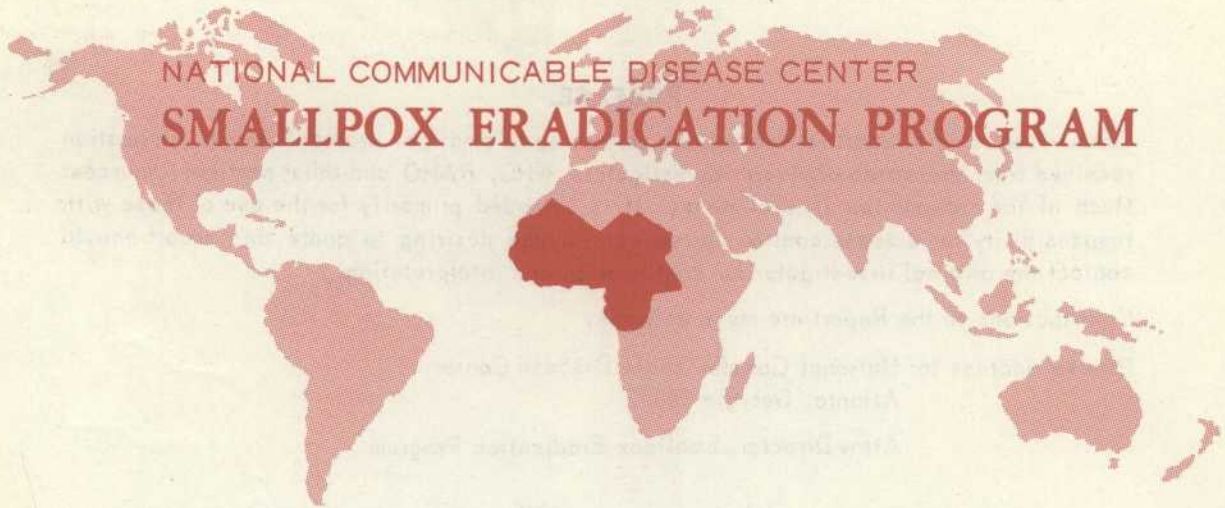


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VOLUME III, NUMBER 2
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THE SEP REPORT

**I. SMALLPOX ERADICATION IN WEST
AND CENTRAL AFRICA**

II. ERADICATION NOTES

**SPECIAL REPORT ON
"ERADICATION ESCALATION"
IN WEST AND CENTRAL AFRICA**

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

PREFACE

Summarized in this report is information pertaining to smallpox eradication and information received from Ministries of Health investigators, WHO, PAHO and other pertinent sources. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Report are most welcome.

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"Future nations will know by history that
the loathsome smallpox has existed."

Thomas Jefferson in a letter
to Edward Jenner in 1806

Faint, illegible text centered on the page, possibly bleed-through from the reverse side.

I. SMALLPOX ERADICATION IN WEST AND CENTRAL AFRICA

A. Smallpox Morbidity Data

Reports received by the World Health Organization as of March 19, 1969, show a total of 5,344 cases of smallpox throughout the 19-country area during 1968. In comparison with the 10,813 reported in 1967, this represents a decrease of 50.6 per cent between 1967 and 1968 (Table 1). A further and more striking decrease is seen in 1969 with reports received by March 19, 1969, 88 per cent below the 1968 figures for the same time period.

Figure 1 shows the monthly incidence of smallpox cases for 1968 and 1969. The average monthly incidence for the years 1960 through 1967 is also shown for the 19-country area.

C. Measles Morbidity and Vaccination Data

During 1968 a total of 169,060 measles cases were reported in the 19-countries participating in the West African Smallpox Eradication/Measles Control Program. The comparison of 1968 with 1967 data continue to show a marked reduction in incidence. Figure 2 shows the seasonal pattern for the 236,631 measles cases reported during 1967 and 169,060 cases reported for 1968.

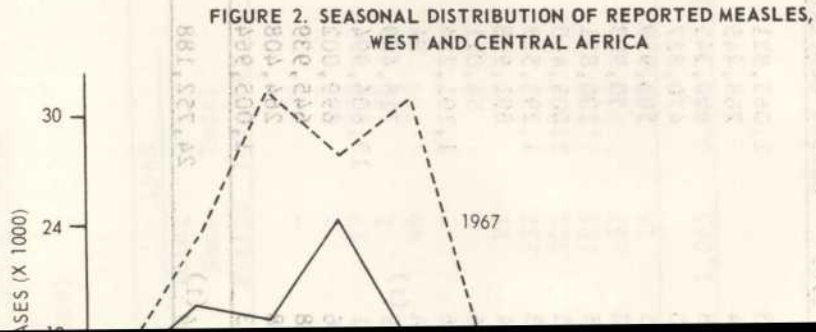


Table 3. Measles Vaccinations West and Central African Area
(Provisional Data)

Country	Cumulative Total 1967	Cumulative Total 1968*	1969		Cumulative Total January 1967- February 1969*	1968	
			January	February*		First and Second Quarter	Third and Fourth Quarter
Cameroon	276,685	298,854	24,000*	24,000	623,539	189,669	109,185
C.A.R.	94,518	84,231	7,000*	7,000	192,749	50,181	34,050
Chad	202,795	196,684	16,000*	16,000	431,479	108,530	88,154
Congo (B)	0	123,488	10,000*	10,000	143,488	86,981	36,507
Dahomey	177,706	206,926	18,000*	18,000	420,632	134,149	72,777
Gabon	35,506	21,397	1,000*	1,000	58,913	11,963	9,434
Gambia	55,774	34,912	1,172	3,000	94,858	28,189	6,723
Ghana	190,514	425,730	35,000*	35,000	686,244	213,716	212,014
Guinea	13,432	278,741	30,000*	30,000	352,173	176,417	102,324
Ivory Coast	303,547	302,600	25,000*	25,000	656,147	193,615	108,985
Liberia	0	47,178	0	5,000	52,178	11,184	35,994
Mali	310,774	288,001	30,674	32,000	661,449	215,728	72,273
Mauritania	NA	NA	NA	NA	NA	NA	NA
Niger	220,001	173,177	14,000*	14,000	443,158 ⁽¹⁾	54,712	118,465
Nigeria	1,217,706	3,115,291	150,000*	150,000	4,632,997	1,769,914	1,345,377
Senegal	108,729	444,728	37,000*	37,000	627,457	260,972	183,756
Sierra Leone	0	146,400	16,000*	16,000	178,400	104,079	42,321
Togo	173,322	81,841	15,294	8,000	278,457	49,184	32,657
Upper Volta	339,211	576,440	35,000*	35,000	985,651	310,582	265,858
Total	3,720,230	6,846,619	465,140	466,000	11,519,969⁽¹⁾	3,969,765	2,876,854

*-Including estimates based on previous performances during 1968.

⁽¹⁾-21,980 vaccinations included in country and cumulative totals.

NA-Not available.

Tactical priority in initiating mass vaccination activities was given to areas of highest smallpox incidence. Once begun, a regular vaccination schedule was not to be interrupted for epidemic control work in areas not yet reached by the mass campaign.

This latter tactic was questioned as several programs gained experience in dealing with smallpox outbreaks in unvaccinated areas. Experience demonstrated that outbreak control activities in unvaccinated areas often contributed to the sharp decline of smallpox incidence without detracting from the over-all effectiveness of mass campaign activities.

This led to a change in strategy later formalized under the name "Eradication Escalation", consisting of the following elements:

1. an aggressive search for smallpox cases whether in vaccinated or unvaccinated areas;
2. investigation of all cases and outbreaks to determine the source and delineate the limits of the outbreak;
3. control of all outbreaks whether in areas previously vaccinated or previously unvaccinated.

This approach is now considered of equal and, under certain circumstances, of even greater importance than systematic mass campaign activities.

The fall of 1968 appeared an opportune time to begin "eradication escalation" activities in West and Central Africa for several reasons:

1. based on past experience, smallpox incidence was expected to begin declining in June-July to reach the seasonal low point in September-October;
2. from 1960-1967, the ratio, on the average, of cases reported in September to cases reported during the ensuing eleven months is 1:27; however, the ratio of cases reported in April to cases reported during the next eleven months is 1:5. Therefore, one case of smallpox in September is on the average associated with five times as many cases during the next eleven months as is one case in April; and, conversely, preventing transmission from one case in September may be viewed as preventing about five times as many cases as the same effort applied in April. It appeared, that in West Africa the most efficient use of epidemic control teams could be made during the fall of the year, the period of lowest transmission, rather than during epidemic periods;
3. after 18 months of mass vaccination activity in West and Central Africa, the vaccination coverage of the total population was approaching 50 per cent; the general immunity level was expected to be at its highest point in history during October-December 1968;

It was hoped that, "eradication escalation" if maximally effective would completely break the chain of smallpox transmission---before the expected seasonal increase of cases in January 1969. If less than maximally effective, "eradication escalation activities" might cause a substantial reduction in the reservoir of smallpox cases, resulting in an end to smallpox before the end of the January-June epidemic season. At the very least, "eradication escalation" might result in a moderation of the usual increase of cases expected during the epidemic period so that smallpox transmission could be stopped during the fall of 1969, the next expected seasonal low.

B. Methodology of "Eradication Escalation"

1. Surveillance

Countries participating in "eradication escalation" activities have implemented a variety of techniques to locate smallpox outbreaks and improve on the information received through the usual surveillance systems:

- a. the use of newspapers, radio and letters has helped alert the public and solicit information on smallpox cases;
- b. widely dispersed informal surveillance systems have been developed through the cooperation of other health teams (malaria, leprosy), other government personnel (school teachers, rural mail carriers, agricultural project personnel), native authority figures (village and area chiefs), and volunteer agencies such as mission groups;
- c. several countries have instituted special active surveillance projects in areas suspected of having smallpox: these projects have resulted in visits made to each village leader in the suspect area or, in some cases, exhaustive house-by-house surveys to locate cases and vaccinate susceptibles;

2. Outbreak investigation

Consistent with the "eradication escalation" strategy stringent efforts were made to:

1. investigate all reported cases of smallpox;
2. delineate, during the course of an investigation, the full extent of the outbreak and to designate the target area for epidemic control vaccinations;
3. obtain information on the events which produced the outbreak;
4. collect laboratory specimens to verify smallpox.

3. Outbreak control

While various outbreak control methods have been used, the objective in all programs has been to vaccinate a geographic or functional area around the case or cases, the scope of which is determined by the outbreak investigation. This approach, therefore, is intermediate between the selective vaccination of contacts (as practiced to contain imported smallpox in non-endemic countries) and the indiscriminate mass campaigns required in the absence of outbreak investigation.

4. Communications

To facilitate the rapid communication of smallpox information, unofficial weekly telegraphic reports were sent to the SEP Regional Office in Lagos, to SEP Headquarters in Atlanta and to neighboring countries, giving the number of smallpox cases, their geographic location and the status of control activities. These data were published in an informal document and distributed to the countries.

C. Meeting of February 10

On February 10, representatives from the countries involved met in Lagos to evaluate progress in "eradication escalation" over the past four months. The results of information presented at this meeting are summarized below.

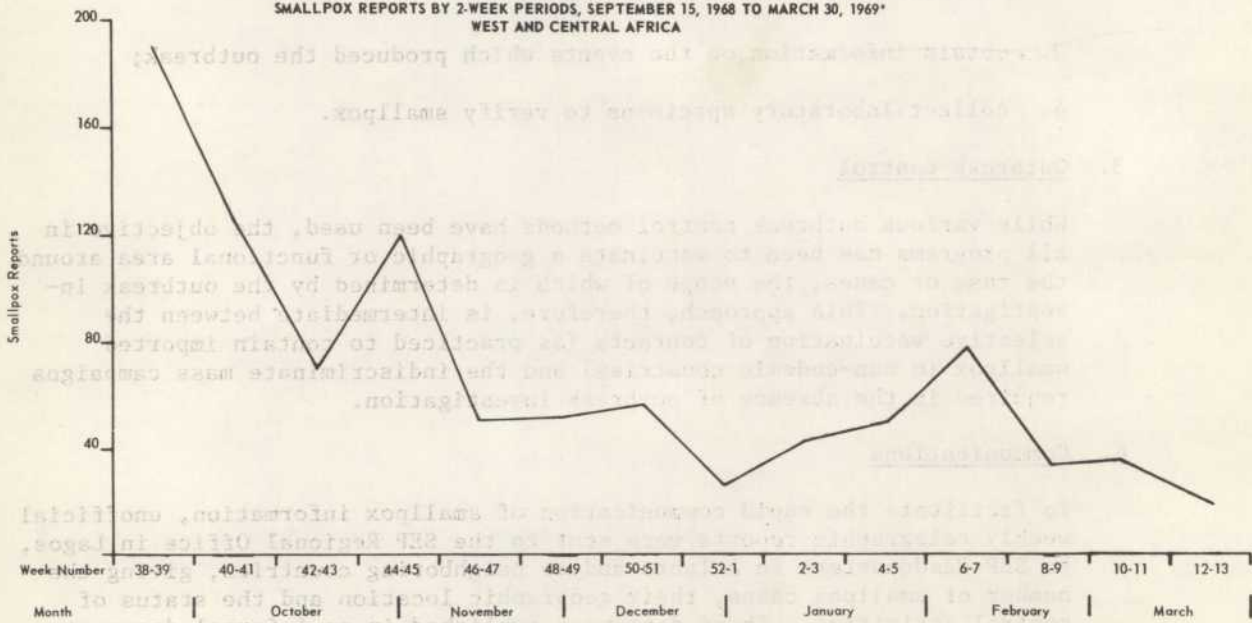
1. Reported smallpox cases

In 1968, as shown by Figure 1, monthly smallpox reports were consistently below the corresponding monthly mean for 1960-1967. The decline of reported cases from May-August, 1968, is interrupted in September: this reflects the results of intensified surveillance activities beginning at that time through which cases were uncovered previously undetected by means of the official reporting network.

Figure 3 shows the smallpox reports cabled to NCDC, Atlanta, by 2-week period from September-March. Reports have remained at approximately the same level since mid-November; significantly, no appreciable increase occurred in January, February and March, 1969, during the usual period of increased smallpox incidence.

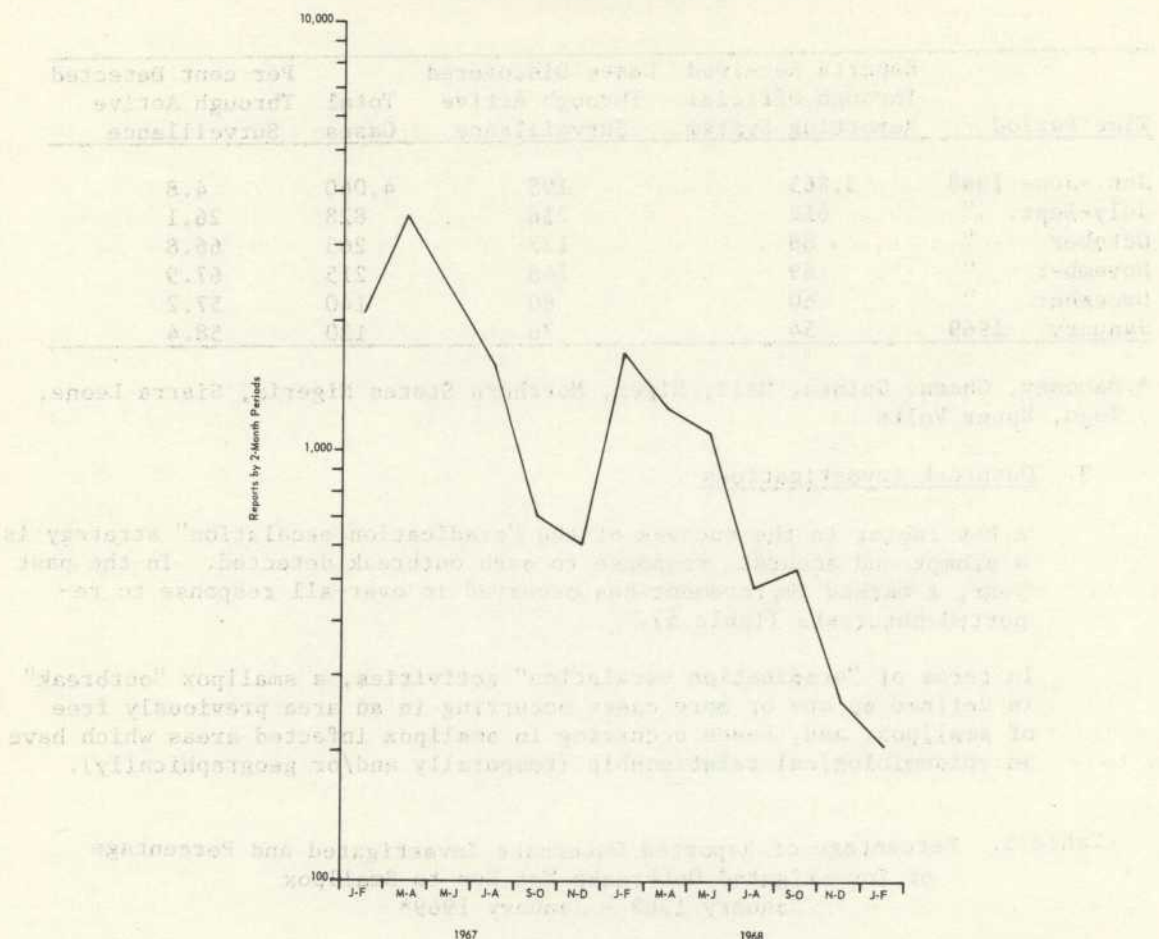
Figure 4 shows, on semilogarithmic paper, smallpox reports by 2-month periods since the first vaccination programs began in early 1967. Again, the continued decline in January and February of 1969 is in marked contrast to the January-February 1968 experience.

FIGURE 3
SMALLPOX REPORTS BY 2-WEEK PERIODS, SEPTEMBER 15, 1968 TO MARCH 30, 1969*
WEST AND CENTRAL AFRICA



* From weekly cabled reports

FIGURE 4
SMALLPOX REPORTS BY 2-MONTH PERIODS
JANUARY 1967 THROUGH FEBRUARY 1969
WEST AND CENTRAL AFRICA



2. Surveillance

The institution of "active surveillance", the search for smallpox cases not reported by the official surveillance system, has made it possible for countries to more accurately assess the level of actual smallpox incidence, better delineate endemic foci, and, consequently, improve the effectiveness of control activities.

Table 4 shows the influence of active surveillance activities on reported smallpox cases from January 1968-January 1969, in the nine countries represented at the February 10 meeting. Between a half and two-thirds of all cases reported by these countries since October have been detected through active surveillance.

Table 4. Comparison of Smallpox Reports Received through Official Reporting Systems and by Active Surveillance in Selected Countries* of West and Central Africa
January 1968 - January 1969

Time Period	Reports Received Through Official Reporting System	Cases Discovered Through Active Surveillance	Total Cases	Per cent Detected Through Active Surveillance
Jan.-June 1968	3,865	195	4,060	4.8
July-Sept. "	612	216	828	26.1
October "	88	177	265	66.8
November "	69	146	215	67.9
December "	60	80	140	57.2
January 1969	54	76	130	58.4

* Dahomey, Ghana, Guinea, Mali, Niger, Northern States Nigeria, Sierra Leone, Togo, Upper Volta

3. Outbreak investigations

A key factor in the success of the "eradication escalation" strategy is a prompt and accurate response to each outbreak detected. In the past year, a marked improvement has occurred in over-all response to reported outbreaks (Table 5).

In terms of "eradication escalation" activities, a smallpox "outbreak" is defined as one or more cases occurring in an area previously free of smallpox, and, cases occurring in smallpox infected areas which have an epidemiological relationship (temporally and/or geographically).

Table 5. Percentage of Reported Outbreaks Investigated and Percentage of Investigated Outbreaks Not Due to Smallpox
January 1968 - January 1969*

Time Period	Number of Reported Outbreaks	Number Investigated	Per Cent Investigated	Number of Outbreaks Not Smallpox on Investigation	Per Cent of Outbreaks Not Smallpox
Jan.-June 1968**	109	86	78.7	7	6.4
July-Sept. "	91	77	84.6	6	12.8
Oct.-Dec. "	71	69	97.2	12	17.4
January 1969	28	28	100.0	5	17.9

* Dahomey, Ghana, Guinea, Mali, Niger, Northern States Nigeria, Sierra Leone, Togo, Upper Volta.

** Incomplete for Northern States Nigeria.

The number of smallpox cases per outbreak has decreased since January 1968. Table 6 was constructed on the basis of known outbreaks and cases: it does not include all cases officially reported. It is unclear whether the decrease in cases per outbreak noted in January 1969 reflects a change in fashion in defining outbreaks or whether it reflects a more rapid response of control teams which prevents the large epidemics reported early in the program.

Table 6. Average Number of Smallpox Cases per Outbreak
January 1968 - January 1969*

Time Period	Outbreaks	Cases	Average Number of Cases per Outbreak
Jan.-June 1968	129	2,433	18.9
July-Sept. "	85	927	10.9
October "	21	267	12.7
November "	21	207	9.9
December "	17	205	12.1
January 1969	23	123	5.3

* Dahomey, Ghana, Guinea, Mali, Niger, Northern States Nigeria, Sierra Leone, Togo, Upper Volta.

4. Effect of surveillance - control activities on the mass vaccination campaign

Fears were expressed in September that ongoing vaccination activities would be severely crippled by the change in strategy. As shown in Table 7, the converse was true. Investigation-control countries diverted a relatively small proportion of mass campaign personnel to control activities and frequently acquired short term personnel to augment the program. Most countries have felt control activities did not jeopardize mass campaigns.

Table 7. Comparison of Smallpox Vaccinations
Fourth Quarter 1967 and Fourth Quarter 1968

	Fourth Quarter 1967	Fourth Quarter 1968	Per Cent Increase
Countries Participating in Investigation-Control Activities*	4,546,424	6,092,684	34
Other Countries	2,137,504	2,287,581	7
Total	6,683,928	8,380,265	25

* Minus Sierra Leone. Sierra Leone did not begin its vaccination campaign until 1968.

D. Summary of Countries Involved in "Eradication Escalation"

1. Guinea

In 1967, the rate of smallpox cases occurring in Guinea was 41 per 100,000 population, one of the highest smallpox rates in the world. Since the inception of its program of smallpox eradication, Guinea has made surveillance-control techniques an integral part of its strategy. In 1968, the rate of cases occurring in Guinea decreased to 9.5 per

100,000 population, and Guinea has reported no cases since January 25, 1969, at which time less than two-thirds of the population had been vaccinated.

At present, Guinea has a three-man team responsible for searching out smallpox cases in high risk areas, conducting investigation, and controlling outbreaks upon detection.

2. Sierra Leone

In 1967 Sierra Leone reported 70.1 cases of smallpox per 100,000 population, the highest smallpox rate in the world. (In comparison, India's smallpox rate in 1967 was 15.6 per 100,000 population). In 1968, when Sierra Leone initiated its program of smallpox eradication, outbreak control activities were heavily emphasized. Fifteen months after the program started, and with less than 50 per cent of the population vaccinated by the present campaign smallpox reports had decreased to very low levels.

Sierra Leone's regular mass vaccination teams operate on a system of rotation whereby one team each month serves as a surveillance-control team ("firefighting team"), operating out of Bo, central Sierra Leone. This team is capable of working independently to trace chains of infection and investigate and control outbreaks.

3. Mali

As with Sierra Leone and Guinea, Mali has employed surveillance-containment techniques since the beginning of its program. Mali reported 164 cases of smallpox in 1967, but has reported only one case since November 1968. Mali became smallpox free at a time when less than 50 per cent of the population had been vaccinated.

A control team, consisting of three vaccinators, is continuously available from the group of mass campaign vaccinators stationed in Bamako. The use of more than one such team has not been required.

4. Upper Volta

In Upper Volta 100 smallpox cases were reported in 1968, and 90 cases were reported in 1967. No cases have been reported since October 1968. Priority has been given in Upper Volta to outbreak control activities conducted by a local infirmier using multiple pressure technique of vaccination and, when needed, by SMP vaccinators using jet injectors. To verify the "smallpox free" status of Upper Volta, surveillance activities are being strengthened. An active surveillance system employing 604 mobile and stationary health facilities is being implemented.

5. Ghana

Ghana, which has been "smallpox free" in the past, has had nine importations of smallpox since January 1968 resulting in a total of 29 cases. This has required strong surveillance-control capabilities in Ghana.

Federal authorities in Accra undertake the investigation of all smallpox cases and assist local health authorities in control procedures.

The risk of importations of smallpox into Ghana has markedly decreased with the recent rapid decrease of cases occurring in neighboring Togo.

6. Togo

In 1967, Togo experienced the fifth highest rate of reported smallpox in the world; in 1968 it ranked second.

In September 1968, Togo initiated an "eradication escalation" program involving:

1. a team to investigate outbreaks and initiate control activities;
2. eight surveillance/vaccination teams to follow the investigation team to conduct a door-to-door search for smallpox cases and susceptibles in areas determined by the initial investigation;
3. eighteen one-man teams to conduct active surveillance and vaccination activities in the circumscription of Anecho, an area where smallpox cases were likely to occur.

The immediate effect of active surveillance was to greatly increase the number of reported cases, over 80 per cent of them discovered by the surveillance teams. Within four months, control activities had eliminated many smallpox foci, reducing transmission and reported cases despite the continued search of surveillance teams.

During January 1969, Togo reported 18 cases of smallpox to the World Health Organization; in February only seven cases were reported. Togo reported 5 cases during the first 2 weeks of March (by weekly telegraphic report) and no cases during the third or fourth weeks.

7. Dahomey

In 1966 and in 1967, Dahomey had the 3rd highest smallpox rate in the world; in 1968 the fifth highest rate in the world.

In late 1968, improvements were made in surveillance-control activities in Dahomey to reduce the continuing high smallpox rates. All medical facilities and volunteer groups were contacted and requested to assist in improving surveillance. Vaccine was distributed to all static health centers to permit immediate outbreak control activities in suspect areas. A full time control team was assigned to the program to conduct control activities in southern Dahomey.

Results have been very encouraging. Dahomey reported 3 cases of smallpox to WHO in December 1968, no cases in January 1969, and only two cases in early February 1969.

At the end of February, Dahomey launched a new active surveillance project in an effort to detect and eliminate any remaining foci.

8. Niger

Each year since 1966, Niger has consistently been ranked among the four countries in the world reporting the highest rates of smallpox. Niger reported 655 cases in the first six months of 1968, evidence of another high incidence year for the country. However, during the last six months of 1968, Niger reported only 24 cases of smallpox. Only seven cases were reported from Niger during January and February 1969, a marked reduction from the 232 cases reported during the corresponding months in 1968.

Niger has made improvements in its surveillance-control system. Static health centers are now required to report on the presence or absence of smallpox each week. Also, voluntary agencies are being called upon to assist in surveillance activities.

9. Nigeria

From 1965 - 1967, Nigeria reported between 4,000-5,000 cases of smallpox annually. In 1968, smallpox reports decreased to 1,832 cases. Western State Nigeria has reported no cases of smallpox since November 1968.

The Northern States of Nigeria have recently formed an epidemic control unit to investigate smallpox outbreaks and initiate outbreak control activities. Control activities are conducted in two stages: 1) vaccination of high risk persons in the immediate outbreak locality; 2) mass vaccination of all people within a 10-mile radius of the outbreak.

The Northern States of Nigeria have presented the largest challenge to escalation activities. The vast land area and large population combined with numerous widely scattered smallpox foci have made active surveillance difficult. The lack of sufficient program personnel has at times jeopardized control activities.

Despite the overwhelming difficulties smallpox reports are rapidly decreasing in Nigeria. In January 1969, only 21 cases of smallpox were reported to WHO. In February an increase to 40 cases was reported to WHO. Provisional data indicate that approximately 25 cases will be reported in March.

E. Summary

A change of strategy with primary emphasis on eliminating smallpox foci rather than on mass vaccination activities was instituted in September 1968. A review of program progress made from September 1968, to February 1969, revealed:

1. active surveillance activities now discover more smallpox cases than does the official reporting system;
2. all known smallpox outbreaks are now being investigated;
3. vaccination totals have not suffered from the change in strategy;
4. the attack on smallpox foci has been successful in preventing a seasonal increase in incidence in early 1969.

The success of escalation activities from September 1968 to February 1969 suggests that the approach should be continued in all countries still harboring smallpox until transmission has ceased.

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GAMBIA—Bathurst	---	Robert C. Helmholtz Lesley M. Jenkins
GHANA—Accra	Richard M. Cashin Director, USAID	David Melchinger, M.D. M. David Newberry
GUINEA—Conakry	K. Fred Carpenter Acting AID Affairs Officer	Joel Breman, M.D. Donald Malberg
IVORY COAST—Abidjan	Michael A. Codi AID Operations Officer	Harry R. Godfrey
LIBERIA—Monrovia	John A. Ulinski, Jr., Mission Director, USAID	David Thompson, M.D. Dennis Olsen
MALI—Bamako	Stanley Clark AID Operations Officer	Pascal J. Imperato, M.D. Mark LaPointe
NIGER—Niamey	Brian Wickland AID Operations Officer	Logan H. Roots, M.D. Anthony R. Masso
NIGERIA—Lagos (Federal)	Michael H. B. Adler Director, USAID	Stanley O. Foster, M.D. James E. Donoho
NIGERIA—Benin	---	Paul A. Bond
NIGERIA—Ibadan	---	Lloyd Wade
NIGERIA—Kaduna	---	Richard B. Arnold, M.D. John Pifer, M.D. Robert N. Evans Robert C. Hogan Clara J. Jones William Shoemaker
SENEGAL—Dakar	Walter J. Sherwin AID Operations Officer	Robert C. Helmholtz Lesley M. Jenkins
SIERRA LEONE—Freetown	---	Donald Hopkins, M.D. James Thornton
TOGO—Lome	Allan E. Dean AID Operations Officer	Andrew N. Agle
UPPER VOLTA—Ouagadougou	Brian Wickland AID Operations Officer	Christopher D'Amanda, M.D. Thomas A. Leonard

*Listed alphabetically by specialty

