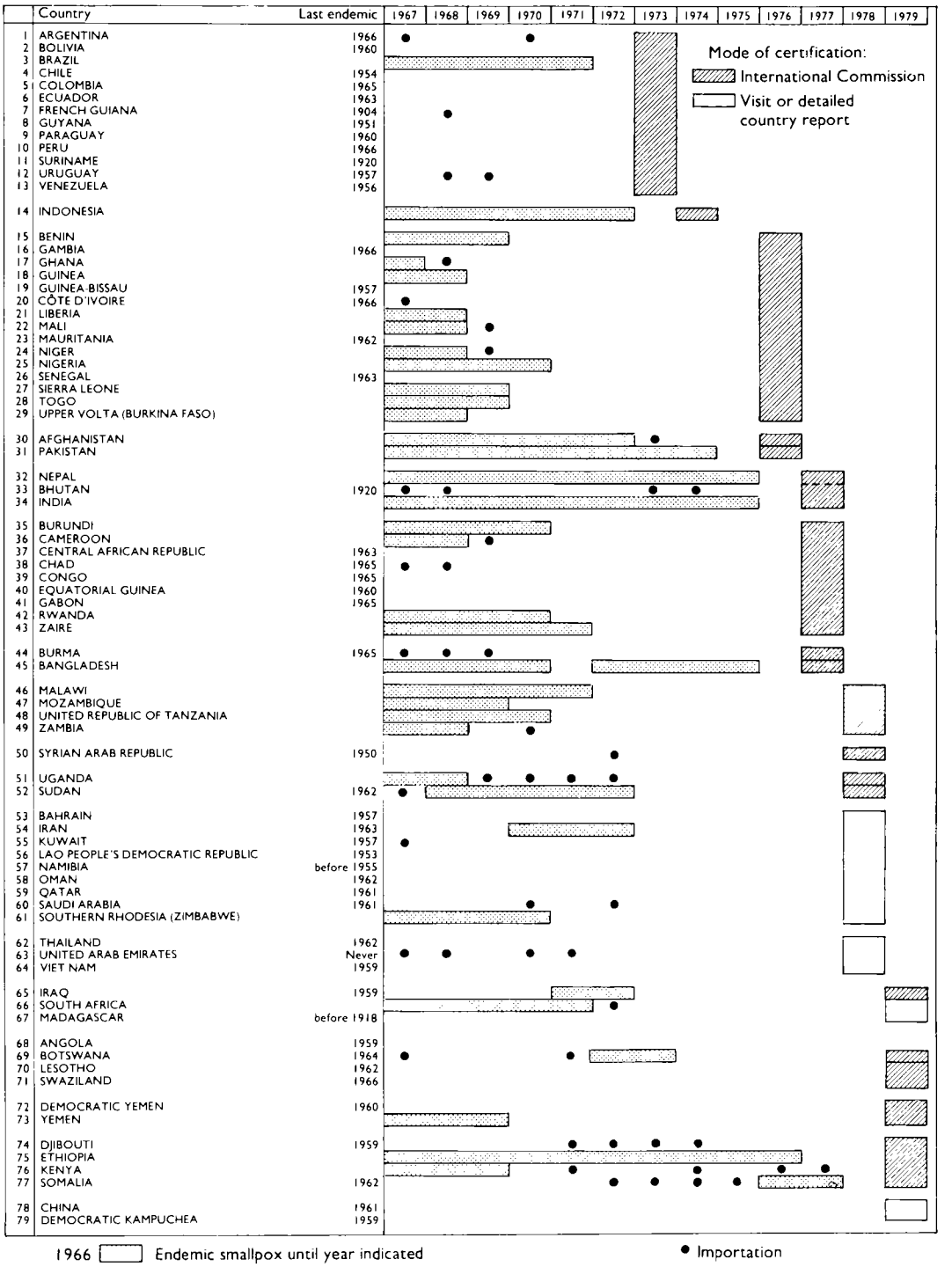


Fig. 24.3. Countries requiring special procedures for the certification of smallpox eradication. The year when the country ceased to be endemic, the year of the last known case, and the year and method of certification are also shown.

number of refugees, of whom there were ten times more in 1982 than in 1972 (see Plate 24.12), certification activities, including field visits by outside experts where necessary, proceeded surprisingly well, perhaps owing to the interest of the international community in this unprecedented event in the history of medicine.

Certification activities were strongly supported by a vigorous information campaign. From March 1978 to August 1980 a special information officer, Mr James Magee, was recruited to ensure good communications with major media agencies as well as medical periodicals. The goal of the information campaign was to reach beyond the scientific community with the news that:

(1) the world's last naturally occurring case of endemic smallpox had been found in Somalia on 26 October 1977;

(2) this was being confirmed globally by certification procedures involving an intensive search for cases; and

(3) it was expected that, if all went well, the target date for the declaration of global eradication, 26 October 1979—i.e., 2 years after the case in Somalia—would be met.

The benefits of eradication to the international community were stressed, including the end of the misery caused by this disease throughout human history and the enormous financial savings to the public health sector with the universal discontinuation of smallpox vaccination and associated control measures. Those with doubts were encouraged to speak out well in advance of the final global certification and countries were urged to change their legislation on smallpox vaccination at an early date.

The last certification activities by international commissions took place in October 1979 in the Horn of Africa—Djibouti, Ethiopia, Kenya, and Somalia, where, as has just been mentioned, the world's last case of endemic smallpox was discovered in October 1977. The 4 commissions that visited the countries of the Horn of Africa in October 1979 subsequently met in combined session in Nairobi, where they considered the region as a whole. On 26 October 1979, exactly 2 years after the onset of rash in the last case of endemic smallpox in the world, smallpox eradication was certified for Africa at a ceremony in which the Director-General of WHO and the directors of the Regional Offices for Africa and the Eastern Mediterranean participated.

WHO SMALLPOX CONFERENCE, KINSHASA, 1968

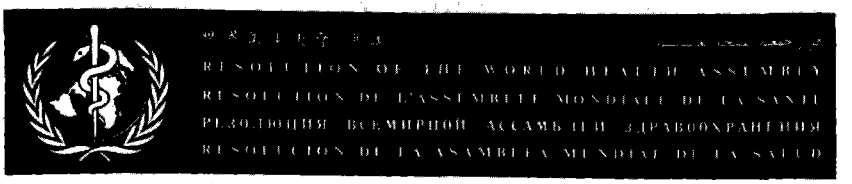
Plate 24.13. Gordon Meiklejohn (b. 1911), Professor of Medicine at the University of Colorado, Denver, USA. Worked with Dr A. R. Rao in Madras in the early 1960s and served as a WHO consultant on smallpox almost every year from the mid-1960s, and for a full year in 1968–1969. He was a member of several international commissions for the certification of smallpox eradication and was responsible for the preparation of the first draft of the Final Report of the Global Commission.

Certification of the Horn of Africa left only 2 countries uncertified, China and Democratic Kampuchea. However, in November 1979, a report prepared after the visit of a WHO team to China became available and the smallpox situation in Democratic Kampuchea was clarified. On 9 December 1979, at its last meeting in Geneva, the Global Commission agreed to certify smallpox eradication in these 2 countries.

By the end of 1979 all other countries—i.e., excluding those visited by the international commissions or certified by the Global Commission on the basis of other evidence—had submitted to WHO their signed declarations that no cases of smallpox had occurred during at least 2 years. The requirements for global certification recommended by the 1977 Consultation on the Worldwide Certification of Smallpox Eradication had thus been met.

DECLARATION OF THE GLOBAL ERADICATION OF SMALLPOX

The ultimate responsibility of the Global Commission, once it was satisfied that world-



RESOLUTION OF THE WORLD HEALTH ASSEMBLY
RESOLUTION DE L'ASSEMBLEE MONDIALE DE LA SANTE
РЕЗОЛЮЦИЯ ВСЕМИРНОЙ АССАМБЛЕИ ЗДРАВООХРАНЕНИЯ
RESOLUCION DE LA ASAMBLEA MUNDIAL DE LA SALUD

The Thirty-third World Health Assembly, on this the 8th day of May 1980;

Having considered the developments and results of the global programme on smallpox eradication initiated by WHO in 1958 and intensified since 1967;

1. DECLARES SOLEMNLY THAT THE WORLD AND ALL ITS PEOPLES HAVE WON FREEDOM FROM SMALLPOX, WHICH WAS A MOST DEVASTATING DISEASE SWEEPING IN EPIDEMIC FORM THROUGH MANY COUNTRIES SINCE EARLIEST TIME, LEAVING DEATH, BLINDNESS AND DISFIGUREMENT IN ITS WAKE AND WHICH ONLY A DECADE AGO WAS RAMPANT IN AFRICA, ASIA AND SOUTH AMERICA;

2. EXPRESSES ITS DEEP GRATITUDE TO ALL NATIONS AND INDIVIDUALS WHO CONTRIBUTED TO THE SUCCESS OF THIS NOBLE AND HISTORIC ENDEAVOUR;

3. CALLS THIS UNPRECEDENTED ACHIEVEMENT IN THE HISTORY OF PUBLIC HEALTH TO THE ATTENTION OF ALL NATIONS, WHICH BY THEIR COLLECTIVE ACTION HAVE FREED MANKIND OF THIS ANCIENT SCOURGE AND, IN SO DOING, HAVE DEMONSTRATED HOW NATIONS WORKING TOGETHER IN A COMMON CAUSE MAY FURTHER HUMAN PROGRESS.

Plate 24.14. Resolution WHA33.3, the formal declaration of the eradication of smallpox, based on the report of the Global Commission to the Director-General of WHO, was adopted unanimously by the Thirty-third World Health Assembly on 8 May 1980.

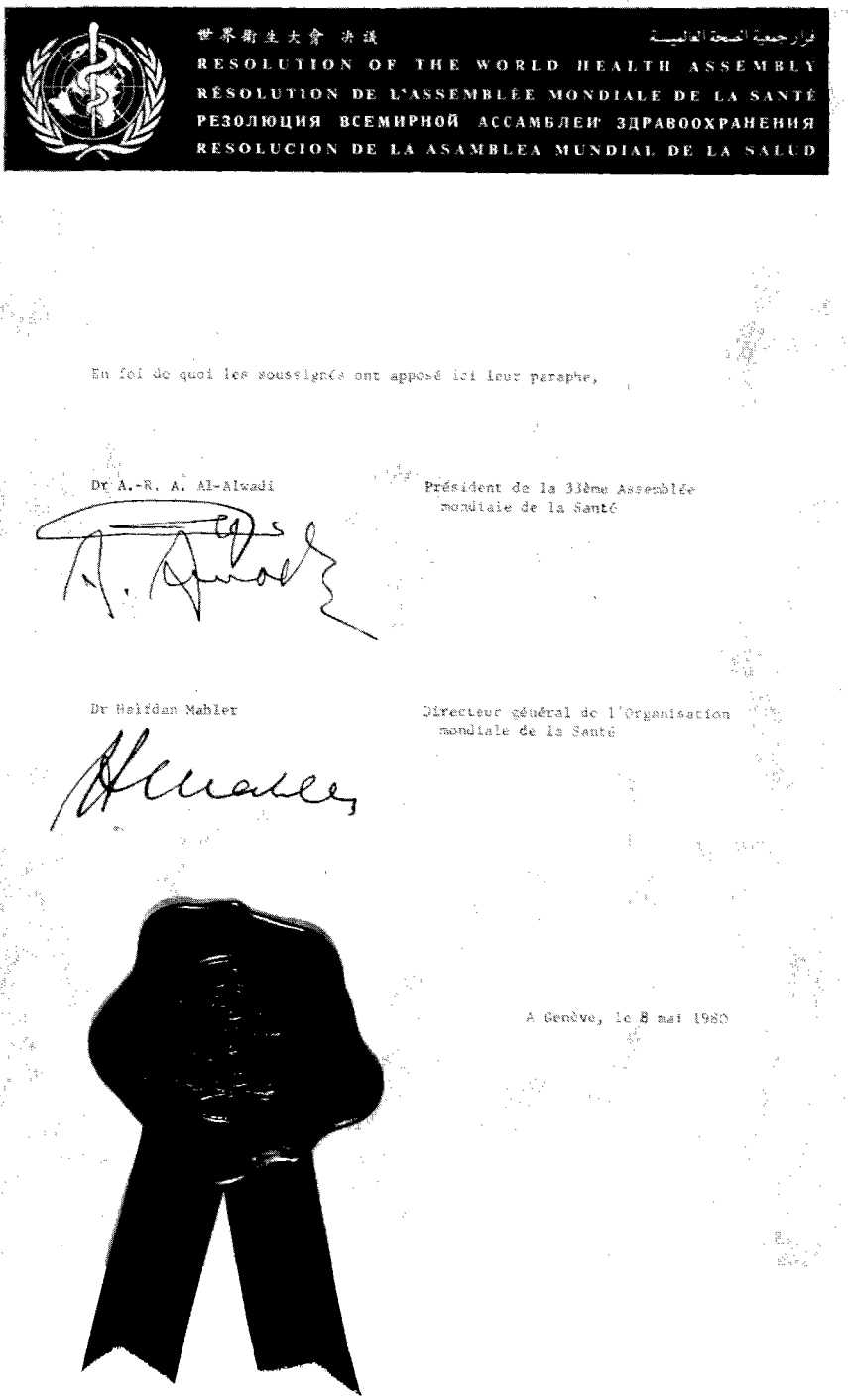


Plate 24.15. As the President of the Thirty-third World Health Assembly, Dr A-R. A. Al-Awadi, and the Director-General of WHO, Dr Halfdan Mahler, signed resolution WHA33.3, the President remarked: "While doctors sign the death certificates of people, today we are signing the death certificate of a disease".

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Plate 24.16. The ceremony of the declaration of global eradication of smallpox, on 8 May 1980, during the eighth plenary meeting of the Thirty-third World Health Assembly. **A:** Dr Frank Fenner (inset), Chairman of the Global Commission, addressed the Assembly and handed to the President the scroll that had been signed by the members of the Commission (see frontispiece). **B:** The President of the Assembly, Dr A-R. A. Al-Awadi, signing resolution WHA33.3, with the Director-General of WHO, Dr Halfdan Mahler, looking on.

Plate 24.17. Signatures of the delegates of Member States, from Afghanistan to Malaysia, appended to resolution WHA33.3.

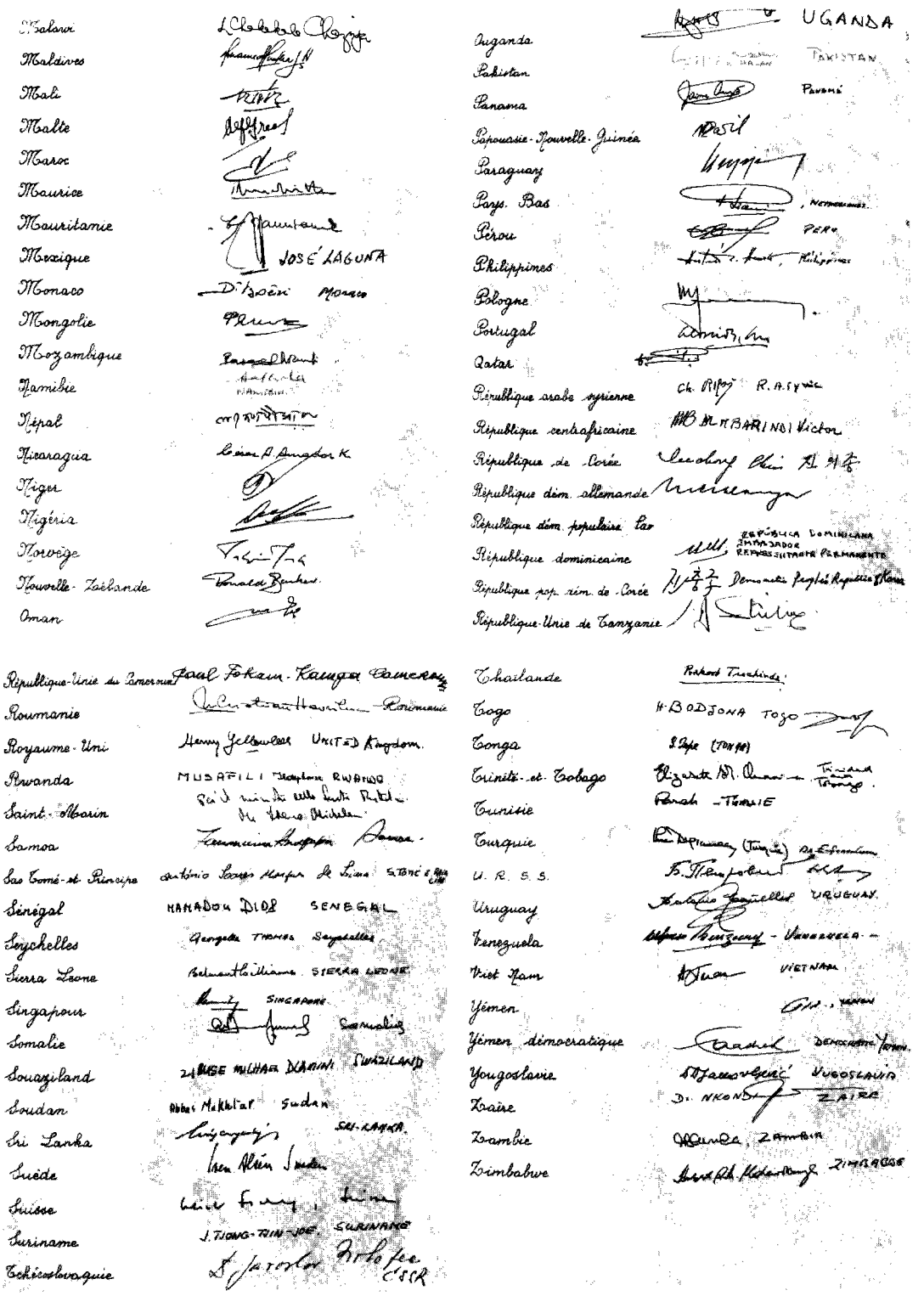

Plate 24.18. Signatures of the delegates of Member States, from Malawi to Zimbabwe, appended to resolution WHA33.3.

wide eradication of smallpox had been achieved, was to document the reasons for its decision in a way that would allow the World Health Assembly to declare that smallpox had been eradicated. In addition, it was important that a post-eradication strategy should be planned and machinery developed to implement it.

During 1979, with the help of Dr Gordon Meiklejohn, a WHO consultant, the Smallpox Eradication unit drafted a report for consideration by the Global Commission. This was reviewed in detail by the 12 members of the Global Commission present in Nairobi in October 1979 (see Chapter 27), and the revised report was the main subject of discussion at the 4-day final meeting of the Global Commission in December 1979. The final report (World Health Organization, 1980) outlines the criteria on the basis of which all members of the Global Commission signed a document proclaiming the global eradication of smallpox (see frontispiece). It also contained 19 recommendations covering all aspects of a post-eradication strategy (see Chapter 28) designed to ensure that all the countries of the world could remain confident that smallpox had indeed been eradicated.

On 8 May 1980 the Thirty-third World Health Assembly reviewed the Global Commission's report and declared that smallpox had been eradicated throughout the world. There were two resolutions: resolution WHA33.3 (see Plates 24.14–24.16) declared that the global eradication of smallpox had been achieved and resolution WHA33.4 endorsed the Global Commission's recommendations on policy for the post-eradication era (see Chapter 28).

ANNEX 24.1. MEMBERSHIP OF INTERNATIONAL COMMISSIONS FOR THE CERTIFICATION OF SMALLPOX ERADICATION

The positions held by members at the time of the international commissions give some indication of their standing and expertise. Members of the Global Commission who were also members of international commissions both before and after the establishment of the Global Commission are indicated by the letters GC in parentheses after their names.

1. SOUTH AMERICA: 12–25 August 1973 (PAHO document CD22/19)

Dr A. N. Bica	Secretary of Public Health, Ministry of Health, Rio de Janeiro, Brazil (*Chairman*)
Dr F. J. C. Cambournac	Director, Institute of Hygiene and Tropical Medicine, Lisbon, Portugal
Dr E. Echezuría	Chief, Department of Demography and Epidemiology, Ministry of Health, Caracas, Venezuela (*Rapporteur*)
Dr J. D. Millar	Director, State and Community Services Division, Center for Disease Control, Atlanta, GA, USA
Dr R. J. Wilson	Chairman, Connaught Medical Research Laboratories Ltd, University of Toronto, Canada

2. INDONESIA: 15–25 April 1974 (WHO/SE/74.68)

Dr N. McK. Bennett	Specialist Physician and Deputy Superintendent, Fairfield Hospital, Melbourne, Australia
Dr J. J. Dizon	Chief of Disease Intelligence, Disease Intelligence Centre, Department of Health, Manila, Philippines
Dr J. S. Gill	Assistant Director, Health and Epidemiology, Ministry of Health, Kuala Lumpur, Malaysia (*Rapporteur*)
Dr S. Kumarapathy	Senior Registrar, Quarantine and Epidemiology, Environmental Public Health Division, Ministry of Environment, Singapore

Dr J. Sulianti Saroso	Director-General for the Control and Prevention of Communicable Diseases, Ministry of Health, Jakarta, Indonesia
Dr I. Tagaya (GC)	Director, Department of Enteroviruses, National Institute of Health, Tokyo, Japan
Dr P. F. Wehrle (GC)	Hastings Professor of Pediatrics, Los Angeles County—University of Southern California Medical Center, Los Angeles, CA, USA (*Chairman*)

3. WESTERN AFRICA: 23 March–15 April 1976 (AFR/Smallpox/80)
Countries included: Benin, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo and Upper Volta (Burkina Faso).

Dr S. Bédaya-Ngaro	Inspector General of Health Services, Bangui, Central African Republic
Dr W. Koinange (GC)	Director, Division of Communicable Disease Control, Ministry of Health, Nairobi, Kenya (*Chairman*, Abidjan)
Dr I. D. Ladnyi	Chief, Central Board of Quarantinable Diseases, Ministry of Health, Moscow, USSR
Dr Lekie Botee	Director-General, Department of Public Health, Kinshasa, Zaire (*Chairman*, Brazzaville)
Dr R. Netter (GC)	Director-General, National Health Laboratory, Paris, France
Dr M. I. D. Sharma	Director (retired), National Institute of Communicable Diseases, New Delhi, India
Dr P. F. Wehrle (GC)	Hastings Professor of Pediatrics, Los Angeles County—University of Southern California Medical Center, Los Angeles, CA, USA (*Rapporteur*)

4. AFGHANISTAN: 22–29 November 1976 (WHO/SE/77.89)
and
5. PAKISTAN: 6–18 December 1976 (WHO/SE/77.90)

Dr H. S. Bedson	Professor of Medical Microbiology, University of Birmingham, Medical School, Birmingham, England
Dr N. McK. Bennett	Specialist Physician and Deputy Superintendent, Fairfield Hospital, Melbourne, Australia
Dr A. I. Idris	Director-General, Epidemiology, Ministry of Health, Khartoum, Sudan (*Chairman*, Pakistan)
Dr G. Meiklejohn	Professor of Medicine, University of Colorado Medical Center, Denver, CO, USA (*Rapporteur*, Afghanistan and Pakistan)
Dr N. Kumara Rai	Director, Planning Department, Directorate General for Communicable Disease Control, Ministry of Health, Jakarta, Indonesia
Dr P. N. Shrestha (GC)	Chief, Smallpox Eradication Project, Department of Health Services, Kathmandu, Nepal (*Chairman*, Afghanistan)

6. CENTRAL AFRICA: 6–30 June 1977 (AFR/Smallpox/86)
Countries included: Burundi, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Rwanda and Zaire.

Dr P. Agbodjan	Chief, Major Endemic Diseases Service, General Directorate for Health, Lomé, Togo
Dr J. G. Breman	Epidemic Intelligence Officer (Michigan Department of Public Health), Bureau of Epidemiology, Center for Disease Control, Atlanta, GA, USA

Dr E. Coffi	Director, Institute of Hygiene, Ministry of Public Health, Abidjan, Côte d'Ivoire
Dr F. Dekking	Health Science Laboratory, University of Amsterdam, Netherlands
Dr A. K. M'Baye	Chief Medical Officer, Major Endemic Diseases Service, and Deputy Director of Public Health, Dakar, Senegal (*Chairman*)
Dr R. Netter (GC)	Director-General, National Health Laboratory, Paris, France (*Rapporteur*)
Dr M. Yekpe	Chief, Communicable Diseases Service, Ministry of Public Health, Cotonou, Benin

7. INDIA: 4–23 April 1977 (SEA/Smallpox/78)
NEPAL: 4–13 April 1977 (SEA/Smallpox/80)
BHUTAN: 28 March–1 April 1977; 22 April 1977 (SEA/Smallpox/80)

India and Bhutan

Dr J. Červenka	Chief (Epidemiology), Institute of Epidemiology and Microbiology, Bratislava, Czechoslovakia
Dr W. A. B. de Silva	Deputy Director (Planning), Ministry of Health, Colombo, Sri Lanka
Dr F. Fenner (GC)	Director, Centre for Resource and Environmental Studies, The Australian National University, Canberra, Australia (*Rapporteur*)
Dr H. Flamm	Institute of Hygiene, University of Vienna, Austria
Lt.-Gen. R. S. Hoon	Director-General, Armed Forces Medical Services, New Delhi, India
Dr T. Kitamura	Chief, Division of Poxviruses, National Institute of Health, Tokyo, Japan
Dr W. Koinange (GC)	Director, Division of Communicable Disease Control, Ministry of Health, Nairobi, Kenya
Dr J. Kostrzewski (GC)	Secretary, Medical Section, Polish Academy of Sciences, Warsaw, Poland (*Chairman*)
Dr H. B. Lundbeck (GC)	Director, National Bacteriological Laboratory, Stockholm, Sweden
Dr A. M. Mustaqul Huq	Director of Health Services (Preventive), Ministry of Health, Dhaka, Bangladesh
Dr D. M. Mackay	Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, London, England
Dr M. F. Polak	Scientific Officer, Faculty of Medicine, Catholic University, Nijmegen, Netherlands
Dr R. Roashan	President, Foreign Relations Department, Ministry of Public Health, Kabul, Afghanistan
Dr D. J. Sencer	Director, Center for Disease Control, Atlanta, GA, USA
Dr U Thein Nyunt	Director, Disease Control, Ministry of Health, Rangoon, Burma
Dr V. M. Zhdanov	Director, Institute of Virology, Academy of Medical Sciences, Moscow, USSR

Nepal

Dr T. Kitamura	Chief, Division of Poxviruses, National Institute of Health, Tokyo, Japan
Dr J. Kostrzewski (GC)	Secretary, Medical Section, Polish Academy of Sciences, Warsaw, Poland (*Chairman*)
Dr D. M. Mackay	Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, London, England (*Rapporteur*)

8. BURMA: 21–30 November 1977 (SEA/Smallpox/83)

Dr S. Jatanasen	Director, Division of Epidemiology, Ministry of Public Health, Bangkok, Thailand
Dr A. D. Langmuir	Professor, Harvard University Medical School, Department of Preventive and Social Medicine, Boston, MA, USA (*Secretary*)
Dr C. Lerche	Director, National Institute of Public Health, Oslo, Norway
Dr H. von Magnus	Head, Department of Epidemiology, State Serum Institute, Copenhagen, Denmark (*Rapporteur*)
Dr A. M. Mustaqul Huq	Director of Health Services (Preventive), Ministry of Health, Dhaka, Bangladesh
Dr I. F. Setiady	Director, Epidemiology and Quarantine, Ministry of Health, Jakarta, Indonesia (*Chairman*)
Dr M. I. D. Sharma	Emeritus Medical Scientist, New Delhi, India
Dr P. N. Shrestha (GC)	Chief, Smallpox Eradication Project, Department of Health Services, Kathmandu, Nepal
Dr U Thein Nyunt	Director, Disease Control, Ministry of Health, Rangoon, Burma

9. BANGLADESH: 1–14 December 1977 (SEA/Smallpox/84)

Dr S. Jatanasen	Director, Division of Epidemiology, Ministry of Public Health, Bangkok, Thailand
Dr A. D. Langmuir	Professor, Harvard University Medical School, Department of Preventive and Social Medicine, Boston, MA, USA (*Chairman*)
Dr C. Lerche	Director, National Institute of Public Health, Oslo, Norway
Dr H. von Magnus	Head, Department of Epidemiology, State Serum Institute, Copenhagen, Denmark (*Rapporteur*)
Dr A. M. Mustaqul Huq	Director of Health Services (Preventive), Ministry of Health, Dhaka, Bangladesh
Dr I. F. Setiady	Director, Epidemiology and Quarantine, Ministry of Health, Jakarta, Indonesia
Dr M. I. D. Sharma	Emeritus Medical Scientist, New Delhi, India
Dr P. N. Shrestha (GC)	Chief, Smallpox Eradication Project, Department of Health Services, Kathmandu, Nepal
Dr U Thein Nyunt	Director, Disease Control, Ministry of Health, Rangoon, Burma

10. MALAWI, MOZAMBIQUE, UNITED REPUBLIC OF TANZANIA and ZAMBIA: 6–29 March 1978 (AFR/Smallpox/87)

Dr M. Davies	Chief Medical Officer, Ministry of Health, Freetown, Sierra Leone
Dr Z. M. Dlamini	Senior Medical Officer of Health, Ministry of Health, Mbabane, Swaziland
Dr J. A. Espmark	Department of Virology, State Laboratory of Biology, Stockholm, Sweden
Dr F. Fenner (GC)	Director, Centre for Resource and Environmental Studies, The Australian National University, Canberra, Australia (*Rapporteur*)
Dr J. S. Moeti (GC)	Director of Medical Services, Ministry of Health, Gaborone, Botswana (*Chairman*)

11. IRAQ: 5–15 October 1978 (WHO/SE/78.127)
and
12. SYRIAN ARAB REPUBLIC: 15–22 October 1978 (WHO/SE/78.126)

Dr R. Netter (GC)	Director-General, National Health Laboratory, Paris, France (*Chairman*)
Dr M. Chamsa	Assistant Director, Organization of Medical Services, Red Lion and Sun Society of Iran, Teheran, Iran

13. UGANDA: 11–27 October 1978 (AFR/Smallpox/88)

Dr A. Deria (GC)	Director, Department of Public Health, Ministry of Health, Mogadishu, Somalia (*Chairman*)
Dr Kalisa Ruti (GC)	Medical Director, Expanded Programme on Immunization, Department of Public Health, Kinshasa, Zaire (*Rapporteur*)
Dr Y. P. Rikushin	Chief, Department of Epidemiology, Pasteur Institute, Leningrad, USSR

14. SUDAN: 15–29 November 1978 (WHO/SE/79.134)

Dr A. M. Fergany	Adviser, Ministry of Health, Oman (*Chairman*)
Dr W. Koinange (GC)	Chief Deputy Director of Medical Services, Ministry of Health, Nairobi, Kenya
Dr C. Lerche	Director, National Institute of Public Health, Oslo, Norway (*Vice-Chairman*)
Dr S. S. Marennikova (GC)	Chief, Laboratory of Smallpox Prophylaxis, Moscow Research Institute for Viral Preparations, Moscow, USSR
Dr G. Meiklejohn	Professor of Medicine, University of Colorado Medical Center, Denver, CO, USA (*Rapporteur*)
Dr D. A. Robinson	Community Physician, Communicable Disease Surveillance Centre, London, England
Ato Yemane Tekeste	Project Manager, Smallpox Eradication Programme, Addis Abeba, Ethiopia

15. ANGOLA: 5–16 February 1979 (AFR/Smallpox/89)

Dr Kalisa Ruti (GC)	Medical Director, Expanded Programme on Immunization, Department of Public Health, Kinshasa, Zaire (*Co-Rapporteur*)
Dr Bichat A. Rodrigues (GC)	Regional Coordinator for the South-East Region, Ministry of Health, Brasilia, Brazil (*Chairman*)
Dr Cabral A. J. Rodrigues	National Director of Preventive Medicine, Secretariat for International Cooperation, Maputo, Mozambique (*Co-Rapporteur*)

16. BOTSWANA, LESOTHO AND SWAZILAND: 5–23 March 1979 (AFR/Smallpox/90)

Dr D. Chilemba	Chief Medical Officer, Ministry of Health, Lilongwe, Malawi
Dr A. Deria (GC)	Director, Department of Public Health, Ministry of Health, Mogadishu, Somalia
Dr P. E. M. Fine	Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, London, England
Dr W. Koinange (GC)	Chief Deputy Director of Medical Services, Ministry of Health, Nairobi, Kenya (*Chairman*)
Dr G. Meiklejohn	Professor of Medicine, University of Colorado Medical Center, Denver, CO, USA (*Rapporteur*)

Dr E. A. Smith	Director of Medical Services, Federal Ministry of Health, Lagos, Nigeria
Dr I. Tagaya (GC)	Director, Department of Enteroviruses, National Institute of Health, Tokyo, Japan

17. DEMOCRATIC YEMEN: 3–11 June 1979 (WHO/SE/79.140)

Dr F. Jurji	Director of Epidemiology and Quarantine, Directorate General of Preventive Medicine, Ministry of Health, Baghdad, Iraq
Dr T. Kitamura	Chief, Division of Poxviruses, National Institute of Health, Tokyo, Japan (*Chairman*)
Dr V. Šerý	Chief, Department of Tropical Diseases, Postgraduate School of Medicine, Prague, Czechoslovakia

18. YEMEN: 2–10 June 1979 (WHO/SE/79.139)

Dr J. M. Aashi (GC)	Assistant Director-General of Preventive Medicine, Ministry of Health, Riyadh, Saudi Arabia (*Co-Chairman*)
Dr T. J. Geffen	Director, Communicable Diseases Division, Department of Health and Social Security, London, England (*Rapporteur*)
Dr R. Netter (GC)	Director-General, National Health Laboratory, Paris, France (*Co-Chairman*)

19. DJIBOUTI: 9–18 October 1979 (WHO/SE/79.147)

Dr N. C. Grasset	Epidemiologist, Douvaine, France; formerly Regional Adviser for Smallpox Eradication in the WHO Regional Office for South-East Asia, New Delhi, India (*Rapporteur*)
Dr T. Nacef	Director, Department of Preventive and Social Medicine, Ministry of Public Health, Tunis, Tunisia
Dr R. Netter (GC)	Director-General, National Health Laboratory, Paris, France (*Chairman*)

20. ETHIOPIA: Preliminary visit: 3–18 April 1979; final visit: 1–19 October 1979 (WHO/SE/79.148)

Dr R. N. Basu (GC)	Assistant Director-General of Health Services, Directorate General of Health Services, New Delhi, India
Dr Z. M. Dlamini	Director of Medical Services, Ministry of Health, Mbabane, Swaziland
Dr K. R. Dumbell (GC)	Head, Department of Virology, The Wright–Fleming Institute of Microbiology, St Mary's Hospital Medical School, London, England
Dr J. Kostrzewski (GC)	Secretary, Medical Section, Polish Academy of Sciences, Warsaw, Poland
Dr H. B. Lundbeck (GC)	Director, National Bacteriological Laboratory, Stockholm, Sweden
Dr T. Olakowski	Deputy Director, National Tuberculosis Institute, Warsaw, Poland
Dr N. A. Ward	Save the Children Fund, London, England

Final visit: 1–19 October 1979

Dr K. R. Dumbell (GC)	Head, Department of Virology, The Wright–Fleming Institute of Microbiology, St Mary's Hospital Medical School, London, England (*Rapporteur*)
Dr D. A. Henderson (GC)	Dean, School of Hygiene and Public Health, The Johns Hopkins University, Baltimore, MD, USA (*Rapporteur*)

Dr J. Kostrzewski (GC)	Secretary, Medical Section, Polish Academy of Sciences, Warsaw, Poland
Dr I. Noormahommed	Deputy National Director of Preventive Medicine, Ministry of Health, Maputo, Mozambique
Dr D. A. Robinson	Epidemiologist, Communicable Disease Surveillance Centre, London, England
Dr A. A. Stroganov	Assistant Professor, Central Institute for Advanced Medical Training, Communicable Disease Department, Moscow, USSR

21. KENYA: 1–19 October 1979 (WHO/SE/79.149)

Dr R. N. Basu (GC)	Assistant Director-General of Health Services, Directorate General of Health Services, New Delhi, India (*Chairman*)
Dr Kalisa Ruti (GC)	Medical Director, Expanded Programme on Immunization, Department of Public Health, Kinshasa, Zaire
Dr S. S. Marennikova (GC)	Chief, Laboratory of Smallpox Prophylaxis, Moscow Research Institute for Viral Preparations, Moscow, USSR
Dr G. Meiklejohn	Professor of Medicine, University of Colorado Medical Center, Denver, CO, USA (*Rapporteur*)
Dr J. S. Moeti (GC)	Senior Medical Officer of Health, Ministry of Health, Gaborone, Botswana

22. SOMALIA: 1–21 October 1979 (WHO/SE/79.146)

Dr J. M. Aashi (GC)	Assistant Director-General of Preventive Medicine, Ministry of Health, Riyadh, Saudi Arabia
Dr Z. M. Dlamini	Director of Medical Services, Ministry of Health, Mbabane, Swaziland
Dr T. J. Geffen	Director, Communicable Diseases Division, Department of Health and Social Security, London, England (*Rapporteur*)
Dr H. B. Lundbeck (GC)	Director, National Bacteriological Laboratory, Stockholm, Sweden (*Chairman*)
Dr J. D. Millar	Assistant Director for Public Health Practice, Center for Disease Control, Atlanta, GA, USA
Dr P. N. Shrestha (GC)	Chief, Planning Division, Tribhuvan University Institute of Medicine, Kathmandu, Nepal

ANNEX 24.2. PARTICIPANTS IN THE CONSULTATION ON THE WORLDWIDE CERTIFICATION OF SMALLPOX ERADICATION AND MEMBERS OF THE GLOBAL COMMISSION

The numbers in parentheses have the following significance:
(1) participated in the 1977 Consultation;
(2) attended the 1978 meeting of the Global Commission;
(3) attended the 1979 meeting of the Global Commission.

Participants in the Consultation and Members of the Global Commission

Dr J. M. Aashi (1, 2, 3)	Assistant Director-General of Preventive Medicine, Ministry of Health, Riyadh, Saudi Arabia
Dr J. Azurin (1, 2, 3)	Under-Secretary of Health, Department of Health, Manila, Philippines
Dr R. N. Basu (1, 2, 3)	Assistant Director-General of Health Services, Directorate General of Health Services, New Delhi, India

Dr P. N. Burgasov (2, 3)	Deputy Minister of Health, Moscow, USSR
Dr H. Corral (1)	Director-General, Ministry of Health, Quito, Ecuador
Dr A. Deria (1, 2, 3)	Director, Department of Public Health, Ministry of Public Health, Mogadishu, Somalia
Dr K. R. Dumbell (1, 2, 3)	Head, Department of Virology, The Wright–Fleming Institute of Microbiology, St Mary's Hospital Medical School, London, England
Dr F. Fenner (1, 2, 3; Chairman: 1, 2, 3)	Director, Centre for Resource and Environmental Studies, The Australian National University, Canberra, Australia
Dr D. A. Henderson (1, 2, 3)	Dean, School of Hygiene and Public Health, The Johns Hopkins University, Baltimore, MD, USA
Dr Kalisa Ruti (3)	Medical Director, Expanded Programme on Immunization, Kinshasa, Zaire
Dr J. Kilgour (1)	Head, International Health Division, Department of Health and Social Security, London, England
Dr W. Koinange (1, 2, 3; Vice-Chairman: 1)	Director, Division of Communicable Disease Control, Ministry of Health, Nairobi, Kenya
Dr J. Kostrzewski (1, 2, 3; Vice-Chairman: 2, 3)	Secretary, Medical Section, Polish Academy of Sciences, Warsaw, Poland
Dr H. B. Lundbeck (1, 2, 3)	Director, National Bacteriological Laboratory, Stockholm, Sweden
Dr S. S. Marennikova (1, 2, 3)	Chief, Laboratory of Smallpox Prophylaxis, Moscow Research Institute for Viral Preparations, Moscow, USSR
Dr J. S. Moeti (1, 2, 3)	Senior Medical Officer of Health, Ministry of Health, Gaborone, Botswana
Dr C. Mofidi (1, 2)	Minister of Higher Education and Science, Teheran, Iran
Dr R. Netter (1, 2, 3)	Director-General, National Health Laboratory, Paris, France
Dr Bichat A. Rodrigues (3)	Executive Secretary, National Council of Health, Brasilia, Brazil
Dr P. N. Shrestha (2, 3)	Chief, Planning Division, Tribhuvan University Institute of Medicine, Kathmandu, Nepal
Dr I. Tagaya (2, 3)	Director, Department of Enteroviruses, National Institute of Health, Tokyo, Japan
Dr P. F. Wehrle (1, 2, 3; Rapporteur: 1, 2, 3)	Hastings Professor of Pediatrics, Los Angeles County—University of Southern California Medical Center, Los Angeles, CA, USA
Dr Zhang Yihao (3)	Deputy Director, National Serum and Vaccine Institute, Beijing, China

WHO Advisers

Dr H. Corral (1)	Director-General, Ministry of Health, Quito, Ecuador
Dr W. H. Foege (2)	Director, Center for Disease Control, Atlanta, GA, USA
Dr T. J. Geffen (2)	Director, Communicable Diseases Division, Department of Health and Social Security, London, England
Dr N. C. Grasset (2)	Epidemiologist, Douvaine, France
Dr Jiang Yu-tu (3)	Military Academy of Medical Sciences, Beijing, China
Dr G. Meiklejohn (2, 3)	Professor of Medicine, University of Colorado Medical Center, Denver, CO, USA
Dr W. Nicol (2)	Area Medical Officer, Birmingham, England
Dr A. G. Rangaraj (2)	Epidemiologist, Nilgiris District, Madras, India
Dr Parviz Rezai (2)	Deputy Director-General, Communicable Diseases Control and Malaria Eradication, Ministry of Health and Welfare, Teheran, Iran
Ato Yemane Tekeste (2, 3)	Programme Manager, Smallpox Eradication Programme, Addis Abeba, Ethiopia

WHO Regional Office Staff

Africa:
Dr A. H. Abou-Gareeb (3), Director, Disease Prevention and Control, Brazzaville, Congo
Dr C. Algan (1, 2), Medical Officer, Health Services, Brazzaville, Congo
Dr Z. Islam (2, 3), Medical Officer, Epidemiological Surveillance of Communicable Diseases Project, Nairobi, Kenya
Dr L. N. Khodakevich (2, 3), Interregional Medical Officer, Smallpox Eradication Project, Addis Abeba, Ethiopia

Americas:
Dr J. Bond (3), Medical Officer, Communicable Diseases, Washington, DC, USA
Dr C. H. Tigre (2), Scientist, Communicable Diseases, Washington, DC, USA
Dr K. A. Western (1, 2), Chief, Communicable Diseases, Washington, DC, USA

South-East Asia:
Dr L. N. Khodakevich (1), Medical Officer, Smallpox Eradication, New Delhi, India

Europe:
Dr M. R. Radovanovic (1, 2), Medical Officer, Epidemiological Surveillance of Communicable Diseases, Copenhagen, Denmark

Eastern Mediterranean:
Dr P. Chasles (1), Medical Officer, Communicable Diseases Prevention and Control, Alexandria, Egypt
Dr F. Partow (2), Medical Officer, Communicable Diseases Prevention and Control, Alexandria, Egypt

Western Pacific:
Dr B. C. Dazo (3), Scientist, Communicable Diseases, Manila, Philippines
Dr R. R. Lindner (1), Medical Officer, Communicable Diseases, Manila, Philippines
Dr Chin Wentao (2), Consultant Medical Officer, Communicable Diseases, Manila, Philippines

WHO Headquarters Staff

Dr I. D. Ladnyi (1, 2, 3), Assistant Director-General
Dr A. Zahra (2, 3), Director, Division of Communicable Diseases
Dr I. D. Carter (2, 3), Epidemiologial Surveillance of Communicable Diseases
Dr H. J. Schlenzka (2), Legal Division
Dr E. Shafa (1, 2), Expanded Programme on Immunization

Smallpox Eradication unit:

Dr I. Arita (1, 2, 3), Chief Medical Officer
Dr J. G. Breman (1, 2, 3), Medical Officer
Mr R. N. Evans (2, 3), Technical Officer
Dr A. I. Gromyko (1, 2, 3), Medical Officer
Mr R. O. Hauge (1), Consultant Technical Officer
Dr Z. Ježek (2, 3), Medical Officer
Mr J. Magee (2, 3), Information Officer
Dr J. L. Tulloch (2, 3), Consultant Medical Officer
Mr. J. F. Wickett (1, 2, 3), Administrative Officer