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EVALUATION: SMALLPOX ERADICATION AND MEASLES CONTROL PROGRAM

Central and West Africa

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EVALUATION OF SMALLPOX ERADICATION

and

MEASLES CONTROL PROGRAM

Central and West Africa

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PREFACE

This is a report of the evaluation of a five-year Smallpox Eradication and Measles Control Program conducted by the governments of 20 Central and West African countries as a part of the World Health Organization program to eradicate smallpox. The National Center for Disease Control, U.S. Department of Health Education and Welfare planned, developed and coordinated the program which was supported by the U.S. Agency for International Development.

As the program approached its termination, the Agency for International Development (U.S.A.I.D.) requested an independent evaluation by contract with the American Public Health Association. The field work was conducted in January, February, and March, by Drs. Dyar and Paffenbarger in Liberia, Ghana, Nigeria and Sierra Leone, and in the remaining (French speaking) countries by Drs. Buck and Peterson.

The authors are indebted to many individuals for their assistance, but particularly to the field staff of the National Center for Disease Control in the various countries. Without their assistance the evaluation would have been difficult, time consuming and more expensive, if not impossible. The authors also wish to acknowledge with particular thanks the assistance of Francis Masson, Ph.D., Economist, Office of Program Planning and Policy Coordination, U.S.A.I.D., Washington, D.C., who is responsible for Appendix II, "Some Economic Aspects of the Smallpox/Measles Program", and for the notes on Mali in Appendix I.

Rather than include the notes, comments and in some instances, recommendations for individual countries in the body of the report, they have been assembled in Appendix I. For readers desiring more detailed information about individual countries, reference to Appendix is suggested.

TABLE OF CONTENTS

		Page No.
I.	Introduction	1 - 7
	A. History	1
	B. Evaluation	1
	C. Objectives of Evaluation	3
	D. Methods of Collecting Data	5
II.	Observations on the Operation of Smallpox/ Measles Program	8 - 28
	A. Smallpox Eradication	8
	B. Measles Control	13
	C. Manpower Training	19
	D. General Logistics	21
	E. Effects of Smallpox/Measles Program on National Health Services Organization	27
III.	Summary Discussion	29 - 36
	A. Smallpox	29
	B. Measles	30
	C. Transportation	31
	D. Manpower	31
	E. Future Projects	32
IV.	Recommendations	37 - 43
	A. Smallpox/Measles Program	37
	B. Future Health Programs	39
Appendix I	Notes and Recommendations for Smallpox/Measles Program in Individual Countries of West and Central Africa	44
	O.C.C.G.E. Countries	45
	Niger	46
	Upper Volta	50
	Mali	54
	Mauritania	58
	Senegal	62
	Gambia	65
	Ivory Coast	66
	Dahomey	71

TABLE OF CONTENTS

(continued)

O.C.E.A.C. Countries

Cameroon 75
Chad 79
Central Africa Republic 84

Anglophone Countries

Ghana 86
Liberia 106
Nigeria 113
Sierra Leone 129

Attachments

1. Secretary General's Letter (OCCGE) 136
2. Eleventh Technical Conference 138
3. Dr. Saveanu's Report 140
4. Secretary General's Letter (OCEAC) 158
5. Epidemiologic Aspects of Smallpox Eradication in Nigeria 162
6. Epidemiologic Aspects of Measles Control in Nigeria 169
7. Institute of Health, Ahmadu Bello University 179

Appendix II. Some Economic Aspects of the Smallpox/Measles Program 183

Appendix III. Data Sources for Smallpox/Measles Program 190

Appendix IV. World Health Organization and Smallpox Eradication in Africa 192

I. INTRODUCTION

A. History - As part of a world-wide effort to eradicate smallpox undertaken by the World Health Organization, in 1966, the U.S. Agency for International Development agreed to sponsor and support the program in 20 countries of West and Central Africa. A measles control program already in progress in half the West and Central African nations was added to the smallpox eradication program. Through a Participating Agency Service Agreement, the Agency for International Development delegated technical responsibility for the dual program to the National Center for Disease Control of the U.S. Public Health Service in Atlanta.

The operation of the program and the geographical, political, and economical background of the countries has been described in detail in other publications and will not be re-stated herein except as necessary for understanding of certain comments and recommendations. The participating nations contributed general medical supervision, local costs and local labor. The United States contributed professional guidance and commodities in the form of vaccines, vehicles for transportation and ped-o-jets for the administration of the vaccines.

The five-year program initiated in 1967 at an estimated cost of $31,000,000, has resulted in the immunization of more than 122,000,000 individuals against smallpox and 20,000,000 children against measles in West Africa from January 1967 through December 1970. No cases of smallpox have occurred in the nations involved since May 1970, but measles continues as a serious epidemic disease in some countries.

B. Evaluation has been defined as "the process of determining the value or amount of success in achieving a predetermined objective, including the formulation of the objective, identification of criteria for measuring success, determination of the degree of success and recommendations for further activity."

An evaluation is influenced by the motives and concepts of both those desiring and conducting the evaluation, by differences in perception of important definitions and terms, by the methods used (goal directed vs. a systems approach) and by the objectives of the evaluation--be it evaluation of effort, performance, or efficiency. Similarly, the purposes of evaluation may differ and influence the amount and character of evidence collected, the method of approach and the interpretation of findings. Whatever the reasons for evaluation,

the methods used, or the objectives desired, four factors are critical in a satisfactory evaluation:

1. A precise definition of the objectives of the program being evaluated;

2. Specific agreed-upon criteria for evaluation;

3. A baseline measure of the status of the situation before initiation of the program;

4. Completion of the evaluation sufficiently in advance to permit the use of the findings.

As recognized by the A.I.D. staff, the present evaluation is limited in terms of the preceding four factors. There are inadequacies in planning in both the project and the evaluation.

The program lacked adequate baseline data against which accomplishment might be measured (particularly for measles control), failed to provide a system of periodic monitoring, and did not include at the time of its conception any plan for a final evaluation or for turning the program over to the participating nations. After several years of operation a further complication was introduced into the program by broadening of objectives from simply eradicating smallpox and controlling measles (imprecise as these may be), to a more general objective of contributing to the economic development of the countries by strengthening the infrastructure of health. On the credit side, this change introduced an important opportunity for flexibility, permitting some essential investigations which have had an important bearing on the efficiency of the program. The change also reduced program costs, and provided additional opportunities for greater services to the countries.

This evaluation effort has not provided adequate time for review of the enormous volume of documentary evidence, the systematic review of epidemiological literature that is desirable, and for preparation of a commonly accepted plan of evaluation. Nevertheless, we hope this effort will prove useful to A.I.D.'s future planning, for instance, in the permanent development of the health institutions of these countries.

A cholera pandemic in this area of the world has seriously interfered with the execution of the program in its terminal year and, undoubtedly limited its final accomplishments. Sporadic cases and focal out-breaks will undoubtedly continue to hamper operations for some time.

In spite of the deficiencies cited above and inadequacies of information later referred to in the report, it is clearly evident that the smallpox eradication program has been successful from an epidemiologic point of view and that the smallpox eradication and measles control program has contributed substantially to the permanent growth and improvement of the socio-economics of the countries concerned.

The following report of our methods, findings, some interpretation of observations and our recommendation presented not as a completed summary and total evaluation of the program, but as an effort to clarify and highlight some of its important aspects. In so doing, it has been necessary to make some arbitrary assumptions, as noted below. Within these limitations, it is hoped these considerations will illuminate the future, as well as document the past.

C. Objectives of Evaluation based on discussions with U.S.A.I.D. staff and from the terms of the agreement between A.I.D. and A.P.H.A., it is assumed the principal reasons for the evaluation are to determine the overall effects of the program and to explore the indications for program change. More specific objectives are:

1. To ascertain the direct effects of the Smallpox/Measles Program in eradicating smallpox and controlling measles;

2. To describe the indirect effects of the program on the health services and health organizations and on the populations of nations concerned;

3. To identify, insofar as possible, significant opportunities for possible support of further public health projects in West Africa that will contribute to the economic growth and social development of the country.

The evaluation of smallpox eradication is based on epidemiologic experience indicating that smallpox is transmitted by contact with an overt case. Once overt cases have been eliminated, the chain of transmission is broken and no new cases will appear. At what point a given area can claim smallpox has been eradicated is moot. It is generally conceded that the complete absence of smallpox cases from a given area for a period of time beyond that necessary for the last case to be infectious constitutes eradication, unless new infections are introduced from outside the area. W.H.O. has stated the complete absence of smallpox anywhere by 1975 will be considered worldwide eradication.

Measles control is not as easily defined. To our knowledge the term was not defined at the initiation of the program, therefore, no fixed criteria exist against which comparisons can be made. For purposes of this evaluation, it is assumed in the absence of a satisfactory a priori definition, that measles control is a sufficiently substantial reduction in morbidity and mortality from measles and its complications on a permanent basis as no longer to constitute a significant factor in infant and childhood mortality. This is to say that measles is controlled when it is no longer a major contribution to infant and childhood mortality. This definition is imprecise, subject to variable interpretations, but in the absence of a more exact definition it is arbitrarily assumed to be satisfactory from the point of view of communicable disease management.

There are four requirements for measles control:

1. An area-wide mass immunization program within a one-to-two-year period, in order to reduce substantially the existing reservoir of suspectibles;

2. A continuing campaign of immunization of incoming suspectibles, i.e., newborns;

3. A mechanism for assessment of the program to assure adequacy of coverage, potency of vaccines, and effectiveness of immunization;

4. An adequate surveillance of disease occurrence in order to maintain disease control.

In examining the second objective, the indirect effects of the Smallpox/Measles Program are those influences, beneficial and otherwise, upon the health organization, its operation and its accomplishments. In this categbry positive contributions to the health organization which improve its capacity to meet its objectives are considered at one extreme to the other of actions detracting sufficiently from other health programs as to cause, increases in morbidity and mortality, as a result of neglect.

The third objective, consideration of future health programs, is the logical utilization of the experience and results gained from the Smallpox/Measles Program. It can be argued that a project is an end in itself. However, if the information gained from an experience is not utilized, the opportunity to develop in a planned and logical fashion is denied and the future is chartered haphazardly.

This point was well expressed during the initial briefing, in the question of what will give health a higher priority in the African scheme (Adams) and reiterated later: "How much should we (A.I.D.) be involved in public health in Africa? How can public health projects be utilized to promote A.I.D. interests in population planning?" (Spencer)

We have, therefore, explored, in the limited time available, the impact of Smallpox/Measles Program on the public health of the countries visited. We have tried to note the opportunities therein for A.I.D. to be a catalytic agent, spinning off responsibilities appropriate to other agencies and to consider those opportunities, to consolidate past accomplishment and to develop new programs appropriate to A.I.D.'s broad objectives. In no sense have we time, skill or knowledge more than to note some major health problems and some significant supplemental resources that might be applied to these problems. The potential programs suggested by these notes may not be original, may possibly be under consideration without our knowledge, may not be feasible for policy reasons of which we are not aware. Hopefully, some will merit extensive exploration.

D. Methods of Collecting Data - The terms used in describing medical service organizations, Smallpox/Measles Program operations, classification of personnel, etc., in this report are those in common usage, and are not otherwise defined unless the usage is contrary to common practice.

The data sources used in preparing this report are indicated in Appendix III.

As noted above, interviews and discussions were held with a wide variety of persons--individuals participating in the Smallpox/Measles Program and responsible for aspects ranging from general supervision to operational details; persons responsible for program policy, evaluation and political assessment; technical staff of health organizations responsible for planning, supervision, education and program priority detail; medical and technical school faculty and administrators; professional staff of hospitals; numerous auxiliary health workers, and not insignificantly, an anonymous but considerable number of "health consumers".

These interviews were open ended, largely undirected, and sought to determine a knowledge of the program including a judgment of its effects; to solicit information on other major health problems when the informant was believed informed, and in some instances to report observations and solicit analysis of interpretation of these observations.

Many of the discussions took place with only the interviewers and the interviewee present. Others were conducted in the presence of staff of the Smallpox/Measles control Program. In no instance to our knowledge was an administrative superior to the individual being interviewed present at the time of the interview. An ttempt was made in the initial phases to keep the discussion undirected, but as significant points were made, a series of questions were posed in order to clarify the discussion.

Liberal handwritten notes were taken on all of the discussions; written documentation and confirmation of the points of views expressed were generally not sought, though interviewees occasionally confirmed their remarks in writing The opinions expressed may be colored by the concept of the purpose of the interview, by self-interest as well as by limitations of knowledge, and relationship of the interviewee to the Smallpox/Measles Program.

Where a single interview has been considered of major significance we have indicated the source of the information; of greater importance is a consensus expressed in a series of unrelated independent interviews.

It has obviously been impossible to check all sources of data and to determine their validity. We have tried to use those we believe are reliable and commonly accepted, and have sought confirmation on important data from other sources, as possible.

Of necessity, great reliance has been placed on the annual reports and operational plans of the Smallpox/Measles Programs in the various countries.

Anyone familiar with the demographic and health statistics of the countries will immediately recognize the limitations of this information. More specific comments on this subject are made in the program description of the several countries. For our purposes these are frequently the only sources of information on some subjects, and the data must be considered as relative rather than absolute.

In Appendix I there is a country-by-country summary of the Smallpox/Measles Program. Although there are similarities in program operation and results among all countries sufficient to warrant some general recommendations, there are also sufficient disparities between English- and French-speaking countries to necessitate different conclusions and recommendations in some respects.

The language, culture, history, and economy are different in the two groups of countries. The Francophone countries are generally smaller geographically than Nigeria and have smaller populations. The systems of government are different; the provision of health services is more highly centralized in the Francophone countries and is based upon a history of continued development from former colonial health services. In Ghana and Nigeria nationals have taken greater initiative in the development of national training resources. These disparities account for major differences in the effectiveness and delivery of health services, the knowledge about health problems, and in some instances, differences in the problems themselves.

II. OBSERVATIONS ON THE OPERATION OF SMALLPOX/MEASLES PROGRAM

A. Smallpox Eradication

Objective: The U.S.A.I.D. assisted Smallpox Eradication Project in West and Central African countries as part of the global program of the World Health Organization to eliminate the disease. The immediate goal has been to make the African continent free of smallpox by 1975.

Achievement: The results of the cooperative programs in the various countries are summarized in Tables 1, 2 and Figure 1. There have been no reported cases of smallpox in this area since May 1970. The disappearance of cases is neither the result of poor reporting nor of large natural variations in smallpox incidence, but is directly related to the improved immunity levels induced by vaccination. This conclusion is supported by the following observations and records:

1) Vaccination coverage has reached 80 or more percent in all countries visited, with the exception of Mauritania and Liberia;

2) The ability to recognize and report smallpox cases has improved in all countries;

3) Surveillance has become more competent in all countries;

4) Each country except Liberia has a program of maintenance vaccinations.

The decline of the annual incidence of smallpox since 1967 has been rapid, progressive and uninterrupted by seasonal peaks expected from previous years, as indicated in Figure 1.

The success of the Smallpox Eradication Project in Central and West Africa is not yet matched by similar results in other African countries, notably Ethiopia, Sudan, Congo, and South Africa. Hence, there is a continuous danger that cases of smallpox might be imported into those countries which have recently become free of the disease. This danger is especially great in nomadic populations where vaccination coverage is often low, and because of the considerable seasonal migration from east to west, and in countries adjacent

Table 1.

SMALLPOX MORBIDITY WEST AND CENTRAL AFRICA*

1967 - 1970

Country	Year			
	1967	1968	1969	1970
Cameroon	59	87	15	-
C.A.R.	-	-	-	-
Chad	86	5	-	-
Congo (B)	-	-	-	-
Dahomey	822	359	55	-
Equitorial Guinea	-	-	-	-
Gabon	-	-	-	-
Gambia	-	-	-	-
Ghana	78	26	-	-
Guinea	1,530	330	16	-
Ivory Coast	2	-	-	-
Liberia	6	5	-	-
Mali	293	58	1	-
Mauritania	-	-	-	-
Niger	1,187	678	28	-
Nigeria	4,752	1,832	204	65
Senegal	0	-	-	-
Sierra Leone	1,697	1,143	80	-
Togo	266	784	83	-
Upper Volta	118	100	-	-
TOTAL	10,896	5,407	482	65

*Source: Smallpox Eradication Unit, WHO, Geneva

Table 2

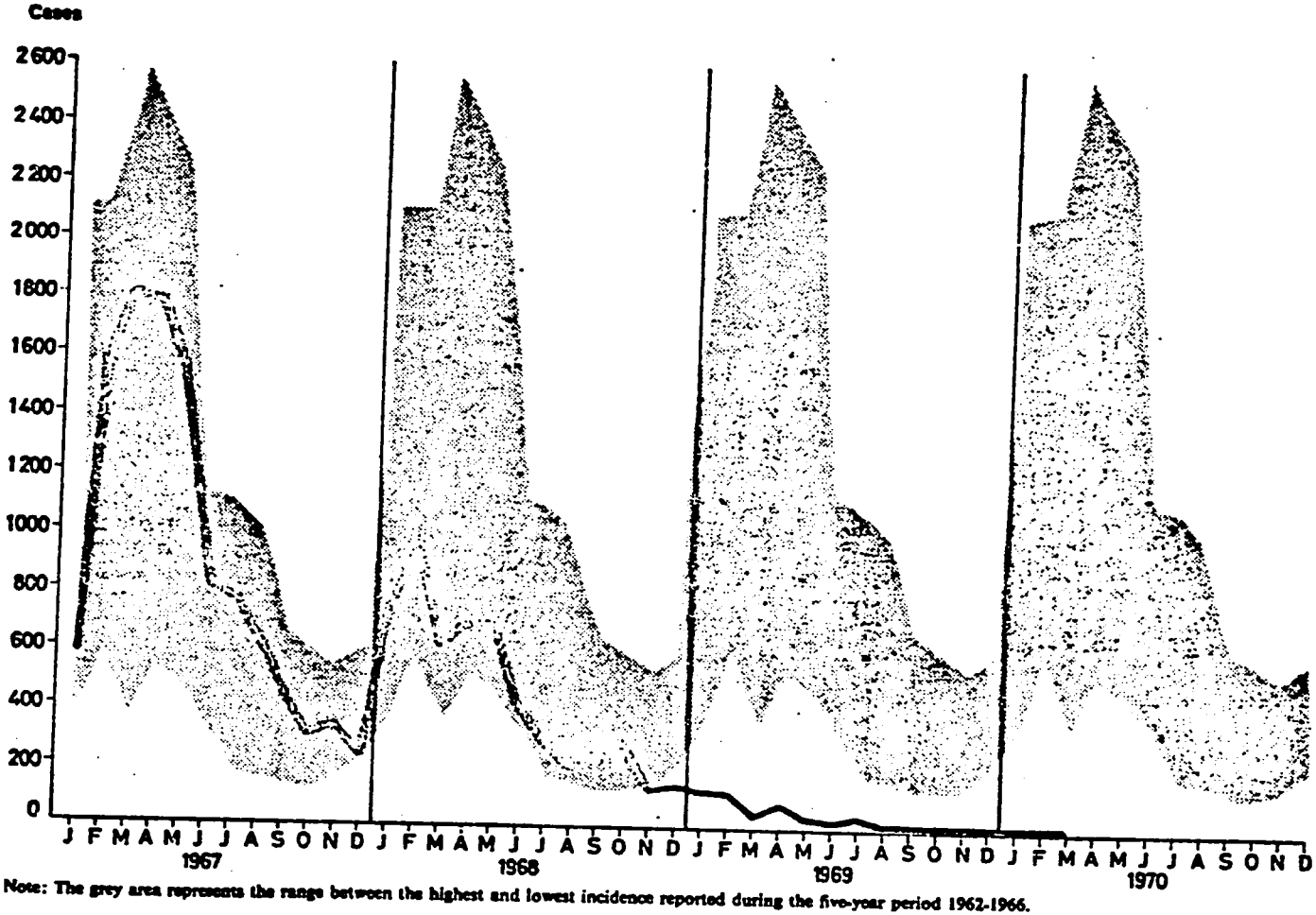
Cumulative Smallpox Vaccinations
West and Central Africa*
1967-70

Country	Cumulative Jan. 1967-Dec. 1970
Cameroon	6,742
C.A.R.	1,771
Chad	5,230
Congo (B)	1,636
Dahomey	3,475
Equatorial Guinea	320
Gabon	755
Gambia	457
Ghana	7,320
Guinea	6,017
Ivory Coast	5,467
Liberia	863
Mali	4,224
Mauritania	718*
Niger	5,009
Nigeria	57,910
Senegal	2,943
Sierra Leone	2,377
Togo	2,603
Upper Volta	6,611
Total	122,448

* Estimates and/or incomplete.

Figure 1

Africa, West and Central: Smallpox Incidence, 1967-1970 *



Note: The grey area represents the range between the highest and lowest incidence reported during the five-year period 1962-1966.

* Wkly Epidem. Rec. WHO 1971, 46: 13-28

to areas where smallpox is still endemic, notably the eastern regions of Chad and the Central African Republic. The present and future role of the U.S.A.I.D. assisted Smallpox Eradication Project as it relates to the entire African continent is summarized in the letter by the Chief of the Smallpox Eradication Unit of the World Health Organization in Geneva (Appendix IV).

Difficulties. Current assessment of vaccination coverage has been variable, ranging from excellent in Ghana and Sierra Leone to sporadic, incomplete, and lacking coordination in some of the Francophone countries. The concept of evaluation for detecting deficiencies of vaccination coverage in certain populations is generally accepted, but assessments in some areas have been hindered by:

1) A shortage of well trained assessment teams and/or independent transportation for the assessors;

2) Lack of direction for assessment from the responsible officers in the Ministry of Health, fuzziness in defining the functions of the operations and medical officers (CDC) in relation to evaluation and assessment. Guidance to medical and operations officers was expected to be provided by an adequate yet flexible job description supplemented by advice from senior professionals during their regular visits to the various countries. Unfortunately, this has not always been the case with time related modifications of the project in different regions or in individual countries (Appendix I, letter from Dr. Labusquiere).

Regularly scheduled vaccination cycles have been disrupted by medical emergencies that required diversion of all available manpower to other projects (cholera in 1970-71, yellow fever in 1969-70). While these medical emergencies have hampered maintenance vaccinations and assessment activities, they have, nevertheless, contributed to improvement in the infrastructure of health services in various countries.

With the disappearance of smallpox from West and Central African countries being only a very recent event, the need for careful and competent diagnostic evaluation of each reported case of suspected smallpox becomes even more important lest reintroduction of the disease may occur. Confirmation or

refutation of the diagnosis of smallpox in cases with suspected skin lesions has now become a key factor of smallpox surveillance. At present the laboratory diagnosis can be made only in a few competent institutions such as the Pasteur Institutes and the Center for Disease Control in Atlanta. The diagnostic work requires that the deep frozen fresh specimens from suspected patients be sent from Africa to Europe or the U.S.A. This technique is not always practicable especially in remote areas where logistic problems abound. The disadvantage of these cumbersome procedures aga inst the possibility of having competent diagnostic facilities in Africa is obvious.

Other difficulties of the smallpox project that are of a more general nature, i.e. transportation, service and maintenance of ped-o-jets, training of personnel, etc. are discussed under "logistics" and "manpower training"

B. Measles Control

Objectives: Of the acute diseases, measles has been one of the major causes of childhood mortality in West and Central Africa. With the development of a new and safe vaccine against the disease, it was originally hoped that systematic vaccination of children between 6 months and 6 years of age would lead to:

a) a considerable reduction in mortality,

b) reduced measles morbidity in participating countries,

c) and possibly the eventual eradication of the disease.

From the inception of the program it was realized that relevant epidemiological data for making reliable prognostic assumptions regarding measles control were lacking. It was hoped that new knowledge concerning the optimal time interval of recycling vaccinations in an area and for selecting the age group of children best suited for maximum benefits to a community would emerge from systematic concurrent assessments of the program. Its initial objectives were the control of measles by vaccination, the combination of the measles program with that of smallpox eradication for the sake of economy and, for humanitarian reasons, extending it at once to as many countries as possible under the circumstances.

Achievement: If, for lack of other means, the success of the measles project in the various African countries is judged entirely on the basis of reported cases and case fatalities

then two extreme situations emerge. On the one side is the unique example of the small country of Gambia where measles has virtually disappeared since 1968 (Table 3). On the other extreme is the example of Niger (Figure 2) and other countries where little change is apparent. Table 4 shows the cumulative number of vaccinations given to children in the 20 African countries included in the project. Perusal of the available information based on case reports, hospital records, and some sketchy assessments indicate that the best results of vaccinations are probably found in areas where the quality of the vaccine was maintained by an intact cold chain from the manufacturer to the site of vaccine administration, where teams were conscientious; where logistic problems were relatively small; and where the vaccination cycles were at most 1 year or less. Although various degrees of success are visible in each of the countries, even though at times counterbalanced by a tendency for improved case reporting, it is also quite evident from the available information that there have been failures, with considerable waste of money, and some signs of professional resistance to the measles part of the program.

Difficulties encountered in the measles program fall into two major categories, i.e. logistics and planning. Foremost among the logistical problems ranks the necessity for maintaining a "cold chain", i.e. for preserving the quality of the measles vaccine by keeping it at temperatures between 2 degrees to 9 degrees C. For international transport appropriate arrangements are made by the manufacturers of the vaccine. Storage in the capital cities in Africa is likewise usually quite adequate. But under actual field conditions the proper storage and transportation of the measles vaccine at low temperatures is often difficult. Under the rugged field conditions a breakdown in the cold chain has been reported by medical officers in the Ministries of Health and by operations officers of CDC from Niger, Mali (rural areas only), Mauritania, Cameroon, Chad, Sierra Leone, Liberia and Nigeria indicated not only temporary problems with the cold chain, but occasionally also insurmountable difficulties in delivering an effective vaccine to remote areas. The situation at its worst is probably best summarized by a statement made by the sub-director for preventive and rural medicine in Cameroon, Dr. J. Dutertre in his annual report for 1969, where on page 15, (Appendix I) he states, "it is altogether an illusion of pretending to vaccinate without mobile deep freezing facilities. Yellow fever and measles vaccine are non-transportable otherwise".

While it is difficult to assess with any degree of accuracy the number of doses of measles vaccine that may have been wasted since the inauguration of the program, it is suspected that the accumulated volume has been substantial.

Table 3

REPORTED MEASLES BY 4-WEEK PERIODS AND GEOGRAPHIC AREAS — THE GAMBIA 1967-1970

Year	Week	Total	Western Division	Bathurst	Lower River Division	Upper River Division	MacCarthy Island Division
1967	1-4	184	75	75	2	3	67
	5-8	247	87	73	14	19	54
	9-12	509	208	106	42	17	136
	13-16	699	443	101	47	2	204
	17-20	721	435	94	85	8	68
	21-24	777	389*	113	184	11	30
	25-28	472	247*	65	126	1	33
	29-32	390	173*	55*	84	3	15
	33-36	63	7	8*	36*	1	11
	37-40	137	2	2	100*	0	33
	41-44	20	0	0	11*	0	9
	45-48	2	0	0	2*	0	0
	49-52	7	1	0	1*	0*	5
1968[1]	1-4	27	2	0	0	1*	24
	5-8	68	0	0	0	6*	62*
	9-12	43	0	0	0	0	43*
	13-16	8	0	0	0	0	8
	17-20	7	0	0	0	0	7
	21-24	4	2	0	0	0	2
	25-28	9	8	0	0	0	1
	29-32	5	4	0	0	0	1
	33-36	2	0	0	2	0	0
	37-40	4	0	0	4	0	0
	41-44	1	0	1	0	0	0
	45-48	0	0	0	0	0	0
	49-52	0	0	0	0	0	0
1969	1-4	1[2]	0	0	0	0	0
	5-8	2	1	0	0	1	0
	9-12	3	0	0	1	0	2
	13-16	0	0	0	0	0	0
	17-20	2	1	1	0	0	0
	21-24	0	0	0	0	0	0
	25-28	0	0	0	0	0	0
	29-32	0	0	0	0	0	0
	33-36	0	0	0	0	0	0
	37-40	0	0	0	0	0	0
	41-44	0	0	0	0	0	0
	45-48	0	0	0	0	0	0
	49-52	1	0	1	0	0	0
1970	1-4	0	0	0	0	0	0
	5-8	0	0	0	0	0	0
	9-12	0	0	0	0	0	0
	13-16	0	0	0	0	0	0
	17-20	1	0	1	0	0	0
	21-24	0	0	0	0	0	0
	25-28	6	2	0	0	0	0
	29-32	0	0	0	0	4	0
	33-36	0	0	0	0	0	0
	37-40	0	0	0	0	0	0

1 - 14 cases, geographic and monthly distributions are unknown.
2 - 1 case, geographic distribution unknown.
* - Mass vaccination activities.

Figure 2.

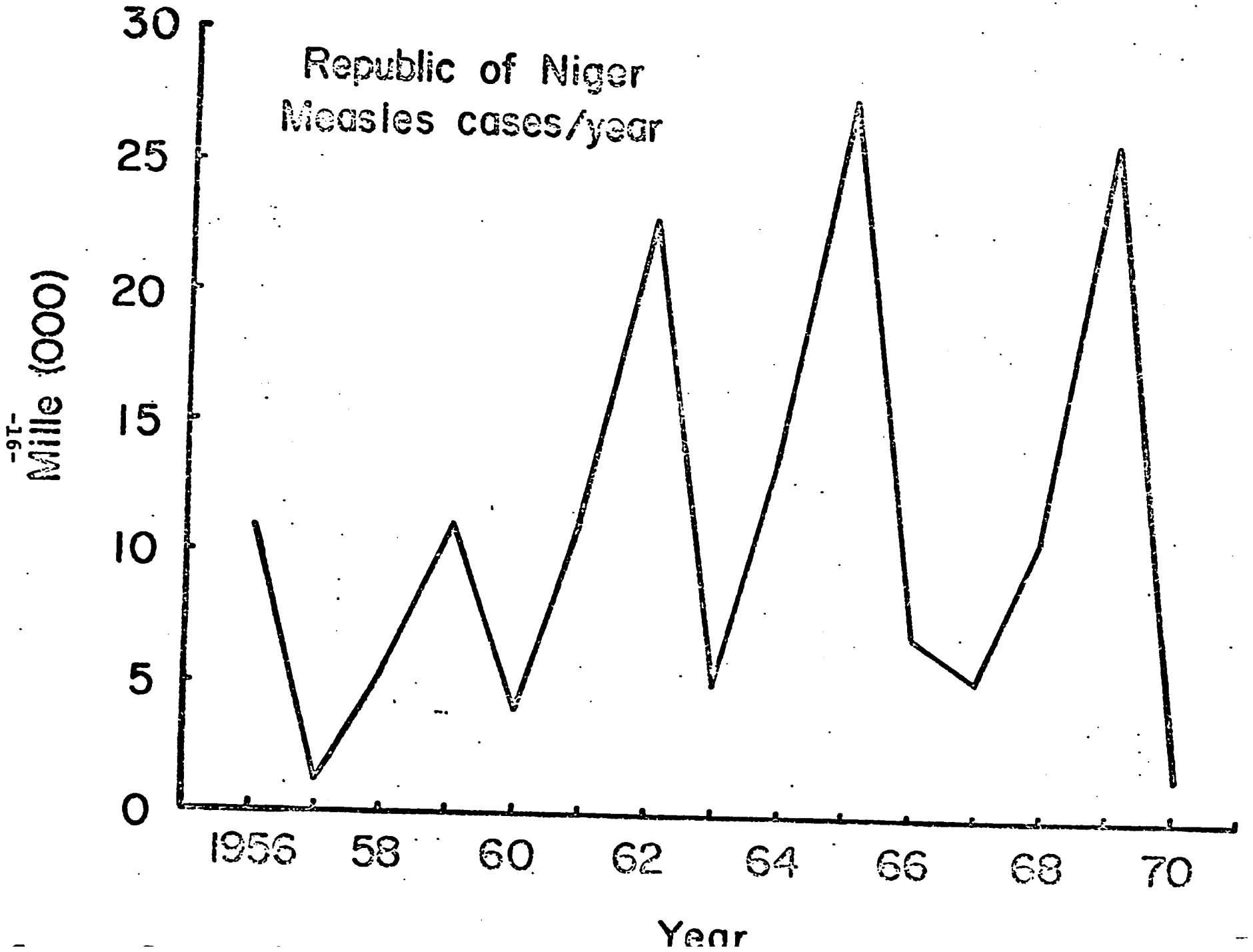

Republic of Niger
Measles cases/year
Mille (000)
30
25
20
15
10
5
0
1956
58
60
62
64
66
68
70
Year

Table 4

West and Central Africa
Measles Immunizations
(In Thousands)
1967-70

Country	Cumulative Jan. 1967-Dec. 1970
Cameroon	1,034
C.A.R.	365
Chad	796
Congo (B)	225
Dahomey	692
Equatorial Guinea	64
Gabon	116
Gambia	128
Ghana	1,408
Guinea	724
Ivory Coast	1,266
Liberia	165
Mali	1,051
Mauritania	95*
Niger	973
Nigeria	8,627
Senegal	913
Sierra Leone	440
Togo	447
Upper Volta	1,017
Total	20,546

* Estimates and/or incomplete.

This judgment is based on discussions with medical officers in the Ministries of Health, with local program directors, and with medical and operations officers of the Smallpox/Measles Program particularly in Mauritania and Cameroon.

In addition to the considerable financial losses in the program from spoilage of expensive measles vaccine, there is another concern, probably more serious, with this situation. Injection of inactive measles vaccine will not protect children against disease. In those populations where ineffective measles vaccines are given repeatedly there may be a growing unwillingness to participate not only in a measles project but eventually in any other vaccination program.

In many areas, valid morbidity and mortality data were not available to assess the results of measles immunization. The accuracy of clinical diagnosis and the completeness of reporting have not been measured. Adequate information on the incidence of measles prior to the inauguration of the program was not collected. Nor has periodic re-evaluation of these items of recognition and reporting been performed so as to assure quality control of the data and permit evaluation of the program. Finally there are many unanswered questions concerning the extent and significance of measles mortality.

The proper timing and recycling of measles vaccination is another major difficulty with which the program is confronted. As a result of recent experiences and studies made by personnel of CDC in some of the West African countries, a considerable decrease of the measles incidence can be expected only when the vaccinations are given to the susceptible children optimally those between 6 months to 18 months of age - at least once a year. In most of the countries, the intervals between vaccination cycles in rural areas are between two to three years. Because of emergency situations, even more than three years may elapse before a vaccination team can return to the same rural community.

In summary, the most important difficulties in the measles project have been the maintenance of the cold chain in certain parts of some countries; the lack of quantitative data on morbidity and mortality; inadequate assessment and evaluation within individual countries; the impossibility of maintaining the schedule of short vaccination intervals recommended for the schedule of short vaccination intervals recommended for the control of measles; and the disruption of preplanned vaccination schedules by medical catastrophies and emergencies (meningitis, yellow fever, cholera).

C. Manpower Training

Objective: One of the major goals of the Smallpox/Measles Program has been the training of auxiliary manpower to create and staff competent vaccination teams.

Achievement. A summary of the achievements is shown in Table 5. For evaluation in the field three categories of trainees in the Smallpox/Measles Program were considered:

1) a national counterpart to the operations officer of CDC who would be in a supervisory position and eventually replace the operations officer;

2) experienced nurses to serve as team leaders and in special cases as assessors of vaccination coverage; and

3) vaccinators capable of operating and servicing the ped-o-jets.

While there has been ample evidence for the success of the project in training and staffing competent, reliable and even imaginative vaccination teams, equivalent achievements for supervisory personnel are less evident. Indeed, there were no national counterparts to the Smallpox/Measles Program/CDC Operations Officers in Upper Volta, Senegal and Chad. Furthermore there were no personnel to conduct current assessment activities in Liberia, Niger, Upper Volta, Ivory Coast, Cameroon, Chad, and in the Central African Republic.

Difficulties. The absence of national counterparts to the Operations Officers in some countries cannot be taken ipso facto as evidence of failure on the part of the U.S. advisors. On the other hand, the presence of well-trained counterparts is by itself no guarantee that the program will be continued efficiently. A country by country analysis shows major differences between the nations that are part of O.C.C.G.E. and the others which belong to O.C.E.A.C. In the latter group of countries there is a strong, dedicated, French dominated, military-like rural health structure. The medical officers in charge expressed the opinion that the Smallpox/Measles Program is only part of the broad activities of the Service des Grandes Endemies which performs many tasks including multiple vaccinations In such a setting it would be difficult to find a suitable national counterpart who would have the same flexibility, partial independence and direct access to material in emergencies that the American operations officer has. A present shortage of manpower and the need to use all available personnel for the

Table 5.

Number of Trainees by Training Area and Job Function

West and Central Africa

Smallpox Eradication-Measles Control Program
(January 1967 - December 1970)

	Training Area		
Job Function	Africa	United States	Total
Supervisory	254	67	321
Vaccinators	2,261	0	2,261
Health Education	106	0	106
Assessors	158	0	158
Other	551	0	551
Total	3,330	67	3,397

never ending major and minor emergencies in public health were also mentioned as reasons why there were neither counterparts nor assessment activities. In short, assessment and evaluation are given different degrees of priority by the medical officers who are in charge of the national program and by the CDC operations officers.

In the O.C.C.G.E. countries the situation is less uniform and there are more counterparts in individual countries. In Upper Volta a strong French advisor (Colonel Sentilhes) shares the opinion of his comrades in the O.C.E.A.C. countries that competent candidates for a national counterpart are hard to find, and that their training seems to be a luxury.

In Senegal, indifference in the Ministry of Health seemed to be the dominating factor for not having assigned a counterpart to the competent Operations Officer of the Smallpox/Measles Program. In Niger one of the two national counterparts has tried to use his new position for further rapid career advancement unrelated to the position for which he was trained. In Cameroon there are two competent and well-trained counterparts; both are lacking adequate and responsible positions within the structure of the Ministry of Health. In the Anglophone countries, Ghana, Liberia, Nigeria and Sierra Leone, competent counterpart operations officers have been trained and are functioning though their effectiveness is problematical if political support is reduced where American operations officers are withdrawn.

D. General Logistics

Objective. Systematic mass vaccination with perishable vaccines in the predominantly rural populations of West and Central Africa depends largely on careful logistical planning and on efficient day-to-day operations. For the Smallpox/Measles Program the following specific provisions had to be made:

1) A fast, safe and uninterrupted supply of smallpox and measles vaccine from the manufacturers to the individual countries presently participating in the program;

2) Availability of storage space in reliable freezers situated in the major cities which serve as distribution centers and operations headquarters;

3) Availability of vehicles to transport teams and equipment from local headquarters to the rural communities where the vaccinations are carried out, including special refrigeration in order to maintain a cold chain;

4) Availability of a sufficient number of ped-o-jets for use by individual teams;

5) Establishment of a maintenance and service center in each country for vehicles, ped-o-jets and refrigerators;

6) Establishment of a service unit for vehicles, ped-o-jets and refrigerators on an international scale;

7) Establishment of a reliable diagnostic service for the laboratory diagnosis (ultimate diagnosis) of smallpox on specimens obtained from suspected patients in the field.

Achievements. Despite the many difficulties, the logistical achievements of the Smallpox/Measles Program have been among the greatest successes of the program. In country after country high ranking officials in the Ministry of Health and medical officers directly responsible for the project were unamimous in their praise of the American contribution to the program. Specifically mentioned in all countries were the Operations Officers whose initiative, ability, dedication and imagination have helped to overcome many emergencies.

The following is a point by point appraisal following the outline listed under "objectives".

1) The regular supply of high quality vaccines by international carriers has been satisfactory, although there have been occasional breaks in refrigeration

2) Storage space for vaccines, including refrigeration facilities for measles vaccines, appeared adequate. Breakdowns in the cold chain occurred occasionally in the most peripheral part of the supply system, i.e. between the rural regional headquarters and the villages in which the vaccinations were given;

3) While the vehicles of U.S.A.I.D. (Dodge trucks) have provided adequate transportation for the vaccination teams in the various countries, problems concerning their maintenance and service have been among the most frequent specific issues mentioned during the visits to all countries. (See Difficulties);

4) The triumph of the ped-o-jets as the presently optimal means of mass vaccination was overwhelmingly evident in all countries. Not only were the ped-o-jets memorialized as a symbol of achievement by issuing special postal stamps in one country, but their flexibility and importance to current public health problems was dramatically demonstrated by the cholera situation encountered in Ghana, Liberia, Sierra Leone, Nigeria, Niger, Upper Volta, Mali, Senegal, Ivory Coast, and Cameroon. In these countries mass vaccination campaigns against cholera were carried out as an emergency measure. The new capability of giving vaccines by ped-o-jet is one of the more important achievements of the Smallpox/Measles Program. Future developments will include the application of multiple antigens against a host of preventable diseases that are still among the more important public health problems in Africa;

5) Establishment of reliable service and maintenance units for the Dodge trucks has often been difficult and was frequently possible only by diverting much of the Operations Officers' time to this task (see Difficulties);

6) The system of servicing the ped-o-jets has contributed considerably to the success of the Smallpox/Measles Program. In addition to maintaining competent workshops in each country, a cooperative exchange system for spare parts needed in countries participating in the program has made it possible to keep the maximum number of ped-o-jets in operation;

7) The importance of proper identification and laboratory confirmation of individual smallpox cases has increased proportionately with the success of the smallpox eradication program in a given country. While clinical appearance and epidemiological data combined are usually sufficient to establish the diagnosis in an epidemic situation, sporadic smallpox cases require exhaustive exploration of all diagnostic possibilities, especially laboratory analyses. Because of the relatively long incubation period from 8 to 17 days for smallpox and difficult differential diagnostic questions as encountered in occasional cases of severe chicken pox, mild smallpox, or even human cases of monkey pox in some of the African countries (Sierra Leone, Liberia),

confirmation or refutation of the diagnosis by laboratory tests is essential for surveillance. The results indicate whether one deals with a potentially dangerous situation (reintroduction of a smallpox case; unrecognized endemic focus of smallpox) that requires immediate and unusual action by the public health officers, or whether one has merely an infrequent variation of a disease that does not endanger the public. The Smallpox Eradication Program of CDC in cooperation with the National U.S. Smallpox Surveillance Program has set up an efficient laboratory system that provides fast diagnostic services for countries which submit specimens from suspected smallpox cases. It should be noted that the A.I.D. sponsored Smallpox/Measles Program benefits financially from the laboratories maintained by the National Smallpox Surveillance Program financed by the Department of Health, Education and Welfare.

Difficulties. The program is confronted with numerous logistical difficulties, most of which are inherent in a project as complicated and as geographically widespread as the Smallpox/Measles Program.

Transportation: There are differences in the wear and tear of the vehicles in the various countries. These are related partly to the differences in the condition of roads and partly to variations in the quality of service and maintenance. With few exceptions, the use of the Dodge trucks was criticized as being too expensive (spare parts; gasoline consumption), and impractical. The difficulty does not lie in the fact that the car is technically inferior but that it is a "white elephant" in countries where there are only European vehicles, car dealers and service organizations. Spare parts for the Dodge trucks are not readily available, and frequently the cars have been inactivated for considerable lengths of time because delivery of the necessary spare parts took weeks or months. In many of the countries too much of the Operations Officers' time and efforts had to be spent in managing an official or unofficial workshop to keep the cars running and, by doing so, keep the teams in the field.

In countries in which cars are always in great demand but in short supply, lack of independent transportation for an assessment team, consisting usually of two assessors and a driver, was mentioned frequently as a reason for the absence of assessment activities.

Ped-O-Jet: Future vaccination programs will undoubtedly be broadened by including new vaccines against other preventable diseases of public health importance to African countries. The ped-o-jet will probably be adopted as the method of choice for administering multiple vaccines. Little is known as yet about the feasibility and efficacy of using various combinations vaccines simultaneously. Recent experiences with outbreaks of yellow fever and cholera have shown the great flexibility of the teams and equipment. But these experiences have also indicated that these emergencies interrupt all systematically planned vaccination programs. Regular and systematic application of multiple vaccines by ped-o-jet could lead to considerable savings in personnel and expenditures.

Technical problems with the air pressure pumps were mentioned as the most serious reason for the breakdown of ped-o-jets in the field. The high costs for repair or pump replacement combined with relatively long periods of inactivation of the jets are strong indicators for further research to improve this equipment.

Refrigeration: Deficiencies of refrigeration facilities in the field have been reported from almost all of the countries visited. Studies by CDC have indicated that the breakdown in the cold chain has occurred most frequently in the field between the most peripherally located regional storage unit and the village selected for vaccination.

There is serious need for a one man portable freezer unit, capable of maintaining for 48 - 72 hours the necessary low temperature for preserving measles vaccine. Samples of measles vaccines believed accidentally exposed to high temperatures while in transit or storage have been sent to CDC for evaluation of vaccine efficacy by various African countries. A special laboratory in Atlanta has advised medical and operational officers in the field whether or not the vaccine samples they had submitted for examinations were still sufficiently potent for producing antibodies in susceptible children that would protect them against natural infections with measles. This service was available to all countries upon request. Since January 1969 a total of 150 specimens was submitted for evaluation. Table 6 lists the results by country. It should be noted that the ranking of the countries by the number of specimens received does not necessarily indicate that they had experienced corresponding degrees of difficulties with the cold chain. The results do, however, indicate that there have been problems; whether these exceed or are short of the 20 percent of failures listed as the total in Table 6 must remain a matter of speculation.

Table 6

VACCINE SAMPLES SUBMITTED FOR RE-EXAMINATION OF TITERS, AND NUMBER AND PERCENT FOUND INACTIVE

	No. submitted	Not recommended for use	
		No.	%
Nigeria	67	12	17.9
Senegal, Mauritania, and Gambia	15	3	20.0
Ghana	14	2	14.3
Niger	14	2	14.3
Mali	13	3	23.1
Cameroon	10	5	50.0
Liberia	4	0	0
Guinea	3	0	0
Chad	2	2	100.0
Upper Volta	2	0	0
Ivory Coast	2	0	0
Sierra Leone	2	0	0
Dahomey	1	0	0
Togo	1	0	0
Total	150	29	19.3

E. Effects of Smallpox/Measles Program on National Health Services Organization.

Objective. A major objective of all A.I.D. programs is to contribute to the long range development and economic growth of the countries receiving assistance.

Achievement. Undoubtedly the Smallpox/Measles Program has been a highly visible political and social success in all countries, as well as eliminating smallpox and preventing untold morbidity and mortality from measles. Beyond these achievements, the program has made a significant contribution to the permanent health services of a number of countries.

In both Ghana and Nigeria special communicable disease surveillance units have been established in the national Ministries of Health as a result of the experience with smallpox. In both countries, sub-units have been established in the states. Notably, in Nigeria, eight such units are functioning with epidemiologists especially trained to supervise them.

As a result of these units, and stimulated by the experience with smallpox and measles detection, all communicable disease reporting has improved. A recent notable example is that of the prompt reporting of cholera in both Ghana and Nigeria, and the international communication of cholera data among the West African nations.

Further evidence of the influence of the Smallpox/Measles Program is the development and use of mobile health teams as part of the integral structure of the health organization in the O.C.E.A.C. countries, Ghana and Sierra Leone.

In nearly all of the countries of this area, the mobile teams have been used to administer a variety of vaccine, (cholera, yellow fever, tuberculosis, D.P.T.) occasionally in emergency situations. Notably in Ghana has there been a sharp increase in all immunizations since the initiation of the Smallpox/Measles Program. Mobile teams have also been used for health education programs, to collect morbidity data, and on occasion to provide emergency treatment.

The evaluation of the Smallpox/Measles Program has itself caused a number of countries to examine their health problems and programs more carefully and will stimulate increased national expenditures for health services and facilities.

Difficulties - Quantification of the permanent effect of the Smallpox/Measles Program is difficult. However, there is no question that the additional training of staff, changes in the organization of health services and the experience gained from the Smallpox/Measles Program will be of lasting value. Undoubtedly as U.S. support for the program diminishes and is withdrawn, some of the benefits will evaporate. But a citizenry, that in many instances, for the first time has received visible preventive health services from their government has been made preventive health minded. This is probably the greatest benefit from the program, but continued health service, probably in increased amounts from the national governments concerned, will be necessary to consolidate all of the benefits derived to date.

III. SUMMARY DISCUSSION

A. Smallpox

Smallpox was endemic throughout the 20 countr: western and central Africa at the inception of the Smal: Measles Program in 1967. Sierra Leone had reported the highest smallpox rates in 1967 and 1968, and six of the otner 19 countries experienced rates in excess of 5 per 100,000 population in 1967. The systematic program of vaccination in these countries beginning in 1967 has been accompanied by a gradual reduction in the incidence of disease. The last reported cases occurred in a village in Kwara State, Nigeria, in May 1970, where transmission had continued for over six months without being detected. Transmission of infection has been interrupted and eradication virtually achieved in this part of Africa, although continued vigilance will be required to prevent the reintroduction of infection by nomadic tribesmen from the heavily endemic countries of Sudan and Ethiopia.

The Smallpox Program had led to the development of several procedures unique in the control of epidemic diseases. These include the use of paramedical personnel in all phases of the operation; application of modern epidemiological techniques based on quantitative analyses for surveillance of disease and assessment of vaccination coverage; execution of mass vaccination when the disease is at low ebb; containment vaccinations around the area of recognized cases; and the use of such recent technological developments as the ped-o-jet injector.

The U.S.A.I.D. can take pride in its contribution to the worldwide effort of eradicating smallpox, an age-old scourge of mankind. In parallel with the 122 million vaccinations administered in these 20 African countries from 1966 through 1970, smallpox cases have ceased to be recognized since the last outbreak in Nigeria in May, 1970. Having contributed significantly to this situation, U.S.A.I.D. is faced with a dilemma-- some form of continuing support is necessary to consolidate the accomplishment, but at the same time it is neither wise nor desirable to assume responsibility for the maintenance of the program. Probably the answer lies in some form of assistance to other health programs, which will permit continuing surveillance of the smallpox situation simultaneously.

B. Measles

It is generally agreed that between four and six hundred children out of every 1,000 born in Western Africa die before their fifth birthday. Ten percent of these children who die have had a recent attack of measles (Lucas, Adenyi-Jones), so that this disease exacts an alarming cost in childhood mortality. Unmeasured, but similarly grim, is the frequency of complications that may leave the child alive but severely handicapped for life by mental impairment, kwashiorkor, pulmonary disease, deafness or blindness. Translated into social and economic costs, the loss is substantial.

A total of 20 million vaccinations against measles had been administered by January, 1971, in the measles control program in central and west Africa. This has undoubtedly prevented thousands of cases, increased public awareness of preventive health services, led to the development and strengthening of public health programs, and otherwise evoked substantial political benefit. To quantify the reduction in number of measles cases or the number of lives saved has not been possible, however. Problems of disease recognition and reporting, absence of baseline data on measles incidence, and inadequacies in follow-up measurements account for this.

Among the unanswered questions on the effectiveness of the measles program, perhaps the most important relate to protection through vaccination under the varied environmental and social conditions that prevail in equatorial Africa. The need to maintain measles vaccine in frozen state until shortly before use is made difficult by deficiencies in transportation and refrigeration facilities. Vaccination of children who have lost their maternal antibody and not yet acquired active measles infection is handicapped by illiteracy, communications problems, and ignorance. (To protect against measles, mothers often seek out vaccination for their children before maternally acquired antibodies have dissipated, resulting in vaccination ineffectiveness.) The need to determine proper intervals for the recycling of measles vaccinations under differing population densities and varied conditions of living arises from inadequate epidemiologic data. It is important to remember that use of impotent vaccine and its inappropriate administration lead to vaccine failures that destroy the public confidence in immunization procedures.

Program personnel recently have demonstrated their interest and willingness to initiate field investigations and assess:

a) the relative incidence of measles before and after mass immunization campaigns,

b) the accuracy and adequacy of clinical diagnoses,

c) and the optimum recycling intervals required to achieve measles control under the differing conditions of urban and rural living.

These observations undoubtedly will lead to improved direction and strengthening of the program.

Not the least important of the unanswered questions on the effectiveness of measles vaccination is that related to competing causes of mortality. Just how many lives are actually saved by reducing measles incidence? How many lives thus saved would be lost before age five by the ravishes of diarrheal diseases, undernutrition, pertussis, malaria, and other infectious diseases? Is such a "one-shot" approach to communicable disease control as a measles immunization program more than just an abortive and short-sighted effort? Would not a multiple antigen vaccination program, coupled to broader maternal and child health activities and developed through an improved delivery system, prove more adequate in promoting the economic and social development of these African communities?

C. Transportation

Disregarding political and administrative considerations, the experiences gained from the evaluation-consultation visits to all countries strongly suggest that too much money, as well as effort and time of qualified personnel, is wasted to keeping the Dodge trucks running. The same amount of money that is presently spent for these trucks would buy much more transportation without involving the operation officer's time, if the locally available brands of vehicles would be used for which spare parts, service facilities, and trained personnel are readily available. Transportation is the key factor of any mobile health project and abrupt discontinuation of assistance in this logistically sensitive field would lead to serious curtailments, if not a collapse of the program. The transportation question must be given very careful consideration since it is the lifeline of the program.

D. Manpower

All available evidence clearly indicates that the success of the Smallpox/Measles Program has been the direct result of the contributions made by the medical and operations officers in the field whose activities were coordinated and directed by a special unit of CDC in Atlanta. The years of experience with the project, both in the field and at headquarters in Atlanta, have created teams of seasoned professionals and

experts in field logistics. The progress made in Smallpox/ Measles Program indicates that a general reduction and re-allocation can be made. However, the abrupt withdrawal of all operations officers from all countries simultaneously would have catastrophical consequences. An orderly and systematic period of transition is essential. At the same time, a clear statement of the duties and responsibilities of the individuals remaining should be provided.

E. Future Programs

It is our conviction that a program which has proved as emminently successful as the smallpox eradication program should serve as the basis for consideration of further assistance in the health field. The experience provided, the good will created, the technical know-how developed, the organizational strengthening provided, and the medical advances contributed, must not be jeopardized by inaction, but must be utilized to contribute further to the well-being of the countries concerned.

As a part of making such assistance effective there are three requirements relating to the provision of any health services which are common to all countries which must be considered.

The first is the requirement for the improvement in the health services delivery system. Unless the mechanisms for planning, developing, providing and evaluating health services are substantially improved, support for the health projects in these African countries will not be fully effective.

Within this general requirement at least three factors must be considered;

a) the organization of the health system,

b) the administration or operation of the system, and

c) the requirement for manpower and training.

The second general requirement is the need for improved health information. This includes:

a) demographic information, i.e., the number of people, their age, sex, geographic distribution, etc.,

b) vital data, i.e., births; deaths by sex, age and specific cause,

c) morbidity and mortality, including new techniques for collecting and communicating the information and,

d) social and economic data relevant to health.

It is not enough to develop the systems for collecting and validating health intelligence. Consideration must also be given to the use of such information, i.e., analysis, evaluation, application and significance in determining priority for health plans and for evaluating health programs.

The third requirement to be considered is interruption of the vicious circle of malnutrition and disease. This circle taxes both human and economic resources. It drains the people of their health, saps their energies, decreases production and demands vast resources for the care of the sick and their families. In these processes important nutritional resources are consumed, without the corresponding increase in productivity

Nutritional inadequacies lead to disease and disease contributes to further nutritional inadequacy. Unless this cycle is broken a major deficiency in the national economy will continue to exist. This is a job, not only for health, but cooperatively for agriculture, education, transportation, communication and housing, and rural economic development.

The priority population in these countries is the mother - infant group. It is here that the major health problems appear to be concentrated. Likewise, this is where the greatest opportunity for service rests.

One of the crucial considerations in dealing with this group is the fact that as one problem is alleviated, another is created, i.e., with the improvements in health and the increase in the survival of children the magnitude of the population problems is intensified.

From our information, a direct assault on the population problem in these countries of West Africa, would be socially unpopular, politically unwise, and technically difficult. In this society polygamy is the rule rather than the exception, a high value is placed on children for their economic importance as agriculture workers and as an asset for old age and social security, and large families are a mark of prestige. Under these circumstances it would be difficult to convince a society that the number of children should be limited, even with proper spacing. As long as a high infant mortality rate persists and it is necessary to beget ten children in order that five survive, limitation of family size is not logical.

Only with the demonstrated assurance that children can survive will consideration be given to limiting the number, and spacing their conceptions to insure adequate resources for optimal development.

Population planning is most likely to succeed, in our opinion, as an attack upon infant mortality, in which maternal ignorance, and lack of education are important elements.

If infant mortality is considered in terms of the elements which contribute to it, communicable disease control programs, based on improved diagnostic services including adequate laboratories, selective multiple-antigen immunization programs, malaria suppressive treatment for pregnant women and pre-school children, and increased surveillance of disease are important. Likewise, a general sanitation program concerned with the improvement of the quality of available water and the disposal of rubbish and wastes is essential.

Increased observation of the child from birth to two years of age, and, hopefully up to five years of age will increase the opportunities for preventive care and the early detection of disease and nutrition deficiency and provide a mechanism for nutritional support and malaria suppression.

A companion effort to educate and train mothers in the care and feeding of their children can contribute to the understanding of the importance of the quality of life as contrasted with the quantity. Only then do programs for the dissemination of information and devices for contraception seem logical.

For those concerned, we believe a population program should logically be concerned with improvement in the delivery of health service, improvement in the quality of health-intelligence and interruption of the malnutrition-disease complex.

At this point special mention should be made of multiple vaccination programs. In all of the countries, communicable diseases constitute the predominant public health problem. Many of these highly prevalent diseases can be prevented by immunization with reliable and commercially available vaccines. Alternative approaches for the prevention of most of these diseases are presently neither available nor economically feasible. Therefore immunization programs are one of the most productive public health investments which any country can make. Multiple vaccination programs are given priority for the immediate future in the comprehensive health plans of many of these countries.

The feasibility and design of multiple immunization programs for developing countries has been the topic of a recent international conference sponsored by the World Health Organization. Significant contributions that would benefit most of the developing countries could be made by a series of small, well-planned research projects to determine the efficacy of various simultaneously administered combinations of vaccines in the same population, but some practical programs need not await these technical developments.

Priorities in Public Health and the Role of the Smallpox/Measles Project

Modification of the Smallpox/Measles Program into a project of disease prevention by multiple vaccination could cover the following diseases: smallpox, yellow fever, tuberculosis, poliomyelitis, measles, diphtheria, tetanus, pertussis, cholera on an emergency basis, and hopefully epidemic meningitis.

The spectrum of diseases that can be prevented by vaccination is indeed impressive. Nevertheless, it must be recognized that many of the medically and economically important health problems of West and Central Africa are either chronic parasitic infections (malaria, schistosomiasis, onchocerciasis, trypanasomiasis, filariasis, amoebiasis, intestinal infections by nematodes) or chronic diseases caused by bacteria (leprosy, yaws, syphilis, gonorrhea, etc.), usually occurring in two or more combinations. These are not preventable by vaccination. Unfortunately, little has or can be done to improve the situation with the presently available methods of prevention or mass treatment.

Regardless of what future programs may be supported consideration must be given to the limited national resources available. We have commented previously on the dearth of physicians and the dependence upon non-professional skilled auxillary health workers for the execution of most health programs. Their responsibilities are largely in the field of therapeutic medicine. They are primarily associated with fixed or static facilities, a system of rural health dispensaries, a number of which are satellites of a rural health center which are in turn responsible to a hospital. There are also throughout the nations concerned a few specialized hospitals. These governmental resources are supplemented by modest missionary hospitals and the limited services of voluntary health agencies.

Only with the initiation of the smallpox and measles programs has a concept of mobile teams for the provision of health services been introduced. Associated with this has

been increased recognition of the need for and the opportunity to provide preventive services, by both the static facilities and the mobile teams. Coverage by all of these resources is inadequate - the problem is both quantitative and qualitative.

In the face of this situation, the proper determination of national health priorities is crucial so that limited national resources are not diffused. The health problems are overwhelming and unless careful consideration is given to them the limited resources of these countries can be wasted on programs that are divergent and unimportant. Consideration must be given to the capacity for these nations to accept new projects and to discharge their responsibilities effectively, despite their eagerness for assistance.

IV. RECOMMENDATIONS

Based on extensive data supplied from numerous sources and our observations in the field, the recommendations are presented in two parts. The first group of recommendations deals with the completion of the Smallpox/Measles Program. The second series of recommendations relate to future health projects which might be supported by U.S.A.I.D. in central and west Africa.

As noted repeatedly, the success of the Smallpox/Measles Program, both in an epidemiological and political sense, has been such that it should be used as a platform from which other health programs are launched. Failure to utilize the experience, the national good will, community relationships and the administrative abilities developed would be short sighted. We do not mean to imply that all future program development should be done through the National Center for Disease Control, but that their skills and knowledge will be helpful to others if utilized before their African based teams are dispersed. Similarly, experience gained in the operation and evaluation of this program should be utilized in the consideration of future health projects.

A. Smallpox/Measles Program

1. It is recommended the Smallpox/Measles Program be gradually phased out subject to country by country variation as noted below. Having supported the successful effort to eradicate smallpox in central and west Africa is part of an international smallpox eradication program. U.S.A.I.D. is morally responsible for the consolidation and preservation of this accomplishment until such time as there is assurance that national resources are sufficient to prevent the re-introduction of smallpox.

a. Extended assignment of National Center for Disease Control epidemiologists and operations officers is recommended as follows:

Epidemiologists to 6/30/73

Nigeria - 3 (Lagos, Kaduna, Benin)
O.C.C.G.E. (Upper Volta)
O.C.E.A.C. (Cameroon)

Epidemiologists to 6/30/72

Ghana
Sierra Leone - Liberia

Operations Officers to 6/30/73

Nigeria - Lagos, Benin and Kaduna
O.C.C.G.E. - Upper Volta
O.C.E.A.C. - Cameroon

Operations Officers to 6/30/72

Nigeria - 3 (in addition to 3 above)
Niger, Senegal, Ivory Coast, Togo, Chad,
Ghana, Sierra Leone - Liberia 1 each

b. We believe American smallpox vaccine to be superior to that manufactured elsewhere and recommend it be provided or purchased by the country concerned, depending on their ability to participate in the program. Measles vaccine will have to be supplied from American sources.

c. It is recommended provision of Ped-o-Jets and Ped-o-Jet parts to 6/30/72 be negotiated on a country by country basis.

d. Provision of spare parts for Dodge trucks to 6/30/72, is recommended but any additional transport should consider national preference, ability to maintain and secure placement parts.

e. We recommend continuing use of smallpox diagnostic services provided by the Pasteur Institutes in Paris and Dakar, the National Center for Disease Control in Atlanta, and such qualified laboratories as now exist in Accra, Lagos and Ibadan.

f. Support for the completion of the attack phase of smallpox vaccination in eastern Nigeria and Liberia is recommended, but maintenance of immunity should be limited to susceptible newborns, unvaccinated adults and individuals at high risk - travelers, health workers (2 ½-3 year cycle), etc.

2. It is recommended measles immunization be continued subject to the following:

a. limitation to areas where effective refrigeration can be maintained;

b. provided from fixed facilities, as well as by mobile teams, wherever possible;

c. operation of programs in such a manner wherever possible to answer pending questions regarding efficacy of vaccines, optimal age of immunization, frequency of re-cycling

effect of immunization on infant mortality;

d. if used in conjunction with other antigens, investigation of possible immunological aberrations.

B. Future Health Projects

Technical assistance in public health should be concerned with those problems that are given high priority by both the recipient and the donor of the assistance. Simple extrapolation of judgments and of professional opinions from the American to the African situation, can contribute little to the solution of the African health problems since most of the regionally endemic diseases have never played an important role in the countries with advanced technology. Unfortunately, the nature and magnitude of the major public health problems in Africa are such that the presently available techniques, however generously applied, might not solve them. Previous reference has been made to the difficulties of controlling the endemic diseases which are important contributors to ill health in central and west Africa, such as malaria (neither eradicated nor in many areas even controlled) schistosomiasis (extension of endemic foci), onchocerciasis (river blindness), filariasis, trypanosomiasis (African sleeping disease), tuberculosis, leprosy, treponematoses (venereal syphilis, yaws, endemic syphilis), gonorrhea, epidemic cerebro-spinal meningitis, yellow fever, measles in children, cholera (in the present pandemic).

The situation is further complicated by the fact that it is the rule rather than the exception for these diseases and such diagnostically ill-defined conditions as malnutrition, diarrheal diseases and intestinal parasitism to occur in combinations in the same communities and patients. Little is known as yet about disease interaction and modification of immune responses in populations with different disease spectra. Generally, there are neither results from prospective studies that have measured the life expectancy of patients afflicted with any one of the major endemic diseases, nor are there reliable data to judge the effects of competitive causes of death which could guide public health planners in selecting certain priorities.

What is needed today is the application of modern concepts of epidemiology and of medicine to the century-old complex health problems of the tropics in order to measure, identify and interpret the situation in some specific target areas of public health, such as maternal and child health; the ecology of disease with environmental changes; antibody responses in populations with different disease spectra; fertility patterns in relation to endemic diseases, dietary patterns, tribal taboos; etc.

Equally important is a realistic solution to the apparently paradoxical methods of educating a sufficient number of physicians and auxiliary health workers. On the one hand there is the explosion of medicine into technically highly competent sub-specialties, and on the other hand there is the cry for educating the "people's physician". It is fair to state that African medical schools have hardly arrived at more than an experimental stage; optimal solutions for the future which would cover a wide range of possibilities have to be found soon, lest the ataxia in planning new curricula for medical students of the future will become a chronic ailment of medical education in Africa. Likewise, imagination and extensive experiments in training auxiliary or sub-professional health workers is indicated.

In order to transfer the emphasis of assistance in public health to west and central African nations gradually from the smallpox and measles project to different areas of interest, it is recommended that the situation in O.C.C.G.E., O.C.C.E.A., Nigeria, Ghana Sierra Leone, and Liberia be explored carefully for potential areas of cooperative assistance. This would include preparation of a list of diverse programs with high priorities, tentative discussions with national and international professionals concerning the feasibility of carrying out such projects; analysis of situations for potentials of international cooperation including financial assistance and some basic logistical estimates. The National Center for Disease Control has unique potentials for making major contributions in specific areas of public health in Africa, but the impact of U.S.A.I.D. supported assistance in health would be even greater if universities and other competent institutions could also be involved. This diversity would permit the application of additional resources, provide a greater flexibility in methodology and offer a higher probability for finding solutions of general applicability to public health problems.

In order to assist in implementing the previously mentioned gradual transition of support to other areas of public health, the following recommendations are offered as avenues of approach and suggested areas of particular interest. They are not intended to be all inclusive.

1. It is recommended criteria for future health projects include:

a. Specifically defined objectives,

b. Adequate base-line information,

c. Periodic monitoring,

d. A plan for evaluation as an integral part of

the proposal and criteria for evaluation,

e. A specified period of duration,

f. Alternate plans for termination, depending on project outcome,

g. Evidence of national importance, value of results and concurrence of the government concerned,

h. Evidence of possibility of accomplishment at reasonable cost.

It is also important to note that the acceptance of research activities will be increased if a concomitant service is provided, and that a pilot project is generally essential to assure ultimate success of a full blown effort.

2. It is recommended that programs for improvement in the delivery of health services be supported by:

a. Provision of qualified professional and technical consultation,--the most important ingredient in any health project. For instance, the assignment of a competent epidemiologist to the O.C.C.G.E. countries, headquartered in Bobo-Dioulasso, could slowly build up a comprehensive program of assistance in public health that would involve contributions through original research, technical advice, teaching and international team work. One might predict that, after a sufficient period of adaptation and orientation, a small group of experts of an as yet undetermined professional composition would join the epidemiologist to work with him as a team for optimal achievements.

To further the professional cooperation and understanding between the Francophone African countries, their French advisors, and the American physicians working in the area, it is recommended that <u>all</u> regional professional meetings and conferences in west and central Africa, Brazzaville, Geneva or Paris be attended by one or more of the American physicians already assigned to African countries.

b. Support of training, particularly the development of national training resources.

Regional training centers for various kinds of ancillary health workers are indicated in Ghana (for Sierra Leone and Liberia and Ghana), Nigeria (Zaria) and in the ten major groups of Francophone countries. There exists a major opportunity in Nigeria to meet an important regional need for a combined governmental (Sokoto, North Western State) and academic (Amadu Bello University, Zaria) program of training, demonstration and service in public health. (See Nigeria Appendix I).

c. Support of demonstration projects, for example

1. Model systems for rural health services for selected communities (Ghana);

2. Use of mobile teams to supplement fixed facilities in provision of preventive services. (Francophone countries, Ghana, Sierra Leone)

3. Model control programs for specific diseases, tuberculosis (Sierra Leone), etc.

d. Applied Research,--for the solution of most of the health problems of Africa will necessitate new knowledge and new methods.

1. Health effects of man made changes in the environment (water impoundments and irrigation systems)--the "ecology of health";

2. Maternal and infant antibody responses and their relationship to immunity;

3. Prevalence of multiple chronic disease occurrence in the same individual;

4. Modification of behavioral patterns;

5. Livestock, zoonosis and human disease, and the effect of zoonoses on man;

6. Administration research in methodologies of providing service;

7. Epidemiological research for: determination of demographic base-lines, health priorities, and program evaluation;

8. Effect of infections and parasitic diseases on fertility.

9. Therapeutic trials.

3. It is recommended data systems be strengthened

a. Support of programs for national censuses under auspices appropriate to secure valid results;

b. Support of multiple small projects for the development of methodology for collection of morbidity data and

vital statistics in rural areas. Small projects are more easily supervised, controlled and evaluated; provide greater training opportunities for nationals; involve more communities; and provide basic data for other health programs. (NCDC - "D^2 studies");

4. It is particularly recommended that the underlying complexities of infant mortality be attacked by comprehensive programs designed to:

a. Improve knowledge of infant morbidity and mortality, i.e. determine incidence of multiple infections and infestations; effect of measles immunization on total infant mortality; etc.

b. Strengthen control of communicable diseases, i.e. development of multiple antigen projects; local and rural water sanitation projects;

c. Improve maternal education, i.e. by training projects for infant feeding, sanitary food preparations, utilization of available proteins, etc.; and by promoting utilization of available health services;

d. Improve nutritional status of infants and children, i.e. studies in the utilization of available protein foods; development of low-cost, efficient diet supplements;

e. Improve diagnosis of infant and childhood diseases, i.e. by provision of consultation services; increase laboratory availability and utilization.

These are only examples, but point to the need for a multi-faceted approach to the problem of infant mortality if it is to be solved. It is the key to successful population planning programs. There are small scale demonstrations of success which should be evaluated, and if appropriate expanded and applied elsewhere. (Firestone, Monrovia). The foregoing recommendations are general in character, but specific instances of national interest and potential resources will be found in the notes on the several countries.

Those situations which in the opinion of A.I.D. offer promise will require further study of feasibility and practicality, as previously noted. In conclusion, we reiterate the central theme of this report: the valuable experience gained in the accomplishment of what is viewed by many as U.S.A.I.D.'s most successful program in Africa must not be lost, but utilized in the further pursuit of international cooperation and good will through support of public health programs in west and central Africa.

APPENDIX I

Appendix I - Notes and Recommendations for Smallpox/Measles Program in Individual Countries of West and Central Africa

INDEX

O.C.C.G.E. Countries

- Niger
- Upper Volta
- Mali
- Mauritania
- Senegal
- Gambia
- Ivory Coast
- Dahomey

O.C.E.A.C. Countries

- Cameroon
- Chad
- Central Africa Republic

Anglophone Countries

- Ghana
- Liberia
- Nigeria
- Sierra Leone

Attachments

1. Secretary General's Letter (O.C.C.G.E.)
2. Eleventh Technical Conference
3. Dr. Saveaunu's Report
4. Secretary General's Letter (O.C.E.A.C.)
5. Epidemiologic Aspects of Smallpox Eradication in Nigeria
6. Epidemiologic Aspects of Measles Control in Nigeria
7. Institute of Health, Ahmadu Bello University

Organisation de Coordination et de Coopération Pour la Lutte Contre les Grandes Endémies (O.C.C.G.E.)

A. General Comments for Region

Member states of O.C.C.G.E. include Niger, Upper Volta, Mali, Mauritania, Senegal, (Guinea), Ivory Coast, Togo and Dahomey. As the name implies, the organization was founded with the purpose of coordinating efforts in the combat of endemic diseases that are of concern to all member states. Other than being merely a loose political league of nations with some mutual interest in health, the organization was established with the realization that effective measures of control for the major endemic diseases such as malaria, schistosomiasis, onchocerciasis, trypanasomiasis, etc., must be based on ecological rather than national borders.

Headquarters for the organization are located in the city of Bobo Dioulasso, Upper Volta. The senior officer of the international organization is its Secretary General. This position is presently held by Dr. Cheick Sow from Mali. Regional cooperative projects sponsored by international organizations that have high priority include the control of onchocerciasis, a pilot study on malaria and schistosomiasis control, mass treatment campaigns against yaws and endemic syphilis, prophylaxis of epidemic meningitis by vaccination, and coordinated efforts to treat and control cholera, recently introduced by the present pandemic. As indicated in his letter, Attachment 1, The Secretary General has expressed an interest in having an American epidemiologist or even a competent multidisciplinary medical team to assist the organization in health programs of high priority through original research, field trials, cooperation and advice in multidisciplinary projects, and teaching.

B. Individual Countries Visited

NIGER

Persons Visited:

Roswell D. McClelland, U.S. Ambassador

Sara J. Littlefield, U.S.A.I.D. Director

Dr. Amadou Mossi, Secretary of State for Health

Dr. Tahirou Bana, Director General of Health

Dr. Leon Tchelle, Director, Service des Grandes Endémies et de Nutrition

Dr. Claude Doineau, Advisor to the Director of the Service des Grandes Endémies

Dr. Emmanuel, W.H.O. Country Representative

Mr. Roger H. Bernier, Operations Officer S.M.P.

Mr. John J. Drescher, Operations Officer S.M.P.

M. Soufi, Counterpart to Operations Officer in Niamey

Mohomad Made, Counterpart to Operations Officer in Zinder

M. Lespine, Secrétariat du Plan

Places Visited:

Capital City of Niamey

Village of Kirtashi, Canton of Kirtashi in the Arondissement of Sai.

Achievement of Project:

There has been no case of smallpox since 1969. The major epidemic of measles occurred in 1969. There have been fewer cases of this disease in 1970, but it is too early to draw any valid conclusions because of the pronounced natural variations in the incidence of measles. In recent years emergencies have almost always dominated the medical scene and have interrupted the planned vaccination schedules for measles and smallpox repeatedly; the first interruption occurred because of the epidemic of cholera.

Judgments Concerning the Continuation of the Measles and Smallpox Project:

Government officials of Niger and U. S. foreign service officers agreed that it would be essential to continue U. S. assistance to the program for another two years until the attack phase is completed and a proper schedule for maintenance established. The government officials felt that in the event the assistance were withdrawn, the vaccination schedule would have to be cut back dramatically and that previous achievements would be lost. It was also clearly stated that money and material alone would not suffice for a successful completion of the smallpox eradication and measles control project because of the lack of sufficiently trained manpower in the host country as of now.

Difficulties

There is no clear cut job description for the Operations Officers. There is a need to redefine the position and the function of the U. S. personnel in context with the structure of the Ministry of Health.

There are counterparts, but neither division of authority nor transition of responsibility are spelled out.

Since intermediate assessment was completed two years ago an assessment team has been on paper but has been inactive.

The quality and the competence of surveillance is doubtful.

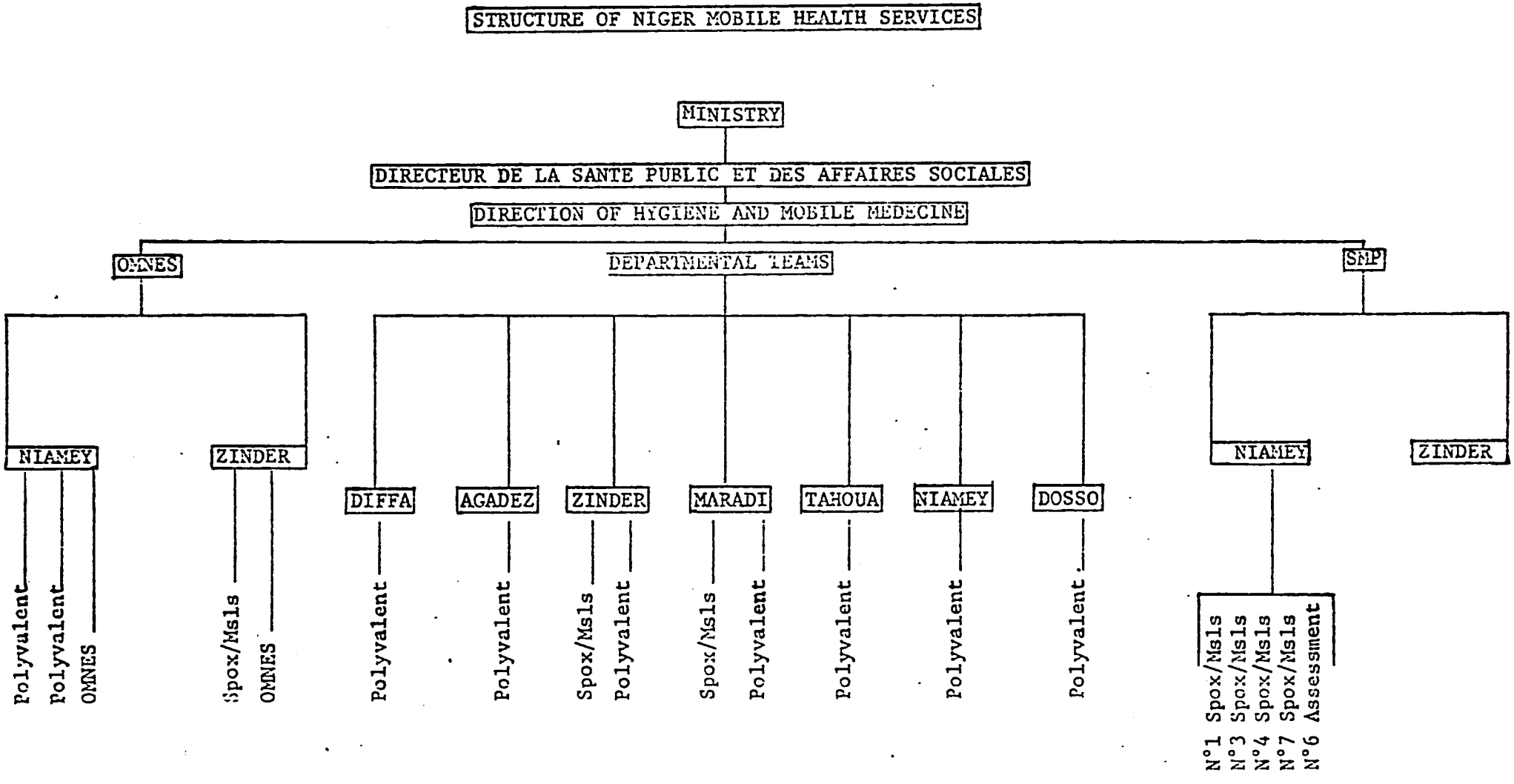
There appear to be considerable deficiencies in maintaining cold chains and distributing measles vaccine to certain rural areas.

The administration within the Ministry of Health and its major subdivisions is too complicated, causes delays, and has led to confusing duplications, overlaps and lack of coordination (See Figure 3). Improvements are promised for the near future. It is essential that C.D.C. specify the functions of the remaining Operations Officer with the new structure of the Ministry of Health in Niger.

Recommendations:

Reduce number of Operations Officers from two to one; delegate responsibilities gradually to counterpart and others in the Ministry of Health; restrict measles vaccine delivery to areas where cold chain is operating properly; clearly redefine functions of Operations Officer; improve the quality of

Figure 3.


STRUCTURE OF NIGER MOBILE HEALTH SERVICES
MINISTRY
DIRECTEUR DE LA SANTE PUBLIC ET DES AFFAIRES SOCIALES
DIRECTION OF HYGIENE AND MOBILE MEDECINE
OMNES
DEPARTMENTAL TEAMS
SNP
NIAMEY
ZINDER
DIFFA
AGADEZ
ZINDER
MARADI
TAHOUA
NIAMEY
DOSSO
NIAMEY
ZINDER
Polyvalent
Polyvalent
OMNES
Spox/Msls
OMNES
Polyvalent
Polyvalent
Spox/Msls
Polyvalent
Spox/Msls
Polyvalent
Polyvalent
Polyvalent
Polyvalent
N°1 Spox/Msls
N°3 Spox/Msls
N°4 Spox/Msls
N°7 Spox/Msls
N°6 Assessment

supervisory teams and supervisory experts from Atlanta.

Major Health Problems

Major public health problems in the country were outlined by Dr. Bana, Director General of Health. The most important diseases listed are: malaria, tuberculosis, epidemic meningitis, schistosomiasis, smallpox, yellow fever, venereal and endemic syphilis, amebiasis, leprosy (+30,000 in country), poliomyelitis, trachoma, tetanus, rickettsioses, possibly arboviruses (little is known as yet about their distribution), endemic goiter and staphylococal infections. The Director General also stressed the important of eye diseases; he has proposed inclusion of a vision test among the routine procedures carried out by mobile health units and in school health examinations.

UPPER VOLTA

Persons Visited:

Mr. William Schaufele, U. S. Ambassador

Dr. Traore, Minister of Health (appointment was cancelled because of re-shuffle in cabinet)

Dr. Pierre Campaore, Director Sante Rurale (attended W.H.O sponsored seminar in Accra)

Dr. Louis Sentilhes, French Technical Advisor to the Director of Rural Health

Dr. Yaoul, Director, Santè Urbaine

Dr. Barraud, Sub-Director Sante Urbaine for the City of Bobo Dioulasso (he is a candidate for the position of Minister of Health)

Dr. Cheick Sow, Secretary General of O.C.C.G.E.

Dr. Lapesonner, Brigadier General, W.H.O. Advisor

Dr. Le Berre, Centre Muraz, Onchocerciasis Section

Mr. Andrew N. Agle Operations Officer

Mr. Lawrence Leser, A.I.D. Representative

Places Visited:

Ouagadougou

Bobo-Dioulasso

Kombissiri (Rural Health Center)

Zorba (Onchocerciasis area located on the Red Volta River)

Samadi (Onchocerciasis area on the road to Mali)

Achievements:

There have been no smallpox cases since 1969. The measles situation is relatively unchanged. Measles vaccinations in Ouagadougou are difficult because of resistance of part of the population of the city. This resistance is related to the early campaign in 1963 when some people felt that administration of the vaccine had been responsible for causing

death (Dr. Yaoul and Dr. Sentilhes). Continuation of measles immunization in Ouagadougou by the P.M.I. centers has led to a slow, but consistent change of attitude among the women because (according to Dr. Yaoul) "they can see the difference in incidence and severity of measles among the vaccinated and non-vaccinated children." In all other parts of Upper Volta measles vaccinations are quite popular and in great demand. It should be emphasized that the lack of participation is encountered only in the capital city of Ouagadougou.

Emergencies caused by outbreaks of meningitis, yellow fever, and most recently of cholera have repeatedly disrupted the routine vaccination schedules. But these emergencies have also demonstrated dramatically the flexibility and capacity of the vaccination teams using the Ped-o-Jet.

Judgments Concerning Continuation of S.M.P. by Government Officials and Their French Advisors:

If U.S.A.I.D. withdraws, there is no possibility for continuing the program against measles, which some doctors feel is the biggest disease problem in the urban areas (Dr. Yaoul). The smallpox vaccination project would also be reduced considerably in this event. There was enthusiastic endorsement for the continuation of the S.M.P. by all professionals and also by all officers in the U.S. Embassy.

Difficulties:

The job description for the Operations Officer is unclear. There is no current assessment of vaccination coverage. There appear to be differences in opinion between the national officials who are in favor of assessment and certain powerful French advisors who do not see the need for it now (Dr. Yaoul "évaluation, oui, mais mes camarades francais..."). A possibility of disagreement between the Director of Rural Health and his technical advisor was also mentioned by Mr. Agle, the Operations Officer in Niger. There is no counterpart for the Operations Officer.

Although it is an appropriate vehicle for transporting a vaccination team, the Dodge pickup truck is impractical for many specialized uses, such as travel of small supervisory teams. Another complaint has been that it consumes too much gasoline. U.N.I.C.E.F. plans to furnish about 200 new cars, but no Dodges. Presently two mechanics have to be paid out of funds from the U.S.A.I.D. "personnel" budget for the Operations Officer to maintain a workshop to keep the trucks running.

The quality of the cold chain for delivery and distribution of measles vaccine has to be reexamined carefully. Supply of vaccine should be limited to those areas and towns

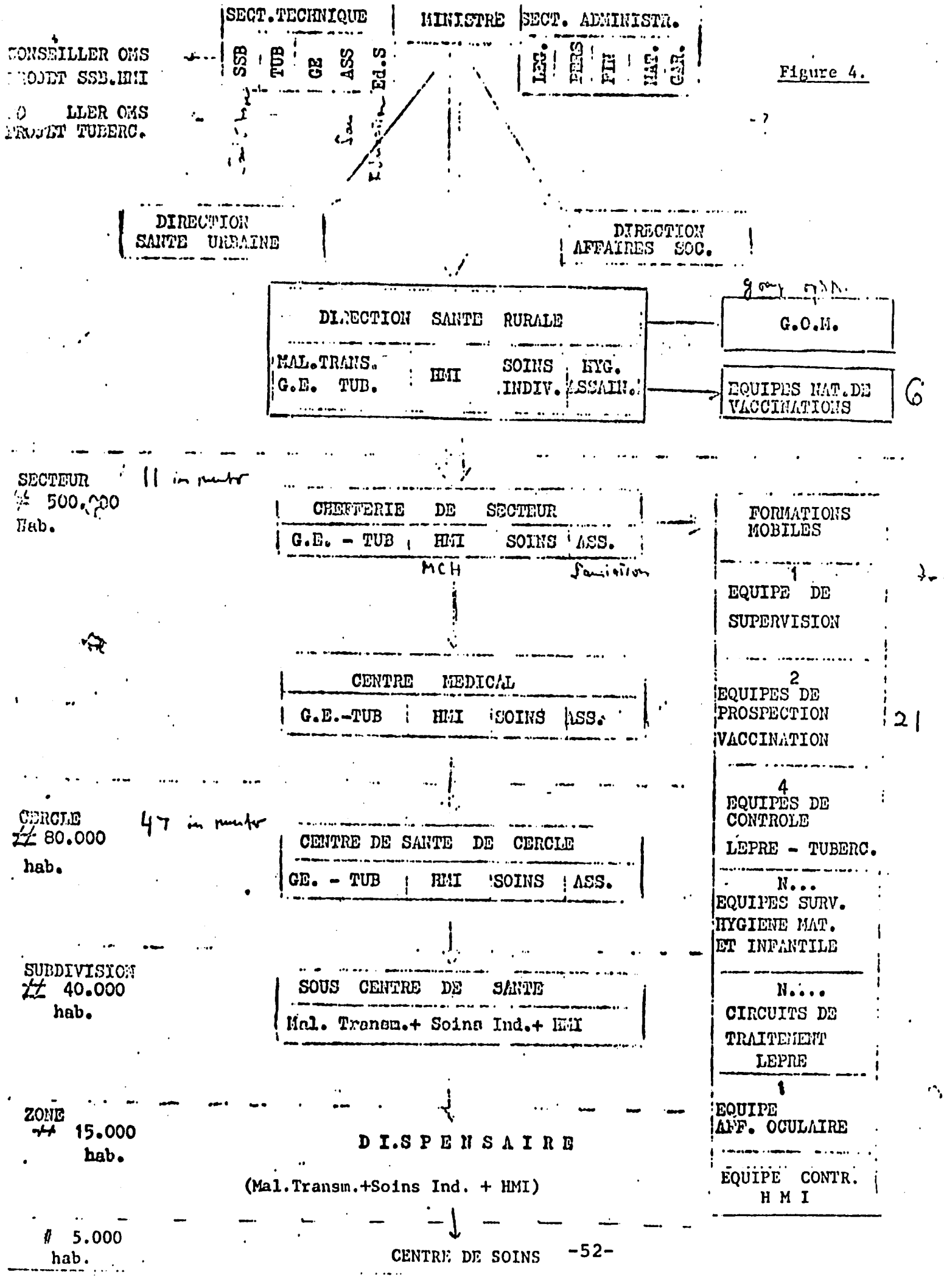

SECT.TECHNIQUE
MINISTRE
SECT. ADMINISTR.
SSB
TUB
GE
ASS
Ed.S
LEG.
PERS
FIN
MAT.
CAR.
DIRECTION SANTE URBAINE
DIRECTION AFFAIRES SOC.
DIRECTION SANTE RURALE
MAL.TRANS. G.E. TUB.
HMI
SOINS INDIV.
HYG. ASSAIN.
G.O.M.
EQUIPES NAT.DE VACCINATIONS
SECTEUR
500.000 Hab.
CHEFFERIE DE SECTEUR
G.E. - TUB
HMI
SOINS
ASS.
FORMATIONS MOBILES
1 EQUIPE DE SUPERVISION
CENTRE MEDICAL
G.E.-TUB
HMI
SOINS
ASS.
2 EQUIPES DE PROSPECTION VACCINATION
4 EQUIPES DE CONTROLE LEPRE - TUBERC.
CERCLE
80.000 hab.
CENTRE DE SANTE DE CERCLE
GE. - TUB
HMI
SOINS
ASS.
N... EQUIPES SURV. HYGIENE MAT. ET INFANTILE
SUBDIVISION
40.000 hab.
SOUS CENTRE DE SANTE
Mal. Transm.+ Soins Ind.+ HMI
N.... CIRCUITS DE TRAITEMENT LEPRE
ZONE
15.000 hab.
D I.S P E N S A I R E
(Mal.Transm.+Soins Ind. + HMI)
1 EQUIPE AFF. OCULAIRE
EQUIPE CONTR. H M I
5.000 hab.
CENTRE DE SOINS

Figure 4.

where proper adminisration through intact cold chains is assured.

Recommendations:

Maintain one Operations Officer with good qualifications and proven abilities, who has already shown qualities of leadership. Since the emphasis of the new National Five Year Plan will be on consolidation and regionalization of the Rural Health Services (Figure 4) it will be essential that the job description of the Operations Officer be modified accordingly.

Major Health Problems:

Important disease problems in Upper Volta were outlined by Dr. Sentihles, advisor for rural health in the Ministry of Health, and by Dr. Cheick Sow, Secretary General of OCCGE. They include leprosy, tuberculosis, schistosomiasis, trypanosomiasis, onchocerciasis, yaws, yellow fever, and malaria. Dr. Sow listed problems that deserve priority in health planning for the area in the following order:-

1. need for the establishment of a competent central laboratory for investigations and control of endemic diseases;

2. studies of the epidemiology of cholera in West Africa;

3. studies of the epidemiology of yellow fever, with special emphasis on animal reservoirs and secondary vectors;

4. meningitis - its epidemiology and prophylaxis, with special emphasis on trials with newly developed vaccines;

5. general disease surveillance, improved disease reporting, diagnosis and improved health statistics.

Dr. Yaoul, Director of the Urban Health Service, mentioned that measles is still the most important public health problem among children in the capital city of Ouagadougou and in Bobo-Dioulasso.

MALI

Persons Visited:

Benitieni Fofana, Minister of Health

Ousmane Sow, Chief, Division of Socio-Preventive Medicine
Jean-Jacques Leveuf, Conseiller Technique, Ministry of Health
Nianankoro Foma, Médecin Chef, Cercle de Segou
Kante, Regional Director of Health, Segou
Pascal Imperato, Medical Advisor, CDC
Mark LaPointe, O.O., CDC

Places Visited:

Bamako
Segou
Several villages in Cercle de Segou

Achievements:

Prior to the late 1960's natural variations in the incidence of smallpox in Mali produced epidemic peaks approximately once in every five to seven years. Such a maximum was again expected for 1965. Instead, the sharp decline in the attack rate from the previous peak in 1960 continued throughout the decade. Prior to the onset of the SMP, smallpox had ceased to be a problem in the southern portions of the country as a result of previous vaccinations. The latest mass campaign, lasting from January 1967 to June 1970, was based upon: 1) new knowledge of the epidemiology of smallpox in Mali; 2) extensive studies of the movements of the pastoral nomads and the migratory peoples living in the center of the country and in the inland delta of the Niger; 3) development of a program strategy based upon this information. The apparent result was effective interruption of smallpox transmission in early 1969. Maintenance vaccination has been planned and executed for the past year on a one-year cycle.

Information on the percentage of the population now vaccinated is rather thin. After June 1969, assessment has consisted of grab samples made by the U.S. advisors (in approximately two villages per cercle) showing immunity levels averaging 80% with none below 75%.

Measles, on the other hand, has been effectively controlled only since late 1969 in the towns of Bamako, Segou, Mopti and Sikasso - - towns with a total population of some 450,000. There has been no serious attempt to control measles elsewhere following the termination of the mass campaign in June 1970.

The slow start on measles control resulted from an initial decision to supply the vaccine to stationary mother-child health clinics (PMIs), which proceeded to vaccinate and re-vaccinate a small group of clients. Only by reassigning the work to mobile teams and working out a plan for re-cycling every six months in the towns listed above was a sufficient level of immunity built up there to interrupt transmission. Measles cases in Bamako averaged 201 monthly for 1967; 101 for 1968; 360 for the first half of 1969; and showed a sharp drop after the mass campaign was initiated in October 1969 to less than four cases monthly through December 1970. In the urban campaigns, all children from six months through three years have been immunized against measles.

Counterpart relations are judged to be generally good. The Chief of the Division of Socio-Preventive Medicine is considered by the CDC Medical Advisor to be his counterpart, and is so in fact. One employee of the Ministry of Health, trained at Atlanta by CDC, has been designated as supervisor of the maintenance phase of the SMP. He was not in Mali at the time of the evaluation, but was characterized by the French Conseiller Technique as "deficient in spirit" - - a view which is obviously not shared by the US personnel nor evidenced by the Malian physicians interviewed. The only real uneasiness felt by the evaluation team was a suggestion by the Minister that he would still prefer to use PMIs for measles control centers rather than systematic vaccinations by mobile teams.

Looking to the future, the Minister assured the evaluation team that given WHO support at the current level for the next three years, plus AID material support in the form of replacement parts for ped-o-jets and vehicles, as well as measles vaccine, that Mali could continue smallpox maintenance and measles control, adding yellow fever and/or meningitis where indicated. In the event that the U.S. advisors are withdrawn (the O.O. plans to leave in May), given an agreement on target population to

be vaccinated and some sensible arrangement on measles immunization (which could be supervised by a WHO epidemiologist who is scheduled to join the ministry to manage an on-going WHO mother-child health project) periodic visits by a qualified O.O. might be enough to ensure a reasonably effective - - if not efficient - - operation.

Difficulties:

On the negative side, the Ministry currently rates measles control/smallpox eradication rather low as a health priority. The Minister regards the onchocerciasis program (currently being implemented in the Sikasso area but ignoring a second major area of infection bordering on Guinea) as the country's #1 health priority. This is operated by OCCGE-trained personnel, and has an autonomous status within the Ministry. The second priority activity is a PMI program, backed by WHO. Thus, external pressure may have to be applied on the Ministry in order to ensure that attention is given to such activities as maintenance vaccination on a regular cycle and assessment of coverage.

The cold chain for measles vaccine is adequate so long as measles control is limited to the cities listed above. As for personnel and transportation, nine mobile teams have been continuously in existence for maintenance vaccination. However, 57 CDC-trained vaccinators have been diverted to a variable number of cholera crews. Vaccination crews have always been headed by an infirmier of the section, and are now to be supplied entirely by the health sectors, in contrast to the mixed arrangement (centrally-directed crews; local infirmier) employed during the attack phase. Five CDC-trained vaccinators have been held in reserve in Bamako to repair ped-o-jets and help out where needed by field crews. The 57 vaccinators will be integrated into the sectors upon completion of the cholera vaccination campaign. The AID-financed vehicles have either been assigned to the measles/smallpox teams in the health sectors or are in the process of being so assigned.

It seems unlikely that simply putting wheels under the Grandes Endémies and assigning some vaccinators to the field will assure continuity of measles control/smallpox maintenance. The infirmiers suffer serious morale problems; the overall system of personnel compensation and control is such that energetic activities by the infirmiers is more likely to be

the exception than the rule. There is no ready way to pry them away from fixed health centers and into the bush; the general malaise of a system in which reform would have to be multi-pronged, and would be unpopular to the point of serious political repercussions, is too complex to be discussed here.

Thus, while the Minister and the Director of the Division of Socio-Preventive medicine sounded quite confident about the future of measles/smallpox in Mali, the French Conseiller Technique predicted total disaster; the CDC personnel seemed somewhere in the middle, believing that spotchecks by a visiting foreign advisor would see the job through.

Recommendations

The CDC program will have to be continued in some form in Mali for the foreseeable future if satisfactory maintenance is to be achieved. The evaluation team would like to see more specific agreements between the GOM and any foreign agency funding some part of this activity; the integrity for the handling of funds earmarked for vehicle maintenance and gasoline, and for per diems for field crews, must be guaranteed; financial incentives must be given to infirmiers to stay in the field; and (to quote the Conseiller Technique) a dynamic pusher must be put over them with authority to discipline them for poor performance.

MAURITANIA

Persons visited:

Mr. Robert Stein, Chargé d'Affaires, U.S. Embassy
Mr. S. W. Buck, Political Officer and Consul, U.S. Embassy
Dr. Ben Amar, Minister of Health
Dr. Abdallah Ould Bah, Director General of Health
Dr. Guy Diebolt, WHO Country Representative
Dr. I. T. Saveanu, WHO smallpox/measles project officer
Mr. Chinien Valivel, WHO technical smallpox/measles project officer
Dr. Dierra Abnédou, counterpart to Mr. Valivel

Places visited:

Nouakchott
Rosso

Achievements:

Since the U.S. government supported smallpox and measles project in Mauritania is guided by foreign advisors who are not affiliated with CDC, a more detailed description of the achievements is given. The results are based on the most recent official report by the WHO project officer, Dr. Saveanu, who is responsible for "Eradication of Smallpox and Vaccinations against Measles and with BCG in Mauritania", Attachment 3

The estimated total population of the country is 1,200,000. By the end of 1970, 620,238 smallpox vaccinations and 96,367 measles vaccinations (limited to children aged 6 months to 6 years) had been administered. It is estimated that about 50% of the total population are now protected against smallpox. Further analysis of the data, however, reveals a markedly uneven regional distribution of vaccine protection in the country. While the more densely populated regions in the southern and central parts of the country have relatively good vaccination coverage, it appears that the most serious deficiencies exist in the Sahara, especially in the areas adjacent to Mali, Algeria and Rio de Oro.

Since 1968 the reported number of measles cases has dropped from

10,860 to 2,349. Because of the considerable perodicity in the incidence of measles, it is presently impossible to judge the true effect of the measles vaccination program on the annual incidence of the disease.

The SMP Operations Officer in Dakar, Mr. Robert C. Helmholz, has been responsible for maintaining an uninterrupted flow of supplies of smallpox and measles vaccine, Ped-O-Jets spare parts, and camping equipment to Mauritania. The importance of these contributions to the Mauritanian measles and smallpox project by the U.S. government is probably not recognized by the public, but is gratefully acknowledged by the responsible officials in the Ministry of Health, all of whom pleaded for continuation of support. In their judgment, withdrawal of this assistance would mean not only collapse of the present vaccination schedule, but also jeopardy of the results already achieved during the past five years in their country, where mobile rural health services are permanently confronted with difficult logistic problems.

At the present time the country receives additional support for its smallpox vaccination program from the Regional WHO office in Brazzaville amounting to $5,000 for vehicles and $9,000 for general operations cost. The Mauritanian government spends 4,000,000 cfa for salaries and team transportation, and another 3,500,000 cfa on nonspecified operation costs, amounting to an estimated total of $27,273. The role of OCCGE, of which Mauritania is a member, as a contributor to the smallpox/measles project is dubious.

Despite the difficult terrain and working conditions in Mauritania, assessment of vaccination coverage had been carried out.
There is a counterpart to the WHO technician-advisor. The project director is a Rumanian physician, Dr. I. T. Saveanu, who appears to be knowledgeable and dynamic, and determined to get the job done. Unlike most of the other Western and Central African countries visited, the smallpox and measles project in Mauritania has never been challenged by intercurrent severe epidemics of other diseases that can paralyze all regularly scheduled vaccinations.

Judgment by health officials:

There was a unanimous agreement of opinion that the smallpox and measles program be continued beyond its present deadline of December, 1971. Discontinuation of support would lead to the temporary interruption of all vaccination activities and to the end of the measles control program.

Difficulties:

Future cooperation between technical counterparts of CDC, WHO, and the national government, and the nature of U.S. technical assistance need to be specified. For the goal of smallpox eradication from the African continent before 1975 this country is strategically important. Because of the high percentage of its nomadic population there remain many unvaccinated persons who can acquire and spread smallpox. Difficult transportation in this sparsely populated desert country makes it imperative to reexamine methods for maximum efficacy of the measles vaccination project. Reports of failures of measles vaccinations in children were mentioned repeatedly and are indicative of interruption of the cold chain.

In contrast to other countries, the vehicles used for transportation of the SMP teams in Mauritania are landrovers and small French cars. Of the five Dodge trucks furnished by US/AID three are still in running condition.

Recommendations

Maintain liaison with the Dakar office of the SMP of CDC/US/AID.

Schedule regular visits by a senior medical officer for optimal results of the national program, advice, and feedback. The modest financial investment in a reasonably well administered health project of great importance to Mauritania should be continued to achieve the goal of complete vaccination coverage against smallpox. Unless the logistical problems for delivering high quality measles vaccine can be solved, the supply of this vaccine should be limited to areas with safe cold chains.

Major Health Problems

From discussions with physicians in the hospitals and with Dr. Diebolt, WHO Country Representative, it appeared that the general diagnostic service in the country has been poor. He mentioned that the Mauritanian government has recently made a request to President Pompidou of France for assistance to establish a National Institute of Hygiene and Epidemiology in the city of Nouakchott.

SENEGAL

Persons visited:

Mr. Edward Clark, U.S. Ambassador
Mr. John Lundgren, U.S. AID Deputy Director
Dr. Ives Rolin, Director Pasteur Institute
Dr. Mahtar N'Diaye, Director Centre d'Hygiène
Dr. P. Gbazo, Deputy Director Centre d'Hygiène
Dr. Makhome Seck, Director Service des Grandes Endémies
Dr. Papa Guaye, Deputy Director Service des Grandes Endémies
Dr. Martin, Technical Advisor to Service des Grandes Endémies
Dr. Ray, Professor of Infectious Diseases and Public Health
Mr. M. Torfs, WHO Regional Advisor
Dr. Kane, Peace Corps physician
Dr. B. Teller, CDC Medical Officer
Mr. Robert C. Helmholz, CDC Operations Officer

Places visited:

Dakar

Achievements:

No indigenous smallpox case has occurred in Senegal since 1967. Smallpox vaccination coverage is estimated to fall between 65 and 85 percent. In its present surveillance phase, efforts are made to maintain a sufficient level of immunity by vaccinating all susceptible children between 6 and 30 months, and to improve vaccination coverage in those areas where the percentage is relatively deficient.

The estimated reduction of the incidence of measles (1963-1967 vs 1968-1970) has been about 54%.

Personnel trained in the SMP has been used also in the vaccination campaigns against cholera and yellow fever, and for giving BCG vaccine.

Judgements concerning conduct and continuation of SMP by local health authorities:

The continuation of the combined smallpox and measles project is highly desirable. Reduction of U.S. personnel is possible, but at least one competent and experienced operations officer should remain in Dakar.

Difficulties:

There is no official assessment team, not even on paper. All presently available assessment data were furnished by the Operations Officers who spend approximately one-third of their time on evaluation. No counterparts are assigned to either of the two Operations Officers. Too much of their time seems to be wasted on trouble shooting for logistic problems which should be the responsibility of the local health authorities. The role and the activity of the present medical officer (epidemiologist) assigned to SMP are nebulous.

Dodge truck maintenance and operations are too costly and at times cumbersome. The pending termination of US/AID support for the smallpox and measles project has caused uncertainty, lack of enthusiasm, and a low ebb in morale. Communication between SMP personnel and other regional US/AID staff appears to be disturbingly inadequate.

The Dakar office has been responsible for supporting the SMP in three different countries (Senegal, Gambia and Mauritania). More than in other places, the success of the project in Senegal must be attributed to the dedication and qualification of the Operations Officers. The situation caused by the uncertainty of continued support for the project by US/AID, further aggravated by gossip and opinionated statements by certain official and semi-official travellers, has had an unfavorable effect on the morale of the persons responsible for the project.

Recommendations:

1. Longitudinal planning for the SMP should receive more than casual attention.
2. Maintain one Operations Officer.
3. Reevaluate role, duties and job descriptions of the remaining Operations Officer.
4. Bring in national counterparts, train them systematically, and transfer responsibilities gradually within two years.
5. Transfer the responsibility for import and handling of the vaccines to the Ministry of Health (this is acknowledged by responsible officials in the government).
6. Clarify property and usage rights of trucks and Ped-O-Jets including their servicing.

7. Integrate SMP into a multipurpose vaccination program.
8. Initiate study on the use of multiple vaccines (special situation in Dakar requires consideration of polio vaccine, see also Abidjan)
9. Continue measles project without major restriction because the quality of the cold chains appears to be good.

Major Health Problems

Dr. Papa Gaye of Senegal listed the following diseases as the major public health problems of his country; epidemic meningitis, syphilis both endemic and venereal, yellow fever,tetanus, schistosomiasis (hematobium and to a lesser extent mansoni) onchocerciasis, measles, African sleeping disease, malaria, still smallpox, tuberculosis, leprosy (25,000 registered cases), hepatitis, hookworm infections, filariasis, and Guinea worm.

GAMBIA

Persons visited:

Mr. Robert T. Burke, Chargé d'Affaires, U.S. Embassy
Mr. J. Mahoney, Director of Medical Services
Mr. V. K. Rimmer, Medical Officer for Health
] Ministry of Health
Dr. McGregor, Director, British Research Council

Places visited:

Bathurst

Achievements:

There have been no smallpox cases in Gambia since 1967. Reported measles cases were only 9 in 1969 and zero for 1970. This small country has made optimal use of its two vaccination teams.

Judgment by local officials concerning the future of SMP:

The Ministry of Health would be unable to continue the project should U.S. Government assistance be withdrawn. There is a great desire for increasing the number of the teams, for broadening the vaccination program and, eventually, for making the vaccination teams the nucleus for mobile health units of broader coverage.

Difficulties:

Despite the shortage of manpower and logistic difficulties the program was very successful. Its success is clearly related to the training, guidance, logistical assistance, and the everready tactful advice given by the professional staff of the SMP office in Dakar.

Recommendations:

Continuation without major modifications; initiation of assessment. The cooperation and advice of the Operations Officer in Dakar would remain essential in the future.

IVORY COAST

Persons visited:

Mr. John Root, U.S. Ambassador
Dr. H. Heuser, US/AID counselor
Dr. Coffi Emmu, Director, Institut d'Hygiène
Dr. Bouffard Bella, Deputy Director, Institut d'Hygiène
Dr. Abrahim Konne, Director, Service de Médecine Sociale
Dr. Felix Serie, Director General of Health
Dr. Hippolyte Aye, Minister of Health

Places visited:

Abidjan

Achievements:

Ivory Coast has been free of smallpox since March 1967. As a result of the annual maintenance vaccination cycle the estimated smallpox immunity level in the community is 90%. Since combination of the vaccination teams of the Service de Médecine Sociale and the Institut d'Hygiène late in 1969, 530,000 or 84% of the children between the ages of 6 months and 3 years have been vaccinated against measles. The remaining four departments in the north and two departments in the south of the country will be covered by April 1971 (Figure 5). Possibly as the direct result of the vaccinations given, the measles morbidity in Ivory Coast has dropped from 32,000 reported cases in 1969 to 12,000 in 1970; mortality data which are available only for the city of Abidjan have shown a similar decline of rates, i.e. 2,900 deaths in 1969 as compared with 615 in 1970.

Judgment of success of project by local officials:

This is "a very satisfactory program based on excellent cooperation between the national teams and the US advisors" (citation at site, Drs. Emu and Bella). Both the Minister of Health and the Director General of Health pleaded for continuation of the program. They expressed concern that abrupt withdrawal of U.S. support, including manpower, might jeopardize not only the future of their own vaccination program, but also the satisfactory results that have been achieved so far. The government is planning

Regional Office for Africa, Brazzaville

The visit to this office was made by Dr. J.S. Peterson of the consulting team at the request of Dr. Henderson and Dr. Quenum, the AFRO Regional Director. The purpose of the visit was to establish liaison with AFRO, gather the impressions and thoughts of the staff regarding the SMP in Africa and to provide any pertinent information. The annual meeting at the same time of the various WHO Representatives from around the continent limited very much the time available for discussions. Persons seen were Dr. Quenum, R.D., Dr. Adenyi-Jones, Director of Health Services, Dr. Charles, Dr. Chu, Dr. Teelock and Dr. Pavio.

The general concensus of opinion was that the achievements of the smallpox program were tremendous and very worthwhile. It was felt that there was not enough data on the measles program to warrant conclusions as yet. Continued assistance by US-AID was felt to be necessary for some time to preserve the gains that had been made. For the African countries another factor for ultimate success was the strengthening of the Basic Health Services throughout each country. This would provide the base on which these programs and other mass campaigns could acquire continuity and permanence. The African Regional Committee had set forth its policy in this regard in its document entitled Basic Health Services in the African Region (AFR) RC18/Doc 8) 1968.

Of interest are the references by delegates to the Twenty-Third World Health Assembly 1970 regarding the SMP. Delegates from Mali (p.73), Nigeria (p. 100), Ghana (p.106), Sierra Leone (p.147), and Liberia (p.164) were effusive in their praise of the programs as conducted by US-AID.

Similar recognition of US-AID contribution is set forth in Official Records of WHO, No. 188, "The Work of WHO in 1970" on pp 15-17 dealing with smallpox.

DATES DE VACCINATIONS VARIOLE/ROUGEOLE (6 MOIS - 2 ANS) DEPUIS L'INTEGRATION DES EQUIPES DES C.E. AUX EQUIPES DE L'INSTITUT D'HYGIENE.

LA NOUVELLE CÔTE D'IVOIRE

to integrate the measles and smallpox vaccination teams into polyvalent teams, i.e. including BCG, cholera, DPT, yellow fever and, hopefully, meningococcal vaccine. Dr. Konne expressed great concern about the poliomyelitis situation in Abidjan (3 cases per week) and desires advice as to when and how to vaccinate.

Difficulties:

There is no reliable assessment of vaccination coverage. It is felt that pushing for the establishment of assessment teams in Ivory Coast was premature at the time when the teams for the attack phase had to be built and personnel be trained. While there has been excellent cooperation between the senior staff of the Institut d'Hygiène and the Operations Officers of the smallpox and measles project, a permanent, true counterpart to carry on logistics and administrative duties has not yet been assigned. Assessment activities are severely hampered by the lack of independent transportation for an evaluation team. As in other countries, it is felt that one or two small cars with good local service potential should be made available to team supervisors and assessors.

While some of the countries visited had received WHO contributions to defray costs for gasoline and truck service and maintenance, no such funds are allocated to Ivory Coast. Therefore, gasoline has always been in short supply. As for the Dodge trucks, it was repeatedly mentioned that their maintenance has been difficult and expensive, and their gas consumption too high.

Recommendations:

Continue project with definite plan for transition of responsibility by stages to a firmly assigned counterpart. Institute independent assessment units with own vehicles; demonstrate practical value of continued evaluation to guide decision making at the Ministry. The country is interested in studies on the use of multiple vaccines. There is need for research on possible improvements of the pumps in the Ped-O-Jets. The government is particularly interested in, and places a high priority on, the establishment of a central Public Health Laboratory with emphasis on service and to a lesser degree on research, because there are numerous diagnostic problems related to a multitude of important endemic diseases

that have had to be ignored because of lack of diagnostic facilities and trained manpower. U.S. government assistance in establishing a Public Health Laboratory and School in Abidjan would be a significant contribution to strengthening the health services of Ivory Coast. A building complex to house such a laboratory is already available.

Major Health Problems

Dr. Ibrahim Koone, Director of the Social Medical Service, and Dr. Flex Serie, Director General of Health, mentioned the following diseases as important public health problems: measles, smallpox, poliomyelitis in Abidjan with approximately 1 - 3 cases per week, tetanus of newborns, tuberculosis in the cities (estimated 7,000 cases for a population of 5 million with about 1,200 cases from Abidjan), recurrence of yaws, leprosy, three endemic foci of trypanosomiasis, endemic schistosomiasis, malaria, meningitis, and most recently cholera.

DAHOMEY

Persons visited:

Mr. Mathew Looram, U.S. Ambassador
M. Ouassa, Minister of Health
Dr. Veranco, Secretary General of Health
Dr. Yepke, Director, Service des Grandes Endémies
Dr. Codja, Director, Health Demonstration Project in Come
Dr. Djazzar, WHO Country Representative
Dr. Schmitt, WHO Country Advisor for Maternal and Child Health
Mr. G. Cornejo, Sanitary Engineer, Technical Advisor
Mr. John W. Nelson, Operations Officer SMP
M. Toussaint, National Counterpart for Administration
M. Dossou, National Counterpart for Assessment and Surveillance

Places visited:

Cotonou
Come
Porto Novo

Achievements

Only a few years ago, Dahomey ranked third in the list of countries where smallpox was still endemic. Since 1970 no new cases have been reported. In actual figures, there were 1,708 cases of smallpox with 212 deaths in 1959 and, despite the considerably improved reporting, only 58 cases with 18 deaths in 1969. No cases have been recognized during the past 16 months. A total of 3,300,000 vaccinations were given between March of 1967 through December 1969 to an estimated total population of 2.7 million. Vaccination coverage as determined by a National Assessment Team, assisted by the Operations Officer, was estimated as about 70%. There are major regional differences in vaccination coverage. Relatively low immunity levels have been found, mainly, in some parts of the central third of the country. As the program enters into the maintenance phase, a countrywide system of smallpox surveillance has been created which employs for case reporting 235 dispensaries and health posts, all teachers in the country, Peace Corps volunteers, missionaries, and others. Assessment in various regions revealed differences in immunity levels. These results provided guidance for escalated vaccination

campaigns in communities with poor vaccination coverage. There are two well-trained national counterparts for the Operations Officer, one for administration and the other for assessment and surveillance.

In contrast to the smallpox project, equivalent results with the measles control program have not yet been achieved. Although there has been a recent decrease in the number of the annually reported measles cases, probably even masked by improved recording, the presently available data are still too equivocal to permit reasonable speculations about the impact of the program on the incidence of measles. As of December 1970 the estimated total number of measles vaccinations given to children in Dahomey was 685,000. Since August of 1970, measles immunization in the six largest cities of the country have been given at 6 month intervals to infants 6 to 12 months of age. But cycles in the rural areas are still synchronized with those of smallpox and are planned at two-year intervals. The emergency created by the recent outbreak of cholera in Dahomey has dramatically shown the degree of flexibility and great capacity of the method of delivering vaccines to large groups of the population by Ped-O-Jet.

Difficulties:

Systematic terminal assessment of vaccination coverage against smallpox has not yet begun. Plans for starting these activities in 1970 had to be abolished because of the cholera emergency. From the available data, it appears that there might still be pockets of susceptibility to smallpox in the more remote parts of the country. Two minor smallpox outbreaks in 1969 were thought to have originated from variolations practiced by fetishers.

There are difficulties in the maintenance of the cold chain in certain rural areas of the country. On the other hand, the frequently heard complaints about servicing and maintaining the Dodge trucks were not specifically mentioned in Dahomey. There have been no major problems with the operation and servicing of Ped-O-Jets.

Recommendations:

The SMP should be continued with full material and financial support, but with a reduction in the supply of measles vaccine. The favorable developments concerning counterpart training and sharing of responsibility

would permit the withdrawal of one of the operations officers from either Dahomey or Togo where similar developments have taken place. The remaining Operations Officer could then serve both countries on a shared time basis. Because of the great interest in the future use of multiple vaccines administered by Ped-O-Jet as mentioned in discussions with high officials in the Ministry of Health, one might consider Dahomey as one of the countries in which pilot studies on the simultaneous administration of different vaccines could be conducted.

Organization de Coordination Pour la Lutte Contre les Grandes Endemies En Afrique Centrale (O.C.E.A.C.)

A. General Comments for Region:

A regional public health organization for the Central African nations was established with goals similar to those already outlined for the OCCGE countries of West Africa. Headquarters for OCEAC are located in Yaoundé, Cameroon, and include some independent laboratory facilities. The services of the Pasteur Institute of Cameroon are available to the organization. The senior medical officers of the organization is the elected Secretary General, a position presently held by Dr. R. Labusquiere, Colonel in the Medical Corps of the French Army. The work of OCEAC is well organized and coordinated in all of the five member states, which include Cameroon, Chad, the Central African Republic (CAR), Gabon, and Congo (Brazzaville).

While the countries in the league of OCCGE have more flexibility and independence in their individual projects in preventive and rural health, those in OCEAC have the same standard programs carried out by the Service des Grandes Endémies on a national level and coordinated and monitored in Yaoundé on a regional level. The head of this professional hierarchy is the powerful and influential Secretary General who, in turn, delegates responsibility to the five country directors of the Service des Grandes Endémies. The line of command ends with the semi-autonomous medical officers who are in charge of the regional operations.

The backbone of the organization is the Service des Grandes Endémies (SGE) of the individual member states. In contrast to the Anglophone countries, where similar units of rural medicine are missing, the SGE has a long and relatively successful history of providing basic curative and preventive services to rural areas that have no permanent medical facilities. Difficulties in cooperation between American medical officers of the SMP and French physicians in OCEAC have arisen mainly because of the vagueness of defining the functions of the American advisor. There have been few or no problems with the Operations Officers whose services can easily be coordinated into the structure of the SGE. The history of the three Medical Officers of the SMP who have been assigned to OCEAC since the inception of the project is characteristic of the situation that may arise when too little attention has been paid to a careful analysis of the local situation. Such an analysis would have provided the ways and means for achieving optimal cooperation between the national government, its strong and competent French advisors, and American experts who lack experience in Francophone Central Africa. The lesion of the past five years, but reflected from

a different angle is summarized by opinions expressed by the Secretary General of OCEAC in his letter included as Appendix II. The experience should provide guidelines for making major changes in the job description of the senior medical officer who will be assigned to OCEAC. The authors of this report believe that the present situation in Yaoundé appears to have good potentials for a professionally productive and harmonious international cooperation in public health problems.

Three areas of possible activities are listed for consideration:

1. teaching and instruction of epidemiological methods by using routinely collected data in the country as examples for practical demonstrations;

2. active cooperative research on public health problems of mutual interest with priorities established locally;

3. a series of cooperative educational projects including exchange of senior medical officers of the African nations, French advisors and American physicians. It is also recommended that American medical literature in local libraries and the rudimentary system for information exchange between medical journals of Francophone and Anglophone countries were items of special concern in discussions with physicians in Cameroon and Chad.

B. Individual Countries in Region Visited:

CAMEROON

Persons Visited:

Mr. Lewis Hoffacker, U. S. Ambassador

Dr. C. Grader, US/AID Director

Dr. S. Joseph, US/AID Medical Advisory

Dr. R. Labusquiere, Secretary General OCEAC

Dr. M. Nebout, Medecin Chef, Grandes Endemies, Secteur

Dr. J. Dutertre, Director, Preventive and Rural Medicine

Dr. Gateff, Assistant to Secretary General OCEAC

Dr. G. L. Monekosso, Professor of Medicine, Director, University Center for Science and Health

Dr. M. Bradley, Medical Epidemiologist, SMP

Mr. R. Baldwin, Operations Officer, SMP

Places Visited:

Douala

Yaounde

Achievements:

The SMP was absorbed into the already existing endemic disease service which uses mobile prospection and vaccination teams. The regular vaccination cycle for individual communities is three years. There has been little concern with assessment activities. A special evaluation team was established in February of 1970. After having done some evaluation in north Cameroon, it was immediately dissolved because of emergency situations - first an outbreak of yellow fever and later the spread of cholera to Douala and Yaounde.

There are two well-trained counterparts to the Operations Officer of SMP. Unfortunately, these individuals are not firmly employed by the national government and would lose their jobs soon after withdrawal of the U.S. advisors.

As late as 1969 Cameroon reported 15 cases of smallpox. All cases came from the northern region of the country. Assessment of vaccination coverage in the area initiated by the American personnel of SMP revealed gross deficiencies of vaccination coverage. A vigorous vaccination campaign was carried out. No smallpox cases were reported in 1970. The Director of Service des Grandes Endémies for Cameroon, Dr. Dutertre, in his annual report praised the American equipment and supplies (vehicles, vaccines, Ped-o-Jets) and the initiative of the U. S. personnel in having prevented a major epidemic of smallpox in Cameroon.

An appraisal of the success of the measles vaccination campaign is difficult. Crude figures published in the Annual Report of the Médecine Preventive et Rurale for the years 1965 to 1969 indicate a twelve-fold increase in the number of reported measles cases (2,178 - 24,257), while a total of 1,502,785 vaccinations against measles had been administered to children between 6 months and 6 years (Annual Report Médecine Preventive et Rurale 1969). This paradoxical effect does not indicate that measles vaccination of Cameroonian children has caused measles, but merely reflects the improvement of case reporting since 1967 superimposed on the natural variations of disease incidence.

Judgment of Project by Officials:

Although there is unanimous agreement among all officials concerned with the SMP that continuation of the project would be highly desirable, the need for modification was the most explicitly mentioned condition for future programs. Reasons for requesting adjustments and changes are listed under Difficulties and recommended changes for improvement under Recommendations.

Difficulties:

Since the inception of the program, the personnel of SMP in Cameroon has been in a particularly sensitive position. On the one side were the young, idealistic, but relatively inexperienced Medical and Operations Officers of the SMP eager for immediate action and change; on the other side stood the medical establishment represented by the Service des Grandes Endémies, dominated and run by medical officers of the French Army, many of them with long and unusual experience in Africa, who were unwilling to change what they thought was an excellent system of disease prevention. They could point to a history of systematic vaccinations against smallpox carried out by their mobile rural health teams. Unfortunately, the first two medical epidemiologists assigned to Cameroon did not help to improve the situation. The first, Dr. Rozenbloom, allegedly ignored decisions made by the Secretary General of OCEAC and acted independently; while the second, Dr. Peters, preferred complete inactivity to show his disagreement with the establishment. The present medical officer, Dr. Bradley, mentioned that he has not yet found his slot in the structure of the National Health Service that would enable him to work with satisfaction.

In contrast, Mr. Baldwin, the Operations Officer, appeared to be content with his job which involves mainly logistics, administrative duties, and trouble shooting.

In various discussions with senior officers of OCEAC (Dr. Labusquiere, Dr. Dutertre, Dr. Gateff, and Dr. Nebout), with Dr. Bradley and with Dr. Joseph of AID, all expressed their desire and hope for improved relationships, rather than suggesting a withdrawal of the American staff. As specific areas of friction and disagreement the following were mentioned:

1. Fuzziness in defining the functions and responsibility of the medical officer and to a lesser degree the operations officer;

2. Inadequacy of the supervisory and coordinating visits by staff members from Atlanta;

3. Need for integration of activities of the SMP personnel into a national team of experts working for the Cameroonian government, rather than an artificial subdivision into French and American advisors. A letter voicing the opinion of the Secretary General of OCEAC and his colleagues is attached as Attachment 4.

Because of the yellow fever outbreaks and, most recently, the cholera epidemic requiring 20 to 40 thousand vaccinations per day, all assessment and regularly scheduled vaccination activities have been temporarily paralyzed.

According to independent statements by American and French experts it is safe to conclude that the cold chain for maintaining the quality of the sensitive measles vaccine is deficient in the majority of the 24 health sectors of Cameroon.

Recommendations:

It is recommended that the SMP program be reconstituted with one medical officer assigned to OCEAC and two operations officers assigned to countries within the region, one to be stationed in Yaounde to serve Cameroon and Gabon, and the second in Fort Lamy for Chad and CAR. It appears imperative that discussions be started as soon as possible between senior officers of the CDC (US/AID) and OCEAC to define more clearly the future functions, responsibilities and work schedules of the US personnel.

It is recommended that the supply of measles vaccine be confined to those sectors and major cities in which the delivery and administration of the vaccine is safe. Public demand might force presently indifferent medical officers in some health sectors to improve their cold chains to become eligible again for receiving the expensive measles vaccine.

Yaounde is one of the key cities in Francophone Africa where fruitful contacts between African, French and American professionals can be established and cooperative projects be inaugurated.

REPUBLIC OF CHAD

Persons Visited:

Terence A. Todman, U.S. Ambassador

John Blane, Deputy Chief of Mission

Dr. O. Bono, Director of Health, Ministry of Public Health

Dr. Tachon, Director, Service des Grandes Endémies

Dr. Lalcube, WHO Advisor

Mr. B. Lincoln, Operations Officer, SMP

Places Visited:

Fort Lamy

Achievements:

There have been no smallpox cases since 1969. Vaccination coverage as assessed by an independent team of The Johns Hopkins University in 1967 covering five communities in contrasting areas was between 80 to 90% (see Table I). Although maintenance vaccinations are carried out regularly, they do not cover the entire country. Because of guerilla activities in the north and east of the Republic no regular vaccinations were given to at least 6 of the 14 Prefectures, i.e. Batha, Biltine, Guera, Ouaddai, Salamat and Borkou-Ennedi-Tibesti (B.E.T.).

Difficulties:

The dubious success of the measles vaccination project as indicated by Table II undoubtedly reflects improved reporting of measles cases. This tendency may have minimized the visible effect of the vaccination campaign on the incidence of measles.

The success of the SMP in Chad is hampered by three major obstacles:

1. by the generally difficult logistics in most of the outlying provinces, with special reference to the breakdown of the cold chain for maintaining the quality of the measles vaccine;

2. by the political situation which, since 1967, has made it impossible for the teams to vaccinate the population in many areas within the six Prefectures listed above; and

3. by a general shortage of trained manpower in the country.

TABLE I AGREEMENT* BETWEEN VACCINATION HISTORIES AND PRESENCE OF VACCINATION SCARS

Age	Lake Chad Djimtilo				South West Africa Ouli Bangala				South Central Africa Ouarai				Lake Iro Boun Khebir				Sahara Faya-Largeau			
	Vaccination history				Vaccination history				Vaccination history				Vaccination history				Vaccination history			
	positive		negative		positive		negative		positive		negative		positive		negative		positive		negative	
	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars	No.	scars
0-9	95	88.4	15	33.3	106	84.0	24	12.5	103	77.8	31	3.2	112	92.9	23	21.7	57	73.7	13	23.1
10-19	62	88.7	4	25.0	105	92.4	4	75.0	68	95.6	4	50.0	61	93.4	1	100.0	33	87.9	4	75.0
20-29	48	97.9	2	0	68	95.6	0	0	61	96.7	1	0	51	98.0	1	100.0	29	86.2	2	100.0
30-39	74	93.2	1	0	49	95.9	0	0	36	88.9	0	0	34	91.2	1	100.0	13	100.0	4	75.0
40-49	29	86.2	0	0	24	87.5	0	0	21	81.0	1	100.0	30	100.0	0	0	21	61.9	1	100.0
50+	46	89.1	3	33.3	17	82.4	1	0	33	78.8	0	0	60	83.3	0	0	23	82.6	1	100.0
Total	354	90.7	25	28.0	369	90.2	29	20.7	327	86.5	37	10.8	348	92.5	26	30.8	182	80.8	25	52.0

* agreement listed in percent

Table 11.

MEASLES INCIDENCE BY CALENDAR YEAR

REPUBLIC OF CHAD

Prefecture	1964	1965	1966	1967	1968	1969
Chari Baguirmi	1536	3435	475	49	132	2110
Mayo Kebbi	187	86	32	8	7	41
Longone Occidental	115	830	3453	260	129	185
Longone Oriental	317	751	1186	983	247	68
Tandjile	46	151	-	372	554	341
Moyen Chari	1286	2270	1679	741	134	107
Ouaddai	706	297	1132	2	357	85
Biltine	591	1516	503	5	348	18
Batha	139	35	63	1	220	95
Guera	370	70	71	4	327	316
Kanem	36	126	245	15	27	235
Lac	0	0	0	0	0	329
Salamat	58	14	137	5	44	163
B.E.T.	694	133	45	1	410	287
Total	6081	714	9021	2446	2938	4380

Deficiencies of immunity levels in certain groups of the general population are the more dangerous because most of these areas border on the Sudan where smallpox is still endemic.

Judgment of the program by local officials:

The country cannot maintain its vaccination programs without continuation of external assistance, notably the US/AID sponsored SMP

Recommendations

The project should be continued with one Operations Officer in residence. He should be involved in assessments and evaluation. For this purpose it would be advisable to have independent transportation. Results of assessment are particularly valuable for Chad in order to spot gross deficiencies in smallpox vaccination coverage in remote areas. Because of the peculiar political situation, emergency plans for modified surveillance must be made for those areas in which recurrence of smallpox appears to be most likely but where routine vaccinations cannot be given at the present time.

It is recommended that a special and systematic effort be made to determine the rate of deterioration of the measles vaccine in relation to various environmental and personnel factors which are found in Chad. The results of such a carefully planned study would benefit other countries presently enrolled in the SMP, can lead to substantial savings and prevent the possibility of a still subliminal, but eventually openly expressed, opposition on part of the population who receive inactive measles vaccines which do not protect their children.

CENTRAL AFRICAN REPUBLIC

Persons visited:

Mr. Manfull, U.S. Ambassador

Mr. Wachob, DCM, U.S. Embassy

Dr. André Délas, Chief, Endemic Disease Service

Dr. H'Garo, Director, Health Services

Dr. Jolitorio, WHO advisor

Dr. Louis Chamorin, Director, Institute for Medico-Social and Public Health Training

M. Emile Atanguire, Deputy Chief, Sector I of Endemic Disease Service

Mr. Robert Baldwin, Operations Officer serving CAR from Cameroon

Achievements:

Since 1967, an estimated total of 1,728,700 individuals have received smallpox vaccinations. No cases of the disease have occurred in the country since 1962. Measles morbidity is said to have declined sharply since 1965. This conclusion is based on data contained in a single table which compares the monthly averages of measles morbidity from 1965 - 1968 with the actually observed incidence of cases in 1969. The total annual average for the period of 1965-1968 was 6,085, with a monthly average of 507 cases, as compared with a total of 1,722, and a monthly average of 144 cases in 1969. A difference as large as the one observed may be produced by natural variations in the annual incidence of measles. It is, therefore, impossible to judge to what extent the reduction in the number of reported cases has resulted from protection of children who were vaccinated against measles.

Judgment of the project by officials:

In the judgment of the national health officials, the SMP has been a very successful program. They pleaded that it be continued beyond the present deadline of December 1971. The responsible health officers felt that the equipment provided under the SMP has made it possible to enter into a new future program of multiple vaccinations against a spectrum of communicable diseases that can be prevented by this method.

Difficulties:

CAR has not followed the general plan of operations which called for an initial attack phase covering the entire population with smallpox vaccinations, followed by a maintenance phase when annual vaccinations are given to children, migrants, and other previously missed susceptibles who have been identified through assessment and surveillance. Instead, the country has been conducting triennial attack phases during which they attempt to cover the entire population each time. There are present plans to reduce the recycling to biennial intervals. The responsible Medical Officer feels that complete coverage of the population with smallpox vaccination is important, since the CAR shares borders with two countries - Sudan and the Congo - (K), where smallpox is still endemic.

It is realized that triennial or even biennial campaigns will be insufficient for the control of measles since it would leave many susceptible children unprotected at an age when the disease is clinically most severe. Dr. Délas, the Director of the Grandes Endémies Service, proposes that all measles vaccinations be given in established health centers of the eleven larger towns in the country where reliable refrigeration is available and where the personnel is well-trained and experienced.

Recommendations:

It is recommended that support for the SMP in the Central African Republic be continued with the condition that systematic assessment and surveillance activities be instituted. Discontinuation of assistance would not only throw back the entire program of smallpox eradication and measles control, but would also leave the country vulnerable to many other endemic diseases whose control depends so much on the tools furnished by the smallpox and measles project. As was outline in the introductory section for the entire region (OCEAC), the full time assignment of an Operations Officer to the CAR does not appear to be necessary. Instead, it is recommended that an Operations Officer stationed in Ft. Lamy, Chad, serve both the CAR and the Republic of Chad.

GHANA

Persons Visited:

U. S. Embassy

Mr. Thomas W. McElhiney, U.S. Ambassador, Ghana

U.S.A.I.D. Mission

Mr. W. Haven North, Chief, A.I.D. Mission, Ghana
Miss Lois Richards, Assistant Program Officer, A.I.D. Mission, Ghana

Federal Ministry of Health

Dr. Beausoliel, Assistant Director Medical Services, M.O.H. Ghana
Dr. Frank C. Grant, Senior Medical Officer, Epidemiologist, M.O.H.
Dr. Edwin C. Marbell, Senior Medical Officer - Laboratories, M.O.H.
Mr. Daniel Sapang, Vital Statistician, Ghana, M.O.H.
Dr. Aki Saakwa-Mante, Senior Statistician, M.O.H.
Dr. Fred Sai, Professor and Chairman Dept. of Community Medicine Ghana Medical School and Director of Medical Services, M.O.H., Ghana
Mr. Fred Sapper, Vital Statistician, Ghana, M.O.H.

University of Ghana Medical School

Dr. Afusu-Amak, Pediatrician, M.O.H., and Ghana Medical School
Dr. Silas Dodu, Professor, Chairman, Department of Medicine, Korle Bu Hospital, Ghana Medical School
Professor K. Minami, Director, Virus Research Laboratory, Ghana Medical School
Dr. Fred Sai, Professor and Chairman Dept. of Community Medicine Ghana Medical School and Director of Medical Services, M.O.H., Ghana
Dr. S. Wurapa, Professor Preventive Medicine, Ghana Medical School

Danfa Project

Dr. Donald Belcher, Epidemiologist, UCLA/AID Danfa Project
Dr. J. Loire, UCLA/AID, Danfa Project Director

Smallpox/Measles Program

Mr. Dennis Dix, Operations Officer, A.I.D., C.D.C. Smallpox/Measles, Ghana
Dr. Chas. Herron, Epidemiologist, A.I.D., C.D.C. Smallpox/Measles, Ghana
Mr. Francis Kofi, Ghana Counterpart of A.I.D. Smallpox/Measles, Operations Officer
Mr. David Newberry, Operations Officer, A.I.D., C.D.C. Smallpox/Measles, Ghana

Places Visited

ACCRA

Federal M.O.H.

Ghana Medical School

U. S. Embassy, A.I.D.

Smallpox/Measles Program Office

Korle Bu Hospital (U. Ghana Medical School Hospital)

Tema-Calco (Kaiser) Industrial Hospital

Kumasi, Ashanti - Regional Ministry of Health

Worasu - Rural Dispensary

Tamale - North Region Ministry of Health

Bolgatanga -Upper Region Ministry of Health

Bawku - Mission Hospital and Rural H.C.

Tumu - Maternity Center and Dispensary

WA - Rural H. C.

Geography

The republic of Ghana, situated near the equator on the Gulf of Guinea on the west coast of Africa, is bounded on the north by Upper Volta, on the west by the Ivory Coast, and on the east by Togo. About the size of Illinois and Indiana combined, its 92,000 square miles has an average population density of 90 persons per square mile. The country contains over 20,000 villages with a population of less than 100 and 50 percent of the people live in villages of less than 1,000 population.

The Southwestern section of the country is a relatively flat, tropical rain forest; further north the forest progressively gives way to a warmer and drier savannah and finally to sub-Saharan grassland plains. The annual temperatures of the country range from 80° along the coast to 95° in the north with temperatures highest during the dry season of November to March.

Government

The country is divided into nine regions; each region is further subdivided into administrative districts. Functionally, the government is being decentralized, delegating responsibility for planning and execution of economic, agricultural, administrative educational, and health programs to the regions.

The Ministry of Health in Ghana is headed by a cabinet officer. The Director of Medical Services, responsible to the Minister, is the Chief Medical Officer, who is responsible for the day-to-day management of the technical programs. He, in turn, has responsibility for a group of senior medical officers, each of whom is responsible for a major program aspect,--communicable disease

control, medical care, nutrition, maternity and child health, etc. A deputy director of medical services is responsible for the regional health programs, both therapeutic and preventive, in the nine regions of the country. Each regional medical officer has two senior medical officers responsible to him, one for therapeutic health services, the other for preventive services. The regions are in turn each broken down into four health areas or districts and a health area consists of a variable number of health posts. Principal services to the populace are provided through the health posts by non-professional health post assistants.

Each senior medical officer in the Federal Ministry of Health is responsible for his own supportive services which leads to unevenness in administration and duplication of administrative services, equipment, budget, employment of personnel, etc.

The national health budget for both preventive and therapeutic services in the last year was the equivalent of $32,000,000 of which $10,000,000 was for new health facilities. This was a 5 percent increase over the previous year.

The Ministry of Health is responsible for three training shcools: The School of Hygiene for the training of sanitarians, public health nurses and health educators; a Health Services Maintenance School for training medical field unit staff or health post assistants; and a school for training community health nurses. The staff of the ministry admit to a serious need for resources for training administrative personnel, and they have been unable to provide any refresher training. Physicians are trained in the Ghana National Medical School and receive a fairly comprehensive course of didactic instruction in community medicine extending through the

four years of school. At the end of their fourth year they are given a rural health assignment of six weeks.

Population and Economy

Population estimates range up to 10,000,000 with the greatest concentration in coastal areas and the two principal cities of Accra and Kumasi. The current rate of population growth is estimated at 2.9 percent. Birth and death rates approximate 47 and 20 per 1,000 population, respectively. Half of the population is 18 years or under and a current concern is not that the country is overpopulated but that the growth rate is so high that it already retards economic progress. Ghana is the only West African nation with a stated population policy. Figures on international immigration are unreliable, but much short-term movement from and to neighboring nations occurs. Ghana is one of two sub-Saharan African countries where the annual flow in and out exceeds 300,000 persons.

Although agriculture (cocoa, coffee, etc.) is the principal industry, and dictates the national social structure, industry is rapidly developing on a diversified scale. As a result of hydro-electric development on the Volta River, industries include meat canning, beer and soft drink production, and the manufacture of aluminum utensils, soap, clothing, glassware, roofing sheets, cement, and tobacco products. The annual per capita income is approximately $200,000.

Smallpox/Measles Program

The Smallpox/Measles Program has been conducted by 15 vaccination teams, four assessment teams, and one epidemic control unit. These teams are based outside of regional headquarters in specific geographic areas where they are familiar with local governments, populations

and work patterns. This enables rapid response to disease outbreaks, with particular emphasis currently being placed on measles control. Recently, however, work of these teams has been diverted to cholera control and progress in the Smallpox/Measles Program has been retarded accordingly. Other antigens administered by mobile teams either for routine or epidemic control have included BCG and yellow-fever.

Smallpox - Since 1966 Ghana has participated actively in the regional program of smallpox eradication and measles control. An integral part of this program has been directed at increasing the indigenous competence of the ministries of health in the prevention and control of communicable diseases. Although oriented to smallpox and measles, the methods of surveillance epidemic investigation and control, mass immunization and assessment developed in the program have been applied widely to other communicable diseases (such as cholera, yellow fever, and meningococcal meningitis).

The most remarkable accomplishment of the Smallpox/Measles Program has been elimination of smallpox from Ghana since October 1968. Although the ministries of health had conducted numerous vaccination campaigns over the years, until the Smallpox/Measles Program was activated, smallpox cases had been reported as far back as data on notifiable diseases are available. The following table gives a historical review of smallpox occurrence and vaccinations performed since 1957.

Year	Smallpox Cases	Smallpox Deaths	Smallpox Vaccinations
1957	154	20	52,386
1958	161	9	140,940
1959	104	14	123,988
1960	139	20	128,051
1961	70	8	168,916
1962	145	8	210,198
1963	23	-	326,120
1964	9	1	947,291
1965	7	-	681,369
1966	13	2	399,989
1967	114	17	1,342,219*
1968	24	6	1,987,151
1969	0	0	2,093,509
1970	0	0	1,885,056

* Vaccinations under the Smallpox/Measles Program began in February, 1967.

The success of the program seems related to the regional (multi-country) cooperation, the wide spread vaccinations, programs, epidemic containment activities, and the high coverage rate achieved. (Perhaps 60 percent of the total population has been effectively vaccinated). The present level of protion has been effected through an admirable organization of health workers in the ministries of health, the development of an efficient vaccine distribution program and a modern transport system for the operation.

The following table gives details on vaccination coverage:

Region	Estimated Population (1970)	SMALLPOX VACCINATIONS 1967	1968	1969	1970	Total
Greater Accra	629,572	634,092	19,396	174,858	36,967	865,313
Eastern	1,400,664	439,277	321,583	81,825	170,744	923,429
Western	801,533	56,383	--	275,785	337,189	668,357
Central	961,845	3,092	--	165,903	370,906	539,901
Ashanti	1,419,779	--	830,130	453,997	126,305	1,410,432
Brong Ahofo	752,586	--	229,327	216,352	207,661	653,340
Northern	680,459	--	82,864	446,104	27,034	556,002
Upper	969,464	299,375	211,778	--	498,631	1,009,784
Volta	994,985	--	292,163	278,685	108,619	679,467
Total	8,610,887	1,342,219	1,987,151	2,093,509	1,884,056	7,306,025

Beyond the accomplishment of smallpox control, a group of health workers have developed skills in differential diagnosis, preventive and therapeutic measures, investigative and assessment techniques, etc.

Federal and regional program have developed to a point that national headquarters has been notified within 24 hours of the identification of a suspected case of smallpox. Whereas only 141 (71 percent) of 199 sites participated in the reporting effort in 1969, this figure had increased to 18 (92 percent) by the end of 1970.

Measles - the mass vaccination of children aged six months through four years began in February, 1967. By the end of 1970, nearly 1,400,000 children had been vaccinated. Despite an apparent overall coverage of 80 percent in the campaign areas, this may be an over-estimate, and a more probable approximation is 60 percent of susceptibles. This lower estimate is based on the recognized fluidity of the population, with 20 percent being removed annually through death and an equal proportion entering the reservoir of susceptibles.

A significant accomplishment of the Smallpox/Measles Program has been an improvement in the reporting system of communicable diseases, and specifically, the statutory requirements as of January, 1969, that measles be a notifiable disease. The full impact of measles immunization on measles morbidity and mortality, however, remains unknown. As elsewhere, clinical impression has suggested a marked decline in measles cases following mass immunization procedures, but epidemiologic data that would support this contention are lacking.

The absence of comparative data to measure any protective effect from measles vaccinations led us to examine selected hospital admission and dispensary outpatient records. The following figures represent such data for the Northwest District of the Upper Region, including the city of Wa, where the attack phase of measles immunization began in Wa in late 1967 and continued into 1968. No measles immunization was performed in 1969, but a strong maintenance campaign was undertaken in 1970.

Year	Measles Cases	Measles Deaths	Year	Measles Cases	Measles Deaths
1962	610	---	1967	1,489	13
1963	629	5	1968	288	3
1964	1,667	8	1969	362	3
1965	1,428	5	1970	438	1
1966	1,208	18			

Morbidity and mortality data on measles 1969-1970, and measles vaccination data, 1967-1970, by regions in Ghana are as follows:

REGION	MEASLES CASES		MEASLES DEATHS	
	1969	1970	1969	1970
Greater Accra	3,808	3,776	34	44
Eastern	7,975	7,845	18	19
Western	7,639	7,492	26	38
Central	1,918	2,066	114	119
Ashanti	2,162	2,107	18	29
Brong Ahafo	1,928	2,090	24	17
Northern	1,592	1,661	23	14
Upper	3,334	3,340	10	8
Volta	3,782	3,934	32	9
TOTAL	34,138	34,311	299	297

REGION	MEASLES VACCINATIONS				
	1967	1968	1969	1970	TOTAL
Greater Accra	90,110	779	20,657	9,644	121,190
Eastern	56,563	60,908	16,015	41,056	174,542
Western	3,232	---	44,651	48,730	96,613
Central	434	---	27,823	71,488	99,745
Ashanti	---	182,930	95,762	32,423	311,115
Brong Ahafo	---	55,737	49,165	52,093	156,995
Northern	---	15,468	85,939	8,587	109,994
Upper	35,096	44,460	---	134,176	213,732
Volta	---	51,689	40,235	11,412	103,336
TOTAL	185,435	411,971	380,247	409,609	1,387,262

Although no firm conclusion can be drawn, the declining disease and death rates since 1967, implied from these figures, is compatible with the concept of effective control. Notwithstanding the natural course of disease with its irregular periodicity in rural areas make any firm conclusions impossible at this time.

Maintenance phase activities for measles control are being developed through outpatient facilities in several hospitals. The feasibility of this system for immunization is under the study. Of more significance, field investigations to test the reliability and validity of clinical diagnoses are underway. Over 300 subjects will be included in these observations which will untilize clinical, virologic, and immunological skills available through the federal Ministry of Health and the University of Ghana Medical School.

To achieve better coverage against measles, mobile teams in many regions have been based outside of headquarter cities. Each team is assigned specific geographic areas for operation, which improves familiarity with population distribution, introduction of new susceptibles, information on prior vaccination coverage, etc. Not only has this system promoted more efficient scheduling of maintenance operations, it has led to earlier recognition of measles outbreaks. The advantage of this system beyond the area of measles control--that is for broader communicable disease surveillance--is apparent.

Cholera was introduced into coastal cities of Ghana in September, 1970. Sketchy epidemiologic evidence suggests that the principal means of propagation is by person-to-person spread. However, once the infection is introduced into a village or housing compound, multiple opportunities exist for common source exposure. It is likely to remain endemic in West Africa for many years. Mobile teams have been diverted to cholera vaccination in the urban areas. In addition, they have proved effective in health education through their contacts in the population at large. Improvement of personal hygience and general levels of community sanitation and the boiling of water for all its usages, have been the principal areas of concentration.

Smallpox maintenance efforts of the mobile teams have been severely curtailed, and they have directed their attention to cholera.

The communicable disease control epidemiologist has been devoting time to educational and service activities to help control cholera. These included the design of appropriate therapeutic methods; establishment of treatment facilities; distribution of electrolyte fluids and drugs; and

the training of nursing, paramedical, and medical personnel. Through this concerted effort, the case fatality ratio of hospitalized cholera has been reduced from nearly 25 percent to less than 5 percent.

By the end of February, 1971, a total of 263,026 cholera immunizations had been performed in the Accra region using Ped-o-Jet equipment. The following data gives distributions by district and dates of vaccination.

CHOLERA VACCINATIONS
(Accra Region Teams)

Area	Dates Of Vaccinations	Number Of Vaccinations
Accra and Central Regions	December 2-22, 1970	137,534
Keta District	December 15, 1970 - January 22, 1971	78,192
Winneba and Swedru Districts	December 22, 1970 - February 25, 1971	27,300
Accra/Winneba Districts	December 22, 1970 - February 25, 1971	20,000

The introduction of cholera into Ghana has again demonstrated the versatility of mobile vaccination teams. The presence of yellow fever in Ghana a few years before had evoked the same kind of administrative and mobile team response, which resulted in bringing that disease under temporary control.

Ghana, unlike some other West African countries, was prompt to report recognized cases of cholera to WHO, thus demonstrating their ability and sincerity in participating in international notification schemes.

Observations and Interpretations:

Among the strengths of the National Ministry of Health are a group of highly competent physicians, a much better than average laboratory service, and an apparently good relationship with the Medical School.

Weaknesses in the Ministry appear to include a political influence on organization and training which leads to instability of structure, difficulty in working relationships and problems in the proper selection of trainees. Several observers commented on this as a particular problem where international training is involved.

The work pressures on the staff of the Ministry for day-to-day operation is such that there is inadequate time for planning. The Director of Medical Services is also Professor

and Chairman of the Department of Community Medicine in the Medical School and directs at least one special project. His activities are so widely spread that he is not easily accessible to the staff, and there is some feeling that he is more politically than professionally motivated.

The laboratory provides a wide range of diagnostic and analytical services, but because of problems of communication and transportation, this is limited to the urban area. There is considerable duplication of laboratory facilities

a. among the public health laboratory which provides public health diagnostic services,

b. the medical school's research laboratory, and

c. a laboratory at Korel Bu (University Hospital).

Another weakness in the health system is the inadequacy of organization and operation of the rural health delivery system. It is seriously handicapped by the absence of trained personnel, poor organization, and inadequate information for planning purposes. Coverage of the rural areas is very incomplete. This was the concensus among the staff of the Ministry as well as the regional medical officers with whom we talked.

An A.I.D. sponsored project conducted by faculty of the School of Public Health, the University of California, Los Angeles in the Danfa region is generally directed at the development of a demonstration maternal-child health program with emphasis on a family planning component. The fact that health services were originally requested by the people of the area is important. The collection of extensive background information is in progress; the specific objectives are commendable but are broad and numerous; the methodologics being considered are multiple. Somewhat limited staff have widely scattered interests in both research and training. It is too early to attest the influence of this project on rural health services in Ghana. Curiously, if a plan for evaluation of the project has been prepared, it was not mentioned by the staff in their discussions.

The Smallpox/Measles Program has had a significant influence on the Ministry of Health. Although the use of mobile teams is not new to the public health service of Ghana, the use of the Smallpox/Measles teams has been extended beyond functions directly related to the program. They include other preventive services, the collection of morbidity information, and on occasion, even the penicillin treatment of secondary infections complicating measles.

As in other countries there is general agreement that the Smallpox/Measles Program has been a political success, widely accepted by the people, and has promoted an increased knowledge of public health among the populace. The Smallpox/Measles Program has also established new community contacts for the Ministry and appears to have contributed to community support for health programs.

Prior to 1967, the concept of health posts was not accepted by the Ministry of Health, but the advent of the Smallpox/Measles Program pointed to the need among other things for fixed rural installations followup to assist the mobile teams. Nine health posts were established in 1968, nineteen in 1969, and others will be as trained personnel become available.

One of the major strengths of the Ministry of Health is its communicable disease control unit, headed by a well trained, competent epidemiologist. The Smallpox/Measles Program has contributed to the improved functioning of this unit. Morbidity information for 10 percent of the population is received from 42 selected areas reporting through regional medical offices which, in turn, have received data from the health posts in the areas. (In addition to this, there are direct telephonic reports of smallpox, cholera, yellow fever, etc.) Emphasis on surveillance of smallpox, an appreciation of the understanding of the importance of reporting, the evidence of some action based on the report, and a feedback of consolidated reports are outgrowth of the Smallpox/Measles Program. They have increased from the health posts significantly. In 1969, 55 percent of the health posts did some reporting. In 1970 this had increased to 92 percent, at a time when the number of health posts was also increasing. Reports are still somewhat fragmentary, but are improving.

Another effect of the Smallpox/Measles Program on communicable disease control has been an increase in the number of types of vaccine administered, largely as a result of vaccination associated with the administration of the smallpox vaccine. Prior to 1967, immunizations were limited to smallpox, diptheria, and those necessitated by epidemics. The number of BCG, yellow fever, and cholera immunizations, by year, is shown as follows:

VACCINATIONS

	1967	1968	1969	1970	Total
Smallpox	1,342,219	1,987,151	2,093,509	1,884,056	7,307,935
Measles	185,435	412,051	380,247	409,608	1,387,342
B.C.G.	229,014	175,230	348,727	477,832	1,230,803
Yellow Fever	9,605	5,301	105,995	442,711	562,611
Cholera	---	---	---	369,991	369,991

A further activity stimulated by the Measles/Smallpox Program has been the laboratory confirmation of diagnoses made in the field. This has been made possible in the smallpox program by use of the independently developed virus laboratory of Professor K. Minami, an eminently qualified Japanese virologist. The practices of epidemiologic investigations among contacts of an index case of infections other than smallpox has also been introduced since the demonstration of this technique in connection with the smallpox program. Containment immunization of contacts has logically followed this kind of investigation. An epidemiologic bulletin, previously referred to, is published on a bi-monthly basis and provides feedback to the regional medical officers and their subordinates. The bulletin, initiated in 1968, continues to emphasize the value of reporting as the key in epidemiologic investigation and control.

Demographic data for the Ghana population are largely derived from a 1960 census. The reliability of this census has been questioned in some quarters, but it is commonly accepted by governmental agencies. The results of an inter-census survey conducted in 1965 have never been published because they were not believed reliable. Data from the 1970 census are not yet available. The reliability of age information in the population is commonly questioned, particularly for individuals in the older age group. (About the only way to determine age of these older individuals is to associate birth with a well-known and nationally recognized event such as a major catastrophe, a change of government, etc.). Although births and deaths have been reported from the entire country, it is estimated that only 15 percent of deaths are reported and even fewer births. A death certificate is required for burial, but the requirement is not commonly observed.

Relatively little use is made of either morbidity or mortality information for health planning purposes, and the ministry is seven years behind in the publication of its annual reports. It is of interest to note that the principal causes of death in Ghana as tabulated in 1959 are remarkably similar to those of the United States in 1900. A more recent tabulation is probably available but was not provided.

	U.S. 1900	Ghana 1959
1.	Pneumonia	Pneumonia
2.	Tuberculosis	Tuberculosis
3.	Diarrhea and Enteritis	Pregnancy and Puerperium
4.	Heart Disease	Disease and Enteritis
5.	Intracranial Lesions	Accidents
6.	Nephritis	Malaria
7.	Diseases of First Month of Life	Heart Diseases
8.	Cancer	Tetanus
9.	Accidents	Nephritis
10.	Diphtheria	Meningitis

The Smallpox/Measles Program has not contributed significantly to the recruitment of additional members for the health services of Ghana. Eighty individuals have been transferred from other programs and given training so that they might be used in the vaccination campaign. There was no evidence that the programs for which they were transferred had deteriorated except for opinions on the part of some officials that trypanosomiasis had increased since the program was curtailed. Additional health recruits are being trained in connection with the development of the rural health service program. Such recruitment can not be called a direct result of the smallpox program.

Personnel used in the smallpox measles program, as members of the mobile team, are being increasingly utilized for other preventive services. With the termination of the Smallpox/Measles Program it is likely they will be absorbed into the general health structure to provide generalized preventive services on an ambulatory basis.

Any summary of the major health problems of Ghana must necessarily be fragmentary, largely undocumented and heavily dependent upon the observations of informed observers. It is the consensus among these observers that make their opinions significant. Probably foremost and most significant is the concern with the inadequacy of rural health service. Coverage is poor, coordination of treatment and prevention at the regional level and below are seriously lacking and information on which to base programs is inadequate. Most of the staff is untrained and unskilled so that quality of services provided is seriously lacking.

Another problem in Ghana, not mentioned by the principal medical officer of the Ministry, but referred to by his staff, was the disorganization and poor management in the federal health organization. One staff member commented that the most important thing that could be done to improve the federal health services would be to take the ministry out of politics and overhaul it with a thorough analysis of its organizational and management problems. As previously noted, little use is made of the available health information, questionable as it is, for health planning.

The ministry has three training schools for personnel, but they lack trained faculty. There is a recognized need for the training of supervisors and administrators for health services, the expansion of training of health auxillaries, and for refresher training of present staff.

Among the categorical diseases the parasitic infections (malaria, bilharzia onchceriasis, trypanosomiasis) are probably most important economically, in an agrarian society, but the vicious cycle of malnutrition and disease takes a heavy toll of the population under 5 years of age.

Dr. Sai, the principal medical officer for the federal ministry, emphasized the need for a nutritional education program, including information regarding the use of available foods and their proper preparation, commenting that infection is more of a problem than lack of calories.

Termination of the Program:

The Smallpox/Measles Program in Ghana has been unusually well organized and operated. Over 7,300,000 doses of smallpox vaccine and 1,400,000 doses of measles vaccine have been administered since its inception. It has contributed remarkably to the overall strengthening of the M.O.H., particularly the Communicable Disease Control Unit.

The country has been free of smallpox since October, 1968.

In spite of these accomplishments, the Ministry of Health did not feel they would be able to take over the program for another three years. They are concerned with their ability to maintain a transportation system for the mobile teams, to purchase vaccine and complete training of their operational staff. This appears to be overly dependent on U.S. assistance and reflect unnecessary hesitancy in assuming program responsibility.

Much can be said for a six months extension of the program. It will provide further time for the national government to plan for procuring vehicles and vaccines beyond 1972, and afford an opportunity to complete training of native automotive maintenance, personnel, particularly in maintaining inventories and ordering spare parts. Cholera has interrupted measles vaccination programs, particularly in the urban areas. If measles maintenance programs can be resumed in those regions where the number of immunizations declined sharply in 1970, it may be possible to demonstrate a program which will significantly reduce measles. Finally, the Smallpox/Measles program has been particularly successful in contributing to the strength of the national health services in Ghana. Any action which will stabilize and consolidate those accomplishments will be worthwhile.

Summary:

Under the Smallpox/Measles program in Ghana, operated on a decentralized basis by the Regions of the country more than 7,300,000 smallpox vaccinations, 1,4000,000 measles immunizations, as well as 2,100,000 other immunizations (cholera, TBC, yellow fever) have been given. The country has been free of smallpox since October, 1968, and the medical consensus is that measles morbidity and mortality have been reduced significantly but epidemiology data are not available to substantiate this conclusion on a nation wide basis. The smallpox program has been unusually successful in strengthening and improving the M.O.H., particularly the communicable disease control limit. The cholera epidemic has seriously curtailed the maintenance of Smallpox/Measles immunization.

Like other Anglophone countries, Ghana lags in the development of its rural health services particularly; and in the creation of an adequate demographic-vital statistics base for planning and evaluating health programs. Training facilities exist which could be developed to provide training on a regional (international) basis, but

there is serious need for additional trained faculty, assistance in curriculum development and refresher training faculty, assistance in curriculum development and refresher training of present health workers. Infant mortality associated with malnutrition, maternal ignorance, lack of child health supervision and a high incidence of infections and parasitic diseases is of major national concern.

Recommendations:

It is recommended:

1. Support of the Smallpox/Measles Program be extended to June 30, 1972, under the following conditions,

   a. Written notice to the Ghana Ministry of Health that they are solely responsible for support and operation of the Smallpox/Measles Program after that date.

   b. Extension of support for six months beyond the previously scheduled termination (12/31/71) is dependent upon a written plan for operation of the program after June 30, 1972.

   c. Participation of C.D.C. Smallpox/Measles personnel be limited to one operations officer and one M.D. epidemiologist, effective not later than 9/1/71.

   This recommendation will facilitate the complete take-over of the program by the Ghana National Government, with extended supervision and consideration by the United States specialists and permit completion of an important phase of the measles maintenance program.

2. A multiple antigen immunization program be undertaken on as country-wide basis as feasible against smallpox, measles, tetanus, diphtheria, pertussis, tuberculosis, and yellow fever and cholera where necessary. Smallpox and BCG should be used as "marker" immunization. A large scale multiple antigen program in a country that has had an effective and efficient Smallpox/Measles Program should be attempted. Operational and logistic difficulties are inherent, but

these can be identified and solved by gradual development of the program and extended field experience.. If this recommendation is accepted, it will necessitate extension of C.D.C. personnel beyond that time recommended in Recommendation #1.

3. Support be provided in three training schools of the Ministry of Health, particularly to training additional faculty, improve curriculum, expand capacity and develop refresher training programs for the present field staff in order that these schools not only meet the needs of Ghana, but also serve as resource for Liberia and Sierra Leone.

4. Early consideration be given to the possibility of an intensive study of the extended use of a mobile team, in conjunction with a fixed facility, to provide comprehensive medical services for mothers and children under five years, on a demonstration basis.

5. A pilot program to develop methodology for collection and utilization of vital and morbidity data in a rural area be undertaken in conjunction with the National M.O.H.

LIBERIA

Persons Visited:

U.S.A.I.D. Mission

Mr. Frank W. Campbell, U.S.A.I.D. Mission Program Director
Mr. John Rumford, U.S.A.I.D. Demographer

Federal Ministry of Health

Dr. Titus, Director Preventive Medicine, National Public Health Services

Smallpox/Measles Program

Mr. C. Randy Moser, U.S.A.I.D. Smallpox/Measles Operations Officer
Mr. Nathaniel (Jack) Berrian, Liberian counterpart, Operations Officer

Others

Mr. Stephen Cerra, Business Manager, J.F.K. Hospital
Mr. Isam Kerran, Health Educator, J.F.K. Hospital
Dr. M. T. Otolorin, W.H.O. Chief of Party, Liberia
Dr. J. C. Jeffry, Medical Director, Firestone Plantation Hospital

Places Visited:

U.S.A.I.D. Mission

World Health Organization Office - Liberia

J. F. Kennedy Hospital

Firestone Rubber Plantation Hospital

Liberia is divided into 9 countries but the government is highly centralized in Monrovia, the capital city, and most services, including health, are provided by the federal government. The National Public Health Service NPHS) is responsible for both preventive and therapeutic health services provided by a chain of hospitals, rural health centers and dispensaries.

The population is currently estimated* at 1,500,000

*Based on the Bulletin of the Population Growth Survey, Department of Planning and Economic Affirs--November 1970 USAID supported) publication No. LPGS-A, 1970.

with an annual crude birth rate of 48-52/1,000 and a crude death rate of 16-20/1,000. Infant mortality is estimated to be 140-145 per 1,000 live births. Forty-three percent of the population is under 15 years of age, and approximately one-third of the population live in villages of less than 100. The annual per capita income is estimated to be $190. Tribalism is still a strong factor in the Liberian culture and society. The low population density, inadequate transportation and community systems and weather are among the factors handicapping the provision of medical services including the operation of the Smallpox/Measles Program.

Smallpox/Measles Program:

As of December 31, 1970, 873,962 smallpox vaccinations and 165,143 measles immunizations had been given since the attack phase began in April, 1968. As of March, 1971, four of the eight vaccination teams were being used in the cholera immunization program. The attack phase of the smallpox vaccination was completed in five countries; 75% completed in Nimba County; Grand Gideh was to be completed by June 30, assuming no further diversion of teams for cholera immunizations by the Liberian National Public Health Service; Grand Bassa and Sinoe counties have no vaccinations to date. A crude estimate indicates about 25% of the total population has not yet been reached by the smallpox attack phase. At the current rate of operation, it is estimated that adequate coverage will be accomplished no sooner than July, 1972, assuming there is not further interference by Cholera. This final effort will be time consuming because of wide scattering of villages and difficult access to some populations (requiring as much as 3 days' foot travel from a road).

Although no assessments are currently being done, prior assessments of areas where vaccinations teams operated indicated approximately 85 percent of the population vaccinated. In areas without vaccination, the N.P.H.S. estimates (basis unknown) that 60 percent of the population have been vaccinated, probably largely as a result of an intensive campaign by the National Public Health Service in 1961-63 with the assistance of the Brothers' Brother organization.

Measles has only recently been made a reportable disease in Liberia, and there are no good estimates of the past or present incidence of the disease. As of December, 1970, 165,143 measles immunizations in children 6 months to 5 years of age were reported. Several observers believed the incidence of measles was low in areas where a major effort had been made, but there is no evidence to confirm or deny the opinions.

The National Public Health Service is reported

to be contributing 59 individuals to the program at present. This is probably a generous estimate and undoubtedly some are part-time. A Liberian operations officer has been trained at Atlanta in the last year. There is one U.S.A.I.D./C.D.C. operations officer stationed in Monrovia.

Liberia appears to be suffering the commonly reported problem with transportation and commodities--especially long delays in truck deliveries, and delay in the delivery of other commodities sufficient to force suspension of the program at times according to local sources.

The total cost of the program to date for A.I.D. (exclusive of administration overhead and inter-country transportation of commodities) is estimated by C.D.C. to be $573,000-$346,000 for commodities and $227,000 for personnel. Liberia's financial input into the program is estimated at $375,000 and has been basically confined to personal support.

As previously noted approximately three-fourths of the population has been covered by the smallpox attack phase, with an estimated coverage of 85 percent, and estimated immunity rate of 85 percent.

Smallpox:

The last major outbreak of smallpox in Liberia was in 1961 when more than 1,000 cases were reported. In recent years, 6 cases were reported in 1967, 5 in the first quarter of 1968 and none since that time. Although reporting of communicable diseases generally is poor, there is high sensitivity to the possibilities of smallpox among missionaries, traders, miners and commercial concerns, and it is doubtful that cases would go undetected and unreported for any long period. Four cases of monkeypox reported for Grand Gideh in late 1970 attest to the surveillance system. Prompt response, intensive diagnostic studies and thorough epidemiologic investigations of that situation reflect a commendable alertness to the serious potential of even one case of smallpox.

Measles:

Little comment can be offered on the measles immunization program, other than it has been brought to a complete halt by the cholera program, both in the attack phase and in the maintenance activities in areas previously covered.

Impact:

The impact of the Smallpox/Measles Program on the health services of Liberia is limited to two respects. The

concept of surveillance has been accepted, a few (about twenty percent) of fixed health stations are reporting major communicable diseases and there is an unquestioned sensitivity to the possibility of smallpox. Secondly, the use of mobile teams to provide health services has been accepted, as evidenced by the total reliance on them for cholera control. They have also been used for health education purposes, to investigate reports of disease, to transport medicine and biologics. It seems likely the concept of supplementation of static facilities by mobile teams has become firmly fixed in the pattern of health services. How it will be extended, to what use it will be subject in the future is dependent upon the extent to which continuing special programs are developed and on the ingenuity and imagination of the national health leadership.

Observations and Interpretation:

The National Public Health Service is generally conceded to be political in character, so grossly understaffed and overworked as to be ineffectual except in the provision of therapeutic health services through the 13 governmental hospitals in the country. There is no evidence of pursuit of the national health plan (prepared by WHO in 1965). Training programs are limited and fragmentary in spite of the possibilities of the (hopefully) embryonic J.F.K. Hospital as a training center.

Demographic data currently being supplied by the previously referred to survey sample of the National Department of Planning and Economic Affairs appears to be better than that available for other Anglophone countries (thanks to U.S.A.I.D.). But admittedly, (by the U.S.A.I.D. Mission staff) this service lacks a built-in provision for development of a permanent national capacity to continue the study. Vital registration is woefully inadequate except for metropolitan Monrovia, where the degree of completeness is unknown. If the National Public Health Service is utilizing morbidity data, it was not apparent and there is no feed back of information to the collecting sources.

The most serious disease problems facing Liberia, by common consensus include tuberculosis, leprosy, and high infant mortality rate. There are no good estimates of the former diseases, although lepers were seen with surprising frequency on the streets of Monrovia. Infant mortality is estimated by the demographic survey group as 150+/1,000 live births.

Among other national health concerns listed were training of "bush" doctors, and communicable disease control. Interest in population planning appears minimal and is limited to Monrovia. U.S.A.I.D. mission staff felt that educational efforts and distribution of contraceptive devices was premature and would be ineffectual.

One important observation should be recorded and is worthy of further detailed investigation for the potential of application by governmental health agencies. This is the experience of the Firestone rubber plantation in reducing infant mortality in the dependent population of their labor force by a program of maternal education, early prenatal care, infant and child care, and regular follow-up of newborn infants by the health assistants in the rural dispensaries. The problem has been the familiar one of the malnutrition--gastrointestinal disease complex, where the malnutritional element is not economic, but educational in the failure to utilize available protein foods in infant feeding. The Medical Director reports the hospital practice in the past 6 years has changed progressively from attention to moribund babies, to attention to sick babies, to well babies. Pediatric deaths have dropped from 20 per month 5 years ago to "very few" at present. Family planning is not accepted by this population because of the feeling of need for more children, but the concept of child spacing to provide healthy children is acceptable. One problem in contraceptive efforts has been the tendency of the patient to take all pills prescribed at one time.

The advent of cholera in late 1970 has largely disrupted the Smallpox/Measles Program. Half of the 8 teams have been diverted to cholera vaccination in the urban areas, where 365,000 individuals have been vaccinated and a second round is being planned. Unfortunately, the total national effort is directed to vaccination at the expense of the more suitable control procedures of boiling water and improving standards of personal hygiene and community sanitation. Measles vaccinations have been brought to a halt, and maintenance programs abandoned. The cholera emergency has interfered with scheduled training programs of mobile team members. It is questionable whether any of the objectives of the 1971 operational plan will be attained as a result of the cholera crisis.

Program Termination:

A Liberian counterpart for the C.D.C. operations officers has been trained and is rapidly assuming increasing responsibilities. However, termination of U.S.A.I.D. support of the Smallpox/Measles Program in December, 1971

would be unfortunate. He does not have sufficient administrative status and support to be effective, and there is insufficient motivation and leadership in the N.P.H.S. to maintain the program for any length of time. The program would probably come to a complete halt. The smallpox attack phase would not be completed and measles maintenance would be limited to urban areas. At present, there is no national competence in ordering spare truck parts to keep transportation moving and the Ministry claims they cannot buy vaccines. The embryonic organized surveillance system would probably disappear except for reporting from hospitals--governmental and mission. Outbreak investigation capacity would be curtailed.

On the other hand, it is our candid opinion that continued support would only encourage sustained dependency, and the best course of action is to provide a part-time operations officer until June 30, 1972 to give the maximum supervised training of the Liberian counterpart, and to require a national contribution to the purchase of commodities as the price of any participation by U.S.A.I.D. beyond December 31, 1971.

Summary:

About three-fourths of the population of Liberia has been covered by the initial attack phase of the smallpox program. Nearly 875,000 smallpox vaccinations and 165,000 measles immunizations have been given. No cases of smallpox have been reported in three years, but four cases of monkeypox occurred in late 1970. The effect of the measles vaccination program is not documented. The program has introduced the concept of disease surveillance and outbreak investigation to the operation of the National Health Service, and mobile teams will become a permanent part of the national health organization. The principal health problems of Liberia are those common to the other countries--communicable disease control, especially enteric infection, tuberculosis and leprosy, shortage of diagnostic laboratory facilities, infant mortality, malnutrition and infectious diseases and the lack of trained manpower. Discontinuation of the program is scheduled in December, 1971 and will probably mean a fairly prompt loss of an organized campaign, with the attack phase of smallpox incomplete and measles immunization limited to urban areas. Mobile teams will probably remain a part of the national health services if transportation can be maintained, and that is questionable. Surveillance will be limited to existing permanent facilities and the adequacy of continued care investigation is doubtful.

Recommendations:

It is recommended:

1. Support of the Smallpox/Measles Program be extended to June 30, 1972, under the following conditions:

   a. Written notice to the Liberian N.P.H.S. that they are solely responsible for support and operation of the Smallpox/ Measles Program after that date;

   b. Extension of support for six months beyond the previously scheduled termination (12/31/71) is dependent upon a written plan for operation of the program after June 30, 1972.

   c. Participation of C.D.C. Smallpox/Measles personnel, effective at a date to be decided by mutual agreement C.D.C.and A.I.D. (but not later than 9/1/72) be limited to one operations officer, one M.D. expected to be shared 50-50 by Liberia and Sierra Leone.

This recommendation will hopefully permit completion of the attack phase of the smallpox program; development of a maintenance phase for measles immunization in Monrovia; completion of the training of the Liberian Operations Officer, with emphasis on shifting responsibility to him from his U.S. counterpart; development of a plan for maintenance of transportation while the U.S. Operations Officer is available to assist; and development of demonstration programs for generalized used of the present mobile vaccination teams.

2. N.P.H.S. participation in a special training program for ancillary medical personnel, laboratory technicians, rural sanitarians and such other public health personnel as are appropriate to the country be explored by A.I.D.

3. Exploration by A.I.D. of N.P.H.S. participation in such other regional health programs as may be considered for the Anglophone countries.

NIGERIA

Persons and Places Visited

LAGOS Smallpox/Measles Program Staff:

John M. Pifer, M.D.	Epidemiologist, Chief of Party
Richard Arnold, M.D.	Epidemiologist, Northern States
Edward Brink, M.D.	Epidemiologist, Midwestern State
Stanley O. Foster, M.D.	Epidemiologist, Atlanta, Ga.
Paul Lichfield	Administrative Officer
Nat. Rothstein	Microbiologist, Yaba Laboratory
Bob Boyd	Operations Officer, Lagos
Paul Bond	Operations Officer, M.W. & Western Stat
John Wilson	Operations Officer, Kwara Sate
Thomas Kimmel	Operations Officer, North C. State
Robert Evans	Operations Officer, North E. State
David Bassett	Operations Officer, North W. State
Jay Friedman	Operations Officer, Kano State
John W. Greenly	Regional Supply Management Officer, Smallpox/Measles Program

Federal Ministry of Health Personnel:

Dr. Okazie	Commissioner of Health
Dr. S. L. Adesuyi	Chief Medical Advisor
Dr. M. A. Silva	Acting Deputy Chief Medical Advisor
Dr. B. A. Johnson	Chief, Preventive Medical Services
Dr. O. E. K. Kuteyi	Acting Chief, Epidemilogic Unit
Dr. Akilade	Chief, Laboratories
Dr. Poopola	Registar, Vital Statistics

AID Personnel:

Mr. Michael Adler	Mission Director
Mr. John Hummons	Deputy Director
Mr. Walter C. Fuerst	Program Officer
Dr. Norman Mosher	Economist
Dr. Patrick Gorhman	Economist

Lagos State and City, Ministry of Health:

Dr. Sinadu	
Dr. B. A. A. Dada	Medical Statistician
Dr. Oshiúkulu	
Dr. Daniels	Epidemiologist
Mr. Shittu	

Ford Foundation
Mr. David Gwatkins, Population Consultant

College of Medicine, The University of Lagos

Dr. Adenyui-Jones, Chairman, Department of Community Health
Dr. Maramola
Dr. O. A. Ransome-Kuti, Prof. of Chemistry, Department of Pediatrics

Western State (Ibadan)

Dr. M. O. Ebun Thompson, Chief Medical Officer of Health
Dr. Joseph I. Idetosoya, Epidemiologist
Mr. J. O. Fagbongbe, Statistician, Ministry of Economic Planning and Reconstruction

University College Hospital (Ibadan)

Dr. Adetokussbo O. Lucas, Professor of Social and Community Medicine

Virus Research Unit, Rockefeller Foundation:

Dr. Donald Carey, Microbiologist and Epidemiologist
Dr. Graham Kempe, Veterinary Microbiologist
Dr. Akihrele Fabiyi, Virologist

Kwara State (Ilorin)

Dr. Philip O. Adeoye, Epidemiolgist
Mr. Omolukun, Deputy Permanent Secretary of Health
Mr. Otonoku, Higher Health Superintendent
Mr. Onietan, Health Superintendent
Mr. Alhagdi Rifun, Senior Health Superintendent
Mr. Kolawolyi, Operations Officer (counterpart)

Vaccination Team Members

North Central State (Kaduna)

Dr. Z. Q. Shaikhi, Chief Medical Officer, MOH and supporting staff
Medical Auxillaries Training School
Dr. R. Prakash, Principal

American Consultate
Mr. Ralph Stephan, First Officer
Mr. Robert DuBois, Consul

Nigerian Institute of Trypanosomiasis Research
Dr. K. B. Thompson, Director

Benue-Plateau State

Dr. Addy, Chief Medical Officer

Ahmadu Bello University - Zaria

Dr. Scarborough, Dean of Medical School
Dr. U. Shehu, Director, Institute of Health and Chairman, Department of Community Medici
Dr. Peter Schram, Department of Community Medicine
Other Staff Members

North-Western State (Sokoto)

Mr. A. I. T. Galadima, Commissioner of Health, MOH
Dr. I. A. Shaw, Chief Medical Officer
Dr. N. Parkrashi, Epidemiologist
Mr. Tamko Kuta, Permanent Secretary, MOH

(Bernin Kibbi)

Emir of Gwandu

North-Eastern State (Maiduguri)

Dr. Hussain, Chief Medical Officer
Dr. J. Arshad, Principal Medical Officer
Dr. A. Gurbali, Epidemiologist
Dr. Shzed Gasi, Tuberculosis Consultant
Personnel, Child Health Clinic (Maiduguri)

Kano State (Kano)

Dr. H. P. Patel, Principal Medical Officer
Dr. D. B. Batu, Acting Epidemilogist
Mohamadu Kazari, Operations Officer (counterpart)
Sharif Olademeji, Assistant Operations Officer

Dr. A. Imam, Minister of Health
Mr. Alfa Wali, Permanent Secretary, MOH
Mr. Ademyi, Director, School of Hygiene

WHO (Lagos)
Dr. J. Golea
and other Professional Staff

SMALLPOX/MEASLES PROGRAM - NIGERIA

The Smallpox Eradication and Measles Control Program, a cooperative effort of the Nigerian and United Stated Governments, began in Fiscal Year 1967 and is scheduled to terminate in December 1971.

GOVERNMENT

The Federal Ministry of Health located in Lagos is responsible for planning and coordination of health services in Nigeria. It has specific responsibility for quarantine, disease reporting and contact with external agencies. It also provides consultative assistance to the individual states in nutrition, health education, epidemiology, statistics, training and laboratory service and financial assistance for vehicle maintenance and repair.

The twelve state ministries of health are administratively autonomous and are responsible for both curative and preventive health services. Curative services are based on a system of referral hospital with satellite hospitals, clinics, maternity centers and dispensaries. Financing of the maternity centers and dispensaries (therapeutic services) is in most areas the

responsibility of local government. The support of preventive services is also divided with state financing of statistics, medical field units, and mobile teams such as used in the Smallpox/Measles Program, and local government support of local health inspectors and vaccinators. Per capita health budgets vary from state to state with annual average per capita expenditure equivalent to 14-56 cents. Trained staff are limited with an overall doctor patient ratio of 1-50,000. Nigeria's three medical schools will soon graduate 200 doctors per year, and efforts are being directed at increasing the output of para-medical personnel.

POPULATION

Nigeria is the most populous and rapidly growing country in tropical Africa. A census made in 1962-63 showed a population of 55,654,000 distributed by state as follows:

State	Population	Square Miles	Population Per Mile
Benue Plateau State	4,009,408	41,744	96
East Central State	6,223,831	8,746	712
Kano State	5,774,831	16,630	347
Kwara State	2,399,365	28,672	83
Lagos State	1,443,567	1,381	1,042
Midwest State	2,535,839	14,922	162
North Central State	4,098,305	25,954	158
North Eastern State	7,793,444	103,639	75
North Western State	5,733,296	65,143	88
Rivers State	1,544,314	7,000	220
South Eastern State	4,626,317	13,730	336
Western State	9,489,523	29,100	315

Present day estimates range to 65,000,000 people and an annual rate of increase of 2.5 percent. The population is distributed unevenly geographically. The arrid northern states with some 80 percent of the land area, have only a little more than half the total population.

While the urban population is expanding faster than that of the country as a whole, the large majority of the total is rural, living largely in extended family groups.

The variety of customs, language, and backgrounds among the many tribal groups gives Nigeria an imposing cultural mix. About 43 percent of the people are pagans, 38 percent Moslem, and 19 percent Christian. The three major tribal groups are the Hausa-Fulani, Yoruba, and Ibo, which together comprise more than 60 percent of the total population. Most Nigerians are able to speak one language in addition to their native tongue, but the literacy rate is estimated at only 25 percent. English is the official and commercial language, but there are some 250 additional languages used by tribal groups. Program communication is carried out by wireless, telegram, letters and persoanl contact. Radio links between Federal and State Ministries of Health are available but not always functionable.

Nigeria's economy hinges primarily on agriculture, forestry, and animal husbandry. But recent oil findings and drilling activities suggest this to be an enormous resource for the future. In addition to oil production, other principal mineral

resources include tin, iron ore, coal, limestone, lead and zinc.

Largely self-sufficient in food production, the country exports large volumes of peanuts, cocoa, and palm produce. Other major exports include crude oil, cotton, rubber, timber, and animal hides.

In 1969, a large hydroelectric plant on the Niger River began operations with potential for a million kilowatts production and provision of electric power to even the most remote parts of Nigeria. It offers further support to industrial development which already includes cement factories, lumber mills, oil refineries, textile mills, and rubber processing facilities.

SMALLPOX/MEASLES PROGRAM

In 1962 the National Council of Health had established the eradication of smallpox as a health goal for Nigeria. The U.S. AID-assisted Smallpox/Measles Program of 1966 provided the opportunity for Nigeria to reach this goal through participation in a regional activity of West Africa and in the world-wide program of smallpox eradication sponsored by WHO. Salient features of the total program with its impact on the national health structure are given in the body of this report. Certain epidemiological aspects of smallpox eradication and measles control with additional bearing on future program and institutional development are attached. (Attachment 5 & 6)

Total costs of commodities and personnel in the Nigerian Smallpox/Measles Program are itemized below. These do not include certain types of support charges such as intercountry transfer of commodities, regional office expenses, and such headquarter (Atlanta) costs as epidemiology and laboratory personnel.

Item	FY 1967	1968	1969	1970	1971	TOTAL
Commodities	1,581,500	1,535,260	2,278,359	481,672	855,429	6,732,220
Personnel	243,000	270,000	387,411	500,901	500,000	1,901,30
	1,824,500	1,805,260	2,665,770	982,573	1355,429	8,633,53

Smallpox. The average attack rate of smallpox in the period 1916-1966, before initiation of this program, differed markedly from area to area. It ranged from less than one reported case per 100,000 population in the southern sections of the Eastern Region to 18 cases per 100,000 in the northern sections of the Northern Region. These rates, which grossly underestimate the true incidence of smallpox, do identify a continual smoldering form of transmission and provide an index of the loss of life that had resulted.

Smallpox vaccinations performed, since the inception of the Smallpox/Measles Program, together with population estimates are given as of June, 1970, in the table below. Although not available on a geographic basis, the total vaccinations through December, 1970, is 58,655,528.

State	Estimated population	Smallpox vaccination
Benue Plateau	4,753,000	2,630,896
East Central	7,218,000	3,191,864
Lagos	1,674,000	1,731,336
Midwestern	2,941,000	2,406,038
North Central	4,753,000	4,941,414
North Eastern	9,046,000	7,311,746
North Western	6,649,000	5,869,009
Kano	6,662,000	7,065,395
Kwara	2,783,000	2,558,563
Rivers	1,791,000	378,628
South Eastern	5,365,000	988,166
Western	11,003,000	15,358,807
Total	64,038,000	55,358,862

The goal of the attack phase of the Smallpox vaccination program was the successful vaccination of the total population. This goal has not been attained for the attack phase has not yet begun in certain areas of Rivers and South Eastern State. In many other areas throughout the country maintenance operations are only now beginning. It is estimated that routine activities with systematic vaccination coverage will not be accomplished on a country-wide basis within the projected future (December, 1971) of the program.

In areas where smallpox immunity is less than 80 percent, selective mass vaccination procedures are either in progress or planned. Although the current cholera pandemic has interrupted some activities, concurrent smallpox, measles, and cholera vaccinations are being given in some areas. To achieve 80 percent smallpox coverage, older susceptibles are sometimes included. Comprehensive assessment of smallpox vaccinations has been conducted in Western Nigeria and in areas of North West and North Central States. To date routine concurrent assessment has been incorporated into the activities of nine states, using cluster sample surveys.

Smallpox incidence is a far-more meaningful measure of the effect of a program than the number of vaccinations performed. Although it is too early to state categorically that eradication has been accomplished in Nigeria, the dramatic success of the program is indicated by the marked reduction of cases from a total of nearly 5,000 in 1966 to only 5 in 1970:

Reported cases of smallpox in Nigeria, 1966-1970, by four-week periods.

Period	1966	1967	1968	1969	1970
1	120	370	171	60	4
2	634	842	596	71	26
3	866	940	176	19	7
4	1,080	771	259	6	5
5	823	858	260	8	3
6	465	337	182	18	0
7	202	153	58	10	0
8	155	93	18	2	0
9	92	86	28	0	0

Period	1966	1967	1968	1969	1970
10	69	36	60	2	0
11	126	104	9	1	0
12	62	91	9	3	0
13	259	72	6	2	0
Total	4,953	4,753	1,832	202	5

No new cases of smallpox have been discovered since May 1970, and it is unlikely that the 20 or more generations of new cases that would have been necessary to maintain indigenous smallpox have occurred. The constant threat of reintroduction from outside sources, however, as for example by pilgrims returning from Mecca, pose a continuing threat and require effective preventive action on a continuing basis.

All cases suspected of being smallpox are promptly investigated epidemiologically and specimens collected for laboratory testing. Containment (concentric-ring) vaccinations are conducted around possible cases. Evaluation of surveillance activities have shown some weaknesses in case-finding and disease reporting. (For example, disease transmissions during the last smallpox outbreak in Kwara State smoldered over a 12-month period before it was detected in March 1970.) Six of the 12 states have prepared written evaluations of their surveillance systems. They indicate that nearly all weekly reports reach the Federal Ministry within two weeks after the end of the report week. Attention is now being directed to shorten the lag time and to further improve reporting from the field to state headquarters. All six states have completed evaluations and developed necessary plans to improve surveillance by providing a minimum of one reporting site for every 200,000 population.

Measles. Measles is a frequent cause of infant and childhood deaths in Nigeria. Case fatality ratios generally run 5-10 percent, but some epidemics have occurred with ratios as high as 30-50 percent. The reasons for this high mortality are complex but relate primarily to the young age at which measles occurs and to the undernutritional status of the child before and during the attack of measles. Some background and epidemiologic data pertinent to the control of measles in Nigeria are given in Appendix III.

The concept of large-scale measles control was introduced into Nigeria in 1966. Initial planning included an attack phase in which all children from six months to 4 years of age would be vaccinated. Pilot projects were conducted during early 1967 and the actual campaign began on a larger scale by July of that year. These activities were suspended in the three Eastern States with the start of the civil war but continued in all other states. Plans were to complete the attack phase within two years, and then to recycle vaccinations as time and facilities permitted. As will be discussed later, such an irregular recycling program might prove inadequate. Rather, to be effective, particularly in cities and larger towns, recycling would seem necessary on a regular basis, and perhaps twice or even three times per year. Mass vaccinations in densely populated urban areas would be expected to protect only a portion of susceptible children and control the disease only for a limited period of time.

In the review of operational procedures aimed at measles control, we find three basic deficiencies: 1, the validity of clinical diagnoses and the completeness of reporting, both of fatal and non-fatal cases, was not assessed; 2, adequate baseline data on the incidence of measles were not collected before the inauguration of vaccination programs. Last, periodic re-evaluat' of these matters of recognition and reporting of measles cases have not been performed, so as to assure sufficient quality control of the data. Hence, any meaningful measure of the effectiveness of the measles vaccination program becomes difficult indeed.

Yet, in the absence of our ability to quantify the extent to which vaccination may have reduced measles incidence on a country-wide basis, there are several indices suggestive of beneficial effects. For example, clinical impressions of pediatricians in medical centers indicate substantial declines in measles cases following mass vaccination procedures, with resurgence of cases only after the accumulation of new susceptibles. Subsequent crops of cases are indicated to be of younger age than those of pre-vaccination periods. Also, the numbers and age distributions of officially reported cases in some areas have followed these same trends.

The number of cases reported and the number of children vaccinated since the inception of the Smallpox/Measles Program are given below.

Reported measles cases and measles vaccinations, 1967-1970

	Measles	
Year	Cases	Vaccinations
1967	28,129	1,070,775
1968	59,062	3,288,844
1969	39,975	2,787,123
1970	38,824	1,333,153

These figures must be considered tentative, because of incomplete reporting in 1970.

Experience to date calls for a series of special studies under the conditions of operation that pertain in both urban and rural environments of Nigeria. These include reliability and validity testing of measles diagnoses, baseline determinations of measles incidence, and cohort analyses of specific individuals to measure vaccination effectiveness. Appropriate techniques and intervals for recycling vaccinations must be developed for the diversity of social and cultural conditions that pertain. Although the studies on quality of diagnoses and selected measures of incidence should have been conducted early in the program before vaccine usage, it is not too late to conduct them now. In fact, t seems essential to proceed, in order that adequate evaluation and quality control determinations can be made in the waning days of the program. Such observations would be helpful, too, for any multiple antigen, communicable disease, nutritional, educational, or broad maternal-child health progr 's that might evolve.

Impact

Second only to the dramatic effect on reducing smallpox incidence has been the success of the Smallpox/Measles Program in strengthening the basic organization and functional capacities

of the state ministries of health. All but the two smallest states, Rivers and Lagos, have established epidemiological units that either are functional or should become so by the end of 1971. The program has increased health awareness, improved public cooperation in other campaigns as those against yaws and tuberculosis, led to village leaders to solicit revaccination against measles, and to request funds that would control outbreaks of yellow fever and cholera. For a first time there has been contact between health authorities and each village and hamlet in the nation and the resulting impact has had a favorable educational as well as public health influence. Even in field investigations and clinical research, as for example in university settings, better response rates for the participating subjects have been attributed to health awareness stimulated by the Smallpox/Measles Program.

The Federal Ministry of Health believes that another value of the program has been in the improvement of laboratory diagnostic services in Lagos with the assistance of assigned laboratory personnel from the National Center for Disease Control.

Although 8 of the 12 States of Nigeria have developed health surveillance units and 7 of the 8 have recruited physicians, to head up the units. These organizational structures are too new to have much impact upon disease reporting and surveillance upon disease reporting and surveillance other than in connection with smallpox. A logical extension of their interests and activities will be into other communicable disease fields. There was general agreement that one of the major benefits from the program was in development and utilization of mobile health teams. The teams had demonstrated their ability to provide service and expose the need for more fixed health facilities to back them up. The next logical step in the use of the teams will be to generalize their services and extend their work beyond the Smallpox/Measles Program.

Epidemiologic units within six state ministries of health have developed effective reporting systems to provide monthly smallpox and measles cases and deaths, vaccination counts by age and sex groups, vaccine inventories by dates of expiration, and spare parts inventories. Also, annual summary reports on progress and future plans have been submitted. To achieve improved cooperation and peak additional interest in epidemiologic activities, the Federal Ministry of Health has compiled, collated, and redistributed state summaries to the contributing participants as well as to neighboring countries, regional organizations, WHO, and other interested parties.

Local competence has been developed in the investigation of outbreaks and their control through inservice training. The federal and state ministries have learned the importance of laboratory backup and are strengthening their facilities and personnel toward this end.

The status of the measles program, highly successful in a social and political sense, as attested to by AID mission staff, cannot now be adequately evaluated in terms of morbidity and mortality figures. Plans are being developed to study problems of diagnosis, disease reporting, vaccine effectiveness under prevailing conditions of usage, and of recycling requirements in populations of varied densities and personal interaction patterns.

Since the Smallpox/Measles Program started in 1966, over 2,000 Nigerians have received formal training varying from 2 weeks for vaccination team leaders to 3 days for vaccinators. Approximately 800 of these men are still active in the program. A total of 34 Nigerians underwent comprehensive training in epidemiologic investigation, communicable disease surveillanc and disease control at the NCDC in Atlanta.

The program has demonstrated the need to collect meaningful data on vital events, particularly birth and death statistics. The initiation of pilot vital statistics and disease surveillance activities in two states (Midwest and North Central) have been approved by the Federal Ministry which has also agreed to provide funds for local support of these activities. Implementatio hopefully, will begin in both states by summer 1971. Initial activities will be limited to specific demographic and disease information. Later, as methodology develops, additional data will be collected to identify and quantify major health problems. It is anticipated that such an intelligence network will lead to establishment of health priorities, to iniation of action programs, and identification of areas requiring more intensive investigation. The system, with its static and mobile personnel, will permit testing health delivery programs.

OBSERVATIONS AND INTERPRETATION

There is general agreement among individuals interviewed as to the major health problems of Nigeria. Authorities interviewed as to the problems included members of the federal and state ministries of health, mission staff of AID, faculty of the medical schools, and representatives of such foundations as Ford and Rockefeller. Although there is lack of unanimity on the rank order of importance of Nigeria's health problems, there is a general consensus (excepting federal officials) of incompetency in the Federal Ministry of Health. Part of this can be attributed to the lack of skilled and knowledgeable personnel and part to weak leadership. But, the uncertainty of the mission of the Federal Ministry and of its working relationship to the states as a result of constitutional changes is also an importan factor. The Nigeria Constitution puts major emphasis on the autonomy of the States and on the importance of State responsibilities in the field of health. As a consequence a weak national Ministry of Health has failed to define its own role and its relationship to the States. The medical school faculties in all three schools (Lagos, Ibadan, and Zaria) all spoke of the lack of an adequate National Health Plan. In the federal ministry, there is little understanding of the health needs, little concept of a plan for organization and provision of services andlittle sense of priorities. The national ministry puts major emphasis on the development of new treatment facilities but at the same time fails to provide training of staff to man these facilities. And as a consequence, there are medical facilities completed and others nearing completion without trained professionals to operate them. Faculty staff members were particularly critical of the absence of any concept of rural health services. We found for instance a much better concept for the organization of rural health services in several States in the North and West than in the Federal Ministry.

Another major problem in the Ministries of Health, both State and Federal, is the lack of administrative skill. The use of good public administrative practices is not incorporated

into health organizations. There are few individuals with special training in the field of public administration employed in health, but rather administrative people seem to have come from political sources.

The two medical schools at Lagos and Ibadan are providing a relatively sophisticated level of professional training for their students, but the goal is to turn out graduates who are clinical specialists or competent in Research. As a consequence, the graduates of these schools do not practice in rural communities. On the other hand, the medical school at Zaria, the newest of the three, has been developed with the goal of training rural health practitioners. This school's potential is discussed in some detail later in the report.

There are scattered schools for training non-professional health workers, the so-called health assistants, dispensary attendants, etc. But the emphasis in their training is almost entirely on therapy. There needs to be a major curriculum revision if these personnel are going to be used effectively in preventive health programs.

All training facilities except the two larger medical schools appear to be handicapped by lack of space and absence of laboratories, equipment, and communicat on resources. There is a serious need for field demonstration centers where the academic community can relate to governmental practice of community health.

Individuals in the private foundations believe that the absence of a good health information system is the major health problem of Nigeria.

Less than two percent of births are registered, and probably only slightly more deaths although registration in both instances is required. A good example of the problem is illustrated in Lagos where the mother is responsible for registering the birth of her baby at the Lagos City Department of Health. She must personally go from her home to the central office of the Ministry to get the necessary forms and having completed them make another trip to return them.

This posed a problem for the mother of five children who we interviewed in a maternity clinic. She lived at least 5 miles from the registry office, had no means of transportation, no one to care for her children while she was away from home and no one to take her place where she worked if she decided to register the birth of her infant.

Nigeria with its rapidly increasing population may shortly be faced with a population crisis. The growth rate is estimated at 2.6 percent. Even with a 50 percent loss of all children born by the age of 5 years, and with an increasing industrial productivity, the country will not be able to feed the increasing numbers of children unless there is unexpected improvement in agricultural productivity. There is no national population policy at the moment although the Federal Government appears to be giving consideration to the development of such a policy. Representatives of the Ford Foundation believe that the only route to the development of any form of population planning is by attack upon the problem of infant mortality and by educating national leaders to what others are doing in the population field.

Among the facilities lacking for good health services in Nigeria, the absence of laboratories for diagnostic confirmation at the State level is important. There are reasonably good diagnostic facilities in the major population centers such as

Lagos and Ibadan. But the problems of communication and transportat on make it difficult to get specimens to the laboratories or reports back to the originating source of the specimens in a reasonable time.

A number of suggestions for specific ways in which to attack these problems are discussed in a later section of this report.

As indicated previously, one of the bright spots of the evaluation in the Anglo-phone countries was the School of Medicine at Ahmadu Bello University in Zaria. This school has developed a concept of community service emphasizing multidisciplinary training to meet the needs of Nigeria. This is contrary to the objectives of the other National Medical Schools at Lagos and Ibadan, which are designed to train clinical specialists and research workers, not "bush doctors". It is the intent of the Zaria Medical School to train physicians in the environment where they are going to work, consequently most of the student recruitment is from the six northern states of Nigeria. The curriculum emphasized an understanding of the environment in which the physician works and exposes the student to community service within this geographic area. His role as a member of health team is stressed by multidisciplinary or team training in the field. There is no intent to slight the basic sciences, compromise clinical skills, or suppress research endeavors but these aspects of medical training are sub-ordinate to community medicine.

The Institute of Health of the Amadu Bellu University under the direction of Professor Shehu was organized in 1968. Its primary functions are to provide courses of instruction in the medical and health disciplines; to operate the Ahmadu Bello University hospital and related clinics, dispensaries and other health servies; to provide facilities for the training of doctors, medical students, nurses, sanitary inspectors and other personnel in the health and medical fields; to provide for and conduct research in matters pertaining to medicine and community health; to assist in the promotion of health services in the northern states of Nigeria, and to assist in the teaching functions of the University of both graduate and undergraduate levels. At the present time, the Institute has responsibility for a total of 950 beds in more than a dozen hospitals in Kaduna, Zaria, Kano and Malumfashi.

Currently the Institute plans to train intermediate personnel, i.e. health workers who function somewhere between the physician and the health or dispensary assistant. These new personnel will be in the health structure. The HPO may be equated with nurses, both in their prerequisite and early formal training. Their last year of clinical training, however, will be spent in the field, the rural setting where they will be employed.

The Institute also operates a training school for medical auxiliaries at Kaduna and the School of Hygiene at Kano for sanitary workers.

A further description of the Institute of Health, its programs and its responsibilities is provided in Attachment 7.

At the present time, the director of the Institute is assisted by Dr. Schram, a Canadian, and a newly arrived Indian physician whose name we did not obtain, both assigned by WHO, and by a number of Nigerian physicians. We were highly impressed by the imagination and motivation of this staff with

whom we spent a half day. Their concept of rural medical services is realistic. By and large, they have the necessary facilities in which to train and have the authority to develop training programs. The problem lies in sufficient staff and in operating support for programs which they hope to develop in conjunction with the state governments of Northern Nigeria.

Outstanding in its concept of health services is the Ministry of Health in North Western State at the capital city of Sokoto where A. I. T. Galadima is Commissioner of Health. Mr. Galadima held a number of Ministerial positions in the Federal cabinet prior to the 1967 coup and is obviously a highly skilled and well-motivated administrator.

Also impressive is Tanko Kuta, the Permanent Secretary of Health in the Ministry. These two men have a plan for the development of rural services in the North Western State which follows very closely that outlined by the Institute of Health at Zaria. They conceive of a system of rural health dispensaries providing preventive as well as theraputic services for population units of 30 to 40 thousand. They would be staffed by dispensary assistants (medical auxillaries). The next echelon of facility would be a rural health post, staffed by the health post officers previously mentioned. Each rural health post would service a group of dispensaries, and groups of health posts would be serviced by a major hospital with medical staff. Four such hospitals are envisioned by the State. The system of staffing provides a commendable promotion system based on experience, competence, and further training, so that suitably qualified individuals at every personnel level could look forward to upward progression. The State feels it can fund the facility development program, but need provisional consultation and assistance in training particularly. It is likely that the Ministry of Health, North Western State, and the Institute could jointly develop model field stations for both training and service, and a training program that would establish a pattern for rural health services in Nigeria.

PROGRAM TERMINATION

If the program terminates on schedule, the effects will differ in several states. Principal problems from abrupt termination in Decembwr, 1971, would relate to the lack of fully trained counterparts for the U. S. AID operations officers and the lack of nationals competent in the maintenance and repair of trucks and jet vaccination equipment.

The Federal Ministry has budgeted for the purchase of vaccine in the current 5-year plan, but it is doubtful if even utilization of the full appropriation would provide all the vaccine necessary. Probably much vaccine would have to be purchased outside of the country since the national production laboratory is beset with problems of poor leadership, unmet production schedules and a product below WHO standards.

Some believe with the termination of AID assistance, the program will undoubtedly be continued but at a much lower level of efficiency and competence. Questions were raised concerning the effect or perhaps the political problem created by the inability to meet anticipated demands for service which have been stimulated by the present successful program. Some are worried that the concept of prevention will be discredited and the preventive medicine program lost to apathy and frustration.

The present mobile teams are considered good to excellent in their capacity to vaccinate but lacking in keeping up with the maintenance phase of the program and poor in terms of surveillance and epidemiologic investigation of suspected cases. As in other countries, cholera is having a profound effect on the productivity of the mobile teams. Many have been diverted from smallpox/measles activities in order to give cholera vaccinations and others have been used for general educational purposes in the cholera programs. As a result, the national measles maintenance program is thoroughly disrupted and s me areas of the country will very likely experience measles epidemics as a result of accumulated susceptibles in the population.

Many areas in the eastern states are just now undergoing attack phase operations and it will be many months before any systematic maintenance vaccinations begin. These areas offer special opportunities for field investigations that would measure the effect of measles immunizations and determine the frequency with which mass recycling is required to effect measles control. Continuation of AID support in these areas would seem especially appropriate through June, 1973.

SUMMARY

Approximately 75 percent of the Nigerian population has been vaccinated against smallpox and nearly 10 million measles immunizations have been given. The dramatic success of the smallpox program is indicated by the marked reduction of reported cases from nearly 5,000 in 1966 to only 64 in 1970. No new cases of smallpox have been uncovered since an outbreak in Amayo Village, Kwara State, that terminated in May, 1970. Transmission of infection would seem to have been interrupted although continued surveillance is required to detect any reintroduction by nomadic herdsmen and travelers. The effect of the measles program, highly successful in a social and political sense, is not so easily quantified, however. Inadequate baseline and follow-up data on measles incidence call for their collection and analysis now, that the best possible maintneance scheme for immunization can be devised. Such observations on disease incidence will assist in the development of multiple antigen and other communicable disease programs and in the utilization and strengthening of mobile health teams.

Termination of AID support to the Smallpox/Measles Program as scheduled in December of 1971 would reduce substantially the effectiveness and efficiency of activities. Although the mobile team is an accepted concept in the Nigerian preventive medical program, teams are not yet competent in establishing maintenance immunizations, conducting surveillance and outbreak investigations, or broadening their activities into multiple antigen programs. Also, areas in the eastern states, just now in the attack phase of immunizations, would suffer from premature termination of AID assistance. Moreover, those latter areas offer opportunity to obtain badly needed information on the required frequency of mass measles immunization to effect adequate control. Such information would have world-wide utility.

The absence of any effective rural health delivery systems and of any adequate public administrative practices in most ministries of health, both federal and state poses serious problems. Opportunities to assist with the development of

rural health services and of better administrative practices present themselves through the Institute of Health and Administration, Ahmadu Bello University, and the Ministries of Health, North Western and North Eastern States.

In like manner, there is special need for developing improved maternal-child health programs with emphasis on communicable disease control, nutritional improvement, and family planning practices. Staff of the University College Hospital, University of Ibadan, seem especially able and motivated to pursue the development of effective programs here.

One final deficiency in the health structure of Nigeria is the totally inadequate health information system. Natality, morbidity, and mortality data are inaccurate and inadequate. Disease surveillance and health accounting systems need study and strengthening. Assistance toward this end might appropriately be explored through the College of Medicine, University of Lagos.

RECOMMENDATIONS

It is recommended:

1. Support of the Smallpox/Measles Program be extended through June 30, 1973, under the following conditions:

   a. Written notice to the Nigerian Ministry of Health that they are solely responsible for support and operation of the Smallpox/Measles Program after that date.
   b. Extension of support for 18 months beyond the previously scheduled termination (12/31/71) is dependent upon a written plan for operation of the program after June 30, 1973.
   c. Activities of the mobile vaccination teams will be broadened in the development of a multiple antigen program to immunize children
      (1) routinely against smallpox, measles, pertussis, tetanus, tuberculosis and poliomyelitis
      (2) selectively against yellow fever, cholera, diphtheria, typhoid, rubella and other diseases as pertinent to the circumstances
   d. Purchase of commodities (transport vehicles and ped-o-jet injectors) and vaccines effective after previously scheduled program termination (12/31/71) to be accomplished by a matched funding procedure (U.S. and Nigeria) that would allow the Ministry of Health to purchase transport vehicles best suited for mobile vaccination team usage.
   e. Participation of NCDE smallpox/measles personnel as follows:
      (1) Phase I, January 1972-June 1972:
         (a) three medical officers (one each stationed in Lagos, Kaduna, and Benin);
         (b) one administrative officer (stationed in Lagos); and
         (c) six operations officers (one each to function in the combined States of

S.E., Rivers, and East-Central; Kano, N.E. and Benue-Plateau; and North-Western and North-Central.

This recommendation hopefully will permit completion of the attack phase of the smallpox program in all areas; development of a maintenance scheme for multiple antigen utilization programs in both mobile and static facilities; completion of the training of Nigerian operations officers with emphasis on shifting responsibility to them from their NCDC counterparts; establishment of appropriate measles vaccine recycling to control that disease in both urban and rural environments; development of a satisfactory transportat on scheme with provision for vehicle maintenance.

2. Exploration by AID for support of special training programs through Ahmadu Bello University at Zaria. These would include:
   a. didactic and field training of professional and auxillary personnel for rural health programs and establishment and operation of model field training units cooperatively with North Western State.

   b. didactic and practical training for the development of mid- and senior level health administrators.

Exploration of opportunities for rural health development might appropriately involve Dr. U. Shehu, Director, Institute of Health, A.B. University; and Mr. A.I.T. Galadima, Commissioner of Health, North Western State (Sokoto). Exploration for training health administrators m ght involve staff of the Institute of Health and the Institute of Administration, Ahmadu Bello University. Both programs would require the collection of extensive background information, and of pilot programs before full-scale operations ensue.

3. Exploration by A.I.D. for support of a demonstration maternal-child health program through University College Hospital at Ibadan that would include the following elements: communicable disease control, nutritional improvement, child-spacing and family planning information, maternal education, and the sum of proper health care from conception to school age.

   Such a program might appropriately involve Dr. A. O. Lucas, Professor of Social and Community Medicine, U. C. Hospital.

4. Exploration by A.I.D. for support of vital statistics, disease surveillance, and demographic programs through the College of Medicine, the University of Lagos. These would include the development of capabilities to quantify natality, morbidity, and mortality data; to collect demographic and disease surveillance information; and to conduct cost analyses and cost benefit ratios for remedial and preventive health regimens.

Exploration of opportunities m ght here appropriately involve Drs. Adenyu-Jones, Chairman, Department of Community Health, and O. A. Ransome-Kuti, Chairman, Department of Pediatrics College of Medicine.

SIERRA LEONE

Persons Visited

Freetown
U.S. Embassy

Mr. Donald Petterson, Consular Officer, U.S. Embassy
Mr. Robert Miner, U.S. Ambassador, Sierra Leone

Federal Ministry of Health

Dr. Evelyn Cummings, Ch. Med., Ministry of Health, Sierra Leone
Dr. Marcella Davies, Deputy Chairman Med., Ministry of Health, Sierra Leone
Mr. O. O. Findllay - Perm. Secretary, M.O.H., Sierra Leone

Smallpox/Measles Program

Dr. Dean L. Hutchins - M. O. A.I.D., Smallpox/Measles Program
Mr. James N. Thornton, Operations Officer, Smallpox/Measles Program

Others

Dr. E. M. Poulton, WHO Rep., Sierra Leone
Dr. P. Binder, WHO, MCH, Medical Officer
Dr. Larry Harding, Dir. Central Stat. Office, Sierra Leone
Mr. Benjamin, Demographer, Central Stat. Off., Sierra Leone
Dr. Hans Koek, Peace Corps., Physician, Freetown

BO

Mr. Alfred Kargbo-Reffel, S.L. counterpart, AID Smallpox/Measles Program, Operations Officer
Dr. M. A. Browne, Prin., Medical Health, Bo District
Miss Elizabeth Wright, Peace Corps Nurse BO

Places Visited

Freetown	U.S. Embassy
	M.O.H. Sierra Leone
	WHO office for S.L.
	Central Stat. Office S.L.
	A.I.D. Smallpox/Measles Office
	Peace Corps
Part Loko	District Hospital
	Rural Health Center
BO	Regional Health Center

GOVERNMENT

The country is divided into three provinces and one area and each province in turn is divided into regions. The local government in regions is by chiefdoms, with 146 such tribal units, each under a paramount chief. The federal government is responsible for the provision of most services, including health, with the Minister of Health a member of the Prime Minister's cabinet. As in other West African countries the Ministry of Health is responsible for both therapeutic and preventive services. A large proportion of the fixed medical facilities (30 hospitals, 65 Health Centers and 44 treatment centers) are in Freetown, the capital city. More than 40 percent of the chiefdoms have no fixed medical facility.

POPULATION

The population is basically rural, with more than 50 percent living in villages of less than 500, many of which are not accessible by road. Tribalism is strong, with paganism predominant in the interior. Only 12 percent of the population is literate in any language. Per capita income is estimated at less than $150.00 per year. Geographic and climatic conditions (heavy rainfall), inaccessibility and scattering of villages, poor roads, multiple dialects and numerous chiefdoms with strong tribalism and an inadequate system of medical facilities have, as in Liberia, handicapped the Smallpox/Measles Program.

SMALLPOX/MEASLES PROGRAM

However, the program was initiated earlier here and has progressed more rapidly than in Liberia. As of December 31, 1970, approximately 2,237,000 smallpox vaccinations and 440,000 measles immunizations had been performed. It is estimated approximately 85 percent of the population was immunized against smallpox during the action phase of the program which was completed in January, 1970. Recycling is planned on a 6 month basis for urban Freetown, a 12 month cycle for villages over 5,000 population and an 18 month cycle for the remaining area. This plan has been disrupted by the diversion of a major proportion of the vaccination effort to cholera.

Extensive assessments based on probability samples of 5 percent of the population, in all areas of the country, have been an integral part of the program during the attack phase. With the advent of cholera, assessment activities have been discontinued. Further details of the operational methods of the program are available in the 1971 Fiscal Year Plan of Operations for Sierra Leone (Smallpox/Measles Program)

Two C.D.C. staff members and 195 nationals have been involved in the Smallpox/Measles Program. Many of the nationals have been recruited from their home areas to facilitate their familiarity with terrain and population. More than 150 nationals have been especially trained in immunization procedures, 12 in health educat on and six in assessment procedures. Six supervisors have been trained at the National Communicable Disease Center in Atlanta, including one of the most competent Operations Officers, Counterpart encountered in the four

Anglophone countries.

Sierra Leone has also experienced a long delay in delivery of commodities and has the same general complaints concerning Dodge transports as in other countries

Cost of the program in Sierra Leone to date is estimated at $469,000 for commodities and $270,000 for personnel, or a total of $739,000. This is exclusive of regional and C.D.C. (Atlanta) administrative cost and inter-country transfer of commodities.

SMALLPOX

Best estimates indicate that approximately 85 percent of the population has been vaccinated against smallpox since January 1968. Prior to that time Sierra Leone had one of the highest reported case rates in West Africa, and probably in the world. Major epidemics have occurred at 10 year intervals since 1936-37, the last in 1967 with 1,697 cases reported. This had been preceded by a major vaccination campaign, but with an effectiveness estimated at only 50 percent.

In 1968, 1,143 cases were reported, this dropped dramatically to 80 cases in 1969 (the last in April of that year) with the adoption of the so-called "ring" or vaccination containment technique around focal cases. No further cases have been reported in 1969 or 1970, a period of 23 months of freedom from smallpox. One case of monkeypox was reported in December, 1970.

MEASLES

The measles situation in Sierra Leone is difficult to interpret. Although measles was not officially made a reportable disease until late 1970, some cases have been reported annually since at least 1967. Undoubtedly, all children who live long enough, eventually get measles. With the advent of the campaign in the urban and more accessible rural areas, measles appears to be occurring at a somewhat reduced rate and in a younger age group than previously. But the data are incomplete; there is no adequate pre-vaccination case rate and questions of reliability of diagnosis exist. The recycling campaign has been delayed by the diversion of teams to the cholera vaccination program: A longer experience with measles vaccination is necessary before any satisfactory conclusions can be drawn.

IMPACT

There are several evidences of the impact of the Smallpox/Measles Program on the national health services. A surveillance unit has been established under the direction of a physician, a number of non-medical disease investigators have been trained, and with medical back-up have investigated suspected cases of smallpox. The surveillance unit has also been involved with the cholera epidemic with back-up from the C.D.C. physician assigned to Sierra Leone. Previous mention has been made of the personnel trained in communicable disease control techniques.

The mobile smallpox/measles vaccination teams have been incorporated into the permanent structure of the Ministry of Health to complement the permanent facilities. Their involvement

in the cholera situation has been previously noted; they have been used in other emergency situations in rural areas, and are used for communication, delivery of drugs, visitations to new-born infants and provision of therapeutic clinics at remote rural villages. In this sense they have acted as rural health assistants, providing the first preventive services received from government to some of the chiefdoms.

C.D.C. staff are frequently consulted by the Ministry on health programs and are currently assisting in developing the national health plan for the next ten years.

There is concensus in both the U.S. Embassy and the National Ministry of Health on the important political effect of the Smallpox/Measles Program. The Ambassador commented that the program had directly and favorably affected more people than any other AID program and had been an important vehicle for disseminating information about the United States. There was also agreement on the points noted in other countries that the program provided the first preventive health services that many of the population had ever received from government, and was an important factor in health education. It was believed to have created a demand for the cholera vaccination program, but in that sense may have a negative value in creating false confidence in a questionable vaccination program, rather than emphasizing a program of health education in personal hygiene, general sanitation and epidemiologic management. It has also popularized jet gun vaccination as opposed to other techniques another situation which could backfire in the future.

OBSERVATIONS AND INTERPRETATIONS

The National Health Service appears to have competent medical personnel, but they are limited in number. They, too, are over-burdened, handicapped by lack of assisting personnel in the rural areas, insufficient funds, inadequate information for planning and deficiencies in training programs. WHO is supporting a maternal and child health demonstration program in Freetown, but the practicality for large scale application is questionable because of the dependence on a relatively large professional staff.

High on the list of national health priorities is the development of an effective rural health system. The use of mobile teams is an important contribution but the development of fixed facilities, the definition of the respective roles of mobile and static personnel, the provision of preventive services and the recruitment and training of personnel are all necessary. Equally fundamental is some reliable knowledge of what the health problems are. There is hope for better demographic data as a result of a recent grant to the Central Statistics Office from the Population Council for development of a demographic data system based on sample surveys.

As in Liberia, there is great interest in tuberculosis control program, but the Sierra Leonneans appear to have a better understanding of the problem and an appropriate plan of action. A WHO survey in 1957 estimated 75,000 open cases and there has been no organized control program in the interim. Although there are no data to substantiate it, the current estimate is of 100,000 infectious cases. Program proposals include case finding by epidemiologic investigation around index cases, not currently being done; case finding by skin testing and

x-ray follow-up of key groups such as urban adolescents, police, military, teachers and industrial workers: ambulatory treatment clinics; and BCG vaccinations as part of a multiple-antigen program. This does not include consideration of environmental problems such as housing or of nutrition, health education, and laboratory diagnostic facilities. The opinion was expressed that such a program had an advantage demonstrated in the Smallpox/Measles Program, that is, the extensive use of specially trained non-medical personnel.

Communicable disease control is a major missing element in child health programs. The MOH expressed interest in a multiple-antigen program, including BOG, measles, smallpox, and tetanus primarily. However, such a program would not influence a major cause of infant morbidity and mortality - the diarrheal diseases.

The principal medical advisor in the MOH advanced the suggestion that WHO and AID ought to put more emphasis on regional programs (i.e. multi-country), reasoning that problems are frequently international in character, that smallpox/measles has effectively illustrated the wisdom of this approach, and that regional training centers can be better staffed and provide better programs than national centers. Training of physicians for rural areas, non-medical administrators, and rural health assistants was particularly mentioned. (Interestingly, the 1969 statistical report of the MOH (Vital Statistics Services 1970 #2) indicates that 40 percent of all extra - national training of health personnel, principally physicians, is being done in the U.S.S.R.)

Family planning per se is of little interest to the Leoneans, at least until infant mortality is reduced.

As in other countries the presence of cholera has disrupted the Smallpox/Measles Program. Its effect will probably be less serious than in Liberia, for the Smallpox/Measles Program is more advanced, and there are more resources. However, attainment of objectives in the operational plan Fiscal Year 1971 appears dubious. Particularly unfortunate will be the delay in the transfer of C.D.C. operational responsibilities for the Smallpox/Measles Program to the Ministry staff.

PROGRAM TERMINATION

Within the Ministry there is a difference of opinion on the effect of eliminating U.S.A.I.D. support for the Smallpox/Measles Program, effective December 31, 1971. Some administrators feel the program would collapse; operating personnel, believe that with some additional administrative training they could carry on the program if the transportation problem in rural areas can be colved. Use of the national transportation system (buses, lorries, etc.) rather than special trucks has been suggested, but not yet tried. Use of ped-o-jets would probably be abandoned ultimately in favor of other forms of faccination because of inability in maintenance of the jets. An effective measles immunization program in much of rural Sierra Leone awaits the development of an adequate portable cold box which can be carried by one person. The recently initiated surveillance unit would be weakened. No mention was made of any problem in purchase of vaccines, probably in the hope UNICEF or WHO would assist. The bright hope for the future of a program in Sierra Leone

is the already accomplished incorporation of the mobile teams into the permanent structure of the Ministry and the presence of a very knowledgeable Leonean operations officer.

SUMMARY

The Smallpox/Measles Program in Sierra Leone has effectively vaccinated the population for smallpox, with nearly 2,100,000 vaccinations during the attack phase. Substantial progress in the maintenance program was being made until the cholera emergency intervened. Only recently have teams returned to smallpox/measles vaccinations. No smallpox has been reported since April 1969. Although over 400,000 measles immunizations have been give to the 6 month to 5 year age group, a tangible effect of the program cannot be documented.

The smallpox program has been politically and epidemiologic a success, and has augmented the national health services by establishing a surveillance unit in the Ministry and by incorporating mobile teams in infra-structure of health.

The health problems of Sierra Leone are those of the other West African countries. Particular interest was expressed in TBC control, multiple-antigen programs and regional training centers.

Termination of the Smallpox/Measles Program as scheduled, December 31, 1971, will not be as disruptive as in Liberia, but will undoubtedly reduce its efficiency and effectiveness. Much will depend on the ability to devise an effective transportation system in the rural areas when trucks are no longer available, and an ability to complete the training of administrative personnel of the Ministry in program administration while the cholera emergency persists.

RECOMMENDATIONS

It is recommended:

1. Support of the Smallpox/Measles Program be extended to June 30, 1972, under conditions similar to those stated for Liberia;

2. M.O.H. participation in a special training program for ancillary medical personnel, laboratory technicians, rural sanitarians and such other public health personnel as are appropriate to the country be explored by A.I.D.

3. The feasibility of an intensive and extended tuberculosis control program be jointly explored by the national M.O.H. and A.I.D.

   Although we are not aware of any previous consideration of the tuberculosis problem, we believe it persists, national interest is high, and there is sufficient possibility of accomplishment to merit further exploration of assistance. Tuberculosis Control is a major problem in all West Africa. A pilot national program could conceivably be highly significant for other countries.

4. Exploration by A.I.D. of M.O.H. participation in such

other regional health programs as may be considered for the Anglophone countries.

LS No. 21760-A
C/R-1V
French

ORGANIZATION FOR COORDINATION AND
COOPERATION IN THE CONTROL OF
MAJOR ENDEMIC DISEASES
[French abbreviation: OCCGE]
General Secretariat

No. 504/SG

Bobo-Dioulasso, February 26. 1971

From:
Dr. Cheick SOW
Secretary General of the OCCGE

To:
Mr. F. G. Masson
Agency for International Development
US/AID WASHINGTON DC 20523
on mission to BOBO-DIOULASSO

Subject: Obtaining for the Secretary General of the OCCGE and American physician (epidemiologist) to serve in the MURAZ Center at BOBO-DIOULASSO

Dear Sir:

In the course of our meeting held February 25, 1971, I had the honor of giving you the estimate covering the activities of the American physician (epidemiologist) who is expected at Bobo-Dioulasso within the framework of the program of cooperation between the OCCGE and the Atlanta Center for Communicable Diseases.

The total cost of this project for a period of three years has been estimated at $68,000, spread over 1971, 1972, and 1973.

To supplement the protocol attached to the above-mentioned estimate, and particularly with regard to Article/2 of that document, I submit to you the clarifications requested:

PRINCIPAL ACTIVITIES OF THE AMERICAN PHYSICIAN (EPIDEMIOLOGIST)
OR OF THE AMERICAN MEDICAL TEAM

1. Participation in therapeutic tests in connection with the control of onchocercosis, in cooperation with the Parisitology Section of the Muraz Center.
2. Participation in experiments with Spinal Meningitis vaccine (especially the American vaccine) in cooperation with the specialized Section of the Muraz Center.
3. Participation in experiments on new insecticide formula in connection with the control of malaria, onchocercosis, yellow fever, and trypanosomiasis vectors, in cooperation with the specialized Section of the Entomological Department of the Muraz Center.
4. Epidemiological studies of measles and of possible smallpox foci.
5. Participation in the training of national middle-level technicians at the Muraz Center School for Laboratory Technicians planned for 1973.

We are awaiting any proposal by US/AID concerning the protocol of agreement, the attached estimate, and the above plan of activities, and will place any such proposal promptly before the OCCGE Executive Board for its consideration.

In the hope that this additional information will enable you to complete your files in the meantime, I am

Sincerely yours,

[Signature]

Dr. Cheick SOW
Secretary General of OCCGE

RECOMMANDATION DE LA XIème CONFERENCE TECHNIQUE

POBO-DIOULASSO (24-27 mars 1971)

OBJET. - Continuation de l'Assistance de l'A.I.D. des USA à l'OCCGE en matière de lutte contre la Rougecle et la Variole

---

Les Participants a la XIeme Conférence Technique de l'OCCGE réunis a Bobo-Dioulasso le 26 mars 1971 sous la Présidence effective de Monsier le Ministre de la Santé Publique et des Affaires Sociales de la République du Dahomey, President en exercice de l'OCCGE;

Vu les recommandations de la Conference Rougeole-Variole de Lagos de mai 1969 placée sous l'égide de l'OMS et de l'US/AID;

Vu les dispositions arrêtees par le Comité Regional de l'OMS dans sa session d'Abidjan en octobre 1969 sur la phase de surveillance des campagnes variole dans les Etats Africains assistés par l'US/AID;

CONSTATANT les exceptionnels resultats enregistres dans les campagnes d'immunisation centre la Variole, grace a l'assistance de l'AID des USA au sein des Etats membres de l'OCCGE, resultats d'une qualite telle qu'ils permettent d'approcher l'éradication de la variole;

CONSTATANT que les résultats actuellement enregistrés dans la plupart des Etats membres de l'OCCGE dans la lutte centre la Rougeole par les campagnes de vaccination sont finalement dans l'ensemble bien meilleurs que ceux espérés ces dernieres années comme le fera ressortir le Rapport final de la présente Conférence;

PERSUADES que ces remarquables resultats seraient fortement compromis si un relais n'intervenait pas au terme du Protocole d'accord US/AID-OCCGE en fin 1971 pour permettre la poursuite des campagnes vaccinales de masse;

DECIDENT

ARTICLE Ier. - De renouveler leur profonde gratitude a l'US/AID pour son soutien efficace, incomparable dans les campagnes de masse Rougeole - Variole menees depuis 1966 dans les Etats membres de l'OCCGE.

ARTICLE 2.- De solliciter de l'US/AID une assistance complémentaire sous la forme la plus appropriee pour parvenir le plus rapidement possible a l'éradication deja certainement proche de la Variole et consolider les résultats reconfortants apportes par les Representants des Etats membres à la presente XIème Conference Technique de l'OCCGE en ce qui concerne le controle de la Rougeole.

ARTICLE 3.- De donner mandat au President en exercice de l'OCCGE en rapport avec son Secretariat General pour maintenir les contacts avec l'US/AID et obtenir d'elle l'assistance complementaire si vivement souhaitee par la totalite des Gouvernements et des populations des huit Etats africains membres.

Delibère et Decide a Bobo-Dioulasso

le 26 mars 1971

Le Président du Conseil d'Administration

de l'O.C.C.G.E.

A. OUASSA

Attachment 3

LS No. 21760-C
Mauritania

1970

FOURTH QUARTERLY REPORT
SMALLPOX ERADICATION, MEASLES AND BCG VACCINATIONS

I. Purposes)
II. Zone of Operation) no change
III. Methods)
IV. Epidemiological Situation

No actual or suspected smallpox cases have been reported.

During nineteen-seventy, 2,389 cases of measles were reported. A drop in the total number of measles cases is observed as compared to the preceding years (10,860 in 1968 and 2,557 in 1969). There has also been a drop in the number of cases recorded per month, except for an epidemic reported at Sélibaby, in June 1970, in the Third Region.
(Annex I)

V. Achievements

During 1970, work on the Project has been done by the mobile teams which had been created in the first six regions (Nema, Aioun, Kiffa, Kaedi, Boghe, and Rosso) and by the evaluation team in Nouakchott.

Activities began with a vaccination campaign in the two eastern regions (Eastern Hodh and Western Hodh) which took place between January 15 and March 10 of this year. After this campaign, there was a slowdown period marked by a drop in the number of vaccinations given during the second and third quarters, by interruptions in the activity of the teams, and by unjustified delays in sending reports to project [headquarters].

Beginning with the arrival of the project chief and the WHO expert, all the teams have been visited and on-site evaluations carried out in the first, second, fourth, and sixth regions. On those visits the work done by the teams was examined, with emphasis on the methods used and the continuity of the activity.

During December, the Nouakchott vaccination campaign was resumed. Thus, better results were obtained during the fourth quarter (Annex II).

At the end of the year, the cumulative total of vaccinations administered was:

627,238 smallpox vaccinations

177,613 B.C.G. vaccinations

96,367 measles vaccinations.

The situation with respect to the smallpox vaccinations administered up to now and the estimated coverage by region are illustrated in Annex III. It shows that the estimated coverage of the population by smallpox vaccination is 54.6% of the total population of the country (627,238 vaccinations out of a total of 1,150,000 inhabitants).

Although the figure for the size of the population is only an estimate, it still allows us to draw some general conclusions on the coverage rate by region. Thus it appears that the best-covered zones are those represented by the city of Nouakchott and by the fourth, third, and second regions.

Moreover, it can be estimated that of the total of the non-vaccinated population (522,762 inhabitants), nearly 86% (446,149 inhabitants) belong to the sixth, first, and seventh regions. These are the regions toward which we should direct all our attention and support during this year, so as to complete the attack phase before the first of July 1972. It should be noted that at present there are no mobile vaccination teams in the seventh and eighth regions.

During 1970, apart from the two Eastern regions where all the teams were working together for two months, the largest number of smallpox vaccinations were administered in the third region (38,938) and in the sixth region (30,308).

More modest results were achieved this year by the following teams in their own regions:

Boghe team (fifth region): 14,404 smallpox vaccinations, with interruptions during March, May, June, and November;

Kaedi team (fourth region): 17,489 smallpox vaccinations, with interruptions during March, May, and September;

Nema team (first region): 12,522 vaccinations during the second, third, and fourth quarters.

The results of the evaluations made so far (Annex IV) also indicate low percentages of population coverage in the first region (49.5%, 43%, and 50% in the control areas) as compared with the second region (79%, 65%, and 52.3%), which is in line with the estimated percentages of coverage for the whole of the population in these regions.

A rather low coverage rate was found in the fourth region (between 43% and 62%) as compared to the estimated population, despite the high total number of vaccinations administered in this region.

The relatively high coverage rate found in the sixth region (73.8%, 78%, and 65.75%) is explained by the fact that evaluation in this region was limited to three towns.

In general, coverage was better for the population in the 1-14 year age group, and was insufficient for the infants up to one year old and for the adult population.

With regard to the BCG vaccinations, it was decided to give them to the birth-to-20 year age group instead of the 6-20 year group, and to give it in conjunction with the measles vaccination for children under six years of age.

The measles vaccinations have demonstrated their effectiveness, in that since 1968 no significant epidemic foci have been recorded, except for the epidemic in Sélibaby, in June 1970, the extent of which was greatly exaggerated by the Medical District.

VI. Supplies and Vaccine

During the second quarter, the stock of measles vaccine ran out once and on one occasion the stock of BCG was nearly used up. For the rest of the year the necessary amounts of vaccine were available.

During this year we received:

100,000 doses of BCG vaccine;

34,000 doses of measles vaccine.

At the end of the year we had left in stock:

7,100 doses of smallpox vaccine (we expect the arrival of 100,000 doses of smallpox vaccine on January 23 of this year);

77,800 doses of BCG vaccine;

12,700 doses of measles vaccine.

PED-O-JETS [innoculation guns]

The project has 23 of these guns in good working order, 21 with the

teams and two in stock.

Means of refrigeration.

Each team has a freezer or a refrigerator in good condition. There are in stock two freezers and three refrigerators kept in the central warehouse and used for storing vaccine.

Experiments with a mobile refrigerator mounted on a Land Rover had to be postponed until the first quarter of 1971.

Means of transport.

The project now owns:

7 Land Rovers in running order

5 Dodge trucks, 2 of them broken down

1 Peugeot 404, in good condition

1 Renault 4, in running order but badly worn.

We have ordered a Land Rover pickup for delivery here, under the terms of the approval granted by the Regional Bureau. We are in the process of completing arrangements for scrapping two old vehicles that are beyond repair.

For 1971, a Land Rover S.W. will be needed for the eighth mobile team, which is to be organized.

VII. Prospects.

The completion of the attack phase of the smallpox-eradication project should occur during the first half of 1972. This phase presupposes the attainment of a smallpox vaccination coverage rate of better than 80% in all regions and for all age groups.

In order to achieve this goal, the following measures have been planned:

a. Work programs have been drawn up by the mobile teams for the next period, which will allow each team to cover in its visits all the territory included in its region, within a period ranging from a year to a year and a half, according to the size of the region and the number of people to be vaccinated.

These programs have been designed to take account of the movements of the nomad populations and the usability of roads at different times of the year.

b. As a working method, for coverage the territory will be divided

into zones. After administering the vaccinations at the various "meeting points" of a zone, the team returns to carry out evaluations in each village. In villages where the coverage rate is found to be still insufficient, vaccinations are then given by the "door-to-door" method.

c. The Ministry of Health has decided to organize the eighth mobile team at Tidjikja in the Tagant circle (fifth region) during the first half of 1971, because a large proportion of the population is nomadic and because of the difficulties of access to this zone.

Another mobile team will be organized before the end of 1971 at Atar, to operate in the territory of the seventh and eighth regions.

d. In the first quarter of 1971, a new vaccination campaign is being organized in the seventh and eighth regions. In connection with it, the Nouakchott team has already been sent out to administer vaccinations along the F'Derick-Bir Moghrein route.

e. The systematic evaluation of the vaccination coverage rate, by the evaluation team, under the direction of the project chief and his deputies.

As each region is satisfactorily covered (rate above 80%), it enters the maintenance phase, in the course of the first half of 1972.

f. At the end of each quarter, written comments will be sent to the teams by the project chief, concerning the development of the campaign, the quality of the work done, and measures to be taken for the subsequent phase.

g. Throughout this whole period, measures will be taken to improve health education and intensify "health propaganda."

2. Preparation of the maintenance phase by:

a. Improvement of epidemiological monitoring by:

[1] the introduction of a proper system for reporting contagious diseases, in all health units. The project chief will make concrete proposals in this connection to the Office of Public Health;

[2] the systematic collection and analysis of data concerning contagious diseases at the technical-services level of the Office of Public Health.

The project chief will continue to contact the chiefs of the medical districts during his visits, in order to improve epidemiological monitoring and the reporting of contagious diseases.

b. For the maintenance phase, the plan is to administer smallpox vaccine and BCG to infants up to one year of age, and to revaccinate against smallpox at the age of seven.

Programs calling for annual visits will allow the mobile teams to administer vaccinations and revaccinations every year throughout the regions.

c. Considering the effectiveness of the measles vaccine and the seriousness of this disease in Mauritania, I propose that the measles vaccinations be continued during the maintenance phase.

[See original for translations penciled in on the four annexes, the Evaluation Report form, and the Health Map.]

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE.

QUARTERLY FIELD REPORT
RAPPORT TRIMESTRIEL SUR L'EXECUTION

PROJ.

Cover Page - Page de couverture

Quarter or period under review Trimestre ou période considérée [redacted] 19[redacted]	Région [redacted]
WHO Project number Numéro du projet OMS [redacted]	Date [redacted]
Short title Titre en abrégé [redacted]	
Géographical location Localisation géographique [redacted]	Source of funds Origine des fonds
Date field operations completed or expected to be completed Date de la fin effective ou prévue des opérations	

Reported by (WHO Officer) / Rapport de (Fonctionnaire de l'OMS) [redacted]	Official title Titre officiel	[redacted]
(Counterpart) / (Homologue) [redacted]	Official title Titre officiel	

Other staff on project, with positions - Autres membres du personnel affectés au projet, avec indication de leurs fonctions.

International - Personnel international
[redacted]

Counterparts - Homologues nationaux
[redacted]

Total local staff active on project (excluding counterparts)
Effectif total du personnel local qui participe à l'exécution du projet (non compris les homologues)
[redacted]

Brief summary - Résumé succinct

(See note overleaf)

[redacted]

Summary note

This should comprise, when judged necessary, an introduction to the report by summarizing briefly-in not more than 10-20 lines-the salient points in the history of the project. This is particularly useful in respect of projects which have been running for some years and also for pointing out the form and type of assistance given (demonstration and training, seminar training course, experts, supplies, fellowships, etc...). The summary helps to make the report to some extent self-contained and provides the reader with a certain perspective of the project; for it should be remembered that, outside Headquarters and regional offices, previous reports are not always readily available for reference).

(Ce resumé doit constituer, s'il est nécessaire, une introduction au rapport présentant brièvement, en 10 à 20 lignes tout au plus, les faits saillants de l'historique du projet. Ces renseignements sont particulièrement utiles dans le cas de projets qui durent depuis plusieurs années ou pour indiquer le genre et la forme d'assistance fournie (démonstration et formation, séminaire, stage, experts, fourniture de matériel, bourses d'études, etc...). Ce résumé doit compléter dans une certaine mesure le rapport en donnant aux lecteurs une idée d'ensemble du projet; ne pas oublier, en effet, qu'en dehors du Siège et des Bureaux Régionaux, il n'est pas toujours possible de consulter les rapports précédents).

ERADICATION VARIOLE, VACCINATIONS ROUGEOLE ET PAR LE B.C.G.

I. Buts)
II. Zone d'opération) pas de changement
III. Méthodes)
IV. Situation épidémiologique.

Aucun cas de variole ou suspect n'a pas été signalé.

Dans le courant de l'année 1970, on a notifié 2.389 cas de rougeole. On constate une diminution du nombre total des cas de rougeole, par comparaison aux années précédentes (10.860 en 1968 et 2.557 en 1969). On constate également la diminution du nombre des cas enregistrés par mois, sauf une épidémie signalée à Sélibaby, en Juin 1970, dans la 3ème Région (annexe I).

V. Accomplissement.

Pendant l'année 1970, le travail pour le Projet a été accompli par les équipes mobiles qui avaient été crées dans les premières six régions(à Nema,Aioun, Kiffa,Kaedi,Boghe et Rosso) et par l'équipe d'évaluation de Nouakchott.

L'activité a débuté par une campagne de vaccination dans les deux régions de l'Est (Hodh Oriental et Hodh Occidental),qui s'est déroulée entre 15 Janvier et 10 Mars a.c.Après cette campagne,une péride de ralentissement a suivi,marquée par la diminution du nombre des vaccinations pratiquées pendant le deuxième et le troisième trimestre,par des interruptions dans l'activité des equipes et par des retards non justifiés des rapports envoyés au projet.

Dès l'arrivée du chef du projet et du technicien de l'O.M.S.,toutes les équipes ont été visitées et des évaluations ont été faites sur le territoire de la 1-ère,2-ème,4-ème et de la 6-ème région.Lors de ces déplacements,on a éxaminé le travail accompli par les équipes,tout en insistant sur les méthodes utilisées et sur la continuité de l'activité.

Pendant le mois de Décembre,on a repris la campagne de vaccinations à Nouakchott.

Par suite,des résultats meilleurs ont été obtenus dans le courant du quatrième trimestre (annexe II).

A la fin de l'arriée,le total cumulé des vaccinations pratiquées s'élève à:

-627.238 vaccinations antivarioliques;
-177.613 vaccinations B.C.G.;
-96.367 vaccinations antirougeole.

La situation des vaccinations antivarioliques pratiquées jusqu'à présent et la couverture estimée par région est illustrée en annexe III.Il en résulte que la couverture estimée de la population par les vaccinations antivarioliques est de 54,6% sur le total de la population du pays(627.238 vaccinations sur 1.150.000 habitants).

Bien que les données sur le nombre de la population soient tout à fait estimatives, elles nous permettent, quand même, quelques conclusions générales sur le taux de couverture par région. Il en résulte ainsi que les zones les mieux ouvertes sont représentées la ville de Nouakchott et par la 4-ème, la 3-ème et la 2-ème région.

D'autre part, on peut estimer que sur le total de la population encore non vaccinée (522.762 habitants), à peu près 86% (446.149 habitants) appartiennent à la 6-ème, à la 1-ère et à la 7-ème région. Ce sont les régions vers lesquelles devront se porter surtout notre attention et notre soutien pendant cette année, afin d'achever la phase d'attaque avant le 1-èr Juillet 1972. Il est à noter que sur le territoire de la 7-ème et de la 8-ème région il n'existe pas jusqu'à présent une équipe mobile de vaccination.

Dans le courant de l'année 1970, appart des deux régions de l'Est, où toutes les équipes ont été réunies pendant deux mois, les plus nombreuses vaccinations antivarioliques ont été pratiquées dans la 3-ème région(38.930) et dans la 6-ème région(30.308).

Des résultats plus modestes ont obtenu cette année, dans leurs propres régions les équipes suivantes:

- -l'équipe de Boghe(5-ème région):14.404 vaccinations a.v, avec des interruptions pendant les mois de Mars, Mai, Juin et Novembre;
- -l'équipe de Kaedi(4-ème région):17.489 vaccinations a.v, avec des interruptions pendant les mois de Mars, Mai et Septembre;
- -l'équipe de Nema(1-ère région):12.522 vaccinations pendant le II-ème, le III-ème et le IV-ème trimestre.

Les résultats des évaluations faites jusqu'à présent(annexe IV), indiquent également une faible couverture de la population dans la 1-ère région(49,5%, 43% et 50% dans les localités contrôlées), par rapport à la 2-ème région(79%, 65% et 52,3%), résultats qui concordent, d'ailleurs, aux pourcentages de couverture estimés pour l'ensemble de la population de ces régions.

On a trouvé un assez faible taux de couverture dans la 4-ème région(compris entre 43% et 62%), malgré le nombre total élevé des vaccinations pratiquées dans cette région jusqu'à présent, par rapport à la population estimée.

Le taux de couverture relativement élevé qu'on a trouvé dans la 6-ème région(73,8%, 78% et 65,75%), s'explique du fait quàon a limité l'évaluation dans cette région à la population des trois villes.

On a constaté en général une meilleure couverture de la population de 1-14 ans et un taux de couverture insuffisant pour les enfants de 0-1 an et pour la population adulte.

En ce qui concerne les vaccinations B.C.G, on a décidé leur extension pour le groupe d'age de 0-20 ans, au lieu de 6-20 ans, en leur associant la vaccination antirougeole pour les enfants de 6 mois à six ans.

Les vaccinations antirougeole ont montré leur efficacité, vu que depuis 1968 aucun foyer important d'épidémie n'a pas été enrégistré, sauf l'épidemie de Selibaby, en Juin 1970, dont les proportions ont été fort exagérées par la circonscription médicale.

VI.Matériel et vaccin.

Pendant le deuxième trimestre,une rupture de stock s'est produite pour le vaccin rougeole et une menace de rupture pour le B.C.G.Pour le reste de l'année,on a disposé des quantités de vaccin nécéssaires.

On a reçu dans le courant de cette année:

-100.000 doses de vaccin B.C.G;

-34.000 doses de vaccin antirougeole.

A la fin de l'année,il nous restaient en stock:

-7100 doses de vaccin antivariolique.On attend l'arrivée de 100.000 doses de vaccin a.v. le 23 Janvier a.c.

-77.800 doses de vaccin B.C.G;

-12.700 doses de vaccin antirougeole.

PED-O-JETS.

Le projet dispose de 23 pistolets en bon état,dont 21 chez les équipes et deux en stock.

Moyens de réfrigération.

Chaque équipe dispose d'un congélateur ou d'un réfrigérateur en bon état.Il y a également en stock 2 congélateurs et 3 réfrigérateurs dans le dépôt central,utilisés pour conserver le vaccin.

L'expérimentation d'un réfrigérateur mobile,monté sur une voiture Land Rover a dû être rapportée pour le premier trimestre 1971.

Moyens de transport.

Le projet dispose en présent de:

-7 voitures Land Rover en marche;

-5 camions Dodge,dont 2 en panne;

-1 voiture Peugeot 404,en bon état;

-1 voiture Renault 4 en marche,mais dont l'état d'usure est avancé.

On a passé la commande pour l'achât d'une voiture Land Rover pick up sur place,selon l'approbation du Bureau Régional.On est en train de perfecter les formalités pour la réforme de deux vieilles véhicules irréoupérables.

Pour l'année 1971,une voiture Land Rover S.W. sera néoéssaire,pour doter la 8-ème équipe mobile qui va être crée.

VII.Perspectives.

1.L'achèvement de la phase d'attaque du projet d'éradication de la variole,dans le courant du premier semestre 1972.Cette étape suppose la réalisation d'un taux de couverture par les vaccinations antivarioliques,supérieur à 80% dans toutes les régions et pour tous les groupes d'âge.

Pour atteindre ce but,les mesures suivantes ont été prévues:

a.Des programmes de travail ont été élaborés par les équipes mobiles pour la période suivante,qui permetteront à chaque équipe de couvrir par ses déplacements. -150-

tout le territoire de sa région, dans un délais compris entre un an et un an et demi, en tenant compte des dimensions de la région et le nombre d'habitants à vacciner.

Ces programmes ont été élaborés compte tenu des déplacements des populations nomades et de l'accessibilité des voies de communication pendant les diverses périodes de l'année.

b. Comme méthode de travail, on a prévue la couverture du territoire par zones. Après avoir effectué les vaccinations dans une zone par "points de rassemblement", l'équipe revient pour faire des évaluations dans chaque collectivité. Dans les collectivités où le taux de couverture s'avère encore insuffisant (moins de 80%), on procède aux vaccinations par le système de "porte à porte".

c. Le Ministère de la Santé a décidé de créer, dans le courant du premier semestre 1971, la 8-ème équipe mobile à Tidjikja, dans le cercle de Tagant (5-ème région), compte tenu de la grande proportion des populations nomades et des difficultés d'acces dans cette zone.

Une autre équipe mobile sera crée jusqu'à la fin de l'année 1971 à Atar, pour opérer sur le territoire de la 7-ème et de la 8-ème région.

d. Dans le premier trimestre 1971, une nouvelle campagne de vaccinations est organisée dans la 7-ème et dans la 8-ème région. Pour ce but, l'équipe de Nouakchott s'est déjà déplacée pour effectuer les vaccinations sur le trajet F'Derick-Bir Moghrein.

e. L'évaluation sistematique du taux de couverture par les vaccinations dans toutes les régions, éffectuée par l'équipe d'évaluation, sous la direction du chef du projet et de ses adjoints.

Au fur et à mesure que chaque région sera ouverte d'une manière satisfaisante (taux supérieur à 80%), elle va passer à la phase d'entretien, dans le courant du premier semestre 1972.

f. A la fin de chaque trimestre, des commentaires écrites seront envoyés aux équipes par le chef du projet, concernant le développement de la campagne, la qualité du travail accompli et les mesures à prendre pour l'étape suivante.

g. Pendant toute cette période, les mesures seront prises pour intensifier l'éducation et la propagande sanitaire.

2. La préparation de la phase d'entretien, par:

a, Le perfectionnement de la surveillance épidémiologique, par:

-l'introduction d'un système de notification approprié pour les maladies contagieuses, dans toutes les unités sanitaires. Le chef du projet fera des propositions concrètes en ce sens à la Direction de la Santé Publique;

-la collection systématique et le dépouillement des données concernant les maladies contagieuses au niveau du service technique de la Direction de

la Santé Publique.

- le chef du projet continuera de contacter les chefs de circonscriptions médicales lors de ses déplacements, afin d'améliorer la surveillance épidémiologique et la notification des maladies contagieuses.

b. Pour la phase d'entretien, on prévoit la vaccination antivariolique et B.C.G. des enfants de 0 - 1 an et la revaccination antivariolique à l'âge de 7 ans.

Des programmes de déplacements annuels permettront aux équipes mobiles de réaliser chaque année les vaccinations et revaccinations sur tout le territoire des régions .

c. Tenant compte de l'efficacité de la vaccination antirougeole et de la gravité de cette maladie en Mauritanie, je propose la continuation des vaccinations antirougeoleu pendant la phase d'entretien.

ANNEXE - I

RECAPITULATION DES CAS DE ROUGEOLE PAR MOIS 1968 - 1970

Année	Janv	Fév	Mars	Avril	Mai	Juin	Juil	Août	Sept	Oct	Nov	Déc	Total des cas
968	1.130	1.755	3.145	2.579	1.384	Manque	263	262	Manque	66	89	187	10.860
969	347	440	429	293	187	409	228	63	46	17	9	89	2.557
970	170	101	160	149	103	1.394	68	104	78	22	40	Manque	2.349

ANNEXE - II

VACCINATIONS PRATIQUEES PENDANT LE 4 ème TRIMESTRE 1970

REGION	OCTOBRE			NOVEMBRE			DECEMBRE		
	A.V.	B.C.G.	A. R.	A. V.	B.C.G.	A. R.	A. V.	B.C.G.	A. R.
HODH ORIENTAL (1ère Région)	1.195	100	86	1.000	100	150	4.600	746	323
HODH OCCIDENTAL (2ème Région)	2.866	633	621	1.496	761	299	5.479	336	639
ASSABA - GUIDIMAKA (3ème Région)	2.850	2.146	325	4.905	4.385	2.124	1.668	139	234
GORGOL (4ème Région)	317	272	230	379	145	220	10.738	-	-
BRAKNA - TAGANT (5ème Région)	1.478	596	362	-	-	-	4.600	3.270	1.021
TRARZA - INCHIRI (6ème Région)	3.238	1.037	918	1.314	1.042	567	6.572	-	-
NOUAKCHOTT	72	222	77	65	87	56	23.671	499	420
T O T A L .....=	12.016	5.006	2.619	9.159	6.520	3.416	57.348	4.990	2.637

TOTAL TRIMESTRIEL : A.V. = 78.523
B.C.G= 16.516
A.R. = 8.672

ANNEXE - III

VACCINATIONS ANTIVARIOLIQUES PRATIQUEES JUSQU'AU 31 DECEMBRE 1970

R E G I O N	Populat. estimée	Populat. vaccinée	Taux couvert.	VACCINATIONS ANTIVARIOLIQUES PRATIQUEES					Population non vaccinée.
				1969	1er Trim. 1970	2e Trim. 1970	3e Trim. 1970	4e Trim. 1970	
HODH ORIENTAL (1ère Région)	192.000	73.401	38,2 %	25.641	35.238	3.622	2.105	6.795	118.600
HODH OCCIDENTAL (2ème Région)	104.000	63.147	61 %	32.138	12.372	6.221	2.575	9.841	40.853
ASSABA-GUIDIMAKA (3ème Région)	184.000	123.399	67 %	86.461	2.718	15.007	9.770	9.443	60.600
GORGOL (4ème Région)	95.000	111.844	100 %	94.355	792	4.716	547	11.434	-
BRAKNA - TAGANT (5ème Région)	206.000	82.779	40 %	68.575	[illegible]	2.446	5.880	6.078	123.221
TRARZA - INCHIRI (6ème Région)	218.000	86.821	39,3 %	56.513	1.713	11.445	6.026	11.124	131.176
ADRAR - TIRIS-ZEMMOUR (7ème Région)	98.000	34.851	25 %	24.851	-	-	-	-	73.149
BAIE DU LEVRIER (8ème Région)	13.000	6.274	48,2 %	6.274	-	-	-	-	6.726
DISTRICT DE NOUAKCHOTT	40.000	55.722	100 %	30.914	-	-	-	23.808	-
TOTAL	1.150000	627.238	54,6 %	425.522	52.833	43.457	26.903	78.523	522.762

ANNEXE . IV. — fait only !

+ = CICATRICE VARIO
— = PAS DE CICATRICE.

COUVERTURE DE LA POPULATION PAR LES VACCINATIONS ANTIVARIOLIQUES
EVALUATIONS PAR ECHANTILLONS STATISTIQUES

REGION	LOCALITE	Popul. estimée	Popul. contrôl.	Popul. vaccinée	0 - 1an		1 - 4 ans		5 - 14 ans		15 ans & +	
					+	-	+	-	+	-	+	-
DH ORIENTAL (1ère Région)	1. Némo	10.000	1.157	573	18	72	85	79	176	80	294	353
	Pourcentage		11,6%	49,5%	20%	80%	51,8%	48,2%	68,8%	31,2%	45,5%	54,5%
	2. Timbédra	3.000	510	219	7	35	51	62	52	41	109	153
	Pourcentage		17 %	43 %	17%	85%	45 %	55 %	55,8%	44,2%	41 %	59 %
	3. Aboué nite	1.000	262	131	3	16	28	7	42	41	58	67
	Pourcentage		26,2%	50 %	18%	82%	80 %	20 %	50 %	50 %	46,4%	53,6%
DH OCCIDENTAL (2ème Région)	1. Afoun	8.000	912	728	28	29	157	26	233	33	310	96
	Pourcentage		11,4%	79 %	49%	51%	85,8%	14,2%	87,6%	12,4%	76,4%	23,6%
	2. Safoni	500	190	124	0	5	32	14	54	14	38	33
	Pourcentage		38 %	65 %	0	100%	69 %	31 %	80 %	20 %	53,6%	46,4%
	3. Medhoub	300	137	68	0	8	18	11	20	15	30	28
	Pourcentage		43,3%	52,2%		100%	62 %	38 %	57,1%	42,9%	52 %	48 %
ORGOL (4ème Région)	1. Kaédi	8.000	1.028	612	4	57	215	61	217	78	176	211
	Pourcentage		12,7%	60 %	6,5%	93,5%	78 %	22 %	73 %	27 %	45,5%	54,5%
	2. Mourguel	800	412	256	0	20	44	23	73	15	139	93
	Pourcentage		51 %	62 %	0	100%	65,7%	34,3%	83 %	17 %	58,7%	41,3%
	3. Seyène	100	49	30	0	3	10	6	14	0	6	10
	Pourcentage		49 %	61 %	0	100%	62 %	38 %	100%	0	38 %	62 %
	4. Gankli	200	42	29	0	0	7	2	12	1	10	10
	Pourcentage		21 %	69 %	—	—	77,8%	22,2%	92,3%	7,7%	50 %	50 %
	5. Luxeiba	800	266	154	0	12	41	13	52	12	71	65
	Pourcentage		33,2%	61 %	0	100%	76 %	24 %	81,3%	18,7%	52 %	48 %
	6. Bélinabé	800	226	115	2	16	28	18	55	22	32	55
	Pourcentage		28,2%	51 %	11 %	89%	61 %	39 %	71 %	29 %	37 %	63 %
	7. Sylla	500	104	52	0	4	26	6	9	9	17	33
	Pourcentage		21 %	50 %	0	100%	81 %	19 %	50 %	50 %	34 %	66 %
	8. Gongona	300	58	25	0	3	14	2	5	6	6	22
	Pourcentage		19,3%	43 %	0	100%	87 %	13 %	45 %	55 %	22 %	78 %
	9. Sinthiou	500	59	33	0	0	10	8	11	5	12	3
	Pourcentage		11,8%	56 %	—	—	56 %	44 %	69 %	31 %	48 %	52 %

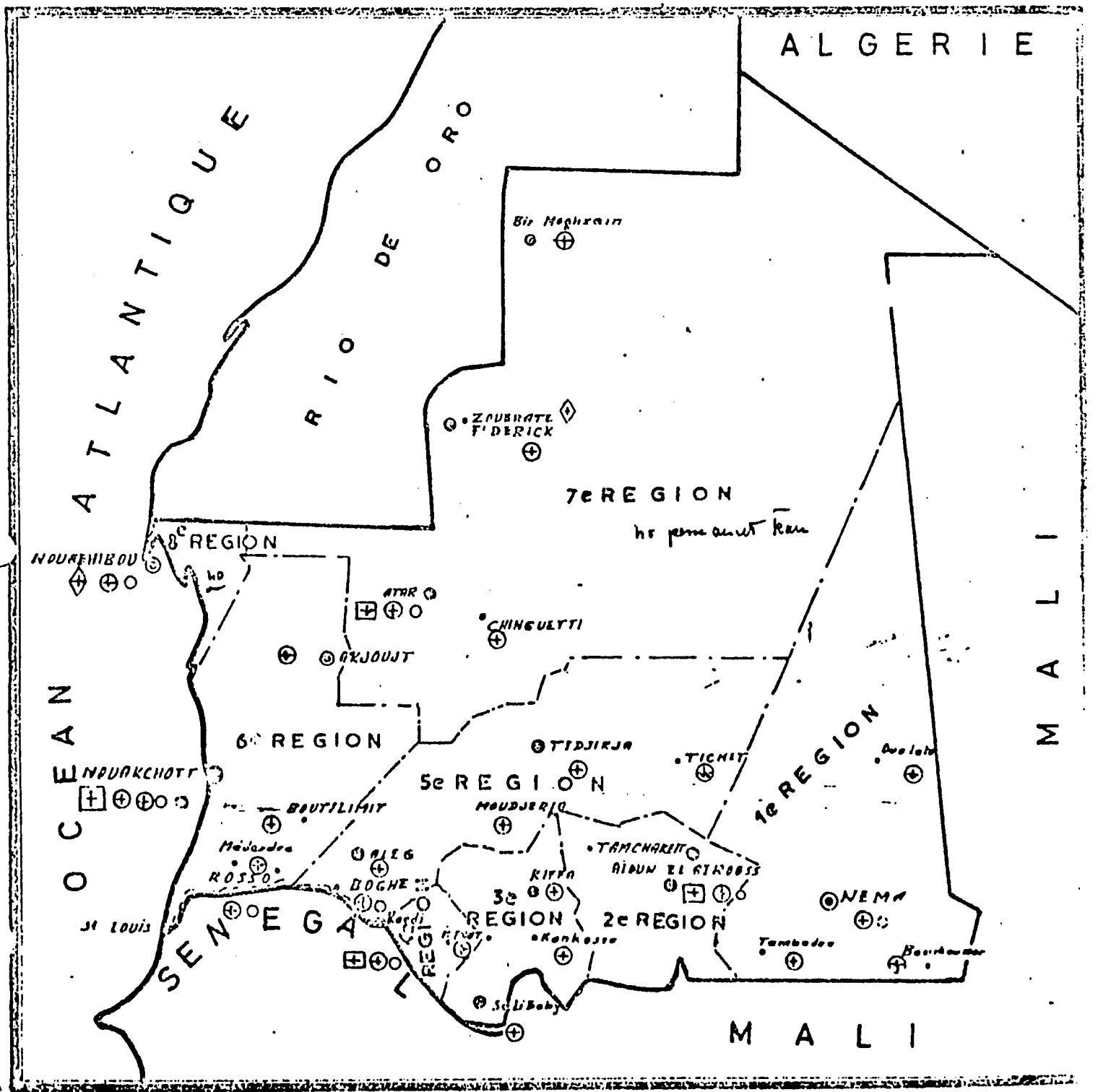
REPUBLIQUE ISLAMIQUE DE MAURITANIE

CARTE SANITAIRE

LEGENDE

- LIMITE DE LA REPUBLIQUE
- LIMITE DES REGIONS
- CAPITALE
- CHEF LIEU DE REGION
- CHEF LIEU DE PREFECTURE
- HOPITAL NATIONAL
- HOPITAL PUBLIC
- HOPITAL PRIVE
- DISPENSAIRE
- PMI (Centre existant)
- PMI (Centre prévu)

N.B. Les petits dispensaires de brousse ne sont pas mentionn



1972 2N pour ouvrages sup.

Attachment 4

LS No. 21760-Ba

Yaoundé, February 19, 1971

ORGANIZATION FOR COORDINATION
IN THE CONTROL OF ENDEMIC
DISEASES IN CENTRAL AFRICA
[French abbreviation: OCEAC]

B.P. [P.O. Box] 288, Yaoundé

No. /OCEAC/SG

From:
Dr. LABUSQUIERE
Secretary General of the OCEAC

TO:
Dr. Alfred A. Buck
Professor of Epidemiology and
International Health
U.S. Embassy, Yaoundé

Personal

My Dear Colleague:

In reference to our conversation concerning the evaluation of the Measles-Smallpox Campaign, and in particular the possibility of continuing to assign American personnel to it, I should like to confirm and further clarify my position to you.

We very much hope that assistance will be continued as in the past, particularly in the provision of vaccines and supplies. On the question of staff, it is evident that it could be useful, because there is enough work for everybody; but we readily understand that it is difficult and expensive to recruit people. If these difficulties were to lead to a reduction in American staff, I believe that some priority should be given to retaining the operations officers, at least for the states of Central Africa where the problems posed by the continuation of the campaign are essentially logistical in nature.

In this connection, while the assigning of one single operations officer for our five states may appear reasonable, actually it is an inefficient practice. Between having only one person responsible and having one for each country, a happy medium could be found by assigning one operations officer for two countries (Chad paired with the Central African Republic and Cameroon paired with Gabon), and by

assigning the officer for Cameroon to the OCEAC and placing him in a position of authority over the officer in charge of the other states, and naming him the sole intermediary between the different states and the NCDC or AID authorities.

Whatever the solution adopted and whatever the number of doctors or operations officers assigned to the Measles-Smallpox program or any program which may follow it, it is absolutely essential that the duties of these officers be clearly defined as well as their exact position in relation to the services with which they will be called upon to work.

To take a concrete example, that of the OCEAC: If any staff member, whether physician or operations officer or both, is placed at its disposal, that person must integrate himself completely into the OCEAC team, reporting only to the person in charge of the OCEAC as far as his professional activities are concerned. He must accept the working conditions and conform to the work schedule in force in the country in which he serves, and must work in constant, complete, and exclusive collaboration with the rest of the team, respecting like the other members of the team the principles of subordination to authority. To him the United States Embassy must be nothing more than a recourse in case of difficulties, just as the French Embassy--to take the most common example--remains the last resort in case of difficulties without ever interfering with the internal work routing of French nationals assigned to serve in the country.

If this total integration is not achieved, if the American personnel cannot work in a spirit of teamwork, it is to be feared that difficulties will be numerous and efficiency jeopardized, and that it would be better to do without such costly personnel. Although the example chosen was that of the OCEAC, the same obligation exists in all States or Services where American personnel is assigned.

In the hope that these few clarifications will allow you to form your own opinion as to what should be decided, I am

Yours truly,

Dr. R. Labusquiere

[See original for translations penciled in on the quarterly Field

ORGANISATION DE COORDINATION
POUR LA LUTTE CONTRE LES ENDEMIES
EN AFRIQUE CENTRALE
(O.C.E.A.C.)

B. P. 288 - YAOUNDE
Tél. : 22-22-32

Yaoundé, le 19 Février 1971

Le Docteur LABUSQUIERE
Secrétaire Général de l'O.C.E.A.C.
à

/OCEAC/SG

Personnelle

Docteur Alfred A. BUCK
Professeur d'Epidémiologie et de
Santé internationale
Ambassade des Etats-Unis

- YAOUNDE -

Mon cher Confrère,

Suite à la conversation que nous avons eue, concernant l'évalua de la campagne Variole-Rougeole, et en particulier l'opportunité de continu à y affecter du personnel américain, je me permets de vous confirmer et de préciser mon opinion.

Nous souhaitons vivement que l'assistance soit maintenue comme par le passé, notamment en fourniture de vaccins et de matériel. En ce qui concerne le personnel, il est évident que celui-ci pourrait être utile, car il y a suffisamment de travail pour tous ; mais nous comprenons qu'il soit difficile et coûteux d'en recruter. Si ces difficultés devaient amener à réduire ce personnel américain, j'estime qu'une certaine priorité devrait être accordée au maintien des officiers d'opération, au moins pour les Etats d'Afrique Centrale où la poursuite de la campagne pose surtout des problèmes de logistique.

A ce propos si l'affectation d'un seul officier d'opérations pour nos cinq Etats parait rationnelle, elle nuit à l'efficacité. Entre cet unique responsable, et un responsable par Etat, une juste moyenne pourrait être trouvée par l'affectation d'un officier d'opérations pour deux Etats (TCHAD + RCA et CAMEROUN + GABON), celui du Cameroun, affecté à l'OCEAC, devant avoir autorité sur celui responsable des autres Etats et être le seul intermédiaire entre les différents Etats et les autorités du NCDC ou de l'AID.

Quelle que soit la solution adoptée et le nombre des médecins ou officiers d'opérations qui sera affecté au programme Rougeole-Variole, ou au programme qui pourrait lui succéder, il est absolument indispensable que les attributions de ce personnel soit nettement définies comme devra être définie d'une façon précise sa situation par rapport aux services à la disposition desquels il sera mis.

Pour prendre un exemple concret, celui de l'OCEAC : si un personnel quelconque -médecin ou officier d'opérations, ou les deux- est mis à sa disposition, ce personnel devra s'intégrer complètement à l'équipe de l'OCEAC et ne dépendre, pour ses activités professionnelles, que du responsable de l'OCEAC. Il devra adopter les conditions et les horaires de travail en vigueur dans le pays où il sert, et travailler en collaboration constante, complète et unique avec le reste de l'équipe, respectant comme tous les autres membres de l'équipe les principes de subordination hiérarchique. L'Ambassade des Etats-Unis ne devra être pour lui qu'un recours en cas de difficultés, exactement comme l'Ambassade de France -pour prendre l'exemple le plus fréquent- reste le recours suprême en cas de difficultés, sans jamais intervenir dans la marche intérieure du service des français affectés dans l'Etat.

Si cette intégration totale n'est pas réalisée, si le personnel américain ne peut travailler avec l'esprit d'équipe, il est à craindre que les difficultés seront nombreuses, l'efficacité compromise et qu'il vaudra mieux faire l'économie d'un personnel coûteux.

Si l'exemple pris a été celui de l'OCEAC, la même obligation se retrouve dans tous les Etats ou tous les Services où du personnel américain sera affecté.

Dans l'espoir que ces quelques précisions vous permettront de vous faire une opinion sur ce qui devrait être décidé, je vous prie de croire, Mon cher Confrère, à mes meilleurs sentiments./-

Dr. R. LABUSQUIERE

Epidemiological Aspects of Smallpox Eradication in Nigeria

The history of smallpox in Nigeria is associated not only with disease, scarring, death, and economic disruption, but also with the supernatural. Explanations of smallpox occurrence included the coming of the hot season, the dry season, the harmattan, and the intensity of the sun. Carrying various names (Agana, Kitikpa, Ntanta, etc.), smallpox was feared, and elaborate fetish rites were often conducted to prevent, cure, or dissipate the disease.

Cases of smallpox officially reported over the 25 years before the SMP ranged from 1,000 to 24,000 per year. They tended to cluster in the late dry season annually, with an increased prevalence in February, March, and April. Most of the seasonal increase occurred in the northern states, perhaps as a result of migratory patterns of agricultural workers. As these workers moved to urban centers in search of work, smallpox spread into the cities. Infected transients often returned to their homes at the onset of prodromal symptoms and transmitted the disease to travelling companions as well as to neighbors in their rural villages. Less marked seasonal patterns occurred in the southern states where there was more constant interchange of rural and urban populations that provided continual exposure of susceptibles.

The epidemiological pattern of smallpox in the urban area is introduced by a travelling adult who passed it on to adult contacts, who in turn seeded the community. The age distribution of smallpox patients investigated by SMP personnel in the first four years of the program largely reflected the urban pattern of the disease (Table 1).

Table 1 - Age Distribution of 1,676 Urban Smallpox Patients

Age (years)	Patients Number	Patients Percent
0-4	292	17.4
5-14	433	25.8
15-44	832	49.6
45+	119	7.1
Total	1,676	100.0

In the rural savannah, where effective vaccine coverage was limited and where heat labile lanolated vaccine had been widely used, the incidence rate of smallpox is believed to be higher than in the urban areas. Here, smallpox epidemics occurred at regular intervals primarily affecting new susceptibles (infants and children) in the widely scattered villages. The rural pattern of smallpox occurrence is shown in Table 2.

Table 2 - Age Distribution of 62 Smallpox Patients from a Rural Village in Sokoto Province

Age (years)	Patients Number	Patients Percent
0-4	17	27.4
5-14	30	48.3
15-44	15	24.2
45+	0	-
Total	62	100.0

Social and cultural conditions have led to under-recognition and under-reporting of fatal smallpox cases, and hence to underestimation of case fatality ratios in field investigations. Mortality data are available from inpatient services and provide estimates of age-specific fatality ratios (Table 3). Although they may represent maximum estimates because only the severely ill are hospitalized, they yet are lower than expected for Variola Major and higher than expected for Variola Minor.

The case-fatality ratios of Table 3 and limited laboratory data on virus identification suggest that both Variola Major and Variola Intermedius have been active in Nigeria over the last few years.

Table 3 - Age-Specific Case-Fatality Ratios Observed in 1,192 Smallpox Admissions to the Kano Infectious Disease Hospital

Age (years)	Number of Patients	Number of Deaths	Case-Fatality Ratio in Percent
1	69	15	21.7
1-4	189	28	14.8
5-15	204	18	8.8
15-44	719	64	8.9
45+	11	4	36.4
Total	1,192	129	10.8

Although highly contagious in nature, exposure of a susceptible individual to an effective donor often requires close contact. For example, only 133 cases (37.2 percent) developed among 3,507 susceptibles (individuals without history of prior smallpox, absence of smallpox scarring, and absence of vaccination scars) who lived in the same housing compounds with active cases. Also, case severity seems associated with the ease of spread (the infectivity) of this disease. Thus, the secondary attack rate among susceptible contacts sharing a housing compound may be as much as four times higher among contacts of a fatal case than among contacts of a nonfatal case.

Smallpox Eradication

When the SMP began in 1966, Nigeria had a political structure of the Federal Territory of Lagos and four Regions. Each geographic area had an epidemiological unit and a smallpox prevention program that was utilized in the new broadened program.

To obtain maximum control of smallpox in the shortest possible time, each epidemiologic unit began its operation in the areas of highest incidence. The widespread distribution of smallpox led to mass vaccination campaigns in high incidence areas without diversion of resources to epidemic control. Also freeze dried vaccine that met WHO standards was substituted for the more heat labile lanolated vaccine for both mobile team and stationary dispensary use.

I. Attack Phase

The goal of the attack phase was the successful vaccination of each of Nigeria's estimated 63 million citizens. Three factors essential to this accomplishment were advance publicity, supervision of vaccination team operation, and assessment of vaccination coverage. The description of each factor together with levels of accomplishment and current activities are summarized below.

Advance publicity on smallpox vaccination was accomplished in accordance with the strength of the local traditional authority and through their leaders - emir, district heads, village heads, or hamlet heads. It included informing the local authority of intent, explaining methods, and soliciting their assistance in itinerary planning, site selection, advance notification, and team accommodation. Where the strength of the local authority was limited, program personnel had to perform advance publicity tasks.

Effective vaccination scheduling was developed in accordance with local customs. Daybreak or early morning scheduling often proved optimum, when the population could be vaccinated before leaving for the fields, schools, markets, etc. Split shifts to utilize the late evening availability of villagers further facilitated improved vaccination coverage.

Supervisory techniques evolved to insure effective advance publicity, local support proper scheduling of vaccinations, and skilled administration of vaccines. All activities, team morale, and acceptance of vaccination by the population were enhanced by the presence in the field of team supervisors and, at intervals, even program administrative personnel.

Assessment of vaccination coverage and induction of smallpox immunity were not performed initially in Nigeria. After the attack phase, however, several pilot assessments indicated lower coverage (75-85 percent) than the previously unfounded estimates of 90 percent or more. Accordingly, systematic techniques of supervisory and follow-up assessment were developed and applied, which appropriately influenced team operation and performance.

II. Surveillance and Epidemic Investigation

Continued observation of disease occurrence and its appropriate response provides the key to effective smallpox eradication. Over the history of the Nigerian SMP, a surveillance system developed whereby immediate reporting of suspect cases to regional headquarters permitted prompt case investigation with verification of negation of diagnosis and appropriate action. When smallpox was still endemic, a scheme developed of weekly telegraphic reports from 80 reporting centers to state capitals where reports were collated and telegraphed to the Federal Statistical Unit. Reports were then cumulated, submitted to WHO, and summated for distribution in the "Weekly Epidemiological Bulletin", an offshoot of the SMP.

The development of investigative competence in the State Minister of Health represents one of the definitive achievements of the SMP. The

Federal Epidemiologic Unit has developed a standard procedure and report form to expedite disease investigation and control activities. With respect to smallpox eradication the following guidelines and operational procedures have proved effective:

1) Selective vaccination of all close contacts of infective cases is more effective than indiscriminate community vaccination.

2) Intense efforts, including early morning and late night visits, often are required to identify and vaccinate all contacts of infective cases in housing compounds.

3) Investigation of the source of each recognized case is essential to identify previously unknown foci of smallpox.

4) Active surveillance of wide geographic areas are required to learn the full extent of the epidemic.

5) Mass vaccination and assessment are both useful tools for case-finding purposes.

6) Numerous revisits of the epidemic area are essential to identify missed cases and verify effectiveness of control.

III. Laboratory Services

As demonstrated by the Nigerian experience, laboratory support services proved essential to a smallpox eradication campaign, both for diagnostic purposes and the production of freeze dried vaccine.

Diagnostic Services were developed in the Federal Ministry of Health through the establishment of a laboratory. Facilities in an older building were renovated, equipment secured, and staff trained through the guidance and direct efforts of a SMP microbiologist. The new laboratory can provide provisional diagnoses on scab specimens within 24 hours using agar gel tests, and definitive diagnoses through egg isolations within

3-7 days. Additional diagnostic services, including electron microscopy and serological testing, had been developed through facilities at the NCDC in Atlanta. Arrangements now are underway to accomplish these latter services through the University College Hospital in Ibadan as needed. These services could be utilized on a multi-country basis with the phase-out of the SMP.

Vaccine production in the Federal Laboratories antedated the SMP, and although some of their stockpiled smallpox vaccine does not meet WHO standards, the facility represents a useful resource for future needs. The maintenance phase of smallpox vaccinations may largely depend on Nigerian produced vaccines. Much credit for improved procedures and effective output of a quality product is due the SMP and its collaborating microbiologist.

Epidemiologic Aspects of Measles Control in Nigeria

In the African society with its extended family housing, intimacy of village life, and free interaction of young children, infections spread easily. The custom of carrying infants on the back from birth until the child can walk provides many opportunities for effective exposure to droplet infections from early in life. After the loss of maternal antibody, about 5 months after birth, measles becomes common in the second half of the first year. In fact, more than a third of measles cases between five or six months of age and the first birthday. The median age of children with measles is 17 months, being lower in urban and higher in rural areas. This compares with a corresponding figure of four to six years in developed countries.

The nutritional state of the child before and during the attack of measles may be the dominate factor in producing a severe form of measles with complications. Severe weight loss is common due to a tendency to restrict the child's diet during measles, which accentuates negative nitrogen balance. Too, the foods given to a child are largely starchy with little protein content. This leads to serious illness in which the mucus membranes of the bronchi and intestine are affected. Complications that follow include kwashiorkor, diarrhea and pneumonia, all of which may lead to rapid death or to death several months later due to malnutrition or chronic diarrhea.

In Nigeria, measles has a marked seasonal pattern in rural areas with 70 percent of cases occurring from December through May. In the more densely populated urban areas, such as in Lagos, measles cases are more evenly dispersed throughout the year.

The successful results of early field trials in reducing the incidence of measles under controlled conditions in Africa led to requests of A.I.D. for assistance in performing mass measles vaccination

in Upper Volta. The spectacular success of this experience (politically, socially and medically) led to other developments detailed elsewhere, and ultimately to the SMP.

The interpretation of measles morbidity and mortality information is both difficult and hazardous. Measles cases are generally diagnosed by mothers or non-professional health attendants. In times of epidemic, as evidenced from hospital and dispensary records, any patient with a rash may be called a measles case. In addition, the uncomplicated and unattended cases of measles are seldom reported. In some areas our information is based on hospital statistics, and hospitals are concerned only with cases having complications or individuals brought to the hospital in extremis.

To determine an incidence rate for measles in the age group under 5 years, the denominator is based on a series of estimates of the total population, of the birth rate and of survival to age 5 years. It is computed from the foregoing estimates and represents an estimated number of children less than 5 years of age.

There are a number of other factors both positively and negatively affecting the reporting of measles. In some countries, nation-wide reporting does not exist, in one country, measles was a non-reportable disease until 1970. In a third, reporting is based on experience in selected health districts, the representativeness of which has not been documented.

The inadequacies and inaccuracies of these estimates have led us to make temporal comparisons of the number of cases for some areas, rather than compute incidence rates. This process assumes that little change in population occured over the period for which comparisons are made.

We are accustomed to dealing with deficiencies in the numerator when calculating morbidity rates, but in this situation the denominator is also so defective as to raise a similar question of the validity of the rate determinations.

To illustrate some of the difficulties in evaluating the measles control program in Nigeria, selected experiences are presented below. Some suggest a substantial reduction in measles cases and others quite the contrary.

I. IBADAN CITY

The measles control campaign began in Ibadan City (population 900,000) in July, 1967, with mass immunization of 72,000 children aged 6 months through 3 years. Assessment proceedings revealed a coverage rate of 92 percent. Whereas 764 measles patients were seen in the University College Hospital outpatient department from January through July, only 43 patients were seen from August to December. This finding is compatible with the idea that vaccination evoked a preventive effect (Figure I). Definitive evidence is lacking, however, and subsequent observations make the concept of control especially dubious.

Reported cases increased in January, 1968, so that a maintenance campaign aimed at children 6 - 18 months of age was undertaken in February and resulted in 6,400 vaccinations. Monthly measles incidence continued at low levels and in August, another maintenance campaign reached 4,800 children. In November, reported cases increased sharply and by December the city was in the midst of a full-blown epidemic. Forty-two thousand outbreak control vaccinations in January - March, 1968, were accompanied by low levels of measles occurence for about nine months. There followed another substantial outbreak and in turn a third measles mass vaccination campaign that covered 51,000 children. This time cases did not fall to the low levels previously observed; and in

spite of a fourth vaccination program in late 1969, another epidemic was recorded in the spring of 1970. A conclusion from these observations might be that vaccinations against measles must be performed more than once a year in a large, densely populated city like Ibadan in order to effect control.

II. MAIDUGURI CITY

Measles control began in Maiduguri (population 200,000) in August, 1968, with 85 percent vaccination coverage. This city had experienced substantial annual outbreaks in 1966, 1967, and 1968 (Figure II). But only a moderate number of cases was reported in 1969. Two extensive maintenance campaigns that reached perhaps 90 percent of susceptibles in 1970 were accompanied by an absence of cases during the balance of the year. Again, findings are consistant with, but not conclusive of, the idea of a preventive influence from measles vaccination.

III. ZARIA PROVINCE

An extensive attack phase of measles vaccinations was conducted in Zaria Province from August through December, 1969. Over 90 percent of the target group was covered. Figure III shows that reported measles cases declined from 1965 through 1968 only to increase again in early 1969. After the completion of the mass campaign, reported cases of measles fell to very low levels where they have remained to date. Maintenance operations have recently begun.

Although this province includes Zaria city (population 200,000), it includes a large, thinly populated rural area, and suggests that measles vaccination can be employed effectively even when extensive travel is required to reach target populations.

IV. LAGOS CITY

Lagos City (population 800,000) was first subjected to mass measles immunization from July through September, 1970 (Figure IV).

A total of 115,000 children aged 6 months through 3 years was vaccinated a coverage rate estimated at 95 percent.

Prior to this campaign, measles cases occurred annually in all months of each year, with an average of 324 cases per four week period during 1965 and 1966. Promptly after the attack phase, reported cases dropped to an average of 150 cases per four week period for the next four weeks. This suggests a 55 percent decline.

Maintenance programs started four months after the attack phase and included two small mass campaigns (January-March, 1968 and January-February, 1969) together with the administration of measles vaccine in six child welfare clinics that began in 1968. Over 20,000 measles vaccinations were performed annually since 1968.

Since the measles campaign began, a seasonal variation has been noticed. Periodic outbreaks seem to peak from six to ten months after mass campaigns are completed. The average number of measles cases reported in Lagos in 1965 and 1966 (before the measles immunization program) was 4,258 per year. The average number reported in 1969 and 1970 was 1,915 per year, a 55 percent decline since maintenance immunization began.

In contrast to what some might interpret as a sparing effect from these morbidity figures, mortality data are not that convincing. Mortality data for infants and children by selected and all causes in Lagos City from 1965 through 1969 are given below.

Number of deaths from selected and all causes among children 0-5 years in Lagos City, 1965-1969

Year	Measles		Malaria		Pneumonia		Enteric		All Causes	
	1	1-4	1	1-4	1	1-4	1	1-4	1	1-4
1965	68	141	117	230	405	413	245	185	2,122	1,424
1966	65	111	94	174	338	326	320	242	2,111	1,384
1967	63	115	83	167	279	327	199	147	1,796	1,155
1968	70	134	88	206	262	359	222	236	1,941	1,512
1969	57	94	78	153	280	358	283	216	2,071	1,375

No appreciable difference in measles mortality is seen between the pre- and post- campaign figures for either infants or children of preschool ages. In general the same can be said for malaria, pneumonia, gastro-intestinal diseases, and the all-causes category. Several interpretations are possible relative to the measles immunization program. For example, vaccination as performed had little effect, or the most fragile perhaps malnourished and poverty stricken, children were not reached. In either event, death from measles in childhood age classes represent but a fraction of the total deaths, and are less significant than each of the other cause specific diseases listed. Implied herein is the need for a broader program than just measles control -- one that includes an attack on a wide range of communicable diseases and, in fact, would be directed at the total benefit that might be derived from a comprehensive maternal and child health program.

FIGURE I MEASLES CASES IN WESTERN STATE BY FOUR WEEK PERIODS 1965-1970

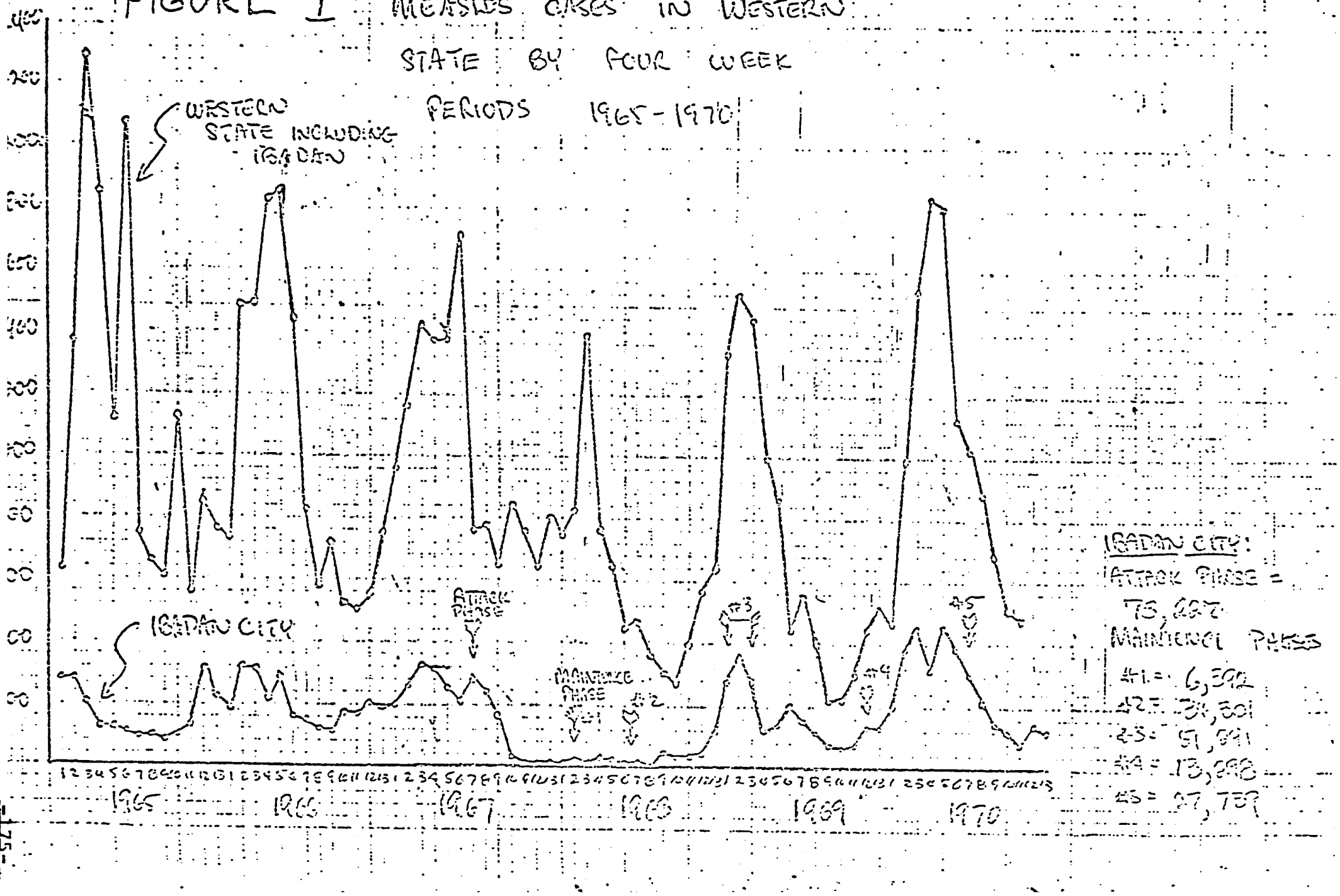


FIGURE II.
MEASLES CASES REPORTED
BY FOUR WEEK PERIOD
IN MAIDUGURI, CITY
1965 - 1970
ATTACK PHASE MASS CAMPAIGN (85% COVERAGE)
MAINTENCE PHASE MASS CAMPAIGNS
(85-90% COVERAGE)
MEASLES CASES REPORTED BY FOUR WEEK PERIOD
1965
1966
1967
1968
1969
1970

FIGURE III MEASLES CASES IN ZARIA PROVINCE
NORTH CENTRAL STATE 1965 - 1970
BY FOUR WEEK PERIODS

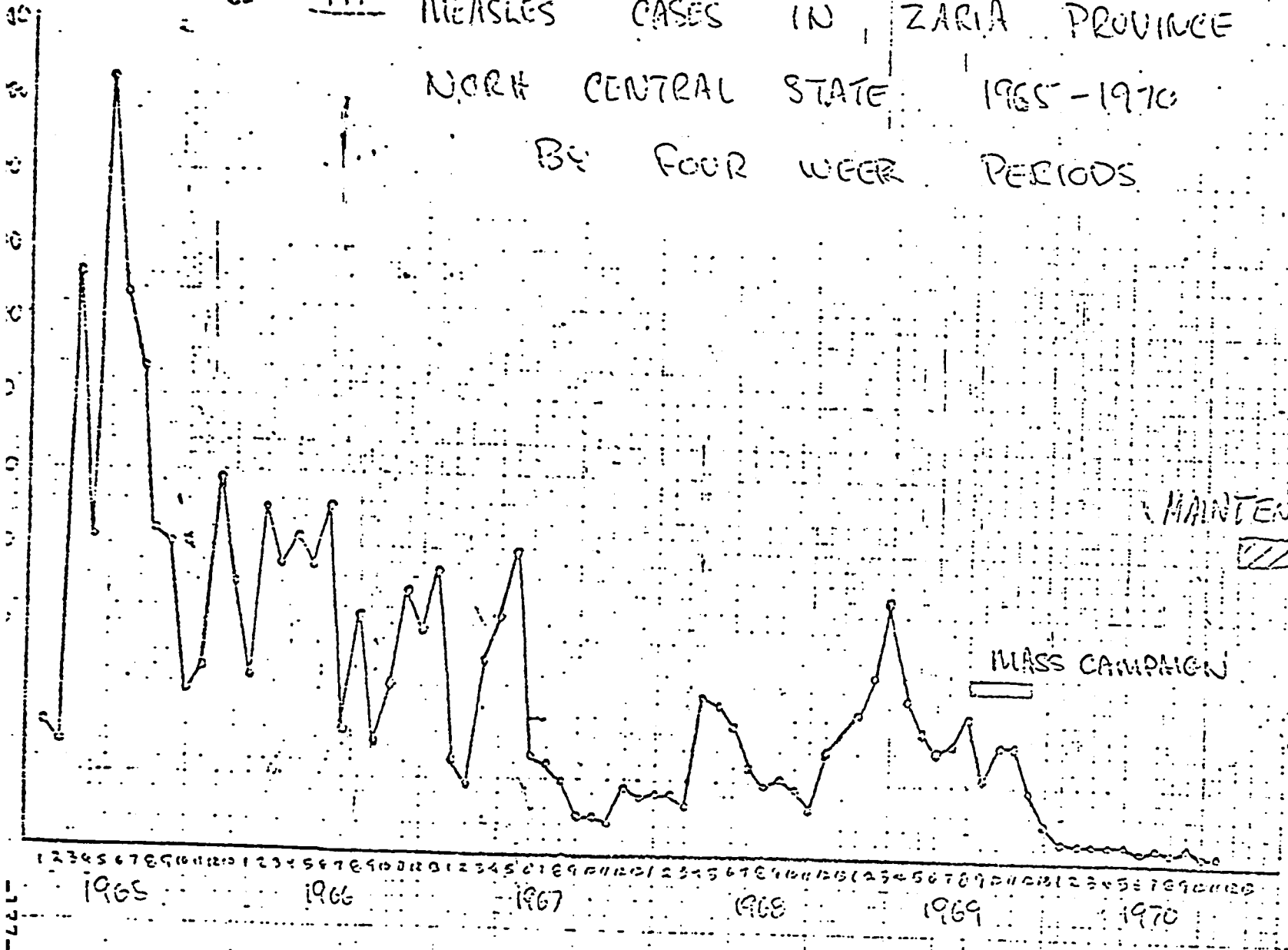
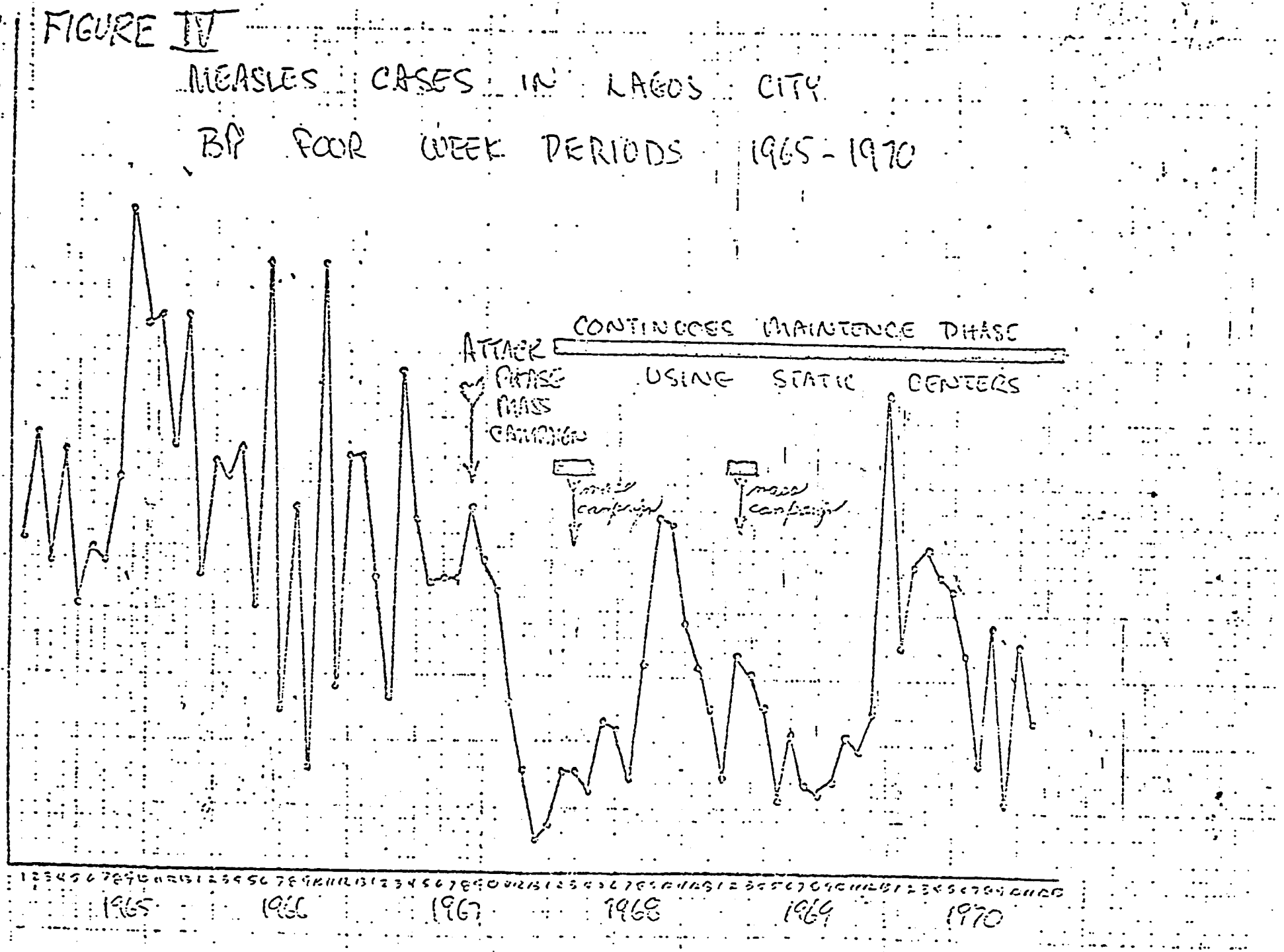


FIGURE IV

MEASLES CASES IN LAGOS CITY

BY FOUR WEEK PERIODS 1965 - 1970



The Institute of Health

The Institute of Health practically came into being on 1st April 1968 when the North Regional Government was dissolved and the six Northern States were established; it was then that the Institute of Health became responsible for the following hospitals, etc.

a) Kaduna - New Hospital (452 beds)
Old Hospital
Nursing Home (33 beds)
School of Nursing
Two Dispensaries
I.D.H.

b) Zaria - General Hospital (206 beds)
School of Nursing
School of Pharmacy
Two Dispensaries
I.D.H.

c) Kano - Orthopedic Hospital (77 beds)

d) Malumfashi - New Hospital (76 beds)
(This takeover was at a later stage)

In addition the Medical Auxilliaries Training School, Kaduna, and the School of Hygiene, Kano, were taken over from the Interim Common Services Agency in April 1970.

2. Departments

a) Administration. The Institute headquarters is accommodated in the old Sick Bay on the Main Campus of the University. At the moment the Director and two Administrative Officers together with about ten clerical/secretarial staff carry out the whole of the work of the headquarters.

b) Accounts. The Accounts Department, housed in the same building as the Administration, is an integral part of the Bursary of the University. At the moment there are the Assistant Chief Accountant, an Accountant, and about ten clerical/secretarial staff

c) Nursing Service. There is a Director of Nursing Services. Quite a number of staff nurses were taken over from the Government though many people who did not want to join the Institute opted out. There are a Matron and an Assistant Matron in Kaduna and Kano respectively, while in Malumfashi there is an Administrative Sister. This Department has been experiencing an acute shortage of personnel since the creation of the Institute.

d) Nurse Education. There is a Director of Nurse Education with a number of Tutors though use has had to be made of Sisters for teaching duties due to lack of adequate personnel. Beginning from January 1969 five batches of Student Nurses (about 80 students) have been admitted. It is hoped that with an increase in facilities larger classes will be admitted in the near future.

e) Medical Records. This Department could be said to have started with the assumption of duty by the Medical Records Officer in April 1969. The Officer is assisted by about 20 clerks spread all over the hospitals. Some clerks are undergoing courses at Ibadan and Lagos, and arrangements are nearing completion with the United Bristol Hospitals for the training of a few officers.

f) Medical Social Service. This Department was opened in Zaria in 1969 to offer a service to patients whose medical and social problems make it difficult for them to cooperate over treatment or function adequately in the community. The main immediate problems usually are accommodation, transport, employment, finance, etc. but some need longterm support as well. There is the Medical Social Worker, with a few other members of staff.

g) Limbfitting. The Limbfitting Department in the Orthopaedic Hospital, Kano, was established by the former North Regional Government in 1959 with a small workshop. It makes peg-legs, appliances, and articulated limbs (lower extrimity) and rendered particularly commendable service during the Civil War.

There are a Senior Limbmaker, a Limbmaker, and a junior staff of about eight. Equipment is lacking and the workshop is small.

h) Instruments. This Department carries out the general maintenance of medical and surgical equipment and also undertakes a considerable amount of design work and manufacturing.

The department is headed by an Instruments Engineer who has quite a number of supporting staff.

3. Schools

a) School of Nursing

ee Nurse Education Department above

b) School of Pharmacy. The School of Pharmacy was established in 1930. It was taken over by the Institute in April 1968. It runs a diploma course in Pharmacy and now functions in close cooperation with the newly created Department of Pharmacy and Pharmacology of the Faculty of Medicine. The School has a Principal

c) Medical Auxilliaries Training School. This school was taken over by the Institute in April 1970 and runs both basic and refresher courses for Dispensary, Rural Health and Sleeping Sickness Assistants, and refresher courses for Dispensary Assistants. The school is at the moment under the charge of an Acting Prinicpal.

d) School of Hygiene. This school was opened in 1932. It was taken over by the Institute in April 1970. It runs courses for Sanitary and Health Inspectors, and is under the charge of an Acting Principal.

4. Committees

Each of the four hospitals has a Hospital Management Committee. There are also the Senior Staff and the Intermediate and Junior Staff Selection Committees, as well as the Medical Advisory, the Director's Advisory, and the Planning Committees. There are a few other Committees also.

5. Functions

According to the Statute, the Institute of Health has the following functions:

a) to provide courses of instructions for diplomas, certificates and other distinctions in the medical and health disciplines;

b) to award or to recommend to Senate the award of diplomas certificates and other distinctions under such conditions as may be prescribed;

c) to operate the Ahmadu Bello University Hospital and related clinics, dispensaries and other institutions and health services, thereby providing facilities for the training of doctors, medical students, nurses, and other persons in the health and medical fields;

d) to cooperate with the Faculty of Medicine in providing adequate facilities for teaching purposes and equipment for carrying out research.

e) to provide for and conduct research in all matters pertaining to medicine and health;

f) to assist in the promotion of health services in the States, and,

g) to assist in the teaching functions of the University at graduate and undergraduate levels.

6. The Institute of Health is a fast developing institution, and new departments are expected to come into full fruition in the future. (e.g. the Department of Dietetics which is not actually a department yet.)

Source: Ahmadu Bello University, Zaria

APPENDIX II

SOME ECONOMIC ASPECTS OF THE SMALLPOX/MEASLES PROGRAM

Prior to this evaluation, a classical analysis of the internal rate of return was applied separately to the measles and smallpox components of the project. Using a table of life expectancy developed from data from Cameroon, Guinea, Togo and C.A.R., and assuming that:

1. every member of the population of the twenty-country area consumes at a uniform rate, and

2. if he survives to age 15, he enters the labor force at that time and begins to earn one per capita GNP per year, it was relatively easy to work in assumptions as to the natural history of the two diseases, compute the probability of various outcomes of an attack, and assign costs to each disease (i.e., the sum of costs from deaths, blindness, mental retardation and medical care). On the further assumption that the measles program was 61 percent effective -- that it prevented 61 percent of the cases of measles each year which otherwise would have occurred -- we sum the total benefits to $601 million, to be realized over a period with an expected value of 39 years. The internal rate of return of the project can be calculated by comparing this assumed benefit with the average annual cost of the program attributable to measles control (about $3.6 million) yielding a rate of return of 26 percent. A similar calculation for smallpox in West Africa yields a rate of return of 10 percent.

Further refinement of these calculations would distinguish between income from labor services and total income, between income to Africans and other income, between consumption levels of workers and non-workers, etc.; and also to adjust the rate of return for such factors as expected increase in labor productivity and expected inflation. It would moreover rely on baseline data rather than assumptions as a basis for the probabilities assigned to each possible outcome of the disease. The real social rate of return thus approximated could then be compared with that computed for other public investments as, for example, the following rate of return on education in Northern Nigeria:

Primary Education	156%
Technical Education	46%
Secondary Education	50%
University Education	109% 1/

Unfortunately, the evaluation team was unable to follow through on this initiative, which suggested that benefits exceeded costs but by a much lower margin in this activity than in certain types of education. Evidently, certain "external" benefits, such as development of health delivery systems, would have to figure in the equation before this project could rate priority over education. Baseline data on the diseases were more difficult to come by than expected; national accounts, labor force participation, and even demographic data proved to be highly inaccurate 2/ and a systematic effort to cost out the program in each country was abandoned. Because of these difficulties, we did not attempt to make a comprehensive analysis of the population implications of the program. Many thousands of cases of disease, and therefore of death, were doubtless avoided. But the general characteristics of health and nutrition among persons saved from these two diseases, and therefore the changes affected in their overall life expectancy, remain largely unknown.

Comprehensive cost breakdowns were in fact made for only seven countries. These are summarized on the following page:

1/ Samuel S. Bowles: "The Efficient Application of Resources in Education: A Planning Model with Applications to Northern Nigeria", Harvard University, Unpublished Ph.D. Dissertation, 1965

2/ In Upper Volta, for example, three different estimates of total population were derived, each based upon equally plausible assumptions but differing from each other by as much as 23 percent. The data base for some other countries of the region is even more sparse.

Table -- Sources of funding and uses of U.S. - financed portions of selected countries.

	Ivory Coast	Mali	Niger	Senegal	Upper Volta	Gambia	Mauti-tania	Total/a/ Program
1) U.S. FINANCED								
-trucks	9	11	14	6	8	16	6	10
-Ped-o-Jets	4	5	4	2	1	4	5	4
-Vaccines								
Smallpox	6	8	12	7	16	10	4	10
Measles	33	38	38	23	36	29	15	25
-Freezers	-	1	-	1	-	1	1	1
-Misc.	9	11	-	9	4	15	6	10
-Personal Service	13	21	26	27	23	5	16	37
TOTAL U.S. FINANCED	75	94	94	75	88	81	53	97
2) W.H.O FINANCED	-	5	6	1	4	-	35	3
3) FINANCED BY NAT'L.BUDGET	25	1	-	24	8	19	12	N.A.
	100	100	100	100	100	100	100	100*

* (See Table)

a/ Figures for total program (for twenty countries) are not comparable to data for countries shown, since grand total excludes amounts financed from national budgets.

Bearing in mind the important qualification explained in the footnote to the above table, it is possible to make some rough generalizations for the region as a whole and some inter-country comparisons. First, the five-year program averages out to somewhat more than 27 U.S. cents per inhabitant of the region. Second, there are extreme differences in this regard among countries. The five most expensive countries, per capita, were Gabon (.68), Gambia (.56), Congo-B (.53), Liberia (.47), and C.A.R. (.38). The five least expensive were Equatorial Guinea (.07), Nigeria (.16), Ghana (.19), Cameroon (.25), and Mali (.25). Of these countries, only the figure for Gambia includes the funding from national sources. No generalizations are possible for the Anglophone countries, since Liberia and Gambia were far above average

in cost and Ghana and Nigeria were far below. Sierra Leone was about average. Within the O.C.E.A.C. countries, all except Cameroon were above average in cost; whereas the opposite was true for the O.C.C.G.E. countries, the exceptions being Ivory Coast, Niger and Senegal. These regional groupings were rather clean-cut for the Francophone countries, the high cost of Senegal being attributable to the fact that additional U.S. staff were maintained there to assist in the administration of programs in the neighboring countries of Mauritania and Gambia. Niger is high because of a duplication of the attack phase of the program, and the two O.O.s still maintained there; but the high costs in Ivory Coast and the O.C.E.A.C. countries other than Cameroon cannot easily be explained. In general, it seems that small countries were more expensive than large, which is opposite from what one might expect. We can only conclude that our look at this program surfaced a number of mysteries on the management side which cannot be solved by the data which we were able to gather.

As regards the sources of foreign funding, the average for the region was 97 percent U.S. ($29,926,000) and 3 percent WHO ($900,000). The U.S. share was 100 percent in Cameroon, Ivory Coast, Congo (B), Gabon, Gambia, Equatorial Guinea and Ghana -- the countries receiving relatively high contributions from the WHO were Mauritania (35%), Sierra Leone (10%), Guinea and Dahomey (9% each). There seems to be no correlation between the costs of programs and the relative share of the WHO contribution, a fact which ought to be looked into in future programs involving joint funding.

A more useful way to look at these data is perhaps from the functional viewpoint. Transport costs were low relative to other costs. These of course include the itemized trucks and the WHO contribution, which was used almost exclusively for gasoline, supplemented, apparently, by some contributions by national governments for this purpose. If we blow up the sample of the countries for which we have data, we may assume that about one-third of the "miscellaneous" expenditures were for vehicle spare parts. This adds up to something over $5 million, out of a total cost of the project of some $31 million to perhaps as high as $42 million including funding from national sources (CDC estimate). The relatively high expenditures on trucks in Gambia and Liberia accounts in large measure for the fact that overall costs in these countries were so high.

The total cost of personal services used by the program is unknown. Of the cost to the U.S., plus the WHO contribution, 28 percent went to personal services in the field (both U.S. and local-hire personnel) and another 9 percent to "administration" (i.e., the maintenance of a regional office in Lagos and the headquarters and supporting facilities in Atlanta, which is largely personal service).

Smallpox vaccine, and the sum of measles vaccine plus the cost of freezers, represented 10 percent and 26 percent of the total, respectively, excluding local costs. No adequate basis exists for prorating the remaining 64 percent of costs between the campaigns against the two diseases. If we simply split the difference, we can say that some $13 million plus nationally-financed sums, went to smallpox; and some $18 million (plus) went to measles.

COUNTRY	COMMODITY COST FY 1967	FY 1968	FY 1969	FY 1970	FY 1971	TOTAL COST
CAMEROON	283,897	200,747	318,103	232,200	115,990	1,150,937
C.A.R	96,239	74,316	119,577	76,390	69,075	435,597
CHAD	209,258	202,655	196,147	155,090	73,325	836,475
CONGO B	138,122	200,728	56,348	58,120	21,504	474,822
DAHOMEY	164,973	144,985	104,913	29,880	67,824	512,575
EQ. GUINEA	-	-	-	1,500	14,460	15,960
GABON	91,809	64,147	34,890	24,250	24,135	239,231
GAMBIA	65,728	45,954	13,139	30,980	11,137	166,938
GHANA	88,510	389,614	325,249	258,910	317,601	1,379,884
GUINEA	-	301,125	248,789	93,960	104,652	748,526
IVORY COAST	243,039	141,070	205,865	251,775	121,869	963,618
LIBERIA	-	143,910	86,611	89,970	25,654	346,145
MALI	295,190	218,450	228,579	168,100	34,935	945,254
MAURITANIA	88,691	-	22,984	47,270	15,982	174,927
NIGER	202,439	162,185	171,255	273,875	127,405	937,159
NIGERIA	1,581,500	1,535,260	2,278,359	481,672	855,429	6,732,220
OCEAC HQ.	-	32,931	8,688	1,800	-	43,419
SENEGAL	211,499	204,126	182,762	56,120	47,855	702,362
SIERRA LEONE	-	185,090	131,056	96,400	56,930	469,476
TOGO	142,142	77,297	108,859	51,615	53,336	433,249
UPPER VOLTA	186,560	255,144	280,975	96,555	142,776	962,010
TOTAL	4,089,596	4,579,734	5,123,148	2,576,432	2,301,874	18,670,784

C. D. C. April 1971

Smallpox Eradication Program

Obligations by Countries and Regional Office

	FY 1967	FY 1968	FY 1969	FY 1970	PROJECTED FY 1971
Equatorial Guinea	-	-	-	$5,738.34	32,000.00
Cameroon	$44,502.25	$73,701.75	$78,818.41	59,229.65	10,000.00
Central African Republic	21,256.91	37,756.12	31,659.20	30,590.94	-
Chad	46,540.79	62,658.32	67,368.92	53,334.04	44,000.00
Congo	-	-	-	759.00	-
Dahomey	34,197.31	51,716.53	35,318.52	53,772.71	36,000.00
Gabon	16,173.59	29,837.65	23,823.72	31,723.86	-
Gambia	-	-	10,873.97	998.92	-
Ghana	23,458.98	52,239.51	92,494.48	41,373.18	102,000.00
Guinea	6,629.97	49,818.54	48,375.07	72,838.68	27,000.00
Ivory Coast	24,336.29	37,694.75	47,821.01	48,557.48	49,000.00
Liberia	4,148.25	47,013.40	62,829.64	46,354.03	67,000.00
Mali	31,839.21	45,786.66	64,342.20	59,742.19	65,000.00
Mauritania	23,105.34	-	118.35	45,747.34	-
Niger	45,292.54	64,483.37	62,053.98	113,698.39	66,000.00
Nigeria	243,240.53	270,937.65	387,411.76	500,901.10	500,000.00
Senegal	46,598.56	99,910.65	82,600.47	81,412.79	82,000.00
Sierra Leone	-	61,885.05	65,084.19	39,334.52	84,000.00
Togo	21,525.37	35,555.48	36,226.56	51,556.36	34,000.00
Upper Volta	46,905.30	67,969.83	71,281.68	91,018.50	56,000.00
Subtotal-countries	679,751.19	1,088,965.26	1,268,502.13	1,423,682.02	1,344,000.00
Regional Office - Lagos	213,699.08	313,660.80	331,544.96	159,438.78	63,300.00
Total	893,450.27	1,402,626.06	1,600,047.09	1,588,120.80	1,407,300.00
Headquarters	234,693.84	308,124.29	288,599.70	471,200.00	378,849.00
Grand Total	1,128,144.11	1,710,750.35	1,888,646.79	2,059,321.79	1,786,149.00

Prepared 4/7/71

FM--4/1/71

APPENDIX III

DATA SOURCES FOR SMALLPOX/MEASLES PROGRAM

ERADICATION

1. The Department of State Background Notes for West and Central African Countries.

2. 1970-71 Plan of Operation Smallpox/Measles Program--countries concerned.

3. Communicable Disease Control, Smallpox/Measles Program Summaries, 1971.

4. Concurrent assessment results and other Smallpox/Measles Program Statistical Data, courtesy Dr. Francis Masson, A.I.D.

5. National Health Plans, Nigeria, Sierra Leone and Liberia.

6. W.H.O. Delegate Responses to Communicable Disease Control Questionnaires re National Health Problems, Ghana, Liberia, Nigeria, Sierra Leone.

7. Annual Reports - National Ministries of Health of Nigeria and Ghana (1963, 1969).

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12. Selected references, including:

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    b. Nigeria in Conflict, Collis.

    c. Milbank Fund Quarterly, Vol. XLVI, No. 2, April, 1968, Part II. Social Science and Health Planning.

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In reply please refer to: Personal
Prière de rappeler la référence:

1 March 1971

Dear Dr Buck,

I am happy to reply in response to your query regarding the future of smallpox in Africa. While, as I know you appreciate, one cannot forecast the future with certainty, I believe we have had sufficient experience now with various eradication programmes to provide some reasonable estimates of anticipated progress over the next few years, assuming there are no major catastrophic events or factors of which we presently are unaware.

During 1971, systematic programmes will be concluded in all endemic countries except Sudan, Ethiopia and South Africa. Less than 500 cases should be recorded in the Congo (Dem. Rep.) with few occurring beyond September 1971. A few imported cases may be detected in such as Kenya, Uganda, Rwanda and Burundi but the outbreaks should be rapidly contained as all are mobilized for surveillance-containment activities. Information regarding South Africa is less complete than we would like but it is our understanding that smallpox is now confined to a very limited area in the Transvaal and vaccination activities have been considerably augmented to contain the residual foci. Thus, Sudan and Ethiopia remain as the principal areas.

In Ethiopia, the programme began in January 1971. With US Peace Corps support, mobile surveillance units have been established in the southern and western provinces and will be extended to all provinces as soon as transport becomes available. Over 1 500 cases have been recorded during the first eight weeks of the year which is itself testimony to the effect of this activity. Although the strategy calls for intensified vaccination programmes by existing health units and vaccination of major urban areas by national smallpox programme staff, the principal area of activity will be in the development of at least a limited reporting network plus investigation and containment of all smallpox cases and outbreaks. The country is fully accessible to this activity except in the north. In the north, health services are far superior to those elsewhere in the country and experience has shown that by vaccinating intensively in the accessible, heavily populated areas served by the health units, the disease dies out in the sparsely populated inaccessible areas. During the past four years, we have observed that in each instance in which a country has aggressively pursued a programme to improve reporting as well as investigation and containment of every reported case, it has become smallpox-free within two years. It is expected that a surveillance programme throughout Ethiopia should be realized by the end of this year. We would thus be hopeful that, by the end of 1973, transmission in Ethiopia would be interrupted.

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Personal

1 March 1971

In Sudan, the health service structure is more developed and the overall immunity level of the population is higher as considerably more vaccinations have been performed in recent years. A change in programme direction is now in progress and I would be hopeful that, by the end of the year, cases would be effectively confined to the extreme south. This is, of course, a troubled area but vaccination in the major population centres is feasible. Vaccination in the urban areas and of agricultural migrants should rapidly reduce transmission to zero levels, hopefully by early 1973.

Following apparent interruption of transmission in a continental area, the WHO Advisory Committee has recommended an intensive programme of surveillance for at least two additional years. Based on present knowledge of smallpox epidemiology, it is believed that any undetected residual foci should become apparent during such a period. We believe this principle remains wholly valid and so, throughout Africa, continuing special programmes of surveillance should be planned through the end of 1975.

Continuing support for this activity as well as for a programme of maintenance vaccination in the countries of western and central Africa is most vital as the limited resources available to WHO for this global programme are now heavily committed and, in fact, over-extended on other endemic and recently endemic areas.

Sincerely yours,

D. A. Henderson, M.D.
Chief, Smallpox Eradication Unit

World Health Organization and Smallpox Eradication in Africa

At present there are four endemic areas of smallpox in Africa, namely the Congo (Kinshasha), Sudan, Ethiopia and South Africa. Within twelve months smallpox in Africa will be limited to the two foci in Sudan and Ethiopia. Without asking for additional assistance from US/AID, experts of WHO believe that they can eradicate the disease from the two remaining countires in East Africa within three years. Because of the considerable east-west migration in Africa (pilgrimage to Mecca etc.), the next three years are crucial to the success of complete eradication of smallpox from the African continent. Presently, there is a great need for reliable assessment of vaccination coverage in each of the countires that participate in the smallpox-measles project of US/AID. Data are needed in order to improve immunity levels in pockets of the population, particularly the nomadic groups, where vaccination coverage is still deficient. Manpower and logistic requirements for competent surveillance must be improved. These include laboratory examinations of all suspected cases for confirmation of the diagnosis as smallpox, chicken pox or monkey pox.

The WHO budget for the global smallpox eradication program is four percent of the total budget and amounts to $3,000,000. Of this WHO's share for Africa is $900,000 of which $300,000 is allocated to Sudan and Ethiopia. The USSR donates approximately one-half million dollars' worth of vaccines, vehicles and transportation to the global program but has no bilateral assistance program in Africa. Twenty-five other countries donate vaccines worth $300,000. For Ethiopia, Japan is presently negotiating a bilateral assistance program for smallpox eradication.

The strategy for smallpox eradication within the next three years and the important role of the US/AID assisted SMP in West and Central Africa to achieve this goal are outlined by Dr. D. A. Henderson, Chief, Smallpox Eradication Unit, WHO, Geneva: