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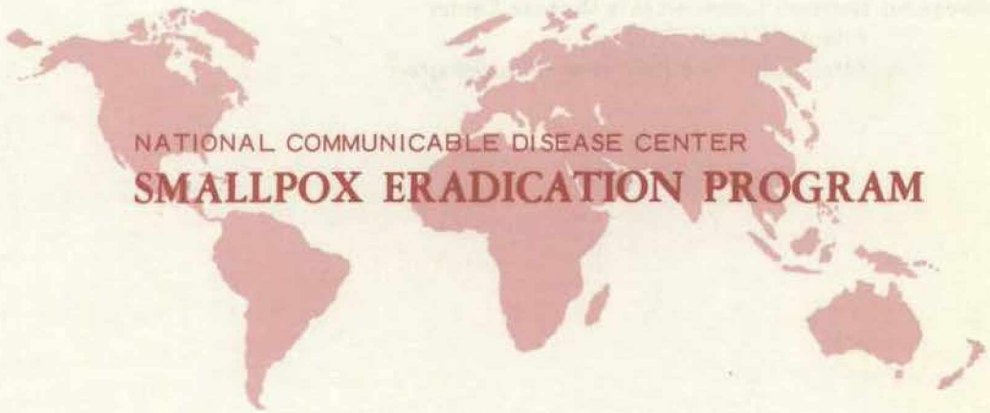

NATIONAL COMMUNICABLE DISEASE CENTER

# SMALLPOX ERADICATION PROGRAM

## THE SEP REPORT

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

PUBLIC HEALTH SERVICE

## PREFACE

Summarized in this report is information pertaining to the SEP and information received from health officials, university investigators 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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## I. INTRODUCTION

Since the last issue, there have been two developments of great significance to the NCDC Smallpox Eradication Program. In July 1967, the first Annual Regional Meeting of the West African Smallpox Eradication/Measles Control Program occurred in Accra, Ghana. The NCDC field staff in Africa, as well as members of the headquarters staff, met at the Continental Hotel, Accra, for one week of technical and administrative discussions. During the first two days reports were presented from each country contingent on the progress of the regional campaigns. Following this, specific operational aspects were discussed in seminar fashion introduced by illustrative presentations by country representatives; these included assessment, surveillance, health education, field operations, epidemic control, etc. A highlight of the conference was the seminar on border control activities representing the distilled thoughts of assignees to contiguous countries who, in small group discussions, defined patterns of migratory movement, potentials for reaching migratory groups, and the general philosophy of border management in a regional program.

A critique committee appointed by Dr. George I. Lythcott, Chief, Regional Office, Smallpox Eradication/Measles Control Program, Lagos, Nigeria (who chaired most of the general sessions) examined the meeting in depth and presented a highly favorable report to the last session of the assembled group. This meeting is expected to be an annual event in Africa; and it is hoped that in the future national counterparts will be able to attend.

Another major event has been the Second Smallpox Eradication Program Orientation and Training Course now being conducted at headquarters for assignees to the West African Smallpox Eradication/Measles Control Program. Four medical officers and three operations officers assigned this year to Ghana, Sierra Leone, Liberia and Guinea have been in Atlanta since July 1. All attended the Epidemic Intelligence Service Course in epidemiology and biostatistics July 5-August 4 as guests of the Epidemiology Program. Since August 7, they have been in the SEP Course designed to provide specific training in theoretical and practical aspects of mass smallpox eradication campaigning. In addition to the NCDC personnel, the course was attended also by Dr. Philip Adeoye, Chief, Smallpox-Measles Unit, Ministry of Health, Kaduna, Northern Nigeria; Dr. Georgji Nickolaevski, Smallpox Eradication Program, World Health Organization, Geneva; and Dr. Juan Ponce de Leon, Chief, Smallpox Eradication Consultant, Pan American Health Organization, Rio de Janeiro, Brazil.

This year, as last, the course director was Dr. Henry G. Gelfand, Special Assistant for Research and Evaluation, Smallpox Eradication Program, Atlanta, Georgia. In addition to the full headquarters staff, a distinguished faculty of national and international experts in communicable disease control participated in teaching the course. A faculty list (excluding the SEP headquarters personnel) is presented below:

Anderson, Miss Janet, Office of International Health, PHS, Washington, D.C.
Berry, Mr. Sidney L., Employee Development Unit, NCDC
Brubaker, Dr. Merlin, MOC, USPHS Hospital, Carville, Louisiana
Cole, Dr. Norman L., National Medical Audiovisual Center
Conrad, Dr. Lyle, Immunization Program and Epidemiology Program, NCDC
Foege, Dr. William H., Immanuel Medical Centre, Yahe, P.M.B.I., Bansara, Eastern Nigeria
Fredericksen, Dr. Harald, Population Service, TCR/HS, USAID, Washington, D.C.
Healy, Dr. George R., Laboratory Program, NCDC
Henderson, Dr. D. A., Smallpox Unit, World Health Organization, Geneva, Switzerland
Herrmann, Dr. Kenneth L., Laboratory Program, NCDC
Holguin, Dr. Alfonso H., Tuberculosis Program, NCDC

Hollinger, Dr. Blaine, Laboratory Program, NCDC
Ismach, Mr. Aaron, U.S. Army Equipment Development Lab., Fort Totten, Flushing, New York
Kagan, Dr. Irving G., Laboratory Program, NCDC
Kaiser, Dr. Robert L., Malaria Eradication Program, NCDC
Kraft, Miss Mary Jo, Office of International Health, PHS, Washington, D.C.
Lichfield, Mr. Paul R., Operations Officer, West African Smallpox Eradication/ Measles Control Program, Enugu, Eastern Nigeria
Lythcott, Dr. George I., Chief, Regional Office, West African Smallpox Eradication/ Measles Control Program, Lagos, Nigeria
Martin, Mr. R. J., Dept. of Geology and Geography, Emory University, Atlanta
Neff, Dr. John M., Research Division Infectious Diseases, Children's Medical Center, Boston, Massachusetts
Roberto, Dr. Ronald R., Dept. of Preventive Medicine, University of Washington, Seattle, Washington
Rodrigues, Dr. Bichat A., Regional Advisor on Smallpox Eradication, Pan American Health Organization, Washington, D.C.
Schrag, Dr. Peter A., Medical Epidemiologist (EIS), North Carolina
Shafa, Dr. E., Regional Adviser on Smallpox Eradication, WHO Regional Office for the Eastern Mediterranean, Alexandria, UAR
Thompson, Dr. David M., Medical Epidemiologist, West African Smallpox Eradication/ Measles Control Program, Enugu, Eastern Nigeria
Waddy, Dr. B. B., London School of Hygiene and Tropical Medicine, London, England
Watson, Mr. William C., Executive Officer, NCDC
Williams, Dr. Olu, General Hospital, Freetown, Sierra Leone
Witte, Dr. John J., Immunization Program and Epidemiology Program, NCDC

Persons interested in the course syllabus may obtain a copy from Dr. Gelfand by request.

## II. SMALLPOX SURVEILLANCE

### A. Current Trends in Smallpox

Notifications received by the World Health Organization through August 17, 1967, show a total of 49,611 reported cases of smallpox. During the comparable time period in 1966, 30,497 cases were reported; thus, an increase of 62.7 percent is observed for the year. Reported cases of smallpox during comparable time periods for 1966 and 1967 is shown by continent in Table 1. This year a 5.9 percent increase is observed in Africa; in the Americas an almost four-fold increase is observed; except for eight cases reported from Argentina, all other cases in the Americas were reported from Brazil. Most significant contributions to the global increase resulted from several epidemics in Asia and the Americas. Through August 17, Asia with an increase of 85.8 percent over last year accounts for 78.8 percent of total cases in the world this year.

Table 1. Distribution of Reported Smallpox Cases by Continent for Comparable Time Periods 1966 and 1967*

| Continent | 1966 | 1967 |
|---|---|---|
| Africa | 9,171 | 9,709 |
| Americas | 225 | 813 |
| Asia | 21,028 | 39,086 |
| Europe | 73** | 3*** |
| Oceania | 0 | 0 |
| Total | 30,497 | 49,611 |

* Compiled from WHO reports through August 17, 1967
** All United Kingdom cases
*** Imported cases: 2-Germany, 1-Czechoslovakia

### B. Asia

Table 2 shows the distribution of reported cases in Asia. A total of 39,086 cases have been reported this year as compared with 21,028 for the same time period last year. Major increases are noted in Pakistan and India.

Table 2. Distribution of Reported Smallpox Cases by Country for Comparable Time Periods, Asia 1966 and 1967*

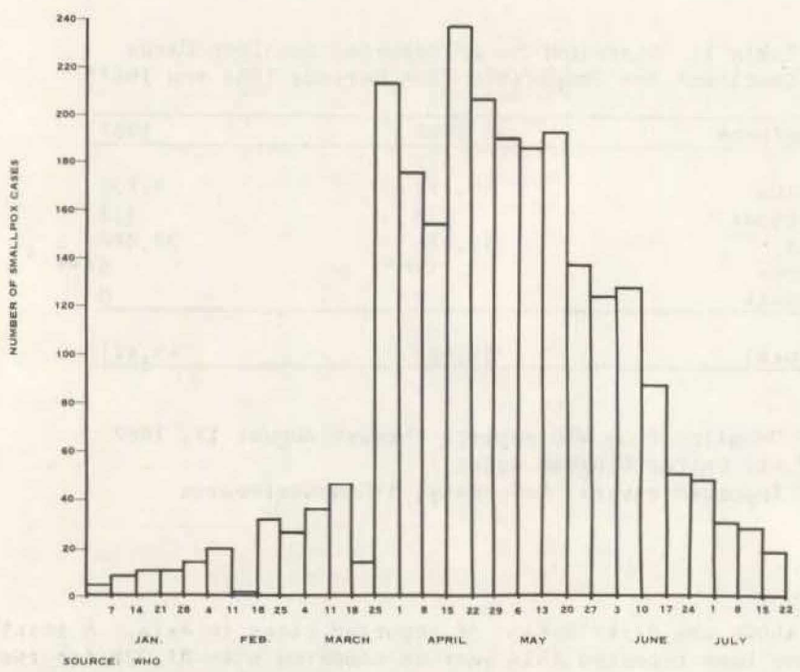
| Country | 1966 | 1967 |
|---|---|---|
| Afghanistan | 62 | 59 |
| India | 16,342 | 29,135 |
| Indonesia | 1,654 | 1,917 |
| Nepal | 312 | 144 |
| Pakistan | 2,656 | 7,777 |
| Other | 2 | 54 |
| Total | 21,028 | 39,086 |

* Compiled from WHO Reports through August 17, 1967

Pakistan

A total of 7,777 cases have been reported this year. This is slightly under a three-fold increase as compared with the same time period of 1966. The weekly distribution of reported cases in Dacca is shown in Figure 1. After an epidemic peak during the week ending April 22 incidence has decreased gradually. No cases were reported from Dacca during this time period in 1966. The death to case ratio is 61.4 percent, (2,437 cases with 1,497 deaths), three times that of India (SEP Report I:1, June 1967). This almost certainly indicates that only the more severe cases are reported.

FIGURE 1
REPORTED SMALLPOX CASES, DACCA, PAKISTAN
JANUARY 1 - JULY 22, 1967




SOURCE: WHO

India

An increase in the cumulative total of reported cases continues. Except for the expected seasonal decline in incidence there have been no consequential changes in the epidemiological characteristics as reported in SEP Report I:1, June 1967.

C. Africa

Through August 17, 9,709 cases have been reported from Africa as compared with 9,171 cases for the similar period in 1966.

West and Central African Regional Smallpox Eradication/Measles Control Program Area

Reports received through August 17 indicate 7,545 cases reported this year as compared with 5,785 last year. An overall increase of 30.4 percent is observed.

Substantial increases are observed in Chad, Dahomey, Guinea, Niger, Sierra Leone and Togo. Table 3 shows the reported cases for comparable reporting dates for 1966 and 1967.

Table 3. Reported Smallpox Cases in the West and Central African Smallpox Eradication/Measles Control Program Countries, Comparable Reporting Periods, 1966 and 1967

| Country | Comparable Reporting Date in 1966 and 1967 | Cumulative Number of Cases 1966 | 1967 |
|---|---|---|---|
| Cameroon | July 29 | 3 | 21 |
| C.A.R. | * | - | - |
| Chad | July 29 | 0 | 87(i) |
| Congo (B) | * | - | - |
| Dahomey | July 11 | 222 | 576 |
| Gabon | * | - | - |
| Gambia | * | - | - |
| Ghana | July 28 | 12 | 32 |
| Guinea | July 22 | 3 | 319 |
| Ivory Coast | March 26 | 0 | 2 |
| Liberia | February 28 | 0 | 3 |
| Mali | July 22 | 249 | 135 |
| Mauritania | * | - | - |
| Niger | August 7 | 830 | 1,035 |
| Nigeria | July 22 | 4,279 | 4,230 |
| Senegal | May 14 | 0 | - |
| Sierra Leone | July 8 | 99(i) | 913(i) |
| Togo | July 23 | 37 | 122 |
| Upper Volta | May 30 | 51 | 70 |
| Total | | 5,785 | 7,545 |

* No cases reported to WHO through August 17, 1967
(i) Includes imported cases

## III. PROVISIONAL VACCINATION DATA - WEST AND CENTRAL AFRICAN REGIONAL SMALLPOX ERADICATION/MEASLES CONTROL PROGRAM AREA

Provisional data compiled for the month of July show that over 2,321,567 smallpox and 274,306 measles vaccinations were administered in the nineteen country area. The cumulative total for the period January 1 through July 31, 1967 is at least 9,562,144 smallpox vaccinations and 1,586,110 measles vaccinations. Table 4 shows these data by country.

Table 4. Smallpox and Measles Vaccinations (Provisional Data) Administered by Country*, January-July 1967

| Country | Smallpox Vaccinations | | Measles Vaccinations | |
|---|---|---|---|---|
| | July | Jan.-July | July | Jan.-July |
| Cameroon | 18,000 | 721,026 | 30,000 | 195,504 |
| C.A.R. | 15,443 | 201,720 | 3,839 | 48,981 |
| Chad | NR | 728,200 | NR | 117,397 |
| Congo (B) | NR | NR | NR | NR |
| Dahomey | 60,331 | 364,104 | 17,849 | 98,771 |
| Gabon | 180,000 | 256,453 | NR | 8,000 |
| Gambia | 39,127 | 73,836 | 8,295 | 16,222 |
| Ghana | 137,472 | 562,236 | 23,064 | 72,892 |
| Ivory Coast | 145,728 | 900,943 | 11,000 | 115,222 |
| Mali | NR | 491,948 | NR | 127,280 |
| Mauritania | 0 | 0 | 0 | 0 |
| Niger | 1,065 | 1,122,205 | 0 | 123,843 |
| Nigeria | 1,505,949 | 2,604,784 | 161,258 | 273,312 |
| Senegal | 0 | 0 | 0 | 0 |
| Togo | 113,452 | 315,570 | 19,001 | 101,885 |
| Upper Volta | 105,000 | 1,219,119 | 0 | 286,801 |
| Total | 2,321,567 | 9,562,144 | 274,306 | 1,586,110 |

* Smallpox Eradication programs had not been instituted in Guinea, Liberia and Sierra Leone as of July 31.
NR No report

## IV. ERADICATION NOTES

### A. Assessment Methodology - Pilot Assessment Activities, Kano, Nigeria

Assessment surveys are generally designed to (1) obtain estimates of the population vaccination coverage by broad age groupings, e.g., less than 5, 5-14, 15-44, and 45 or over and (2) measure the efficacy of the vaccination as determined by the clinical reaction, e.g., primary vaccination "take rates" in children under age 5.* Slight modifications regarding the classification by age are required dependent upon the existing records and practices of the local health authorities.

Two pilot mass vaccination campaigns were conducted in the Kano Province (SEP Report I:1, June 1967) of Nigeria in April with assessment surveys conducted 10 days afterwards. In addition to the objective listed above. a further aim of these surveys was to test the practicality of standard assessment techniques in an African field situation. Both urban and rural areas were selected. For both areas a brief description of the assessment procedure is presented.

The interview questionnaire (Figure 2) was discussed in detail during the interview-training session (3 hours) held prior to each survey. The interview questionnaire was designed to obtain data permitting the calculation of coverage rates for age groups less than 6 months, 6 months-3 years, 4-14,

* For those interested, a detailed document describing assessment methodology may be obtained upon request.

Figure 2

SURVEY FORM FOR KANO DISTRICT

Name of Village_____

Estimated Population_____

Date of Vaccination_____

Date of Survey_____

| Compound No. | No. H.U. | H.U. No. | Total Persons | Less than 6 mos. of Age | | | | | | | | 6 mos.-3 years of Age | | | | | | | | 4-14 years of Age | | | | 15-44 years of Age | | | | 45+ years of Age | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | No. in House | | No. Vacc. | | No. Insp. | | No. With "Take" | | No. in House | | No. Vacc. | | No. Insp. | | No. With "Take" | | No. in House | | No. Vacc. | | No. in House | | No. Vacc. | | No. in House | | No. Vacc. | |
| | | | | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
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15-44 and 45+ years. Clinical reactions to vaccination were read in children under age four.

In these pilot surveys a team consisted of one interviewer, (a local employee of the Nigerian Smallpox Eradication/Measles Control Program) and one observer, a member of the NCDC Advisory Staff. Usually a team consists of two persons both local employees.

Description of Selected Areas

Kano-Urban

Using a city street map, the urban area in Kano was stratified into five major geographic sections of approximately equal populations using paved streets as boundaries. A further arbitrary substratification along unpaved roads, was done to yield five minor geographic sections within each major geographic section. Thus, a total of 25 geographic sections were delineated in the assessment area.

To assure a statistically reliable estimate of the coverage rate a sample of 200 children under age 4 is required; therefore, using preliminary estimates of an average number of children per household in this age group of approximately 1.3*, a sample of 150 households was taken. Each minor geographic section in the city consisted generally of several large compounds surrounded by a wall; within the confines of the wall were several smaller compounds. These smaller compounds were defined as households. Fifty large compounds were randomly selected (two within each minor geographic section) and three households were taken from each compound.

Kano-Rural

A portion of the Dawakin Tofa District of Kano Province was selected for the rural pilot project. The area, agricultural in general, was located approximately 30 miles southwest of Kano. Seven villages were in the assessment area and all were located within an area ten to twelve miles across. This rural area was geographically stratified by village. In each village interviews were conducted in all compounds as the village populations were not large enough to warrant sampling, i.e., the estimated number of households in each village was less than 200.

This pilot assessment deviates from recommended procedures for rural assessments as follows:

1) All villages in the area were included rather than a sample of villages. Since the target area for the rural mass vaccination campaign contained only approximately 20,000 people, the usual sampling of villages would have yielded uninterpretable data.

2) Interviews were obtained in all compounds because (1) original plans to interview only a sample of the compounds had to be abandoned due to inaccurate overestimates of village populations and (2) the evaluation of the assessment practicality in rural areas necessitated for a work load sufficient to measure the maximum daily interview output of each team.

* Based on available local estimates of household size.

Results of Surveys

Regarding the practicality of the assessment techniques, several observations are noteworthy. First and most important, the assessment results are totally dependent on the competency of the assessors. The assessors must be able to read, write, and speak the Lingua Franca of the area (English in this instance). This avoids the subject matter loss inherent in systems based on gathering data in a tribal language, translating this information to English by a non-technical translator, and final analysis of the third hand result by a statistician.

The interviewing techniques seem generally understood by the team leaders and as field experience was gained detailed supervision was not necessary. The assessors seemed to have the most difficulty in evaluating vaccination reactions. In view of this, more attention must be given to training the assessors in interpreting results of vaccinations. Visual techniques such as a pictorial series of clinical reactions would be helpful. Also a field evaluation of clinical reactions by each assessor prior to the start of the survey would have value.

The daily work output appeared greater in the rural area than the urban area. An average of 125 households per day per assessor was obtained in the rural assessment whereas an average of 50 households per day per assessor was obtained in the urban area. This is in part due to an extension of the "work-day" in the rural area to 10-12 hours as compared with 7-8 hours in the urban area. In addition effective village organization under the cooperative leadership of the village chief permitted more rapid assemblage of respondents and more facility in obtaining desired information.

A truck was provided for transportation of the assessor in the urban area. This was more than adequate as the assessment team was driven to the sampled households wherever possible. Under usual circumstances one truck would be adequate for many assessors if used to "shuttle" teams to sample points from which they "work back" to the headquarters on foot. In the rural area assessment teams were driven to selected villages but transportation between sampled households was by foot. In most circumstances one bicycle or motorbike per assessor will be necessary in rural assessment activities for transport between sampled villages, once teams are delivered to a District by truck.

The estimated vaccination coverage was 72.4 percent in the urban area as compared with 92.5 in the rural area. Age specific differences in the percent vaccinated (Table 5) were observed in the urban area. These differences ranged from a low of 67.3 percent in the 15-44 age group to a high of 84.1 percent in the 6 months-3 years age group. (In the 45 and over age group only 27 people were included in the sample of which 18 were vaccinated). In contrast to this, the rural area survey results revealed a vaccination coverage ranging from 75.0 percent in the less than 6 months age group to 94.8 percent in the 4-14 years age group.

Table 5. Comparison of Percent Vaccinated in Urban and Rural Areas by Age, Kano, Nigeria

| Age Group | Percent Vaccinated | |
|---|---|---|
| | Urban Area | Rural Area |
| Less than 6 months | * | 75.0 |
| 6 months-3 years | 84.1 | 90.4 |
| 4-14 years | 80.7 | 94.8 |
| 15-44 years | 67.3 | 93.2 |
| 45+ years | * | 92.0 |
| Total | 72.4 | 92.5 |

* Number in sample too small for meaningful interpretation

As to the estimation of "take rates", field observations showed that training of the assessors was insufficient to obtain reliable estimates in the urban assessment. This was partly due to the language barrier between the assessors and the advisory staff during training sessions. During the rural assessment using English speaking assessors, primary reactions were evaluated for the six months-3 years age group with an overall "take rate" of 94.2 percent. The largest village, Yawla, had the lowest "take rate" (87.0 percent) with the remaining six villages having "take rates" ranging from 95.0 percent to 98.8 percent.

In conclusion, even though problems were encountered in the assessment activities, the methodology is conceptually sound and the interviewing techniques and sampling procedures were performed by the assessors in a satisfactory fashion. As more experience is gained by the assessors, assessment efficiency will most certainly increase.

(Reported by Dr. E. Ademola Smith, Director, Nigerian Smallpox Measles Program; Dr. P. O. Adeoye, Director, Smallpox Measles Unit, Northern Region, Nigeria and C. J. "Vickie" Jones, NCDC, SEP, Operations Officer for Assessment, Northern Region, Nigeria.)

B. Measles Vaccination, Age, Sex and Geographic Distribution - Ivory Coast

The first phase of the 1967 measles vaccination campaign ended on March 28. The total number of measles vaccinations given during February and March of this year was 92,107. An age and sex distribution is given in Table 6. The vaccinations are approximately equally distributed between the males and females within age groups. Of the total vaccinations given, 1/3 was given to children 5 and 6 years old.

Table 6. Age and Sex Distribution, Measles Vaccinations, Ivory Coast, February-March 1967

| Age | Males | Females | Total | Percent of Total |
|---|---|---|---|---|
| 6 months-11 months | 8,811 | 8,203 | 17,014 | 18.5 |
| 1-2 years | 10,264 | 10,163 | 20,427 | 22.2 |
| 3-4 years | 11,467 | 11,072 | 22,539 | 24.5 |
| 5-6 years | 17,034 | 15,093 | 32,127 | 34.9 |
| Total | 47,576 | 44,551 | 92,107 | 100.1 |

The geographic distribution by sous-prefecture in which these vaccinations have been given are shown in Figure 3. Table 7 summarizes the number of males and females vaccinated in each area and the percent of the total population vaccinated against measles.

FIGURE 3
GEOGRAPHIC DISTRIBUTION OF MEASLES VACCINATIONS
IVORY COAST, JANUARY-FEBRUARY, 1967

Table 7. Measles Vaccinations by Sous-Prefectures
Ivory Coast, February-March 1967

| Department | Sous-Prefectures* | Males | Females | Total | Percent of Total Population** Vaccinated |
|---|---|---|---|---|---|
| North | Borotou (4) | 1,775 | 1,632 | 3,407 | 20.6 |
| North | Tieninghoue (18) | 2,058 | 2,036 | 4,094 | 22.2 |
| North | Touba (5) | 5,152 | 4,864 | 10,016 | 23.7 |
| North | Mankono (17) | 3,694 | 3,486 | 7,180 | 23.7 |
| North | Dianrha (16) | 2,124 | 2,213 | 4,337 | 26.3 |
| North | Seguela (11) | 3,014 | 3,186 | 6,200 | 38.5 |
| North | Kani (9) | 2,389 | 2,457 | 4,846 | 36.5 |
| North | Ourofla (10) | 2,117 | 2,108 | 4,225 | 27.9 |
| West | Man (5) | 12,646 | 11,971 | 24,617 | 22.2 |
| West | Biankouma (4) | 6,960 | 5,452 | 12,412 | 23.0 |
| West | Fakobly (6) | 2,761 | 2,487 | 5,248 | 20.6 |
| West | Kouibly (7) | 2,886 | 2,639 | 5,525 | 24.7 |
| Total | | 47,576 | 44,531 | 92,107 | 24.2 |

* The numbers within the parenthesis indicate sous-prefectures within Department.
** Population Source: Institut d'Hygiene, Ivory Coast

EDITORIAL COMMENT:

Although it is impossible to quantitate precisely the coverage rate in the target population (less than age 7), an indication of a relatively high coverage is deduced if the proportion of the total population vaccinated is compared with the estimated proportion of children under age 7. Using United Nations demographic data for the Regional Program area, the estimated proportion of children under age 7 is 25 percent. (Demographic Yearbook, 1965, United Nations.)

(Reported by Smallpox Eradication/Measles Control Program, Ministry of Health, Ivory Coast and Mr. R. C. Hogan, SMP, Abidjan.)

C. Movements of a Nomadic Tribe - Mali

Following is an extract from a letter (dated April 17, 1967) written by Dr. P. Imperato, USAID, SMP, Bamako, which illustrates the complexities of "reaching" all groups of people for smallpox vaccination.

"At present I am studying the problem of nomads here in Mali. It is a very complicated situation. However, I have gotten precise information on movements, time, etc. The biggest group are the Peuhl. There are several groups of them in Mali, each having a different pattern of movement.

"The Peuhl are now down country with their cattle and families. Each family of Peuhl attaches itself to a family of sedentary Bambara. For each village of sedentaries there may be five or six families of Peuhls. The same Peuhls stay with the same Bambaras each year, having done so for countless generations. They camp out in the fields which may be several miles from the Bambara villages, where their cattle provide manure for the Bambara fields.

"Each group of Peuhls have a chief. The women, along with the kids, come into the villages and markets to sell milk. The men are out with the cattle and somewhat away from the campment during the day. Generally, vaccination

teams miss these people because they do not concern themselves with the affairs of the villages. Unless it is explained to them in advance they will be reticent about coming to the village for the team thinking it is a team of tax collectors or census takers.

"However, they will come to the village if the matter is presented to them before the team's arrival. We are beginning to vaccinate where there are a great many Peuhl. I have explained to all the teams, urging them to get the Peuhls. They understand the situation. The Peuhls will move up to the north, crossing the Mauritania border in July. I am making up a separate report on all nomadic movements in Mali and across our frontiers, and also some information on movement in Mauritania. Most of the information comes from the people conducting the Rinderpest campaign. They have these movements down to the minutes of latitude.

"Interestingly enough there is a massive week-long crossing of the Niger in December of the Macina Peuhl. About 10,000 people cross, all men with the cattle. It is here that the Rinderpest people reach them, setting up police barricades and refusing to let anyone pass whose cattle are not vaccinated. We plan to station a few teams up there next December in order to do the same."

EDITORIAL NOTE:

Migratory tribal groups may be responsible for smallpox transmission over vast distances; as the adult males of such tribes may be the most difficult cohort to find and vaccinate, they may also serve as the most efficient smallpox vectors.

The Rinderpest campaign has been in operation for over five years in eight countries of West Africa. The goal is the eradication of this economically devastating disease of cattle (etiologically related to measles); marked success to date in reducing the incidence of the disease is related in large part to the detailed information collected on cattle movements. The assistance to the Smallpox Eradication Program provided by the experience of the Rinderpest group illustrates how a wealth of local knowledge and expertise gained in one eradication activity may be of great value in other quite different disease eradication efforts.

D. Hospital Acquired Smallpox - Ivory Coast

In outbreaks resulting from importations of smallpox into USA, Europe and more recently Kuwait the hospital has characteristically played a major role in propagation of disease. The following is a summary of an investigated outbreak in Ivory Coast involving hospital spread of smallpox which originated in a migratory tribesman.

M.D., age 25, is employed by his father as an agricultural worker in the village of Dimba in the sous-prefecture of Tinda. He came to the Ivory Coast from Upper Volta two years ago. In 1964 he was vaccinated in Banfora, Upper Volta. Ivorian smallpox vaccination teams vaccinated Dimba the 5th and 6th of November, 1965, but M.D. was away at that time.

In the middle of December, 1966, M.D. left Dimba to visit relatives in Bobo-Dioulasso, where he stayed for approximately three weeks. On or about January 20, 1967, he left Bobo-Dioulasso to return to Dimba, travelling in a Renault "mille-kile" with a number of other passengers. During this trip he sat next to a man whom he describes as having a skin eruption very

similar to that which he developed shortly after his return. This man, whom he remembers only as "a Peuhl from behind Ouagadougou," was so ill that he had to leave the truck at "the first village after Kampti." (Note: Exhaustive efforts to locate this man did not prove successful. Epidemiologists searched in all of the villages near Kampti and no sign of the Peuhl was found. Hospital authorities in charge of the dispensary at Kampti, indicate that Peuhls frequently conceal patients with communicable diseases.)

Returning to Dimba about January 24, M.D. worked for eight to ten days until he became ill with fever, headache, and stiffness of the joints. Two or three days later he developed a rash which led him to come to a hospital at Agnibilekrou on February 4. At that time he was diagnosed as having smallpox. M.D. remained at the hospital until March 13 and was discharged after making a full recovery.

On February 12, K.P., also an Upper Voltan, was brought to the Agnibilekrou hospital with Cerebro-Spinal Meningitis. Neither M.D. nor K.P. were in isolation. On March 3, K.P. died, his death being attributed to smallpox.

K.P. was visited in hospital by his brother-in-law, S.P., and S.P.'s sister-in-law, T.P. Both of these people, who had spent the last two years in villages near Agnibilekrou, spent considerable time in close proximity to their relative. S.P. estimates that he spent a number of hours for thirteen consecutive days in and around the room where his relative was presumably isolated, and that T.P. had visited the patient frequently and had sat up at least two nights near his bed helping tend to his needs.

On March 1, S.P. and his sister-in-law, T.P., left Agnibilekrou for Kaora, her home, some fifteen kilometers from Gaoua. By the time they reached Gaoua she was sufficiently ill that she was unable to continue and was hospitalized. Initially diagnosed as having malaria, the appearance of a pustular eruption on March 5 indicated the correct diagnosis. On March 6, S.P. reported to the same hospital with a rash and was also diagnosed as having smallpox. He apparently suffered no prodromal discomfort. Both of the Gaoua patients subsequently recovered.

A.P., the wife of K.P., also visited him at the hospital in Agnibilekrou. According to S.P., she returned to Kaora, was vaccinated at Kampti during the trip north, and was in good health.

An additional fourteen cases have been reported from Gaoua. While it is not known whether these cases can be linked epidemiologically with the cases discussed here it seems quite possible that all may be part of the same chain -- a chain whose first link is the mysterious "Peuhl from behind Ouagadougou."

(Reported by Smallpox Eradication/Measles Control Program, Ministry of Health, Ivory Coast and Mr. R. C. Hogan, SMP, USAID, Abidjan).

## STATE EPIDEMIOLOGIST

Key to all disease surveillance activities are those in each State who serve the function as State epidemiologists. Responsible for the collection, interpretation and transmission of data and epidemiological information from their individual States, the State epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

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