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Project for Smallpox Eradication and Measles Control in 19 Countries of West Africa

I. The Activity Target

The primary goal of this Regional Project is the eradication of smallpox from 19 geographically contiguous countries in West Africa (Cameroon, Central African Republic, Chad, Congo Brazzaville, Dahomey, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo and Upper Volta) and the establishment of measles control programs in each of these. The program will be funded by AID and carried out by the Communicable Disease Center, Public Health Service, through a PASA.

The reduction or elimination of measles and smallpox in West Africa can be expected to have a major impact in several areas:

1. Such medical facilities as are now existent in West Africa devote up to 20 percent of their resources to the care of individuals afflicted with these diseases. The elimination or control, respectively, of these disease problems thus represents an indirect and very significant expansion of available medical resources.

2. Long term sequelae following these diseases are not uncommon. Their costs are not insignificant in terms of a drain on medical and human resources. Blindness, chronic lung disease, kwashiorkor, deafness and a variety of other complications are known to be precipitated by these illnesses. Although their frequency is poorly documented, one report from a Blindness Commission in Northern Nigeria ascribes 38 percent of the cases of blindness in this area to measles and 15 percent to smallpox. Measles in West Africa results in death among approximately 10 percent of all children born; most deaths occur in pre-school age children. Smallpox, now partially controlled, results in a reported 3,000 to 6,000 cases annually although these figures may be understated by as much as tenfold.

3. The eradication of smallpox in West Africa coordinated with an intensified global program under WHO auspices should permit the discontinuation of smallpox vaccination programs within 8 to 10 years. Termination of continuing vaccination programs would permit diversion of limited medical resources to other pressing needs.

In accomplishing the primary objectives of smallpox eradication and measles control secondary objectives are envisaged:

1. The establishment or, in some countries, improvement of mobile disease control services capable of administering vaccines or other preventive medications efficiently, economically and on a mass scale throughout the country.

2. The establishment in each country of a system of disease surveillance broadly applicable to a variety of communicable disease problems. Such a disease surveillance system includes the development of effective disease reporting mechanisms, epidemiological field investigations of specific problem areas and educative techniques designed to acquaint responsible medical personnel throughout the country with current problems and development relating to the occurrence and control of the diseases of concern.

3. The development of highly simplified statistical sampling techniques applicable in these developing countries which will permit rapid assessment of disease problems.

4. The establishment of elementary virological laboratories in many of the countries capable of simple laboratory procedures for the diagnosis of smallpox.

5. Improvement of the existing smallpox vaccine production laboratory in Yaba, Nigeria, such that it is capable of producing stable, potent, safe vaccine of the multiple puncture type economically and in quantities sufficient for Nigeria and other countries in this area.

If the projected plan can proceed as scheduled, indigenously transmitted smallpox cases should cease by the end of the fourth year of the program; at this time, measles should be reduced to the level of sporadic occurrences or, at most, small focal outbreaks. By the end of the fifth year, maintenance vaccination programs capable of being conducted by local personnel should be fully established. Of the secondary objectives, the first two must evolve progressively throughout the program; the last three objectives should be accomplished by the end of the third year of the program.

Delay in achieving these objectives may be expected to occur variably from country to country depending on political stability and the capability and permanence of local personnel assigned to the specific projects.

II. Justification

A. Smallpox Eradication

1. For centuries, smallpox has represented one of the most lethal, readily communicable diseases known to man. In all countries, vaccination is practiced to effect at least partial control of the disease. Concern regarding smallpox is reflected by the fact that in the United States, despite an absence of cases for over 15 years, $20 million is expended annually in protection; other countries in Europe and North America with no indigenous smallpox spend proportionately large sums.

   As stated by the Director-General of WHO in a report to the Executive Board in January, 1966: "Of all the infectious diseases, smallpox, in its epidemiological behaviour, lends itself uniquely to an eradication effort. Directly transmitted from person to person, without known insect or animal reservoirs, rarely occurring in sub-clinical form, smallpox may quickly be detected in an area. The victim of the

disease is generally incapable of transmitting the virus for more than two weeks and is rendered essentially permanently immune against a subsequent attack. Since the disease has a two-week incubation period, prompt identification of a case permits the initiation of effective containment measures. Eradication can be accomplished in a comparatively simple and straightforward manner by rendering immune, through vaccination, a sufficiently large proportion of the population so that transmission is interrupted."

From the results of successful vaccination programs in the Central and South America, Southeast Asia, the Middle Eastern countries and North Africa, it has become abundantly clear that intensive, systematic vaccination programs can rapidly eradicate the disease even in the less economically privileged areas.

The development in the United States of a lyophilized (dried) form of smallpox vaccine which will not deteriorate in tropical climates and the later American scientific breakthrough of a process for vaccination by jet injection, permitting vaccination of up to 1000 persons per hour, has brought the concept of global eradication within the realm of reasonable probability.

At the Eighteenth World Health Assembly, May, 1965, the President of the United States pledged the support of this country "for an international program to eradicate smallpox completely from the earth within the next decade." In accord with the instructions of the President, the United States Delegation successfully sponsored a resolution declaring the world-wide eradication of smallpox to be a major objective of the World Health Organization. This resolution was unanimously approved by the Assembly and urged "member States to give the program greater support than in the past and to provide the substantial contributions essential for its execution." Although it was recognized that each of the endemic countries would have to take initiative in this enterprise, the Director-General of the World Health Organization pointed out: "The speed at which initial control and ultimate eradication will be accomplished will depend on how much practical help is given by the countries already free from the disease . . . . The non-endemic countries must provide either in kind or in cash the very large quantities of vaccine, equipment, transport, and other support necessary for the programs."

In September of 1965 the African countries at a Regional WHO meeting in Lusaka, Zambia, unanimously reaffirmed the resolve of the World Health Assembly that smallpox eradication should be regarded as an immediate major objective of the African countries.

The need for and importance of well-coordinated regional eradication programs has been strongly emphasized by the Director-General of the World Health Organization. Failure in the past in South America, for example, to undertake an eradication program on a regional scale has resulted in frequent disease reintroductions from Brazil to neighboring

countries and, in several instances, has required repeated country-wide vaccination programs.

A number of exploratory discussions relating to the present Project have been held with the Director-General of the World Health Organization and members of his staff. They strongly urged that the Project be conducted as a Regional effort and that it be closely coordinated with World Health Organization efforts in Africa and elsewhere in the world. The Director-General indicated that the World Health Organization would promptly undertake to implement eradication programs in smallpox endemic countries adjoining the Regional group of 19 countries designated in this proposal. The adjoining endemic countries are Sudan and Congo Leopoldville. All countries north of the Sahara are presently smallpox free.

In the 19 countries indicated in this Project, all except Mauritania and the Central African Republic have reported cases in the past two years. During 1964, 3454 cases were reported; incomplete data from 1965 record 5909 cases. On the basis of discussions with responsible national authorities, it is estimated that these figures represent one-tenth or less of the actual number occurring.

Smallpox case rates, as reported, are highest in Congo Brazzaville, Dahomey, Gabon, Guinea, Liberia, Mali, Niger, and Nigeria. (Fig. 1) However, of the 9363 cases reported during these two years, over 80 percent were reported from the three adjacent countries of Nigeria, Niger and Dahomey. (Fig. 2)

B. Measles Control

A disease experienced by over 90 percent of children throughout the world, measles is the most serious of the so-called "common" childhood diseases. It is characterized by high fever, rash and systemic symptoms normally lasting a week or more. Among children in tropical Africa, it normally occurs at a much younger age than in the United States and imposed on a background of other acute and chronic infections, results in a staggeringly high mortality. It is estimated that about 10 percent of all African children die from this disease; in some local epidemics, over 50 percent of infected children have succumbed. Sequelae from the disease may leave the child alive but handicapped throughout life by mental impairment, chronic pulmonary disease, kwashiorkor, or loss of hearing or eyesight.

During measles epidemics, available medical resources are severely taxed. It has been stated that up to 20 percent of all medical resources are concerned with the care of measles cases and complications.

Although, like smallpox, measles is transmitted from person to person and has no known insect or animal reservoirs, it appears to be considerably more communicable than smallpox. Illustrative of this phenomenon is the fact that while the occurrence of smallpox among adults is not unusual, measles cases in adults are rare throughout the world. In the United States, for example, over 90

percent of children have experienced measles by age 15; in Africa, this proportion is reached by 4 to 6 years of age. Although it is conceivable that measles eradication might be achieved through this Project in West Africa, the apparently greater communicability of measles suggests that it will be considerably more difficult to attain eradication than in the instance of smallpox. Valuable information pertinent to this question should be forthcoming from this Project. Until more is known, however, the measles vaccination aspect of the West Africa Project must realistically be regarded as a "control" effort rather than an "eradication" effort.

The discovery and development in the United States of measles vaccines provides the only possible means for control of this feared disease which constitutes such a significant drain on the economy of the country. A single injection of the vaccine provides durable, probably lifetime immunity. Since the measles vaccine can be administered by the jet injector guns, large scale programs can quickly and efficiently be carried out at a modest cost compared to the present economic liability imposed by the disease.

III. Course of Action

The Project will be developed as an overall Regional endeavor closely coordinated with World Health Organization efforts elsewhere in Africa. Programs will be carried out through bilateral arrangements with each of the individual countries and in direct collaboration with recognized sub-regional organizations which serve some of the countries, OCCGE (l'Organisation de la Coordination et Cooperation pour la leutre les Grande Endemies)* and the OCCGEAC (a similarly named organization in Afrique Centrale)**. Since the United States does not have diplomatic relationships with Congo Brazzaville, it is not possible to formulate a plan of action in this country without further discussions with the State Department.

A. Countries to be Included

Programs will be initiated in a majority of the countries in the Fall of 1967 and in the remainder during the succeeding year. Mass vaccination programs will be completed in most countries by 1970 and in all countries by 1971. Maintenance campaigns will be supported through June, 1972. The nature of the campaigns, the specific methods of disease surveillance and investigation and assessment methods for the programs will be specifically adapted to the existent pattern of health services in each of the countries. This will permit maximum utilization of the limited available resources in each of the countries and should, with greater certainty, insure the permanent incorporation of many of the techniques employed into the permanent structure of their developing health services.

This program represents, in significant measure, a continuation of measles vaccine control programs initiated by AID in Upper Volta

* Includes Dahomey, Ivory Coast, Mali, Mauritania, Niger, Senegal, Togo and Upper Volta.

** Includes Cameroon, Central African Republic, Chad, Congo Brazzaville and Gabon.

in FY 1962, in 6 additional countries (Dahomey, Guinea, Ivory Coast, Mali, Mauritania and Niger) in FY 1963 and in an additional four countries (Cameroon, Central African Republic, Chad and Togo) in FY 1964. Experience gained by Communicable Disease Center technical consultants assigned to these projects for periods of one to five months during each of these programs and more detailed exploratory discussions with these and other countries in the 19 country area during November-December, 1965, by a special consultant team (Tour Report attached - Appendix I), provides the foundation upon which these more detailed Project plans have been based.

Although it has been made abundantly clear to us by representatives of 17 countries with whom this overall project was directly discussed (indirect reports only were forthcoming from Gambia and Ghana) that they would eagerly welcome the proposed assistance, it is also apparent that to begin projects in all of the countries within the coming year would represent a difficult logistical fete. Priorities have had to be assigned.

Each of the 11 countries presently receiving measles vaccine fully anticipates continuation of the program next year. Rather firm commitments have also been made by AID to Gabon that it too would be included next year. Political considerations thus dictate the inclusion of these 12 countries in the smallpox eradication/measles control (SPE/MC) Project during FY 1967.

In addition, Nigeria, the most populous country in this area and the one which has accounted for fully 60 percent of all smallpox cases in West Africa in the past two years, has taken a series of definitive steps in planning a smallpox program to be initiated in the autumn of 1966. Federal direction and coordination of the program has been agreed upon; a budget has been prepared for submission to Parliament this Spring; plans have been made to divert the 500 or so yaws eradication team members from the yaws project which is being concluded to a national smallpox eradication effort; vaccine for multiple puncture has been produced in substantial quantity and stockpiled. Mr. P. C. Asiodu, Permanent Secretary, Federal Ministry of Health of Nigeria wrote to Mr. MacDonald, Director, U.S.AID Mission as follows on January 3, 1966: "I am to indicate that the Nigerian Government welcomes the United States Government offer of assistance. As you are aware, however, much preparatory work and planning have been completed in connection with our National Smallpox Eradication Campaign. Doses of vaccines have been built up and the project is given the highest priority. We would not wish to delay longer than is necessary. The assistance which you envisage could be most useful in ensuring the rapid execution of the Campaign. This Ministry will be happy therefore to receive Communicable Disease Center staff as early as possible to work out the necessary details on the basis of which a formal agreement can be reached." Although very recent political events could conspire to delay this program, it is presumed at this stage that the groundwork laid over the past two years should mature into an active program.

In the development of preliminary proposals for the Regional SPE/MC Project, the progress made in Nigeria in the planning of a national smallpox eradication program was not appreciated. It is apparent, however, that the immediate initiation of a program in

Nigeria is critical in order to capitalize the momentum already generated and to eradicate with all possible speed the principal focus in the entire Region.

Thus, programs in 13 of the countries are planned for FY 67. In the remaining 6 countries, more detailed plans will be developed by personnel from the Regional Project Office during FY 67 for implementation during FY 68.

B. Nature of Mass Campaigns

In the 12 countries (all Francophone countries) in which continued assistance in the conduct of measles programs has been implied or essentially committed by AID, all have a more or less adequately functioning Service des Grandes Endemies, which include a number of roving medical units normally providing vaccination and a number of other curative and prophylactic biologicals to the native populations. The adequacy of these teams and their programs varies widely from country to country. Coverage of the population thus is variably complete. Special teams have been drawn from these Services to conduct the measles campaigns to date. Responsible personnel in the countries which have the most adequate multi-purpose roving medical units indicate that they would prefer to offer smallpox vaccination by multiple puncture to the population in the context of the mobile multi-purpose team activity while carrying out the measles program with special teams for this purpose alone. While this eventuates in what would appear to be a less efficient system, cogent arguments have been advanced regarding the advantages of this system (see Tour Report). Since a program of this nature was propounded by countries with generally effective Service vaccination activities, it is difficult to propose an alternative approach without close observation of the total program over many months to a year's period. In the countries with a less adequate roving medical unit program, a program involving simultaneous administration of measles and smallpox vaccines was readily accepted as the preferred approach. In Nigeria, the concept of combined simultaneous vaccination against measles and smallpox was readily accepted. Thus, in the framework of the policy to adapt the program to the country's operating health structure and needs, it is clear that different approaches will be required.

In principle, the objective of the Regional Project will be to achieve widespread vaccination coverage of populations throughout each of the countries as rapidly as possible. Since smallpox cases in Africa as elsewhere in the world occur among persons of all ages, smallpox vaccine must be admininistered to the total population. However, since virtually all children in Africa have experienced measles by the sixth year of age, measles vaccine will be given only to those 6 years of age and younger. It will not be given to children younger than 6 months of age since, in this age group, antibody acquired at birth from the mother prevents a satisfactory vaccine "take".

A number of additional considerations also influence the nature of the programs to be carried out. In 11 of the Francophone countries, substantial quantities of measles vaccine have already been dispersed in a variably systematic fashion. Smallpox vaccine, however, was made available to only a few of these

countries late in FY 66. The small amount of smallpox vaccine (3 million doses) already supplied has not been further considered in the Project planning. Where the combined program is to be conducted, areas previously covered by measles vaccination teams will have to be revisited to provide smallpox vaccination; since no program for maintenance measles immunization has been developed, children born since the last program will have to be vaccinated also. Epidemiological and serological studies to define the previously accepted age limits for measles vaccination must be undertaken by Regional and Headquarters staff of the Project. Limited studies to date in Ghana and Nigeria indicate that vaccination of 5 and 6 year old children is not indicated. If this can be confirmed elsewhere, a saving of about one-third can be realized in quantities of measles vaccine required.

C. Nature of Maintenance Campaigns

Maintenance vaccination programs to date have received essentially no attention. Since these particularly must be imaginatively integrated with the country's existent and projected health structure, definitive plans must await continued close observation by assigned personnel in each country over a period of a year or more. For example, in some areas, permanently based health units effectively serve local populations and might well provide maintenance coverage; in other areas, mobile services may be required to visit each area every two or three years. In some instances the multi-purpose mobile service may be able to carry out this function; in other areas, special teams may be required. Since epidemiological evidence as to the proportion of susceptibles necessary for the occurrence of measles outbreaks is not known, it is yet uncertain as to what intervals in a mass maintenance-type campaign it will be necessary to provide vaccination to children born since the last campaign. It may be at intervals of two, three or even four years. Studies to deal specifically with this problem will be developed by the Regional Staff of the Project.

Maintenance programs for smallpox vaccination pose a somewhat different problem. Immunity conferred by the vaccine appears to be less permanent than for measles vaccine; cases occur among all ages in the population. Although an effective program to vaccinate newborns may be developed, sporadic large-scale programs in more densely settled urban areas may be required to sustain immunity at sufficiently high levels among imigrants and others in lower socio-economic classes where crowding permits ready transmission.

Clearly, for the development of an effective maintenance phase for the smallpox-measles programs, considerable study, thought and imagination will be required. The nature of the programs may be expected to vary considerably from country to country and even between areas within countries.

D. Surveillance Procedures

None of the countries concerned in this Project has much more than a rudimentary reporting system for the communicable

diseases. In none, is there a well-defined procedure for the investigation of suspect cases, a system to appraise and control cases and outbreaks or an adequately developed scheme for current analysis of disease problems and problem areas.

In each of the countries, it will be a principal responsibility of the assigned technical personnel of the Project to work with country authorities in the development of an adequate surveillance system for suspect smallpox and measles cases. Only by this means can there be an adequate assessment of the success of the program as a whole.

Surveillance can be carried out through medical posts, hospitals, aide stations, etc., of which each country, in fact, has a surprising number. This fact is well illustrated in Table 1 which, although computed several years ago, indicates the existence of a substantial number of hospitals and medical centers in each of the countries. In addition, there are a number of other aide posts and local dispensaries at which patients might be seen and from which information could be routinely obtained.

Utilizing these as principal "detection sites", amplified by whatever other sources may be developed (e.g. schools, political authorities, etc.), a system for the routine reporting of suspect cases will be developed along with a program of systematic follow-up of all suspect cases of smallpox and outbreaks of measles. Appropriate control procedures, principally mass vaccination, would be applied in each instance.

Since the occurrence of measles outbreaks or smallpox cases essentially represents a flaw in the vaccination program, specific emphasis will be placed in determining the cause of outbreaks or cases in order that subsequent activities may be appropriately redirected.

Information pertaining to the occurrence of these diseases in each of the countries will be routinely forwarded to the Regional Staff of the Project for consolidation and distribution to responsible authorities throughout the Region.

E. Vaccine Assessment Procedures

Continuing assessment of the extent of vaccination coverage will be carried out by highly simplified sampling techniques to be developed by Regional and Headquarters Project Staffs. In general, assessment will be carried out by independent teams in each country seven days following a mass program. Vaccination reactions will be appraised. An alternate appraisal system may be employed in which each person vaccinated will be asked to dip a finger in a silver nitrate solution. This non-toxic solution discolors the fingernail for a period of weeks and makes it possible to identify readily vaccinated persons. This could represent a means for rapid assessment of vaccination coverage. The acceptability and ease of this approach will have to be further explored in pilot projects to be conducted by Regional and Headquarters Project Staffs.

F. Virological Confirmation of Smallpox and Measles Cases

When cases have reached a low level in a given country or area, the importance of accurate diagnosis becomes increasingly important. Chickenpox, herpes simplex and other diseases may, at times, closely simulate smallpox. Occasionally, outbreaks of febrile illness associated with rash may mimic measles.

Simplified diagnostic techniques for smallpox, probably employing growth of virus on egg chorioallantoic membrane and an agar gel precipitin method, will be perfected and progressively introduced to about 10 laboratories throughout this Region. These laboratories will be able to serve as Regional diagnostic centers. Since smallpox virus is very stable, specimens can be transported over long distances without refrigeration thus making a Regional laboratory concept feasible.

For the laboratory diagnosis of measles, the problem is more complex. Serological procedures will undoubtedly be required. Some capability for testing by the hemagglutination-inhibition procedure now exists at Dakar, Lagos, Accra, and Bangui. With some training and provision of limited laboratory supplies, specific diagnostic tests can be carried out in these centers.

The refinement and evaluation of these tests and the subsequent training of local personnel will be the responsibility of virological staff in Regional and Headquarters Project Offices.

G. Smallpox Vaccine Production Facilities

Facilities for smallpox vaccine production are presently operative at Lagos (Yaba Laboratory) and Dakar. On the basis of past experience, a few, large vaccine production centers are to be preferred. In a large production facility, more adequate supervision is possible thus insuring a better quality of vaccine. The Yaba Laboratory is capable of large scale production of vaccine of acceptable potency but the vaccine contains a bacterial count too high to permit its use in jet injection equipment. Although technical assistance to this laboratory is planned under this Project to improve both the quality and quantity of production, Dr. Colin Kaplan, Director of the Lister Institute and long-time consultant to this facility, believes for a variety of technical reasons, that a vaccine of sufficiently low bacterial count to permit its use in jet injectors is not technically possible. The situation regarding the capability of the Dakar Laboratory to produce smallpox vaccine for jet injection is not yet clear. Efforts will be directed to raising standards of production of smallpox vaccine at Yaba and Dakar to fulfill all multiple puncture vaccination needs during the maintenance programs.

H. Relationship of Project Program to Regional Organizations

The Project in all stages of its evolution to date has been developed in the closest consultation with the World Health Organization.

In preparation for the major global eradication program, the World Health Organization in the summer of 1965, divided Africa for operational purposes into two Areas, designated "West Africa" and "East Africa". West Africa constitutes the 19 country group in this Project excluding Brazzaville Congo. WHO Medical Officers were assigned to Area headquarters in Monrovia and Nairobi to begin the development of operational plans. These plans have been duly considered and variously incorporated into the presently proposed program. Specific project agreements and more detailed planning in subsequent years will be developed in collaboration with WHO Regional and country representatives.

In discussion with the Director-General, it was agreed that with approval of the Project, the United States should assume principal responsibility for the conduct of the West African Area program. It was agreed that relocation of the WHO staff presently in Area Headquarters in Monrovia to the site of the Headquarters of the Regional Project would be carried out. This will facilitate effective cooperation and will permit a free exchange of important technical data pertinent to the programs in East and West Africa. Additionally, WHO agreed to support local costs for campaigns in particular countries in West Africa where inadequate local costs pose the major barrier to implementation of the program. WHO agreed to support local costs for campaigns in particular countries in West Africa where inadequate local costs pose the major barrier to implementation of the program. WHO agreed, further, to the joint sponsorship of a conference this year to include the principal representatives of each of the participant Project countries. This has been tentatively scheduled for April 29-30 in Geneva. Formal written agreements with WHO with respect to these several points will be consumated in the near future.

The proposed program has been discussed at length with the Secretariat of the OCCGE and OCCGEAC and has received their enthusiastic approval. Close liaison with these two organizations will be maintained by the assignment of senior medical staff officers to Upper Volta and to the Cameroons. Plans will be made for senior staff who are fluent in French to attend all technical meetings of these organizations for continued dialogue regarding the progress of the program. At present, both organizations serve primarily to sponsor forums for the discussion of common problems in communicable disease control and as directorates for the conduct of specific research at specialized institutes. Since neither conduct operational programs at the country level, the operational aspects of the Project will be handled on a bilateral country basis in general accord with the wishes of the organizations' members. Should either organization in the future indicate a desire to participate directly in operational programs at the country level, every effort will be made to adjust the administrative aspects of the Project to take cognizance of this.

It has been proposed by Mr. Barrows, American Ambassador to the Cameroons, that support to a program in Brazzaville Congo might be directed through the OCCGEAC group. This possibility will be explored in the coming year.

I. Regional and Headquarters Project Staff Activities

A Regional Office for this Project will be established in Lagos staffed by two medical officers, two administrative officers, an equipment specialist, a statistician, a health educator, a virologist, and necessary supporting staff.

As previously noted, the WHO will shift its West Africa Area headquarters from Monrovia to Lagos and will assign a medical officer and secretary to the Regional Project Office to serve in a coordinative liaison capacity.

The Regional staff will be expected to travel extensively throughout the region to insure that the programs are running effectively and to make such suggestions or adjustments of personnel or equipment as to insure the optimal operation of the separate programs. Within this context, the staff will develop arrangements between countries to coordinate programs along the border areas where nomadism is prevalent; consult with assigned Project staff regarding the development of plans for subsequent year's programs; arrange for specific operational field research studies; consult with and train, country staffs in specific surveillance and assessment methods, in health education, and in equipment maintenance. At the Regional headquarters, a reserve supply of equipment will be maintained which can be mobilized quickly and dispatched where indicated. The Regional Project staff will be responsible for the distribution of information to the respective countries detailing the current status of first smallpox and later measles; the progress of campaigns; new developments in methodology and scientific findings. The staff will also serve as an emergency personnel resource for problem areas. The virologist will be specifically responsible for upgrading the Yaba Laboratory, for the institution of smallpox diagnostic centers throughout the area and for continuing support to these laboratories to insure their optimal performance.

The necessity for such a Regional Project staff was repeatedly stressed by AID Mission personnel, WHO Regional Office and country representatives. Lagos was unanimously recommended as most ideal since it places the resources of the Regional Project Office in close proximity to a country program which constitutes fully 50 percent of the overall effort; transportation to and from Lagos is as optimal as anywhere in West Africa; Lagos also is the site of the regional supply center for the American Embassies and AID Missions in West Africa. Further, the Yaba Laboratory is located in Lagos along with substantial available laboratory and office space in an adjoining compound.

The Project Headquarters Staff in Atlanta will be supplemented at no cost to the Project by additional CDC personnel currently working on smallpox problems both in the laboratory and in the field. The Headquarters staff will be responsible for overall policy guidance for the program, coordination and liaison with AID and other organizations conducting programs in West Africa of immediate pertinence such as the Public Health Service, Peace Corps, Crossroads Africa, etc.; special studies and evaluations of

an operational type will be pursued in West Africa or other areas as appropriate; reference, operational and instructional manuals pertaining to the diagnosis of smallpox, laboratory methodology, statistical assessment, surveillance and operational procedures will be developed. The Headquarters Project Laboratory will serve as the principal resource for a variety of studies pertinent to the most efficient operation of this Project, many of which have previously been detailed. The Headquarters staff further will serve to recruit and train personnel for the program, undertake negotiation and procurement of commodities and arrange their transport. They will provide substantial direct consultation and assistance to the Regional Project Office and country Project personnel.

Regional and Headquarters Project staffs functioning effectively in this overall activity can be expected to effect overall savings which should largely repay costs relative to their establishment. With only brief exploration of operational methods currently employed in the AID measles programs, it is abundantly clear that a more efficient program at substantially reduced cost can be carried out.

J. Technical Staff Assigned to Countries

An Operations Officer will be assigned to each country in which a program is to be conducted and in each of the regions of Nigeria, each of which is more populous than many of the participating countries; a Medical Officer will be assigned to each of the major countries and to each Nigerian region. Planned assignments for FY 67 are as follows:

Country	Population (millions)	Medical Officer	Operations Officer
Cameroon	4.6	1	1
CAR	1.3	1	1
Chad	2.8	1	1
Congo Brazzaville	1.0	Planning Deferred	
Dahomey	2.3	1	1
Gabon	0.5	0	1
Gambia	0.4	For FY 68	
Ghana	7.4	For FY 68	
Guinea	3.5	1	1
Ivory Coast	3.7	0	1
Liberia	1.1	For FY 68	
Mali	4.7	1	1
Mauritania	1.0	0	1
Niger	3.2	1	1
Senegal	3.5	For FY 68	
Sierra Leone	2.3	For FY 68	
Togo	1.7	1	1
Upper Volta	4.8	1	1
Nigeria	55.7	1	1
Northern Region	29.8	1	2
Mid-Western Region	2.5	1	1
Eastern Region	12.4	1	1
Western Region (incl. Lagos)	11.0	1	1
Total		14	18

Technical assistance has been provided to AID by CDC in a number of measles vaccine campaigns during the past two years. Medical officers assigned were principally occupied throughout the consultations in seeking to locate supplies and material ostensibly dispatched to the country but lost in transit or never shipped at all; in locating miscellaneous spare parts for various types of equipment and repairing the equipment or facilitating its repair; and in instructing vaccinators in the use of equipment. Time to provide more constructive assistance and advice in the conduct of campaigns was limited at best. Past experience thus dictates the necessity of assigning an operations officer to each country. This officer will be responsible for carrying out minor mechanical repair and maintenance of vehicles, jet guns and refrigeration equipment and expediting supply problems; he will also provide basic training to vaccinators in use and preventive maintenance of vehicles, guns and refrigerators. The operations officer will be responsible with the medical officer in the planning and conduct of the mass campaigns and maintenance programs, in establishing the surveillance activities and in the broader assessment program.

K. Training Program

Personnel for this Project not already employed under the FY 66 PASA will be brought on duty on or about July 1, 1966. During July and August all will be provided an intensive program of training and orientation which will include: discussions of the plans, objectives, and methodology of the SPE/MC Project including principles of mass campaigns, surveillance and assessment; principles of field epidemiology; the organization and development of preventive medical services in West Africa; the geography, history, sociology and political structure of West Africa; administrative details pertinent to this program and a discussion of personnel problems and living conditions to be encountered in West Africa. Instruction and training pertinent to the mechanical equipment will be provided to all personnel with more detailed instruction to be given all operations officers.

Since French is a "must" in the Francophone areas, provision will be made for adequate language training. Since such training normally might extend eight weeks or more, preference in assignment will be given to those with capability in French. Some training may be given prior to their entry on duty in July 1966, to shorten the training period.

In the overall training program, special consultants with particular skills or knowledge will be employed to conduct many of the phases of training. Tentative agreements for assistance in this training have been reached, for example with Dr. Weaver and his staff, Atlanta University, who are responsible for much of the West Africa Peace Corps training; Mr. Estes, American Ambassador to Upper Volta; and several on the staff of the London School of Tropical Medicine who have been instrumental in the development of health services in West Africa.

L. Equipment - Special Notes

In addition for the responsibility of carrying out this program, the Public Health Service will also be fully responsibile for the procurement of supplies and equipment. This should facilitate the operational aspects substantially.

1. Transport - The experience of the past two years has amply demonstrated that the simplier the vehicle, the more practical it is for field use in terms of maintenance and servicability. Further, the cost of the standard carry-all type vehicle, much employed by Service des Grandes Endemies teams, is about half that of the more elaborate vehicles provided by AID for the measles programs in recent years. Since American vehicles must be purchased and since parts and repair facilities for such vehicles are rare to non-existent in West Africa, the American vehicles constitute essentially a financial and operating liability. Accordingly, spare parts must be provided and stockpiled in profusion; in addition, a vehicle in reserve for every two operating is felt to be a necessity.

   Provision for transport of assigned technical personnel must also be made. A station wagon type vehicle has been generally advised.

   In some areas along the coast, motor launches will be required to reach certain villages and population groups. Only a rough estimate of actual needs for launches can be ascertained at this time. In addition, as experience is gained in the operational logistics of the program, a limited supply of bicycles or motorcycles may be indicated for advance propaganda teams. None, however, are provided for under the current plans.

   The makes of vehicles preferred for the different countries will be determined in consultation with GSA which is endeavoring to standardize on particular makes in different countries for all operating agencies.

2. Vaccines

   a. Measles - Two principal types of measles vaccines are available and have been made available to date in the AID measles programs. The Edmonston B vaccine, the first to be developed, provokes approximately twice the frequency of marked febrile responses (temperatures over 103°F.) as does the further-attenuated (Schwarz) vaccine. However, a higher antibody titer is produced by the Edmonston B vaccine but whether this is important so far as the durability of protection is not known. From experience with other virus diseases and from scientific studies to date pertaining to this question, it is not felt to be of significance.

In the Francophone countries, Edmonston B vaccine has been determined to be quite safe and practical for mass use. Most tend to favor using this vaccine in their programs. In Nigeria, Sierra Leone and Gambia, however, health officials have been very concerned that the high frequency of marked febrile responses (30 percent) would cause their limited health resources to be overburdened by children with fevers shortly following a mass campaign. Despite studies to the contrary and the favorable experience of the former French countries, vocal advisors to the Nigerian and Sierra Leonean governments are strongly opposed to the use of the Edmonston B vaccine.

Ideally, it would be best if each government could indicate the vaccine strain it prefers. AID officials, however, have been concerned that with only one producer of the Schwarz strain vaccine, the monopoly position would cause the company to elevate the price sharply. The present price of about $.10 per dose was in fact over twice this figure when Merck, Sharp and Dohme held a monopoly position for measles vaccine. This was, of course, prior to the availability of the more recently developed Schwarz strain.

This problem must yet be fully explored. Politically, however, it would be preferable if the country were given the option as to the vaccine type rather than to be informed that "you will take what we give you".

b. Smallpox - Vaccine either for multiple puncture inoculation or administration by jet injection will be provided. As previously noted, some smallpox vaccine for multiple puncture use will be produced at Lagos, Nigeria, and Dakar, Senegal. Hopefully, in the second year of the program, most of the vaccine for multiple puncture use will be provided by these laboratories.

3. Refrigeration - To date in the measles vaccine programs, refrigeration both on the trucks and at base depots has been provided to store measles vaccines. Provisional data, presently being investigated in a series of complex laboratory studies at the Communicable Disease Center (CDC), suggest that actual refrigeration equipment in the trucks can be replaced by styrofoam-type containers with cooling bags. This simplification in the logistics should result in substantial savings and make the programming much easier.

4. Jet Guns - Present experience suggests that the fewer the numbers of types of equipment, the better. Although two types of jet guns are available, the "Ped-O-Jet" presently appears to be the most versatile for general use. Until subsequent experience indicates that the slower but more portable hand model jet injector could be effectively used, principal reliance will be on the Ped-O-Jet. Simplified manuals for its operation and maintenance are now under development at CDC and will be provided in French. Promising

simplfied sterilization techniques which will result in less wear and tear on the gun are also currently being tested at CDC. It is anticipated that with a better manual, more adequate and continued training of local vaccination personnel by technical assignees of the Project, and an equipment specialist at the Regional Project Office to handle more major problems that the guns will have a more extended and functional life span.

Electrically powered jet injectors previously provided to a number of the countries by AID will be dismantled to provide additional spare parts which are largely interchangeable with the Ped-O-Jet. This will permit full discontinuation of generators on the trucks presently used to power these guns and the refrigerators.

5. Miscellaneous - Field equipment, such as tents, cots, etc., provided in the past has been "more adapted for tourist use" as expressed by one French medical officer. More durable Army-type equipment will be provided with a less complex array of miscellaneous items.

Battery operated "bull horns" will be substituted for more complex amplification equipment.

M. Miscellaneous

1. Local Costs - Under some circumstances, it may be impossible for the governments of participating countries to provide all of the necessary local costs. Since AID policy will not permit the SPE/MC Project to provide such support at this time, WHO has indicated that it might be able to do so at least on a limited basis to selected countries.

2. Local Hire - Provisions must be made in the Project for local hire of clerical, interpreter, driver, laborer, and other services in support of technical Project personnel. In some instances, it may be possible to hire locally, skilled secretarial or professional talent from among African, American or others.

3. Local Funds - Provision must be made in each country Project Agreement for local funds for miscellaneous emergency and petty expenses without reference to the Lagos Regional Project Office or Atlanta Headquarters.

4. Participant Training - Provision must be made for the special training of country Nationals in epidemiology, laboratory procedures, equipment maintenance, etc., either in the Lagos Regional Project Office or in the U.S. Most training, however, will be conducted in the respective countries.

5. Country Intelligence - Information on the geography, history, political development, medical facilities and programs, etc., will be gathered by field personnel and transmitted to Atlanta. From this source, and other sources in the United States, information of value to

the SPE/MC program will be compiled and made available to the field.

N. Specific Country Plans

As previously described, the health structures and capabilities of each of the countries differ. Plans accordingly must be tailored to secure maximum utilization of these resources and to meld the SPE/MC Project program into functioning health structures so that it may have durability beyond the five-year projected period of the Project. This can be effectively accomplished only when an intimate working knowledge of the country's health programs has been achieved. Fully 6 to 12 months will be required. Desirable redirection of highly structured existing programs, particularly various of the Services des Grandes Endemies, will require time, tact and imagination. A map depicting areas where programs will be conducted during FY 67 is presented as Figure 3.

Programs which will be initiated in the 12 Francophone countries during FY 67 will initially have to correspond closely with current program practices. It is planned therefore not to propose a deviation from the already formulated, current plans of operations in these countries during FY 67. Assigned Project personnel, after having achieved acceptance and professional recognition and after acquisition of knowledge of the programs, will be able to work constructively with local authorities to develop more definitive program plans after the first year.

Nigeria, as described in the letter from the Permanent Secretary (see before) and as verified by the WHO West Africa Area Smallpox Director, has been formulating plans during the past two years. Fundamentally, the program as now envisaged incorporates the concept of small scale pilot programs in each Region of that country to be initiated in November and December, 1966. These pilot projects will be expanded progressively to include increasing numbers of teams by incorporation of former members of the yaws teams and others as the yaws program is phased out. Training of vaccination teams is expected to proceed concomitant with the expansion of the program; detailed methodology will be evolved as the program expands. The program will be under the overall direction of the Nigerian Federal Ministry of Health who will finance a portion, perhaps all of the local costs although for administrative purposes, the program will be conducted on a Regional basis. The concept proposed is sound; assurance must be provided, of course, as with each of the other participating country projects, that the government is willing to provide necessary local costs for the program.

An overall, country-by-country estimate of costs under this Project has been prepared for each of the five years of planned operations. It must be understood, of course, that this represents the best current estimate of the situation and needs. Periodic revisions will be requisite. Country visits by CDC staff during January-April, 1966, may be expected to

alter the FY 67 estimate by perhaps 10 percent but as material changes are anticipated.

Specific considerations pertaining to each of the countries are provided below:

1. Ivory Coast, Togo, Mauritania (Tables A9, A12, A17)

In these countries, sufficient measles vaccine has been provided in recent AID programs to vaccinate about 50 percent of the estimated population between 6 months and 6 years of age. An additional 50 percent of the population can be done in FY 67 following which maintenance programs will be continued. During the maintenance phase, measles vaccine sufficient for the newborns will be provided. Newborns each year represent about 4 percent of the population. Allowing an additional small quantity of vaccine for local outbreak control and some inadvertent loss, it is estimated that during the maintenance phase, an amount equivalent to 5 percent of the population should be provided annually.

For the smallpox vaccination program, these countries, with moderately well-developed Services des Grandes Endemies, have indicated a desire to integrate the smallpox vaccination activity with the functions of the mobile multi-purpose treatment teams using multiple puncture vaccination (see previous). Annual vaccination of about one-third of the population is planned. Using consistently high potency smallpox vaccine in their programs, these countries should accomplish eradication with reasonable facility.

Primary emphasis in these countries will be to increase the efficiency of the multi-purpose mobile teams to develop assessment and surveillance mechanisms and to initiate sound maintenance programs.

2. Chad, Upper Volta (Tables A3, A18)

Measles vaccine was provided by AID to Chad in FY 66 sufficient for vaccination of about one-third of the population between 6 months and 6 years of age. Upper Volta carried out an extensive measles vaccination program early in 1962 but established no maintenance program. Measles control was good until late in 1965 when accumulating numbers of unvaccinated newborns provided fertile soil for the development of outbreaks once again. Measles vaccine sufficient for about one-third of the 6 month to 6 year old population was again provided by AID to Upper Volta during FY 66.

For these two countries, measles vaccine sufficient for the vaccination of approximately one-third of the susceptible children has been provided for both FY 67 and FY 68. Vaccine for the maintenance phase has been calculated by the same formula as for the countries in Category 1.

Other comments pertinent to smallpox vaccination and program emphasis described under group 1 pertain also to these countries.

3. Central African Republic (Table A2)

Measles vaccine plus some supporting equipment were purchased for the C.A.R. during FY 66. Delays in delivery, however, precluded the initiation of a program in this country during FY 66. Additional vaccine will be provided during FY 67 to permit vaccination of approximately half the estimated proportion of susceptible children during FY 67 with the remainder scheduled for vaccination during FY 68.

Comments relating to maintenance vaccination programs for measles vaccine, smallpox vaccination and program emphasis for countries in group 1 are also pertinent to the Central African Republic.

4. Dahomey, Guinea, Mali, Niger (Tables A4, A8, A11, A13)

Each of these countries is reporting substantial numbers of smallpox cases, a reflection in part of less efficient Services des Grandes Endemies. All, in the past two years, have received sufficient measles vaccine from AID to vaccinate half of their estimated susceptible childhood population.

In these countries a program involving simultaneous administration of measles and smallpox vaccines is highly desirable and can be implemented with reasonable facility. With the limited resources available in each of these countries, however, the program must be simplified if success is to be realized. For these countries, therefore, it is planned from the inception of the Project in FY 67 to implement a plan whereby all areas are visited for vaccination purposes once every three years. Sufficient smallpox vaccine to vaccinate one-third of the population annually has been planned (as in the other OCCGE countries) and adequate measles vaccine for previously unvaccinated measles susceptible children (quantity estimated at 5 percent of the total population as previously described). Although initial coverage of the population will require three years for completion, this plan of operation is more applicable for these countries than a more significant major effort to effect coverage in a shorter space of time.

In each of these areas, substantial training and supervision of local personnel will be required to bring them up to the standard of those described in the previous categories.

5. Gabon, Senegal (Tables A5, A15)

No vaccine or equipment has yet been provided by AID to either country. The pattern of the conduct of the programs in these two countries will be similar to that described for the countries in group 1. Vaccine sufficient

for about 50 percent of the estimated susceptible children will be provided to Gabon in both FY 67 and FY 68 and in Senegal in FY 68 and FY 69. Maintenance programs will follow the mass vaccination efforts.

Service des Grandes Endemies activities in Senegal are comparatively advanced such that the principal efforts in this Project will be directed toward surveillance and assessment activities. In sparsely populated Gabon, all facets of the program will require substantial strengthening.

6. Nigeria (Table A14)

The program in Nigeria will involve the simultaneous administration of smallpox and measles vaccines. The operational plan has previously been commented upon and implementation will follow along the general lines already evolved by the Federal Ministry of Health. It is anticipated that about 20 percent of the population can be covered during FY 67 if pilot projects are developed beginning in November and progressively expanded in an orderly manner.

At present, it is anticipated that smallpox vaccination maintenance programs for the English speaking countries, including Nigeria will differ from those in the Francophone countries. It is probable that maintenance programs providing vaccination for the newborns only plus limited periodic mass programs in major urban areas will provide adequate protection for the population if continent-wide eradication can be achieved within the next 10 years. This must, of course, be assessed. Thus, smallpox vaccine for about 5 percent of the population annually has been estimated as a continuing need. Although a similar program should also be effective in the Francophone areas, the concept of annual vaccination of one-third of the population is deeply ingrained in the French speaking areas and within the context of the established Services des Grandes Endemies can probably be realized with reasonable facility.

The maintenance program will be multi-faceted in approach employing both permanent health units and mobile teams which will visit each area in the country every three years.

7. Ghana (Table A7)

Although it has not yet been possible to discuss the program in detail with Ghanian officials, it can be anticipated that the general type of program conducted in Nigeria will be applicable to Ghana since both countries have reasonably similar health structures. Specific plans for initiating a program in FY 68 will be developed by staff of the Regional Project Office when permission is given by the State Department to initiate discussions.

8. Gambia (Table A6)

The mass campaign phase of the program in this very small enclave can easily be completed over a one year's period if some advance planning is done during FY 67 by the Regional Project Office staff. Maintenance programs for newborns for measles and smallpox vaccines would be carried out subsequently in the pattern of Nigeria.

9. Liberia, Sierra Leone (Tables A10, A16)

In both countries, combined programs in measles and smallpox vaccination will be conducted with approximately 40 percent coverage planned in FY 68 and 60 percent coverage in FY 69. The status of health services in these countries is such, however, that some local cost support may have to be sought from WHO or other sources. The maintenance program will be conducted as in Nigeria.

10. Congo Brazzaville

Since the United States has no diplomatic relationships with this country, the conceptualization of plans requires further clarification of the political climate. No projections have been made.

Summary of Needs and Costs

Table A summarizes the presently estimated overall needs of the Project for the individual country programs by year. The cost estimate of these needs is presented in Table B.

O. Alternate Courses of Action

As in any international program of this character which involves the participation of a number of different countries, various problems may arise which involve a delay in implementation of specific programs in the different countries. It is highly doubtful, however, that this program would experience more than a temporary delay in implementation in any of the countries. As pointed out by the Director-General of WHO in a meeting with Mr. Hutcheson in November, 1965, the political, economic and quarantine pressures exerted by adjacent countries on a neighboring country with endemic smallpox would soon cause it to respond with an active program of its own.

Should there be a delay in the signing of project agreements for FY 67 with any of the 12 Francophone countries, personnel otherwise programmed for these countries would be assigned temporarily to the Regional Project Office. They would assist in whatever manner was appropriate in facilitating the signing of agreements with the countries in which delays were being experienced and would serve as additional technical resource personnel for the development of programs in alternate areas. Should a protracted delay be anticipated, these technical people would be appropriately reassigned to programs in need of additional support; supplies and equipment intended for the country in question would be diverted to the Regional Project supply pool.

If it were not possible, because of civil strife, to embark upon the Nigerian project during FY 67, a more radical alternation in the Project plan of action would be required. Immediate steps would be taken to implement project agreements for FY 67 with Liberia, Sierra Leone, Gambia and Senegal. From present knowledge, it would be feasible to consumate agreements with these countries within a comparatively brief span of time. Personnel and supplies intended for the Nigerian country program would be diverted to these areas. It would not, however, be possible to carry out the mass vaccination programs in either Liberia or Sierra Leone in the two-year period, FY 68-FY 69, as presently planned. Realistically, a 20 percent coverage during the first year would be maximum with completion of the mass program over the subsequent two-year period.

So far as alternate locations for the Regional Project Office, no other site represents better than a third choice. Even if the Nigerian program were to be delayed a year, the advantages of the Lagos site are so compelling as to dictate the establishment of the Regional Office in Lagos from the inception of the Project. If civil strife precluded the establishment of the Office in Lagos, the Liberian Institute of Tropical Medicine would be the best alternate. Adequate buildings for offices, laboratories and housing are now available and unoccupied. The Government of Liberia has informally indicated its interest in making this available to the Project.

O. Estimates of Cost for Regional and Headquarters Offices

Estimates of cost for the Regional and Headquarters Office are presented in Tables C and D, respectively. The cost estimates for the Regional Office are derived from detailed budget estimates kindly provided by the Assistant Executive Officer of the AID Mission in Lagos at the time of the visit of Communicable Disease Center consultant personnel in December, 1965. Provision has, in addition, been made for an emergency and contingency pool of supplies and equipment. Only a very rough approximation of needs can be provided, of course, beyond the first year. Appendices to each of these tables provide a more detailed explanation as to the derivation of these estimates.

The overall cost of the entire project by year is presented in Table E.

P. Local Country Contributions to the Project

To assess the extent of local costs to be contributed by each country to this Project is difficult for, as pointed out, many of the programs will incorporate certain of the vaccination activities into present multi-purpose functioning programs. Cost accounting under such circumstances is difficult.

In countries somewhat more advanced than those in Africa, the WHO calculates that local costs for a mass vaccination program are approximately $.07 per dose of smallpox vaccine administered by the multiple puncture method. In Africa, because of transportation problems and less adequate personnel, this cost would normally be expected to be greater. However, with jet injection equipment, a compensatory saving would be anticipated. Recent AID measles vaccination programs suggest that a figure of

approximately $.06 per dose of vaccine administered represents the approximate magnitude of local costs in a mass program using jet injectors.

In programs in which both measles and smallpox vaccines are administered at the same time, or in which smallpox is administered as part of a multi-purpose mobile team activity, a substantial saving is realized in transport, personnel and supporting service costs in relation to the costs involved if each vaccine were administered as an individual separate program. The proportionate saving, however, is not known. For purposes of deriving an estimate of local costs for this Project, the cost of administering a vaccine as a second procedure or as part of another program is estimated to be $.02.

Table F presents the best available approximation of local costs for each country for each year. It should be recognized, of course, that within the present context of the Services des Grandes Endemies of the Francophone countries and the yaws eradication projects in Nigeria, a variable but frequently substantial portion of these costs already being budgeted by the individual countries.

IV. Progress to Date

A. Measles Program - AID

In 1961, the Division of Biologic Standards, Public Health Service, conducted a limited trial of measles vaccination in 200 African children. The results were so successful that Dr. Lambin, Minister of Health, Upper Volta, requested AID's assistance in performing a mass measles vaccination campaign throughout Upper Volta. Two scientists were provided to this project by the Division of Biologics Standards; the Merck Company donated the then unlicensed, experimental vaccine; and AID funded (FY 61) $43,000 for vehicles, jet guns, supplies and equipment. The campaign was carried out in the autumn of 1962; 732,000 children were vaccinated.

The success of the program in Upper Volta led six additional countries (Dahomey, Guinea, Ivory Coast, Mali, Mauritania and Niger) to request assistance in conducting similar programs. In FY 63, AID allotted $230,000 for demonstration and training projects in these countries. These were conducted as a regional project in collaboration with the OCCGE. In FY 64, AID allocated $1,478,000 for mass vaccination programs in these countries; sufficient vaccine was provided to vaccinate 25 percent of the estimated susceptible childhood population.

In FY 65, programs were continued in each of these countries and assistance was extended to five other countries, Cameroon, Central African Republic, Chad, Togo and Upper Volta, to vaccinate a portion of their susceptible populations. No program, however, was carried out in the Central African Republic because of an unanticipated delay in delivery of the necessary commodities.

Of the 11 programs in FY 65, seven are being serviced in part through the OCCGE, an organization composed of eight West African countries and France (Guinea, formerly a ninth member is regarded by the Organization as a member but does not so regard itself). The OCCGE serves to provide a forum for the exchange of information regarding endemic disease control and as an informal coordinating mechanism for disease control campaigns. This year a similar organization, the OCCGEAC (OCCGE for Afrique Centrale) has been formed (see previous). Presently, however, arrangements for AID measles programs in the OCCGEAC countries, Chad, Cameroons, and Central African Republic, are being carried out on a bilateral basis.

During FY 64 and FY 65, the Communicable Disease Center, Public Health Service, has provided technical assistance to AID for programs in each of the countries where measles vaccine was offered. Thirteen medical officers will have spent a total of over 36 months in all in West Africa during FY 64 and FY 65 on technical consultant missions.

B. Smallpox-Measles Program

As noted under the Project Justification Section, the President of the United States at the World Health Assembly in May, 1965, pledged the support of this country "for an international program to eradicate smallpox completely from the earth within the next decade."

The possibility was subsequently explored that the West African measles vaccine programs sponsored by AID might be extended to include smallpox vaccination and eventually smallpox eradication. A series of exploratory meetings were held between representatives of the Public Health Service and AID which led to the presentation on August 20, 1965 of a formal proposal to the Administrator by Dr. Luther Terry, then Surgeon General of the Public Health Service. Dr. Terry indicated that the Public Health Service was willing to undertake, through a Participating Agency Service Agreement, a program for the eradication of smallpox and the control of measles in 18 West African countries.

During the week of August 30, 1965, Mr. Milton Segal, Assistant Director-General of WHO, and Dr. Karel Raska, Director, Communicable Disease Division, WHO, visited Washington and discussed the proposed Project at length with AID and Public Health Service officials. In early November, 1965, Dr. Marcelino Candau, Director-General, WHO, also discussed this Project at length with AID and Public Health Service officials in Washington. Dr. Candau stated that smallpox eradication activities were wanted and would be acceptable to the governments to whom assistance was offered.

From these various meetings, it was concluded that a Project for smallpox eradication and measles control in the 18 countries of West Africa was a feasible undertaking. The 18 countries, representing a cohesive entity, were felt to be susceptible both technically and administratively to complete eradication of smallpox.

This project was submitted to and subsequently approved by the President of the United States in late November. An announcement of this offer of assistance was made to each of the 18 countries in

late November. In late December, 1965, following the announcement of the President offering assistance to 18 countries, a special request was made to AID and subsequently agreed to that Congo Brazzaville would also be included in the overall Project.

Over a four-week period in late November and early December, two Communicable Disease Center medical staff, and AID official and a special consultant discussed the Project at length with representatives of the countries concerned (except for Ghana, Congo Brazzaville and Gambia) at a ministerial meeting of the OCCGE at Ouagadougou, Upper Volta; at a technical staff conference of the OCCGEAC in Yaounde; and through separate discussions with health officials in Nigeria, Liberia, Sierra Leone and Guinea. The team also discussed the Project at length with WHO staff from the African Regional Office, the West African Area Smallpox Eradication Office and with Dr. Candau and his staff in Geneva.

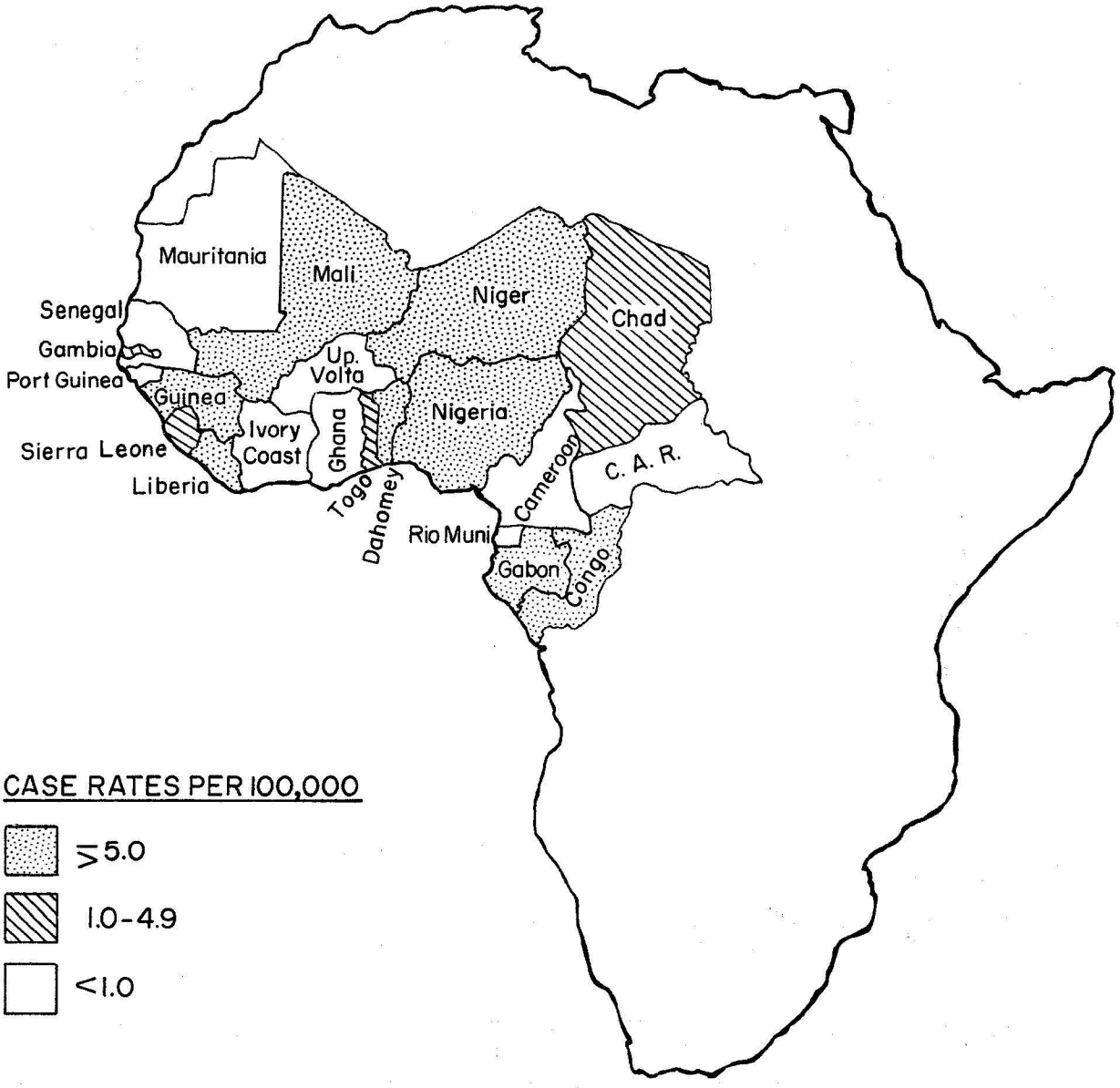
A PIO/T was issued on January 1, 1966, to the Communicable Disease Center providing funds for a headquarters staff which would be responsible for determining requirements of the Project, establishing guidelines and program plans for the conduct of the program, assisting the USAID Missions in the preparation and negotiation of project agreements with the respective countries, etc.

In late December and early January, a proposed plan for implementation of the Project as a whole was evolved at the Communicable Disease Center based on the considerable experience of the technical consultants to the AID measles programs over the past two years, advice and information provided by WHO Headquarters, Regional Office and West African Area Smallpox Advisors, and the month-long series of discussions with representatives of the individual countries. This plan was discussed in detail in a special week-long program planning conference in Atlanta attended by CDC staff, special consultants and a member of the WHO Smallpox Eradication Unit from Geneva and presented for comment at a meeting with various AID staff members at a special meeting in Washington on January 13.

The plan of operation described in this Project is based on a now substantial body of information and experience tempered by the views and opinions of a great many persons with considerable expertise and a broad background of personal knowledge of immunization and West African problems. As such, it represents a best appraisal and forecast as of today. The plan, however, is not regarded as a final blueprint to be followed irrevocably over the next five years. Constant modification to adapt and to improve must proceed throughout the program.

Figure 1

REPORTED SMALLPOX MORBIDITY - WEST AFRICA AVERAGE ANNUAL CASE RATE, 1964-65*

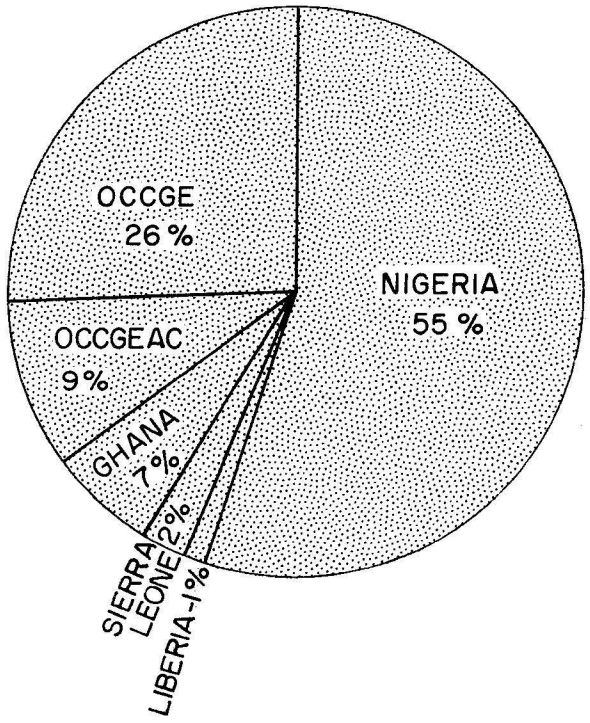


*FROM WHO REPORTS THROUGH DECEMBER 31, 1965

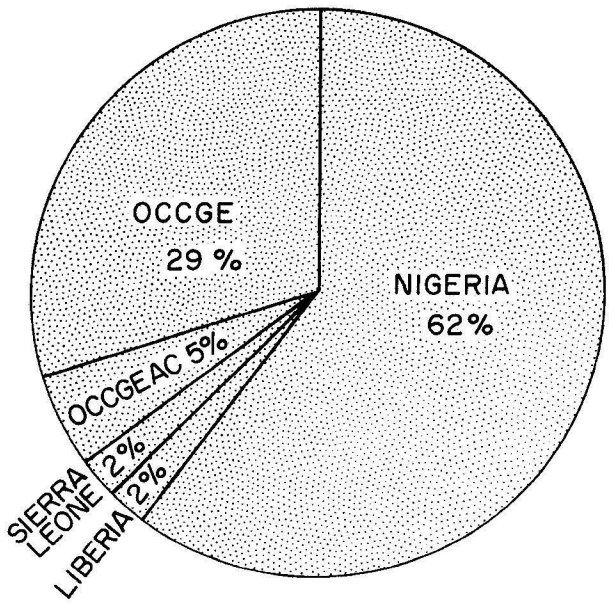
Figure 2

BACKGROUND DATA
19-COUNTRY SPE/MC PROGRAM, WEST AFRICA

POPULATION*
PER CENT DISTRIBUTION



REPORTED SMALLPOX MORBIDITY**
PER CENT DISTRIBUTION



* LATEST AVAILABLE WHO ESTIMATE. (GAMBIA NOT SHOWN AS IT COMPRISES <1% OF THE POPULATION)

** LATEST AVAILABLE WHO REPORTS FOR 1964-65. (GHANA AND GAMBIA NOT SHOWN AS THEY COMPRISE <1% OF THE REPORTED SMALLPOX MORBIDITY)

NOTE: OCCGE COUNTRIES INCLUDE DAHOMEY, GUINEA, IVORY COAST, MALI, MAURITANIA, NIGER, SENEGAL, TOGO, AND UPPER VOLTA.

OCCGEAC COUNTRIES INCLUDE CAMEROON, CENTRAL AFRICAN REPUBLIC, CHAD, CONGO, AND GABON.

Figure 3

WEST AFRICA SPE/MC PROGRAM PLAN OF OPERATION - FY 1967

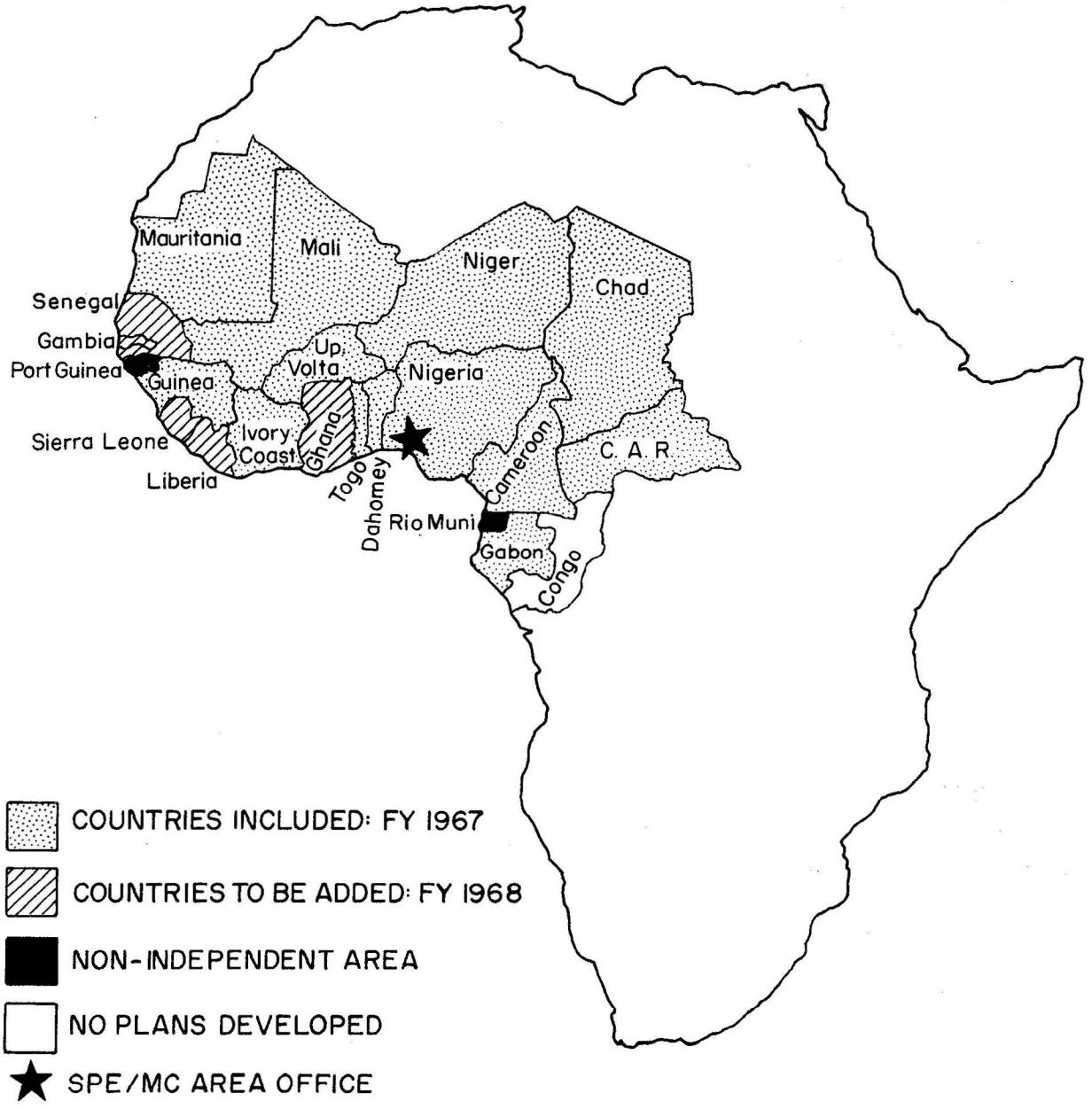


Figure 4

WEST AFRICA SPE/MC PROGRAM
ALTERNATE PLAN OF OPERATION - FY 1967

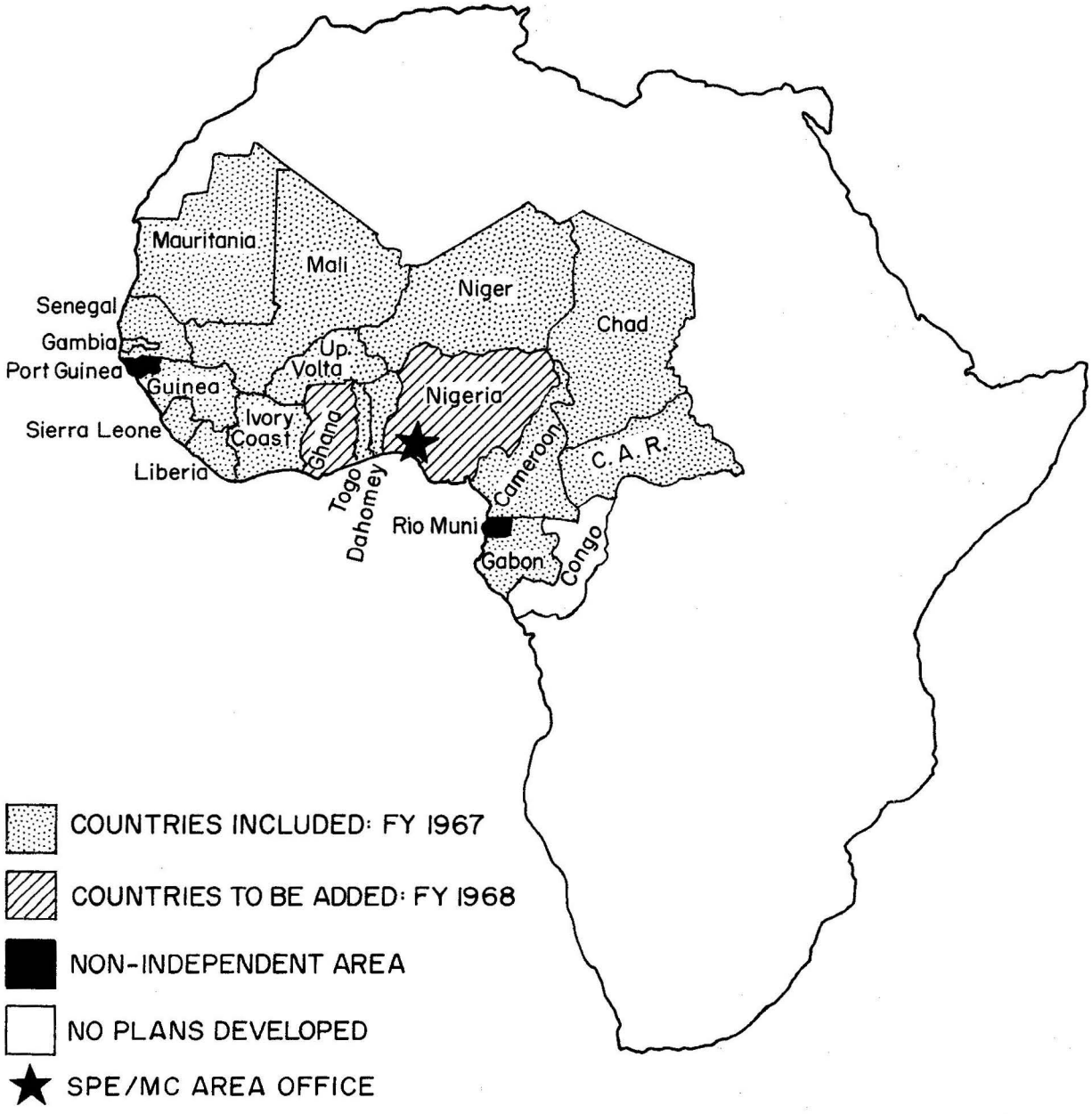


Table 1

West Africa - Hospital and Medical Center Establishments

Country	Total Hospitals	Number Medical Centers*
Cameroon (1962)	458	336
Central African Republic (1960)	106	35
Chad (1961)	128	124
Dahomey (1960)	34	?
Gabon (1962)	34	?
Gambia (1961)	8	2
Ghana (1960)	39	?
Guinea (1960)	57	33
Ivory Coast (1958)	427	326
Liberia (1960)	31	?
Mali (1961)	42	36
Mauritania (1961)	24	14
Niger (1961)	?	?
Nigeria (1961)	1217	908
Senegal (1961)	38	31
Sierra Leone (1961)	?	?
Togo (1961)	38	?
Upper Volta (1962)	93	82

*These are small medical units not provided with hospital equipment but nevertheless with some beds for the treatment of patients (dispensaries, infirmaries, etc.).

Source: Annual Epidemiological and Vital Statistics Report - 1961 (WHO)

Table A

Composite Table - Estimate of Needs
for 18 Countries (excluding Congo Brazzaville)
By Item and Fiscal Year

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	4,904	8,366	8,470	5,795	5,435	32,970
Doses of Smallpox Vaccine (000's)	25,281	43,541	45,476	19,421	16,541	150,260
Vaccination Certificates (000's)	26,759	45,145	46,791	20,736	17,776	157,207
Vehicles						
Carryalls (No.)	74	68	80	28	76	326
Transport Vehicles (No.)	32	9	32	8	27	108
Vehicle Spare Parts (units)	120	183	189	148	139	779
Jet Injectors (No.)	188	331	342	186	170	1,217
Jet Injector Spare Parts (units)	188	331	342	186	170	1,217
Refrigerators (No.)	120	77	112	36	103	448
Field Equipment (units)	120	77	112	36	103	448
TECHNICAL ASSISTANCE						
Medical Officers (No.)	14	18	18	17	12	79
Operations Officers (No.)	18	23	23	23	23	110
Local Supporting Services ($)	192,000	214,000	205,000	200,000	175,000	986,000

Table A

Explanatory Notes

Vaccination Certificates - The number of vaccination certificates has been determined on the basis of the number of persons vaccinated. In those programs in which measles vaccine and smallpox vaccine are simultaneously given to an individual only one vaccination certificate has been provided for.

Vehicles - In general, one vehicle per 100,000 planned measles vaccinations has been provided with an additional vehicle in reserve for every two operative in the field. In countries in which smallpox vaccination will be carried out by the multi-purpose teams of the Service des Grandes Endemies, limited additional vehicles have been provided to strengthen this Service. The estimated life span of a vehicle is estimated to be two years. Transport vehicles (probably station wagons) are provided for each Technical advisor.

Vehicle Spare Parts - A "unit" is defined as approximately $1,000 worth of spare parts including tires. This figure is based on experience of AID measles programs during the past two years. One "unit" per operating vehicle is provided annually.

Jet Injectors - Two guns per 100,000 measles vaccinations and two guns per 500,000 smallpox vaccinations are provided. It is estimated that the life span of these guns will average one year. In countries in which smallpox vaccination will be carried out mainly by multiple puncture by the Services des Grandes Endemies, a couple of guns have been provided for epidemic control and occasional mass campaign use.

Jet Injector Spare Parts - A "unit" is defined as approximately $400 worth of spare parts. This estimate of annual need is based on the experience of the AID measles campaigns of the past two years.

Refrigerators - In general, one refrigerator is provided for each vehicle. The life span of the refrigerator is estimated to be two years.

Field Equipment - A "unit" is defined as approximately $1,000 worth of equipment. This will include tents, cots, mosquito netting, miscellaneous camping gear, uniforms, and some ancillary equipment for the vehicles such as "bull horns". In general, one unit is provided for each new vehicle added.

Local Supporting Services - This has been estimated to be about $6,000 per year per country assignee for the first year and $5,000 per year thereafter. This will provide expenses for secretarial, driver and translator office equipment, emergency and miscellaneous technical support costs.

Table A1

CAMEROON

Population: 4.6 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine*(000's)	506	230	230	230	230	1,426
Doses of Smallpox Vaccine (000's)	1,530	1,530	1,530	1,530	1,530	7,650
Vaccination Certificates (000's)	2,000	1,800	1,800	1,800	1,800	9,200
Vehicles						
Carryalls (No.)**	5	0	5	0	5	15
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	11	7	7	7	7	39
Jet Injectors (No.)	11	7	7	7	7	39
Jet Injector Spare Parts (units)	11	7	7	7	7	39
Refrigerators (No.)	11	0	7	0	7	25
Field Equipment (units)	11	0	7	0	7	25
TECHNICAL ASSISTANCE						
Medical Officers (No.)***	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	10,000	52,000

*50% of susceptible population scheduled for vaccination prior to FY 1967.
**4 vehicles sent in FY 1966.
***Will also have responsibility for Gabon.

Table A2

CENTRAL AFRICAN REPUBLIC — Population: 1.3 million (1966 Estimate)

	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	71	142	65	65	65	408
Doses of Smallpox Vaccine (000's)	433	433	433	433	433	2,165
Vaccination Certificates (000's)	504	575	498	498	498	2,573
Vehicles						
Carryalls (No.)**	0	3	0	3	0	6
Transport Vehicles (No.)	2	0	2	0	1	5
Vehicle Spare Parts (units)	5	5	5	5	4	24
Jet Injectors (No.)	3	5	3	3	3	17
Jet Injector Spare Parts (units)	3	5	3	3	3	17
Refrigerators (No.)	5	3	2	3	1	14
Field Equipment (units)	5	3	2	3	1	14
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	0	4
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	5,000	47,000

*Vaccine for 25% of susceptible population purchased in FY 1966.
**3 vehicles sent in FY 1966.

Table A3

CHAD — Population: 2.8 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	198	198	140	140	140	816
Doses of Smallpox Vaccine (000's)	932	932	932	932	932	4,660
Vaccination Certificates (000's)	1,130	1,130	1,072	1,072	1,072	5,476
Vehicles						
Carryalls (No.)**	0	4	0	4	0	8
Transport Vehicles (No.)	2	0	2	0	1	5
Vehicle Spare Parts (units)	6	6	6	6	5	29
Jet Injectors (No.)	5	5	5	5	5	25
Jet Injector Spare Parts (units)	5	5	5	5	5	25
Refrigerators (No.)	6	4	2	4	1	17
Field Equipment (units)	6	4	2	4	1	17
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	0	4
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	5,000	47,000

*33% of susceptible population scheduled for vaccination prior to FY 1967.
**4 vehicles sent in FY 1966.

Table A4

DAHOMEY

Population: 2.3 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	115	115	115	115	115	575
Doses of Smallpox Vaccine (000's)	842	842	842	842	842	4,210
Vaccination Certificates (000's)	842	842	842	842	842	4,210
Vehicles						
Carryalls (No.)	3	0	3	0	3	9
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	5	5	5	5	5	25
Jet Injectors (No.)	7	7	7	7	7	35
Jet Injector Spare Parts (units)	7	7	7	7	7	35
Refrigerators (No.)	5	0	5	0	5	15
Field Equipment (units)	5	0	5	0	5	15
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services	12,000	10,000	10,000	10,000	10,000	52,000

*50% of susceptible population scheduled for vaccination prior to FY 1967.

Table A5

GABON

Population: 0.5 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	55	55	25	25	25	185
Doses of Smallpox Vaccine (000's)	167	167	167	167	167	835
Vaccination Certificates (000's)	222	222	192	192	192	1,020
Vehicles						
Carryalls (No.)	2	0	2	0	2	6
Transport Vehicles(No.)	1	0	1	0	1	3
Vehicle Spare Parts (units)	3	3	3	3	3	15
Jet Injectors (No.)	3	3	2	2	2	12
Jet Injector Spare Parts (units)	3	3	2	2	2	12
Refrigerators (No.)	3	0	3	0	3	9
Field Equipment (units)	3	0	3	0	3	9
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	0	0	0	0	0
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services($)	6,000	5,000	5,000	5,000	5,000	26,000

Table A6

GAMBIA — Population: 0.4 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	0	90	20	20	20	150
Doses of Smallpox Vaccine (000's)	0	450	20	20	20	510
Vaccination Certificates (000's)	0	450	20	20	20	510
Vehicles						
Carryalls (No.)	0	1	0	1	0	2
Transport Vehicles (No.)	0	1	0	1	0	2
Vehicle Spare Parts (units)	0	2	2	2	2	8
Jet Injectors (No.)	0	4	2	2	2	10
Jet Injector Spare Parts (units)	0	4	2	2	2	10
Refrigerators (No.)	0	2	0	2	0	4
Field Equipment (units)	0	2	0	2	0	4
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	0	0	0	0	0
Operations Officers (No.)	0	1	1	1	1	4
Local Supporting Services ($)	0	6,000	5,000	5,000	5,000	21,000

Table A7

GHANA — Population: 7.4 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	0	325	650	650	370	1,995
Doses of Smallpox Vaccine (000's)	0	1,625	3,250	3,250	370	8,495
Vaccination Certificates (000's)	0	1,625	3,250	3,250	370	8,495
Vehicles						
Carryalls (No.)	0	5	5	5	1	16
Transport Vehicles (No.)	0	2	0	2	0	4
Vehicle Spare Parts (units)	0	7	12	12	8	39
Jet Injectors (No.)	0	14	26	26	10	76
Jet Injector Spare Parts (units)	0	14	26	26	10	76
Refrigerators (No.)	0	7	5	7	1	20
Field Equipment (units)	0	7	5	7	1	20
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	1	1	1	1	4
Operations Officers (No.)	0	1	1	1	1	4
Local Supporting Services ($)	0	12,000	10,000	10,000	10,000	42,000

Table A8

GUINEA — Population: 3.5 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine*(000's)	175	175	175	175	175	875
Doses of Smallpox Vaccine (000's)	1,283	1,283	1,283	1,283	1,283	6,415
Vaccination Certificates (000's)	1,283	1,283	1,283	1,283	1,283	6,415
Vehicles						
Carryalls (No.)	3	0	3	0	3	9
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	5	5	5	5	5	25
Jet Injectors (No.)	9	9	9	9	9	45
Jet Injector Spare Parts (units)	9	9	9	9	9	45
Refrigerators (No.)	5	0	5	0	5	15
Field Equipment (units)	5	0	5	0	5	15
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	10,000	52,000

*50% of susceptible population scheduled for vaccination prior to FY 1967.

Table A9

IVORY COAST — Population: 3.7 million (1966 Estimate)

	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine*(000's)	204	204	185	185	185	963
Doses of Smallpox Vaccine (000's)	1,233	1,233	1,233	1,233	1,233	6,165
Vaccination Certificates (000's)	1,437	1,437	1,418	1,418	1,418	7,128
Vehicles						
Carryalls (No.)	4	0	4	0	4	12
Transport Vehicles (No.)	1	0	1	0	1	3
Vehicle Spare Parts (units)	5	5	5	5	5	25
Jet Injectors (No.)	5	5	5	5	5	25
Jet Injector Spare Parts (units)	5	5	5	5	5	25
Refrigerators (No.)	5	0	5	0	5	15
Field Equipment (units)	5	0	5	0	5	15
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	0	0	0	0	0
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	6,000	5,000	5,000	5,000	5,000	26,000

*50% of susceptibles scheduled for vaccination prior to FY 1967.

Table A10

LIBERIA

Population: 1.1 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	0	97	145	55	55	352
Doses of Smallpox Vaccine (000's)	0	485	725	55	55	1,320
Vaccination Certificates (000's)	0	485	725	55	55	1,320
Vehicles						
Carryalls (No.)	0	2	0	1	0	3
Transport Vehicles (No.)	0	2	0	2	0	4
Vehicle Spare Parts (units)	0	4	4	3	3	14
Jet Injectors (No.)	0	4	6	2	2	14
Jet Injector Spare Parts (units)	0	4	6	2	2	14
Refrigerators (No.)	0	4	0	3	0	7
Field Equipment (units)	0	4	0	3	0	7
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	1	1	1	1	4
Operations Officers (No.)	0	1	1	1	1	4
Local Supporting Services ($)	0	12,000	10,000	10,000	10,000	42,000

Table All

MALI

Population: 4.7 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	235	235	235	235	235	1,175
Doses of Smallpox Vaccine (000's)	1,722	1,722	1,722	1,722	1,722	8,610
Vaccination Certificates (000's)	1,722	1,722	1,722	1,722	1,722	8,610
Vehicles						
Carryalls (No.)	5	0	5	0	5	15
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	7	7	7	7	7	35
Jet Injectors (No.)	13	13	13	13	13	65
Jet Injector Spare Parts (units)	13	13	13	13	13	65
Refrigerators (No.)	7	0	7	0	7	21
Field Equipment (units)	7	0	7	0	7	21
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	10,000	58,000

* 50% of susceptible population scheduled for vaccination prior to FY 1967.

Table A12

MAURITANIA

Population: 1.0 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	55	55	50	50	50	260
Doses of Smallpox Vaccine (000's)	333	333	333	333	333	1,665
Vaccination Certificates (000's)	388	388	383	383	383	1,925
Vehicle Spare Parts (units)						
Carryalls (No.)	2	0	2	0	2	6
Transport Vehicles (No.)	1	0	1	0	1	3
Vehicle Spare Parts (units)	3	3	3	3	3	15
Jet Injector (No.)	3	3	3	3	3	15
Jet Injector Spare Parts (units)	3	3	3	3	3	15
Refrigerators (No.)	3	0	3	0	3	9
Field Equipment (units)	3	0	3	0	3	9
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	0	0	0	0	0
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	6,000	5,000	5,000	5,000	5,000	26,000

* 50% of susceptibles scheduled for vaccination prior to FY 1967.

Table A13

NIGER — Population: 3.1 million (1966 Estimate)

	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	155	155	155	155	155	775
Doses of Smallpox Vaccine (000's)	1,136	1,136	1,136	1,136	1,136	5,680
Vaccination Certificates (000's)	1,136	1,136	1,136	1,136	1,136	5,680
Vehicles						
Carryalls (No.)	3	0	3	0	3	9
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	5	5	5	5	5	25
Jet Injectors (No.)	9	9	9	9	9	45
Jet Injector Spare Parts (units)	9	9	9	9	9	45
Refrigerators (No.)	5	0	5	0	5	15
Field Equipment (units)	5	0	5	0	5	15
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	10,000	52,000

* 50% of susceptible population scheduled for vaccination prior to FY 1967.

Table A14

NIGERIA — Population: 60.0 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	2,700	5,400	5,400	3,000	3,000	19,500
Doses of Smallpox Vaccine (000's)	13,500	27,000	27,000	3,000	3,000	73,500
Vaccination Certificates (000's)	13,500	27,000	27,000	3,000	3,000	73,500
Vehicle Spare Parts (units)						
Carryalls (No.)	40	41	40	5	40	166
Transport Vehicles (No.)	11	0	11	0	9	31
Vehicle Spare Parts (units)	51	92	92	56	54	345
Jet Injectors (No.)	108	216	216	72	72	684
Jet Injectors Spare Parts (units)	108	216	216	72	72	684
Refrigerators (No.)	51	41	51	5	49	197
Field Equipment (units)	51	41	51	5	49	197
TECHNICAL ASSISTANCE						
Medical Officers (No.)	5	5	5	5	3	23
Operations Officers (No.)	6	6	6	6	6	30
Local Supporting Services	66,000	55,000	55,000	55,000	45,000	276,000

Table A15

SENEGAL

Population: 3.5 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	0	255	255	255	175	940
Doses of Smallpox Vaccine (000's)	0	1,200	1,200	1,200	1,200	4,800
Vaccination Certificates (000's)	0	1,455	1,455	1,455	1,375	5,740
Vehicles						
Carryalls (No.)	0	6	0	6	0	12
Transport Vehicles (No.)	0	2	0	1	0	3
Vehicle Spare Parts (units)	0	8	8	7	7	30
Jet Injectors (No.)	0	7	7	7	7	28
Jet Injector Spare Parts (units)	0	7	7	7	7	28
Refrigerators (No.)	0	8	0	7	0	15
Field Equipment (units)	0	8	0	7	0	15
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	1	1	0	0	2
Operations Officers (No.)	0	1	1	1	1	4
Local Supporting Services ($)	0	12,000	10,000	5,000	5,000	32,000

Table A16

SIERRA LEONE — Population: 2.3 million (1966 Estimate)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine (000's)	0	200	300	115	115	730
Doses of Smallpox Vaccine (000's)	0	1,000	1,500	115	115	2,730
Vaccination Certificates (000's)	0	1,000	1,500	115	115	2,730
Vehicles						
Carryalls (No.)	0	3	2	0	2	7
Transport Vehicles (No.)	0	2	0	2	0	4
Vehicle Spare Parts (units)	0	5	7	4	4	20
Jet Injectors (No.)	0	8	12	4	4	28
Jet Injector Spare Parts (units)	0	8	12	4	4	28
Refrigerators (No.)	0	5	2	2	2	11
Field Equipment (units)	0	5	2	2	2	11
TECHNICAL ASSISTANCE						
Medical Officers (No.)	0	1	1	1	1	4
Operations Officers (No.)	0	1	1	1	1	4
Local Supporting Services ($)	0	12,000	10,000	10,000	10,000	46,000

Table A17

TOGO — Population: 1.7 million (1966 Estimate)

	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine* (000's)	85	85	85	85	85	425
Doses of Smallpox Vaccine (000's)	570	570	570	570	570	2,850
Vaccination Certificates (000's)	645	645	655	655	655	3,255
Vehicles						
Carryalls (No.)**	0	3	0	3	0	6
Transport Vehicles (No.)	2	0	2	0	1	5
Vehicle Spare Parts (units)	5	5	5	5	4	24
Jet Injectors (No.)	3	3	3	3	3	15
Jet Injector Spare Parts (units)	3	3	3	3	3	15
Refrigerators (No.)	5	3	2	3	1	14
Field Equipment (units)	5	3	2	3	1	14
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	0	4
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	5,000	47,000

* 60% of susceptibles scheduled for vaccination prior to FY 1967.
** 3 vehicles sent in FY 1966

Table A18

UPPER VOLTA — Population: 4.8 million (1966 Estimate)

	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
Doses of Measles Vaccine*(000's)	350	350	240	240	240	1,420
Doses of Smallpox Vaccine (000's)	1,600	1,600	1,600	1,600	1,600	8,000
Vaccination Certificates (000's)	1,950	1,950	1,840	1,840	1,840	9,420
Vehicles						
Carryalls (No.)	7	0	6	0	6	19
Transport Vehicles (No.)	2	0	2	0	2	6
Vehicle Spare Parts (units)	9	9	8	8	8	42
Jet Injectors (No.)	9	9	7	7	7	39
Jet Injector Spare Parts (units)	9	9	7	7	7	39
Refrigerators (No.)	9	0	8	0	8	25
Field Equipment (units)	9	0	8	0	8	25
TECHNICAL ASSISTANCE						
Medical Officers (No.)	1	1	1	1	1	5
Operations Officers (No.)	1	1	1	1	1	5
Local Supporting Services ($)	12,000	10,000	10,000	10,000	10,000	52,000

*33% of susceptible population scheduled for vaccination prior to FY 1967.

Table B

Composite Table
Cost Estimates for 18 Countries*
By Item and Fiscal Year
($ Shown in Thousands)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
COMMODITIES						
1. Measles Vaccine	$1,962	$3,346	$3,388	$2,318	$2,174	$13,188
2. Smallpox Vaccine	506	871	910	388	331	
Less multiple pressure vaccine supplied by Yaba Laboratories:	(0)	(174)	(182)	(78)	(66)	
Tot. cost smallpox vaccine	506	697	728	310	265	2,506
3. Vaccination Certificates	268	451	468	207	178	1,572
4. Vehicles - Carryall	370	340	400	140	380	1,630
Transport	112	32	112	28	95	379
5. Vehicle spare parts	120	183	189	148	139	779
6. Jet Injectors	129	227	234	127	116	833
7. Jet Injector Spare Parts	75	132	137	74	68	486
8. Refrigerators	36	23	34	11	31	135
9. Field Equipment	120	77	112	36	103	448
TECHNICAL ASSISTANCE						
10. Salaries	1,056	1,353	1,353	1,320	1,155	6,237
11. Local supporting services	192	214	205	200	175	986
TOTALS	$ 4,946	$ 7,075	$ 7,360	$ 4,919	$ 4,879	$29,179

*Excludes Congo (Brazzaville)

Table B

Explanatory Notes (See also Table A Explanatory Notes)

Measles Vaccine - Calculated to be $.40 per dose delivered.

Smallpox Vaccine - Calculated to be $.02 per dose delivered. From the second through the fifth years, it is estimated that the Yaba and Dakar Laboratories will supply 20 percent of the needs for vaccine for multiple puncture use.

Vaccination Certificates - Calculated to cost $.01 each.

Vehicles - Carryall - Calculated to cost $5,000 each delivered.
Transport - Calculated to cost $3,500 each delivered.

Jet Injectors - Calculated to cost $685 each delivered.

Refrigerators - Calculated to cost $300 each delivered.

Salaries - Calculated at $33,000 per man per year. This figure is estimated to cover basic pay, movement of household goods, travel, housing and other benefits.

Table C

Cost Estimate
By Item and Fiscal Year
Regional Office - Lagos

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
DIRECT COSTS						
1. Personnel (8)	$280,000	$280,000	$280,000	$280,000	$280,000	$1,400,000
2. Non-Personnel Costs	200,000	125,000	125,000	125,000	125,000	700,000
3. Vehicles (4)	14,000	0	14,000	0	14,000	42,000
BACKUP RESERVE						
4. Measles Vaccine	200,000	20,000	20,000	20,000	20,000	280,000
5. Smallpox Vaccine	30,000	3,000	3,000	3,000	3,000	42,000
6. Vehicles (Carryalls)	25,000	25,000	25,000	25,000	25,000	125,000
7. Vehicles-Spare Parts	24,000	37,000	38,000	30,000	28,000	157,000
8. Refrigerators	1,800	1,200	1,800	600	600	6,000
9. Jet Injectors	13,000	22,600	23,300	13,000	600	83,500
10. Jet Injectors-spare parts	15,000	26,400	27,400	14,800	13,600	97,200
11. Boats	60,000	0	0	60,000	0	120,000
ADDITIONAL						
12. Annual Meeting	20,000	20,000	20,000	20,000	20,000	100,000
13. Lab. Supplies and Equipment	20,000	30,000	30,000	20,000	20,000	120,000
14. Short-term training costs	10,000	10,000	10,000	10,000	10,000	50,000
TOTALS	$912,800	$600,200	$617,500	$621,400	$570,800	$3,322,700

Table C

Explanatory Notes

Personnel - Calculated at $35,000 per man per year. This figure is estimated to cover basic pay, movement of household goods, travel, housing and other benefits.

Non-personnel Costs - Includes costs of local hire, office rent, communications and utilities, printing and reproduction services, supplies and materials, equipment and other services. Estimate based on costs provided by AID Mission, Lagos.

Vehicles - Four transport vehicles at $3500 each for use of local staff.

Backup Reserve - (Supplies to be rotated through arrangement with Nigerian program)

Measles Vaccine - 500,000 doses reserve with replacement at rate of 10 percent per year.

Smallpox Vaccine - 1,500,000 dose reserve with provision for replacement at rate of 10 percent per year.

Carryall Vehicles - 5 vehicles for emergency and other problem situations.

Vehicle Spare Parts - 20 percent reserve of all vehicle spare parts shipped.

Refrigerators - 5 percent reserve for all refrigerators shipped.

Jet Injectors - 10 percent reserve for all jet injectors shipped.

Jet Injector Spare Parts - 10 percent reserve for all jet injector spare parts shipped.

Boat - Provides 10 boats costing about $6,000 each for use in coastal areas of different countries.

Annual Meeting - Transport and per diem cost for regional meeting in Africa for review, assessment and program planning with Project technical staff and country representatives.

Lab Supplies and Equipment - For development and support of vaccine production center and diagnostic facilities.

Short-term Training Costs - For short-term training of limited numbers of country nationals, principally at Regional Project Office, in laboratory diagnostic techniques, surveillance and assessment methods.

Table D

Cost Estimate
By Item and Fiscal Year
Atlanta Headquarters

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
Personnel (15)	$181,636	$190,718	$200,254	$210,267	$220,780	$1,003,655
International Travel	30,000	30,000	30,000	30,000	30,000	150,000
Local Travel (U.S.)	25,000	20,000	15,000	15,000	15,000	90,000
Consultants	30,000	30,000	30,000	30,000	20,000	140,000
Security Clearances	16,400	4,100	13,120	4,100	15,170	52,890
Professional and Technical Training	60,000	20,000	60,000	20,000	20,000	180,000
Language Training	15,000	5,000	15,000	5,000	5,000	45,000
Manuals (Laboratory, procedural and diagnostic)	30,000	20,000	0	0	0	50,000
Lab. Equipment	15,000	10,000	10,000	10,000	7,500	52,500
Office Equipment, supplies, materials and audiovisual services	12,000	12,000	12,000	12,000	10,000	58,000
Rent, communications, utilities	16,000	16,000	16,000	16,000	16,000	80,000
Procurement Charges (3%)	123,834	170,856	180,195	108,222	111,069	694,176
Overhead*	239,000	284,000	285,000	281,000	258,000	1,347,000
TOTALS	$793,870	$812,674	$866,569	$741,589	$728,519	$3,943,221

*15% on all personnel, travel and annual meeting.

Table D

Explanatory Notes

Personnel - Actual costs derived from present year's PASA. Includes additionally, during FY 67, one procurement and supply officer (GS-15), and three laboratory supporting staff (GS-12; GS-9; GS-5).

Consultants - For short-term program, statistical and laboratory appraisal.

Professional and Technical Training - Per diem and instructional costs for two-month preparatory training course for all Project participants.

Laboratory Equipment - For expendable supplies and equipment for principal laboratory.

Table E

Total Cost Estimates by Fiscal Year
West Africa SPE/MC Program
($ Shown in Thousands)

	Fiscal Year					
	1967	1968	1969	1970	1971	TOTAL
18 Country Programs*	$4,946	$7,075	$7,360	$4,919	$4,879	$29,179
Regional Ofc.-Lagos	913	600	618	621	571	3,323
Atlanta Headquarters	794	813	867	742	729	3,945
TOTALS	$6,653	$8,488	$8,845	$6,282	$6,179	$36,447

*Congo (Brazzaville) not included.

Table F

Approximation of Local Costs
For Vaccination Programs
By Country and Fiscal Year

Country	Fiscal Year 1967	1968	1969	1970	1971	TOTAL
Cameroon	$61,000	$44,400	$44,400	$44,400	$44,400	$ 238,600
Central African Republic	12,900	17,200	12,600	12,600	12,600	67,900
Chad	30,500	30,500	27,000	27,000	27,000	142,000
Dahomey	52,800	52,800	52,800	52,800	52,800	264,000
Gabon	6,600	6,600	4,800	4,800	4,800	27,600
Gambia	0	28,800	1,600	1,600	1,600	33,600
Ghana	0	104,000	208,000	208,000	29,600	549,600
Guinea	80,500	80,500	80,500	80,500	80,500	402,500
Ivory Coast	36,900	36,900	35,800	35,800	35,800	181,200
Liberia	0	31,000	46,400	4,400	4,400	86,200
Mali	108,000	108,000	108,000	108,000	108,000	540,000
Mauritania	10,000	10,000	9,700	9,700	9,700	49,100
Niger	71,300	71,300	71,300	71,300	71,300	356,500
Nigeria	864,000	1,728,000	1,728,000	240,000	240,000	4,800,000
Senegal	0	39,300	39,300	39,300	34,500	152,400
Sierra Leone	0	64,000	96,000	9,200	9,200	178,400
Togo	16,500	16,500	16,500	16,500	16,500	82,500
Upper Volta	53,000	53,000	46,400	46,400	46,400	245,200
TOTALS	$1,404,000	$2,522,800	$2,629,100	$1,012,300	$ 829,100	$8,397,300