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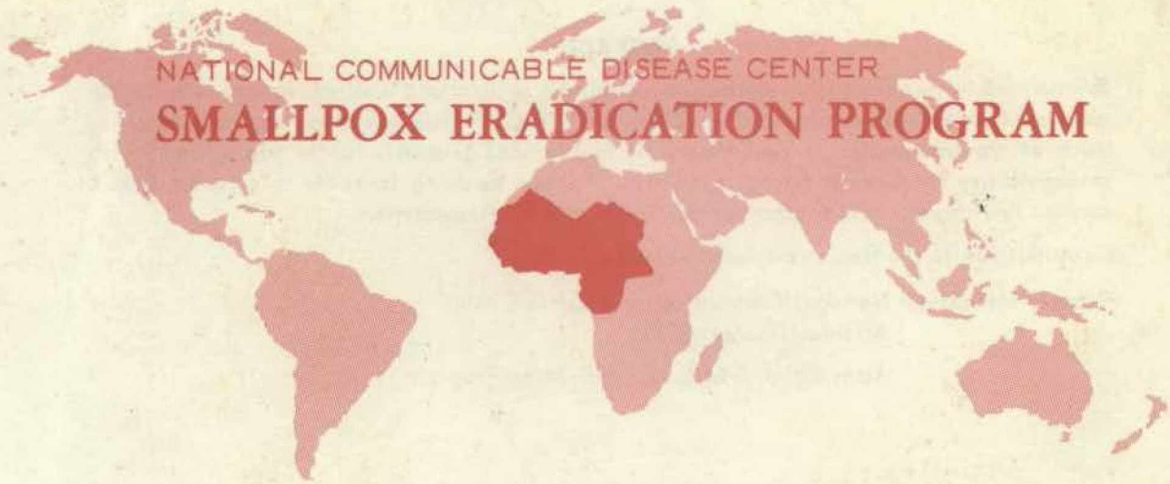

NATIONAL COMMUNICABLE DISEASE CENTER

# SMALLPOX ERADICATION PROGRAM

## THE SEP REPORT



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.

Please address to: National Communicable Disease Center
Atlanta, Georgia 30333

Attn: Chief, Smallpox Eradication Program

"to achieve and maintain the eradication status of a specific disease within an area, it is necessary (1) to obstruct transmission until endemicity ceases, and (2) to prevent or nullify the reestablishment of the disease from carriers, relapsing cases, or imported sources of infection. Accordingly, an adequate surveillance organization must be developed to identify and to cope with these threats...."

Justin M. Andrews, Sc.D., and Alexander D. Langmuir, M.D., The American Journal of Public Health, January 1963.


National Communicable Disease Center . . . . . David J. Sencer, M.D., Director

Smallpox Eradication Program . . . . . J. Donald Millar, M.D., Chief

Statistical Services, SEP . . . . . Donald L. Eddins, B.S., Chief

CONTENTS

## I. INTRODUCTION

The Third Annual Smallpox Eradication/Measles Control Program Orientation and Training Course was conducted at the National Communicable Disease Center from July 25 to September 12. Part I of the Course, which concerned the basic principles and mechanics underlying smallpox eradication, was jointly sponsored for the first time by WHO and NCDC. The faculty was drawn from the professional staff of the Smallpox Eradication Unit of WHO, the Eastern Mediterranean Regional Office of WHO, and the professional staff of the Smallpox Eradication Program, NCDC. The participants included twenty-seven medical and non-medical health workers from 14 countries, representing eradication programs in endemic areas throughout the globe. Nine of the participants were NCDC Medical Epidemiologists and Operations Officers who have subsequently assumed assignments as Technical Advisors to countries participating in the 19-country West African Smallpox Eradication and Measles Control Program.

The NCDC West African assignees also attended Part II of the Course, which included the theory and practice of measles control, principles of program management and operations, as well as additional studies of other tropical medical problems and of the African culture and environment. For those assignees bound for francophone countries, a subsequent intensive course in French was provided.

Participants in this year's training course are listed below:

NCDC PARTICIPANTS IN SMALLPOX ERADICATION/
MEASLES CONTROL PROGRAM ORIENTATION-TRAINING COURSE
July 25 - September 12, 1968

Dr. Josie Ifedayo Adeymo Adetosoye
Smallpox Eradication/Measles Control Unit
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Lagos, Nigeria

Mr. Robert Evans
USAID/Nigeria
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Kaduna, Nigeria

Dr. Georges Foli Glokpor
Direction de la Santé Publique
Lome, Togo

Mr. Harry R. Godfrey
USAID/Ivory Coast
c/o American Embassy
Abidjan, Ivory Coast

Dr. Surjanto Gunawan
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Dr. Logan H. Roots
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c/o American Embassy
Niamey, Niger

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EIS Officer
Smallpox Eradication Program
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Dr. Aleksej Jurjevich Samostrelski
WHO Advisor to Somalia
World Health Organization Office
Geneva, Switzerland

Mr. Kebba Alhadji Mam Sanneh
c/o Ministry of Health
Bathurst, The Gambia (West Africa)

Mr. James W. West
USAID/Nigeria
c/o American Embassy
Lagos, Nigeria

The Course Coordinator this year was Dr. David Vastine, EIS Medical Epidemiologist, Smallpox Eradication Program Headquarters Staff. The faculty for the course, excluding the SEP Headquarters Staff, is listed below:

FACULTY - LIST
(Excluding SEP Headquarters Staff)

AGLE, Andrew N., SEP Operations Officer, Lome, Togo.

BATES, Robert B., Chief, Training and Communications Aid Unit, Training Program, NCDC.

BRUBAKER, Dr. Merlin L., Director, Career Development Program, Global Community Health, USPHS, Silver Springs, Md.

CHALLENOR, Dr. Bernard, O., SEP Medical Epidemiologist, Cotonou, Dahomey

CLIFTON, Miss Rochelle, History Department, Spellman College, Atlanta, Ga.

CONRAD, Dr. J. Lyle, Deputy Chief, Technical Services Section, Immunization Program, NCDC.

DRAKE, Dr. Thomas E., Dermatology Dept., N.Y.U. Medical Center, N.Y.C., (former SEP Medical Epidemiologist, Dakar, Senegal).

FOSTER, Dr. Stanley O., SEP Medical Epidemiologist, Lagos, Nigeria.

HENDERSON, Dr. Donald A., Chief, Smallpox Eradication Unit, WHO, Geneva, Switzerland.

HENDERSON, Dr. Ralph H., SEP/RO Medical Epidemiologist, Lagos, Nigeria.

HERRMANN, Dr. Kenneth L., Chief, Viral Exanthems Unit, Laboratory Program, NCDC.

HOLGUIN, Dr. Alphonso H., Chief, Tuberculosis Program, NCDC.

KAISER, Dr. Robert L., Chief, Malaria Eradication Program, NCDC.

KIMMEL, Thomas R., Technical Services Section, Immunization Program, NCDC.

LEADLEY, Dr. Peter, EIS Officer, State Department Health and Welfare, Augusta, Maine.

LICHFIELD, Paul R., Public Health Advisor, Tuberculosis Program, State Dept. of Health, Salt Lake City, Utah, (former SEP Operations Officer, Enugu, Nigeria).

MARTIN, R. J., Department of Geology, Emory University, Atlanta, Ga.

McCORMACK, John R., Director, Communications Skills Co., Huntsville, Ala.

NELSON, Dr. George S., Professor of Helminthology, London School of Hygiene and Tropical Medicine, London, England.

NORINS, Dr. Leslie C., Chief, Venereal Disease Research Lab, VD Program, NCDC.

NUCKOLLS, Dr. James G., Arbovirus Unit, Laboratory Program, NCDC.

RAVENHOLT, Dr. Reimert T., Director, Population Service, USAID, Washington, D.C.

RIKER, Dr. Jeffery, EIS Officer, District of Columbia Department of Public Health, Washington, D.C.

ROSENBLOOM, Dr. Arlan L., SEP Medical Epidemiologist, Yaounde, Cameroon.

ROSS, Dr. Hubert, Department of Sociology and Anthropology, Atlanta University, Atlanta, Ga.

SHAFA, Dr. E., Regional Advisor on Smallpox Eradication, Eastern Mediterranean Region, WHO, Alexandria, Egypt.

WATSON, William C., Executive Officer, NCDC, Atlanta, Ga.

NOTE: Persons interested in a course syllabus may obtain this from Dr. Vastine by request.

## II. SMALLPOX ERADICATION IN WEST AND CENTRAL AFRICA

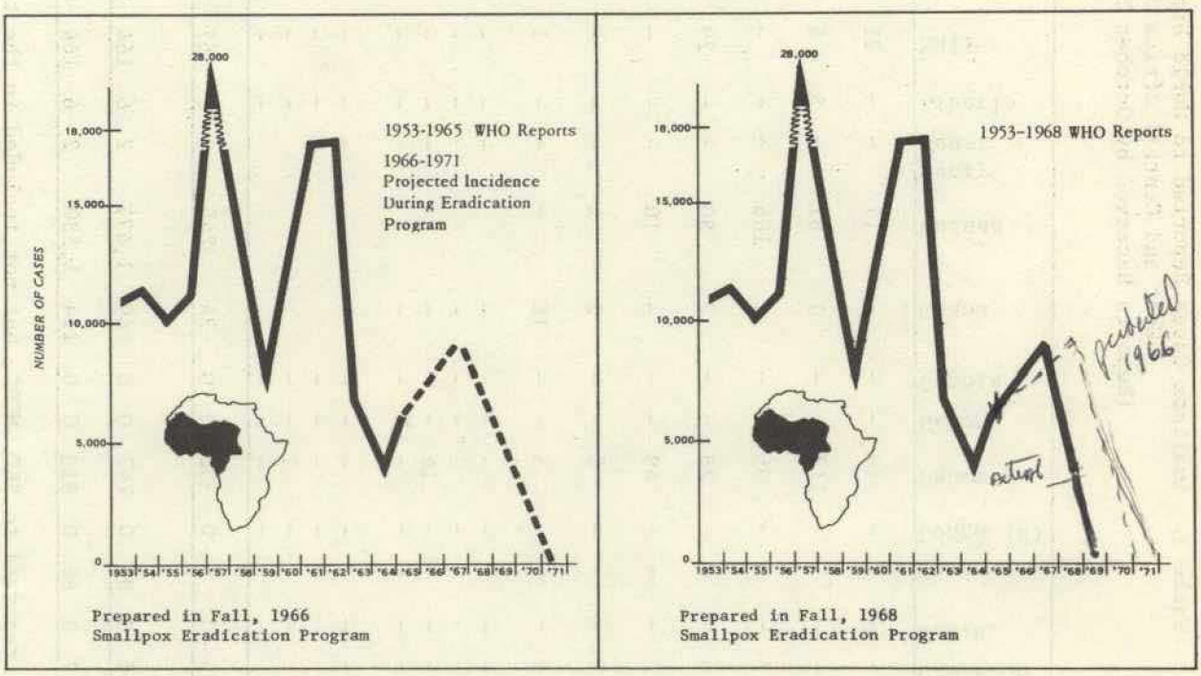
### A. Morbidity Trends

The incidence of reported smallpox in the 19-country area remains below previous levels for comparable time periods. For the period January 1-August 31, 1968, the magnitude of this reduction is 52.7 percent.

Figure 1 pictorially presents a comparison of the estimated pattern of smallpox incidence as projected in the fall of 1966 versus the actual pattern as of the fall of 1968. Initial predictions are strikingly close to the reported data for 1966 and 1967. It is estimated that from the West and Central African area less than 5,000 cases will be reported during 1968.

In view of this, an intensification of surveillance and outbreak control activities has been initiated in those endemic countries where mass vaccination campaigns have reduced the incidence of smallpox to unprecedentedly low levels.

**FIGURE 1. SMALLPOX INCIDENCE IN WEST AND CENTRAL AFRICA (PROJECTED AND ACTUAL)**




### B. Current Disease Reporting

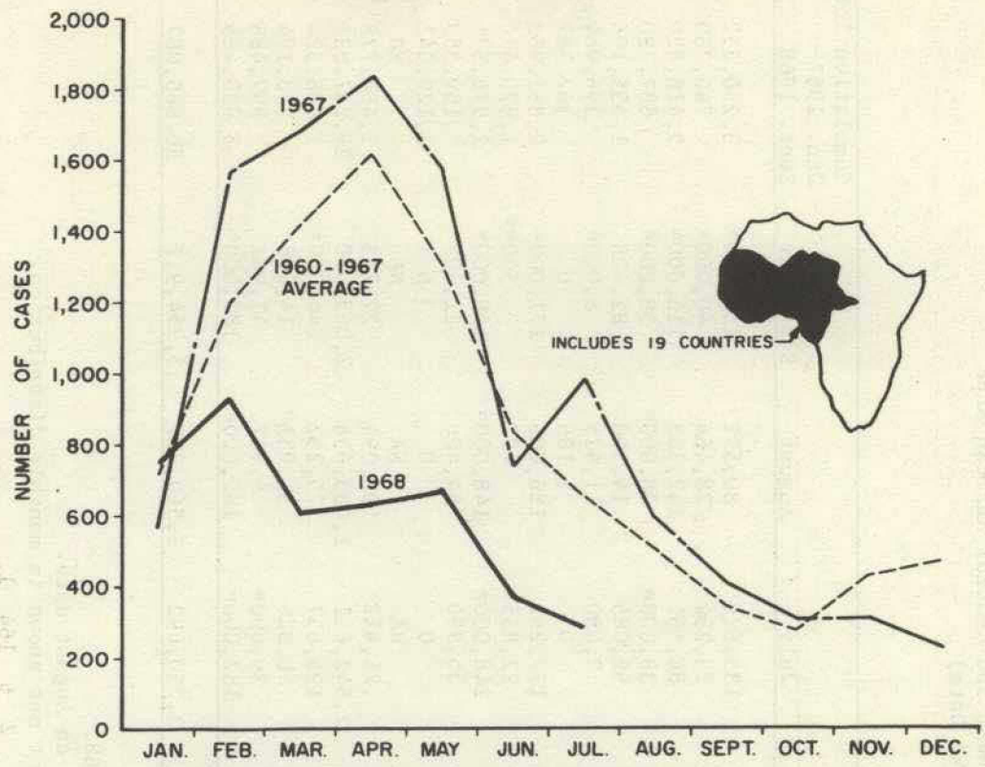
Table 1 presents the weekly distribution of smallpox cases reported to the World Health Organization for each country. Reports received as of October 17, 1968, reveal 4,536 cases of smallpox reported from the West and Central African area. This compares with a total of 9,586 cases reported for the same time period in 1967, a decrease of 52.7 percent. Figure 2 relates the 1968 experience with that of 1967 and the average for the 1960-1967 period (data for August and September are still incomplete).

Table 1. Smallpox Cases Reported to World Health Organization
West and Central Africa Area
(Reports Received by October 17, 1968)

| Month | Week No. | Cameroon | C.A.R. | Chad | Congo (B) | Dahomey | Gabon | Gambia | Ghana | Guinea | Ivory Coast | Liberia | Mali | Niger | Nigeria | Senegal | Sierra Leone | Togo | Upper Volta | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan. | 1-5 | - | - | - | - | 19 | - | - | - | 17 | - | - | 21 | 168 | 302 | - | 136 | 66 | 16 | 745 |
| Feb. | 6-9 | - | - | 1 | - | 117 | - | - | 1 | 61 | - | 5 | 6 | 64 | 496 | - | 87 | 101 | - | 939 |
| Mar. | 10-13 | 13 | - | - | - | 95 | - | - | 1 | 106 | - | - | - | 58 | 200 | - | 97 | 54 | 1 | 625 |
| Apr. | 14-17 | 6 | - | - | - | 28 | - | - | 2 | 50 | - | - | 29 | 212 | 229 | - | 23 | 45 | 10 | 634 |
| May | 18-22 | 2 | - | - | - | 49 | - | - | - | 10 | - | - | - | 69 | 384 | - | 124 | 22 | 12 | 672 |
| June | 23-26 | 2 | - | - | - | 5 | - | - | 2 | 1 | - | - | - | 83 | 65 | - | 192 | 30 | - | 380 |
| July | 27-31 | 2 | - | 4 | - | 5 | - | - | 18 | - | - | - | 1 | 10 | 40 | - | 148 | 56 | 1 | 285 |
| Aug. | 32 | - | - | - | - | - | - | - | - | | - | - | - | - | 4 | - | 5 | - | | 9 |
| | 33 | - | - | - | - | 2 | - | - | - | | - | - | - | - | 8 | - | 79 | 8 | | 97 |
| | 34 | - | - | - | - | 16 | - | - | - | | - | - | - | - | 15 | - | (2) | 1 | | 32 |
| | 35 | - | - | - | - | - | - | - | - | | - | - | - | - | 1 | - | (26) | 1 | (0) | 1 |
| Sept. | 36 | - | - | - | - | - | - | - | - | | - | - | - | - | 4 | - | (12) | 1 | (0) | 2 |
| | 37 | | - | - | - | - | - | - | | | - | - | - | - | (12) | - | (39) | 2 | (0) | 4 |
| | 38 | | - | | - | 2 | - | - | | | | - | - | - | (6) | - | (4) | 42 | (19) | 44 |
| | 39 | | - | | - | - | - | - | | | | - | - | - | (15) | - | (20) | 64 | (1) | 64 |
| Total to Date | | 25 | 0 | 5 | 0 | 338 | 0 | 0 | 24 | 245 | 0 | 5 | 57 | 664 | 1,748 | 0 | 891 | 493 | 40 | 4,536 |
| Total same Period 1967 | | 55 | 0 | 86 | 0 | 747 | 0 | 0 | 49 | 1,477 | 2 | 6 | 164 | 1,096 | 4,450 | 0 | 1,183 | 186 | 85 | 9,586 |
| Total 1967 | | 72 | 0 | 86 | 0 | 813 | 0 | 0 | 114 | 1,530 | 2 | 6 | 164 | 1,181 | 4,753 | 0 | 1,698 | 304 | 90 | 10,813 |

( ) - Additional data reported to SEP, NCDC, but not included in the totals.

FIGURE 2. REPORTED SMALLPOX CASES BY MONTH, 1960-1967 AVERAGE, 1967 AND 1968, WEST AND CENTRAL AFRICA




SOURCE: WHO

In Mali and Niger no cases of smallpox are being reported at present. Also, major decreases in reported cases are apparent in Nigeria, Guinea, and Chad.

C. Smallpox Vaccination Data

The estimated cumulative total of smallpox vaccinations administered in the West and Central African Area from January 1, 1967, through September 30, 1968, is 56,885,087, or 49.4 percent of the estimated mid-year 1968 population in the 19-country region. Of these vaccinations, 34,260,507 have been given in 1968 (Table 2).

D. Measles Morbidity and Vaccination Data

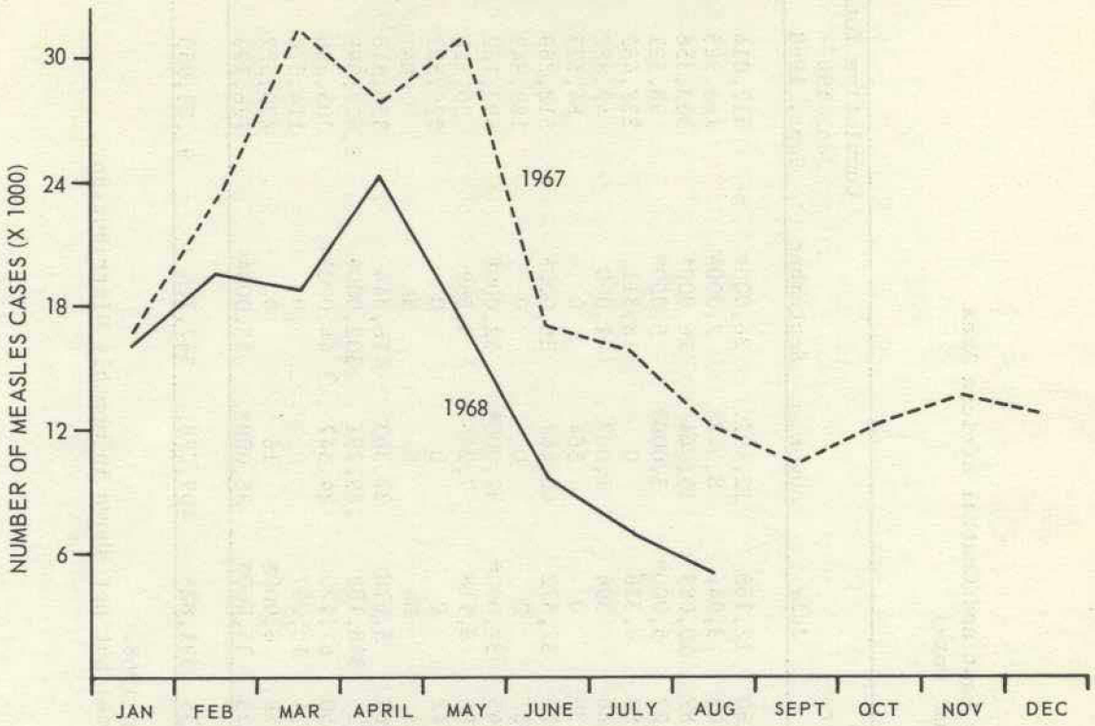
During the first eight months of 1968 a total of 118,782 measles cases were reported in the 19 countries participating in the West Africa Smallpox Eradication/Measles Control Program. This represents a decrease of 32.0 percent from the 174,642 cases reported during the same period in 1967. In Figure 3 the seasonal pattern for the 236,631 measles cases reported during 1967 is shown. The January-August 1968 experience is also shown; a marked reduction in incidence during the March-August period is apparent.

Table 2. Smallpox Vaccinations West and Central African Area
(Provisional Data)

| Country | Cumulative Total 1967 | First Quarter 1968 | Second Quarter 1968 | July | August | September | Cumulative Total Jan. 1967-Sept. 1968 |
|---|---|---|---|---|---|---|---|
| Cameroon | 1,815,311 | 416,396 | 647,425 | 135,629 | 80,591 | 155,000* | 3,250,352 |
| C.A.R. | 380,560 | 146,202 | 122,243 | 23,281 | 28,464 | 40,000* | 740,750 |
| Chad | 1,386,526 | 324,420 | 365,925 | 84,561 | 142,388 | 115,000* | 2,418,820 |
| Congo (B) | 162,160 | 148,136 | 163,494 | 38,000* | 38,000* | 38,000* | 587,790 |
| Dahomey | 702,136 | 275,285 | 308,674 | 52,085 | 14,500 | 82,428 | 1,435,108 |
| Gabon | 224,576 | 27,272 | 23,631 | 2,080 | 11,425 | 8,000* | 296,984 |
| Gambia | 230,750 | 104,767 | 26,084 | 0 | 1,186 | 0 | 362,787 |
| Ghana | 1,318,253 | 464,624 | 544,816 | 177,265 | 186,005 | 171,000* | 2,861,963 |
| Guinea | 201,090 | 775,731 | 519,797 | 22,855 | 497 | 500** | 1,520,470 |
| Ivory Coast | 1,580,373 | 461,251 | 430,747 | 148,000* | 148,000* | 148,000* | 2,916,371 |
| Liberia | 43,691 | 0 | 54,021 | 35,930 | 34,406 | 21,305 | 189,353 |
| Mali | 1,027,787 | 581,025 | 520,229 | 0 | 0 | 0 | 2,129,041 |
| Mauritania | NA | NA | NA | NA | NA | NA | NA |
| Niger | 1,610,473 | 372,875 | 345,614 | 21,412 | 102,094 | 27,725 | 2,484,778 (1) |
| Nigeria | 9,559,590 | 6,316,241 | 7,290,753 | 2,542,611 | 1,485,636 | 2,063,000 | 29,257,831 |
| Senegal | 382,633 | 468,974 | 430,028 | 195,657 | 75,232 | 146,000* | 1,698,524 |
| Sierra Leone | 0 | 301,693 | 344,246 | 50,326 | 31,931 | 14,998 | 743,194 |
| Togo | 605,150 | 100,390 | 164,018 | 39,000* | 6,967 | 41,961 | 957,486 |
| Upper Volta | 1,393,521 | 565,990 | 527,974 | 182,000* | 182,000* | 182,000* | 3,033,485 |
| Total | 22,624,580 | 11,851,272 | 12,829,719 | 3,750,692 | 2,569,322 | 3,254,917 | 56,885,087 |

* Estimates based on previous performance during 1968.
** Vaccination teams are on vacation, estimate based on August data.
(1) 4,585 vaccinations included in cumulative total but not shown in monthly distribution.

FIGURE 3. SEASONAL DISTRIBUTION OF REPORTED MEASLES, WEST AND CENTRAL AFRICA




The estimated cumulative total of measles immunizations administered in the West and Central African area from January 1, 1967 through September 30, 1968, is 9,223,953. Of these, 5,503,723 immunizations have been given during 1968 (Table 3).

## III. ERADICATION NOTES

### A. Smallpox Outbreak Investigations

#### 1. Two Outbreaks of Smallpox in the Arrondissement of Koula, Circle of Tominian, Republic of Mali

Background

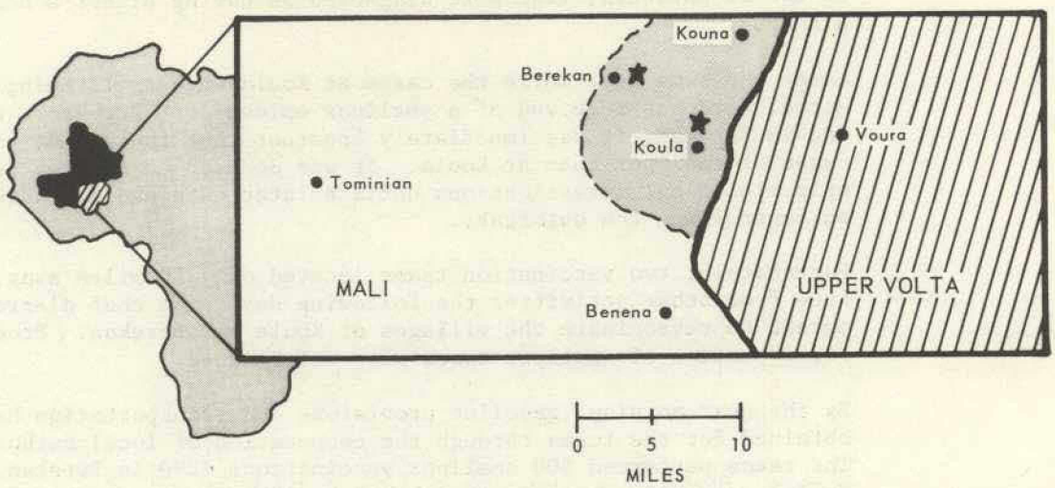
In Figure 4 a map of the arrondissement of Koula, Mali, is shown. Two outbreaks of smallpox were reported and investigated early this year in the villages of Koula, the chef-lieu (chief seat), and Berekan, six miles north-west of the village of Koula.

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

| Country | Cumulative Total 1967 | First Quarter 1968 | Second Quarter 1968 | July | August | September | Cumulative Total Jan. 1967-Sept. 1968 |
|---|---|---|---|---|---|---|---|
| Cameroon | 276,685 | 68,509 | 121,160 | 12,168 | 12,492 | 26,000* | 517,014 |
| C.A.R. | 94,518 | 25,878 | 24,303 | 3,944 | 8,342 | 7,000* | 163,985 |
| Chad | 202,795 | 46,843 | 61,687 | 10,089 | 15,944 | 16,000* | 353,358 |
| Congo (B) | 0 | 72,604 | 10,527 | 5,000* | 5,000* | 5,000* | 98,131 |
| Dahomey | 177,706 | 61,366 | 72,783 | 8,316 | 0 | 18,311 | 338,482 |
| Gabon | 35,516 | 7,775 | 4,188 | 396 | 1,007 | 1,000 | 49,882 |
| Gambia | 55,774 | 22,550 | 5,639 | 0 | 564 | 0 | 84,527 |
| Ghana | 190,514 | 95,593 | 118,123 | 37,572 | 40,467 | 36,000* | 518,269 |
| Guinea | 13,432 | 106,536 | 69,881 | 0 | 0 | 0 | 189,849 |
| Ivory Coast | 303,547 | 125,150 | 68,465 | 32,000* | 32,000* | 32,000* | 593,162 |
| Liberia | 0 | 0 | 11,184 | 8,118 | 7,245 | 3,569 | 30,116 |
| Mali | 310,774 | 115,686 | 100,042 | 0 | 0 | 0 | 526,502 |
| Mauritania | NA | NA | NA | NA | NA | NA | NA |
| Niger | 220,001 | 40,343 | 14,369 | 5,618 | 37,363 | 16,844 | 356,518(1) |
| Nigeria | 1,217,706 | 808,294 | 961,620 | 348,188 | 189,291 | 302,000* | 3,827,099 |
| Senegal | 108,729 | 138,822 | 122,150 | 67,120 | 24,547 | 44,000* | 505,368 |
| Sierra Leone | 0 | 50,845 | 53,234 | 10,297 | 0 | 0 | 114,376 |
| Togo | 173,322 | 15,506 | 33,678 | 8,000* | 16 | 0 | 230,522 |
| Upper Volta | 339,211 | 151,059 | 131,523 | 35,000* | 35,000* | 35,000* | 726,793 |
| Total | 3,720,230 | 1,953,359 | 1,984,556 | 591,826 | 409,278 | 542,724 | 9,223,953 |

* Estimates based on previous performance during 1968.
(1) 21,980 vaccinations included in cumulative total but not shown in monthly distribution.

FIGURE 4. TWO SMALLPOX OUTBREAKS – ARRONDISSEMENT OF KOULA, MALI




The arrondissement borders on the frontier of Upper Volta. International contact is facilitated by an excellent, graded, laterite road passing 11 miles to the south of Koula to cross the border at Benena. Frequently various members of the same family will live on opposite sides of the frontier.

At Benena, and at Kouna are large, weekly, international markets where Malian agricultural products are exchanged for Voltaic produce and foreign manufactured goods. Traders come to these markets from as far away as Segou in Mali, and Ouagadougou in Upper Volta.

The population of the arrondissement is 15,934, consisting mainly of the Marka, Bobo and Dogon ethnic groups. The village of Koula has a population of 1,175, most of whom are Marka. The population of Berekan is approximately 400, mostly Bobo-Fing.

In 1966, the arrondissement of Koula, along with the rest of the Circle of Tominian, participated in a mass smallpox vaccination campaign which was attached to a USAID-sponsored measles control program. A poor coverage of only 41 percent was achieved. This was attributed primarily to the reluctance of the population, particularly the Bobo, Marka, and Dogon ethnic groups to submit to vaccination. They would often hide their children from vaccination teams on the days scheduled for team arrival.

In mid-November 1967, a second mass vaccination campaign was conducted by the Mali Smallpox Eradication/Measles Control Program. Again, a poor coverage of 62 percent was achieved. Local authorities referred to the difficulties of working with the same ethnic groups. They explained this resistance to vaccination as due largely to fears associated with vaccination reactions.

The Epidemics

A telegram, sent on February 23 by the Commandant de Cercle, Tominian, was received on March 4 at the Ministry of Health reporting six cases of

smallpox in the village of Koula. A health team was organized and departed for Koula within two days. After arriving in Koula it was learned that 12 cases with one death had occurred. Upon physical examination of the 11 patients, five were diagnosed as having either a heat rash or a fungus.

Later the same day, while the cases at Koula were still being investiagted, word was received of a smallpox epidemic at Berekan. Upon arriving in Berekan, it was immediately apparent that there were many more cases of smallpox than at Koula. It was decided to abandon detailed epidemiological investigations until a later date and to concentrate on controlling the outbreaks.

Fortunately, two vaccination teams located only 50 miles away, would be free from other activities the following day. The chef d'arrondissement agreed to revaccinate the villages of Koula and Berekan. Procedures for isolation of smallpox cases were established.

By the next morning, gasoline provisions and transportation had been obtained for the teams through the cooperation of local authorities. The teams performed 500 smallpox vaccinations (290 in Berekan, 210 in Koula), covering what was thought to be 100 percent of the susceptible individuals in the two villages.

However, on a subsequent visit to the area (March 25), it was observed that susceptible individuals still remained present in the two villages and the outbreaks had not been completely contained. In Koula, five more cases of smallpox had been discovered. None of the patients had been isolated. Many inhabitants of Berekan had hidden children from the vaccination teams in November and again in March. In Berekan, 28 cases of smallpox had accumulated over this period, including two deaths.

Epidemiological Investigations

Transmission among the smallpox cases in Koula was traceable to two possible sources, or "index" cases. The first "index" case was in an unvaccinated one-year-old female who had traveled on her mother's back to an unknown destination in Upper Volta about February 3. She remained there only two or three days before returning to Koula where she developed smallpox on February 18. It is unknown whether she had contact with smallpox in Upper Volta or back in Mali. The patient recovered.

The second index case for Koula was in a 14-year-old female who had been in Vouro, Upper Volta, for several says (see Figure 4). She returned to Koula on February 27, and was questionably diagnosed as having smallpox. The patient was only mildly ill and had a previous history of vaccination. A possibility of chickenpox was also considered as the diagnosis.

One probable index case at Berekan is described. A four-year-old unvaccinated female came to Berekan from Borere, near Kouna, in late December. She was already suffering from smallpox. She died in early January. According to the "responsable" of the village, the epidemic started somewhat later, in mid-February. However, exact dates were unavailable. Linking the epidemic to the probable index case is difficult since precise histories of contacts among the Berekan cases were not obtained.

A summary of the statistical data for both outbreak investigations shows that the overall attack rate (per 1,000 population) in Koula was 10.2 while in Berekan an attack rate of 70.0 occurred. The case fatality rate was 8.3 percent in Koula and 7.1 percent in Berekan. In both outbreaks the age distribution was quite similar: sixty-six percent of the Koula cases occurred in children under age 10; in Berekan, 71 percent of the cases occurred in children under age 10; the oldest patients in Koula and Berekan were 14 and 15 years of age respectively. The male to female ratio in both villages was 1:3. It is interesting to note that 75 percent of the cases in both villages were female. Population data by age and sex for the villages are not available, thus negating further analysis.

The vaccination status of the cases by age and sex is shown in Table 4. In Koula three patients gave histories of prior vaccination. Their ages were 7, 11 and 14 years old. Only one, a six-year-old female, gave a positive history of prior vaccination in Berekan.

Table 4. Vaccination Status of Cases by Age and Sex, Koula and Berekan, Mali

A. Koula

| | Vaccinated | | Not Vaccinated | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| Age | Male | Female | Male | Female | Male | Female | Total | Percent |
| <1 | - | - | - | 2* | - | 2 | 2 | 16.7 |
| 1-4 | - | - | 2* | 2 | 2 | 2 | 4 | 33.3 |
| 5-9 | 1 | - | - | 1 | 1 | 1 | 2 | 16.7 |
| ≥10 | - | 2 | - | 2 | - | 4 | 4 | 33.3 |
| Total | 1 | 2 | 2 | 7 | 3 | 9 | 12 | 100.0 |

B. Berekan

| | Vaccinated | | Not Vaccinated | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| Age | Male | Female | Male | Female | Male | Female | Total | Percent |
| <1 | - | - | - | 1 | - | 1 | 1 | 3.6 |
| 1-4 | - | - | 3 | 6 | 3 | 6 | 9 | 32.1 |
| 5-9 | - | 1 | 2 | 7 | 2 | 8 | 10 | 35.7 |
| ≥10 | - | - | 2 | 6 | 2 | 6 | 8 | 28.6 |
| Total | - | 1 | 7 | 20 | 7 | 21 | 28 | 100.0 |

* 3 month-old female vaccinated after onset and 3 year-old male vaccinated after onset.

The onset dates of illness in the Koula epidemic were obtained from history. The earliest date of illness was thought to be February 18 with the last case having onset of illness on March 14.

Discussion

Due to lack of information, the two epidemic outbreaks cannot be attributed to importation from Upper Volta. Likewise, they cannot be related to each other (though there is daily contact between the two villages, especially by means of Berekan schoolchildren who attend school in Koula).

Evidence remains of unvaccinated persons in the area. Fortunately, the epidemics have so far been confined to the villages of Koula and Berekan.

Conclusions

These investigations showed once again that smallpox in Mali is primarily a disease of unvaccinated children. In those areas where the population is apt to resist vaccination efforts, special measures must be taken to see that all individuals are vaccinated.

Surveillance in poorly vaccinated, outlying border areas must be stressed. Such areas are often difficult to reach. Also, easy migration across the border facilitates the possibility of importation (for example, the chef d'arrondissement contended that he had seen Voltaic mothers carrying children with smallpox to the international market at Kouna, Mali).

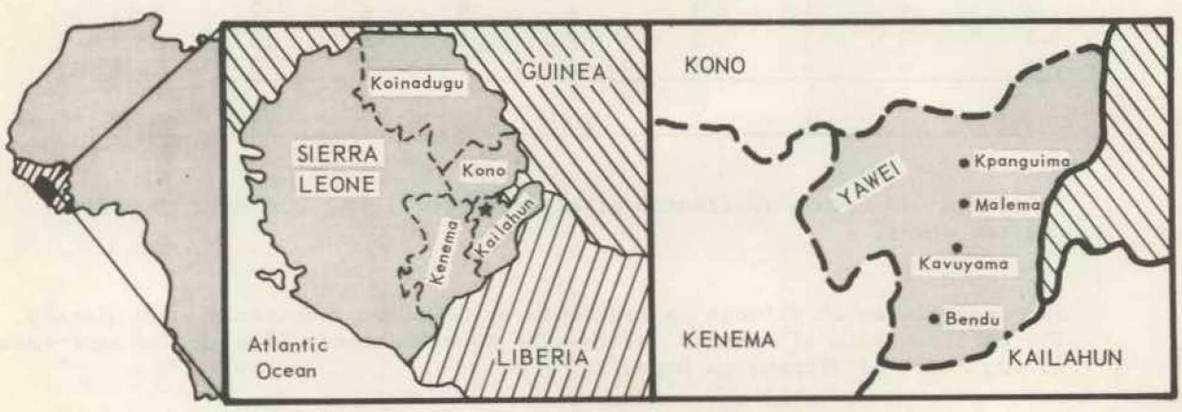
(Reported by Ousmane Sow, Médecin-Chef du Secteur de Segou, Grandes Endemies, Mali; Pascal J. Imperato, M.D., Medical Officer, and Jay S. Friedman, Operations Officer, Smallpox/Measles Program, Mali; and Smallpox Eradication Program, NCDC.)

2. Yawei Chiefdom, Kailahun District, Sierra Leone

Background

An outbreak of smallpox occurred in the Yawei Chiefdom, Kailahun District, Sierra Leone, in May 1968 (Figure 5).

FIGURE 5. SMALLPOX OUTBREAK – YAWEI CHIEFDOM, SIERRA LEONE



The Kailahun District is bordered on the west by the Kono and Kenema Districts in Sierra Leone and on the east by the countries of Guinea and Liberia. An international market is situated at Koindu, near the point where the three countries meet. The District enjoys a comparatively extensive laterite road network, two hospitals, two health centers, three mission dispensaries and fifteen treatment centers. It has consistently reported the lowest incidence of smallpox in Sierra Leone, even considering the present outbreak in Yawei. An estimated 162,615 persons reside in Kailahun; the population density is 97.0 people per square mile.

The Epidemic

Smallpox cases in the Yawei outbreak were first reported in late May 1968, to a local health inspector who immediately sought out and isolated the patients and conducted "ring" vaccinations among individuals in close contact with these patients. On June 8, the Sierra Leone Smallpox Eradication/Measles Control Program received word of the outbreak and subsequently dispatched a vaccination team which administered 3,421 vaccinations in the Chiefdom (on June 14th and 15th).

Epidemiological Investigation

The original contact case, the "index" case, for the epidemic was described as a 40 year-old petty trader who had visited overnight in the village of Wordu, in Kono District, sometime in late April. Approximately one week after her return to the village of Kavuyama, she complained of headache, fever, and neck pain; five days later she developed a rash; two days after that, she died. At that time, the woman's illness was not recognized as smallpox.

The woman was also local head of the Bundu Society, a secret female society. Several visitors came to see her during her illness. Women from throughout and beyond the Chiefdom attended her funeral. In all, an estimated 243 persons were present at the funeral (110 persons from the village Kavuyama, 130 persons from other towns in Yawei Chiefdom, 3 persons from Sandaru Penguia Chiefdom). A line listing of the secondary cases, describing those individuals who developed smallpox after contact with the index patient, is given in Table 5.

Table 5. Smallpox Cases - Yawei Chiefdom, June, 1968

| Patient No. | Village | Age | Sex | Onset | Vaccinated | Outcome | Isolated | Exposure: Visited Patient | Exposure: Washed Corpse | Exposure: Attended Funeral |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Kavuyama | 40 | F | Mid-May | ? | Died | No | -- | -- | -- |
| 2. | " | 50 | M | 5/22 | No | Died 6/7 | Yes | Yes, husband | No | Yes |
| 3. | " | 30 | M | 5/23 | No | Recov. | Yes | Yes | No | Yes |
| 4. | " | 30 | F | 5/23 | >5 Yrs. | " | Yes | Yes | Yes | Yes |
| 5. | " | 35 | F | 5/23 | >5 Yrs. | " | Yes | Yes | Yes | Yes |
| 6. | " | 45+ | F | 5/24 | >5 Yrs. | " | Yes | Yes | No | Yes |
| 7. | Kpanguima | 4 | M | 5/24 | No | " | Yes | No | No | Yes |
| 8. | Bendu | 50+ | F | 5/26 | >5 Yrs. | " | Yes | ? | Yes | Yes |
| 9. | Malema | 45+ | F | 5/26 | >5 Yrs. | " | Yes | Yes | Yes | Yes |
| 10. | Malema | 60+ | F | 5/26 | >5 Yrs. | " | Yes | Yes | Yes | Yes |
| 11. | Bendu | 60 | F | 5/29 | >5 Yrs. | " | Yes | No | Yes | Yes |

## Discussion

A peculiar pattern of exposure and transmission resulted from the index patient's position as head of the female secret society.

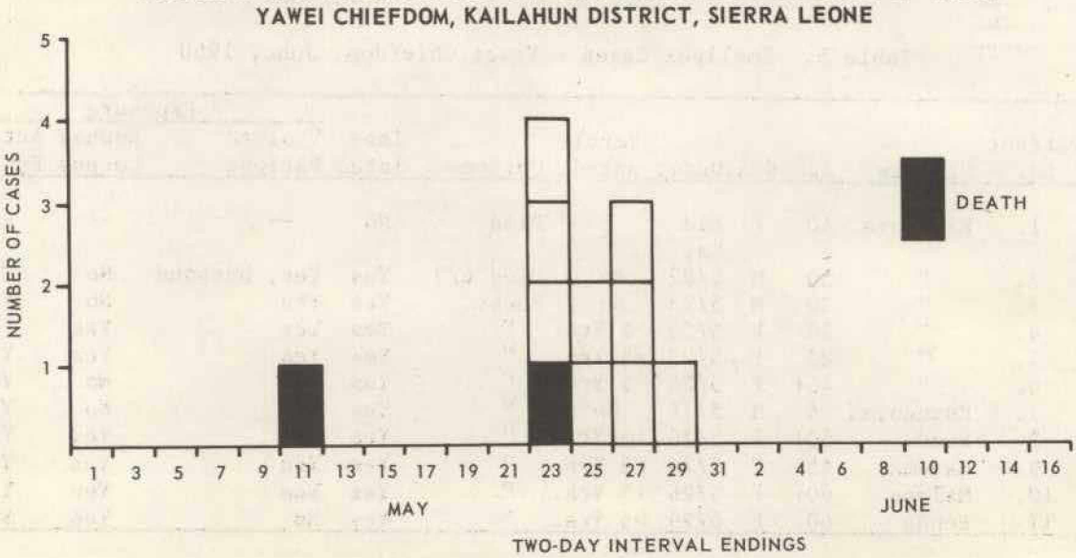
Three types of exposure to the index patient are identified as apparently responsible for the transmission of smallpox in the epidemic: 1) visited the index patient during her illness; 2) washed the corpse; and 3) attended the funeral (Table 5). With the exception of the seventh patient, all the secondary patients experienced at least two of these types of exposure. Of the six persons who washed the corpse, all six were infected (attack rate = 100%). The attack rates were much lower among those individuals exposed by visiting the ill woman or by attending her funeral (10/243, or attack rate = 4.1%). The overall case fatality rate was 18.3 percent.

Ninety-one percent of the secondary cases occurred in persons over 30 years of age, and 73 percent of these were women. Of the ten secondary cases, seven concerned individuals who had been vaccinated, but longer than five years previously; all these seven patients recovered. The three remaining secondary-case patients had never been vaccinated; one of these died. Furthermore, those individuals who had the greatest amount of exposure to the index patient were generally over 15 years of age.

In a scar survey which was conducted on June 12, it was observed that 73 percent of the 15 years and older age group showed old vaccination scars, indicating that a significant amount of protection existed among this group. This would partly account for the limited extent of the smallpox transmission in the epidemic.

Patient number seven had direct contact with the index patient only once, on the day of the funeral. His rash began on May 24. Unless he was infected by virus passively brought home by his mother (who visited the index patient while she was ill), he must have been infected about May 12. Hypothetically, therefore, the index patient's rash began sometime around May 9th or 10th. The probable evolution of the smallpox cases in the Yawei epidemic is shown in Figure 6.

**FIGURE 6. SMALLPOX CASES BY TWO-DAY INTERVALS FOR ONSET OF RASH, YAWEI CHIEFDOM, KAILAHUN DISTRICT, SIERRA LEONE**



Though the corpse was kept in the house of patient number 4 for 24 hours, it is surprising that there were no other infections in the household. Of the fifteen inhabitants, none had been vaccinated in the past five years; seven had never been vaccinated.

Conclusion

The fact that the index smallpox patient apparently developed smallpox after an overnight visit in the Kono-Koinadugu area is probably typical of many such episodes in which smallpox is spread by transient visitors or residents to a highly endemic area.

Nevertheless, the epidemic was limited to two generations, even before Smallpox Eradication/Measles Control Program teams were dispatched. This illustrates the effectiveness of immediate isolation of cases and vaccination of close contacts.

(Reported by Ministry of Health, Sierra Leone; Donald Hopkins, M.D., Medical Officer and James Thornton, Operations Officer, Sierra Leone Smallpox Eradication/Measles Control Program; and Smallpox Eradication Program, NCDC.)

B. Status of Attack Phase Efforts in the West African Smallpox Eradication/Measles Control Program Countries

Since January 1967 the West African Smallpox Eradication/Measles Control Program has been in the "attack" phase of operation. This phase generally defined includes all primary mass vaccination efforts. It implies any systematic scheme of vaccinating the total target population and is the point of departure in efforts to eradicate smallpox and control measles in endemic areas of West Africa. Its objective is to "attack" these diseases on an intensive, community-wide basis and raise the population's immunity to a high level.

Table 6 shows data regarding the percent of the estimated population now vacci-

Table 6. Vaccinations Related as Percentages to Estimated Mid-Year 1968 Population

| Country | Smallpox Vaccinations Related to Total Population | Measles Vaccinations Related to Total Population* |
|---|---|---|
| Gambia | 100+ | 23.3 |
| Ivory Coast | 69.8 | 14.2 |
| Niger | 68.9 | 9.5 |
| Chad | 67.8 | 10.0 |
| Congo (B) | 66.4 | 11.1 |
| Gabon | 62.0 | 11.0 |
| Cameroon | 60.3 | 9.7 |
| C.A.R. | 57.9 | 12.3 |
| Upper Volta | 57.5 | 13.8 |
| Togo | 56.9 | 14.0 |
| Dahomey | 56.6 | 13.4 |
| Nigeria | 48.9 | 6.5 |
| Senegal | 45.3 | 13.5 |
| Mali | 43.3 | 10.7 |
| Guinea | 40.0 | 5.0 |
| Ghana | 33.5 | 6.1 |
| Sierra Leone | 32.9 | 5.9 |
| Liberia | 17.4 | 2.9 |
| Total | 49.4 | 8.2 |

* The target population for measles vaccinations is estimated to be 22 percent of the total population.

nated against smallpox as a result of attack phase efforts among the 19 countries participating in the Program. For the total area, the estimated number of smallpox vaccinations through September 1968 as related to the mid-year 1968 population estimate is 49.4 percent.

These data show that many countries are well along in the first phase of the Program. One country, The Gambia, has already completed its "attack" phase. Western State Nigeria is nearing completion of its attack phase (vaccination teams are expected to finish the first cycle of vaccinations in November). Both of these programs have conducted very successful campaigns to date. A summary of these two programs follows.

The Gambia

In May 1967, The Gambia began training of its three vaccination teams. Each team included one measles vaccinator, one smallpox vaccinator, one recorder and one driver. These teams operated under the charge of a single supervisor, who is also responsible for organizing health education and publicity.

The attack phase was completed by the vaccination teams in less than 12 months. They directed their efforts at a target population of about 360,000 people. Averaging 15 work days per month and 3.5 villages per team day, the teams performed approximately 350,000 smallpox vaccinations and 85,000 measles vaccinations.

Terminal assessment revealed that good coverage of the population had been achieved. Eighty-five percent of the population was vaccinated for smallpox (with 93% showing vaccination scars). Coverage for measles vaccinations in the key age group (6 months to 4 years of age) varied from 87 percent to 96 percent within geographic divisions.

No smallpox cases have been reported since 1967. It is felt that the current immunity level when combined with maintenance programs efforts will reduce the threat imposed by smallpox importation from endemic areas.

The measles incidence declined to zero or near zero in each geographic division within two weeks after completion of the mass campaign and remained at levels of less than 4 cases per week through July. At this point evaluation is not possible since data after July are not available. It appears that with the institution of the measles maintenance program (first maintenance campaign took place in August 1968) measles control can be sustained.

Western State Nigeria

In July 1967, training was completed for 10 teams of six persons each. In February 1968, five additional teams were trained and joined field operations. Each team includes two smallpox vaccinators, one measles vaccinator, and one recorder.

The target population is about ten and one-half million people. As of August 1968, after 14 months of attack phase work, teams had vaccinated 10,413,074 persons with smallpox vaccine and 910,849 children with measles vaccine. They averaged 21.8 work days per month. Assessment at that time showed that 92 percent of the population had been reached. Completion of the attack phase is now scheduled for November. It was originally estimated to require a total of 24 months.

In Western State Nigeria, as in The Gambia, attack phase efforts have been very successful in raising the immunity level of the population.

During the first three months of 1968, only 17 cases of smallpox were reported as compared with 173 cases during the corresponding period in 1967. By July 1968, smallpox reports had fallen to two cases for the month. Indications are that smallpox cases currently reported are resulting only from importation.

Measles incidence in vaccinated areas has decreased as much as 60-80 percent below that reported for unvaccinated areas. In the first half of 1968, usually the epidemic period of the year, monthly measles reports averaged from 10-18 cases per 100,000 population in unvaccinated areas as opposed to an average four cases in vaccinated areas. In July 1968, the beginning of the usual decline period of measles incidence, unvaccinated areas reported 6.5 cases per 100,000 population whereas the vaccinated areas reported 1.8 cases.

(Reported by Headquarters Staff, Smallpox Eradication Program, NCDC.)

C. Missionaries and Smallpox Eradication/Measles Control Program in West Africa

Missionaries in West Africa constitute a valuable resource for local Smallpox Eradication/Measles Control Programs. They are scattered widely throughout the West African area and maintain a long-term acquaintance with the population. They possess an intimate knowledge of the locality, including the geography and road systems and the local prejudices and customs of its people. For many reasons, their support could be essential to local smallpox eradication and measles control programs, especially in reporting smallpox cases or assisting in epidemic control measures in out-lying areas. In at least three instances, they have already demonstrated the value of such support.

In December 1966, missionaries in Nigeria played a major role in reporting and eventually suppressing a smallpox outbreak there. A local missionary first reported the outbreak to the Nigerian Smallpox Measles Program. Radio contact with other local missionaries served to delineate the extent of the smallpox spread. Missionaries joined government health workers to form vaccination teams. Within three weeks smallpox transmission was aborted in all infected areas.

In one area of Togo, a local missionary who had the respect of local villagers and leaders helped to accomplish a very successful campaign. His work with the population was instrumental in allowing Smallpox Eradication/Measles Control Program personnel to overcome initial resistance to vaccination attempts.

Similarly, investigators in Cameroon were initially unsuccessful in conducting a study of measles vaccine dilutions which required drawing blood samples at the time of vaccination and again one month later. They were having difficulties tracing the children after one month and contending with the population's reluctance to submitting children to such testing. A local missionary public health nurse with long-term experience in the area and an extensive knowledge of the children and their medical histories offered her services. Through her work, a study was arranged which was one-hundred percent successful.

At present, the need for greater utilization of missionary support is especially apparent in West African Smallpox Eradication/Measles Control Programs. Smallpox eradication is presently approaching a critical stage in West Africa which allows many countries the opportunity to break the chain

of smallpox transmission before the end of the year. To effect this, additional personnel resources are required.

In an effort to acquaint missionaries with Program needs, smallpox information is being sent to approximately one-hundred and twenty mission boards and mission organizations. It is hoped that further encouragement of missionary support at this point may contribute favorably to achieving eradication goals.

In addition, successful participation of missionaries in smallpox eradication and measles control efforts may well set a precedent leading to better utilization of local resources in future West African health programs.

(Reported by William H. Foege, M.D., Chief of Operations, Area B, Smallpox Eradication Program, NCDC.)

## IV. SPECIAL REPORT

(This is an abstract of a paper entitled "Status of Health Education and Publicity in the Smallpox Eradication and Measles Control Program," prepared by Gordon Robbins, Health Educator, Smallpox Eradication Program, Regional Office, Lagos, Nigeria. The original paper was presented at the Second Annual Regional SMP Conference in May of this year.)

### Introduction

From the beginning of the Smallpox-Measles Program, the terms "health education," "publicity," and "propaganda" have been used interchangeably. These terms and their relation to the Program need clarification.

"Health education" is the process of communicating ideas in a manner that is comprehensible to the population. It aims to stimulate public interest in the principles of disease prevention. Its objective is to promote understanding of the efforts to eradicate smallpox and control measles.

"Publicity" brings vaccination information to the attention of the public, generally through the means of mass media---radio, TV, news and magazines. It is often used to provide vaccination information in large contiguous population, such as those found in major urban centers.

"Propaganda" is the 'systematic, widespread indoctrination of ideas.'* It implies the manner in which publicity and health education are handled in a population. However, as the term often connotes deception or distortion, its use can be omitted.

Health education and publicity together make up the "publicity program." The purpose of a publicity program is not only to induce people to report to vaccination sites. It is to develop from within the population an acceptance of vaccination concepts.

In all of the 19 countries participating in the Smallpox Eradication and Measles Control Program, at least some efforts have been made to establish publicity programs. In some countries such programs are very superficial and consist al-

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* Webster's New World Dictionary, p. 595.

most entirely of radio announcements and slogans. In others, there is evidence of soundly conceived, well-organized services utilizing a multiplicity of motivational approaches and involving a great deal of creativity.

Successful Approaches

The use of mass media alone has had little effect on increasing receptivity of people to vaccination. The well-coordinated Ibadan, Nigeria campaign, in July 1967, is an exception. It demonstrated how the press, radio, and television can be effectively utilized in a densely populated area provided there is careful and thoughtful preplanning.

In the Ibadan campaign, contact was initially made with the schools, informing them of vaccination plans. Further contact was made with voluntary organizations who provided scripts for spot announcements on radio and television. Posters and printed schedules were posted in public places. A meeting of local representatives from the different media was organized in order to discuss publicity plans for the campaign period. Recommendations were made at this meeting, which were carried out for the duration of the campaign, as follows:

1) A press conference announced the opening of the campaign. A launching speech was given by a high official of the Ministry of Health.

2) Radio publicity included spot announcements and rediffusion nightly.

3) On television, announcements with slide showings of campaign posters were given twice nightly. The films "Miracle in Tonga" and "Conquest of Disease" were shown. A 30-minute panel program was presented.

All these efforts were performed at no additional cost to the Program. This publicity program had the effective support of the mass media. It helped vaccination teams to attract nearly 800,000 people (over 90 percent of the population) to vaccination sites during the 10-day campaign period.

In rural areas, successful campaign efforts are generally "tailor made" for a given area. Here, communications networks are not so clearly defined as in the urban areas. Also, the variables of customs, religion, literacy, and economics have greater influence on population response to vaccination efforts. Programs are best promoted through the existing political and/or traditional leader structure. Emphasis is put on involving local leaders in the planning of a campaign.

In at least two countries, publicity programs have been conducted in this manner with very good results. In the Mali Smallpox Measles Program, all publicity concerning the program is handled by the local administrative and political representative who adequately sees to it that the people turn out for vaccinations. Thus far, 86-100 percent reportage has consistently been recorded at vaccination sites. In the reaches of Northern Nigeria, the Program relies almost entirely upon communications networks within the existing traditional leader structure for disseminating program information. Vaccination coverage figures reside in the 90 percent range.

The concept of advance notification, first developed and demonstrated to be effective in Eastern Nigeria, is the most effective method of "reaching" local leaders with the ideas of vaccination. This notification system usually involves the use of an "advance man" who is responsible for making personal visits, primarily to the chiefs and elders, in advance of the arrival of vaccination teams. He is responsible for distributing posters and other materials and working out with the villagers themselves the more suitable locations for vaccination sites.

Dahomey and Togo rely heavily on advance meetings with village leaders, but instead of using specially assigned advance men for this activity, the U.S. advisors and their counterparts arrange and conduct these sessions. Dahomey has shown a 15-16 percent increase in coverage figures since including the advance notification system in their publicity program.* Guinea, Sierra Leone, The Gambia, and Northern Nigeria are also employing systems of advance notification which have proved effective in their work.

A number of supplementary "tactics" have lent strength to publicity programs in many countries:

1) Formal orientation for other health personnel (particularly health superintendents and nurses) has engaged the active interest and support of these people, especially at the village level.

2) A liaison with the United States Information Service has proved vitally helpful in obtaining for programs material and support often not otherwise available. The USIS has provided motion picture films, projectors, exhibits, posters and other information materials, photo laboratories, and the like. It has developed on-going publicity programs and provided film coverage of different campaigns.

3) In other instances, various organizations such as the National Red Cross and the Peace Corps have assisted in health education and publicity efforts for the Program.

4) The use of a full-time health educator who has the responsibility to direct and coordinate health education activities has been extremely valuable in those countries fortunate to have such an individual. This reduces considerably the amount of time that health education units have to devote to the administrative aspects of health education and publicity.

5) Posters are considered valuable for giving information (though they have limitations as explanatory or motivational devices). Motion pictures, especially in team training and preparing the public for the visit of vaccination teams, are an effective educational tool. Portable loudspeakers (or "bull horns") are particularly useful devices for drawing atrention to a program and convoking the public to vaccination sites.

Recurring Problems

In the first year of vaccination efforts by the Smallpox Eradication and Measles Control Program, six major problem areas have been identified. They relate to health education and publicity.

Poor coverage has been realized almost universally in the over forty-five and the very young age groups. Special techniques and methods have not yet been developed to fully cope with this problem.

In many countries, there are large numbers of small villages with populations of less than 100 people where methods of communication are uneffectual in motivating the people to report to vaccination sites. Likewise, communication with the vast numbers of nomadic people who range unhampered across international frontiers is frequently impossible. In other instances, fetish practices and superstitions among certain populations are in continuing conflict with vaccination efforts.

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* See Volume II, Number 2 for further description of the Dahomey Program.

Transportation for health education and publicity personnel in various areas has been inadequate and, in some instances, nonexistent.

Available human and material resources, though often limited to a great extent, are not always being utilized to the potential possible.

Not enough consideration has been given to the development of staff-centered training which would enable Smallpox-Measles Program personnel to become more aware of problems hindering the Program on a regional basis.

Because of the rapidity with which the Program has progressed in the mass vaccination phase of operation, it has been difficult to take definite measures in view of the maintenance phase. Further consideration and organization is necessary to ensure the cooperation of the people in both the vaccination and surveillance aspects of this phase.

Conclusion

Over the year and a half that the Regional Smallpox Eradication/Measles Control Program has been underway in West and Central Africa, various health education and publicity techniques have been developed and utilized. Successful publicity programs have enabled certain vaccination teams to achieve high vaccination coverage of populations.

Nevertheless, many difficulties still impair the progress of vaccination efforts in many areas. It is important that countries participating in the Program realize the value that health education and publicity and the proper development of publicity programs has in bringing about effective disease control and eradication.

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Nigeria Desk Officer ..... Ralph H. Fisher
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* The Vesicular Disease Laboratory of the Viral Exanthems Unit, Laboratory Program, bears responsibility for all smallpox-related laboratory activities and is a vital component of the NCDC Smallpox "team".

Listed below are officials responsible for Smallpox Eradication Activities in countries participating in the West African Regional Smallpox Eradication/Measles Control Program. Their contributions to this report are greatly appreciated.

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Médecin-Chef du Service d'Hygiène

Dr. P. Gbezo
Directeur Adjoint du Service d'Hygiène

*Sierra Leone*

Dr. Marcella Davies
Acting Chief, Endemic Disease Control Unit
PMO Office

Dr. Evelyn Cummings
Deputy Chief, Medical Officer
Ministry of Health

*Togo*

Dr. Leopold Prince-Agbodjan
Chef, SHMP

*Upper Volta*

Dr. Hubert Sansarricq
Chef des Grandes Endemies

## COUNTRY ASSIGNEES

| Country | AID Representative | NCDC Medical Officer and Operations Officer* |
|---|---|---|
| CAMEROON—Yaounde | John C. McLaughlin<br>AID Operations Officer | Bruce H. Peters, M.D.<br>John McEnaney |
| CENTRAL AFRICAN REPUBLIC—Bangui | Charles S. Gordon<br>AID Operations Officer | Neal Ewen |
| CHAD—Ft. Lamy | Roy A. Harrell, Jr.<br>AID Operations Officer | Russell S. Charter |
| DAHOMEY—Cotonou | Robert M. Beckman<br>Act. AID Operations Officer | Jeannel Roy |
| GABON—Libreville | Richard J. Delaney<br>Acting AID Assistant Operations Officer | Mark LaPointe |
| GAMBIA—Bathurst | Henry Uznanski<br>AID Operations Officer | Robert C. Helmholz<br>Lesley M. Jenkins |
| GHANA—Accra | Richard M. Cashin<br>Director, USAID | David Melchinger, M.D.<br>James O. Lewis<br>M. David Newberry |
| GUINEA—Conakry | K. Fred Carpenter<br>Acting AID Affairs Officer | Joel Breman, M.D.<br>Donald Malberg |
| IVORY COAST—Abidjan | Michael A. Codi<br>AID Operations Officer | Harry R. Godfrey |
| LIBERIA—Monrovia | John A. Ulinski, Jr., Mission Director, USAID<br>Dr. Arthur M. Shelamer<br>Public Health Office, AID | David Thompson, M.D.<br>Dennis Olsen |
| MALI—Bamako | Stanley Clark<br>AID Operations Officer | Pascal J. Imperato, M.D.<br>Jay Friedman |
| NIGER—Niamey | Brian Wickland<br>AID Operations Officer | Logan H. Roots, M.D.<br>Anthony R. Masso |
| NIGERIA—Lagos (Federal) | Michael H. B. Adler<br>Director | Stanley O. Foster, M.D.<br>James E. Donoho |
| NIGERIA—Benin | ——— | Paul A. Bond |
| NIGERIA—Ibadan | ——— | Lloyd Wade |
| NIGERIA—Kaduna | ——— | Richard B. Arnold, M.D.<br>John Pifer, M.D.<br>Robert N. Evans<br>Robert C. Hogan<br>Clara J. Jones<br>William Shoemaker |
| SENEGAL—Dakar | Henry M. Uznanski<br>AID Operations Officer | Robert C. Helmholz<br>Lesley M. Jenkins |
| SIERRA LEONE—Freetown | Newman Jeffrey<br>AID Operations Officer | Donald Hopkins, M.D.<br>James Thornton |
| TOGO—Lome | Allan E. Dean<br>AID Operations Officer | Andrew N. Agle |
| UPPER VOLGA—Ouagadougou | Irving H. Licht<br>AID Operations Officer | Christopher D'Amanda, M.D.<br>Thomas A. Leonard |

* Listed alphabetically by specialty

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