

THE GLOBAL STATUS OF SMALLPOX ERADICATION

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The achievement of this region in altering its status from one of the most highly endemic in the world to a virtually smallpox-free state in a period of less than three years, has been an inspiration to countries throughout the world. The fact that virtually every sort of difficulty experienced by programmes elsewhere has been encountered and satisfactorily dealt with has provided a fund of experiences and techniques applicable in many parts of the world.

While programmes in western and central Africa have been proceeding at an unprecedented pace, programmes in other parts of the world have also been gaining momentum. It is well, I believe, to take a few minutes at the beginning of this Seminar to view the developments in the smallpox eradication programme from a global vantage point.

As you know, the global programme commenced in January 1967, and is now in its third year. During the first year, reported cases actually increased from 89,000 to over 123,000. (Figure 1) In part, this may be attributed to better reporting but, in part, longer term cyclical trends may have been responsible. During 1968, despite increasingly improved reporting, the incidence decreased by 40% and, in 1969, a further decline of almost 45% has been observed to date. Based on present trends, it is estimated that about 45,000 cases will be recorded during 1969.

Figures 2 and 3 depict smallpox rates by country in 1968 and 1969 (projected estimate). These show a reduction in the number of countries recording 5.0 or more cases per 100,000 population. In 1968, 10 countries recorded rates in excess of 5.0 per 100,000; 13 countries recorded such rates in 1967; and, in 1966, 15 countries recorded rates of this magnitude or greater. Based on present trends, it is likely that only two countries, Indonesia and the Democratic Republic of the Congo, will record rates of 5.0 per 100,000 or greater during 1969.

South America (Figure 4)

In the Americas in 1969, cases have been recorded only in Brazil, the sole endemic country in this Region. The eradication programme has been intensified in Brazil during the past year. The number vaccinated in the systematic vaccination campaign is approaching 2 million per month; almost 35 million have been vaccinated since the programme began. Smallpox incidence began declining approximately a year ago and, to date in 1969, 861 cases have been recorded, a decrease of 30% from the number recorded last year at this time. Neighboring countries have also intensified vaccination and surveillance activities.

Africa, West and Central (Figure 5)

As the progress of smallpox eradication in western and central Africa will be discussed subsequently in detail, I shall note only that the curve depicting incidence by month is by far the most dramatic of those for any endemic region. This is even more remarkable when it is recognized that since the intensified programme of surveillance began in October 1968, reporting has been much more complete in your countries than in most others. It is also worth mentioning that of the 10 countries with the highest rates of smallpox in the world in 1968, 5 were in this area.

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Africa, East and South (Figure 6)

During 1969, recorded cases of smallpox in east and southern Africa declined more than 50% from the number reported in 1968 during the same period of time. Smallpox incidence is presently at a record low level. No cases have been reported to date in Rwanda, Swaziland or Zambia and only three countries, the Democratic Republic of the Congo, Ethiopia and Sudan, have reported more than 100 cases in this year.

In the Democratic Republic of the Congo, 635 cases have been recorded in 1969 compared to 1,602 cases at this time last year. In this country of 16.7 million persons, vaccination activities have been sharply increased during the past two years as indicated below:

	<u>Eradication Programme</u>	<u>No. of Vaccinations</u>	
		<u>Other Health Services</u>	<u>Total</u>
1967	302,000		302,000
1968	2,275,000	574,000	2,849,000
1969 (5 months only)	1,701,000	1,618,000	3,319,000

Since the beginning of 1969, special efforts have been made to improve the completeness of routine case notification and plans are being developed to undertake intensified investigation and containment activities later in the year. A successful programme in the Congo is particularly important as this country occupies a strategic position in Africa, having common borders with nine other countries.

In 1969 to date, Ethiopia and Sudan have together recorded a total of 272 cases, an increase of 25% over the number of cases recorded at this time last year. In the Sudan, smallpox outbreaks commenced in mid-December in the southern part of the country and continued into May. A total of 121 cases were detected in 34 towns and 4 provinces. Investigations did not begin until several months after the outbreaks began and the original source of infection could not be determined. The outbreaks coincided with a very large seasonal migration of agricultural workers into east central Sudan from the southern part of the country and from Ethiopia. Over 900,000 vaccinations were performed in an effort to contain the outbreak, which has now receded, as in previous years, with the onset of rains and the return of the agricultural workers to their homes in southern Sudan and Ethiopia. It is possible, however, that residual foci of smallpox may persist in this area. In the meantime, an eradication programme has commenced in Sudan. At present, activities are principally concentrated in the central part of the country.

Little information is available regarding smallpox activities in Ethiopia. No formal programme of control or eradication is planned. Reporting is recognized to be very incomplete and it is reasonable to assume that the actual incidence of disease is many times that which is presently recorded.

Asia (Figure 7)

Smallpox incidence in Asia declined by 40% in 1968 and appears to be declining at a comparable rate in 1969. However, from one country to the next, progress in the smallpox programmes differs widely as do the trends in incidence and factors influencing these trends.

A very intensive programme is underway in Indonesia. The programme commenced in July 1968 and has progressively been extended throughout the country. Paradoxically, in 1969, the reported incidence of smallpox to date is little different from that in 1968. Reporting, however, has been greatly intensified and containment teams, initiated in January of this year, have steadily broadened their extent of activity. The impact of the vaccination programme in reducing reported incidence has thus been nullified by the improvement in notification. Comparatively few foci of smallpox are present outside of the island of Java, on which reside 65% of the population and on Sumatra. East Java with a population of 26 million has had no smallpox with the exception of a few importations, and these have been rapidly controlled. Intensive containment operations in parallel with the systematic vaccination programme have strongly curtailed smallpox in Central Java.

Increased notifications were received during 1968 from both Afghanistan and Nepal, and a further increase in 1969 from Nepal. In both countries, eradication programmes are steadily being intensified and more complete reporting is apparent.

A marked decline in smallpox occurred this year in East Pakistan which, in 1968, recorded its highest incidence in a decade. Although an eradication programme has begun, the fall in incidence must be attributed in part to the expected cyclical variation. The opposite pattern occurred in West Pakistan which is one of the few reporting areas which has recorded an increase in smallpox in 1969. An eradication programme in West Pakistan is just beginning; surveillance activities have not yet been organized.

In India, an increased emphasis has been placed on vaccination of those never previously vaccinated, particularly pre-school children; the use of liquid vaccine has been totally abolished; vaccine storage has been improved; and the bifurcated needle is being substituted for the rotary lancet in the vaccination programme. Although reporting is still very incomplete and surveillance activities are still very limited, there appears to be a modest decline in incidence from 1968.

General Programme Activities

In the development of the eradication programme, initial efforts were directed toward the development of the technical and operational strategy. These were fully discussed by a Scientific Group on Smallpox Eradication which met in October 1967 and presented in a report (Technical Report Series No. 393). A "Handbook for Smallpox Eradication" was also written, which will be revised during 1969 to take into account the experience of the past two years. Additionally, a special manual which discusses the theory and practice of surveillance-containment operations was prepared.

Special seminars dealing with programme execution have been conducted in 1967 for countries in Asia and in November 1968 for countries in eastern and southern Africa. Others are being planned.

Because of the critical need for adequate supplies of freeze-dried vaccine which meet standards established by WHO, major efforts have been devoted to this problem. Assistance in the form of consultation, vaccine testing, equipment (in conjunction with UNICEF) and antigens for testing have been provided to laboratories throughout the world. To date, WHO consultants have visited 24 production laboratories; equipment, special reagents and testing materials have been provided to 30 laboratories. All countries have been urged to submit vaccine specimens regularly for testing purposes. These are tested either at the Rijks Institute, Netherlands, or the University of Toronto, Canada. This service has been increasingly used as shown in the following table:

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
No. of samples tested	12	43	83	167

A group of specialists in freeze-dried smallpox vaccine production met in April 1968, and developed a detailed manual describing the production of freeze-dried smallpox vaccine as grown on animal skin.

The needs for freeze-dried smallpox vaccine still exceed the production capacity in most endemic countries; other countries not sufficiently populous to support a vaccine production laboratory depend on vaccine donations to execute their programmes. Bilateral donations by the USSR of approximately 100 million doses per year and by the USA for countries in this region take care of most of the need. In addition, 14 countries have made donations to WHO. The amount of vaccine distributed by WHO has steadily increased as shown below:

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
No. of doses distributed (in 000's)	2,290	3,767	13,008	19,746

It is satisfying to note that almost all vaccinations now performed in endemic countries are performed with freeze-dried vaccine which conforms to the potency standards recommended by WHO. At the inception of the programme two years ago, it is doubtful that more than a quarter of the vaccinations in endemic countries were performed with satisfactory vaccine.

Recommended vaccination techniques have been altered substantially to provide simpler methods which assure higher take rates and use smaller quantities of vaccine. In 1967, the foot-operated jet injector was first employed for routine field operations after several years of testing and evaluation. It is now in widespread use in Brazil, in the Democratic Republic of the Congo, as well as in the countries of this area. It is being employed also in several other countries for special programmes of epidemic containment and for vaccination of large groups. Early in 1968, after a number of special field studies, the bifurcated needle was introduced for field use and has now been adopted in essentially all programmes. Employing bifurcated needles, vaccinators in eastern Africa have been able to vaccinate 400-500 persons daily, while realizing savings of several fold in vaccine. By the end of 1969, virtually all vaccinations in endemic countries will be performed either with the jet injector or the bifurcated needle, techniques unknown to routine vaccination programmes prior to the beginning of the global eradication effort.

Since the inception of the global programme, the importance of more complete reporting of cases of smallpox has been stressed and the majority of countries have made special efforts to strengthen their reporting and surveillance activities. In addition to various administrative measures to assure the regular notification of cases from health facilities throughout their countries, several have initiated the telegraphic reporting of cases; special case investigation teams have been established in many areas; and smallpox surveillance reports are now published regularly by five countries.

To facilitate the more rapid exchange of current information regarding the global status of smallpox and eradication activities throughout the world, WHO has, since June 1968, prepared a special surveillance report on smallpox which is published every two weeks in the Weekly Epidemiological Record. To permit more rapid and detailed analysis of disease trends, smallpox morbidity data is now being recorded and tabulated by computer.

Intercountry co-ordination of surveillance as well as vaccination activities is assuming increased importance and to facilitate this activity, special WHO teams will be created next year.

Reliable reporting rests in large measure upon the accurate clinical diagnosis of the disease. To assist health personnel and others responsible for the reporting of smallpox, WHO is producing initially for the African countries and subsequently for those in Asia, a series of teaching aids, including posters and slides, which show cases of smallpox and varicella at different stages of the evolution of the rash. During October 1968, a WHO staff member and a photographer obtained 4,000 pictures of African patients with smallpox and varicella. These should be ready for distribution in a few months. It is anticipated that a similar series of photographs of Asian patients will be obtained during 1969.

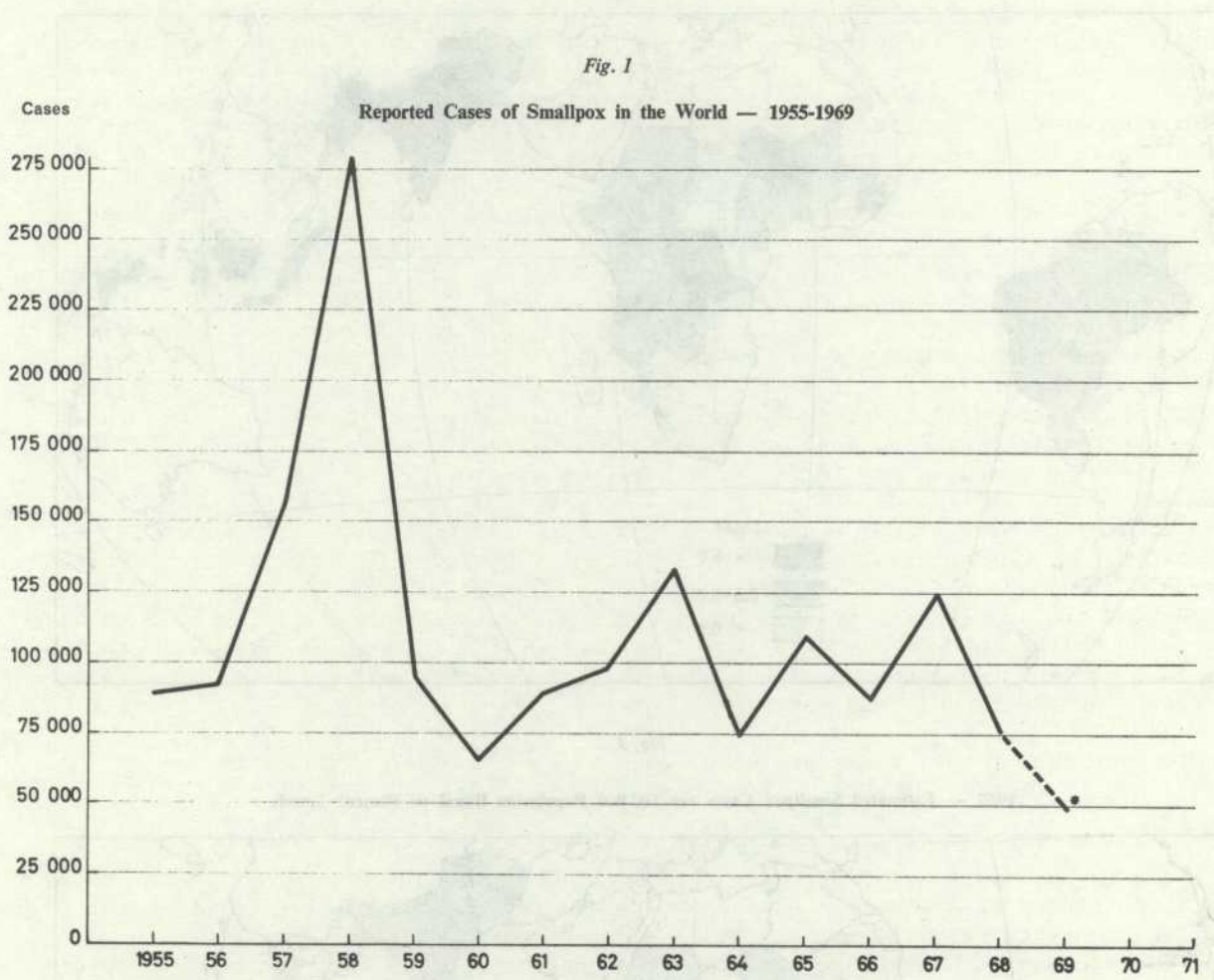
A network of diagnostic laboratories to provide geographically convenient diagnostic services to every country is also being developed by WHO. It is planned for each participating laboratory to be able to conduct at least three basic examinations for the identification of variola virus; a microscopic smear examination, a precipitation-in-gel test and definitive identification through virus isolation on the chorioallantoic membrane of chick embryos. A 48-page manual has been prepared entitled "Guide to the Laboratory Diagnosis of Smallpox" which describes in detail and pictorially each of the tests noted. Arrangements have been made with collaborating laboratories to produce requisite antisera and antigens and additional materials for each of the tests have been procured.

Training courses have already been conducted in the Americas and a network of 12 diagnostic centres established. During 1969 and 1970, it is planned for additional courses to be conducted in other regions. Following the training course and the designation of laboratories as diagnostic centres, arrangements are being made to distribute twice each year to each of the laboratories specimens as "unknowns" to ensure that each of the laboratories has retained its competence or, if not, to assist in retraining the technicians concerned.

Research studies of many types are also being fostered or sponsored by WHO.

Summary

As I hope to have portrayed, the past three years have been active ones indeed, not only in this part of Africa but throughout the world. We are now beginning to see some very concrete results but this is, of course, only a beginning. As yet, no major endemic region has become smallpox-free and this, after all, is our real objective. If the target of a space programme is to land a man on the moon, the programme can hardly be termed a success if the man only gets part way there. We, therefore, await, with great anticipation, the day when countries in this vast area consistently record nil cases of smallpox, a day that is hopefully only months in the future.



* Estimated on present trends.

Fig. 2

1968 — Smallpox Cases per 100 000 Population

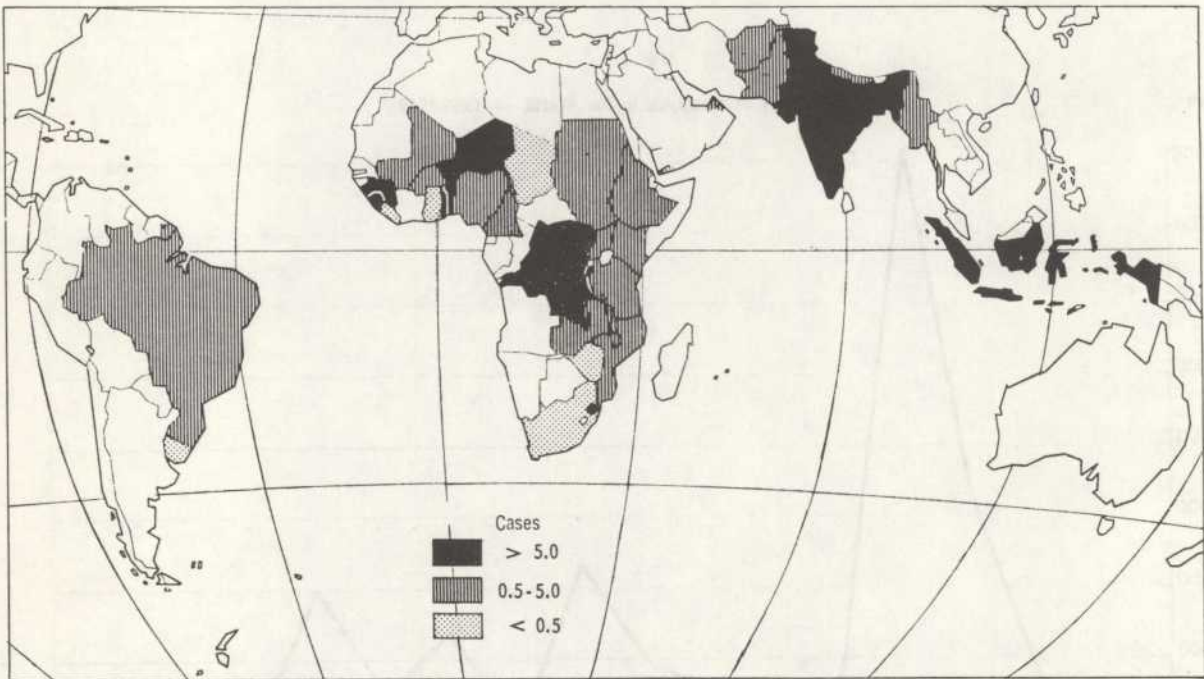


Fig. 3

1969 — Estimated Smallpox Cases per 100 000 Population Based on Present Trends

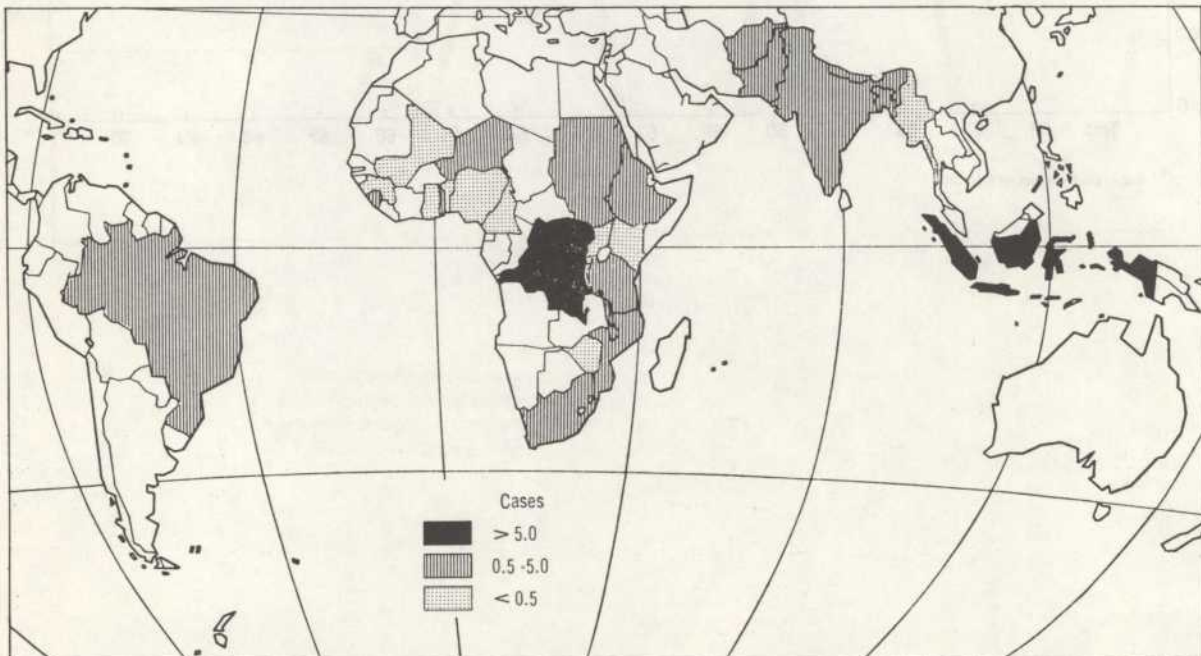
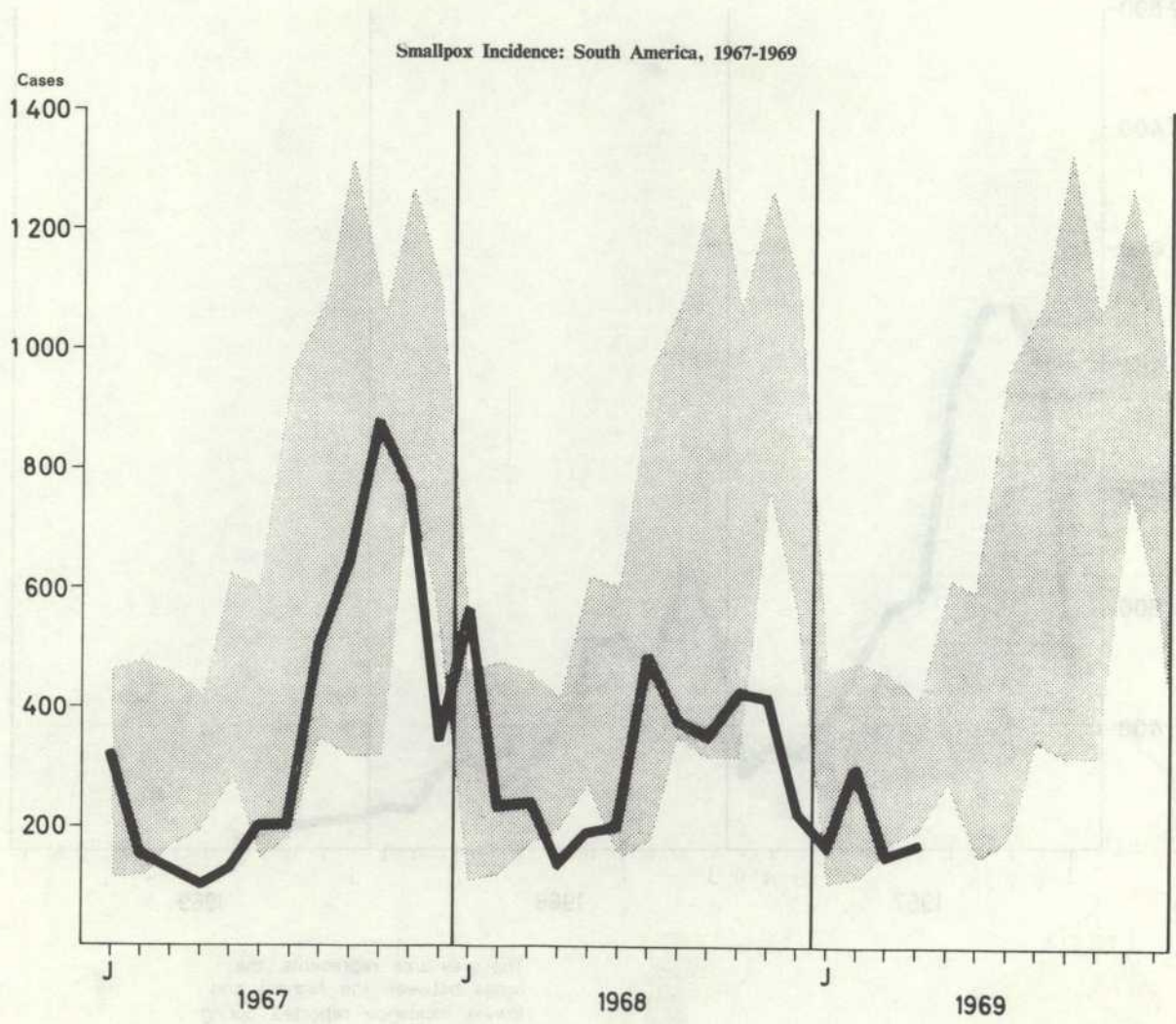


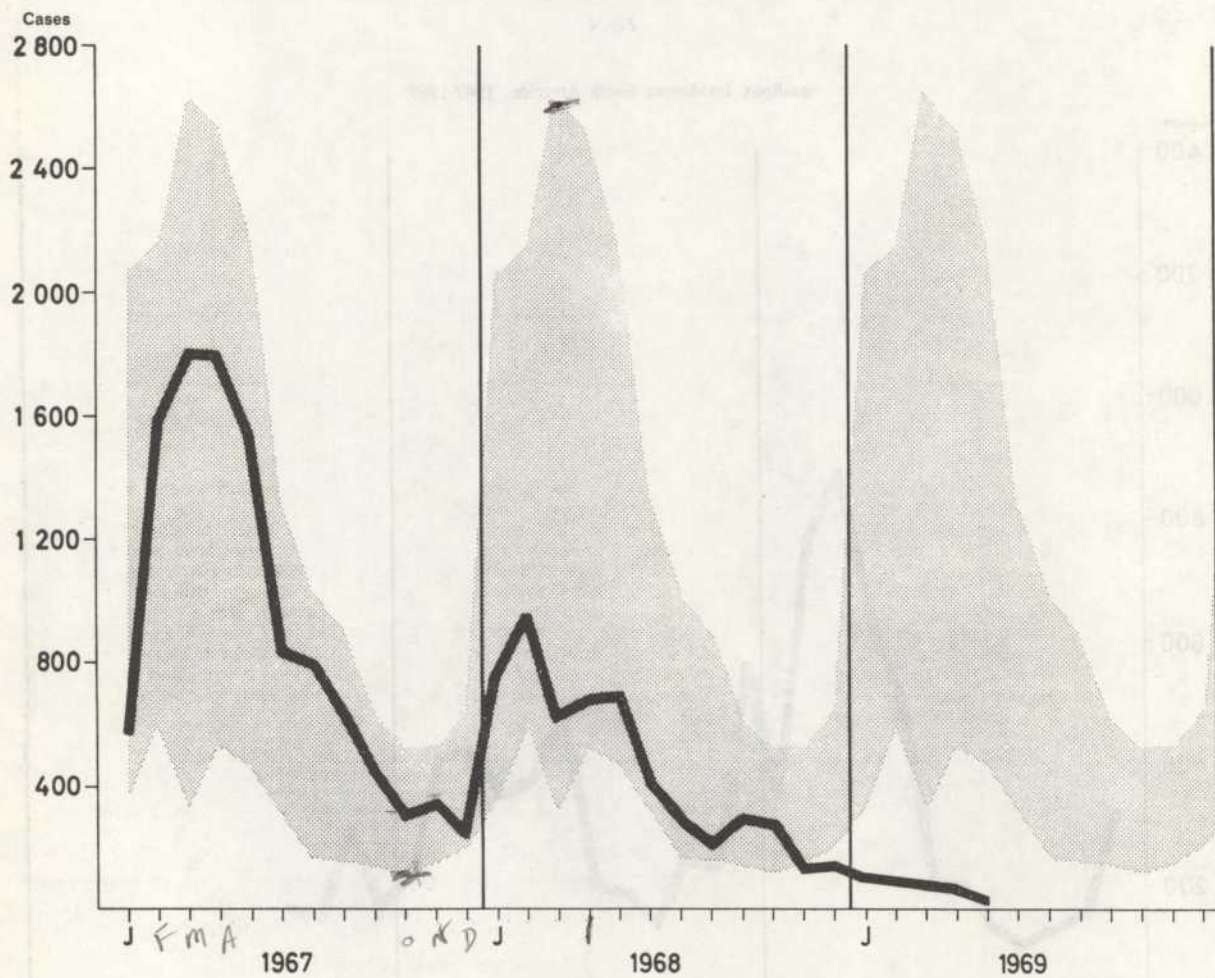
Fig. 4



The grey area represents the range between the highest and lowest incidence reported during the 5-year period 1962-1966

Fig. 5

Smallpox Incidence: Africa, West and Central, 1967-1969

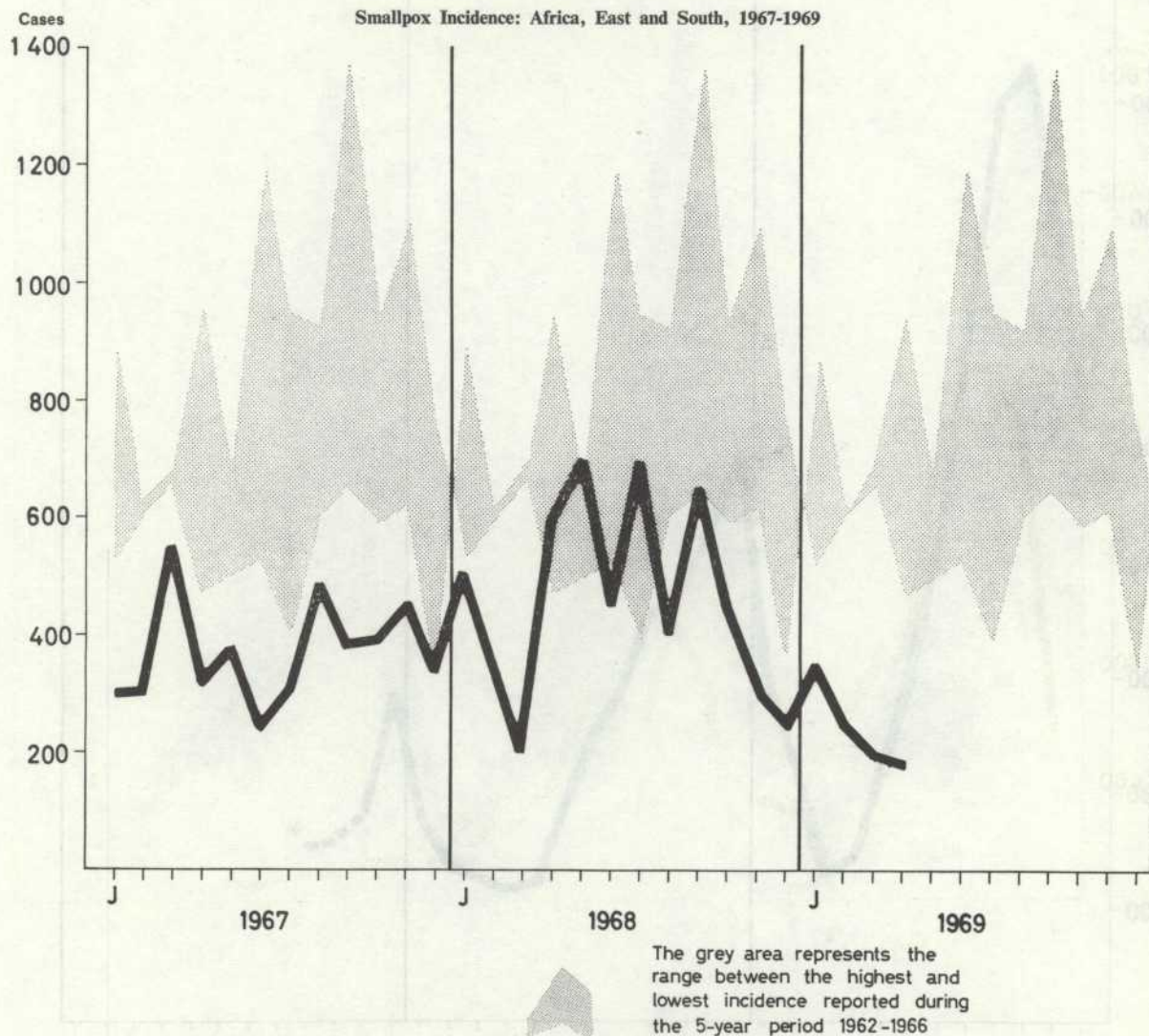


The grey area represents the range between the highest and lowest incidence reported during the 5-year period 1962-1966

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150

2600
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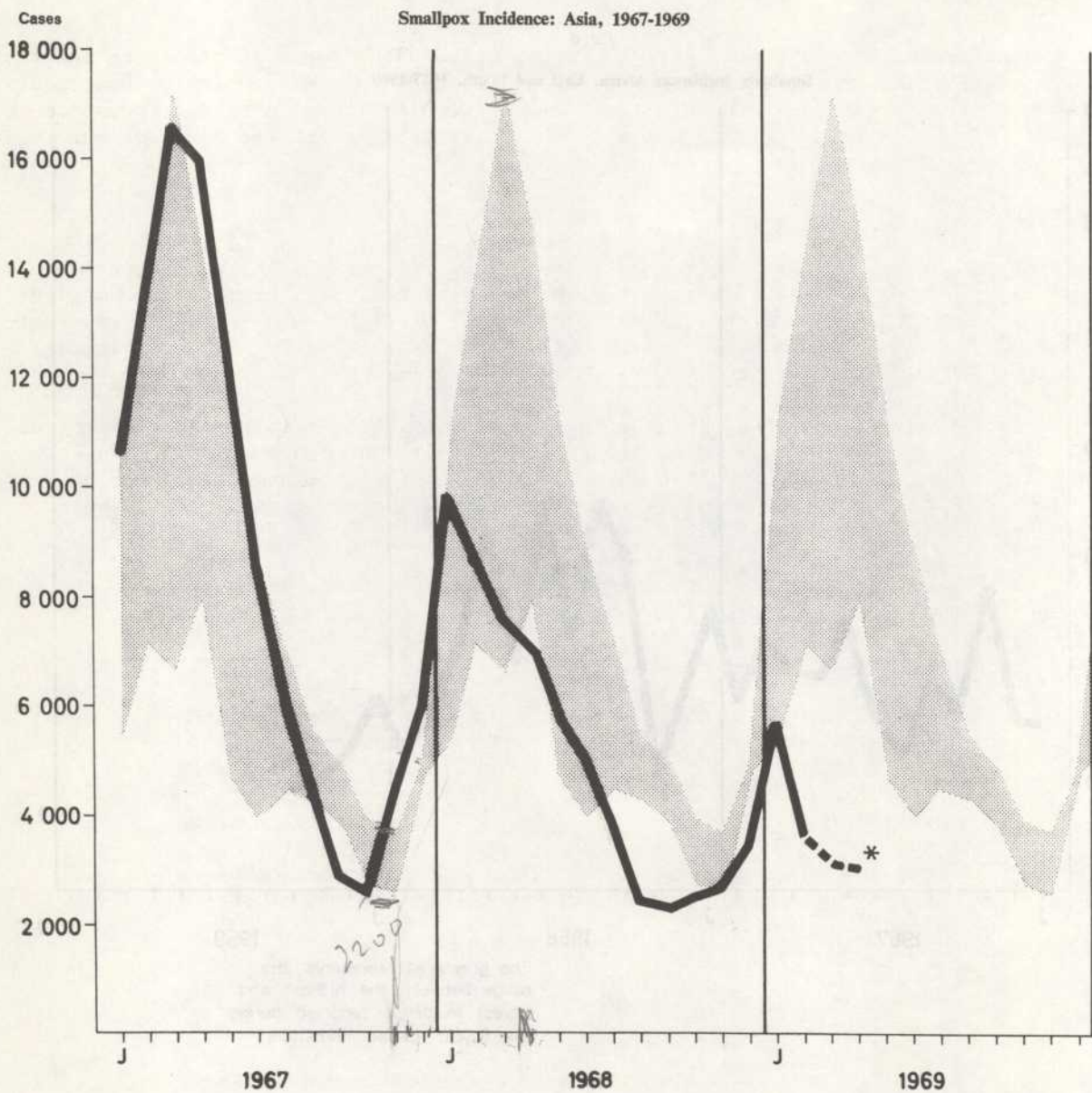
Fig. 6



17000

Fig. 7

Smallpox Incidence: Asia, 1967-1969



• Provisional Data.

The grey area represents the range between the highest and lowest incidence reported during the 5-year period 1962-1966