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COMBATTING CHILDHOOD COMMUNICABLE DISEASES PROJECT IN SUB-SAHARA AFRICA

Submitted by

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Submitted to

Agency For International Development
Washington, D.C. 20006

July, 1980

AID/SOD/PDC-C-0201, #4

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September 22, 1980

TO: AID/AFR/RA

FROM: ONE AMERICA, INC.

SUBJECT: The following modifications and typographical errors have been noted in the above referenced document:

PAGE	LINE	
2	2	Delete one-third and insert one-fourth
	24	Delete three-week and insert two-week
3	8	Delete four-week and insert two-week
6	chart	Delete U.S. LOP column and Other Donor/Host Country LOP column
	20	Should read Disease Control, CDC
	21	Should read Feasibility).
7	9	Delete and. Should read epidemiologists, health operations
8	2	Should read CILSS
10	8	Should read Health For All
13	7	Should read An AIP for... Delete have and substitute has
14	9	Delete two and substitute three
	23	Delete Solution (Salts) and substitute Salts
15	1	Delete However, CCCD ... as such
	10	Should read Childhood Communicable Diseases ... yaws.
17	9	Should read country specific
	22	Underline Operational Research
24	23	Should read program area
25	3	Should read diseases).
25	8	Should read parenteral
26	8	Should read enhanced in nineteen (19) Ministries
	9	Should read at least 4,200 health staff
	13	Should read severe
34	22	Should read responsive
35	5	Should read quality
37	9	Delete the following sentence "The following ... issue."
42	11	Should read independent contractor
47	chart	Delete U.S. LOP column and Other Donor/Host Country column

COMBATTING CHILDHOOD COMMUNICABLE DISEASES PROJECT

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I. Recommendations

A. Face Sheet

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: ____ — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: AFRICA/REGIONAL AFFAIRS

3. PROJECT NUMBER: 698-0421

4. BUREAU/OFFICE: AFR/RA — 06

5. PROJECT TITLE (maximum 40 characters): Combatting Childhood Communicable Diseases

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 85

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4): A. Initial FY 81 — B. Quarter 3 — C. Final FY 85

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 81 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C *	G. Total
AID Appropriated Total						
(Grant)	( )	( )	( )	( )	( )	( )
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country						
Other Donor(s)						
TOTALS						

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) PH	510	510							
(2)									
(3)									
(4)									
TOTALS									

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 530 | 550 | 563 | 570 | 590 |

11. SECONDARY PURPOSE CODE: 530

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code							
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

To strengthen the capabilities of sub-Sahara Africa health systems to control communicable diseases in children by 1) training and educational programs, 2) operations research and 3) data collection and evaluation.

14. SCHEDULED EVALUATIONS: Interim MM 11 YY 81 — MM 10 YY 82 — Final MM 11 YY 83

15. SOURCE/ORIGIN OF GOODS AND SERVICES: ☐ 000 ☒ 941 ☐ Local ☐ Other (Specify) ____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

*

No locally generated currency is presently projected for this project

17. APPROVED BY — Signature — Title — Date Signed MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY

AID 1330-4 (8-79)

B. Project Summary

In sub-Sahara Africa close to one-third of the 12,000,000 children born each year will die before the age of five. Communicable/infectious diseases directly or indirectly account for approximately 75-80% of infant and childhood morbidity and mortality. These diseases can be largely prevented by immunization and other relatively low cost public health measures.

1. Goal and Purpose

The goal of this project is the improvement of the health status of the pediatric population of sub-Sahara Africa. The project purpose is to strengthen, over a five year period FY1981 - FY1985, the capability of sub-Sahara Africa health care systems to control selected communicable diseases (diphtheria, pertussis, tetanus, polio, measles) in children through immunization, diarrheal disease control and other measures by: (1) provision of training to health care workers, (2) the conduct of operations research and technical development assistance in problem areas to be determined, (3) the establishment of data collection and evaluation systems and (4) the development of public education programs in combatting childhood communicable diseases. Insofar as possible this will be done within the framework of primary health care (PHC). (see Section II-B.4 Description for discussion of PHC).

2. Project Components

To accomplish these project purposes the following regional and sub-regional activities are proposed over a five year period (FY1981 - FY1985):

a. Training.

(1) Sixty two (62) three-week regional training courses will be conducted on the control of childhood communicable diseases for approximately

2,480[1] sub-Sahara Africa health workers.

These courses will consist of training in EPI (Expanded Programme of Immunization) and CDD (Diarrheal Disease Control) program management. Training will be presented in French and English in two cycles: Management I (for senior level health planners and workers) and Management II (mid-level and other health managers and workers) on the planning, implementation, management and evaluation of childhood communicable disease control programs.

(2) Twenty four (24) four-week sub-regional training courses will be conducted in French and English for 960[2] health workers on cold chain repair and maintenance in specific countries of sub-regional groups of countries.

(3) Approximately nineteen (19) seminars/workshops will be organized in French and English as required to deal with other selected childhood communicable diseases (such as yaws, yellow fever, malaria, etc.) specific to or prevalent in a given country or sub-region.

Estimated life-of-project (LOP) funding for the project's training component is $6,457.000.

b. Operations Research and Technical Development. Research activities will be carried out to develop and implement cost effective and acceptable procedures and systems to control the targeted diseases in diverse environmental and socio-cultural situations.

New operational research projects will be initiated in a minimum of 10-15 countries. Assistance will be provided on an ad hoc short-term basis to countries requiring technical aid in planning and mounting programs to combat

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1/ Management I/II training courses comprise 40 participants in 5 groups.

2/ Cold chain courses are usually individual and bilateral.

targeted childhood communicable diseases. Estimated LOP funding for this project component is $6,431,200.[1]

c. Data Collection and Evaluation. Epidemiological surveillance as well as data collection and evaluation systems will be developed to facilitate regional and sub-regional planning and implementation of communicable disease control programs. Ministries of Health (MOH's) in a minimum of nineteen countries will conduct data collection/evaluation activities. Estimated LOP funding is $1,391,900.

d. Health Education Promotion. Informational materials to inform and educate target populations on the control of childhood communicable diseases will be developed and utilized. Health promotion materials in French and English will be distributed in a minimum of 25 countries for reproduction and use (at the local level in local languages) to MOH's, regional organizations and other donors. Estimated LOP funding is $2,025,000.

Training course cycles in EPI, CDD Management I/II and cold chain repair/maintenance in French and English will be initiated sequentially as curricula and training materials become available, as shown in the Implementation Timetable of Events. Collaborative planning and implementation will determine the scheduling of specific country or sub-regional seminar/workshops dealing with other selected communicable diseases.

3. Financial Summary

Total project costs are estimated at $38,294,600 including 5% contingency costs of $1,503,500 and 15% contingency inflation costs of $4,736,100. In view

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1/ Includes provision for short-term start-up (catalytic) CCCD bilateral activities in 2-3 countries annually.

of the high level of funding required it is assumed that other donor support including participating host country contributions will be forthcoming and/or sought. A summary allocation of the proposed funding follows:

a. AID. Total financing of $22,976,400 representing 60% of total project costs in foreign exchange and local currency costs.

b. Other Donor/Host Country. Participating international organizations, other donors and host countries will provide $15,318,200 or 40% of total project costs in both foreign exchange and local currency costs. Host countries could be asked to provide local currency costs or equivalent value of services up to 70% of local costs and 25% of overall project costs.

c. Summary of Projected Inputs.[1]

		U.S. 1st Year ($000)	U.S. LOP ($000)	Other Donor/ Host Country LOP ($000)	TOTAL ($000)
(a)	US T/A Personnel	240	1,924.8	1,283.2	3,208.1
(b)	Operational Research/ Technical Development	144	3,858.7	2,572.4	6,431.2
(c)	Training	252	3,874.2	2,582.8	6,457.
(d)	Data & Evaluation	156	835.1	556.7	1,391.9
(e)	Health Education	90	1,215.	810.	2,025.
(f)	Commodities R&D Equipment	375	5,664.1	3,776.	9,440.2
(g)	Project Evaluation	31.2	670.	446.7	1,116.9
(h)	Contingency/Inflation[2]	282.3	3,743.7	2,495.8	6,231.6
(i)	Other Costs[3]	104	1,190.8	793.8	1,984.7
	FY1981-1985 TOTAL		22,976.4	$15,318.2	$38,294.6

4. Project Implementation

Project implementation will be carried out by an implementing agency (IA) under the supervision of AID/W. It is proposed for reasons of cost effectiveness, availability of relevant expertise and personnel that the Center for Disease Control be made the IA through a PASA arrangement with AID (the rationale for this proposal is presented in Section III-D, Administrative Feasibility.

1/ See Annex H, Detailed CCCD Project Budget.

2/ 5% contingency, 15% inflation.

3/ Implementing Agency overhead (U.S. costs 20%, overseas costs 5%).

It is recommended that this project be submitted to an international group of donors involved in combatting childhood communicable diseases (see Section II, Description of the Project, Other Donors/Organizations Involved in CCCD Activities) for their consideration, review, possible inputs, including financial support and other contributions particularly at the national level for bilateral programs (where in some instances other donors may already be conducting CCCD activities).

The IA will establish CCCD project support and field staff including epidemiologists and health operations officers and other specialists in epidemiology, health planning, implementation, evaluation, statistics, training and health education.

CDC

CCCD training courses will be mounted in coordination with WHO/AFRO, other donors and participating countries as shown in the projected training schedule.[1] Implementation of the training courses will be carried out subject to AID/W and other contributors approval of annual program and budget projections.

CCCD staff will work with regional and sub-regional organizations and selected countries or groups of countries in data research/evaluation and operational research and technical development activities to plan and implement programs to control childhood communicable diseases. In each instance memoranda of understanding will be developed between host country or countries, host country institutions and CCCD with the approval of AID/W, AID mission directors and/or REDSO directors and representatives of other donor contributors.

Overall CCCD program activities will be generally coordinated with the World Health Organization (Geneva), WHO/AFRO (Brazzaville), and regional and

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1/ See Annex R, Projected CCCD Training Schedule.

other donor programs active in combatting childhood communicable diseases such as CILLS, SHDS, FAC, DANIDA, etc.[1]

5. Summary of Project Outputs.

All anticipated results of this project cannot be quantified, however the following major outputs are projected:

a. 4200 health personnel trained in target region.

b. CCCD programs (EPI/CDD) operating in a minimum of 15 countries.

c. MOH's conducting new operational research projects in 10-15 countries.

d. MOH's conducting data collection evaluation activities in a minimum of 19 countries.

e. Health promotion materials being utilized in a minimum of 20 countries.

f. Oral rehydration salts sufficient for a population of 1 million being produced/available and utilized annually.

6. End of Project Status

This project paper describes the utility of the proposed project interventions, the means required to achieve them, the areas and means of their application, and the anticipated results. The projected End-of-Project Status is as follows:

a. 1. Incidence of EPI target diseases (measles, polio, pertussis, neonatal tetanus) to be reduced by 50% in CCCD operational areas by end of FY85.

2. Mortality from diarrheal diseases reduced up to 50% in CCCD operational areas by end of FY85.

3. Prevalence of infectious yaws reduced to less than 50 cases per 100,000 population by FY85 in CCCD operational areas.

1/ See Annex J, Glossary of Terms

7. Critical Issues

Critical issues which impact on this project are the length of time required for CCCD to have measurable impact upon its overall goal, the impact of malaria as a childhood communicable disease, CCCD and recurrent costs and the conflict between health and other development strategies. These issues are raised in Section C of the Project Description.

II. DESCRIPTION OF THE PROJECT

A. Project Context/Background

Sub-Sahara Africa contains two-thirds of the world's relatively least developed countries. Economic and social conditions in this vast geographic area, comprising some 47 countries, remain among the world's lowest.

Improving the quality of life in Africa means among other things improving the health status of the population. As part of WHO's and the world health community's commitment to health for all by the year 2,000 through primary health care (PHC)[1], the reduction of morbidity and mortality of children under the age of five (5) years is a high priority objective.

Communicable/infectious diseases directly or indirectly account for approximately 75-80% of infant and childhood morbidity and mortality in sub-Sahara Africa. To respond to this important public health problem the United Nations World Health Organization (WHO) has since 1975 embarked on an expanded program of immunization (EPI)[2] and in 1978 initiated a diarrheal disease control program (CDD).[3] These programs were requested and actively supported by member nations in Africa. Considerable progress in the development and implementation of these programs has been accomplished by WHO and UNICEF, especially in the EPI program where several regional training courses have been carried out and vaccines and other equipment have been supplied to many national immunization programs in sub-Sahara Africa. The CDD program is in a less advanced state, but regional training courses have been developed and are scheduled to begin in 1981-1982.

1/ Articulated in the Declaration of Alma Ata, adopted by WHO on September 12, 1978. See Annex J for the Alma Ata Delcaration's Definition of the essential components of primary health care.

2/ Annex K, WHO EPI Medium Term programme.

3/ Annex L, WHO CDD Medium Term programme.

1. EPI

It is estimated that less than ten (10) percent of children or pregnant women in sub-Sahara Africa are now being immunized. As a result, hundreds of thousands of preventable deaths and a similar number of needlessly crippled or mentally retarded children occur each year. To alleviate this situation, the World Health Assembly, established the Expanded Program on Immunization. Its goal is to reduce morbidity and mortality from diphtheria, whooping cough, tetanus, measles, poliomyelitis, and tuberculosis by making immunization available to every child in the world by 1990. Other goals are to promote countries' self-reliance in the delivery of immunization services and regional self-reliance in vaccine quality control and production.

2. CDD

Diarrhea is also a leading killer of children in sub-Sahara Africa. It causes millions of deaths each year and fills more than one-third of children's beds in hospitals. It causes malnutrition because children with diarrhea are often starved or have diminished appetites, and the food lost in the stools is not adequately replaced. But malnutrition also makes children more susceptible to diarrhea, and this creates a vicious killing cycle. Diarrhea can be prevented by breastfeeding infants and young children and weaning them with food and fluids which are clean and nutritious. Most diarrheas can be treated, preventing death and associated malnutrition, by giving the sick child an oral rehydration solution made from clean water and the right amount of salts and sugars and feeding the child as soon as possible.

3. Other Important Childhood Communicable Diseases

Control of malaria, by far the greatest single cause of childhood morbidity and mortality, is being approached by AID and other donors through

separate and discrete programs. The significance of this to the CCCD project is examined in Critical Issues, Section II-3 below.

In addition to the above mentioned childhood communicable diseases, other illnesses such as yaws are of increasing concern in certain African countries. Yaws is a chronic, nonvenereal spirochetal infection which is predominantly a disease of children, transmitted by discharges from skin lesions via body contact, clothing or insects. During the past decade, there has been a marked resurgence of this disease in Ghana, Togo and the Ivory Coast. Yaws can be effectively controlled by prompt detection and treatment with antibiotics such as penicillin. Such a program can be readily integrated with developing PHC systems.

4. Recent Background and History of CCCD

The broad lines of the CCCD project grew out of a December 1977 visit to the United States by the WHO Director General, Dr. Halfdan Mahler, who asked for U.S. special assistance to childhood communicable diseases control programs, specifically EPI, in sub-Sahara Africa. A pledge, by then HEW Secretary, Joseph Califano at the 31st World Health Assembly in May 1978, of such U.S. support was followed by a legislative initiative by Senator Schweiker, formulating the CCCD program.

In November 1978 AID/W cabled all sub-Sahara Africa USAID Missions (State 297999) with a comprehensive description of the program and questions regarding host country interest in participating. Following analysis of the response, which indicated wide interest, AID/W contracted with CDC (PASA HZ/AFR 0135-1-79) to deploy teams to several countries to explore the feasibility of carrying out CCCD program activities.

Teams were sent to Ghana, Ivory Coast, Togo and Mali to help determine the needs for and likelihood of controlling yaws. Also during 1979, CDC teams visited Liberia, Somalia, Sudan, Tanzania, Rwanda, and Burundi to assess CCCD feasibility, with particular emphasis on EPI.[1]

These activities resulted in several Accelerated Impact Programs (AIPs), each providing approximately $500,000 over two (2) years for CCCD operations. AIPs for yaws/yellow fever control in Ghana have been approved. Rwanda and Burundi currently are also candidates for AIPs for EPI.

In February 1980 AID contracted with One America, Inc. to field a five (5) member design team which included two widely experienced CDC technicians.[2] In developing the present project paper, the team carried out a series of research visits and interviews at WHO in Geneva and Brazzaville, and with various regional organizations and individual health care technicians in West, Central, East and Southern Africa, and the U.S.[3]

5. Other Donors and Organizations Involved in CCCD Activities

A number of individual sub-Sahara Africa countries are involved in childhood communicable disease control programs, and many bilateral and regional agencies provide some support to these programs. CCCD will generally coordinate its activities with these donors to avoid unnecessary duplication of efforts.

The major external donors presently carrying out communicable disease control activities in Africa are WHO, UNICEF and AID. WHO, through AFRO[4] and

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1/ Annex P, Reference list CDC Country Assessment Studies (EPI/Yaws).

2/ Dr. James Chin, Public Health Physician, (team leader); Dr. William Rutherford, Design Officer/Economist; Dr. Theresa Ware, Anthropologist; Dr. Jason Weisfeld, Epidemiologist (CDC);Mr . Andrew Agle, Health Operations Officer (CDC).

3/ Annex Q, Project Design Team Meeting/Interviews.

4/ WHO Africa Regional Office.

and EMRO,[1] is the principal organization providing coordination and support for the planning and implementation of childhood communicable disease control programs including EPI, CDD and yaws. UNICEF is the principal group furnishing vaccines, equipment and supplies for EPI and will also be the major source of ORS[2] packets.

AID is supporting the development of many rural health delivery systems in Africa which could be expanded to include CCCD activities. In addition, the AID-funded SHDS[3] project has been involved since 1977-78 in the training of health care workers in the west/central regions of Africa and includes two EPI demonstration components. The CCCD project will need to be closely coordinated with all of these programs.

Many other international, national and non-governmental organizations are also implementing CCCD type activities in sub-Sahara Africa. A partial list includes: IBRD, CILSS, ADB, FAC, OCFAC, OCCGE, SIDA, and DANIDA.[4] It is these and similar organizations and donors who would coordinate activities and inputs, in combatting childhood communicable diseases, as proposed in this paper.

B. Detailed Description

1. Goal and Purpose

The key objective or goal of this project is to reduce over a five year period: FY1981 to FY1985, morbidity and mortality of children under the age of five in sub-Sahara Africa from selected communicable diseases within the

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1/ WHO Eastern Mediterranean Regional Office

2/ Oral Rehydration Solution (Salts)

3/ Strengthening Health Delivery Systems

4/ See Annex I, Glossary of Terms.

framework of primary health care (PHC) in so far as possible. However, CCCD project activities will not focus directly on immunization and diarrhea control activities as such. The purpose of the project is to support and contribute to such activities by strengthening the capabilities of regional and national health care organizations and systems to control communicable diseases in children.

CCCD's primary focus will be on immunizable diseases (diphtheria, pertussis, neonatal tetanus, measles and poliomyelitis) targeted by the World Health Organization (WHO) in the Expanded Program of Immunization (EPI) and other major childhood diseases such as diarrhea and yaw.

2. Components

The major project components consist of the following:

a. Training. CCCD will continue WHO's emphasis on curriculum development and conducting courses as priority elements of disease control training programs. During FY81-85, CCCD will sponsor both regional[1] and country-specific training activities.[2]

For EPI training, CCCD will offer the following courses:[3]

(1) Management I. First offered in 1977, this two week course teaches skills in program planning, management and evaluation to national level managers. It is presented on a regional or sub-regional basis, with several countries sending senior level personnel as participants. The curriculum is available in English, Spanish and French.

1/ In the context of this project paper Region or Regional refers to the entire geographic target area of sub-Sahara Africa; sub-Region I refers to West and Central Africa, sub-Region II refers to East and Southern Africa.

2/ See Annex R, Projected CCCD Training Schedule.

3/ These courses have been developed by CDC in consultation with WHO and are available from both organizations.

In Africa, the course has been conducted four times and over 150 participants have been trained:

October 1978	Tipaza, Algeria	French	Francophone Countries North, Central and West Africa.
January 1979	Lagos, Nigeria	English	SHDS - Anglophone countries.
April 1979	Abidjan, Ivory Coast	French	SHDS - Francophone countries.
March 1980	Brazzaville, Congo	French	Francophone countries.

(2) Management II. This two week course for mid-level managers has been presented on a country-by country basis and the curriculum can be easily modified to fit local needs. WHO has offered two such courses in Africa (Benin and Zambia) and two courses will be conducted during the first half of 1980 (Gambia and Zaire). It is expected that several African countries will utilize the materials in 1980/81.

(3) Cold Chain Logistics. The Cold Chain Unit of EPI has developed a curriculum on vaccine handling and distribution which is generally presented in one day in conjunction with either Management I or II courses. An expanded version (four/five days) is also available for training cold chain specialists.

(4) CDD. Diarrheal Disease Control training activities will provide one English and one French presentation of Management I each year. As CDD Management II curricula will not be available until 1982, it is unlikely that a French version will be available before 1983. Plans for 1982 include Management II courses in two Anglophone countries. In 1983, English or French courses

will be conducted in six countries.[1]

Training for other activities will be arranged as needed. Training in West and Central Africa will be coordinated with SHDS and other appropriate organizations. Wherever possible, the project will incorporate EPI, CDD and other CCCD-related training into existing institutional curricula.

b. Data and Evaluation. The CCCD project will contribute to WHO-sponsored initiatives to strengthen national capabilities to collect relevant health data for the planning of communicable disease programs. In EPI, short-term technical assistance (TA) will support coutry-specific data collection, epidemiological surveillance, program planning, management information system development and program evaluation.

The project will also provide epidemiological assistance in generating and revising national EPI plans. IA staff have participated in demonstration, planning and training exercises for EPI in Cameroon, Zaire, Gabon, Central African Republic, Congo, Rwanda, Burundi, Sudan, Somalia, Ivory Coast and The Gambia.

As diarrheal control programs are primarily in the planning stages, the bulk of activities during FY81-85 will be short-term data collection and program planning. Development of CCCD activities to fight diseases other than EPI and diarrhea will depend upon request from African countries during FY81-82.

c. Operational Research. For operational research in EPI, all CCCD activities will coordinate with the WHO EPI units in Geneva and Brazzaville. African health officials and institutions will be utilized as fully as possible

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1/ See Annex R, Projected CCCD Training Schedule 1980-1985.

in all operations research activities. In fact most such activities will be the direct responsibility of host country MOH's to the degree possible as outlined below under country-specific program administration. Probable activities for CCCD support in EPI include:

(1) Field testing of available EPI equipment, including high performance insulated containers (cold boxes, flasks), multifuel source refrigerators (electric, kerosene, and/or propane gas), temperature monitoring devices, solar-powered refrigerators and automated injectors.

(2) Studies to improve vaccine quality control, production and distribution.

(3) Increased integration of EPI activities with other health services, including primary health care efforts.

(4) Management studies of cost, cost/benefits, and cost/effectiveness of EPI activities.

In the areas of diarrheal disease control, CCCD will support field studies in child care practices, and in new improved vaccines and drugs. These studies will build on previous WHO-supported research in utilization of oral rehydration therapy.

(5) The needs of CDD are for oral rehydration salts (ORS), production equipment for ORS, transportation equipment and office supplies (record/report forms). CCCD will furnish ORS production equipment in two locations as yet to be determined. In addition limited support will be given to development of laboratory capabilities to diagnose diarrheal disease agents.

The development of project activities to control childhood communicable diseases other than those mentioned above will also require considerable field testing. Operational research activities to study the feasibility of combining yaws control and yellow fever control will begin in Ghana, and other such studies will be required in other countries, depending on which specific additional communicable diseases are identified. Similarly, studies to test methods of improving community participation in CCCD activities will be necessary for the effective development of the health services initiated by this project.

d. Health Education/Promotion. For EPI, CDD and other childhood diseases such as yaws, CCCD will give priority to the development, publication and distribution of health education materials through African institutions, as available. Emphasis will be placed on tested materials which have been designed with community participation. In addition, support will be offered for the translation, duplication, and distribution of WHO promotional materials for health workers as well as the public. Sub-regional workshops to stimulate the development of new materials and methods and to improve the utilization of available materials and methods will be conducted as appropriate. CCCD will supply health education materials to MOH's, in the target region, through the training courses and other channels and, to the extent possible, to other donors and regional organizations working on CCCD (WHO, UNICEF, SHDS, etc.) for reproduction and utilization.

3. Administrative Arrangements

a. Implementing Agency. This project will be carried out by an implementing agency (IA) under the supervision of AID/W. The IA will be responsible for coordinating and implementing field activities in cooperation

with regional organizations, USAID missions, host governments and other donors.

It is proposed that the Center for Disease Control (CDC) be named implementing agency through a PASA arrangement with AID (see Section III-D. Administrative Feasibility). It is also recommended that project coordination be assisted by an Advisory Council composed of AID/W, CCCD, African Regional Organizations, other donors (WHO/AFRO, UNICEF, FAC, DANIDA, etc.) and representatives of African host countries.

b. Advisory Council. It is proposed that this project paper be presented to a group of international donors prior to its finalization. Such a meeting could review the proposed CCCD project in the light of similar activities presently going on or planned and in addition to coordinating current or planned interventions the provision of additional financial resources would be explored.

The donors meeting would provide the nucleus for the advisory council which would subsequently be expanded to include host country representatives, Africa regional organizations and other donors active in combatting childhood communicable diseases. The advisory council would meet at the commencement of the CCCD project and thereafter annually or more frequently as needed.

c. Project Management.

(1) Responsible Organizational Foci

(a) A project manager will be appointed by AID/W to be the principal AID contact with the IA and the AID regional bureaus for this project.

(b) The IA will establish a project support and field staff. The support staff will include project manager(s), specialists in epidemiology,

planning, implementation, evaluation, statistics, training, social science and health education, and secretarial staff. The IA will recruit or with the approval of AID/W contract for these personnel services. Overseas, the IA will assign medical epidemiologists and operations officers to work with regional or sub-regional organizations and selected countries in operational research and technical development activities to assist sub-Sahara African countries to plan and implement better control of childhood communicable diseases.

(c) The IA project manager will be the primary liaison person to AID. Planning cycles will be coordinated to the maximum extent possible by the IA to meet the planning and budgetary deadlines of each agency.

(d) The IA will prepare an annual budget for implementation of the project for review and approval by AID and will provide quarterly financial reports of expenditures.

(e) Appropriate representatives of AID and the IA will meet at least twice yearly to review overall progress, activities, policies, and plans. Progress reports on the project will be prepared every six (6) months according to an agreed upon format. These reports will be prepared to coincide with the twice yearly meeting of AID and the IA staffs.

(2) Personnel. The IA will be responsible for recruitment, training, and orientation of all CCCD project staff (U.S., African and others as required) and will consult AID as appropriate. The IA will be responsible for the technical direction and technical supervision of field personnel. Those CCCD personnel assigned to operational research or technical development activities in specific countries will be approved by USAID missions and the host governments.

(3) Communications. Communications between the IA and the field involving programmatic and administrative issues such as policy and budget, assignment of personnel, travel, etc., will be through AID channels.

Routine, technical, and administrative communications can be direct with copies to AID/W and the appropriate regional bureau for communications originating at the IA and copies to the USAID mission for communications originating overseas.

(4) Operational Research and Technical Development Activities in Specific Countries. AID, WHO (Geneva and AFRO) and the IA will jointly determine which operational research and technical development activities are needed to effectively achieve CCCD objectives. When such activities are to be carried out in specific countries, overtures to these governments to ascertain their level of interest and commitment will be made by USAID mission staff with the participation of CCCD staff as mutually agreed upon and appropriate. These programs will be collaborative efforts with the host governments and following approval by AID/W will be negotiated by the USAID's and the IA. CCCD staff will be considered an integral part of USAID missions. USAID will provide CCCD staff with the same support as for AID direct hire. CCCD personnel overseas will be responsible administratively to the USAID mission but receive technical supervision from the IA. USAID missions have the final diplomatic and legal authority for all country programs.

Program implementation will be undertaken by AID and the IA in collaboration with the host government. The IA will decide the necessary technical inputs. AID and the IA will advise on the country's technical and administrative capacity to effectively implement a cooperative program.

AID will be responsible unless otherwise agreed upon by AID and the IA for the administration of CCCD project funds and procurement of equipment and supplies required by individual programs.

d. Program Administration (Country-Specific).

(1) Country programs for operations research and data collection will be developed as appropriate, taking into consideration other available donor support. These programs will be developed by the IA in conjunction with USAID missions, other donors and with the host governments and submitted to AID/W for approval. Individual projects undertaken under the terms of this initiative will be documented by a project agreement that describes the scope of work including the objectives, the plan of operation, the detailed budget (with all sources specified - AID, CCCD, host governments, etc.), job descriptions of expatriate personnel, criteria for evaluation, etc.

(2) Direct program implementation in host countries will be undertaken by the host government in collaboration with CCCD and AID. Host governments will decide the necessary technical inputs based on CCCD and AID recommendations. USAID and CCCD will also advise on the countries' technical and administrative capacity to effectively implement cooperative programs.

In certain instances short term (one to two years) demonstration operations research or surveillance projects will be mounted and funded by CCCD. However, it is anticipated that such activities will be undertaken only on one or two occasions each year when no other resources or arrangements can be developed.

e. Country Project Participation Criteria. All CCCD project components will be available to USAID eligible countries on a bilateral basis, provided

that the following two criteria are met: (1). the country has a primary health care plan acceptable to AID; and (2). the country has developed written plans for the integration into the PHC system of selected childhood communicable disease control programs, such as EPI, diarrhea disease control, control of yaws, etc. If these criteria are not met, sub-Sahara Africa countries will be able to request short-term TA to be provided by appropriate institutions and experts to develop the necessary planning and to obtain appropriate training, which would then lead to their eventual eligibility for full CCCD project support.

4. Integrating CCCD with Primary Health Care

To the extent possible, CCCD communicable disease control programs will be compatible with or incorporated into developing primary health (PHC) systems in Africa. The goal of primary health care, as articulated by the Alma Ata declaration[1] is to have by the year 2000, the following basic components of PHC provided to all persons throughout the world: promotion of proper nutrition and an adequate supply of safe water; basic sanitation; maternal and child health services, including family planning; immunization against the major infectious diseases; prevention and control of locally endemic diseases; education concerning prevalent health problems and promotion of methods for preventing and controlling them; and appropriate treatment for common disease and injuries.

The CCCD project will integrate into existing and developing health care systems in Africa those basic PHC components which are in its program are (i.e. immunization against the major infectious diseases, prevention and control

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1/ See Annex I

of selected locally endemic diseases such as yaws and education of the public and promotion of methods for preventing and controlling these childhood communicable diseases.

The delivery of oral rehydration solutions (ORS) by all levels of health care providers may be possible to accomplish in a relatively short time. However, due to the technical difficulties inherent with immunization activities (record keeping, different dosage schedules for different vaccines, cold chain maintenance, the need for parental injections, etc.) it will be difficult if not impossible to have provision of immunizations routinely available at most peripheral rural health units such as the developing "village health huts." Therefore, it will require operational research in many different types of situations to develop acceptable and cost effective methods to provide immunizations to these hard to reach population groups.

During the initial phase of the CCCD project, it is expected that several of these basic components of PHC will be established in many of the developing health care systems in sub-Sahara Africa.

5. Beneficiaries of CCCD.

Potentially all of the thirty to forty million children under the age of five years in sub-Sahara Africa are ultimate beneficiaries of CCCD activities.[1] For instance, it is projected that fifty percent of the EPI target population (children under one year) will be fully immunized; eighty percent of the yaws target population (generally children below fifteen years) will have been screened and/or treated; and fifty percent of children under five years, who have had an episode of moderate or severe diarrhea, will have received oral

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1/ This figure is based on an annual birthrate of 12,000,000 less projected annual attrition due to childhood mortality rates.

rehydration therapy (ORT). Until operational areas are defined however and the exact target population quantified, it is not possible to estimate the number of these ultimate beneficiaries.

The number of more direct beneficiaries of CCCD inputs, Ministries of Health and health personnel, can be estimated more easily. During FY81-85, institutional capabilities for program planning, data collection, program evaluation, operational research, and health education and promotion will be enhanced in ten (19) Ministries of Health, and training in these disciplines will benefit at least 42,000 health staff.

C. Critical Issues

ISSUE NO. 1: CCCD LIFE OF PROJECT

The proposed CCCD project is designed to support and contribute to the overall effort to control sever childhood communicable diseases by many organizations and donors in the health field, as well as the individual countries in sub-Sahara Africa.

It is estimated by WHO, UNICEF and other organizations active in the field, that this effort will require several hundreds of millions of dollars over at least two decades to achieve a significant reduction in morbidity and mortality. In addition, the goal of WHO and the world health community to have immunization available to all children by 1990 and to achieve the goal of health for all by the year 2000 will require continued external donor support to even begin to approach these goals.

The CCCD project will be a definite contribution to the achievement of these goals but the central problem posed is that this project is scheduled to end in FY85.

It should also be noted that by definition immunization programs are recurrent programs, otherwise their effectiveness stops. Therefore the question of continuing the CCCD effort in subsequent phases well beyond 1985 must be considered.

ISSUE NO. 2: CCCD AND THE CONTROL OF MALARIA

The major cause of childhood morbidity and mortality in sub-Sahara Africa is malaria, it victims number in the millions each year. The planning and development of programs to control malaria in Africa are being actively studied by AID and other external donors.

A major component of such programs will be the presumptive treatment of fevers. This aspect of malaria control, which needs to be integrated into existing and developing Primary Health Care Systems (PHC) should also be closely coordinated with or integrated into CCCD since one strategy of CCCD will include using village health workers for dispensing materials for oral rehydration.

ISSUE NO. 3: CCCD AND RECURRENT COSTS

As indicated under Issue No. 1 above, immunization programs are continuous by nature. Consequently recurrent programs engender recurrent costs. There are a number of differing opinions as to the ability of host governments to assume, in the short, mid and even long term, the recurring costs involved in CCCD.

In the short term covered by the present project there seems to be little likelihood that more than a limited number of target countries will have sufficient growth to be able to contribute substantially to the high costs of the CCCD program. However, in cases where they do CCCD activities could possibly be phased out accordingly.

ISSUE NO. 4: CONFLICT WITH COUNTRY STRATEGIES

There is an area of serious conflict, both present and potential, between CCCD and AID country development and host country strategies on two levels:

a. In some countries priorities for health sector interventions are by no means oriented towards combatting childhood communicable diseases (concentrating instead on other components of PHC, developing rural health care systems,

combatting other diseases such as onchocerciasis, etc.); and

b. In some countries both AID missions and host country governments have established absolute priorities for the development of other sectors (eg. agriculture, education, family planning, food sufficiency, range management, etc.)

III. PROJECT SPECIFIC ANALYSES

A. Technical Feasibility/Program Components

The technical feasibility of the control of the major childhood communicable diseases proposed by this project has been extensively investigated by WHO, CDC, and other health organizations. The basic methods selected for the control of these important childhood communicable diseases in sub-Sahara Africa have been demonstrated by these organizations to be effective. Similarly, these and other studies[1] have demonstrated the wide ranging needs for support in those program areas covered by the intervention components of this project.

The impact of immunization can be predicted with reasonable certainty, based on work carried out in several countries over the last three years. Projects undertaken by CDC in selected areas of Ivory Coast, Cameroon and Zaire indicate that coverage of at least fifty percent of the susceptible population with the target vaccines can ordinarily be achieved in these countries within five years. This would result in a reduction of approximately fifty percent in morbidity and mortality attributed to the targeted immunizable diseases. In addition, the effective control of these diseases in developed countries attests to the technical feasibility of this method of disease control. However, for most of these vaccines to be effective, they must be carefully handled and kept adequately refrigerated until administered. In sub-Sahara Africa, one of the greatest challenges to mounting an effective immunization program is the development of an efficient cold chain for these vaccines, especially in rural areas. The development of an adequate cold

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1/ Annex K, WHO, EPI Global Overview
Annex K.1, WHO, EPI Overview for Africa
Annex K.2, WHO, EPI Global Medium Term Programme
Annex L, WHO Development of a Programme for Diarrhoeal Diseases Control
Annex L.1, WHO Global Medium Term Programme (CDD)
Annex L.2, WHO Report of WHO/UNICEF Consultation on the National Production, Packaging and Distribution of Oral Rehydration Salts.

chain is technically feasible but will require considerable operational research to determine how these vaccines can best be delivered to medically underserved populations.

Less experience is available regarding the effectiveness of diarrheal disease control programs, especially in Africa. However, from WHO and CDC experience in demonstration projects in Asia, oral rehydration therapy programs have been shown to reduce infant and childhood mortality from diarrhea by ten to thirty percent. The oral rehydration packets are relatively inexpensive and the technology is available for their production within some African countries.[1]

The effective control of yaws in Africa has also been shown to be attainable if sustained efforts at case identification and treatment with penicillin are applied.

All CCCD project components have an important technical assistance element which is key to the implementation of CCCD. In addition to the short-term technical assistance for program planning, evaluation, surveys, operational research, and training, long-term assignment of technical assistance personnel will be required on both regional and sub-regional bases. (Regional and sub-regional medical epidemiologists can assist with data systems, epidemiologic surveillance, and program problems in developing countries.) As management weakness is a pervasive problem in developing countries, and as the U.S. has strengths in this field, the effective implementation of individual country programs will be greatly assisted by the assignment of operations officers.

Following its consultations, interviews, meetings and other research in Europe, Africa and the U.S.[2] the project design team identified the following intervention components as essential and of critical importance for the achievement of CCCD objectives:

1/ See Annex L.2, WHO/UNICEF Consultation on the National Production, Packaging and Distribution of ORS.

2/ See Annex Q.

1. Health Training

Training was the intervention method considered by WHO as well as all of the regional health organizations consulted and Ministries of Health from whom the project design team obtained input, as the major current and continuing means of responding to health needs at all levels, in sub-Sahara Africa. A serious paucity of African health workers with sufficient training in health planning, program management and evaluation exists, particularly in the technical and program areas of EPI and CDD. Appropriate training courses have been or are being developed by WHO and CDC. Sufficient experience with the EPI training courses held in Africa during the past year is available to make this planned CCCD activity a success.

Principal project inputs would consist of appropriate curriculum development and long and short term technical assistance training personnel - U.S. and African. Training courses to be conducted in French and English over the five year life of the project (LOP) are as follows:[1]

a. Sixty two (62) three week regional training courses for approximately 2,480 health workers will be conducted covering the following:

(1) EPI Management I (senior level health planners/workers)

(2) EPI Management II (mid level managers/workers)

(3) CDD Management I

(4) CDD Management II

b. Twenty four (24) four week sub-regional training courses will be conducted for approximately 960 health workers on cold chain repair and maintenance.

1/ See Annex R, Projected CCCD training schedule 1981-1985.

c. Approximately nineteen (19) sub-regional seminars/workshops will be conducted as needed on other selected childhood communicable diseases (yaws, yellow fever, etc.) prevalent in a given country or sub-region. Estimated LOP funding for training is $6,457,000.

2. Operational Research

Although WHO and many African nations have developed specific programs for the control of childhood communicable diseases, many technical and operational issues remain to be clarified.[1] This component of CCCD project activities will include applied field research to address deficiencies in knowledge, which provides significant obstacles to the achievement of project objectives as well as activities directed towards the study of ways to more efficiently and effectively utilize current knowledge.

Some of this research, to be conducted in at least 10-15 countries, will be carried out by CCCD staff, short and long term as well as experts from American Schools of Public Health and other appropriate institutions. However, it is anticipated that host country MOH's and other institutions will be utilized to the maximum extent possible in conducting operations research. In some instances MOH's will require assistance in long term planning and developing CCCD country programs. TA will be provided by CCCD on an ad hoc basis to establish catalytic demonstration projects in two or three countries annually. LOP funding for this project component is $6,431,200.

3. Data Evaluation (Including Epidemiological Surveillance)

The development of national capabilities to collect relevant health information upon which to plan communicable disease programs has been identified

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1/ See Annexes K, K.1, K.2, L, L.1 and L.2.

as a necessary and major CCCD activity. WHO has conducted overall country health programming (CHP) exercises in several African nations, and short-term consultants have assisted many nations in collecting baseline data for the justification and program planning of a variety of communicable disease initiatives. In addition, WHO has traditionally supported national efforts, including those affecting children. CCCD will provide support to those countries participating in CCCD activities to develop their own capabilities, to collect necessary data, to evaluate these programs, and to be able to investigate and control outbreaks of these diseases.

Technical assistance from both CCCD staff as well as specialists from the U.S. and other countries will be provided to assist MOH's in this area. Estimated LOP funding is $1,391,900.

4. Health Education/Promotion

The ultimate success of all health service programs is substantially dependent upon the informed participation and support of the communities and population served. While children are the ultimate target population for the services provided by this project, it is recognized that major efforts will be necessary to inform parents and various hierarchies of community leaders of the rationale justifying support of the program being made available. Although health education/promotion has long been identified as an essential component for successful programs, little has been done to date, and the opportunity exists for CCCD activities to make a major contribution in this field.

Illustrated written materials as well as mostly visual materials (posters, slides, etc.) and some audio materials, will be developed drawing on a variety of sources in Africa as well as elsewhere. Some other donors including WHO

and UNICEF have had some experience in developing appropriate international posters and similar materials.

The CCCD approach will be to seek the maximum input from target populations before preparing materials and then to test them for appropriateness prior to reproducing them in quantity.

It will be necessary for these materials to be translated/reproduced in a variety of local languages to achieve the desired impact on target populations. However, it is planned to utilize host country and other experts for this transposition and local presentation. CCCD will develop and distribute health promotion materials in French and English in twenty five countries. LOP funding for this project component is estimated at $2,025,000.

B. Economic Analysis

1. General

The fundamental objective of the CCCD project is to reduce infant mortality in sub-Sahara Africa by strengthening health delivery systems. The rationale for the project's components, the analysis of cost factors within the project and the time phasing for project implementation and evaluation are covered in detail in the project description, the financial plan and other sections of this project.

The general approach as well as the specific techniques to be used in this project were selected on a least cost basis, focusing on the need to provide a variety of health services responsibe to the varying needs and environments of the forty seven nations of sub-Sahara Africa. Donor and host country project costs can be readily estimated. It is also possible to easily identify the beneficiaries of the project, beginning with the recipient systems as well as individuals of project outputs such as training, organizational

support, commodities and medicines, and continuing through strengthened health service institutions to the ultimate target populations.

However, measuring the cost effectiveness and cost benefit of health activities is generally unsatisfactory and highly tenuous at best. The problem of placing a dollar value on human life, health and improved "qulaity" of life has never been satisfactorily resolved.

The subjective view of increased productivity by target populations can be quantified given a rarely found adequate data base. However, even this type of analysis is complicated and usually frustrated by the difficulty of attributing changes in health status and subsequent productivity increases to specific health care interventions.

Consequently, in recognition of the need for combatting childhood communicable diseases as described earlier in this paper, this analysis focuses on the least cost aspect of the administrative arrangements and project interventions analyzed earlier.

2. Anticipated Socio-Economic Benefits

The deleterious effects of childhood communicable diseases on the social and economic life of sub-Sahara Africa include:

a. The direct cost of caring for and supporting the several millions of sick children under the age of five each year and the concomitant loss of productive time on the part of their parents and other family members; and

b. The direct cost of lost productive capacity due to the mourning of the parents and other family members of the four million children who are estimated to die each year as a result of childhood communicable diseases. Direct and indirect socio-economic benefits will result first from impact on existing programs such as EPI and CDD and secondly, from the identification

of new areas of need and the development of methodologies to respond to them.

(1) Direct Effects:

(a) An improvement in the cost effectiveness of EPI, CDD and PHC programs prepared independently of the project;

(b) Increased capability of target area health delivery systems impacted upon by the project;

(c) Reduction of infant morbidity and mortality.

(2) Indirect Effects:

(a) Improvement in the productive capacity of the target populations;

(b) Induced effects (spread) on the various sectors of the economy; and

(c) Improved or positively enhanced "quality" of life for target populations.

Project impact and benefits are seen accruing over a period of time, however, the spread effect from upgraded and improved health delivery systems will range from immediate to mid-term and should have a multiplier factor and influence the overall economic development of the target areas.

It is incumbent upon the sub-Sahara host governments to channel and utilize this increased productive capacity. External donor development programs, nevertheless, will be enhanced by the success of this project.

3. Alternative Strategies and Least Cost

The approach of this project is less costly and more effective for combatting childhood communicable diseases than a number of alternatives:

a. Increase project impact by concentrating project activities and

resources on fewer than the four project interventions presently proposed. However, this means of achieving project purpose is not responsive to the widely divergent needs and stages of development of the health care systems of the forty seven countries of sub-Sahara Africa.

b. Limit CCCD interventions to selected areas: this approach is incompatible with the U.S. commitment to combatting childhood communicable diseases in all of sub-Sahara Africa.

c. Involve other donors in CCCD interventions. This alternative is quite feasible if other donor support is forthcoming.[1] The following analysis of estimated vaccination costs in Africa was prepared by the project design team and CDC in Atlanta, for illustrative purposes and to provide a basis for some quantitative facts on this fundamental issue.

1/ The PP design team found little or no evidence to sustain this possibility.

ESTIMATING COST RANGES FOR VACCINATION OF CHILDREN IN AFRICA

For economic and program analysis, an estimate of the "total cost" to vaccinate a child (or pregnant woman) is very useful. There are, however, multiple pitfalls in the estimation process which limit the validity of the resulting estimation.

The Expanded Programme for Immunization (EPI) of the World Health Organization (WHO), has estimated the cost per "fully vaccinated" child as $3. Other estimates run as high as $7 to $10 per "fully vaccinated" child.

The cost of vaccinating a child has many components. For each of these components, there are important definitions or methodologic problems. The following is a list of some of the cost factors and their variability.

I. VACCINE

A. Purchase Price of Vaccine: This price varies with the type of vaccine, the number of doses per vial, the total number of doses ordered, and the length of the contract.

B. Vaccine Shipment Costs: This is the cost of shipping the vaccine from the manufacturer to the country in which it will be used. This cost varies with the distance between manufacturer and each country; the amount of insulation and cooling built into the vaccine shipment container and the frequency of shipments required per year.

C. Vaccine Loss: Some of the vaccine purchased is not used to immunize children because of doses left in multiple dose vials, expired vaccine, vaccine mishandling, etc.. The percent of vaccine lost varies from country to country and may range from 10% to 40% (or more).

II. DEFINITION OF "FULLY VACCINATED"

The EPI specifies three doses each of DPT and oral polio, and one dose each of measles and BCG vaccine in the first year of life of each child. In practice, many children do not receive the full schedule. Even so, each dose of vaccine confers some immunologic benefit in the child.

III. COLD CHAIN

Good preservation of vaccine requires well-maintained equipment including refrigerators, freezers, vaccine carriers, ice, fuel for the refrigerators, etc.. The purchase price of capital equipment, fuel and maintenance must be assigned to the cost of vaccinating children.

IV. TRANSPORTATION

Transportation is needed to move vaccine to health centers and for the movement of personnel. How much of these often "buried" costs, to assign to each vaccinated child, must be decided.

V. PERSONNEL

Achieving the objective of vaccinating children and pregnant women requires personnel work. How the salaries and other benefits of staff are assigned to the cost of vaccinating a child is a necessary analytic decision.

Factors One through Five will vary widely from country to country. Without detailed study in particular countries, one must rely on the estimate of range from $3 (U.S.) to $10 per "fully vaccinated" (EPI definition) child.

C. Social Soundness Analysis

1. Social Impact and Policy Implications: A Twenty Year Perspective

The CCCD project goal of a reduction in morbidity and mortality among targeted sub-Saharan African populations aged 0-5 will have population, employment, and food production and consumption implications in the next two decades. To lessen the adverse impact of population growth resulting from reduced mortality, it will be of critical importance to confront land tenure problems, food production and food security issues, and expanded employment strategies and opportunities. In ten years the targeted EPI and CDD populations will be between 10-15 years of age. The AID health sector policy paper points out that population growth is taking place among the dependent age groups, so that in many developing countries half of the total population is under 15 years of age. This in turn creates a tremendous strain on the productive segment of society, and other limited resources as well.

The policy implication of this demographic impact is the need for an intensification of food production to meet consumption needs in the next twenty years. Dialogue and operational collaboration between policymakers in health and agricultural sectors will be vital to the design and implementation of responsible development activities which will have consequences over the next two decades.

In an article on health education in developing countries, Navid and Priden (1962:157) point out that in the United States, Europe, and other industrialized countries; the control of communicable diseases was accompanied by the gradual and parallel growth of several economic as well as medical and social services. They further state that "it has been repeatedly demonstrated that any public health programme, conducted anywhere in the world and irrespective

of any health or disease condition, is almost certainly bound to fail in its objectives if, simultaneously, provision is not made for growth and improvement in the economic field." Food security and employment opportunities will loom on the horizon as significant issues in development strategies as childhood mortality is reduced through EPI and CDD interventions.

2. Time Frame Project Results or Culture Change

While the reduction of mortality and morbidity in sub-Sahara children aged 0-5 is the ultimate project goal, a concomitant goal is the development of a commitment to health maintenance and infectious disease prevention among ever-widening sub-Sahara populations. Because newly introduced public health measures mean changes and modifications in beliefs, attitudes, and behavior; all of which define and cohere any special system, EPI and CDD measures cannot be expected to have any long-term benefits over the remaining budget life of this project.

D. Administrative Feasibility

A simple administrative structure has been designed to supervise and administer this multifaceted project which will be implemented in a very large geographic target area comprising some forty seven nations of sub-Sahara Africa with a total population of 340.5 million[1] including an estimated 30 to 40,000,000 children five years of age or less. Certain elements of this structure cannot be presently finalized (eg. posting resident staff in East Africa). However, the design maintains adequate flexibility to respond to anticipated project needs as they occur.

1/ Estimated 1979 population for all of Africa except Morocco, Algeria, Tunisia, Egypt and South Africa (for CCCD the seven AID-ineligible countries should be subtracted). Source: Population Reference Bureau 1979. 1979 World Population Data Sheet.

All major CCCD activities will be conducted on a regional or sub-regional basis, although some components will be implemented through bilateral programs to be coordinated through USAID missions with individual Ministries of Health or national research agencies. This does not preclude participation by non-governmental organizations; rather, the Ministry of Health in each country is seen as the chief planning arm and approval channel for developing CCCD programs.

Cost effectiveness as well as experience and background is another major reason for the recommendation of the following administrative arrangement. The proposed implementing agency's (IA) overhead rate is 20% for domestic U.S. activities and 5% for international activities, and is by far the least cost possible for the implementation of this project by any independent country or institution.

1. Implementing Agency

It is proposed that the Center for Disease Control be the implementing agency for CCCD. As such CDC under the supervision of AID will, in consultation with USAID missions, REDSO Directors, regional organizations and other donors, be responsible for project implementation (under a PASA and utilizing PSC's or other contractual arrangements as needed). A project supervisor will be appointed by the IA who will recruit and assign other staff as needed, including African professionals.

CDC was chosen as the preferred IA because of its demonstrated capabilities in the planning, implementation and evaluation of communicable disease control programs; its strong institutional commitment and support for international health programs led to a consensus among the project design team that CDC be the implementing agency for the CCCD project. It is understood the IA will utilize African staff members, research organizations and other institutions to the degree possible and feasible.

Other major factors are CDC staff expertise and experience in the program region as well as its extensive background and experience in the areas of program interventions and components (eg. training, surveillance, etc.). CDC staff have played key roles in international communicable disease control programs in Africa, the most prominent of which was their work in helping to eradicate smallpox. They have also worked closely with SHDS, CILSS and other regional organizations. As a result, CDC has developed productive working relationships with key individuals and groups throughout the target region and with the Health Ministries of many African nations. In addition, the EPI training courses utilized by WHO world wide were developed by CDC staff and the agency has actively participated in conducting these courses in Latin America, Asia, and Africa.

2. Advisory Council

The IA will be assisted in coordinating CCCD activities by an Advisory Council formed by representatives of AID/W, CCCD, African regional organizations, other donors (eg. WHO, WHO/AFRO, UNICEF, FAC, etc.) and invited host countries. The advisory council will meet at least annually and review CCCD activities and projected plans in view of coordinating them with other childhood communicable disease control activities.

This arrangement will assure African input as well as the coordination of on-going activities and project planning among donors and organizations working in combatting childhood communicable diseases in the region.

It is proposed that an external donors conference be held to establish the necessary framework for the advisory CCCD coordinating council or committee to provide guidance and maximum impact of CCCD activities. Other donors might be called upon simultaneously to provide financial support to the project.

3. Alternative Administrative Arrangements

In arriving at these conclusions the project design team considered several alternative administrative arrangements, including the following, all of which were found to be less desirable than the recommended choice for the reasons indicated:

a. Contract with a private firm or institution to staff and implement the CCCD program (this would at least double project costs);

b. CCCD funds could be turned over entirely to WHO for program implementation (AID/other donor control would be diluted or lost);

c. Make all CCCD funds available to USAID missions on a bilateral basis. Requests for such funds would be approved either by the REDSO's or by AID/W (less efficient method which places heavy additional duties on REDSO's, USAID missions);

d. Develop a consortium of major external donors to support a coordinated an expanded CCCD program and incorporate AID's CCCD program funds into such an integrated program (this option is considered to be open for consideration by AID/W and other prospective donors).

E. Environmental Statement

CCCD project activities will have their major environmental impacts in the sub-areas of socio-economics and health. Insofar as regional and bilateral programs will provide for improvement of health support facilities, CCCD will beneficially affect children resident in target areas. The most obvious beneficial health impact will be reduction of morbidity and mortality in the pediatric population for diseases covered by CCCD programs. This will lead to an absolute increase in the population growth rate. Nevertheless, as the impact of other components of primary health

care programs, such as adequate food supply, better nutrition and proper child-spacing, begins to be felt the quality of life in sub-Sahara Africa will be substantially upgraded.

This project is not expected to have any tangible impact on the physical environment, as CCCD funds will not directly support construction of buildings, nor interventions directed at the physical environment.

IV. FINANCIAL PLAN AND ANALYSIS

In view of the fact that this PP will be reviewed and submitted to other donors, for possible project participation, before being finalized, this financial plan and analysis is illustrative only and is based on several arbitaray and tenuous assumptions.

This project is a non-revenue producing project, the prime objective of which is to provide support in combatting childhood communicable diseases in sub-Sahara Africa focusing principally upon EPI and CDD programs within the framework, insofar as possible, of primary health care systems.

The total five year financing (FY1981 - FY1985) estimated for carrying out the CCCD project and the projected sources of this financing are shown below as "Summary Cost Estimate and Financial Plan."

In view of the fact that CCCD is an AID initiative and program priority, the assumption is made that AID will bear the major share of CCCD costs: arbitrarily set at 60%. It is further arbitrarily assumed that other donor support will be secured and together with host country input it will bear the remaining 40% of project costs. Another assumption made in this financial plan is that CDC will be contracted with as an implementing agency.

Financial Implementation

Operational budget support will be affected through a PASA between AID and CDC acting as implementing agency (IA). Commodity, capital and consumable property procurement will be handled through normal AID procedures as appropriate. Administrative support and the necessary waivers will be provided to the CCCD IA to the extent that it is usually provided to technicians for other projects.

A. Budget Summary

The total project budget including contingencies (5%) and inflation (15%) is $38,294,600. During the development phase of the project and until other donor

support is secured project financing for foreign exchange and local costs will be provided by AID. Project costs are broken down into three parts, initial, first year, AID expenditures, anticipated LOP AID expenditures (FY1981 - FY1985) representing 60% of total costs and projected other donor host country expenditures representing 40% of costs as follows:[1]

1. Summary of Project Inputs:[2]	U.S. 1st Year ($000)	U.S. LOP ($000)	OTHER Donor Host Country ($000)	TOTAL ($000)
(a) U.S. T/A Personnel	240	1,924.8	1,283.2	3,208.1
(b) Operational Research Technical Development	144	3,858.7	2,572.4	6,431.2
(c) Training	252	3,874.2	2,582.8	6,457.
(d) Data & Evaluation	156	835.1	556.7	1,319.9
(e) Health Evaluation	90	1,215.	810.	2,025.
(f) Commodities/R&D Equipment	375	5,664.1	3,776.	9,440.2
(g) Project Evaluation	31.2	670.	446.7	1,116.9
(h) Contingency/Inflation[3]	282.3	3,743.7	2,495.8	6,239.6
(i) Other Costs[4]	104	1,190.8	793.8	1,984.7
FY1981-1985 TOTAL		22,976.4	$15,318.2	$38,294.6

1/ See Annex H, CCCD Project Budget.

2/ See Annex H, CCCD Project Budget.

3/ 5% contingency, 15% inflation

4/ Implementing agency overhead (U.S. costs 20%, overseas costs 5%).

2. Projected Other Donor/Host Country Expenditures

Other donor/host country contributions cannot be even broadly estimated at this point due to lack of specifics of program participation. Project development and implementation, particularly regarding the bilateral components of the project must be made specific to obtain more segmented cost projections. Essentially all project components, with the exception of cold chain training and specific bilateral technical development projects will be carried out on a regional or sub-regional basis. These costs would, in principal, be assumed by AID and other donors. Costs for bilateral or country-specific activities would be assumed by other donors with host countries assuming 25% of those costs.

B. Summary Budget and Financial Plan

Assuming the "usual" host country contribution of 25% only of other donor contribution would make for total host country contributions of $3,825.0. However, if 25% of the total budget was to be derived from host country contributions it would amount to $9,573.5 and reduce AID/other donor contributions accordingly.[1] It is further assumed that host country contributions will be largely in-kind and consist of counterpart personnel, office and physical operational facilities, administrative and secretarial support and certain transportation.

1. Summary of Project Costs by Contribution

I.	AID Contribution (60%)	$ 22,976.4
II.	Other Donor/Host Country Contribution (40%)	15,318.2
	TOTAL COST OF PROJECT	$ 38,294.6

1/ This projection of 25% is proforma and highly arbitrary since a number of targeted countries obviously would not be able to make prorated contributions of this magnitude and certain others would be unable to make any contribution.

2. Recurrent Costs

As indicated in the Project Description recurrent costs is a central "critical issue". Immunization programs by their very nature are continuing programs. If they are ended the diseases they were used to control will certainly reappear. There is serious question as to when and if target area countries will be able to support EPI programs on their own. Consequently, external donor support will be required in the future.

V. IMPLEMENTATION PLAN

A. AID/IA Administrative Arrangements

This project presents no unusual administrative problems to either AID/W or CDC the proposed implementing agency (IA) with the caveat that appropriate personnel will be available despite the current staffing freeze.

Implementation Arrangements

1. General and Time Phasing

The list of tasks to be carried out in this project is diverse and varied. To ensure that the activities follow a logical order and that the project supervisors and monitors have before them a scheduling device to cover all aspects of the project a listing of events is presented in this section. It is sequential and is time phased in keeping with the design team's best/optimal estimates and projections.

2. Monitoring

Responsibility for the project monitoring will rest with AID/W, Regional Affairs Office of the African Bureau. In addition, the IA will prepare an annual budget for implementation of this agreement for review and approval by AID. The IA will provide quarterly financial reports of expenditures. Unless otherwise agreed upon, procurement of equipment and supplies will be handled through regular AID channels.

Additional technical support as needed will be procured and provided by the IA. (It may be possible during the life of the project that REDSO/W and REDSO/E personnel, including the resident Public Health advisor attached thereto, may be available from time to time on an as needed basis.)

Evaluation of the health services supported/developed under this project is an integral part of the project itself. Each evaluation is viewed as mutually

reinforcing the purpose of this project and provides a means of determining whether the main goals of the project are being met. (see Section VI - Evaluation Plan)

3. Planned Activities FY1981 (Start Up)

After final approval of the Project Paper, AID/Washington will negotiate a PASA with CDC Atlanta. Signing of the PASA is anticipated by December 1, 1980. Initial project management staff assignments will be made at this time.

During the balance of FY81, agreement will be reached with REDSO/W in Abidjan for the assignment of a CCCD team (a medical epidemiologist and an administrative officer) to an appropriate locus in the West-Central Africa sub-region. Sub-Sahara Africa USAID's will be informed of the initiation of the project and the services available to countries. From the responses of the USAID's, two to three bilateral CCCD programs will be identified for implementation in FY1982. 2

Procurement of the technician vehicles and other start-up material requirements identified in planning of the bilateral and sub-regional activities can be initiated.

4. Planned Activities FY1981 (continued)

a. Technical Assistance. Recruitment of the sub-regional medical epidemiologist and the operations officers for the bilateral programs will be completed, and they will be at post by April 1, 1981. 2 4 or more

b. Training. Regional training courses will be held for national managers of EPI and CDD activities in both English and French. EPI mid-level management training will be provided in four countries. Cold chain repair and maintenance courses will be held in two countries. One ORS production machine operator will be trained. Specialized laboratory training for yaws and other serologic testing will be arranged as required. ?

c. Data and Evaluation. Consultant visits will be made to eight countries for EPI, four countries for CDD, and five countries for yaws and other CCCD programs for data collection, program planning, systems development and/or program evaluation.

d. Operational Research. Meetings with WHO will result in identification of six to eight operational research projects for which protocols will be developed and implemented. These will include vaccine trials, ORT administration, etc..

e. Health Education and Promotion. Consultation with African experts in health education and sociology will identify promotional materials and public education methods for testing, development, publication or distribution in one country.

f. Commodities. Vehicles, vaccine cold storage equipment, selected vaccines, and immunization supplies, oral rehydration packets, laboratory supplies and equipment, and selected biologics and drugs will be supplied to support CCCD project activities in operational areas in the three countries with bilateral programs.

5. Planned Activities FY1982.

6 a. Technical Assistance. Six additional long term field staff will be assigned, the administrative officer for the West-Central Africa sub-region; a medical epidemiologist for the East-Southern Africa sub-region, a medical epidemiologist in a bilateral project, and three additional operations officers also for bilateral projects.

b. Training. The annually held training courses for national program managers of EPI and CDD will be presented in English and French. Management II courses for mid-level staff of both EPI and CDD will be conducted in eight and two countries, respectively. Cold chain maintenance and repair courses will be held in five countries and laboratory and other specialized training courses in four countries.

c. Data and Evaluation. Consultant visits will be made to six countries for EPI, eight countries for CDD, and five countries for other CCCD programs for data and evaluation component activities.

d. Operational Research. An additic . l 10-12 projects will be identified in consultation with WHO. Protocols will be prepared and the projects carried out.

e. Health Education and Promotion. Methods and materials tested during FY1981 will be modified and adopted as required, then introduced in all bi-lateral project operational areas. A workshop will be held to develop and test methods for wider dissemination of materials.

6. Planned Activities FY1983

a. Technical Assistance. Two additional long term CCCD field staff will be assigned to bilateral programs, one operations officer and one medical epidemiologist. 2

b. Training. The annual EPI and CDD national managers' courses will be held both in English and French. EPI and CDD Management II courses will be conducted in eight and six countries respectively. Specialized courses will be held in six countries and cold chain maintenance and repair courses in eight countries.

c. Data and Evaluation. Consultant visits will be made at the same level as in FY1982.

d. Operational Research. 15-16 projects will be conducted.

e. Health Education and Promotion. Previously tested and accepted (FY1982) materials and methods will be adopted and introduced into new bilateral program areas.

f. Commodities. Scheduled supplies and equipment will be provided to initiate activities in new bilateral programs and to maintain activities in established programs.

7. Planned Activities FY1984

Consequential extension of prior year activities, for all program components.

8. Planned Activities FY1985.

Consequential extension of prior year activities for all program components.

B. IMPLEMENTATION: TIMETABLE OF EVENTS

PLANNED/LATEST DATE (MONTHS) AFTER PROJECT APPROVAL		EVENTS	ACTION AGENT
NOV. 1980	00/00	Project Funding Authorized PIO/T, PIO/C issued	AID/W
DEC. 1980	01/02	PASA with Implementing Agency (IA) signed	AID/W, IA
JAN. 1981	02/03	Project Management Staff in Place	IA
FEB. 1981	03/04	Initiation EPI Management I Periodic Training Cycle (English)	CCCD
MAR. 1981	04/05	Initiation EPI Management II Periodic Training Cycle (English)	CCCD
APRIL 1981	05/06	Initiation EPI Management I Periodic Training Cycle (French)	CCCD
FEB. 1982	15/16	Initiation CDD Management I Periodic Training Cycle (English)	CCCD
MAR. 1982	16/17	EPI Management I Periodic Training Cycle (French)	CCCD
APRIL 1982	17/18	Initiation EPI Management II Periodic Training Cycle (French)	CCCD
MAY 1982	18/19	CCCD West Africa Epidemiologist at Post	CCCD
JUNE 1982	19/20	Initiate Cold Chain Repair Periodic Training Cycle (English)	CCCD
JULY 1982	20/21	Initiate Cold Chain Repair	

PLANNED/LATEST DATE (MONTHS) AFTER PROJECT APPROVAL		EVENTS	ACTION AGENT
		Periodic Training Cycle (French)	CCCD
OCT. 1982	23/24	Initial Internal Evaluation	AID/IA/WHO
NOV. 1982	24/25	CCCD West Africa Sub-Regional OPS and Technical Development Two Officials at Post	CCCD
NOV. 1982	24/25	Three CCCD West Africa CCCD Countries Operational Research Begins	CCCD
MAY 1983	30/31	CCCD East Africa Sub-Regional Epidemiologist Posted to Assignment	CCCD
MAY 1983	30/31	Implement CDD Management II Periodic Training Cycle (English)	CCCD
MAY 1983	30/31	Implement CDD Management II Periodic Training Cycle (French)	CCCD
OCT 1983	35/36	Second Internal Evaluation (Two teams)	AID/IA/WHO
NOV. 1983	36/37	External Evaluation	External Team
NOV. 1983	36/37	CCCD Epidemiologist Posted	CCCD
NOV. 1983	36/37	CCCD Operations Officer Posted	CCCD
JAN.-DEC.'84	39/50	Periodic Training Cycle (English)	CCCD
JAN.-DEC.'84	39/50	Periodic Training Cycle (French)	CCCD
OCT. 1984	47/48	Third Internal Evaluation	AID/IA/WHO
NOV. 1984	48/49	External Evaluation Replacement of CCCD Field Staff (PRN)	External Team
JAN. 1985	50/51	Periodic Training Cycle (English)	CCCD
FEB. 1985	51/52	Periodic Training Cycle (French)	CCCD

PLANNED/LATEST DATE (MONTHS) AFTER PROJECT APPROVAL		EVENTS	ACTION AGENT
MAR. 1985	52/53	Periodic Training Cycles (French)	CCCD
MAY 1985	54/55	Cold Chain Repair Periodic Training Cycles (English)	CCCD
JUNE 1985	55/56	Cold Chain Repair Periodic Training Cycles (French)	CCCD
SEPT. 1985	58/59	Fourth Internal Evaluation	AID/IA/WHO
NOV. 1985	59/60	External Evaluation	External Team

VI. EVALUATION PLAN

A. Internal

Four internal and three external evaluations of CCCD project activities will be carried out over the life of the project. The first year's evaluation will be an internal review of the status of regional and sub-regional activities. It will be conducted in late calendar 1982 by a three-person team (representing WHO, AID, and CCCD).[1] This evaluation will also assess the extent of bilateral interest and involvement in CCCD. The evaluation report will serve as the background document for a second internal evaluation, to be carried out in late 1983. This second internal evaluation will be conducted by two three-person teams and will also assess regional and bilateral CCCD activities. A third internal evaluation with three three-member teams will take place in late 1984 using the external evaluations findings as its basis. It will review regional CCCD and ten bilateral activities. A fourth and final internal evaluation will take place in September 1985.

B. External

In November 1983, an external evaluation team of five persons (public health physician/team leader, health educator, operations officer, anthropologist, and economist) will conduct an evaluation to measure the following project output indicators: (1) number of Ministry of Health managers and mid-level personnel trained in EPI, CDD and yaws techniques; (2) number of baseline surveys conducted; (3) number of operations plans written; (4) number of health information systems designed; and (5) quantities and utilization of project commodities. This evaluation will also examine the status of cold chain refrigerator equipment in terms of the condition of

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1/ For purposes of evaluation, WHO and AID are considered to be internal personnel. All of the internal evaluations will be carried out by similar teams.

chain refrigerator equipment and the number of people trained in maintenance. Health education and promotion activities will be evaluated for quality and quantity of materials developed and distributed. A total of three 5-person teams will review regional CCCD activities and approximately ten bilateral activities.

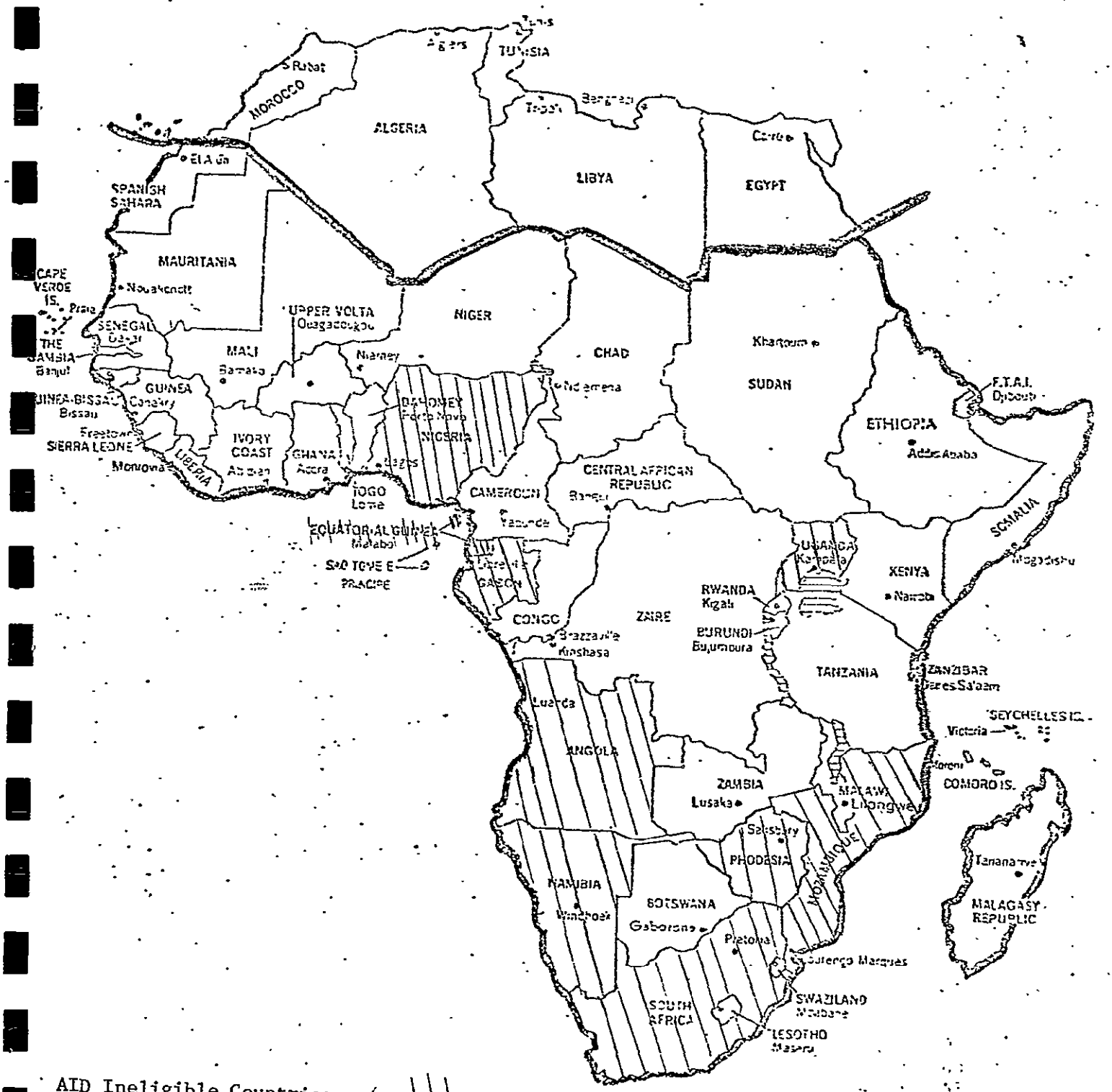
A second external evaluation with two teams of five members[1] will take place in November 1984.

A third and final external evaluation will be carried out in late 1985 by two five-person teams with the same mix of skills as the first external evaluation team. This evaluation will assess all EPI, CDD and other CCCD project outputs and the extent to which the project has achieved its purpose and objectives.

1/ All external evaluations will be carried out by similar teams.

ANNEX A

AFRICA



AID Ineligible Countries

ANNEX B

COMBATTING CHILDHOOD COMMUNICABLE DISEASES: SOCIAL SOUNDNESS ANALYSIS

I. INTRODUCTION

Health and Cultural Contexts

The point of departure here is that a new public health intervention in a developing country is ultimately a cultural and social process. A public health intervention is therefore the interaction between or among a number of actors, each fulfilling a role or set of roles defined by the cultural context and normative behavioral patterns of the particular sets of actors involved in the process. Care should be taken not to assume that sociological inquiry applies only to host governments and populations. The situation is not one simply of catalyst versus responder. It is rather a complex interaction and communication among external donors and host governments representing different cultural, economic, educational, and ethnic backgrounds attempting to assist in the delivery of expanded public health services to populations with limited or nil access to modern health care services.

II. SOCIAL IMPACT AND POLICY IMPLICATIONS: A TWENTY YEAR PERSPECTIVE

The CCCD project goal of a reduction in morbidity and mortality among targeted sub-Saharan African populations aged 0-5 will have population, employment, and food production and consumption impli-

cations in the next two decades. To lessen the adverse impact of population growth resulting from reduced mortality, it will be of critical importance to confront land tenure problems, food production and food security issues, and expanded employment strategies and opportunities. In ten (10) years the targeted EPI and CDD populations will be between 10-15 years of age. The AID health sector policy paper points out that population growth is taking place among the dependent age groups, so that in many developing countries half of the total population is under 15 years of age. This in turn creates a tremendous strain on the productive segment of society, and other limited resources as well. (n.d.:41).

The policy implication of this demographic impact is the need for an intensification of food production to meet consumption needs in the next twenty years. Dialogue and operational collaboration between policymakers in health and agricultural sectors will be vital to the design and implementation of responsible development activities which will have consequences over the next two decades.

In an article on health education in developing countries, Navid and Priden (1962:157) point out that in the United States, Europe and other industrialized countries; the control of communicable diseases was accompanied by the gradual and parallel growth of several economic as well as medical and social services. They further state that "it has been repeatedly demonstrated that any public health programme, conducted anywhere in the world and in respect of any health or disease condition, is almost certainly

bound to fail in its objectives if, simultaneously, provision is not made for growth and improvement in the economic field." Food security and employment opportunities will loom on the horizon as significant issues in development strategies as childhood mortality is reduced through EPI and CDD interventions.

III. SOCIOCULTURAL FEASIBILITY

Assessment of Host Government Strengths in Health

Host country requests for participation in EPI and CDD activities will be assessed within the context of the country health plan submitted to WHO/AFRO. These country health plans which set forth the primary health care strategy and implementation plan have a June 1980 deadline. During the CCCD team visit to WHO/Geneva, Dr. David Tembo, Regional Officer for Primary Health Care, pointed out that the primary health care action plan for the Gambia had been submitted and approved for 1980-86. Mauritania had also submitted a country health plan, but would require the assistance of an WHO/AFRO technical advisor in the preparation of an acceptable plan.

Regardless of the status of country health plans, countries will be eligible to participate in the regional CCCD activities such as training in EPI and CDD techniques and methods. However, if countries are interested in participating in CCCD component activities through, for example, an AIP or other bilateral program; they must have a WHO/AFRO approved country health plan which would set forth their strengths, priorities, and implementation schedules.

Benefit Incidence

A major sociocultural aspect of this project from the regional perspective is that the ultimate direct beneficiaries will not be the first to be impacted by external inputs. In this project design, inputs will first impact those responsible for managing health services in their countries. A project assumption is that EPI and CDD activities resulting in new and upgraded knowledge, techniques, and methods will be shared and transferred from the managerial or central level all the way to the local or peripheral level. A way of ascertaining that this is actually taking place would be through an evaluation mechanism of the impact of training, for instance, of managers beyond the managerial level.

Perception of Benefits: Donor vs Host Governments/Populations

What is assumed to be a benefit by the donor may not be similarly perceived by the host population. The perception and attitude concerning health and illness will have different cultural reference points which will impact the effectiveness of EPI and CDD activities. For example, the concept of "maintenance" may mean that whatever is running well needs no attention. This can apply to the human body, vehicles, and equipment. In this type of philosophical milieu, preventive medicine and care may have little success. Also of importance is the attitudinal configuration concerning illness; who diagnoses illness; and who ministers unto the ill. For the majority of the projected target populations, illness is not per-

ceived as an individual phenomenon, thus the sick person cannot be treated singly or outside the context of his cultural milieu.

This cultural view has serious implications for a periphery to center referral system since the first person or persons to whom a patient turns are household and neighboring kin. Depending on the kinship structure of the affected household, a sick child may be placed in the care of paternal or maternal kin. Relations in other villages who belong to the wider kin group are also consulted. The household kins and wider kin group consultation are at the very heart of indigenous health systems. Kin groups observe and diagnose the illness; comfort the patient; and represent a continuing source of support. If the illness does not yield to home remedies, a medical specialist from among the hierarchy of traditional medical personnel may be called in on a consulting/diagnostic basis. This specialist may or may not, after treatments produce no relief of the illness, refer the patient to a modern health service.

It is therefore important to be aware of the fact that the existence of public health services may not be perceived or accepted as efficacious or beneficial as the first line of diagnosis or referral. Treatment may very well be accepted within a modern health context as a last resort, the consequences of which may be a referral which comes too late to prevent death.

Health Interventions and Demands on Targeted Adult Populations

The ultimate demand on targeted adult populations, especially mothers, is that they assume full responsibility for the maintenance of the health of their children and that of their families. This demand implies modification and/or changes in individual and group beliefs, attitudes, and behavior about health, illness, and disease.

It is, however, precisely the beliefs, attitudes, and social and economic production behavior which define and cohere any human society. These social systems change slowly in terms of their beliefs, attitudes, and behavior. Care should be taken, therefore, not to single out African societies as being characterized by rigid adherence to conservative ideas and behavior. What appears to be rigid conservatism may very well be culturally adaptive ways of responding to the causation, treatment, and prevention of illness. An understanding of the culturally adaptive ways of responding to health, illness, and disease requires on-going appropriate social science research and information about groups targeted. The importance of some understanding of the cultural context of attitudes, beliefs, and behavior concerning health issues should be reflected in the design and implementation of health education and public promotion programs. Building on the familiar facilitates understanding and acceptance of a new intervention. New and/or modified changes in behavior will "make more sense" if case within familiar and normative cultural frames of reference.

Demographic and Social Unit Analysis

Demographic profiles of participating countries - migration and resettlement patterns, as well as birth rates, ethnic and language make-up; and income and educational levels should be available from WHO and other regional sources. This data is critical because it will provide the base for forecasting demographic configurations into the next decade when this intervention will impact population pyramids with consequences for economic policy. The location and clustering of important religious and political groups should also be determined. Being in a position to analyse population shifts and movements; as well as structural and behavioral patterns of family units, kin groups, political groups, and religious groups should facilitate planning and operations design. Knowledge of group structure and function, for example, could aid in the determination of identifying local health personnel. Health extension personnel brought from the outside runs the risk of not being accepted; not only because of possible language and communication barriers, but, because they would have no legitimacy and credibility within the traditional context. Lack of legitimacy and credibility would also mean the lack of influence in terms of garnering the attention of local populations. Membership in a local and popularly recognized kin group, political group, or religious group would greatly facilitate the entree of the health person and the intervention into the targeted area.

Locally Familiar Health Structures: Indigenous Health Care

Insofar as it is possible to separate out the health component of targeted social systems from the rest of the cultural complex, the most significant and familiar local health structure is the indigenous or traditional system of health care. This system represents and reflects adaptive responses to mortality, morbidity, and the causes thereof.

Traditional medicine and health care is often viewed as ineffective, harmful, or both. It has been, in many instances, relegated to a position of negative images ranging from strange and exotic customs, to harmful magic and witchcraft. The African ethnographic record indicates that despite the existence and availability of modern health care services, belief in and adherence to traditional health care systems endures.

This being the case, it is incumbent upon the planner to understand traditional health systems, not as an odd collection of customs nor for the purpose of ridding a group of taboos, rituals, or witchcraft; but as a part of a complex of social relationships and cultural patterns of beliefs and behavior. Traditional health systems should be understood not solely for the purpose of pinpointing cultural resistences or obstacles, though this is important; but, rather, to identify and pinpoint positive aspects which can be strengthened and utilized in the fuller realization of the delivery of a CCCD Program.

Care should be taken that research into traditional health care systems not become an end unto itself. Too narrow a concentration into this area of indigenous health care can lead to an obfuscation of the larger picture which is the attitudinal and behavioral complex of traditional health care and the traditional specialist.

It is important not to lump traditional health specialists, into one indiscriminate group. Distinguishing between special categories, roles, statuses, and gender have implications for potentially effective incorporation and utilization of these people into health education and public promotion programs designed to raise the acceptance level of a new intervention. Specialty categories within the traditional hierarchy of specialists are as follows:

1). First, there are the women whose training, skills, and techniques "include such practices as the use of poultices, purgatives and emetics, inducing sweating by various processes, and all the traditional birth practices."[1]

Women are generally considered to be very unspecialized people within the hierarchy of traditional health specialists. Their significant role and status is that of midwife and/or traditional birth attendant.

1/ Margaret Read. Culture, Health, and Disease. Social and Cultural Influences on Health Programmes in Developing Countries. London: Tavistock Publications, 19-6, p. 16.

In many instances the presence of this person is not essential, since any female kin can assume this role if necessary. However unspecialized these women's skills may be defined in the traditional medical hierarchy, they are an integral part of the health system.

From the point of view of the planner, these women represent a first line indigenous cadre of personnel in the development or strengthening of a health referral system. A Johns Hopkins Population Center March 1980 draft report on "Traditional Midwives and Family Planning" points out that data indicates that "traditional midwives are most effective when their program involves a technology that is easy to apply, effective, and without long term side effects." An example of the referral process is provided in this draft report by an example from Haiti where "using midwives to bring women to the hospital or clinic for a tetanus vaccination or to accept tetanus immunization at home by community workers contributed more to eliminating neonatal tetanus than training midwives to use sterile material for cutting and dressing the umbilical cord" (1980:14).

2). Second are the male specialists with ascribed or acquired skills and techniques in such areas as bone-setting and rudimentary surgery.

3). Next are the male religious-medical specialists whose roles are highly specialized. Their usually ascribed powers emanate from a supernatural source. In the diagnosis and treatment of illness supernatural powers are part of ritual healing.

4). Last are the herbalists or traditional pharmacists whose extensive knowledge of herbs, mixtures of herbs, and bark is utilized in such illnesses as headaches, rashes, and fevers.

These categories of specialists exert a tremendous amount of influence in their social systems, therefore, the identification and solicitation of their assistance in health education and public promotion is vital to the establishment and implementation of any new health intervention.

This constellation of indigenous health personnel represents the basic organizational structure through which a new health intervention could be channeled at the local level. There may be some initial reluctance at the national or regional level to 1) admit the existence of this system because of its negatively projected image or 2) agree to its efficacy in the implementation process due to political relations between the center and the

periphery. This possibility should not relieve the external planner of responsibility for acknowledging the existence of this indigenous structure and factoring it into the implementation strategy.

In a discussion of the importance of traditional health care and the traditional specialist, Margaret Read comments as follows:

> The traditional practitioner, as he appears in recent studies by medical personnel and social scientists, is an essential link in the chain binding the patient and his kin group to the process of diagnosing and treating the illness. Local communities expect the practitioner to take a detailed and personal interest in the patient. He on his side considers it important to create an atmosphere of confidence and trust to ally the anxiety felt by the patient and his friends, and he establishes this atmosphere by an unhurried and patient question-and-answer process, as well as by the kind of inquiries he makes about the illness and its sumptoms...Local practitioners are willing to be 'called' and to visit the patient in his own home, surrounded by his relatives. Even more important, the local practitioner speaks to the patient and his relatives about the illness and treatment in language and concepts that are familiar to them, and that they can understand...[1]

It should not be assumed that traditional specialists are necessarily obstacles to a new health intervention. They may very well view a new intervention as a means of increasing their prestige and status in the community. Raymond Firth (1971:136) points out that among the Manus of New Guinea, "local practitioners, spirit-mediums or 'medicine men,' are...not antipathetic to the new therapy. They are happy to intermingle their own simple systems of leaf infusions, massage, and prayerful laying on of hands with

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1/ Ibid., p. 21.

the administration of Western pills. These practitioners are almost pathetically anxious to gain Western approval. They are convinced that their spirit techniques are correct, but are under fire from modernists in their own community."

If the regional or local political structure permits the integral inclusion of traditional specialists in the new intervention, their power relationships in the community could be positively enhanced. The motivation, then, for participation in a new health intervention on the part of traditional specialists may be an enhancement within the culturally defined prestige and status complex. Since they enjoy legitimacy and credibility in their communities, they are in a position to influence wider acceptability.

Traditional Health Care and WHO

Despite the importance of the traditional health care system as the basic indigenous organizational structure linking the patient and his kin group to a process of diagnosis and treatment, its status in WHO is very low. At WHO/Geneva there is a staff of two people and no operational budget. Dr. Bannerman, a gynecologist-obstetrician and head of traditional medicine at WHO/Geneva informed this writer that DANIDA has provided funds for two African conference/workshops designed to bring modern and traditional practitioners together to explore their respective knowledge bases. Margaret Read notes in her discussion of traditional specialists that, as part of a field research project, she participated in a health education

IV. SPREAD EFFECTS: THE DIFFUSION OF INNOVATION

Women as a Crucial Target Population

The population expected to ultimately benefit directly from EPI and CDD activities will be sub-Saharan African children aged 0-5. To get to this population, however, it will be necessary to go through the adult population, especially mothers. Exactly who these adults will be will depend on the specific kinship structure and organization of the targeted population. Biological mothers, for example, may not be the decision-makers concerning the health or illness of their children. Nevertheless, EPI and CDD activities will be greatly facilitated by an understanding of women's roles and status in their society.

Women, for example, have the daily task and responsibility of supplying water for all household needs. Contaminated drinking water is a source of illness in children and adults, yet boiling water may not be perceived as a sensible or practical solution to this problem; especially in light of the problem of a fuel supply for rural villages. A supply of fuel, usually firewood in the form of twigs and branches, is also the responsibility of women. The greater part of a day may be devoted to searching and gathering firewood. Using portions of the firewood to boil water, portions of which will be lost to evaporation, will make no sense to rural women. Other practical and adaptable ways of solving the contaminated water problem should be sought, for example, through the Ministry of Hydraulics, an accessible and safe water source should be part of over-all economic development.

Preventive and curative health measures for children aged 0-5 may be the sole responsibility of the biological mother; of patrilineal aunts, or of wider kin groups. Whatever the responsibility structure, mothers will rarely make a unilateral decision concerning modern medical care for their children.

For women as childbearers, the culture of sexual and childbirth practices, beliefs, and rituals dramatically impacts morbidity and mortality profiles in some African societies. For example, major health problems for women revolve around beliefs and practices of pregnancy, childbirth, chronic malnutrition, and female circumcision. Sterility, stillbirths, and brain damaged babies are often the result of clitoral surgery. It has been pointed out in the health sector policy paper that among certain African women "physical damage from clitoridectomy and genital infibulation range from shock, bleeding, and chronic pelvic infection to infertility, lengthened delivery, brain damage to the fetus and fetal wastage". (n.d.:5)

Cultural beliefs and practices in these areas will not yield easily to health education and public promotion activities. It is, nonetheless, important that the health planner have some knowledge and understanding of these beliefs and practices for two reasons:

1) training and health education of traditional midwives and birth attendants will have to be cast within this familiar and traditional belief and knowledge system, and

2) most births still take place within the confines of this cultural complex, where older, more traditionally-oriented women usually have recognized influence and authority.

The African traditional midwife of birth attendant is usually a woman beyond child-bearing age whose services generally do not extend beyond a specific geographic area. Her services may extend across generations of families because she is trusted and accepted. Generally, she is a respected source of information concerning the care and feeding of babies, sexual and childbirth behavior and practices. She is a tremendous potential channel for influencing attitudinal change concerning acceptance and participation in EPI, CDD, and where appropriate, YAWS, and other CCCD activities.

The utilization of these indigenous channels for communicating information about new health interventions will not happen automatically. The spread effect of diffusion of the ideas and new practices will depend on the capability of the health education and promotion personnel to develop information to be shared or transmitted within the context of the existing and familiar knowledge and learning base. Without the familiar base from which to absorb new information destined to ultimately change or modify behavior, the natural channels for diffusion will assume no potency.

Allocation of Time and Implications for EPI and CDD Activities

A valuable working tool for health planners would be a record of how women plan and allocate their time during the day. The daily routine will vary according to seasonal production activities and mobility. In addition to the above mentioned responsibilities of supplying water and fuel for domestic needs and tasks, many rural women also have agricultural responsibilities, namely, sowing, weeding, and assistance in harvesting. The implications of this kind of daily schedule for EPI and CDD activities are threefold:

1) women may not be able to fully participate in programs which conflict with their daily routines,

2) their inability to participate may be misinterpreted as lack of interest or lack of acceptance of the intervention, and

3) before the particular health measures can be operationalized, it may be necessary to provide labor saving amenities such as easily accessible and safe sources of water (this would theoretically, increase a woman's discretionary time).

Since a rural woman's time and daily routine is so inextricably interwoven with her role and status as a wife and mother, it is important to understand the regularized social and economic production behavior of these women if their acceptance and participation

in CCCD related activities is to be expected. These women cannot be expected to halt or interrupt their daily routine to participate in or listen to health education information concerning EPI and CDD.

The limitations and demands of the rural woman's time present a special consideration constraining the spread of a new health intervention unless the necessary information concerning the intervention is communicated to women within the context of familiar surroundings and routine schedules.

Language, Women and Spread Effect

Unlike a number of development interventions where the primary target population is usually males, this CCCD health intervention, has as its primary target population the mother/child complex. Across sub-Saharan Africa, socioeconomic profiles of women bear out the fact that they have less proficiency in the official language of the country (usually English or French) than do males. Women, especially rural women, will communicate most proficiently in the major indigenous language of their country. It will therefore be important to design materials, both written and audiovisual, which are the language and culture specific.

Field Research, Health Education and Diffusion

Field research activities, including data collection and analysis, by the social scientist and health educator should be designed with-

in the theoretical framework that health education is essential for both individual and group understanding, acceptance, and participation in EPI, CDD and related CCCD activities. The importance of health education should first of all be communicated to national authorities. Through the regional WHO/CDC Management I and Management II training courses in EPI, the proposed health educator and social scientist can design and incorporate units or modules on health education for EPI and CDD.[1] The critical role of women and traditional medical specialists as natural and indigenous channels for diffusion of information (which will hopefully lead to acceptance and participation in project activities) would be the focus of these education modules.

A simultaneous EPI and CDD education effort in the design and preparation of written and audiovisual materials should be undertaken approximately mid-1982 after appropriate baseline data has been gathered by the health educator and social scientist.

Leadership/Authority and Diffusion

Identifying and soliciting the support of respected leaders from the center to the periphery would be a first step in the diffusion process. At the center, for example, a logical start would be the Ministry of Health; but it is important to bear in mind that the locus of power and influence for operationalizing a new health

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1/ The Office of International Health Volume 4 on "Guidelines for Analysis of Socio-Cultural Factors in Health", is a useful document.

intervention may lie outside the Ministry of Health. It may be in the Ministry of Rural Development, Ministry of Planning, or Ministry of Finance. The entry point for a new health intervention may be through an agricultural extension program or through a Ministry of Education extension program. The need for tactful diplomacy would be in order if and when the Ministry of Health is not the locus of power in a country-specific situation.

At the periphery, local religious, political, or traditional family leaders may have more power, influence, and authority than Ministry of Health civil servants. Traditional medical specialists, depending on the degree of specialization and whether powers are ascribed or acquired, will enjoy a legitimacy and credibility not possible for outsiders. It is important here to point out that outsiders refers equally to nationals and foreigners. An impediment to the spread of EPI, CDD and other CCCD information and techniques could be the national who may have no understanding of the intricacies of behavior and attitudes which define and cohere a social system. Often, if he speaks the language, it is assumed that he will fit right in and be readily accepted. Difference in educational, ethnic, and economic background may in fact completely separate this person from the rest of the community. The consequences of this is reduced communication and a poor spread effect. Indigenous leadership, therefore, represents the best source for insuring support and spread of a new idea or intervention.

Identification of active special interest groups, factions, and informally structured groups (groups which may form only when there is an issue or problem of importance to them. Their existence parallels the life of the issue or problem, after which they dissolve the group) is very important in securing wide support and participation. Determining who these groups are, how they are organized, where they are located, and how they exercise power, influence, and authority will facilitate the implementation and diffusion process.

Patterns of Mobility

A complete study of the regularized and established cyclical patterns of mobility of regional donor personnel, government Ministry personnel, extension personnel, and local populations will provide some indication of the cross-fertilization of ideas. Attention should not focus only on the mobility patterns of local populations because the exchange of information and feedback is a complex of all involved in the process. Local populations are involved daily and seasonally in social and production activities which do not necessarily permit them to have or give much time to dialogue with visiting personnel about a new intervention. A record of the pattern of movement and mobility into and out of an area would permit planning which meshes with the flow of normal mobility and production activities. Communication and information points of entry may be most effective at known leisure periods or during peak market periods. Again, diffusion has the possibility of covering a wider area when

exposure to new ideas and information takes place at times when targeted populations, particularly women, are in the "captive audience" role.

Previous Project Design, Execution, and Diffusion

Although this proposed CCCD project is larger in scope than on-going WHO/EPI and AID/AIP/EPI activities, the latter, an example of which is operational in Somalia, provides some insights into the problems of diffusion. The Foster[1] assessment of the Somalia WHO/EPI does not indicate that the intervention demonstrates any diffusion or spread effect. Team interviews with the WHO/EPI physician assigned to the Ministry of Health indicated that assessments of critical weaknesses in the implementation process were being strengthened through an AID/AIP. It may be inappropriate from the point of view of design and scope as well as from the point of view of length of project operating time to use this AIP/EPI as an example of a possibility for diffusion. However, it seems important to look critically at this activity because the problem of language and communication represents a barrier to diffusion.

This is a critical barrier because the significant targeted population of women speak almost no English, nor do health auxiliaries outside Mogadishu. During an interview with the gynecologist

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1/ See the AID Assessment July 1979 of the Expanded Program of Immunization by Stanley Foster and Mike Marty.

working with the program (she is the wife of the WHO/EPI director and assisting in the MCHs on a volunteer basis as a means of remaining professionally active), she acknowledged, interestingly, that a number of the health workers under her direction speak no English. The fact that she speaks no Somali did not seem to be an issue.

V. SOCIAL CONSEQUENCES AND BENEFIT INCIDENCE

Differential Spread Effect: Direct and Indirect Beneficiaries

EPI, CDD and other CCCD project activities will impact different groups in different ways. The ultimate direct beneficiaries will be rural and urban children aged 0-5 in sub-Sahara Africa. Among this population cumulative mortality is 300 to 500 per 1000 births and infant mortality rates vary from 100 to 200 deaths per 1000 births.

Immediately impacted targets, however, will be Ministry of Health managerial and mid-level personnel participating in EPI and CDD training courses. The knowledge, techniques, and methods gained from these courses will be shared with and formally communicated to lower echelons in Ministry of Health personnel structures. Methods for relating this technical information to mothers who represent the intermediate target population will be researched by the health educator and social scientist.

The distribution of EPI led CDD project activities and benefits among geographical, ethnic, and socioeconomic levels cannot be determined from the regional vantage point. The benefit incidence will be at the bilateral level.

Time Frame, Project Results, and Culture Change

While the reduction of mortality and morbidity in sub-Saharan children aged 0-5 is the ultimate project goal, a concomitant goal is the development of a commitment to health maintenance and infectious disease prevention among ever-widening sub-Saharan populations. Because newly introduced public health measures mean changes and modification in beliefs, attitudes, and behavior; all of which define and cohere any social system, EPI and CDD measures cannot be expected to have any long-term benefits over the remaining budget life of this project.

Health education, for example, is a slow and complex process designed to change attitudes, habits, and practices. Improved health as a benefit accruing to the larger social group may not be a visible result for a generation. Activities, then, in a CCCD project should be phased over a twenty year period.

Indeed, in keeping with AID's strategy for improving the health populations in sub-Saharan Africa, selected disease control such as EPI and CDD activities is approached as part of a four-part program. One of the cornerstones of this four-part program is a primary health

care delivery system. The other two components are health planning and the provision of clean water and improved sanitation. The need to move simultaneously on all four fronts will require a timefrane beyond the budget life of this CCCD activity. The remaining three years of the proposed project should therefore be viewed as a start-up phase I with a commitment to continue this activity over the next two decades.

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ANNEX C

Project Design Summary - Logical Framework

Combatting Childhood Communicable Diseases

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS
Goal: To improve the health status of the pediatric population of Sub-Sahara Africa. Sub-Goal: Contribute to the world health community goal of achieving health for all by the year 2000.	Goal: Reduced morbidity and mortality rates for selected communicable diseases in target populations. (see details in project description) Sub-Goal: (1) Reduction in incidence of communicable diseases. (2) Target population participation in health care system. (see details in project description)
Purpose: To strengthen the capability of Sub-Sahara Africa Health Care Systems to control selected communicable diseases in children through: (1) training and education programs in communicable disease control (2) operations research (3) establishing data collection and evaluation systems.	End of Project Status: (1) Established regional and sub-regional training programs for CCCD technology. (2) Functioning program for public health education and promotion in target region. (3) Increased capabilities of MOHS in CCCD in target region.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS
Outputs:	
(1) Health personnel trained in CCCD target region.	(1) 4200 health personnel trained in target region.
(2) EPI programs operating.	(2) CCCD programs (EPI/CDD) operating in a minimum of 15 countries.
(3) CDD programs operating.	(3) MOH's conducting new operational research projects in 10-15 countries.
(4) CCCD programs incorporated into Host country primary health care programs.	(4) MOH's conducting data collection evaluation activities in a minimum of 19 countries.
(5) CCCD health education promotion materials produced and widely available.	(5) Health promotion materials being utilized in a minimum of 20 countries.
(6) Oral rehydration salts produced/available.	(6) Oral rehydration salts sufficient for a population of 1 million being utilized annually.
(7) Operational research develops CCCD appropriate technology.	
(8) Data collected and evaluated.	
Inputs:	
A. AID	13
	AID
(1) Technical assistance	(1) 1 Medical epidemiologist, 1 administrative officer (5 years); 1 subregional medical epidemiologist and 3 operational officers (4 years); 6 long-term field staff (3 years); 1 additional medical epidemiologist and operations officer (2 years).
(2) Training support (regional, subregional, and bilateral).	(2) Training courses: 6 in 1981; 12 in 1982; 23 in 1983; 32 in 1984; and 32 in 1985.
(3) Oral rehydration salts production equipment.	
(4) Commodities and materials.	
(5) Vehicles.	

NARRATIVE SUMMARY

Inputs:

B. Host Country

(1) Personnel.

(2) Land and office space.

(3) Some transportation.

OBJECTIVELY VERIFIABLE INDICATORS

AID (cont'd)

(3) Oral rehydration salts production facility, functioning and sufficient for a population of 1 million annually.

(4) EPI/software/hardware distributed in at least 15 CCCD countries.

(5) Health promotion materials distributed in a minimum of 25 countries.

(6) 65 vehicles (4-wheel); 500 mobilettes and 650 bicycles.

Project Design Summary - Logical Framework

Combatting Childhood Communicable Diseases

NARRATIVE SUMMARY	Means of Verification:	Important Assumptions:
Goal:	Collection and analysis of data.	(1) Life of CCCD activities be extended for at least 20 years. (2) Adequate baseline data will be available or will be collected by special surveys. (3) Host governments will support the development and maintenance of data collection systems.
Sub-Goal:	A marked increase (50%) of countries with an acceptable primary health care (PHC) program include a CCCD component.	(1) Host countries will continue to place a high priority on developing PHC programs. (2) WHO, SHDS and other regional organizations will continue to provide support and training in developing country specific health care programs.
Purpose:	(1) Internal and external evaluations. (2) CCCD activities reports.	(1) Host countries will actively seek participation in CCCD programs. (2) Host countries will make adequate and appropriate personnel available for participant training.

Project Design Summary - Logical Framework

Combatting Childhood Communicable Diseases

NARRATIVE SUMMARY

Means of Verification:	Important Assumptions:
Outputs: (1) CCCD project records. (2) Examination of MOH programs. (3) On-site visits. (4) On-going training program observation.	MOHS develop ways and means of reproducing, distributing and utilizing: a. Oral rehydration salts; b. Public health promotion materials.
Inputs: (1) PASA with CDC. (2) PIO/Ts. (3) PIO/Cs. (4) PIO/Ps and in-country records. **Host Countries:** (1) Host country records. (2) Project records and reports.	(1) Personnel ceilings will be increased sufficiently to allow for projected staffing. (2) Host country has the ability to provide personnel, office space and other support. (3) T/A personnel can be recruited and assigned to project as needed. (4) Commodities/materials can be procured for timely arrival. (5) Appropriate health education material can be developed. (6) AID funding requirements will be met.

ANNEX D

MAY 1 1979

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/RA, E. Dennis Conroy

SUBJECT: Combating Childhood Communicable Disease - Expanded Program of Immunization (EPI) Initial Funding Authorization (698-0421)

Problem: This project does not have an approved Project Paper, and we will not be able to complete one until early in FY 1980. Meantime there are a number of short term activities involving both EPI and Yaws control to be undertaken during FY 1979 that require funding.

Discussion: This Bureau has proposed to undertake a project to develop and strengthen the capacity of sub-Saharan African developing countries to provide immunization and related public health measures which will substantially increase the health status of children. There is considerable Congressional interest in this activity; the Foreign Assistance and Related Programs Appropriations Act, 1979, contains a statement "That not more than $5,000,000 shall be available for an Expanded Immunization Program - Yaws Eradication Program in West Africa".

We propose to participate in an international effort that will attack diseases of epidemic potential that primarily affect infants and children. Our combined efforts will reduce the human tragedy in the developing countries of Africa that results in an excessive number of deaths of infants in the first year of life and in one-third of all children born alive, dying before the age of five. The World Health Organization has already endorsed an expanded program of immunization as a priority initiative. The six childhood diseases targeted for attack are diptheria, pertussis (whooping cough), tetanus (lock-jaw), measles, poliomyelitis and tuberculosis. In addition, yaws (treponematosis) which is a communicable/contagious disease, and a major cause of morbidity among children will be targeted.

Our understanding of the present state of childhood diseases and of immunization programs in Africa leads to the conclusion that the developing African countries are at various stages of planning and at differing levels of operation in their public health and immunization programs. Their needs vary from some technical and commodity assistance to the full complement of support assistance including program planning, technical advisors for program implementation and significant commodity support. Discussions with WHO and CDC reveal the advisability of programming/assistance largely on a bilateral basis. We will coordinate with WHO/Geneva and WHO/AFRO but do not, based on discussions to date, contemplate putting funds into a WHO/AFRO account.

AFR/RA has queried sub-Saharan African countries on the program and based upon replies received there is considerable African and AID interest. FY 1979 plans call for surveys and workshops in Africa to obtain details on the scope and magnitude of the overall problem. In addition, we intend to provide immediate short term support to approximately eight countries (Liberia, Mauritania, Somalia, Sudan, Tanzania, and three to be selected),based on AID mission requests and field assessments by CDC, of country plans for immunization. To get started in FY 1979, we propose to sign a PASA with the Center for Disease Control (CDC) in Atlanta to provide approximately thirty (30) person months of technical assistance that will assess country EPI capability, collect data on EPI diseases, review country immunization plans and recommend modifications, provide technical and logistic data to AID missions for the development of AID proposed mini-project papers, and prepare specifications for procurement as required. We anticipate the above PASA activity will cost about $425,000. The mini-project papers will result in additional funding needs for commodities which will be financed in FY 1979 from AIP and SDP funds.

In addition to the above PASA, we want to contract now for preparation of demographic and health background materials and economic analysis for a project paper. The data to be collected will include demographic and health statistics about the problem, national budgets for primary health care and immunization programs, information about donor activities and illustrative economic analysis. This material can be obtained through the CDC, OIH, WHO (Geneva), WHO (Brazzaville) and African subregional health organizations. The contract will be for four person months of activity and will cost about $75,000. The above information will be essential in the development of a project paper. We hope to have the PP approved early in FY 1980. As we have indicated in the FY 1980 Congressional Presentation (p. 490), a long term project will begin during that fiscal year.

A third action involves follow-on action to the three yaws teams who went to four countries in March under a PASA financed with PDS funds. In mid-May we will review their reports and anticipate, from comments to date, that control activities will be recommended in at least two countries. We need to be able to move this summer on a PASA with CDC to begin a yaws program but cannot estimate the cost at this time.

Finally, we plan, in cooperation with AFR/DR, to field a design team this summer/fall. The team will include technical personnel from CDC and will coordinate with WHO/Geneva, WHO/AFRO, UNICEF, OCEAC, OCCGE and selected ministries of health.

Implementation plans for the yaws and EPI activities are attached.

Recommendations:

1. That you authorize the obligation during FY 1979 of up to $500,000 for use in the development and implementation of the project, Combating Childhood Communicable Diseases - Expanded Program of Immunization. The authorized funds will be used to undertake a PASA agreement with CDC and to obtain a contract for the development of background materials.

APPROVED: [illegible]

DISAPPROVED: _____

DATE: 5/3/79

2. That you authorize us to develop plans with CDC to begin a yaws control campaign in FY 1979, with the form and cost to be presented to you in a subsequent memo.

APPROVED: [illegible]

DISAPPROVED: _____

DATE: 5/3/79

Attachments:

Implementation Plans
for EPI and Yaws

Clearance:
AFR/DP:CWard (draft)
AFR/DR:JWKoehring (draft)
AFR/DR/H/N:TGeorges (draft)
DS/HEA:LHoward (info)
AFR/SFWA:WTate (draft)

by EGRuoff

AFR/RA:EGRuoff:rg:4/23/79:X-28964

Not applicable for this project

5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Asistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights?

2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully?

3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?

4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?

5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

A.

6. FAA Sec. 620(a), 620(f); FY 79 App. Act, Sec. 108, 114 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Uganda, Mozambique, or Angola?

7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?

8. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?

9. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason?

10. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters:

a. has any deduction required by the Fishermen's Protective Act been made?

b. has complete denial of assistance been considered by AID Administrator?

11. FAA Sec. 620; FY 79 App. Act, Sec. 603. (a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds?

12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the

A.12.

amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism?

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA?

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty?

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy?

B.1.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor?

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights?

b. FAA Sec. 533(b). Will assistance under the Southern Africa program be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests?

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

d. FY 79 App. Act,Sec. 113. Will assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

e. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina after September 30, 1978?

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?	Overall notification will be handled in the annual Congressional Presentation. Requests for bilateral projects within CCCD will be handled by Congressional notification on a case-by-case basis.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	No
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	N/A
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	N/A
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	Project is planned as a regional effort

A.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

N/A

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

N/A

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

Not possible to ascertain since bilateral programs have yet to be identified.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

N/A

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes

12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained

Women will be key actresses in the process of transmittal of educational information about the need for CCCD services. Since training is being offered on a regional and sub-regional basis, cooperation among participating countries will be fostered.

B.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

N/A

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

This project is aimed at children under five in sub-Sahara Africa, which includes some of the world's poorest people. It will extend EPI and diarrheal disease control programs in the context of WHO-approved primary health care systems.

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

The project's training component will focus on senior and mid-level managers of EPI and CDD services in health institutions in participating countries.

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

The project will provide technical assistance to regional health and training organizations.

(ii) to help alleviate energy problems;

N/A

(iii) research into, and evaluation of, economic development processes and techniques;

Operational research in epidemiological needs

(iv) reconstruction after natural or manmade disaster;

N/A

B.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;	N/A
(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.	N/A
c. [107] Is appropriate effort placed on use of appropriate technology?	Yes. Project will promote production of oral rehydration therapy materials.
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?	To be determined on a case-by-case basis.
e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	N/A
f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.	Graduates of project-supported training programs will contribute to their countries' institutional capabilities in health planning and management.
g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?	N/A. This is not a production project.
2. Development Assistance Project Criteria (Loans Only)	
a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.	N/A
b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	N/A

B.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102? N/A

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities? N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	To be established
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the United States on commodities financed?	Yes
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	N/A a
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	Yes
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.	Yes
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the	The Center for Disease Control, a federal agency, is uniquely suited to implement parts of this project. Its international division will be responsible for implementation, and it will not be competitive with private enterprise. Consultants will be hired on a competitive basis where practicable.

A.7.

facilities of other Federal agencies will be utilized, are they paritcularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Comoetitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available? — Yes

9. FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States? — N/A

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? — N/A

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? — N/A

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the United States not exceed $100 million? — N/A

C. Other Restrictions

1. FAA Sec. 122 (e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — N/A

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foriegn aid projects or activities of Communist-bloc countries, contrary to the best interests of the United States? — Yes

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or guaranty of such transaction? — Yes

C.

5. Will arrangements preclude use of financing:

a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization?	Yes
b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?	Yes
c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs?	Yes
d. FAA Sec. 662. For CIA activities?	Yes
e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel?	Yes
f. FY 79 App. Act Sec. 106. To pay U.N. assessments?	Yes
g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.)	Yes
h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields?	Yes
i. FY 79 App. Act Sec. 601. To be used for publicity on propaganda purposes within United States not authorized by the Congress?	Yes

ANNEX F

INITIAL ENVIRONMENTAL EXAMINATION

Project Country: Africa/Regional

Project Title: Combatting Childhood Communicable Diseases (CCCD)

Funding: FY(s) 79-83 $ 38,837,400

Period of Project: FY79-83

IEE Prepared by: Dr. James Chin, Team Leader/Public Health Physician, Project Design Team, CCCD Project

Environmental Action Recommended:

Negative determination

Concurrence:

Assistant Administrator Decision:

APPROVED _____

DISAPPROVED _____

DATE _____

I. Description of Project:

The CCCD Project will provide financial support and technical assistance to regional organizations and national governments to strengthen childhood communicable disease control capabilities in sub-Sahara Africa. CCCD's focus will be on the six communicable diseases (diptheria, whooping cough, tetanus, measles, poliomyelitis, and tuberculosis) targeted by the World Health Organization in the Expanded Program of Immunization (EPI) and other major childhood diseases such as diarrhea and yaws. To the extent possible, these communicable disease control programs will be compatible with or incorporated into o developing primary health care (PHC) systems in Africa.

The major components of CCCD are: 1) technical assistance; 2) training of senior and mid-level health workers; 3) data collection and evaluation systems; 4) operational research; 5) health education/promotion; and 6) supply of commodities and equipment.

Of these components, training and operational research are expected to carried out mainly on a regional or sub-regional basis. Other components will be implemented through bilateral programs to be coordinated by country-specific Ministries of Health.

II. Examination of Nature, Scope, and Magnitude of Environmental Impacts:

(In terms of items on attached Impact and Evaluation Form)

The major environmental effect of CCCD will be reduction of morbidity and mortality of the pediatric population of sub-Sahara Africa for infectious diseases covered by the project. These diseases are transmitted primarily from person-to-person, and no intervention directed at the physical environment is anticipated in this project. While the project may increase the number of children surviving past the age of 5, the other essential components of PHC to be implemented concomitantly by AID and other external donors should result in an overall upgrading of the quality of life in sub-Sahara Africa.

III. Recommended Environmental Action:

Negative determination

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact areas and Sub-areas	Impact Identification and Evaluation
A. LAND USE	
I. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	N
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important uses	N
4. Jeopardizing man of his works	N
5. Traffic access	N
6. Land use planning	N
7. Squatter, other development	N
B. WATER QUALITY	N
I. Physical state of water	N
2. Chemical and biological states	N
3. Ecological balance	N
C. ATMOSPHERIC	
I. Air additives	N
2. Air pollution	N
3. Noise pollution	N

D. NATURAL RESOURCES

I. Diversion, altered use of water	N
2. Irreversible, inefficient commitments	N
3. Wildlife	N

E. CULTURAL

I. Altering physical symbols	N
2. Dilution of cultural traditions	L

F. SOCIOECONOMIC

I. Changes in economic/employment patterns	L
2. Changes in population	M
3. Changes in cultural patterns	L
4. Dislocation and relocation of area residents	N
5. Support facilities	M

G. HEALTH

I. Changing a natural environment	H
2. Eliminating an ecosystem element	N
3. New pathways for disease vectors	N
4. Safety provisions	H

H. GENERAL

I.	International impacts	H
2.	Controversial impacts	L
3.	Larger program impacts	H
4.	Aesthetics	M

N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

ANNEX G

TRAINING MATERIALS REFERENCE LIST

(available at CDC, Atlanta, Georgia)

[redacted] P[redacted]ECT[redacted]DG[redacted]

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	TOTAL
I. US SUPPORT AND ADMINISTRATION PERSONNEL						
Project Manager	$ 60	$ 60	$ 63	$ 66.5	$ 73.15	$ 322.65
Deputy Project Manager	50	50	62.5	55.2	60.0	277.7
Secretaries	20	20	42	44.1	48.5	174.6
Medical Epidemiologist	25	50	63	66.5	73.15	277.65
Public Health Advisor	35	40	52.5	55.2	60.0	242.7
Administrative Officer	15	20	35	36.8	40.0	146.8
Social Scientist	20	40	42	45	50	197
Health Educator	20	40	42	45	50	197
Statistician	20	40	42	45	50	197
US PERSONNEL SUB-TOTAL	$265*	$360	$444	$459.3	$504.8	$2,033.1
TRAVEL AND PER DIEM						
Domestic-Recruitment, Liaison, Technical Consultation	20	30	40	50	55	195
International-New Program Development, Supervision, Eval.	40	60	80	100	110	390
US STAFF TRAVEL AND PER DIEM SUB-TOTAL	$ 60	$ 90	$120	$150	$165	$ 585
COMMODITIES/ COMMUNICATIONS	75	100	100	150	165	590
US SUPPORT AND ADMINISTRATION PERSONNEL SUB-TOTAL	$400	$550	$664	$759.3	$834.8	$3,208.1

*Includes consultant contract for Services

ANNEX H

CCCD PROJECT BUDGET

		FY 1981		FY 1982		FY 1983		FY 1984		FY 1985	TOTAL
:I. OPERATIONAL RESEARCH AND TECHNICAL DEVELOPMENT OVERSEAS (LONG-TERM) SUB-REGIONAL											
Medical Officers	½	60	1	120	1	126	2	252	2	264.6	822.6
Administrative Officer	½	60	1	120	1	126	1	132.3	1	140	578.3
SUB-REGIONAL PERSONNEL SUB-TOTAL		$120		$240		$252		$384.3		$404.6	$1,400.9
TRAVEL AND PER DIEM		12		30		66		87.2		90	285.2
TECHNICAL DEVELOPMENT/POL/ LOCAL LABOR		35		55		82.5		108.9		135	416.4
SUBREGIONAL TD SUBTOTAL*		$167		$325		$400.5		$580.4		$629.6	$2,102.5
OPERATIONAL RESEARCH AND TECHNICAL DEVELOPMENT PERSONNEL											
Public Health Advisors	½	60	1½	180	5	630	5	630	5	630	2,130
Medical Epidemiologists	½	63	1	126	1	126	2	264.6	2	291	870.6
RESEARCH PERSONNEL SUB-TOTAL		$123		$306		$756		$894.6		$921	$3,000.6

ncludes provision for short-term start-up (catalytic) CCCD bilaterial activities, in 2-3 countries annuall

CCCD PROJECT BUDGET

		FY 1981		FY 1982		FY 1983		FY 1984		FY 1985	TOTAL
	TRAVEL AND PER DIEM		20		36		92.4		130.7	145	424.1
	RESEARCH/POL/LOCAL LABOR		50		90		231		254	279	904
	OPERATIONAL RESEARCH SUB-TOTAL		$193		$432		$1,079.4		$1,279.3	$1,345	$4,328.7
	OPERATIONAL RESEARCH AND TECHNICAL DEVELOPMENT SUB-TOTAL		$360		$757		$1,479.9		$1,859.7	$1,974.6	$6,431.2
III.	TRAINING										
	EPI										
	Management I	1	100	2	200	2	220	2	242	2 250	1,012
	Management II	2	100	4	200	8	440	8	484	8 500	1,724
	Cold Chain Repair and Maintenance	1	50	2	100	5	275	8	484	8 500	1,409

CCCD PROJECT BUDGET

	FY 1981		FY 1982		FY 1983		FY 1984		FY 1985		TOTAL
CDD											
Management I	1	100	2	200	2	220	2	242	2	250	1,012
Management II		-		-	2	110	6	200	6	240	550
Technical/Laboratory		20		20		50		100		110	300
OTHER, e.g., Yaws Workshop											
Miscellaneous	1	50	2	100	4	100	6	100	6	100	450
TRAINING SUB-TOTAL		$420		$820		$1,415		$1,852		$1,950	$6,457
IV. DATA AND EVALUATION											
EPI											
Personnel	8	48	8	48	6	39.6	6	43.6	6	43.6	222.8
Travel and Per Diem	8	48	8	48	6	39.6	6	43.6	6	43.6	222.8
Commodities/Local Labor	8	48	8	48	6	6.6	6	7.3	6	7.3	117.2
CDD											
Personnel	4	24	4	24	8	52.8	8	58.1	8	58.1	217
Travel and Per Diem	4	24	4	24	8	52.8	8	58.1	8	58.1	217
Commodities/Local Labor	4	4	4	4	8	8.8	8	9.7	8	9.7	36.2
OTHER											
Personnel	5	30	5	30	5	33	5	36.3	5	36.3	165.6
Travel and Per Diem	5	30	5	30	5	33	5	36.3	5	36.3	165.6
Commodities/Local Labor	5	5	5	5	5	5.5	5	6.1	5	6.1	27.7
DATA AND EVALUATION SUB-TOTAL		$261		$261		$ 271.7		$299.1		$299.1	$1,391.9

CCCD PROJECT BUDGET

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	TOTAL
V. HEALTH EDUCATION/ PROMOTION FOR:						
EPI, CDD AND OTHER CCD's	150	250	475	500	650	2,025
HEALTH EDUCATION/ PROMOTION SUB-TOTAL	$150	$250	$475	$500	$650	$2,025
VI. COMMODITIES AND EQUIPMENT FOR RESEARCH AND DEVELOPMENT						
EPI						
Cold Storage supplies and Equipment	50	250	300	300	350	1,250
Selected Commodities (includes pharmacuticals)	50	100	100	200	200	650
Immunization Supplies and Equipment	50	100	250	375	375	1,150
CDD						
Oral Rehydration Production Equipment	25	75	125	150	150	525
Oral Rehydration Production Supplies/ Reagents	50	50	100	200	300	700
Selected Biologicals and Drugs	50	50	100	200	200	600
Laboratory Supplies and Equipment	50	100	200	300	200	850
OTHER						
Selected Biologicals and Drugs	50	100	200	200	200	750

CCCD PROJECT BUDGET

	FY 1981		FY 1982		FY 1983		FY 1984		FY 1985		TOTAL
Program Supplies and Equipment		50		75		250		300		300	975
Laboratory Supplies and Equipment		50		100		200		200		200	750
TRANSPORT EQUIPMENT											
Program Vehicles I (4 wheels)		40	4	80	5	110	3	72.6	3	72.6	375.2
Program Vehicles II (4 wheels)		50	6	100	8	200	4	100	4	100	550
Motorbikes		50		50		50		50		50	250
Bicycles		10		10		15		15		15	65
COMMODITIES SUB-TOTAL*		$625		$1,240		$2,200		$2,662.6		$2,712.6	$9,440.2
II. PROJECT EVALUATION											
INTERNAL											
Personnel	3	15	3	18	9	59.4	15	108.9	15	108.9	310.2
Travel and Per Diem	3	15	3	18	9	59.4	15	108.9	15	108.9	310.2
Commodities/Communications/Services		1		1		2.2		3.7		3.7	11.6
EXTERNAL											
Personnel	3	10	3	15	10	66	10	72.6	10	72.6	236.2
Travel and Per Diem	3	10	3	15	10	66	10	72.6	10	72.6	236.2
Commodities/Communications/Services		1		1		2.5		4		4	12.5
PROJECT EVALUATION SUB-TOTAL		$ 52		$ 68		$255.5		$370.7		$370.7	$1,116.9

IBID II

1981-1985 SUB-TOTAL	$2,268	$3,946	$6,761.1	$8,303.4	$8,791.8	$30,070.3
CONTINGENCY (5%)	113.4	197.3	338	415.2	439.6	1,503.5
1981-1985 SUB-TOTAL INCLUDING CONTINGENCY	$2,381.4	$4,143.3	$7,099.1	$8,718.6	$9,231.4	$31,573.8
INFLATION (15%)	357.2	621.5	1,064.9	1,307.8	1,384.7	4,736.1
IA OVERHEAD						
US COSTS (20%)	80	110	132.8	151.9	166.9	641.6
OVERSEAS COSTS (5%)	93.4	169.8	304.9	377.2	397.8	1,343.1
1981-1985 TOTAL	$2,912.0	$5,044.6	$8,601.7	$10,555.5	$11,180.8	$38,294.6

ANNEX I

GLOSSARY OF TERMS AND DEFINITIONS

AAPC	Afro-American Purchasing Center
AID/W	Agency for International Development, Washington, Africa Bureau, Regional Affairs
AFRO	African Regional Office of WHO
AIP	Accelerated Impact Program
ADB	African Development Bank
CCCD	Combatting Childhood Communicable Diseases
	CCCD Region - Sub-Saharan Africa CCCD Sub-Region - West/Central Africa CCCD Sub-Region - East/Southern Africa
CDD	Program for Diarrheal Disease Control
CDC	Center for Disease Control, Atlanta
CHP	Country Health Programming
CILSS	The Permanent Interstate Committee to Fight the Drought in the Sahel
DANIDA	Danish International Development Agency
EPI	Expanded Program on Immunization
EMRO	Eastern Mediterranean Regional Office of WHO
FAC	Fund for Aid and Cooperation
HEW	Department of Health, Education and Welfare (As of April, 1980, reorganized as the Department of Health and Human Services - HHS)
IBRD	International Bank for Reconstruction and Development
ORS	Oral Rehydration Solution (Salts)
ORT	Oral Rehydration Therapy (Treatment)
OCCGE	Organization for Coordination and Cooperation in the Battle Against the Endemic Diseases (West Africa)

OCEAC	Organization for Coordination and Cooperation in the Battle Against the Endemic Diseases (Central Africa)
PASA	Participating Agency Service Agreement
PSA	Procurement Services Agent
PSC	Personal Services Contract
PHC	Primary Health Care
REDSO/E	Regional Economic Development Services Office, (East Africa)
REDSO/W	Regional Economic Development Services Office, (West Africa)
SHDS	Strengthening Health Delivery Systems
SIDA	Swedish International Development Agency
USAID	US/AID Missions in Host Countries
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

DECLARATION OF ALMA-ATA

The International Conference on Primary Health Care, meeting in Alma-Ata this twelfth day of September in the year Nineteen hundred and seventy-eight, expressing the need for urgent action by all governments, all health and development workers, and the world community to protect and promote the health of all the people of the world, hereby makes the following Declaration:

I

The Conference strongly reaffirms that health, which is a state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity, is a fundamental human right and that the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector.

II

The existing gross inequality in the health status of the people particularly between developed and developing countries as well as within countries is politically, socially and economically unacceptable and is, therefore, of common concern to all countries.

III

Economic and social development, based on a New International Economic Order, is of basic importance to the fullest attainment of health for all and to the reduction of the gap between the health status of the developing and developed countries. The promotion and protection of the health of the people is essential to sustained economic and social development and contributes to a better quality of life and to world peace.

IV

The people have the right and duty to participate individually and collectively in the planning and implementation of their health care.

V

Governments have a responsibility for the health of their people which can be fulfilled only by the provision of adequate health and social measures. A main social target of governments, international organizations and the whole world community in the coming decades should be the attainment by all peoples of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life. Primary health care is the key to attaining this target as part of development in the spirit of social justice.

VI

Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of in-

viduals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.

VII

Primary health care:

1. reflects and evolves from the economic conditions and socio-cultural and political characteristics of the country and its communities and is based on the application of the relevant results of social, biomedical and health services research and public health experience;
2. addresses the main health problems in the community, providing promotive, preventive, curative and rehabilitative services accordingly;
3. includes at least: education concerning prevailing health problems and the methods of preventing and controlling them; promotion of food supply and proper nutrition; an adequate supply of safe water and basic sanitation; maternal and child health care, including family planning; immunization against the major infectious diseases; prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries; and provision of essential drugs;
4. involves, in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, communications and other sectors; and demands the coordinated efforts of all those sectors;
5. requires and promotes maximum community and individual self-reliance and participaton in the planning, organization, operation and control of primary health care, making fullest use of local, national and other available resources; and to this end develops through appropriate education the ability of communities to participate;
6. should be sustained by integrated, functional and mutually-supportive referral systems, leading to the progressive improvement of comprehensive health care for all, and giving priority to those most in need;
7. relies, at local and referral levels, on health workers, including physicians, nurses, midwives, auxiliaries and community workers as applicable, as well as traditional practitioners as needed, suitably trained socially and technically to work as a health team and to respond to the expressed health needs of the community.

VIII

All governments should formulate national policies, strategies and plans of action to launch and sustain primary health care as part of a comprehensive national health system and in coordination with other sectors. To this end, it will be necessary to exercise political will, to mobilize the country's resources and to use available external resources rationally.

IX

All countries should cooperate in a spirit of partnership and service to ensure primary health care for all people since the attainment of health by people in any one country directly concerns and benefits every other country. In this context the joint WHO/UNICEF report on primary health care constitutes a solid basis for the further development and operation of primary health care throughout the world.

X

An acceptable level of health for all the people of the world by the year 2000 can be attained through a fuller and better use of the world's resources, a considerable part of which is now spent on armaments and military conflicts. A genuine policy of independence, peace, détente and disarmament could and should release additional resources

that could well be devoted to peaceful aims and in particular to the acceleration of social and economic development of which primary health care, as an essential part, should be allotted its proper share.

* * *

The International Conference on Primary Health Care calls for urgent and effective national and international action to develop and implement primary health care throughout the world and particularly in developing countries in a spirit of technical cooperation and in keeping with a New International Economic Order. It urges governments, WHO and UNICEF, and other international organizations, as well as multilateral and bilateral agencies, non-governmental organizations, funding agencies, all health workers and the whole world community to support national and international commitment to primary health care and to channel increased technical and financial support to it, particularly in developing countries. The Conference calls on all the aforementioned to collaborate in introducing, developing and maintaining primary health care in accordance with the spirit and content of this Declaration.

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ ANNEX K

EPI/GAG/79/WP.4
ENGLISH ONLY

EPI GLOBAL ADVISORY GROUP MEETING
12-16 November 1979, New Delhi

EPI GLOBAL OVERVIEW

1. Introduction

Much of the information pertaining to the general progress of the EPI at the Global level has already been provided to participants, particularly in the discussion papers for the working groups (documents EPI/GAG/79/WP.1, 2 and 3) and in the EPI Update (EPI/GEN/79/4). The present paper is not intended as a summary of those documents. Rather, it focusses on two specific areas: (1) providing comments on activities pertinent to the conclusions of the Global Advisory Group in 1978, and (2) updating information where new data have recently become available.

2. Programme Implementation

2.1 Training

Conclusion of the Global Advisory Group in 1978:

"Emphasis on training should be continued and efforts to evaluate its impact pursued. Training of staff in the motivation of health workers and in research methodology, concentrating particularly on methodology appropriate to field studies, should be included and appropriate emphasis placed on epidemiology and surveillance. Efforts should be made to prepare EPI-related training materials suitable for incorporation into existing training programmes for health workers."

Annex 1 provides the most recent available data concerning training conducted through October 1979. Annex 2 provides the results of an evaluation of the post-training activities of participants in the 1977 Course in Planning and Management held in Kuala Lumpur. Training of staff in the motivation of health workers is being attempted within the curricula which have been developed, but training in research methodology has not, this being felt to be a lower priority for the categories of health workers now being involved in the training programmes. Epidemiology and surveillance are receiving emphasis in the materials.

Efforts have been and will continue to be made to incorporate EPI-related training into existing programmes for health workers. The curriculum on planning and management was taught in its entirety as part of the nine month International Course on Health Development of the Royal Tropical Institute, Amsterdam. Two individuals concerned with managing the WHO Inter-regional Training Courses in the Epidemiology and Control of Communicable Diseases have attended the EPI Planning and Management Course held in Damascus, Syria, in October 1979, to review the potential for incorporation of some of the EPI elements, and interest has been expressed in introducing elements of this course to training institutions within India. In November/December 1979 work on incorporating EPI training materials into the curriculum will be conducted with the Regional Centre for Health Development established by AFRO in Benin. In the Planning and Management Course now scheduled for 6-21 March 1980 in Brazzaville in the French language, AFRO plans to make a special effort to include teachers from training institutions within the Region, and it is anticipated that inclusion of teachers will become a regular feature of future senior and middle-level EPI courses.

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A visit to Pakistan was made in August 1979 to explore the potential for using the EPI Middle-Level Supervisors training materials in schools of nursing, and visits were made in September to WPRO and the Philippines for similar discussions. A visit is also planned to AFRO in early 1980. An EPI staff member presented one of the middle-level modules to the Inter-Regional Course on Teaching Methodology sponsored by Maternal and Child Health in Singapore in September and October 1979. The inclusion of these middle-level materials within the curricula of reference libraries being created by the Division of Health Manpower Development is also being explored.

2.2 Evaluation

Conclusion of the Global Advisory Group in 1978:

> "Evaluation is an integral component of programme management at national, Regional and global levels. It consists of routine monitoring and analysis of information on programme activities, as well as periodic review of the programme as a whole. Individuals outside of the programme itself may be invited to participate in the periodic reviews of the overall programme. Simplicity of approach, flexibility of application, and the development of appropriate information systems are needed."

Annex 3 represents an EPI/Geneva effort to summarise data available at the global level concerning the status of immunization programmes in the 15 largest EPI participating countries. As they account for some 80% of the newborns in the 94 countries now participating, this information is of interest as an index of total programme progress. It was decided to utilise the immunization coverage objective for 2 or 3 doses of DPT (depending on the schedule in use in the individual country) in the final year of the national plan as an indicator of the status of national planning. First, it was felt that national plans should be specifying coverage objectives, and second, it was felt that a given level coverage with 2 or 3 doses of DPT would be at least as difficult to achieve as coverage with 2-3 doses of polio or 1 dose of BCG and measles vaccines. With the further evolution of programme management information systems expected in 1980/1981, it is anticipated that the quality of routine monitoring and analysis at Regional and global levels will improve.

As an additional approach to programme evaluation, programme audits, especially with the participation of individuals from outside of the programme, are being encouraged. Countries in which audits with such outside participation have been completed include Tanzania, Philippines, India and Sierra Leone.

3. Research and Development

3.1 General

Conclusion of the Global Advisory Group in 1978:

> "The Global Advisory Group approves the emphasis being placed by the EPI on research concerned with improving programme effectiveness. It recommends that operational and epidemiological studies as well as sociological studies concerning community participation and motivation be encouraged. The major needs for such studies are within participating countries themselves, and national capacities in this regard should be strengthened. Work on improving the technology and equipment related to the programme, especially that related to the cold chain and to vaccine administration, should be continued, and governments and individual laboratories should be encouraged to continue work on increasing the stability and potency and decreasing the reactogenicity of the EPI vaccines."

During 1979 the results of studies and/or analyses of surveillance data were published in the Weekly Epidemiological Record pertaining to poliomyelitis (Indonesia, Thailand, Egypt), measles (Indonesia, Cameroon, Singapore) and TB (Solomon Islands). A study of measles in Somalia awaits publication. An anthropologist has been invited to review factors which might be contributing to the continuing low immunization coverage rates being recorded in Yaounde, Cameroon; surveys of lameness attributable to poliomyelitis were conducted in the Ivory Coast

ANNEX 1

SUMMARY OF EPI TRAINING ACTIVITIES
October 1977 - October 1979

Table 1: Number of participants, and number and percentage of countries/territories participating in EPI Courses in each Region.

Table 2: Summary of EPI Planning and Management Courses.

Table 3: Summary of EPI Cold Chain and Logistics Courses.

Table 4: Summary of EPI Management for Mid-level Supervisory Personnel Courses.

Table 5: Summary of EPI/BLG Vaccine Quality Control Courses.

and Cameroon; and reviews of the epidemiology of poliomyelitis and measles were conducted in India. A multi-country cooperative study to examine the immunological effectiveness of measles vaccine administered between six and twelve months of age is being undertaken in Brazil, Chile, Costa Rica and Ecuador in collaboration with PAHO, with the results expected by the end of 1979. Based in part on work done during 1978 in the Philippines, guidelines for costing of immunization programmes were drafted in 1979, with plans being made to field test them in 1980 in the course of conducting additional costing studies.

Recent work in the area of the cold chain is summarized in EPI/GAG/79/WP.4/Add.1. Information concerning the stability of freeze-dried measles vaccine resulting from WHO-sponsored research is summarized in Annex 4. Some general information concerning the stability of EPI vaccines has been summarized in Annex 5. An article on this subject is in preparation for the WER.

3.2 Vaccine Quality Control

Conclusion of the Global Advisory Group in 1978:

> "The EPI will not succeed unless vaccines of good quality are used. Every effort should be made to ensure that all countries use vaccines meeting WHO requirements. Existing vaccine production capacities appear adequate to meet the needs of the programme, but assuring their availability will require sound advance planning to provide adequate lead times to manufacturers. This situation could change if the number of vaccine manufacturers continues to decline, and in this connexion attention is drawn to Resolution WHA 30.54 in which the need to promote Regional and national self-reliance in vaccine production is stated. A review of existing and projected vaccine production capacities should be undertaken by WHO in the coming year. Each country should be encouraged to establish quality control procedures appropriate to its resources, recognizing that such procedures might entail having certain tests performed outside the country, using the good offices of WHO or collaborating laboratories within the Region. A review of the quality control procedures in use within participating countries and within Regions should also be undertaken during the coming year."

Annex 6 summarizes available information concerning the quality of the vaccines being used in the EPI in 15 participating countries. Efforts will be pursued to refine this information and to obtain it for all EPI participating countries during 1980.

The EPI Update (EPI/GEN/79/4) contains projects of global vaccine requirements in its Annex 4. The data make it clear that capacities for projecting vaccine requirements need continued strengthening. Conversations with a number of commercial vaccine manufacturers have been held in 1978/1979 and at present there appears to be limited willingness for them to share information on current and projected vaccine production capacities. Their general sense is that they would be able to respond to the needs of the global EPI, given a two to three year lead time. This does not appear to be unreasonable, and underlines the importance of improving global vaccine projections.

4. Global Strategies

Conclusion of the Global Advisory Group in 1978:

> "The Global Advisory Group considers the Expanded Programme on Immunization a major priority among WHO's efforts to foster the development of Primary Health Care, and considers that the programme's success is an essential element in the achievement of the Organization's primary objective: Health for All by the Year 2000."

Nothing has happened since this conclusion was written to diminish the importance of the EPI as an element in WHO's strategy to achieve Health for All by the Year 2000. On the contrary, 1979 has witnessed increasingly close collaboration between the EPI and other activities supportive of Primary Health Care. As proposed in the discussion paper for the Global Strategies Working Group, the EPI will seek to intensify its promotion of the general objectives of primary health care in recognition that this is not only useful to WHO as a whole, but directly self-serving in helping to create a world climate in which it is feasible to provide immunizations for all children of the world.

Table 2: EPI Planning and Management Courses
(October 1977 - October 1979)

Region	Location	Dates	Language	No. of countries represented	No. of PARTICIPANTS				No. of COURSE MANAGERS			
					TOTAL	NATIONAL	WHO	OTHER*	TOTAL	NATIONAL	WHO	OTHER*
AFRO	Lagos NIGERIA	8-20 Jan 1979	English	13	29	21	7	1	18	3	12	3
AFRO	Abidjan IVORY COAST	18-28 Apr 1979	French	19	51	33	12	6	20	3	12	5
AMRO	San José COSTA RICA	10-19 July 1978	Spanish	11	32	24	8	-	12	2	9	1
AMRO	Lima PERU	15-26 Jan 1979	Spanish	12	45	38	7	-	12	1	10	1
EMRO	Karachi PAKISTAN	16-28 Sept 1978	English	1	31	31	-	-	12	-	11	1
EMRO	Damascus SYRIA	29 Aug - 11 Sept 1979	English	15	36	29	1	6	11	-	10	1
EMRO	Tipaza ALGERIA	14-26 Oct 1978	French	15	40	36	4	-	17	4	6	7
SEARO	New Delhi INDIA	20 Nov - 2 Dec 1978	English	1	33	33	-	-	11	7	4	-
SEARO	Bangkok THAILAND	23 July - 4 Aug 1979	English	17	45	38	3	4	13	5	6	2
WPRO	Kuala Lumpur MALAYSIA	23 Oct - 4 Nov 1978	English	19	39	30	9	-	11	-	8	3
WPRO	Suva FIJI	14-27 Sept 1978	English	20	32	28	4	-	10	1	8	1
TOTAL					413	341	55	17				

* Includes staff of multi and bilateral aid agencies, representatives of training and scientific institutions and members of the EPI Global Advisory Group

Table 1: Number of Participants, Number and Percentage of Countries participating in EPI Training Courses (October 1977 - October 1979)

Region	No. of countries/territories in the Region	PLANNING AND MANAGEMENT			COLD CHAIN AND LOGISTICS			MANAGEMENT FOR MID-LEVEL SUPERVISORY PERSONNEL			VACCINE QUALITY CONTROL		
		No. of participants in Courses held in the Region	Countries/terr. participating		No. of participants in Courses held in the Region	Countries/terr. participating		No. of participants in Courses held in the Region	Countries/terr. participating		No. of participants in Courses held in the Region	Countries/terr. participating	
			Number	Percentage		Number	Percentage		Number	Percentage		Number	Percentage
AFRO	44	80	38	86	-	-	-	-	-	-	-	5	11
AMRO	34	77	20	59	57	19	56	196	4	12	17	11	32
EMRO	23	67	13	57	-	1	4	120	1	4	-	7	30
EURO	36	40	3	8	-	-	-	-	-	-	-	3	8
SEARO	11	76	9	82	47	8	73	-	-	-	-	4	36
WPRO	32	71	18	56	-	-	-	39	1	3	-	5	16
INTER-REGION	-	-	-	-	-	-	-	-	-	-	49	-	-
TOTAL	180	413	101	56	104	28	16	355	6	4	66	35	19

Table 3: EPI Cold Chain and Vaccine Logistics Courses
(Up to October 1979)

Region	Location	Dates	Language	No. of countries represented	No. of PARTICIPANTS				No. of COURSE MANAGERS			
					TOTAL	NATIONAL	WHO	OTHERS	TOTAL	NATIONAL	WHO	OTHERS
AMRO	Quito ECUADOR	8-12 May 1978	Spanish	9	29	29	-	-	7	-	4	3
AMRO	San José COSTA RICA	21-25 July 1978	Spanish	12	28	28	-	-	6	-	4	2
SEARO	Chandigarh INDIA	30 April - 5 May 1979	English	3	18	18	-	-	4	-	3	1
SEARO	Madras INDIA	14-19 May 1979	English	3	13	13	-	-	4	-	4	-
SEARO	Bangkok THAILAND	6-17 Aug 1979	English	4	16	16	-	-	9	5	3	1
TOTAL					104	104	-	-				

Table 4: EPI Management for Mid-level Supervisory Personnel
(Up to October 1979)

Region	Location	Dates	Language	No. of countries represented	No. of NATIONAL PARTICIPANTS	No. of COURSE MANAGERS			
						TOTAL	NATIONAL	WHO	OTHERS
AMRO	Lima PERU	26 Feb-3 March 1979	Spanish	2	46	4	1	3	-
AMRO	Tegucigalpa HONDURAS	26 Feb-2 March 1979	Spanish	1	35	2	1	-	1
AMRO	Cochambamba BOLIVIA	18-23 Jan 1979	Spanish	1	81	10	3	6	1
AMRO	Bogota COLOMBIA	2-7 July 1979	Spanish	1	34	6	1	4	1
EMRO	Lahore PAKISTAN	12-31 May 1979	English	1	80	12	10	2	-
EMRO	Karachi PAKISTAN	16-25 June 1979	English	1	40	12	10	2	-
WPRO	Madang P.NEW GUINEA	3-14 Sept 1979	English	1	39	13	6	4	3
TOTAL					355				

Table 5: EPI/BLG Courses on Quality Control of Vaccines
(1977 - 1979)

Region	Location	Year	Language	No. of countries represented	No. of PARTICIPANTS	Course content
IR	WHO - GENEVA	1977	English	11	11	Seminar on biological standardization
IR	Wellcome Research Laboratories - UK	1977	English	10	11	Viral vaccines
IR	Statens Serum Inst. DENMARK	1977	English	3	3	Production and control of freeze-dried BCG
IR	Institute Mérieux FRANCE	1978	French	4	5	Viral vaccines
IR	Statens Serum Inst. DENMARK	1978	English	5	5	Production and control of freeze-dried BCG vaccine
PAHO	MEXICO	1978	Spanish	7	9	Production and control of bacterial vaccines
PAHO	MEXICO	1978	Spanish	6	8	Tissue culture titration of live viral vaccines
IR	Institut Mérieux FRANCE	1979	French	4	5	Viral vaccines
IR	Statens Serum Inst. DENMARK	1979	English	5	9	Production and control of freeze-dried BCG vaccines
TOTAL					66	

ANNEX 2

Summary of Responses to a Questionnaire Evaluating the Kuala Lumpur Course on EPI Planning and Management

Number of participants: 39
Number of respondents: 29 (74%)

Were you directly involved in EPI during 1978, or do you expect to be in 1979?

Yes: 28 (96.5%)
No: 1

If yes, specify areas of involvement:	1978	1979
1. Surveys to estimate morbidity and/or mortality of diseases included in EPI (if yes, list diseases)	41%	24%
2. Quantifying objectives for:		
- vaccination coverage	83%	55%
- reduction of morbidity/mortality of diseases included in EPI	45%	41%
3. Preparing or revising an immunization schedule	72%	38%
4. Planning necessary resources (men, money, material)	83%	66%
5. Vaccination coverage assessment	72%	66%
6. Preparation of job descriptions for EPI staff	66%	52%
7. Training:		
- organization of EPI workshops	70%	45%
- delivery of lectures on EPI subjects	79%	62%
- on-the-job training of EPI staff	79%	59%
- other	48%	31%

Comments:

The first EPI training course on planning and management, held in Kuala Lumpur 24 October - 4 November 1977, was attended by 50 people, 39 of whom were participants and 11 training staff. The course follow-up questionnaires were sent to all 39 participants (9 of whom were WHO staff). By 9 July 1979, 29 participants had returned questionnaires with their replies, giving an overall response rate of 74%.

The analysis of the course evaluation must necessarily be based upon the 29 replies received, recognizing that there may be a bias leading those not pleased with the course not to return their questionnaires. Yet, even if all the missing replies had been negative, the results would still indicate a generally favorable evaluation.

The detailed results are provided above. All but one of the respondents indicated that they were involved in the EPI in their countries following the course, suggesting that these participants had been appropriately selected by WHO and that the course subjects were appropriate for this audience of programme managers.

In their written comments, which have not been included here, the majority of the respondents indicated that they had benefited from the course by improving their understanding of EPI strategy,

ANNEX 3

Summary of Status of Immunization Programmes in 15 EPI Countries containing 80% of Newborns in all Participating EPI Countries

Table 1: EPI Planning and Training

Country	Estimated Annual No. of Newborns (millions)	Planned coverage with 3 doses of DPT		Participation in EPI training*		
		Year	% Coverage	I	II	III
1. India	23.0	1983	64	+		+
2. Indonesia	6.5	1984	80**	+		+
3. Bangladesh	4.3	1984	60	+		
4. Brazil	4.2	...	...**	+		+
5. Pakistan	3.4	1983	50	+	+	
6. Nigeria	3.4	...	...	+		
7. Mexico	2.8	...	...	+		+
8. Viet Nam	2.0	...	...	+		
9. Philippines	1.6	1981	50**	+		
10. Thailand	1.6	1981	80	+		+
11. Egypt	1.5	...	...	+		
12. Ethiopia	1.5	...	...	+		
13. Turkey	1.4	...	...	+		
14. Zaire	1.2	...	...	+		
15. Burma	1.2	1983	80	+		+

... Not available.

* One or more national staff participating: I = Planning and Management;
II = Management for Mid-Level Supervisors;
III = Logistics and Cold Chain

** Two dose schedule used.

Table 2: Summary of Evaluations

Country	Vaccination Coverage Evaluation[1]									Programme Audit - Year	Surveillance: Reported Cases per 100 000 population				
	Area Surveyed	Year	BCG %	DPT I %	DPT III %	Polio I %	Polio III %	Measles %	Tetanus[2] %		Year	Neonatal Tetanus	Pertussis	Measles	Polio
India	New Delhi	1978	71.8	74.3	54.9	69.9	53.4	n/a	...	1979	1978	...	26	16	1.3
Indonesia	Operational areas	1978/79	80	...	41*	n/a	n/a	n/a	27		1977	...	0.17	8	0.08
Bangladesh	...	...	...	...	...	...	...	...	...		1977	...	6	0.29	0.1
Brazil	Country	1977	...	57.5	42.4*	80	39.4	41.6	...		1977	...	26	40	1.9
Pakistan	...	...	...	...	...	...	...	...	...		1977	...	8	4	0.1
Nigeria	...	...	...	...	...	...	...	...	...		1978	...	61	260	0.8
Mexico	...	...	...	...	...	...	...	...	...		1977	...	9	27	1.3
Viet Nam	...	...	...	...	...	...	...	...	...		1978	...	155	221	2.4
Philippines	Operational areas	1978	...	53	42*	n/a	n/a	n/a	...	1978	1977	...	46	55	2.9
Thailand	Bangkok	1979	61	61	31	60	45	n/a	...		1978	...	6	8	1.3
Egypt	Country	1977	65	...	63.5	...	63.5	48	...		1976	...	0.29	5	1.1
Ethiopia	...	...	...	...	...	...	...	...	...		1977	...	10	10	0.6
Turkey	Nevsghir Province	1978	22	64	32	84	37	52	...	1979	1978	...	5	29	0.6
Zaire	...	...	...	...	...	...	...	...	...		1978	...	68	138	1.4
Burma	Rangoon	1979	33	37	9	n/a	n/a	n/a	...		1977	...	40	19	0.9

Results relate to coverage achieved in children below 2 years of age.

Tetanus toxoid coverage of pregnant women with 2 or more doses.

Two-dose schedule.

.. Not available.

/a Not applicable.

ANNEX 4

Improved Stability of Freeze-Dried Measles Vaccine

Tests have recently been completed at a WHO Reference Laboratory comparing the heat stability of measles vaccine produced by several manufacturers (Table 1). Vaccines stored for varying intervals at 37°C and 45°C were assayed using the micro-focus method, the results being expressed as plaque forming units (PFU) per single human dose. Two indices of stability were then calculated:

1. The half-life in days, indicating for each temperature the number of days required for the vaccine titer to fall to half its original level; and

2. The number of days required for the vaccine titer to fall to the minimally acceptable level of 10^3 per single human dose.

The data in Table 1 indicate that wide differences in the stability of freeze-dried measles vaccines currently exist. At 37°C, half lives range from 0.62 to 12.2 days, and the time required to reduce the titer to 10^3 PFU per single human dose range from 2.74 to 35.8 days. The best of the vaccines tested (Manufacturer No. 2, improved product and Manufacturer No.5) should, in the freeze dried form, be able to withstand exposure to 37°C for 15-30 days and to 45°C for 4-8 days and still induce immunity, although such storage conditions are hardly to be encouraged.

The use of vaccines with stability characteristics similar to the two cited above is recommended in countries in which problems with the cold chain exist. Purchasers of freeze-dried measles vaccines for use in such countries are encouraged to obtain stability data as well as copies of vaccine production and control protocols from the manufacturers.

TABLE 1: The results of the accelerated stability test on freeze-dried measles vaccine performed at a WHO Reference Laboratory

Manufacturer	Vaccine Code	Doses per vial	Initial titer Log PFU^{10} per single human dose	Half-life in days[1]			Number of days to reduce initial titer to 10^3 PFU per single human dose		
				Temperature			Temperature		
				8°C	37°C	45°C	8°C	37°C	45°C
1	1 A	1	4.46	45	0.62	0.22	220	3.02	1.06
	5 A	10	3.93	116	0.88	0.27	359	2.74	0.83
2	1 B*	1	4.22	1796	8.82	2.41	6431	31.60	8.66
	4 A**	10	3.43	166	4.57	1.91	238	6.55	2.74
	5 B**	10	3.28	177	4.72	1.96	165	4.40	1.83
3	3	5	4.01	798	1.60	0.35	2691	5.38	1.19
4	2 A	1	3.25	6438	5.54	0.99	5365	4.61	0.83
5	2 B	10	3.88	9804	12.20	2.40	28758	35.80	7.00
	4 C	10	3.79	1250	7.21	2.05	3292	19.00	5.41
	5 C	10	3.73	801	6.12	1.87	1947	14.90	4.53
6	4 B	10	3.57	535	1.49	0.36	1016	2.84	0.68

* new, improved version

** old product

[1] Corrected/predicted values derived from the Arrhenius plot which shows relationship between the specific degradation rate of the tested vaccine and the reciprocal of the absolute temperature.

ANNEX 5

The Heat Stability of Vaccines Used in the EPI

Vaccine	Storage temperature			
	2 - 8°C	20 - 25°C	37°C	over 37°C
Diphtheria and tetanus toxoids (as monovalent vaccines or components of DPT vaccine)	Stable for 2.5-6 years	Stable for 6-12 months	Stable for 2-6 months	Some loss at 45°C for two weeks but rapid loss at temperatures higher than 50°C
Pertussis vaccine	Safe storage for 18-24 months, although with continuous slow decrease of potency, estimated rates varying from 6-14% per year.	Information scarce; vaccines in one study stable for 3-12 months	Stability varies. Some vaccines retain satisfactory potency for 2-4 months, others show 20-50% loss of potency after 8 weeks and 40-90% loss after 28 weeks storage	Rapid loss of potency at 45°C, complete loss of potency after storage at 56°C for 2 weeks
BCG	Safe storage for 8-24 months. The number of viable BCG organisms decreases approximately 10% per annum	Stability varies. Vaccines supplied by UNICEF: 2-7% loss of viable organisms after 2 weeks and 4-14% loss after 4 weeks storage	Stability varies. Vaccines supplied by UNICEF: 16-52% loss of potency after 2 weeks, 27-56% loss after 4 weeks storage. Other vaccines, particularly freeze-dried in rubber stoppered vials, may have lower heat stability	Precise data lacking.
Freeze-dried measles vaccine	Many vaccines retain satisfactory titer after 6 months to 1 year storage. Improved vaccines retain satisfactory titers after storage for 2 years or longer.	Stability varies. Many vaccines stable for 7-30 days. Improved vaccines retain satisfactory potency after storage for 1-4 months	Stability varies. Many vaccines retain required titer for only 2-6 day exposure. Improved vaccines retain satisfactory titer after storage for 1-4 weeks	Stability varies. Many vaccines are inactivated within 1 day at 41-45°C. Improved vaccines retain satisfactory titer after storage 4-8 days.

/...

Vaccine	Storage temperature			
	2 - 8°C	20 - 25°C	37°C	over 37°C
Reconstituted measles vaccine	Unstable. Should be used in one working session. Improved vaccines may keep their potency for 1 day to 1 month	Unstable. Titer remains satisfactory for 4-48 hours.	Very unstable. Titer remains satisfactory for only 1-7 hours.	Precise data lacking.
Oral polio-myelitis vaccine	Stable for 3 months to 1 year.	Unstable. Some vaccines may retain satisfactory titers for 1-3 weeks.	Very unstable. Loss of satisfactory titer after 1-3 days.	Precise data lacking.
Inactivated poliomyelitis vaccine	Stable for 12-18 months.	Precise data lacking.	Stable for 4 weeks.	Precise data lacking.

ANNEX 6

Quality of Vaccines Used in 15 Countries Participating in the EPI

Table 1 shows the assessed quality of vaccines used in 15 EPI participating countries with the largest number of newborns. The quality of vaccines was assessed by taking into consideration a WHO/UNICEF survey of vaccine requirements, the reports of WHO/HQ staff and short term consultants, statements of the Regional Offices and National Plans of Operation.

Vaccines supplied through UNICEF receive WHO clearance and have been listed as meeting WHO requirements. The vaccines supplied other than through UNICEF sources were assessed as having unknown quality.

Tables 2 and 3 (for bacterial and viral vaccines, respectively) show the following additional data:

1. The existence of a National Control Authority. This is usually an appropriate unit in the Ministry of Health for vaccine licensing, importing and releasing.

2. The existence of the quality control laboratory (facilities). This does not necessarily mean the existence of an independent National Control Laboratory It refers often to the second tier control of the final product affiliated to the manufacturing unit, although responsible to some extent to the National Control Authority.

3. The number of persons trained in WHO courses in vaccine quality control in 1970-1979 (excluding one course in 1972 for which no data were available).

4. The percentage distribution of locally produced and imported vaccines (based mainly on WHO/UNICEF data).

5. The assessed quality of individual vaccines locally produced and imported. DPT vaccines produced in Indonesia and the Philippines were considered as not meeting WHO requirements because of the sub-standard quality of the pertussis component. Turkish BCG vaccine (liquid) tested in the BCG International Control System monitored by the WHO Reference Laboratory in Copenhagen showed low viability and low heat stability.

Table 1: The Assessed Quality of Vaccines Used in 15 EPI Participating Countries

Country	All vaccines used in EPI considered to meet WHO Requirements	Status of one or more vaccines either unknown or known not to meet WHO Requirements during most recent test
India		+
Indonesia		+
Bangladesh	+	
Brazil		+
Pakistan	+	
Nigeria		+
Mexico		+
Viet Nam		+
Philippines		+
Thailand		+
Egypt		+
Ethiopia	+	
Turkey		+
Zaire	+	
Burma		+

le 2: Percentage of Bacterial Vaccines Locally Produced and Imported, and Assessed Quality of Vaccines Used in 15 EPI Countries

Country	Control Quality Authority	Quality Control Laboratory for:			No. of persons trained at WHO courses 1970/79	Vaccines						Quality of Vaccines[1,2]					
						% Locally Produced			% Imported[1]			Locally Produced			Imported		
		BCG	DPT	Te		BCG	DPT	Te	BCG	DPT	Te	BCG	DPT	Te	BCG	DPT	Te
ndia	Yes	Yes	Yes	Yes	6	100	53	100	0	47	0	+	+	+	n/a	+	n/a
ndonesia	Yes	Yes	Yes	Yes	4	100	100	100	0	0	0	+	–	+	n/a	n/a	n/a
angladesh	No	No	No	No	0	0	0	0	100	100	100	n/a	n/a	n/a	+	+	+
razil	Yes	Yes	No	Yes	1	0	0	0	100*	100*	100*	n/a	n/a	n/a	?	?	?
akistan	Yes	Yes	No	Yes	0	0	0	0	100	100	100	n/a	n/a	n/a	+	+	+
igeria	No	No	No	No	2	0	0	0	100*	100*	100*	n/a	n/a	n/a	16%(+) 84%(?)*	14%(+) 86%(?)*	29%(+) 71%(?)*
exico	Yes	Yes	Yes	Yes	1	0	0	0	100*	100*	100*	n/a	n/a	n/a	?	?	?
iet Nam	Yes	?	?	?	0	4	8	25	96	92*	75*	?	?	?	+	59%(+) 33%(?)*	60%(+) 15%(?)*
hilippines	Yes	Yes	Yes	Yes	5	36	27	35	64	73*	65	+	–	?	+	+	+
hailand	Yes	Yes	Yes	Yes	3	5	38	94	95*	62*	6*	?	+	+	?	38%(+) 24%(?)*	6%(?)*
gypt	Yes	Yes	Yes	Yes	3	20	9	?	80	91	?	+	+	?	+	+	?
thiopia	No	No	No	No	0	0	0	0	100	100	100	n/a	n/a	n/a	+	+	+
urkey	Yes	Yes	Yes	Yes	1	100	53	100	0	47*	0	–	?	?	n/a	?	n/a
aire	No	No	No	No	0	0	0	0	100	100	100	n/a	n/a	n/a	+	+	+
urma	Yes	Yes	No	Yes	0	0	0	100	100	100*	0	n/a	n/a	?	+	?	n/a

1. Supplied wholly through UNICEF, unless marked by an asterisk (*).

2. + Vaccine complies to WHO requirements.
– Vaccine does not comply to WHO requirements.
? No information about vaccine quality.
n/a Not applicable.

Table 3: Percentage of Viral Vaccines Locally Produced and Imported, and Assessed Quality of Vaccines Used in 15 EPI Countries

Country	Control Quality Authority	Control Quality Laboratory for:		No. persons trained at WHO courses 1970/9	Vaccines				Quality of Vaccines [1,2]			
					% Locally Produced		% Imported[1]		Locally Produced		Imported	
		Measles	Polio		Measles	Polio	Measles	Polio	Measles	Polio	Measles	Polio
1. India	No	Yes	Yes	1	0	0	100	100*	n/a	n/a	+	?
2. Indonesia	Yes			1		Not Used						
3. Bangladesh	No	No	No	0	0	0	100	100	n/a	n/a	+	+
4. Brazil	Yes	Yes	Yes	1	0	0	100*	100*	n/a	n/a	?	?
5. Pakistan	No	No	No	1	0	0	100	100	n/a	n/a	+	+
6. Nigeria	No	No	No	0	0	0	100*	100*	n/a	n/a	?	16%(+) 84%(?)*
7. Mexico	No	Yes	Yes	2	0	0	100*	100*	n/a	n/a	?	?
8. Viet Nam	Yes	?	?	1	0	40	100*	60	n/a	?	86%(+) 14%(?)*	+
9. Philippines	No	No	No	1		Not Used						
10. Thailand	Yes	No	Yes[3]	1	Not used	0	Not used	100*	n/a	n/a	n/a	44%(+) 56%(?)*
11. Egypt	Yes	Yes	Yes	2	0	0	100	100*	n/a	n/a	+	?
12. Ethiopia	No	No	No	0	0	0	100	100	n/a	n/a	+	+
13. Turkey	Yes	Yes[3]	Yes[3]	0	0	0	100*	100*	n/a	n/a	?	?
14. Zaire	No	No	No	0	0	0	100	100	n/a	n/a	+	+
15. Burma	No	No	No	0	Not used	0	Not used	100*	n/a	n/a	n/a	?

1. Supplied wholly through UNICEF, unless marked by an asterisk (*).

2. + Vaccine complies to WHO requirements.
   ? No information about vaccine quality.
   n/a Not applicable.

3. Only some tests.

ANNEX K.1

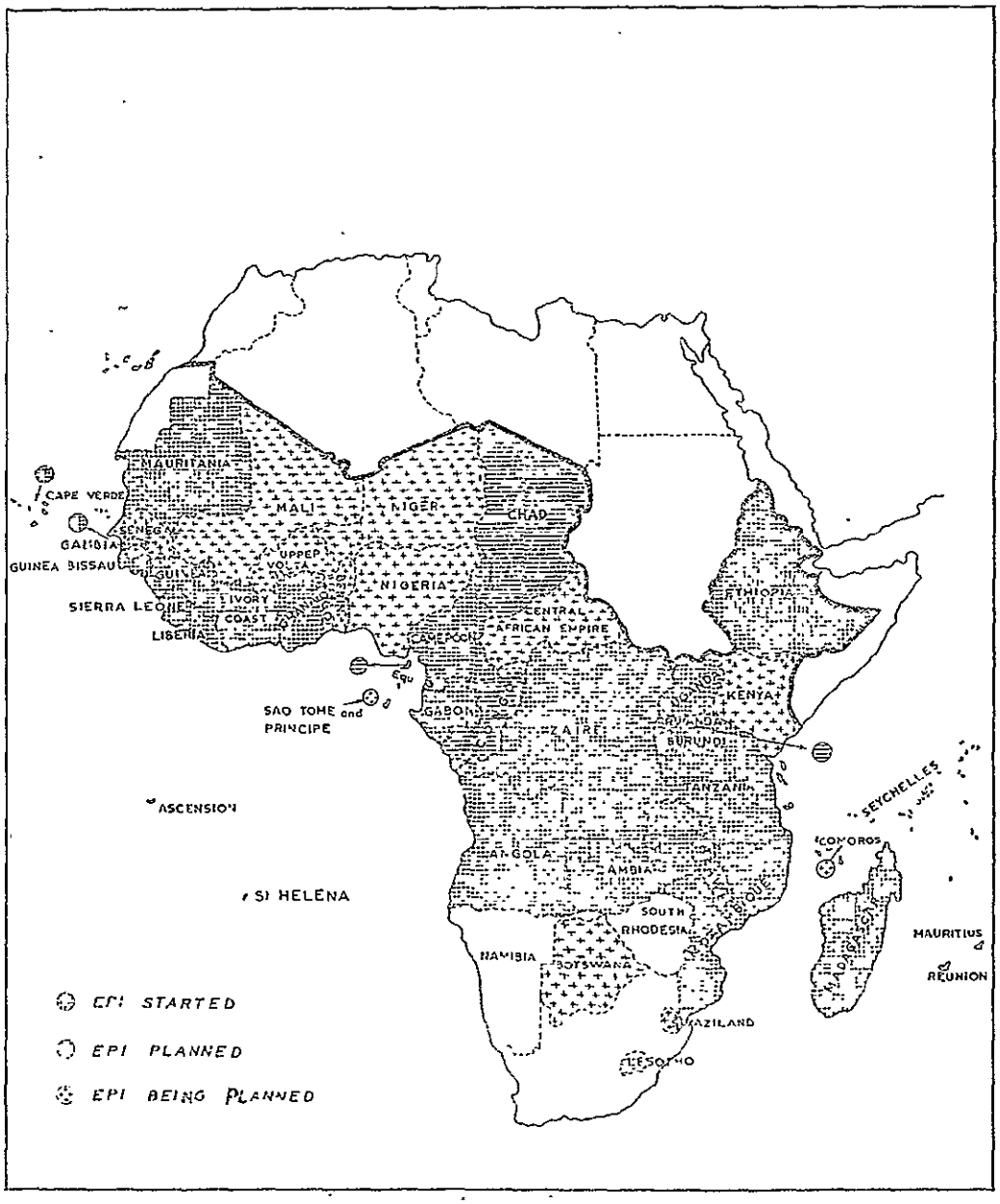
WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

EPI/GAG/79/WP.5.1

EPI GLOBAL ADVISORY GROUP MEETING
12-16 November 1979, New Delhi

EPI OVERVIEW FOR AFRICA
SITUATION IN MAY 1979



CONCLUSIONS

24. In a comparatively short period, high-level administrators and planners have been trained in 38 countries (see list of Annex 1). These personnel are at present working in the field (82 nationals, 11 members of bilateral agencies and 35 WHO staff members) to strengthen planning, speed up implementation, and participate in evaluation and in the training of national front-line workers.

25. If the number of countries that have embarked upon an EPI programme is taken as an indicator, the results far exceed the forecasts. In view of the rate at which requests are received from governments, it may be estimated that within two years all countries of the Region will have an EPI programme that meets the basic requirements. To achieve this it is essential to maintain very close cooperation between governments, WHO, the other international organizations (UNICEF, UNDP) and the bilateral technical cooperation agencies (USAID, DANIDA, SIDA, FAC, etc.). This cooperation will have a choice of several courses in the areas listed above in paragraph 6 of this document and among the categories of countries listed in paragraphs 17, 18 and 19 (see also the map in Annex 2). The cost of the full immunization of a child against the six target diseases (tuberculosis, measles, tetanus, pertussis, diphtheria and poliomyelitis) is estimated at three dollars. Observations so far confirm that hardly any country can afford even one dollar per child per year from its own resources. It is hoped that the present contribution from all extra-budgetary sources (international and bilateral) can be raised to one dollar per child if both sides give this priority in their negotiations. However, it will still be necessary to find the third dollar if the target of vaccinating all children by 1990 is to be achieved. It should be borne in mind that about 12 million children are born in the Region every year and about one million of them die from these diseases before reaching their first birthday. Taking these figures as the basis for calculation, donors can make a rough estimate of what their annual financial contribution would be in the countries of their choice; this contribution could be made either directly or via WHO. WHO could assist donors through the mechanism of joint evaluation missions either in identifying countries' needs or in measuring the impact of external cooperation.

contribution of parents to the cost. Each country is endeavouring to apply the strategy best adapted to its own socioeconomic conditions.

22. The following vaccines are produced locally in limited quantities:

- BCG: Madagascar, Senegal
- Smallpox: Madagascar
- Rabies: Cameroon, Ethiopia, Madagascar, Senegal, Zaire
- Yellow fever: Senegal
- TAB: Ethiopia
- Cholera: Ethiopia

Facilities for quality control of vaccines are available in the Region as follows:

- BCG: Madagascar, Senegal, Tanzania
- Smallpox: Madagascar, Nigeria, Tanzania
- DPT: Cameroon
- Polio: Cameroon, Uganda
- Measles: Uganda
- Yellow fever: Nigeria, Senegal, Uganda
- Rabies: Cameroon, Nigeria, Senegal, Zaire
- Typhoid and cholera: Cameroon, Ethiopia, Zaire.

The production and quality control of vaccines in the African Region, which is one of the activities designed to meet basic community needs, particularly for disease control, needs to be developed during the next decade. Regional activities are still in the preliminary stage and require increased collaboration between countries and cooperation agencies.

CONSTRAINTS

23. A large number of constraints hamper the countries of the Region which are undertaking vaccination programmes and prevent them from carrying them out successfully. The most important of these constraints include:

i) the shortage of qualified personnel;
ii) the shortage of equipment and transport facilities;
iii) the difficulty of keeping the vaccine at a constant temperature (cold chain)

Realistic planning taking the financial limitations and general conditions of the country into account enables some of these difficulties to be overcome.

15. The medium-term programme for the period 1978-1983 calls for the implementation of EPI programmes in 25 countries of the Region so as to provide at least 60% coverage of the target population[1] (see map).

16. By the end of April 1979 EPI programmes had been planned and implemented in 20 countries:

Angola	The Gambia	Liberia	Sierra Leone
Cameroon	Ghana	Madagascar	Tanzania
Cape Verde	Guinea	Malawi	Uganda
Ethiopia	Guinea-Bissau	Mauritania	Zaire
Gabon	Ivory-Coast	Mozambique	Zambia

17. The five countries the EPI programme had been planned but not yet implemented:

Chad Congo Equatorial-Guinea Lesotho Rwanda

18. In 13 countries the EPI programme is still in the planning stage:

Benin	Burundi	Centreal African Empire			Comoros	Kenya
Lesotho	Mali	Niger	Nigeria	Togo	Sao Tome and Principe	
Senegal	Upper Volta					

19. It should be noted that there are national immunization programmes in all countries of the Region. This classification takes the new EPI approach into account and does not in any way reflect conventional immunization activities.

20. Up to May 1979, 82 national staff, 11 members of bilateral agancies and 35 WHO staff members working in 38 countries had followed EPI planning and management courses. Two nationals of two different countries had attended the course on vaccine quality control. Other training courses for EPI managers, for intermediate-level operational staff and for teachers are being prepared with the aim of covering all countries.

RESEARCH

21. Research is in progress on the local production of components for the cold chain in Ghana, on the use of solar energy for the cold chain in Madagascar, on the local production of insulated boxes for the field transport of vaccines in Tanzania and Kenya. A specimen refrigerator operating on solar energy is to be tested in Ivory Coast, the Gambia and Cameroon under project USAID/WHO ICP/SPM/013 (Strengthening of public health services delivery systems in Central and West Africa). The various models of compressed air injectors have been tried out in Ghana with the collaboration of SIDA. Operational research on the various strategies for the provision of vaccinations by non-mobile and mobile services is being conducted almost everywhere, and in one country research is being carried out on the

[1] Document AFR/RC28/13

9. Responsibility for EPI rests with the epidemiologists, operational officers and other staff conducting activities relating to maternal and child health, particularly within the context of primary health care. Teachers also take part in the programme.

10. Each country should appoint a national manager to direct the EPI, either full-time or part-time. In most countries the programme managers are epidemiologists or medical practitioners who have taken courses in EPI; in other countries they are senior staff of maternal and child health services.

11. At the regional and subregional levels and in the intercountry projects, close cooperation is essential between the managers of various programmes, especially of those concerned with communicable disease control, maternal and child health, primary health care, production and control of biological substances, teaching, health education, cooperation among developing countries, appropriate technology, health planning, etc. WHO Headquarters contributes actively to the development of the regional proggramme.

FINANCING

12. Since 1978 special budget lines have been included in the WHO regular budget. Previously the funds used for immunization activities were included in integrated health development projects and in regional activities for epidemiological surveillance and disease control

13. In 1977 US$250 000 was allocated by the Director-General as supplementary support for the EPI/AFRO programme; this amount was used for the purchase of vaccines, transport facilities and equipment for five countries which needed them urgently (Cape Verde, Equatorial Guinea, Mozambique, Mauritania, Rwanda). The urgent needs of three front-line countries (Botswana, Mozambique and Zambia) for immunization activities were met through a substantial allocation from the regular budget.

14. The WHO Voluntary Fund for Health Promotion contributed to drug supplies for seven countries in 1977 and 14 countries in 1978. The regular budget for 1978-1979 makes a provision of US$850 000 for EPI in country programmes, while the 1980-1981 budget contains a provision for US$1 520 000. The funds allocated to intercountry projects (five epidemiological forward posts) in the same financial periods are US$1 334 000 and US$1 930 000 respectively. The majority of intercountry activities are concerned with cooperation with national EPI programmes. As from 1 November 1978, an amount of US$700 000 has been allocated for three years and two months as UNDP support to the regional EPI programme.

6. Collaboration at country level may concern all phases of the planning, formulation and management of programmes, such as (i) the setting-up or strengthening of the epidemiological information network; (ii) feasibility studies, including the analysis of resources and constraints; (iii) manpower training, adaptation of manuals and other educational tools; (iv) setting-up and development of logistic facilities; (v) quality control and production of vaccines, programme evaluation; (vi) cooperation in international research; etc.

ORGANIZATION

7. At the Regional Office: two regional officers responsible for EPI and all regional officers responsible for the coordination of activities at country level.

8. Five forward posts for the intercountry project ICP/ESD/005 (epidemiological surveillance and expanded programme on immunization) provide support for the countries:

(i) Accra (Ghana) forward post: (a) an epidemiologist;
(b) an operational officer

This forward post covers five countries: The Gambia, Ghana, Liberia, Nigeria, Sierra Leone.

(ii) Luanda (Angola) forward post: (a) an epidemiologist;
(b) an operational officer

This forward post covers eight countries: Angola, Cameroon, Congo, Equatorial Guinea, Gabon, St Helena, São Tome and Principe, Zaire.

(iii) Maputo (Mozambique) forward post: (a) an epidemiologist;
(b) an operational officer

This forward post covers eight countries: Botswana, Lesotho, Mauritius, Mozambique, Namibia, Reunion, Swaziland, Zambia.

(iv) Nairobi (Kenya) forward post; (a) an epidemiologist;
(b) an operational officer

This forward post covers 10 countries: Burundi, Comoros, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, Seychelles, Tanzania, Uganda.

(v) Niamey (Niger) forward post (formerly at N'Djamena): (a) an epidemiologist;
(b) an operational Officer

This forward post covers 13 countries: Benin, Cape Verde, Central African Empire, Chad, Guinea, Guinea-Bissau, Ivory Coast, Mali, Mauritania, Niger, Senegal, Togo, Upper Volta.

OBJECTIVES

1. General objective: By 1990, to vaccinate all children during their first year of life (at birth: BCG; 3rd, 4th and 5th months: DPT + polio; 9 months: measles).

2. Specific objectives: To strengthen the planning, implementation and evaluation of vaccination activities within the framework of the Expanded Programme on Immunization (EPI). To organize country and intercountry training activities both for the health workers responsible for the management and general supervision of immunization programmes and for those in charge of field operations. To develop and disseminate techniques for the storage and transport of vaccines, using a cold chain.

3. International Coordination: Several countries undertaking the expansion of their programmes will need external cooperation of various kinds. The aim of EPI is to meet the countries' various needs through a set of coordinated activities at country, regional and global levels.

4. EPI is designed as a component of primary health care (PHC) and makes use of technical collaboration and cooperation among countries, particularly developing countries (TCDC). The regional programme provides a basis for large-scale activities within the context of TCDC and international technical cooperation.

5. At the regional level, the main tasks of EPI are as follows:

i) to identify common needs for training and to prepare training programmes (for programme managers, epidemiologists, etc.);

ii) to collect and analyse information on the countries' needs for vaccines, equipment, supplies, cold chains, communications media, etc;

iii) to promote the quality control and production of vaccines where appropriate;

iv) to contribute to organizing the logistic aspects of the supply of vaccines and other equipment and supplies;

v) to collaborate in identifying the priority research problems;

vi) to participate in promoting a regional network of research centres;

vii) to collaborate in defining the needs for external funds and to coordinate the mobilization of such funds at the national and regional levels;

viii) to collaborate with countries in the planning, management and evaluation of programmes;

ix) to classify and analyse national data; to evaluate the efficiency and effectiveness of the regional programme developed on the basis of these data.

ANNEX K.2

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

EPI/GEN/80/2

ORIGINAL: ENGLISH ONLY

MTP.CDS.4.1.5

(1 February 1980)

GLOBAL MEDIUM TERM PROGRAMME

EXPANDED PROGRAMME ON IMMUNIZATION

1. BACKGROUND AND ANALYSIS

1.1 Policy Basis

WHO Resolutions: the Expanded Programme on Immunization (EPI) has its basis in resolution WHA 27.57 adopted by the World Health Assembly in 1974. This resolution called on Member States to develop or maintain immunization and surveillance programmes against some or all of the vaccine preventable childhood diseases. It also requested WHO, among other activities, to collaborate closely with governments in developing their programmes, in mobilising all efforts to make available quality vaccines and other equipment and supplies to meet country needs, to support educational and research activities, and to establish a special account under the Voluntary Fund for Health Promotion.

The provision of immunization services is considered to be a basic element of WHO's strategy to provide Health for All by the Year 2000, and they are included in the Declaration of Alma Ata as one of the essential elements of primary health care.

1.2 Situation Analysis

1.2.1 Introduction

The programme is initially concentrating on six diseases: diphtheria, pertussis, tetanus, measles, poliomyelitis and tuberculosis, and seeks to reduce morbidity and mortality. Primary emphasis is being placed on programmes in developing countries, where it is estimated that less than 10% of the 80 million children born each year are being immunized. As a result of these low immunization levels up to five million children die annually, and a similar number are permanently crippled, blind, or otherwise disabled.

The EPI has been subdivided into four major programme elements in recognition of the broad approach required to cope with the basic problem described above. Some of the reasons why immunization programmes have not been more generally implemented in developing countries derive from a lack of basic knowledge and a lack of its application. Research is needed to answer both technical and operational questions. These gaps in knowledge, however, are not as important at this point as transferring already available knowledge and skills to national staff through training. As research produces new information and technology, training needs to be modified. At the present time, staff at all levels need training in programme management and supervision skills, and this will be a major emphasis during the period 1978-1983. As staff are trained, planning of programmes can be improved and actual operations can be expanded. Such expansion will be gradual during this period, and global coverage may not exceed 50% of the susceptible children in developing countries by 1983. The care given to training and planning, however, should result in country programmes developing from a sound basis, and more rapid expansion should occur during the following period. Such expansion will also be the result of thorough programme evaluation so that the experience of the past can be accurately interpreted and understood. Such evaluations will provide guidelines for future planning, and may also identify new areas requiring additional research.

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The following sections describe each of these four elements in more detail; the work already accomplished in each problem area is also described.

1.2.2 Research

Both basic and applied research are being carried out:

a) Work is continuing on the development of more stable, more potent, and less reactogenic vaccines for the six EPI diseases, and success has been reported in improving the stability of measles vaccine.

b) In applied research emphasis has been placed on clarifying the epidemiology of the six target diseases and on the improvement of equipment used both in the cold chain and in administering vaccines.

1.2.3 Training

Both formal courses and distribution of material have been used to improve staff skills.

a) A course on programme management for developing country national EPI managers, using an innovative participant oriented approach, has been designed and carried out. This course emphasises problem identification and quantification, establishment of priorities and objectives, implementation of work systems, and evaluation.

b) A course in cold chain management for personnel responsible for supervision of staff involved in vaccine handling has been designed, and development has started on a course covering all of the responsibilities of middle-level supervisors.

c) The EPI field manual has been distributed broadly, and is currently available in English, French and Spanish. It is composed of five books: programme design, programme management, vaccine handling, health education, and programme evaluation.

d) Manuals have been developed by the WHO Biologicals Unit (BLG) describing the facilities and techniques recommended for the production and quality control of vaccines. Training programmes for national staff engaged in vaccine quality control and production have also been developed.

e) Films and slide sets on cold chain management have been developed, tested and distributed.

1.2.4 Operations

Using criteria which vary somewhat between regions, as of May 1979, 90 developing countries, in which some 74 million children are born annually, have been identified as expanding their immunization programmes in active collaboration with WHO.

a) As expected at this early stage, reported vaccinations from participating countries indicate low levels of coverage. No more than 10% of children in the developing world are currently being fully immunized.

b) With emphasis on training and planning it is still too early to expect reliable reports of operational status in terms of quantified country specific estimates of morbidity and mortality. Methods of improving surveillance systems have been emphasised in training courses and the field manual.

1.2.5 Evaluation

In developing Plans of Operations, the importance of including evaluation of the achievement of programme objectives as an integral programme element is being stressed. Emphasis is being put on both continuous evaluation carried out as a part of routine activities by programme staff and periodic programme audit performed by a group of independent evaluators. Evaluation includes four components:

a) Surveillance of trends in disease morbidity and mortality measures achievement of a programme's most basic objective.

b) Disease reduction is achieved by immunizing a susceptible population. A programme's immunizing capability depends first on the quality of the vaccines (measured by vaccine potency testing), and second on production of immunity in those vaccinated (measured by periodic serologic surveys).

c) Even if a programme is using potent vaccine which produces satisfactory sero-conversion, it is still essential to evaluate vaccination coverage to determine how successful it has been in actually reaching the target population.

d) To identify the basic causes of programme successes and failures, thorough evaluation of all of the elements involved in management and operations needs to be performed both as a part of regular supervision and as one component of the periodic independent audit.

2. OBJECTIVES

2.1 Long-term Objectives

Each of the four programme elements described in "1" contribute toward achievement of the programme's long-term objectives, which have been defined as follows:

a) Reduce morbidity and mortality from diphtheria, pertussis, tetanus, measles, poliomyelitis and tuberculosis by providing immunization against these diseases for every child in the world by 1990. Other selected diseases may be included when and where applicable.

b) Promote country self-reliance in the delivery of immunization services within the context of comprehensive health services.

c) Promote general self-reliance in matters of vaccine quality control and vaccine production.

2.2 Medium-term Objectives

For the period 1978-1983, the following medium-term objectives have been established:

2.2.1 Research

a) Increase the efficiency and effectiveness of the epidemiologic strategies recommended to reduce morbidity and mortality from the target diseases. This will require greater understanding of the epidemiology of the six target diseases.

b) Improve the safety, potency, stability, ease of administration and efficiency of production of all vaccines in which the Programme has an interest.

c) Improve and develop the equipment required for Programme implementation so as to increase its suitability for Programme purposes, to decrease its cost and, where applicable, to facilitate its manufacture within developing countries.

2.2.2 Training

The overall medium-term objective is to develop global, regional and national strategies for training national and international staff in the variety of disciplines required for successful programme planning and implementation.

2.2.3 Operations

a) Develop appropriate immunization plans at the regional and country level.

b) Attract the investment of external funds from bilateral and multilateral sources to support Programme activities at global, regional and country levels by working with Member States, other WHO programmes at Headquarters and Regional Offices and with representatives of other United Nations agencies and donor groups.

c) Improve all aspects of programme management by applying the knowledge obtained from management information-evaluation systems and from research to promote the use of the most efficient and effective disease control techniques appropriate to each country.

d) Promote the delivery of immunizations as a component of comprehensive health services provided to the entire population through cooperation with national governments and other WHO programmes.

2.2.4 Evaluation

A single comprehensive medium-term objective has been defined: develop country, regional and global management information systems and evaluation mechanisms which accurately and continuously assess progress in achieving the programme objectives.

3. STRATEGIES

EPI strategies have been developed to respond to the problems identified in the Situation Analysis (1.2). The basic strategy during the first half of this period will involve the training of national and international staff at all levels. Such training will include a new emphasis on problem definition, realistic objective setting, monitoring of performance, evaluation of operations, and feedback of information for use in programme modification. While this basic strategy is being followed, research will continue to improve available knowledge and appropriate technology. In the second half of this period strategies will emphasise improvement in operational programmes integrated into comprehensive primary health care services and development of more useful management information (evaluation) systems.

In achieving its own goals, the EPI contributes directly to the broader goals of primary health care. The EPI seeks to establish permanent immunization services which reach a high proportion of newborns and pregnant women as these populations are continuously being replenished. Such services are most cheaply and most sensibly provided as a component of more comprehensive preventive and curative health services, as, for example, maternal and child health services. The addition of immunization services, in turn, strengthens such other services. The EPI is therefore committed to primary health care by intent, as well as necessity, as this approach provides the most rational context for the provision of immunization services.

In expanding the provision of immunization services, attention is first paid to immunizing children and pregnant women who are already utilizing fixed facilities. Next, outreach services are provided to populations which can be reached from the fixed facilities during regularly scheduled weekly or monthly visits. These services should not necessarily be limited to immunization. Finally, aided by the experience gained in accomplishing the above, the far more difficult questions of how and in what time-frame to provide services to the remaining population will be addressed.

4. TARGETS

Each of the medium-term objectives is further defined in terms of more detailed objectives, or targets. A set of tables portraying activities for the targets related to each of the four Global Medium-term Programme elements is presented in 5.

4.1 Research

4.1.1 Disease

Additional work is required to improve understanding of the epidemiology of the EPI target diseases and the impact of various immunization strategies in developing countries. The work does not require highly sophisticated laboratory research. Rather, it requires systematic observation within national immunization programmes to clarify such issues as the age specific morbidity and mortality being caused by these diseases; the cost-effectiveness of alternative strategies of immunization, both in situations where it is feasible to provide immunizations on a continuous basis and in situations where they can be provided only in cycles which may range from 1 to 6 months, and the immunological effect of immunizations given to children with concurrent medical problems such as malnutrition and malaria.

4.1.2 Vaccines

While many of the vaccines have long been in use in developed countries their broad application under difficult circumstances in developing countries has hignlighted the need for research in making them as heat stable as possible, and exploring ways to reduce the number of vaccine administrations required. Because the target diseases are striking the very young in developing countries, continued studies on the earliest age at which effective immunization can be conducted are needed. Finally, studies to develop simplified serological tests to measure antibody levels and studies to evaluate various methods of vaccine administration will be continued.

4.1.3 Cold Chain

In the cold chain, now that cold boxes and portable carriers have been developed, research emphasis will be on development of multi-energy source refrigerators and freezers and time/temperature indicators. In so far as possible, preference will be given to modification of already existing equipment.

4.2 Training

The target is to provide each participating country with the necessary managerial capability and to provide all staff involved in the programme with the required knowledge and skills to supervise and implement the programme.

4.2.1 Programme Managers' Course

The Programme Managers' training courses will be given to participants from all countries participating in the EPI.

4.2.2 Mid-level Supervisors' Course

A middle-level supervisors' training course will be developed, and made available to regions and countries so that modifications can be made to meet particular country needs. Training will be available for all national supervisory staff.

4.2.3 Cold Chain Course

A vaccine logistics course will be developed as well as a course on refrigeration equipment maintenance and repair. Training will be available for all national staff.

4.2.4 Basic-level Staff

The managerial and supervisory personnel trained in 4.2.1 and 4.2.2 will serve as trainers of basic-level staff, and training will be available for all such staff by the end of this period.

4.2.5 Manual

The EPI field manual will undergo a general revision.

4.2.6 Training Material

On a continuous basis training materials for all four programme elements will be developed and distributed as needed.

4.3 Operations

4.3.1 Plans

In the development of regional and country immunization plans, the following targets are being utilised:

a) Each region annually will establish lists of those countries defined as participating in the EPI.

b) Each country defined as an EPI participant will have a Plan of Operations. It is recommended that these plans cover a several year period, provide for phased expansion of activities, and provide for initial and refresher training of personnel. It is further recommended that each plan describe programme objectives in quantified terms, describe methods of implementation, and include budget summaries and a specific section on evaluation procedures.

4.3.2 External Funds

In attempting to attract the investment of external funds:

a) A document designed for potential donors and collaborating agencies will be designed which will describe the characteristics and requirements of country, regional and global programmes. This will have as an appendix a catalogue of specific projects, countries, and activities to which donors may contribute. This document will be updated periodically.

b) On an annual basis each donor and collaborating agency will receive a report on the status of the EPI permitting them to assess what part their participation had in the achievement of programme objectives.

4.3.3 Programme Management

The success of programme management will be reflected through the achievement of the following targets:

a) In participating countries overall coverage levels for DPT, measles and poliomyelitis may reach 50% and levels for BCG may reach 75% by the end of this period.

b) In participating countries there will be a decline in the incidence of the target diseases by the end of this period. The extent of disease reduction cannot be meaningfully estimated at the present time.

c) Based on accumulated programme experience, analysis of results and methods will be carried out periodically. On the basis of these analyses, country, regional and global strategies, policies and plans will be modified.

4.3.4 Vaccines

Targets for vaccine quality control, production and distribution include the following:

a) An inventory will be established of all programmes administering vaccines not on record as conforming to recommended WHO quality standards, and attempts will be made to assist such programmes to improve the quality of their vaccines. It is hoped that all vaccines in use will meet WHO standards by the end of this period.

b) Quality control centres will be established in each Region.

c) Vaccine production centres will be established in all Regions.

d) Vaccine distribution systems will be sufficiently developed so that all participating countries receive adequate quantities of vaccine in sufficient time to carry out planned activities.

4.3.5 Primary Health Care

At least 75% of all immunizations in participating countries will be given within the context of primary health care or other comprehensive health services by the end of this period.

4.4 Evaluation

Targets for information systems and evaluation mechanisms include:

4.4.1 Development of Management Information Systems

This will involve determining information to be collected, deciding on the form of submission to country, regional and global levels, the preparation, submission, and analysis of this data, and feedback of results to appropriate levels. Information systems of particular importance include:

a) Vaccination coverage evaluation systems in all EPI countries.

b) Morbidity and mortality measurement systems in all EPI countries. Special procedures will be developed for measuring occurrence of poliomyelitis and neo-natal tetanus.

4.4.2 Programme Audit

Protocols for comprehensive independent audit of country programmes will be developed and field tested.

5. ACTIVITIES (5.1 Programme Elements - Research)

Activities	1978	1979	1980	1981	1982	1983	Linkages
1. Studies of the epidemiology of the 6 EPI diseases relating to:							CDS, BLG, SHS, Appropriate National Institutions
(a) Age-specific pertussis morbidity and mortality		All Regions					
(b) Area-specific diphtheria incidence					All Regions		
(c) Area-specific neo-natal tetanus incidence			All Regions				
(d) Age-specific measles morbidity and mortality outside Sub-Saharan Africa				All Regions			
(e) Age-specific polio morbidity and mortality		All Regions					
(f) Cost-effectiveness of different immunization schedules and cycles			(AMRO, SEARO), (WPRO)				
(g) Implication of concurrent medical problems on effectiveness of immunization					(AMRO,SEARO,WPRO)		
(h) Clarification of diagnostic criteria, and development of diagnostic and reporting aids		(AMRO,SEARO,WPRO, HQ)					
2. Studies to improve vaccines, vaccine administration and testing of immunologic response, including those relating to:							BLG CDS, Production and Control Laboratories and other Appropriate National Institutions
(a) Improved vaccine stability for:							
(i) Measles vaccine	HQ			HQ			
(ii) Poliomyelitis vaccine			HQ				
(iii) Pertussis vaccine			(AMRO,SEARO, WPRO)				
(b) Improved pertussis vaccine potency		(AMRO) (WPRO)					
(c) Serological response to measles vaccine, children 6-12 months of age	(SEARO)	(WPRO)					
(d) Comparative effectiveness of killed and live polio vaccines		(SEARO) (WPRO)					
(e) Minimum age for administration of DPT vaccine	(AFRO, HQ, WPRO)						
(f) Comparison of the effectiveness and efficiency of various automatic injectors			(AMRO, WPRO)				
(g) Simpler and more reliable serologic tests for immunity (all 6 EPI target diseases)							
3. Improvement/development and testing of cold chain equipment, including:							ATH and Testing and Manufacturing Institutions
(a) Cold boxes and vaccine carriers	(AFRO,AMRO,SEARO,WPRO,HQ)						
(b) Multi-energy source refrigerators			(AMRO,SEARO,HQ)				
(c) Time/temperature indicators		(HQ)					

5.2 Programme Elements - Training

Activities	1978	1979	1980	1981	1982	1983	Linkages
1. Programme Managers' Course: (a) Participation in course by nationals of all EPI countries. (b) Incorporation into curriculum of post-graduate schools of public health.	(All Regions and HQ)	(All Regions and HQ)					HMD, FHE, SHS, CDS, Appropriate National Institutions
2. Middle-level Managers' Course: (a) Development of course (b) Testing Sessions for course (c) Participation in course by nationals of all EPI countries (d) Incorporation into curriculum of schools of nursing, midwifery, and paramedical health workers	(AMRO, HQ)	(All Regions,HQ) (All Regions and HQ)	(All Regions and HQ)				
3. Vaccine Logistics Course: (a) Modification of course content (b) Testing sessions for course (c) Participation in course by nationals of all EPI countries	(HQ)	(SEARO,HQ)	(All Regions and HQ)				
4. Refrigeration Equipment Maintenance and Repair Course: (a) Development of course (b) Testing sessions for course (c) Participation in course by nationals of all EPI countries		(HQ)	(All Regions and HQ)	(All Regions & HQ)			
5. Training and periodic re-training of basic-level staff	(All Regions)						
6. Revision of EPI Field Manual				(AMRO, HQ)			
7. Development and distribution of EPI training materials	(All Regions and HQ)						

5.3 Programme Elements - Operations

Activities	1978	1979	1980	1981	1982	1983	Linkages
1. Development and revision/update of regional and country plans:							HPC, ISD, FHE, SHS, BLG and Appropriate National Institutions
(a) Prepare annual list of participating countries	(All Regions and HQ)						
(b) Assist in preparation of Plans of Operation for participating countries which are consistent with WHO recommendations	(All Regions and HQ)						
2. Collaboration in the selection of priorities for investment of external funds:							
(a) Prepare a document describing global, regional and country characteristics and needs	(AMRO, HQ)						
(b) Prepare annual update of document		(AMRO, HQ)					
(c) Prepare annual status report for distribution to donors	(AMRO, HQ)						
3. Improvements in vaccine quality control, production and distribution:							
(a) To ensure that vaccines used by EPI countries meet WHO standards:							
(i) Evaluate quality of vaccines used in EPI countries		(All Regions, HQ)					
(ii) Promote improvement of vaccine quality			(All Regions and HQ)				
(b) Establish regional quality control centres	(All Regions)						
(c) Establish regional vaccine production centres	(All Regions)						
(d) Establish distribution systems capable of providing adequate amounts of vaccines for all EPI countries	(All Regions and HQ)						
4. Increased integration of immunization and PHC or other generalized health services, with 75% of all immunizations to be given by such centres by the end of 1983	(All Regions)						

Programme Elements - 5.4 Evaluation

Activities	1978	1979	1980	1981	1982	1983	Linkages
1. Development of information systems to serve programme needs:							ISD, HPC, CDS, CDC Atlanta
(a) Determination of specific data to be collected, and the form of submission at country, regional, and global levels	(All Regions and HQ)						
(b) Preparation, submission and analysis of this data, with appropriate feedback		(All Regions and HQ)					
(c) Establishment of vaccination coverage evaluation systems		(All Regions and HQ)					
(d) Establishment of morbidity and mortality measurement systems:		(All Regions and HQ)					
(i) Development and testing of poliomyelitis protocol		(AFRO, HQ)					
(ii) Development and testing of neo-natal tetanus protocol			(HQ)				
2. Development of a system for programme audits:							
(a) Development of protocol	(AMRO, HQ)						
(b) Field testing in one country per region		(AFRO, AMRO, SEARO, HQ)					
(c) Modification as necessary and implementation of system in all EPI countries			(All Regions and HQ)				

6. OUTPUT INDICATORS

The following indicators will be used to measure the achievement of targets:

6.1 Research

a) The extent to which planned research activities are actually carried out.

b) The extent to which completed research answers the questions which prompted the activity.

c) The extent to which programme activities are provided with adequate cold chain, vaccination equipment and other technology.

6.2 Training

a) The number and percentage of national programme managers who have participated in the EPI Programme Managers' course.

b) The number and percentage of mid-level supervisors who have participated in the EPI middle-level course.

c) The number and percentage of staff with cold chain responsibilities who have participated in the relevant EPI courses.

d) The number and percentage of basic level staff who have received training and retraining in EPI activities.

e) The extent to which follow-up indicates that personnel who have received EPI training use the skills taught.

6.3 Operations

a) Number and percentage of countries participating in EPI.

b) Number and percentage of countries whose EPI Plans of Operations are consistent with WHO recommendations.

c) Extent to which programme activities are not limited by lack of external funds.

d) Extent of vaccination coverage.

e) Extent of morbidity and mortality reduction.

f) Extent to which vaccines in use meet WHO standards.

g) Number of regions which have vaccine quality control and production centres.

h) Extent to which country programmes are not limited by lack of vaccine.

j) Percentage of vaccinations given within the context of comprehensive or primary health care services.

6.4 Evaluation

a) Number and percentage of countries with management information systems.

b) Number of countries with management information systems which include coverage evaluation and measurement of morbidity and mortality.

c) Number of countries which have been evaluated through independent audit.

7. RESOURCES

Country self-reliance in the provision of immunization services (as well as in the provision of other essential health services) is a long-term goal of WHO. Yet for the foreseeable future, the resources available to a majority of developing countries will need to be supplemented from external sources if immunization coverage is to be expanded and then maintained at desired levels.

During the period under consideration for the Medium Term Programme, and probably for several years beyond, immunization programmes will be incurring developmental costs which will make it unlikely that the cost per fully immunized child will be reduced to less than US$ 3.00. Approximately half of this amount will cover items such as personnel, facilities and local operating expenses, and is expected to come from within the national health budgets of the involved countries. The other half, covering items such as vaccines, cold chain equipment and transport, will need to be found from external sources.

Assuming that programme expansion approximates that shown in the percent coverage column in the table below, the resources required during the period 1979-1983 can be estimated. By 1983 the programme will be expected to cost US$ 130 million per year, having incurred a total cost of US$ 380 over the preceding five-year period.

National commitment is the most critical factor in providing this financial support, and it is expected that half of this amount can come from national health budgets. The remaining US$ 190 million must be attracted from bi and multilateral funding. Recognizing that in 1978 only some US$ 10 million was donated (and more than half of this from UNICEF), a substantial growth in such external support will be required.

Table 1

Cost of Immunization Coverage in the Developing World*

Year	% Coverage	National Resources (US$)	External Resources (US$)
1979	10%	12 000 000	12 000 000
1980	20%	25 000 000	25 000 000
1981	30%	37 000 000	37 000 000
1982	40%	51 000 000	51 000 000
1983	60%	65 000 000	65 000 000
		190 000 000	190 000 000

* Based on an estimated 80 000 000 annual births and a cost of US$ 3.00 per fully immunized child

Additional support, from both the WHO regional and HQ regular budgets (ca. US$ 4 million per year) and, particularly, from national institutions will be needed to provide coordination, information dissemination, training curricula and materials, establishment of evaluation systems and research.

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ANNEX L

WHO/DDC/78.1

ORIGINAL: ENGLISH

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DEVELOPMENT OF A PROGRAMME FOR DIARRHOEAL DISEASES CONTROL

Report of an Advisory Group

(Geneva, 2–5 May, 1978)

This report contains the collective views of an international group of experts and does not necessarily represent the decisions or the stated policy of the World Health Organization.

The issue of this document does not constitute formal publication. It should not be reviewed, abstracted or quoted without the agreement of the World Health Organization. Authors alone

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1. INTRODUCTION

An Advisory Group on Development of a WHO Programme for Acute Diarrhoeal Diseases Control met in Geneva from 2 to 5 May 1978. Dr H. Mahler, Director-General, opened the meeting and said that the Organization was committed to giving the highest priority to the Diarrhoeal Diseases Control Programme in view of the extent, importance and complexity of the problem of diarrhoeal diseases in developing countries. Member States had urged WHO to help develop the activity as a technical cooperation programme at the national and international level. He counted on the continued partnership of UNICEF and on further bilateral and multilateral collaboration. He asked the Group to be very realistic in assessing the value of different control strategies and looked forward to studying its recommendations for development of the Diarrhoeal Diseases Control Programme.

2. JUSTIFICATION OF THE PROGRAMME

2.1 Diarrhoeal diseases as a major health problem

The acute diarrhoeal diseases constitute one of the greatest social evils - not only do they kill people living in hunger and poverty but they retard the growth of young children and impair the quality of life of those who survive. The problem is overwhelming and complex as it involves deep-rooted cultural and behavioural factors in addition to the more obvious socioeconomic inequalities.

Although there is a lack of reliable information on incidence and associated mortality from diarrhoeal diseases, particularly from countries where the problem is serious, some data are available which allow a fair assessment of the magnitude of the problem:

On a global scale it has been estimated that in 1975 there were about 500 million episodes of diarrhoea in children below five years of age in Asia, Africa and Latin America, resulting in 5 to 18 million deaths[1] which is comparable to the situation seen in the industrialized countries at the end of the last century.

In the South-East Asia Region, the incidence of diarrhoeal diseases in different countries has been shown to vary from 1.5 to 12 per 1 000 population of all ages.[2]

In one report published by PAHO in 1973 describing patterns of childhood mortality in Latin America, diarrhoeal diseases accounted for 28.6% of 35 095 deaths due to all causes in children below five years of age and were by far the major single cause of death in the study areas.[3]

In a study conducted by a WHO Diarrhoeal Diseases team working in 7 developing countries in 1960-65, diarrhoeal disease monthly incidence rates in young children were in some instances as high as 40%.[4]

In addition to the high incidence of diarrhoeal diseases many studies have convincingly demonstrated a close association between diarrhoea and malnutrition. These conditions thrive in the same socioeconomic and cultural surroundings, and by perpetuating each other, contribute to high rates of childhood morbidity and mortality and hinder efforts to regulate fertility. While malnourished children have a higher incidence of diarrhoeas which are often more severe causing a higher rate of diarrhoea-related mortality, diarrhoeal diseases are probably the most important contributors to malnutrition because of food withdrawal, anorexia and malabsorption.

In the developing countries more than one third of the beds in children's hospitals or wards are occupied by cases of diarrhoea receiving expensive antibiotics and intravenous fluid, putting a heavy load on the limited budget for health care in these countries.

Since 1961, cholera has been reported by 80 countries in Asia, Africa and Europe and has caused major outbreaks and become endemic in those areas where the incidence of acute diarrhoeal diseases is high and water supplies and sanitation facilities are inadequate. In cholera-endemic areas, however, cholera accounts for less than 5-10% of all acute diarrhoea cases in non-epidemic seasons; even when it occurs, in more than 90% of instances cholera is clinically indistinguishable and is treated in the same way as other acute diarrhoeas. Although most cases are mild, cholera can spread fast and be fatal even in adults; the economic losses of countries can be great and the sufferings of the people considerable. After a quiescent period in 1975-76, cholera has recrudesced in several countries and has extended most recently to the Gilbert Islands in the South Pacific and the Maldives, illustrating the need for preparedness for epidemic control as the prevailing pandemic shows no sign of ending.

2.2 Recent research developments

Intensive research activities stimulated by the current cholera pandemic have made available abundant new knowledge about diarrhoeal diseases. This includes:

- The discovery that a single modality - oral rehydration fluid - can be used to treat most cases of dehydration from watery diarrhoea, including cholera, in all age-groups;

- The recognition of the role of new viral and bacterial agents which makes it possible to identify etiological agents in more than 80% of diarrhoeas; this is a reversal of the situation prevailing a few years ago when 80% of cases remained undiagnosed and were called "acute undifferentiated diarrhoeas";

- The understanding of the pathogenesis of most of the acute diarrhoeas, opening up other possibilities for improving treatment and prevention, including development of vaccines;

- The demonstration that the provision of safe drinking water supplies alone is not sufficient to prevent acute diarrhoeal diseases;

- The finding that travellers' diarrhoea though caused by a variety of diarrhoeal pathogens is commonly due to enterotoxigenic Escherichia coli, in which case judicious use of antibiotics like doxycycline may have a preventive role;

- The demonstration that aluminium adjuvanted whole-cell cholera vaccines may provide better protection in children and longer protection in adults than the generally available vaccine, justifying their further study.

Among these and many other advances of fundamental and applied importance, the discovery of oral rehydration therapy is considered to be of special significance as it has made it possible to undertake immediately a common programme for reducing deaths from all acute diarrhoeal diseases while efforts continue to attain the long-term objective of their prevention and control.

2.3 Need for a WHO-supported programme

There is a widespread awareness of the problem of diarrhoeal diseases but there has been a lack of definite commitment to deal with it. This is partly due to inadequate dissemination of information to those in the medical profession and other health-related fields about the available technology that can be used. Member States have expressed concern and have pressed the Organization for technical cooperation in this field. It is therefore necessary to make information available to all health workers and those involved in socioeconomic development in order to enlist their participation in and commitment to a concerted, unified, multi-disciplinary, medium-term programme for diarrhoeal diseases control. Such a programme will also lay the foundation for early detection of epidemics, particularly of cholera, and consequently their rapid control. There is also an important need for the transfer of managerial skills to assist in reorienting national activities for the control of acute diarrhoeal diseases including the re-allocation of funds so that the most beneficial use is made of available resources, both financial and human.

3. CURRENT WHO ACTIVITIES

During the last few years the Organization has been working towards the development of a multi-disciplinary programme for acute diarrhoeal diseases control and has established interdisciplinary groups in Headquarters and the Regional Offices. These groups, working in close collaboration with the complementary programmes of the Organization on environmental health, maternal and child care, nutrition, food hygiene, health education and appropriate technology, have taken up the promotion of oral rehydration as one of their main activities. For this purpose they have organized field studies on the feasibility, acceptability and effectiveness of oral rehydration when delivered through the existing health services facilities in countries with different cultures and health service infrastructure. These studies convince local health administrators of the practicability and benefits of the procedure and serve as entry points to a broader control programme. Such studies are in progress or have been completed in Costa Rica, Egypt, El Salvador, Guatemala, India, Iran, Laos, Liberia, Nigeria, Philippines and Turkey. In addition to these field evaluations being carried out at the community level, at least 15 more countries are known to have introduced oral fluid for routine treatment of acute diarrhoeas and also for treatment of cholera during epidemics.

Interregional, regional and national courses to train different levels of health workers have been held in Bangladesh, Brazil, Congo, Dominican Republic, Guatemala, India, Indonesia, Liberia, Panama, Papua New Guinea, Philippines, Singapore, Thailand and Yemen.

Several manuals and guidelines[5-13] for workers at different levels have been published and distributed widely.

Regional Advisory Committees on Medical Research of five of the six WHO regions have given priority to diarrhoeal diseases research, determing priority research areas, and identifying institutions and individuals to undertake the work. Some Regional Offices have already made a special budget allocation for this purpose.

Close collaboration exists with UNICEF for the promotion of oral rehydration and the improvement of water supply. The Government of the United Kingdom has made a contribution to the WHO Voluntary Fund for Health Promotion for diarrhoeal diseases control.

These activities represent the beginning of the expanded multi-disciplinary programme for acute diarrhoeal diseases control which is planned to be complementary to and supportive of other WHO activities in primary health care and overall health development.

4. OBJECTIVES OF THE PROGRAMME

After reviewing the nature and extent of the problem and recent scientific advances, the Advisory Group strongly endorses the current WHO policy, as outlined by the Director-General, and urges WHO to establish a global Programme for Diarrhoeal Diseases Control with the following objectives:

(i) The immediate and medium-term objective of the Programme is to increase technical cooperation with Member States (a) in reducing mortality and preventing other ill effects of the acute diarrhoeal diseases, particularly deterioration of nutritional status, through the implementation of oral rehydration programmes and (b) in decreasing morbidity through the improvement of water supply and sanitation. The objective will also include research on various aspects of the problem to develop and improve other possible means of prevention and control.

(ii) The long-term objective is to prevent and control acute diarrhoeal diseases by ensuring adequate water supply and sanitation and other appropriate control measures so that they cease to be a major public health problem.

5. POSSIBLE CONTROL STRATEGIES

This section of the report is a brief factual review of the main strategies that can be and have been used to treat, prevent and control the acute diarrhoeal diseases.

5.1 Management of acute diarrhoeal diseases

There are three aspects of management of acute diarrhoeal disease:

5.1.1 Treatment and prevention of dehydration

The primary cause of mortality from diarrhoeal disease is dehydration. In cholera, the most severe of the diarrhoeal illnesses, fluid losses can reduce body weight by 10% in 4-6 hours. Rapid administration of appropriate intravenous fluid has brought mortality rates from cholera and other diarrhoeal illnesses in hospitalized patients to well under 1%. The disadvantages of this type of therapy are that these fluids are only available in hospitals and treatment centres, they are costly and they need aseptic precautions in their preparation and administration.

The recent development of oral rehydration solution has vastly simplified the procedures of rehydration. The solution contains glucose and essential electrolytes which when administered orally are absorbed in the small intestine even in the presence of copious diarrhoea. Many studies have shown that this solution can be used successfully, both orally and by nasogastric infusion, to treat most cases of dehydration both in the hospital and at home. In the absence of glucose, sucrose can be substituted without compromising the usefulness of the fluid. Delivery of the fluid in most areas at the moment is primarily through a pre-packaged mixture of glucose and salts which is added to an appropriate volume of water. Home-made solutions containing locally available sugar and salt prepared by "pinch and scoop" methods or by spoon measures are under evaluation.

The challenge today is to provide replacement of diarrhoeal losses with oral rehydration fluid as early as possible during illness. At present this cannot be done on the massive scale necessary by depending on the existing health care delivery systems with their limited coverage and outreach. This problem can be overcome only by a more universal dissemination of rehydration services which in the case of diarrhoea in children must include participation of mothers in this health care process.

5.1.2 Dietetic management

Of all the common childhood diseases diarrhoea has the greatest impact on nutrition mainly as a result of:

- withholding of food by mothers because they believe that fasting is important for curing diarrhoea;

- decrease in food intake due to anorexia which is associated with dehydration;

- nutrient losses through malabsorption and protein leakage, particularly during dysentery which is associated with destruction of the intestinal epithelium.

WHO-supported studies in the Philippines and Turkey have shown that oral rehydration coupled with education on proper feeding practices during and after diarrhoea results in better weight gain than when no oral rehydration is used, and thus may reduce the ill effects of diarrhoea on nutritional status and constitute an important step in interrupting the diarrhoea-malnutrition cycle.

Adequate feeding of a child during and after diarrhoea is of definite nutritional importance. In a borderline or malnourished child fasting for any period of time is inappropriate and potentially dangerous. Breast feeding should continue uninterrupted unless severe vomiting makes it difficult; children receiving artificial milk should be given it temporarily in more diluted form. Any foods the child consumes regularly can continue to be offered during diarrhoea. During convalescence all foods should be given in greater than normal quantities by feeding the child more frequently.

5.1.3 Drugs

Antimicrobial agents are beneficial in the treatment of diarrhoeal disease only in a few specific circumstances. These include treatment of *Shigella* dysentery, severe cholera and typhoid fever. These agents should not play a primary role in diarrhoeal disease control programmes because most diarrhoeas are not due to these diseases; moreover, their use diverts the attention of health workers from the more important tasks of rehydration and dietary management. Spasmolytics are also inappropriate because they do not alter the duration or severity of the disease, may prolong the carriage of organisms in the gut, and are associated with many toxic side effects, particularly in children.

Other time-honoured remedies such as iodo-hydroxy-quinoline, kaolin and charcoal have not been shown in careful studies to offer any reduction in frequency or change in composition of diarrhoeal stools.

5.2 Nutrition of the child and mother

The composition of human milk is uniquely sufficient and ideal for the nourishment of infants. No other product can equal it for this purpose. In addition, breast feeding contributes directly to immunological adaptation to extra-uterine life. In all societies it is free of such potential hazards associated with artificial feeding as allergic disorders and metabolic derangements including tetany, hyper-osmolar dehydration and obesity. In developing countries, however, it is even more important in that it avoids the risks of over-dilution leading to malnutrition and contamination of bottles, rubber teats and milk which so often results in acute diarrhoeal diseases. In one study area milk in feeding bottles has often been found to contain a large number of faecal and non-faecal bacteria. It is not therefore surprising that early weaning in developing countries is associated with a high incidence and greater severity of diarrhoeal diseases and malnutrition in young infants.

To be maximally effective breast-feeding should begin as soon as possible after the moment of birth and, except in unusual circumstances such as illness in the mother, should continue unsupplemented as the child's sole source of fluids and nutrients for a period of between 4 and 6 months. Attempted supplementation by the bottle is often a sad delusion, since in general this causes a decline in breast milk production in the same proportion as the volume of milk given by bottle.

The lactation performance of the mother is affected not only by socio-psychological factors like confidence and satisfactory mother-child relationship, but also by her own health and nutritional status. The nutritional requirements of women increase during pregnancy and lactation and they must be met to prevent delivery of low birth weight infants and to facilitate production of breast milk in sufficient quantity to permit breast feeding to continue for an adequate period of time.

Full lactation by the mother also diminishes fertility, thereby helping to maintain better birth spacing which has significant health benefits for her and her babies. On the other hand, if pregnancy occurs the volume of breast milk greatly diminishes.

5.3 Water supply, sanitation and food hygiene

For the eventual elimination of diarrhoeal diseases as a major health problem interventions in water supply, sanitation and food hygiene, combined with improved personal hygiene, are the most effective. Despite the progress made by Member States in the provision of water supply and sanitation during the period 1970-1975[14], the actual situation expressed in real terms as a percentage of population served was as follows:

	% Population Served	
	Urban	Rural
Water supply	77%	22%
Excreta disposal	75%	15%

Until recently, water supply and sewage disposal facilities have mainly been provided to the privileged urban communities rather than to the deprived and under-served populations of rural and fringe urban areas.

The role of water supply and sanitation as an essential health measure, particularly with respect to rural and urban-fringe populations, was emphasized by the recommendations of HABITAT - the United Nations Conference on Human Settlements, 1976, and the United Nations Water Conference, 1977, which were echoed in Resolution WHA30.33 adopted by the World Health Assembly in May, 1977. Concurrently the Organization has been reinforcing its cooperation with Member States in preparing for the International Drinking Water Supply and Sanitation Decade which aims at providing safe drinking water and sanitation for all by 1990.

Given the limited resources available in developing countries, the best strategy for approaching the problem of diarrhoeal diseases associated with unsanitary conditions from a cost-effective perspective is through primary health care. To this end, and following a decision of the twenty-first session of the UNICEF/WHO Joint Committee on Health Policy on this subject, a study is presently being undertaken on water supply and sanitation as integral parts of primary health care. A key factor in this approach is the enlisting of community participation to reduce the cost of installation and ensure the proper maintenance and utilization of these facilities. In keeping with this approach, over recent years there has been a growing awareness of the need to develop appropriate technologies to facilitate the provision of water supply and sanitation in different situations. Nevertheless, there still remains scope for adaptation of existing technologies that are appropriate to various needs and conditions. There is also a need for coordinated multi-sectoral (health, agriculture, public works) approaches for water supply and sanitation in order to meet the needs of the populations in the urban-fringe and rural areas.

Recent studies, however, have demonstrated that provision of safe drinking water supplies alone is not sufficient to control the acute diarrhoeal diseases. This is because (1) the use of contaminated water for non-drinking purposes (e.g., bathing and cooking) also contributes to transmission of diarrhoeal diseases, and (2) diarrhoeal diseases such as shigellosis and rotavirus infection may be transmitted through non-waterborne routes. Thus, control efforts comprising the supply of safe water must be complemented by a combination of efforts to provide proper means of waste disposal and to educate the public on proper personal and food hygiene practices such as handwashing, avoidance of the use of polluted water for irrigation, and use of only safe water for washing fruits, vegetables and utensils.

5.4 Health education

In the control of acute diarrhoeal diseases health education should not be regarded as a separate strategy in itself but as an integral part of all strategies. As a general principle, to be effective health education activities must take into consideration the beliefs and health practices of people and their communities. Since health education is behaviour-oriented, activities should be based as far as possible on an individual approach. Collaboration with persons who are well respected in the community as opinion leaders is beneficial. The mass media, particularly the radio, are very useful as a tool for reinforcing health education activities. Health education programmes for diarrhoeal disease control must be directed towards those concerned at every level, namely:

- top decision makers, to ensure priority in the allocation of resources;
- health workers, to assure technical guidance;
- mothers, to encourage them to provide care promptly and correctly;
- community members, to obtain their active participation in the use of oral rehydration and in improving water supply, waste disposal, and personal and food hygiene.

5.5 Epidemiological surveillance

In the present context surveillance can be defined as the continuous appraisal of the occurrence of diarrhoeal diseases in a community based on information supplied by persons involved in some way in the delivery of health care. Its primary objective is to provide information on the prevalence or incidence of diarrhoea and to define population groups who are at greatest risk of infection. Other types of surveillance programmes looking at specific indicators of disease (e.g., water and sewage sampling) are also useful, particularly in surveillance of cholera.

Although laboratories are not essential for conducting surveillance, they are very beneficial in that they provide information on the most prevalent pathogens and thus facilitate specific control measures.

In the absence of regular surveillance, studies or ad hoc surveys can provide information on the prevalence of different etiological agents in a particular locality, including their antibiotic-susceptibility pattern. Besides the more traditional enteric bacterial pathogens (Salmonellae, Shigellae, Vibrios, enteropathogenic E. coli) and foodborne pathogens (enterotoxin producing Staphylococcus aureus, Vibrio parahaemolyticus, Bacillus cereus and Clostridium perfringens), a large number of additional pathogens have now been recognized as causing diarrhoea. These include:

- Enterotoxigenic E.coli which cause an illness similar to cholera and are a common cause of diarrhoea in young children and also in adults and travellers to endemic areas;

- Newly recognized bacterial pathogens - Yersinia enterocolitica and Campylobacter jejuni - which have unusual isolation requirements and have not been adequately investigated in many countries;

- Rotaviruses, which in most studies are the most commonly recognized causes of infantile diarrhoea, accounting for 50-60% of diarrhoea cases in children aged 6-24 months;

- Other small viruses, such as parvoviruses, which cause diarrhoea in adults and whose importance is not yet defined.

Laboratories involved in diarrhoeal diseases surveillance need not be elaborate, and with innovation in their design, can function with a minimum of funds and equipment. Developments in recent years which have greatly facilitated laboratory diagnosis include:

- The use of transport media which can sustain bacterial life for long periods for transporting rectal swabs to the laboratory. On an even simpler scale, blotting paper moistened with stool has been shown to be an excellent transport material on which vibrios can survive for weeks;

- For the isolation of vibrios, the development of TCBS medium which does not require autoclaving;

- Most recently, the employment of simplified ELISA[a] assays which, for example, can detect rotavirus antigen in stool within four hours of collection.

A simple surveillance system functioning properly should be able to provide an early warning system for the detection of epidemics, especially of cholera, by reporting changes in the pattern of age and seasonal incidence and severity of cases. When these are observed, prompt laboratory and epidemiological investigations can be set up to take samples for determining the etiology and mode of spread. While these investigations are being conducted, treatment and sanitation facilities can be reinforced with the necessary staff and supplies.

Another benefit of surveillance is that it provides an opportunity to undertake operational and basic research.

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[a] Enzyme-linked immunoadsorbent assay

5.6 Epidemic control

Of the epidemic diarrhoeal diseases, cholera deserves special attention as it can kill very rapidly and spread very fast in receptive areas. The speed and volume of travel and trade is such today that no country is able to prevent the introduction of cholera, but its spread within a country can be controlled by good surveillance and a high standard of sanitation.

WHO has developed an effective mechanism for responding to requests for epidemic assistance from Member States. The need to maintain and strengthen the capability of the Organization to respond promptly to such requests has been underlined by World Health Assembly resolution WHA24.26 (May, 1971) and Executive Board resolution EB47.R31 (January, 1971). Several documents and guidelines have been prepared describing strategies for epidemic control in different situations[7-10,12,13]. (See also Sections 5.7 and 5.8 concerning immunization and mass chemotherapy.)

Countries that have already adopted a medium-term programme for diarrhoeal disease control will be in a better position to detect and control epidemics of enteric infections. Countries confronted with epidemics may find it opportune to develop such a programme using the experience gained and resources mobilized during the epidemic period.

5.7 Role of immunization

In general, the development of enteric bacterial vaccines has been unable to take into account the optimum mechanism for enhancing local immune response in the host because the nature of gut-associated immunity against enteric infections is still very poorly understood. The following is a review of vaccines that may be used in control of some of the diarrhoeal diseases.

Cholera

A number of controlled field trials of bivalent whole-cell cholera vaccines in endemic areas during the last two decades have demonstrated up to 50%-60% protection for 3-6 months in adults receiving one dose.

Efforts to improve the cholera vaccines have continued and in recent years two aluminium adjuvant bivalent whole-cell vaccines have been found to protect children in endemic areas in India and Indonesia to a much greater extent than the generally available vaccines; they also provided about 50% protection for approximately 14 months in adults. However, since the number of cases was small in both areas, these observations need to be confirmed.

During the last decade there has also been considerable interest in a toxoid vaccine prepared from cholera enterotoxin. In a single large field trial one such preparation was found to convey little protection, but another field trial is planned to assess the efficacy of a purified toxoid and a combined toxoid-bacterial vaccine. Because of shared antigenicity between cholera enterotoxin and the heat-labile toxin of enterotoxigenic *E. coli* there is a prospect that a cholera toxoid may protect against both diseases. Since enterotoxigenic *E. coli* are the leading cause of travellers' diarrhoea there is an additional impetus for the development of this vaccine.

Naturally occurring and laboratory mutants of Vibrio cholerae have been tested as oral vaccines and have been found ineffective or unstable. A streptomycin-dependent mutant has been tested with some encouraging results in primates, but the need for multiple oral doses and its potential for reversion preclude its usefulness. Multiple oral doses of toxoid afforded no protection to animals or volunteers. Prolonged protection was achieved in animals by combined subcutaneous and oral administration of cholera toxoid but this has not been tested in volunteers.

Typhoid

Since 1954, controlled field studies have been conducted in areas where typhoid fever was endemic to test the effectiveness of acetone-killed and dried, formalin-killed, heat-killed phenol-preserved, and alcohol-inactivated vaccines. While the acetone-killed and dried vaccine is generally considered to be superior, properly prepared heat-killed phenol-preserved vaccine was only slightly less effective; alcohol-inactivated vaccine (preserving Vi antigen) was less effective than either.

A field trial with a vaccine prepared from a non-motile strain of S. typhi showed lack of effectiveness. A recently developed "unaltered" Vi antigen has attracted interest and may be field tested. Interest in a live streptomycin-dependent typhoid oral vaccine has waned because of the danger of reversion, but an epimerase-less strain has shown some promise in volunteer studies and is presently being field-tested. Killed oral preparations are marketed in several countries, but no protective effect has been observed in three field studies.

Practical application of cholera and typhoid vaccines

Mass immunization programmes for the control of cholera with existing vaccines cannot be justified because (1) although high levels of protection have been observed in some field trials of cholera vaccines, their effectiveness has not been demonstrated in epidemic control; claims that have been made about their usefulness cannot stand scientific scrutiny; (2) even when potency can be ensured, they provide only about 60% protection to adults in endemic areas for about 2-3 months; (3) they do not materially interrupt transmission; (4) they do not affect the carrier state; (5) they do not prevent the introduction of cholera into a country; (6) they give a false sense of security to those who receive them; (7) they give a false sense of accomplishment to those who administer them; (8) there are more effective control measures such as treatment and simple sanitation supported by health education which are also less expensive; and (9) very often mass vaccination is performed using the same needle for several persons which allows transmission of viral hepatitis - a much more serious disease. However, selective vaccination of high-risk population groups using appropriate techniques and potent vaccine may be advisable in circumstances where there is little or no possibility of providing treatment facilities or instituting simple sanitation measures supported by health education.

Carefully selected typhoid vaccine of known potency would probably be useful in known endemic areas if a high-risk group has been determined by surveillance and in selected outbreaks where there is evidence to suggest a continuing common source.

Shigella

Streptomycin-dependent strains of Shigella flexneri and S. sonnei have been developed, extensively studied and field-tested. High levels of type-specific efficacy have been demonstrated in children and members of the armed forces but protection lasted for less than one year. Laboratory reversion of these strains and in one instance reversion in man of a vaccine strain have been reported. These facts and the need for multiple doses seriously limit the possibilities of public health application of these vaccines.

Live oral vaccines prepared from recombinant Shigella and E. coli have been tested but have not been shown to protect.

Rotavirus vaccine

Increasing titres of antibodies against rotavirus with increasing age associated with decreased susceptibility to the disease suggest the possible usefulness of a rotavirus vaccine. Although rotavirus strains appear to be morphologically similar, there may be subtle antigenic differences and this question is being studied as a step towards the development of a vaccine.

5.8 Role of chemoprophylaxis

The term chemoprophylaxis usually implies administration of antimicrobial drugs to a person to prevent disease in that particular individual, but such drugs are now being increasingly used for mass treatment for the prevention and control of epidemics when it may be more appropriate to use the term mass chemotherapy.

Travellers' diarrhoea

This syndrome, which may affect as many as 60% of travellers to the developing countries within a few weeks of arrival is considerably hindering the development of the tourist industry. One tablet of 100 mg of doxycycline daily has recently been found to significantly reduce the incidence of travellers' diarrhoea due to enterotoxigenic E. coli in a field trial among Peace Corps Volunteers in Kenya. It must, however, be recognized that travellers' diarrhoea can be caused by a variety of organisms, some of which are resistant to tetracyclines. Thus, while doxycycline may offer some degree of individual protection to travellers in certain circumstances, hygienic measures remain the best method of prevention.

Cholera

Tetracycline has been shown in clinical field trials in Dacca, Calcutta, and the Philippines to reduce the transmission of V. cholerae among close contacts of cases, although in one endemic area the effect was repeatedly shown to last only a day or two longer than the period of treatment. Tetracycline was administered in most of these trials in multiple doses for 3 to 5 days; one large daily dose given for 5 days was less effective. Recently, however, doxycycline in only one 300-mg dose was found to be almost as effective as multiple doses of tetracycline given over 3 days.

A long-acting sulfa drug - sulfadoxine (Fanasil) - was also found in a field trial in a newly affected area in Africa to shorten the period of vibrio excretion by close contacts but the appearance of new carriers among them - i.e., transmission - was not looked for. In another trial in Calcutta, sulfadoxine was found as effective as tetracycline in reducing transmission but was slower in action, being less effective during the more important first 48 hours.

These findings have led countries to use antimicrobials like tetracycline, chloramphenicol, sulfadoxine, and streptomycin in the control of cholera epidemics but their effectiveness has never been properly evaluated. All these drugs have potentially serious side effects, particularly when administered in an unsupervised manner. Tetracycline may cause liver damage and is contraindicated in pregnant women, young children and persons with renal disease; sulfadoxine may cause blood dyscrasias and hypersensitivity reactions including Stevens-Johnson syndrome; chloramphenicol can cause aplastic anaemia; and all of these drugs can promote the development of multiple drug resistance and alter intestinal flora.

A WHO working group[15] discussing this problem concluded that the evidence for the effectiveness and safety of drugs used for preventive medication against cholera is not such that they could recommend any of them for mass application. It has also been pointed out that, as in a community usually not more than 5% of persons will be infected with V. cholerae at any one time and of them less than 5% may go on to develop cholera, it may be necessary to treat about 400 persons to prevent one case. Thus, the risk-benefit ratio does not justify mass treatment. Multiple symptomatic cases of cholera in a family are very rare. With the system of surveillance available in most areas, by the time an epidemic is recognized the infection is generally too widespread to be controlled by mass chemotherapy or even by treatment of close contacts.

This kind of therapy with the appropriate drug may, however, be effective in controlling outbreaks in small, rather isolated and stable communities, e.g., refugee camps, on board ships, etc. Doxycycline or other tetracyclines given in appropriate dosage may be suitable for that purpose. Clinical experience with other antimicrobials is limited and does not allow a critical assessment though chloramphenicol and trimethoprim-sulfamethoxazole may be considered as alternative drugs.

Other diarrhoeas

Mass chemotherapy may also be effective in controlling outbreaks of shigellosis and other severe bacterial intestinal infections in small, stable communities as described above if the pathogen and sensitivity pattern can be determined and the effective antimicrobial drug obtained quickly.

It is difficult to find a technical justification for the use of chemoprophylaxis or mass chemotherapy in the control of diarrhoeal diseases in circumstances other than those special situations mentioned above.

6. RECOMMENDATIONS

The Group's recommendations are presented in 5 areas: appropriate strategies; implementation; evaluation; training, education and dissemination of information; and research.

6.1 Appropriate strategies

After reviewing the various possible strategies and considering their applicability under the circumstances prevailing in the areas where the programme is needed most, the Group recommends five appropriate strategies for inclusion in the WHO Diarrhoeal Diseases Control Programme: management of acute diarrhoeas; nutrition of the child and mother; water supply, sanitation and food hygiene; epidemiological surveillance; and health education. For reasons discussed in Sections 5.7 and 5.8, the Group does not feel that the strategies of vaccination and chemoprophylaxis should be included in the Programme, except in special epidemiological circumstances, and therefore they are not discussed in this section. The role of WHO in technical cooperation with Member States in the control of epidemics due to cholera and other enteric infections is closely linked with this Programme as described in Section 5.6.

While the Group recognizes the value of an interdisciplinary approach for ultimate control of diarrhoeal diseases and believes that the Programme will need to be flexible so that priorities accorded to different strategies can be adjusted as required in different situations, it wishes to emphasize its strong feeling that the strategy that can be applied now with available means and which will have the greatest immediate impact on a global basis is wide implementation of oral rehydration therapy. The Group also believes that the Diarrhoeal Diseases Control Programme should be complemented by other related WHO programmes in environmental health, maternal and child care, nutrition, food hygiene, health education, bacterial and viral diseases, primary health care, and appropriate technology.

6.1.1 Management of acute diarrhoeas with particular reference to oral rehydration

Because oral rehydration therapy based on administration of oral rehydration fluid along with proper dietary instructions

- provides a balanced fluid and electrolyte replacement at low cost;
- is easily administrable not only in hospitals and treatment centres but also by community-based workers and family members; and
- improves appetite and allows better feeding and thus prevents malnutrition

the Group recommends that programmes be instituted immediately to apply this therapy with the principle objective of reducing mortality and other ill effects from diarrhoea, especially in children. The Group believes that the provision of such services to persons with diarrhoea will also contribute to the promotion and success of other control strategies. While making this recommendation the Group emphasizes that there is a great need for more operational research to determine alternative ways that are suited to the situations prevailing in given

regions and countries for delivering oral fluid therapy along with dietetic education.

The Group believes that oral rehydration programmes will be incomplete without the inclusion of appropriate dietary management of children during and after diarrhoea. The practice of withholding food from children with diarrhoea must be strongly discouraged. Children who are receiving cow or goat milk should be given it in diluted form. Some restrictions, particularly of solid and semi-solid foods, may be needed in cases with severe vomiting but adequate feeding with usual foods must be resumed as soon as possible. Under no circumstances should breast feeding be discontinued; in fact, positive efforts should be made to maintain it. Immediately after the acute stage, efforts should be made to compensate for nutrient losses which are inevitable during diarrhoea by advising mothers to feed the children more than the usual amounts of food during the convalescent period; this may require a change in the intra-family distribution of foods and in the frequency of feeding the child and the mother needs to be convinced of its importance.

It is recognized that primary care or basic health service workers, especially those involved in the delivery of maternal and child health care, will be primarily responsible for providing this basic therapeutic health care service. Most of the cost of provision of oral rehydration at the community level can be met by the savings in reduction of hospitalization and need for expensive intravenous fluids and drugs.

Antimicrobials so often used in the treatment of diarrhoeas should be discouraged except for the management of dysentery, severe cholera or typhoid fever. Antimicrobials should not be used as prophylaxis for diarrhoea except in persons from non-endemic areas travelling in highly endemic areas, when doxycycline or other tetracyclines may be beneficial in certain circumstances. The use of spasmolytics should be discouraged but non-specific diarrhoeal drugs (e.g., kaolin), while not recommended for therapy, may be considered as harmless practice and have been used by some workers as entry points for the introduction of oral fluid therapy.

6.1.2 Nutrition of the child and mother

Because of the protective value of breast feeding and the risk associated with too early introduction of other foods, the Group recommends that efforts be made to ensure that infants are fed exclusively from the breast for their first 4 to 6 months of life. This is particularly important in developing countries and for families living in an insanitary environment without sufficient resources and facilities to ensure safe artificial feeding, although there is now evidence that under any circumstances (including those in the industrialized countries) breast feeding has many advantages over artificial feeding.

Health workers should promote breast feeding by

- educating mothers about the importance of lactation and improving their nutrition;

- facilitating during postnatal care such practices as early mother-child contact and rooming-in, and discouraging bottle-feeding of babies during the first days of life;

- refuting propaganda that advocates artificial feeding.

Breast feeding should be continued even when a child become sick; if he has to be hospitalized he should be admitted together with his mother. To facilitate breast feeding governments should be encouraged to enact legislation and promote social measures to restrict the importation and control the advertising of infant formulas and sale of bottles for artificial feeding, to promote the creation of creches and to grant adequate maternity leave.

The health of the mother is very important for ensuring the provision of adequate amounts of breast milk with sufficient nutrients. Thus, health workers must identify pregnant and lactating mothers who are nutritionally deficient and ensure their rehabilitation by providing food supplements, if necessary.

Special efforts should be made to inform obstetricians, paediatricians, general practitioners, public health personnel, nurses, midwives and all cadres of paramedical personnel of the importance of breast feeding. Particular attention must be directed to medical and other related curricula; these should include lectures on the scientific attributes of breast milk with special emphasis on the possibility of disease transmission by artificial feeding. Every effort must be made to promote breast feeding in the community. Through every medium available - the press, radio, television, word of mouth, etc. - the public must be made aware of the advantages of breast feeding and attention must be given to the enlightenment of men as well as women. The nutritional value of human milk and the advantages of breast feeding should be taught in primary and secondary schools as part of health and nutrition education and of preparation for family life and responsible parenthood. To achieve this there is an urgent need to educate teachers and to provide them with material for inclusion in their syllabus.

Starting from the 4th - 6th month of life infants need other foods in addition to breast milk to satisfy their nutritional requirements. In families living in an insanitary environment and with an inadequate concept of personal hygiene this is a period of great danger (weanling diarrhoea). To help control diarrhoeal diseases in this period the Group believes that health and nutrition education programmes emphasizing proper methods of preparing solid and semi-solid foods from those normally eaten by adults should be carried out. The use of bottles should always be discouraged.

6.1.3 Water supply, sanitation and food hygiene

The Group recognizes the need for an all-out effort in improvement of water supply, sanitation and food hygiene for reducing morbidity from diarrhoeal diseases. The best prospects for success lie in mobilizing entire communities to prevent diarrhoeal diseases through measures that are culturally acceptable and feasible. There must, however, be support for the development and transfer of appropriate water supply and sanitation technologies that can be applied at the primary health care level, especially in the underserved rural and fringe urban areas. These technologies should be simple in their design and, especially, in their maintenance. Further innovations in materials, equipment and practice are needed. Improvements in only one of these areas (e.g., water supply) are not sufficient; an attempt must be made to effect these innovations in the 3 areas of water supply, sanitation and food hygiene.

WHO manuals [12,13] can be of general guidance in the planning and implementation of these programmes though it is emphasized that intervention measures will vary greatly between countries and areas with different geography, climate, and sociocultural characteristics.

To be effective in the control of diarrhoeal diseases, water and sanitation programmes must consider the behavioural and sociocultural characteristics of the community and its ability to participate and use alternative technologies so that those concerned become agents for improving their own quality of life.

The approach to the provision of water supply and sanitation should be simple, innovative and acceptable to the community at a cost that they can afford now. There should be encouragement for the utilization of well-known simple techniques for the supply of safe, adequate and accessible water and the control of excreta disposal such as the protection of existing water sources from pollution, the utilization of slow sand filtration, sanitary latrines, low cost sewage collection and treatment methods, etc. These approaches should be reinforced and simplified to reduce cost through the transfer of technologies developed by operational research, particularly at the national level.

Prior to and during the application of these technologies, intensive efforts in health education are needed in order to enhance their impact. This should be carried out by workers at all levels of the health and other social services. For example, programmes on environmental sanitation and personal and food hygiene should be part of school syllabuses; the message in these programmes should inform children of the dangers of insanitary conditions and habits and of the simple measures that must be taken by each individual, which can in turn influence both family and community attitudes and practices. The implication of this is that sanitary habits can be instilled at a very early age and that each individual has a responsibility for his or her own health and the health of the community. Water supply and sanitation facilities should be provided in schools as an important health measure, and at the same time serve as part of the educational programme.

The Group recognizes also the important role that women play in educational programmes both as educators for hygiene and sanitation within the community and the family and as the primary procurers and users of water and preparers of food.

The Group emphasizes that there should be no conflict between activities to promote oral rehydration and activities to improve water supply, sanitation and food hygiene. The former have as their main objective the reduction of mortality and improvement of nutrition and they can be implemented immediately at a relatively small cost. The latter, however, represent the ultimate means of reducing morbidity and controlling diarrhoeal diseases and will require more time, efforts and resources for their realization.

6.1.4 Health education

Factors responsible for diarrhoeal diseases are basically behaviour-related. Therefore, the Group strongly believes individuals and communities should be educated to be more active in practicing healthy behaviour. Moreover, since communities differ in their dynamics of decision-making, efforts must be made to plan educational activities to conform with these patterns and practices as opposed to following stereotyped patterns which may not necessarily meet the needs of the particular situation. Community participation resulting from effective health education can ensure proper utilization of the various services as well as active involvement of the people in preventive and promotive measures.

Health education should be considered as an essential function of every health worker at every stage of health activity, and health education specialists should assist these workers by providing them with guidelines and in-service training. Particular attention should be given to the importance of educating government decision makers on the need for multisectorial commitment to the control of diarrhoeal diseases. Emphasis should be given not only to the health benefits, but also to the value of such a programme in ensuring the success of education, family planning, urban development and other national investments. A broad appreciation of the problem and its importance for the health and economy of the society will ensure that sufficient manpower and fiscal resources are allocated to attain the programme objectives.

6.1.5 Epidemiological surveillance

The Group believes that epidemiological surveillance should play an important role in the Diarrhoeal Diseases Control Programme by providing information on the incidence and etiology of diarrhoea in different population groups and by forming the basis of an early warning system for the detection of epidemics. Surveillance programmes, whenever possible, should be integrated into other national communicable disease surveillance programmes. They should use simple definitions and forms for collecting data on vital events and diarrhoea cases, or at least deaths due to diarrhoeas, and should have a strong feedback component to provide an interpretation of the data for those collecting it. Although it is not absolutely essential, diagnostic laboratories should be involved in surveillance where possible, and analyse specimens on a sampling basis, especially when an epidemic is suspected.

In its simplest form, a surveillance system based on reporting of changes in the pattern of age and seasonal incidence or in the severity of diarrhoeas in a locality as observed by the persons delivering health care (e.g., oral rehydration) can provide an early warning system for prompt detection of an epidemic or recrudescence which would then be confirmed by laboratory and epidemiological investigation. Ancillary personnel who are also involved in some way in health care delivery, like traditional medical practitioners, pharmacists, village leaders, teachers or religious leaders, can also provide useful information about excess deaths due to diarrhoea and draw attention to an epidemic.

6.2 Programme implementation

The Group recognizes that the Diarrhoeal Diseases Control Programme constitutes a part of the overall WHO programme of technical cooperation with Member States. The basic interpretation of "technical cooperation" endorsed by the WHO Executive Board[16] is that:

"Technical cooperation means activities which have a high degree of social relevance for Member States in the sense that they are directed towards defined national health goals and that they will contribute directly and significantly to the improvement of the health status of their populations through methods that they can apply now and at a cost they can afford now, and which conform to the principle and aim of developing national self-reliance in matters of health".

There can be no doubt that the WHO Diarrhoeal Diseases Control Programme satisfies all these criteria and will bring benefit to a very substantial number of people, particularly children, in the developing countries.

The mechanism envisaged for implementation of the Programme is for WHO to work with national authorities as partners in all stages of their programme development. It is anticipated that the basic approach to be adopted by national authorities for implementing the programme will be through their existing infrastructures, particularly primary health care and programmes of maternal and child health care, environmental health, or the basic health services as they are available at the community level, with a focus on the rural and peri-urban areas. A national programme in general usually evolves from pre-existing activities aimed at coping with identified specific problems. The Group believes that the identification of national personnel with the necessary competence, motivation and influence to ensure the implementation of the programme is probably the single most important factor for its success. Unless active national commitment and participation is secured, including that of the communities involved, no long-term impact can be expected.

In applying oral fluid therapy, which is a strategy given high priority, efforts should be made to use and strengthen existing systems. It is most important that the development of systems for oral fluid delivery should be used as an occasion for strengthening community capacity to handle other health problems as the development of diarrhoeal disease control activities should be linked with other health care activities within the community.

National and/or local conditions must be the principal determinant of the nature, scope and elements of the programme. Whatever changes may be found necessary or desirable, they should be the outcome of constructive exchanges of experience gained within or outside the country; in other words, the programme must be adapted to local conditions and gradually integrated into the existing health and social services activities both at the local and national level.

Countries may find it desirable to implement a diarrhoeal diseases control programme on a limited basis in a state, region or a subdivision before embarking on a countrywide programme. With this experience planning for a national programme will be facilitated as regards estimating costs and having an experienced cadre of health workers available.

In its role of promoter of and partner in technical cooperation concerning this Programme, WHO in collaboration with UNICEF can provide critical inputs, depending on circumstances and local needs. Examples of such inputs are:

- technical cooperation in assessment of the nature and extent of the diarrhoeal disease problem and in the formulation, implementation and evaluation of national programmes;

- collection, evaluation and distribution of relevant scientific information (see Section 6.4);

- organization and management of training activities such as seminars, meetings, training courses, including the preparation and provision of educational and teaching aids (see Section 6.4);

- procurement and/or development of local facilities for production of essential supplies (e.g., ingredients for oral rehydration) and equipment through the establishment of national or regional centres as required;

- production, standardization and distribution of essential laboratory reagents;

- support to countries which have identified water supply and sanitation as priority areas for underserved rural and fringe urban areas;

- provision of technical services by staff members or consultants.

The Group, having considered the global magnitude and severity of diarrhoeal diseases and their health and socioeconomic implications, and realizing the urgent need to improve the present unsatisfactory situation on a technical cooperation basis, recommends to the Director-General that:

(a) a suitable mechanism for consultation with representatives from interested organizations within the United Nations system and other national, international and non-governmental organizations be established by WHO Headquarters to ensure coordination and support to this Programme, and

(b) technical advisory groups be set up both at Headquarters and Regional Offices to review periodically the strategies and the overall Programme progress.

Although consideration must be given to the fact that there is a need for improving the currently available methods for the treatment, prevention and control of diarrhoeal diseases, it is clear that many lives can be saved and the quality of life improved by wide application of oral fluid therapy, the effectiveness of which has been proved. It would not be justified to postpone action while waiting for better methods to become available; by pursuing a pragmatic approach, the Programme will be able to incorporate new knowledge as it is generated by basic research and by operational activities in the field.

6.3 Programme evaluation

Evaluation of national diarrhoeal disease control programmes will have to be encouraged and supported by WHO to ensure the progress and effectiveness of the activities that have been selected and undertaken. Two aspects need to be considered: (1) operational evaluation and (2) impact evaluation.

Operational evaluation can be used to assess and measure the progress of programme inputs against pre-established targets; for example, there may be a need to evaluate the programme of procurement or manufacture of oral rehydration supplies and of their distribution, delivery and use. Similar targets will be needed for the development of water and sanitary facilities if not already established. A time schedule for each programme operation will serve as a guide to progress. At periodic intervals (i.e., weekly, monthly), the national programme coordinator can review each of these parameters and determine and rectify the causes of shortcomings. Evaluation can be based on such operational indicators as the following:

- number of packages of ingredients for oral rehydration manufactured, distributed or consumed;
- personnel trained in their administration;
- sanitary facilities provided or improved;
- production of supplies and equipment (e.g., for sanitation).

Impact evaluation is important to assess the benefits of the programme in reducing the ill effects of the diarrhoeal diseases problem. The ultimate objective is to reduce mortality and morbidity. This may be difficult to measure because of unavailability and unreliability of vital statistics, the need for a large population base to reliably measure impact on mortality and the tendency for aberrant increases in incidence to appear as surveillance is improved. Impact indicators may include:

- number of deaths from diarrhoea, with age-specific data, if possible;
- number of diarrhoea cases in hospitals, health centres or outpatient departments;
- awareness of mothers;
- sales of supplies for bottle feeding;
- acceptance of treatment by the population;
- nutritional status surveys;
- nursery school attendance; and

other parameters which remain to be defined.

It may be possible to select several representative areas of a country or region to measure impact by serial collection of data before and after intervention, but it should be stressed that other variables which cannot be easily controlled or recognized often operate and influence findings. It may not be essential to demonstrate impact as certain information derived from other countries can also be accepted and applied.

These evaluation techniques complemented by surveillance information can facilitate early recognition of problems, permitting rapid corrective actions. They may also indicate a need to modify goals and objectives, to obtain additional resources, or to request technical guidance from within the country or from WHO.

6.4 Training and education; dissemination of information

The Group believes that, for the success of this Programme, WHO should give high priority to technical cooperation in the training and education of national health workers. The following specific training needs are recognized:

- intercountry/interregional seminars for the motivation of policy-making senior public health administrators and paediatricians;

- national/intercountry training courses for professional and auxiliary health personnel and community workers on technical aspects of oral rehydration therapy including dietetic management, surveillance, and water supply, sanitation and personal and food hygiene;

- development of educational and training material, communicational technology and manuals for education and training of the public and health personnel on these control strategies; preparation of a handbook of simple measures for community hygiene and sanitation which emphasizes their relationship to diarrhoeal disease control, for use at the community level and in schools;

- organization of training courses to teach laboratory workers well established and newly devised laboratory techniques (e.g., ELISA assays) in enteric bacteriology and virology;

- supporting countries in the training of personnel in the operation, maintenance and surveillance of sanitation facilities. Water supply and sanitation facilities require that personnel (particularly at the local level) be trained in the operation and maintenance of these facilities as frequent breakdowns reduce considerably the health benefits derived from these installations.

The Group also feels that WHO should retrieve all available information and experience and disseminate widely material on:

- the effectiveness of different strategies for delivery of oral fluid;

- the unique advantages of breast feeding and means of promoting it.

Regarding breast feeding, the Group urges WHO to continue to cooperate with countries in their activities to discourage the inappropriate use of milk formulas and unethical advertising practices. In order to encourage countries that have declining trends in breast feeding WHO should disseminate information on countries where such trends have been reversed; the results of the WHO cooperative study on breast feeding in seven developing and two developed countries should be used for this purpose.

6.5 Research needs

The Group recognizes the great importance of continuing research and presents below, under the different strategies, what it considers to be the priority needs that should receive further WHO support.

6.5.1 Management of acute diarrhoeas including feeding practices

- Development of technology for cheaper packaging of oral rehydration salts using the presently recommended formula;

- Research to develop appropriate methodology for implementation of oral rehydration therapy using either packages, the "scoop and pinch" method, or spoon measures by peripheral health workers, community leaders or family members;

- Research to explore the linkage of oral therapy with other health activities (e.g., fertility regulation, nutrition, expanded programme on immunization, etc.);

- Research to determine the most suitable diet for use during and after diarrhoeal episodes, taking into consideration the availability of foods and local practices;

- Search for effective anti-diarrhoeal drugs, particularly antisecretory agents to block the action of enterotoxins at different levels, to be used as an adjunct to rehydration;

- Research to improve or modify for simplification the composition of oral fluid (e.g., need for bicarbonate and potassium, possibility of using sucrose instead of glucose);

- Studies of traditional remedies used in treatment of diarrhoea.

6.5.2 Water supply and sanitation

- Search for and review of existing information on operational studies that further quantify the beneficial effect against diarrhoeal diseases of individual and collective control measures concerning water, food, liquid and solid wastes - i.e., to identify the relative importance of each of these sanitary/hygienic interventions:

- Promotion of the acceptance and utilization of appropriate technologies through strengthening the capabilities of the existing network of collaborating centres for water supply and wastes in the adaptation and testing of appropriate water supply and sanitation technologies for the prevention and control of diarrhoeal diseases - e.g., use of faecal wastes for composting, biogas, etc., slow sand filtration for the treatment of water supplies, etc.

- Research to ascertain the effect of travellers' diarrhoea on the tourist industry with a view to encouraging the intensification of measures for the provision of water and sanitation and improving food safety in touristic areas.

6.5.3 Epidemiology

- Studies to define the etiology and epidemiology of diarrhoeas in different age-groups and populations of varying socioeconomic status and environment (e.g., rural vs urban and dry vs wet areas). Particular emphasis should be placed on rotavirus and enterotoxigenic *E. coli* which are known important causes of diarrhoea in children. These studies should also look into the relationship between specific agents and malabsorption;

- Studies to define the importance of small viruses as a cause of diarrhoea;

- Development of simplified and rapid techniques for laboratory diagnosis of diarrhoeal diseases;

- Field studies to demonstrate the effectiveness of surveillance based on reporting by community-based health workers;

- Studies on economic aspects of diarrhoeal diseases and their control.

6.5.4 Health education

- Research to determine cultural and societal traits influencing behaviour as it relates to diarrhoeal diseases and to explore methods for effective intervention.

6.5.5 Vaccine development

- Studies on the nature of gut-associated immunity and on optimal ways of enhancing the intestinal immune response;

- Studies of the immunological relationships of enterotoxins produced by different enteric pathogens;

- Development and field testing of oral (live or killed) and improved parenteral vaccines, especially against cholera and typhoid fever;

- Studies on methods of cultivation and antigenic characteristics of rotaviruses and development of rotavirus vaccine;

- Studies on the role of antitoxic immunity in *E. coli* diarrhoea and on the development of a toxoid for its prevention;

- Studies on the mechanisms of colonization of small intestinal pathogens.

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ANNEX L.1

WORLD HEALTH ORGANIZATION

CDD/January 1980

DIARRHOEAL DISEASES CONTROL (CDD) PROGRAMME

GLOBAL MEDIUM-TERM PROGRAMME (1978-1983)

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1. INTRODUCTION

The acute diarrhoeal diseases including cholera continue to be a major public health problem in developing countries and are a leading cause of mortality and morbidity among infants and young children. They are also a major contributor to malnutrition and are more severe in those who are undernourished, thus forming a vicious cycle in which the two conditions perpetuate each other. The problem is a particularly complex one since diarrhoeal diseases are associated with poor personal hygiene, lack or inadequate use of safe water and sanitation facilities, unsatisfactory food hygiene, poor socioeconomic conditions, and a general unawareness of their importance in the populations affected.

2. BACKGROUND

2.1 Policy basis

The Diarrhoeal Diseases Control (CDD) Programme has as its basis resolution WHA31.44 adopted by the Thirty-first World Health Assembly in 1978.[1] This resolution urged Member States to identify diarrhoeal diseases as a major priority area for action and to apply known effective measures for the management and control of these diseases in the primary health care context. It requested the Director-General to intensify the involvement of Member States in the formulation and implementation of country CDD programmes as an integral part of health activities, in the training of health workers at different levels, and in the undertaking of research activities for the further development of simple, effective, and inexpensive methods of treatment, prevention and control.

The Sixth General Programme of Work of the Organization for the period 1978-1983 affirmed that "The impetus given to cholera control should be extended, through prophylactic, therapeutic and environmental health measures, to the entire range of acute infections of the intestinal tract,...".[2] In line with this objective, and in the context of the WHO technical cooperation programme, the Executive Board, at its Fifty-ninth session in 1977, agreed that "in communicable disease control the development programme will be used to launch a major attack on diarrhoeal diseases".[3] In addition, the WHO Global Advisory Committee on Medical Research, at its nineteenth meeting in 1977, reviewed recent advances and remaining gaps in knowledge, and emphasized the need to strengthen the Organization's support for research in diarrhoeal diseases.[4]

At the Twenty-second session (January 1979) of the UNICEF-WHO Joint Committee on Health Policy,[5] UNICEF and WHO agreed to establish jointly an effective mechanism for collaboration with governments in the formulation and implemention of CDD programmes as an integral part of primary health care.

2.2 Situation analysis

2.2.1 Diarrhoeal diseases as a major health problem

Although there is a paucity of reliable information on the incidence and associated mortality from diarrhoeal diseases in countries where the problem is most serious, it was estimated that in 1975 there were about 500 million episodes of diarrhoea in children below five years of age in Asia, Africa, and Latin America and that at least 1% of them resulted in death.[6] In South-East Asia, the incidence of diarrhoeal diseases has been shown to vary from 1.5 to 12 per 1000 population of all ages,[7] and in a comprehensive, multi-country study in

Latin America these diseases were found to account for 28.6% of 35 095 deaths due to all causes in children below five years of age.[8] In the Eastern Mediterranean Region, available information indicates that out of eleven million births, approximately two million die each year before reaching the age of five; of these, thirty to forty per cent die of diarrhoeal diseases.[9]

Although these types of data give only an estimate of the problem, it is clear that in most developing countries the acute diarrhoeal diseases are one of the leading causes of death in infants and young children under five years of age and one of the top five causes of death in the entire population. Case-fatality rates are, in general, at least twice as high in infants as in other age groups. In addition, the acute diarrhoeal diseases are among the first three causes of morbidity in most developing countries and account for 30% or more of admissions to children's hospitals or wards where the children often receive expensive and unnecessary drugs and intravenous fluids.

The diarrhoeal diseases also retard the physical growth and impair the quality of life of young children by contributing to malnutrition due to food withdrawal, anorexia, and malabsorption. Diarrhoea, in turn, is more common and more severe in the malnourished.[10]

In the past, it has been the better known diarrhoeal diseases - such as cholera, typhoid, and shigellosis - that have attracted the greatest attention from the world medical and scientific community. Yet cholera, for example, in areas where it is endemic, accounts for less than 5-10% of all acute diarrhoea cases yearly. Although the world community has rightly been alarmed by the spread of the current cholera pandemic, which began in 1961 and is continuing to extend into new areas each year, in fact in more than 90% of instances cholera and the other acute diarrhoeal diseases are clinically indistinguishable and both are treated in the same manner.

It needs to be emphasized that, while there has been a widespread awareness of the problem of diarrhoeal diseases, there has been a lack of strong commitment to deal with it and give it the priority it deserves. There has also been little attempt to involve the community or to integrate the activities of various sectors into a cohesive national effort to prevent and control the diarrhoeal diseases.

2.2.2 Recent research developments

A number of recent important research findings have made available new knowledge that can now be used as a basis to strengthen control efforts against the acute diarrhoeal diseases and as a foundation for further research. These include: (1) the recognition of the role of new viral and bacterial agents - such as rotavirus and enterotoxigenic *Escherichia coli*, which has made it possible to identify the etiological agents in about 70% of diarrhoea cases attending treatment facilities;[11] this is a reversal of the situation prevailing a few years ago when 80% of cases remained etiologically undiagnosed and were called "acute undifferentiated diarrhoeas", and will allow the epidemiology of acute diarrhoea to be better defined; (2) the understanding of the pathogenesis of most of the acute diarrhoeas, which has offered new possibilities for developing better methods of treatment and prevention, especially as regards the

application of existing and new drugs and the development of new vaccines; (3) the elucidation of the critical sequence of events that occurs in the development of intestinal immunity against the diarrhoeal pathogens, which now provides better opportunities for the development and study of candidate oral enteric vaccines; (4) the confirmation that the provision of safe water supplies for drinking purposes alone sometimes has a limited impact on the incidence of the acute diarrhoeal diseases because persons are exposed to other water sources during bathing, washing, and cooking, and because not all diarrhoeas are water-borne; this has pointed out the need for a comprehensive approach toward environmental control; and (5) the demonstration that, except in extremely severe cases, dehydration from diarrhoea of any etiology can be safely and effectively treated in all age groups by the simple method of oral rehydration using a single balanced solution containing glucose and salts;[12] in addition, the finding that the use of oral rehydration along with guidance on proper feeding practices early in the course of diarrhoea results in less weight loss in children associated with the diarrhoea episode, and thus reduces the detrimental effects of diarrhoea on nutritional status.[13]

2.2.3 Development activities of the Diarrhoeal Diseases Control Programme

Since its inception the CDD Programme has been divided into two major programme components, as recommended by the first Technical Advisory Group (TAG) in May 1978.[14] These are: an implementation or health services component, which is concerned with the planning, implementation, and evaluation of national CDD programmes as part of country health programmes and in the context of primary health care; and includes the transfer of available knowledge to national staff through training in technical and managerial skills; and a research component, which is concerned with the promotion, support, and evaluation of goal-oriented operational and basic research and the strengthening of the capability of existing institutions in developing countries to carry out this research.

The following section summarizes work already undertaken in each area.

2.2.3.1 Implementation

(a) Since 1974 the Organization has been supporting field studies to demonstrate the feasibility, acceptability, and effectiveness of oral rehydration therapy when delivered through existing health delivery systems in 11 countries with different cultures and health service infrastructures. As of January 1980, at least 50 additional countries are known to have introduced oral rehydration therapy for routine treatment of acute diarrhoea, many for the first time during cholera epidemics.

(b) To accelerate the development of national CDD Programmes in these and other countries, regional planning meetings were convened in 1978-79 in the South-East Asia Region (December 1978, June 1979), the Western Pacific Region (June 1979) and the Eastern Mediterranean Region (June 1979). In the American Region, a number of area planning meetings are being convened in 1979-80. These meetings have provided a forum for countries to discuss their planned control strategies. In the African Region, a questionnaire survey was conducted in 1979 to identify countries planning to implement expanded diarrhoeal disease control activities, and follow-up activities are planned. In the European Region, a consultant has visited countries where the problem of diarrhoeal diseases is greatest to promote national CDD programme development. It is estimated that, so far, about 55 countries have initiated plans for the development of national CDD programmes.

(c) Discussions have been entered into with UNICEF to help guide their support for the development of national CDD programmes, which comprises mainly the provision of pre-packaged oral rehydration glucose-electrolyte salts (ORS) or assistance to countries in the local production of ORS.

(d) Since 1974, interregional, regional and national technical training courses have been held in at least 20 countries. Several manuals and guidelines have been produced[15-22] and more are in preparation.[23,24] The training programme now requires expansion emphasizing the underlying primary health care approach of the CDD Programme.

2.2.3.2 Research

(a) Beginning in August of 1978, Scientific Working Groups (SWGs) composed of experts in the relevant disciplines have met to review current knowledge and recommend priorities for research in 5 areas: Immunity and Vaccine Development (August 1978),[25] Clinical Management of Acute Diarrhoea (October 1978),[26] Child Care Practices related to Diarrhoeal Diseases (April 1979),[27] and Environmental Health and Diarrhoeal Diseases Prevention (July 1979).[28] In the fifth field - Epidemiology and Etiology - Sub-groups have been convened on Escherichia coli Diarrhoea (January 1979),[29] Rotavirus and other Viral Diarrhoeas (March 1979),[30] Cholera and other Vibrio-associated Diarrhoeas (September 1979),[31] and Enteric Infections due to Campylobacter, Yersinia, Salmonella and Shigella (November 1979);[32] a further sub-group meeting is planned in the area of Parasite-related Diarrhoea (March 1980).

(b) Under the guidance of the Regional Advisory Committees for Medical Research, regional multi-disciplinary study groups in five of the six regions have been performing similar reviews and deciding on regional research priorities; they have also been identifying research workers and institutions that could undertake research projects. The research priorities have also been discussed at the regional and area planning meetings described in 2.2.3.1 (b).

(c) A global research management scheme is under development and will be ready for implementation by February 1980.

3. OBJECTIVES

3.1 Long-term objectives

Both programme components described in 2.2.3 contribute towards achievement of the Programme's long-term objectives, which are:

(a) Reduce the mortality from acute diarrhoeal diseases;

(b) Reduce the morbidity from acute diarrhoeal diseases and associated ill-effects, particularly malnutrition, especially in infants and young children;

(c) Promote country self-reliance in the delivery of health and other social services for the control of diarrhoeal diseases.

3.2 Medium-term objectives

For the period 1979-1983 the following medium-term objectives have been established for each component.

3.2.1 Implementation

(a) Promote and cooperate with Member States, other UN agencies (UNDP, UNICEF, UNIDO, World Bank, etc.), bilateral and international organizations, and other WHO programmes in the development and implementation of national CDD programmes as a component of basic health and educational services;

(b) Train programme staff at all levels in the managerial and technical skills required for successful programme planning and implementation;

(c) Develop national, regional, and global evaluation mechanisms for assessing, on a continuing basis, progress in achieving the Programme's objectives.

3.2.2 Research

(a) Improve the strategies of programme delivery in country CDD programmes by supporting applied and operational research;

(b) Improve tools for the prevention and treatment of acute diarrhoeal diseases by supporting basic and laboratory research;

(c) Enhance the research capabilities of national institutions in developing countries.

3.2.3 External funding

Attract the investment of external funds from bilateral and multilateral sources to support Programme activities under both components at country, regional and global levels.

4. STRATEGIES

4.1 Implementation

4.1.1 To achieve the long-term objectives of reduction of mortality and morbidity due to diarrhoeal disease and associated ill-effects, particularly malnutrition, the following strategies will be applied in country CDD programmes.

(a) Extensive use of oral rehydration therapy for the treatment of acute diarrhoeas, together with the promotion of proper feeding practices during and after diarrhoea in children. This includes the delivery of oral rehydration therapy at the household level through the approach of primary health care, and the making available at appropriate health service levels of backup treatment (e.g., intravenous fluid) for use when necessary.

(b) Promotion of proper maternal and child care practices related to the prevention of diarrhoea, especially the promotion of breastfeeding, use of proper weaning practices, and good personal hygiene.

(c) Promotion of appropriate and effective environmental health interventions and technologies. This strategy includes educational efforts to promote the use and maintenance of such water and sanitation facilities that are constructed, taking into account the beliefs and practices of communities. It also includes support to food hygiene programmes. This strategy complements the efforts being made by environmental health programmes during the International Drinking Water

(d) Strengthening of systems of epidemiological surveillance (including laboratory surveillance where relevant) to enable them to detect and control epidemics of acute diarrhoea, particularly cholera, and to provide a basis for the evaluation of national CDD programmes.

(e) Application, as they develop, of new specific measures to interrupt transmission, prevent infection, and treat diarrhoea.

4.1.2 To help ensure, in the medium-term, the successful development, implementation, and evaluation of national CDD programmes, it is essential that there be:

(a) a national commitment, as reflected by adequate resource support;

(b) cooperation among and within relevant government ministries and with non-governmental organizations through appropriate mechanisms, such as coordinating committees;

(c) identification of a programme coordinator or manager responsible for programme development and activities;

(d) involvement of the community at each stage and at all levels in the development and implementation of CDD programmes;

(e) promotion and rapid dissemination, through all possible channels, of existing and new knowledge about diarrhoeal diseases and their control;

(f) development of the capacity to utilize existing and emerging knowledge and technology so as to achieve national self-reliance;

(g) promotion of international cooperation in support of national CDD programmes.

4.2 Research

4.2.1 The management plan for the global research effort is designed to support a goal-oriented research programme that takes into immediate account the recent research findings and is directed primarily toward the finding of better strategies for prevention and treatment. It is recognized that as the Programme progresses new research priorities will emerge, and the management plan will be flexible enough to identify and provide support to these priorities.

4.2.2 The plan utilizes the entire structure of WHO for managment of the research activities. National and regional staff will be responsible for stimulating research and identifying investigators to carry it out. The Regional offices will be responsible for the funding of research directed towards improving strategies for programme delivery, while the funding of basic research concerned with the development of new and better tools for prevention and treatment will be managed globally in close association with the Regional Offices.

4.2.3 The plan includes mechanisms at the regional level for the strengthening of research capabilities of existing institutions and for the exchange of research information.

4.2.4 To ensure that decisions regarding the funding of research projects are made with the broadest perpsective and with due consideration of research priorities, all efforts will be made at the regional and global levels to obtain advice from leading scientists in the various disciplines and from different geographical areas. The membership of groups and committees with responsibility for making decisions will be on a rotating basis to ensure wide participation.

4.3 Integrated strategy

The overall integrated strategy during the first half of the medium-term period will be to promote the development of national CDD programmes based on the available strategies (see. 4.1.1) while defining research priorities and a plan for research management. During the second half of the period, emphasis will be placed on the training of health workers in implementation and research activities, the implementation and initial evaluation of national CDD programmes, and the support of research activities and application of early research findings.

5. TARGETS

Each of the medium-term objectives for the two major Programme components is further defined in terms of targets.

5.1 Implementation

5.1.1 National CDD programme development and implementation

(a) It is estimated that, by the end of 1983, plans for national CDD programmes will have been initiated in 80% of developing countries and activities will have begun in 50%.

(b) With the implementation of these CDD programmes, it is estimated that 25% of diarrhoea cases globally will have access to treatment with oral rehydration therapy within the context of primary health care, and that, of these, 50% will actually receive this therapy.

(c) In these populations with access to oral rehdyration, there will begin to be a decline in diarrhoea case-fatality rates and in assoicated ill-effects during and after diarrhoea. The extent of mortality reduction cannot be meaningfully estimated on a global level at the present time.

5.1.2 Training and manpower development

(a) by 1981, the management and technical training materials needed to support country CDD programmes will have been completed and distributed.

(b) by 1983, management and technical training courses and seminars will have been provided to staff from 75% of the countries in which CDD programmes have been implemented.

(c) by 1983, a core of regional and sub-regional training centres for health manpower development will have been established.

5.1.3 Evaluation

(a) During this period a model scheme will be developed for the evaluation [illegible]

5.2 Research

5.2.1 Applied and operational research

To achieve the objective of improving strategies for programme delivery, research will be undertaken in the following areas:

(a) Comparisons of the safety, efficacy, and cost-effectiveness of oral electrolyte solutions of different composition and form of presentation;

(b) Assessment of locally appropriate systems of delivery of oral rehydration therapy at the village level within the context of primary health care;

(c) Identification of locally appropriate infant feeding and other child care practices that will reduce and prevent infantile and childhood diarrhoea, and of foods most suitable for use during and after diarrhoea;

(d) Determination of suitable methods for environmental interventions (water supply and sanitation) that take into account the behaviour patterns of the community.

5.2.2 Basic and laboratory-based research

To achieve the objective of improving tools for the prevention and treatment of diarrhoeal diseases, research will be undertaken in the following areas:

(a) Development of vaccines against the major causes of diarrhoea (i.e., rotavirus, enterotoxigenic *Escherichia coli*, *Vibrio cholerae*, and *Salmonella typhi*;

(b) Development and testing of chemotherapeutic agents for use in the treatment of diarrhoea, based on knowledge gained about the pathogenesis of diarrhoea;

(c) Definition of the epidemiology of the important etiological agents of diarrhoea in different environmental, cultural, and socioeconomic conditions, with a view to developing improved, more specific measures for interrupting transmission and preventing infection;

(d) Identification of the etiological agents responsible for the remaining diarrhoeas of unknown etiology.

5.2.3 Research capability strengthening

To enable research to be successfully undertaken, it is planned during the medium-term period to:

(a) Provide support to strengthen the research capabilities of at least 10 institutions, including at least one in each Region, with the aim of making them self-reliant;

(b) Promote and develop collaborative research among institutions in developing countries (TCDC) and also between institutions in developing and developed countries;

(c) Develop a network of at least 10 collaborating institutions in the developing and developed countries;

(d) Disseminate, as widely as possible, new research findings in the field of diarrhoeal diseases.

5.3 External funding

To attract external funds a mechanism will be developed for keeping potential multilateral and bilateral donors informed of the status and resource needs of the Programme.

6. ACTIVITIES

The following tables list the activities to be carried out to achieve the targets given in section 5.

6.1 Implementation

6.1.1 National CDD Programme development and implementation

Activities	1978	1979	1980	1981	1982	1983
(1) Convene Regional and Area Planning Meetings to plan national CDD programmes		(SEARO, WPRO	(AMRO, EMRO, AMRO)			
(2) Cooperate in preparation of plans of operation for participating countries, including the identification of country programme coordinators or managers		(all regions, HQ)				
(3) Ensure, on a country, regional and global basis adequate supplies of ORS						
(a) collaborate with UNICEF on a country basis;		(all regions, HQ)				
(b) develop sub-regional ORS production centres			(AMRO, AFRO, EMRO, WPRO)			
(4) Develop promotional and educational materials to support the control strategies, especially those directed toward mothers living in rural areas			(all regions, HQ)			
(5) Improve reporting and investigation of epidemics of diarrhoeal diseases, especially cholera		(all regions)				
(6) Provide support to national complementary programmes in nutrition and environmental health		(all regions, HQ)				
(7) Publish and distribute newsletter				(HQ)		

6.1.2 Training and manpower development

Activities	1978	1979	1980	1981	1982	1983
(1) Management training						
(a) Programme Managers Course						
(i) Development of course		(AMRO, HQ)				
(ii) Participation of nationals					(all regions)	
(b) CDD Programme Operations Manual						
(i) Development of Manual		(AMRO, HQ)				
(ii) Distribution (multi-lingual)			(all regions)			
(2) Technical training						
(a) Prepare and distribute materials (multi-lingual)						
(i) Manual on Treatment and Prevention of Diarrhoea for Physicians and Senior Health Workers		(HQ)				
(ii) Manual on Treatment and Prevention of Diarrhoea for Primary Health Care Workers		(HQ)				
(iii) Diarrhoeal Diseases Compendium		(HQ)				
(iv) An Annotated Bibliography on Oral Rehydration Therapy		(AMRO , HQ)				
(v) Guidelines for Local Production of Oral Rehydration Salts		(HQ, UNICEF)				
(vi) Guidelines for control of epidemics		(HQ)				
(b) Conduct national training courses for professional and auxiliary health personnel and for primary health care workers on technical aspects of control strategies, especially oral rehydration therapy			(all regions)			
(c) Motivation Training - Clinical demonstrations of oral rehydration therapy			(AMRO, AFRO EMRO)			
(3) Regional and subregional training centres						
(a) Identify by feasibility study		(WPRO, SEARO, EMRO)				
(b) Provide training support to national CDD programmes				(WPRO, SEARO, EMRO)		

6.1.3 Evaluation

Actitivies	1978	1979	1980	1981	1982	1983
(1) Develop an evaluation system to serve programme needs						
(a) Determine specific data to be collected, including mortality and morbidity data and coverage data			(all regions, HQ)			
(b) Decide on best means of collecting data and strengthen existing national surveillance systems to enable them to provide data required			(all regions, HQ)			
(c) Prepare, submit and evaluate the data					(all regions, HQ)	
(d) Develop and field test a model system for evaluation of country programmes					(all regions, HQ)	
(2) Convene yearly meeting of global Technical Advisory Group*			(all regions, HQ)			

* Although shown here, the meeting of TAG will in fact review all the activities of the implementation and research components of the Programme.

6.2 Research

6.2.1 Improve strategies of programme delivery

Activities	1978	1979	1980	1981	1982	1983
(1) Meetings to review knowledge and outline priorities						
(a) Regional meetings	(AFRO, AMRO, EMRO, SEARO, WPRO)					
(b) Global SWG on Clinical Management of Acute Diarrhoea	(SEARO) (HQ)					
(c) Global SWG on Child Care Practices related to Diarrhoeal Diseases		(HQ)				
(d) Global SWG on Environmental Health and Diarrhoeal Disease Prevention		(HQ) (WPRO)				
(2) Implementation of Research Programme*						
(a) Meeting of Regional SWGs				(all regions)		
(b) Meeting of Global Coordinating Group on Operational Research				(all regions, HQ)		
(c) Site visits to research institutions				(all regions)		
(d) Monitoring of research activities				(all regions)		
(e) Annual presentation to TAG				(all regions, HQ)		

*Details of the research management activities will be included in an overall Research Operation and Management Plan (under preparation).

6.2.2 Improved tools for prevention and treatment

Activities	1978	1979	1980	1981	1982	1983
(1) Meetings to review knowledge and outline priorities						
(a) Regional meetings	(AFRO, AMRO, EMRO, SEARO, WPRO)					
(b) Global SWG on Immunity and Vaccine Development	(HQ)					
(c) Global SWSGs on Epidemiology and Etiology:						
- Escherichia coli Diarrhoea		(AMRO, HQ)				
- Rotavirus and other Viral Diarrhoeas		(EURO; HQ)				
- Cholera and other Vibrio-associated Diarrhoeas		(HQ)				
- Enteric infections due to Campylobacter, Yersinia, Salmonella, and Shigella Enteric Infections		(HQ)				
- Parasite-related diarrhoea			(HQ)			
(d) Global SWG on Clinical Management of Acute Diarrhoeas	(SEARO, HQ)					
(2) Implementation of research programme*						
(a) Meeting of Global SWG on Microbiology, Immunology and Vaccine Development in Viral Diarrhoea				(all regions, HQ)		
(b) Meeting of Global SWG on Microbiology, Immunology and Vaccine Development in Bacterial Diarrhoea				(all regions, HQ)		
(c) Meeting of Global SWG on Therapeutic Management of Diarrhoea				(all regions, HQ)		
(d) Site visits to research institutions				(all regions, HQ)		
(e) Monitoring of research activities				(all regions, HQ)		
(f) Annual presentation to TAG				(all regions, HQ)		
(g) Collaboration with Pharmaceutical Industry				(all regions, HQ)		

* Details of research management activities will be included in an overall Research and Operations Management Plan (under preparation) and strategic plans of SWGs (under development)

6.2.3 Research capability strengthening

Activities	1978	1979	1980	1981	1982	1983
(1) Identification of national institutions to be strengthened			(all regions)			
(2) Provision of support to identified institutions						
- training of national workers through visiting scientist grants, research training grants, etc.				(all regions, HQ)		
- provision of equipment and supplies				(all regions, HQ)		
(3) Meeting of Global SWG on Research Strengthening				(all regions, HQ)		
(4) Organization of inter-country training courses in diagnostic microbiology, epidemiology, immunological techniques and research protocol design for interested scientists				(all regions, HQ)		
(5) Preparation and dissemination of recent research findings through periodic newsletters, bibliographies, etc.				(all regions, HQ)		
(6) Preparation and distribution of a Manual for Identification of Diarrhoeal Pathogens		(AMRO, HQ)				
(7) Sponsorship and support of International Research Seminars and Meetings			(all regions, HQ)			

7. OUTPUT INDICATORS

The following indicators will be used to measure achievements in relation to set targets in the medium term:

7.1 Implementation

(a) Number and percentage of countries with CDD programmes;

(b) Extent of access to oral rehydration therapy;

(c) Extent of diarrhoeal disease mortality reduction;

(d) Frequency of diarrhoea cases admitted to treatment facilities for intravenous therapy;

(e) Number of countries obtaining ORS from a local or regional source;

(f) Extent to which country programmes are not limited by a lack of ORS supplies;

(g) Number of ORS packages manufactured and distributed locally, regionally, and globally;

(h) Number of copies of training manuals and guidelines published and distributed;

(i) Number and percentage of national programme coordinators/managers who have participated in the Managerial Training Course;

(j) Number and percentage of treatment facility and primary health care staff who have received training in CDD activities;

(k) Extent to which follow-up indicates that personnel receiving management or technical training have used the skills taught;

(l) Number of regional and sub-regional training centres established;

(m) Number and percentage of countries with evaluation systems.

7.2 Research

(a) Number of operational research activities supported;

(b) Number of countries in which operational research is supported;

(c) Number of basic research activities supported;

(d) Number of investigators receiving support for basic research;

(e) Number of institutions receiving support for strengthening of research capabilities;

(f) Number of designated collaborating institutions;

(g) Number of inter-country research training courses held;

(h) The extent to which completed research provides better delivery strategies and tools for prevention and treatment.

8. RESOURCES

National self-reliance in the provision of services for the prevention and control of diarrhoeal diseases is a long-term programme objective. For the present, the resources available to most developing countries will need to be supplemented from external sources to allow both the expansion of services for the control of diarrhoeal diseases and the carrying out of needed research.

Contributions in 1978 and 1979 to the CDD Programme included US$ 1 million donated by the United Kingdom for country and regional CDD programme development, US$ 5.6 million from UNDP for support over a 5-year period to research activities in vaccine and drug development, and US$ 900 000 from UNDP over a 3-year period for country CDD training activities in Asia. These contributions have been vital to the development of the Programme.

It is clear that a substantial growth in support is required above that obtained in 1978 and 1979 for further development of the Programme. Such support does not take into account the resources that need to be committed from national health budgets, which are the funds that are most vital for the implementation of national CDD programmes.

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WORLD HEALTH ORGANIZATION
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ORIGINAL: ENGLISH

ANNEX L.2

DIARRHOEAL DISEASES CONTROL PROGRAMME

REPORT OF THE WHO/UNICEF CONSULTATION ON THE NATIONAL PRODUCTION, PACKAGING AND DISTRIBUTION OF ORAL REHYDRATION SALTS (ORS)

Bangkok, 23-26 January 1979

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Annexes

1. Agenda
2. List of Participants
3. Country Reports:

Bangladesh
Costa Rica
Egypt
India
Indonesia
Mozambique
Pakistan
Philippines
Thailand

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Introduction

A Consultation on the National Production, Packaging and Distribution of Oral Rehydration Salts (ORS), jointly sponsored by WHO and UNICEF, was held in the UNICEF gional Office in Bangkok from 23-26 January 1979 with the objective of producing recommendations for the preparation of a practical guide for use by countries wishing to produce, package and distribute prepackaged Oral Rehydration Salts (ORS) locally. (See st of participants in Annex 2).

After a brief statement to the participants, Dr Torfs introduced H.E. the Deputy inister of Public Health, Dr Prapont Pujaratn, who inaugurated the Consultation and lcomed the participants to Bangkok. He stated that the topic of the Consultation was significant to the relief of human suffering and to the promotion of health of people throughout the world. Diarrhoeal diseases as a group were a major health problem in eloping countries. Under-privileged communities and children are the most vulnerable up. In his own country, with 44 million population, there was a million persons sick with the same conditions and, of these, 50,000 died annually. Much of the mortality in se cases was due to dehydration.

The logical treatment to save life in cases of diarrhoea is immediate rehydration. In addition, the introduction of other measures like health education, safe water supply, . are also needed to contain the disease. Perhaps the main reason that diarrhoeal eases continue to be so significant in the developing world was that rehydration treatment was not readily available. This is attributable to various factors, such as, k of production facilities, shortage of raw material, defective production, packaging delivery systems, high prices, etc. Whatever the reason, it is a social injustice to allow people to suffer and die from diseases which have now been proved to be easily able. It was gratifying, then, to know that oral rehydration had been developed and t it was possible to treat the majority of patients.

He wished the participants success in defining a technology which, besides being ective and sound, will be acceptable to the community and can be applied locally at a ce people can afford.

Mr Esguerra Barry, UNICEF's Regional Director for East Asia and Pakistan, undered the importance of the meeting, particularly for those countries where diarrhoeal disease control was a priority. He said that one of the main causes of child mortality was malnutrition; combined with diarrhoeal diseases, malnutrition becomes an aggravating tor and a child may die very quickly of dehydration if no rapid intervention takes e. The production and distribution of ORS offered a solution which would treat dehydration and keep the child alive. The mother was the first auxilliary. She must be e aware of the availability of the treatment "now". To the children we cannot say morrow" because the child is "today".

Dr Sathianathan, WHO Programme Coordinator for Thailand, then referred to the goal by the World Health Assembly of "Health for All by the Year 2000" and said that dehydration resulting from diarrhoeal diseases being one of the main killers of children, widespread utilization of oral rehydration salts will be an asset in reaching this goal.

Finally, Dr Torfs underlined the importance of the programme of Appropriate Technology for Health in this specific field of activities. He outlined the objectives of the consultation as follows:

(1) To examine the problems and constraints in the local production of oral rehydration salts in developing countries and

(2) to prepare principles and recommendations for the production of a practical guide which can be used by other countries wishing to locally produce, package and distribute ORS.

He stressed the importance of the participants' sharing their experiences, problems and constraints for the benefit of all. He emphasized the point that the participants themselves were responsible for working out the recommendations arising from their pooled experience.

After the introduction of the participants, Mr Kho, Secretary of the Government Pharmaceutical Organization, was elected Chairman and Mr Lari from Pakistan kindly agreed to act as Rapporteur.

2. General background information on the diarrhoeal diseases problem (Agenda Item No.4)

Following acceptance of the provisional agenda (Annex ~~II~~ 1), Dr Barua, WHO , Geneva, outlined the magnitude of the problem of diarrhoeal diseases and their impact on the growth and development of the child. Besides being a medical problem it is also a social problem. Although reliable statistics are not available, data from prospective studies in Bangladesh, Guatemala, India and Indonesia indicate that about 100-300 episodes of diarrhoea usually occur per 100 children per year during the first three years of life, the incidence being highest between 6-24 months of age. Diarrhoeal diseases were found in a study area in Latin America to be responsible for 28.6% of the total of 35.095 deaths due to all causes and 69.2% of the deaths due to infectious diseases - these figures show that the diarrhoeal diseases as a group were the major single killer there.

Diarrhoeal diseases are intimately related to malnutrition. While children with malnutrition suffer more frequently from diarrhoea, bouts of diarrhoea aggravate malnutrition due to food withdrawal, food refusal and food wastage.

In addition, diarrhoeal diseases cause a heavy economic burden on the health services as the children with such diseases occupy about 30% of the beds in the children's hospital or ward requiring expensive treatment.

Although it is mainly a paediatric problem, it also affects adults, particularly travellers. Cholera, a typical acute diarrhoeal disease, attracts more attention in view of epidemic propensity but constitutes only 5-10% of the total cases of acute diarrhoeas and requires almost similar public health action. However, the intensified research during the current cholera pandemic has led to development of new tools to reduce diarrhoea-related mortality thus giving rise to new hope for millions of children.

The most significant among them is the development of a single modality - oral rehydration therapy - that can prevent and treat dehydration in most acute diarrhoea cases excepting the most severe ones who cannot drink. The fluid containing (per liter) Sodium chloride 3.5 g., sodium bicarbonate 2.5 g., potassium chloride 1.5 g. and glucose 20.0 g., has been successfully applied widely by medical practitioners, health workers and even by mothers after brief instructions for treatment of diarrhoea in rural areas, and for treatment of adults and children with excellent results and economic benefits. Further studies have shown that sucrose 40 g. can be substituted for glucose with only minimal loss of effectiveness. Education of mothers on continued feeding during and after diarrhoeal episodes in addition to oral rehydration has contributed to increased weight gain in children so treated. If this simple treatment is brought to mothers at home so that they can administer it properly, millions of lives will be saved and the vicious circle of diarrhoea/malnutrition will be interrupted.

Another important development has been the recognition of the new viral and bacterial pathogens which now permit one to establish etiological diagnosis in around 70 per cent of acute diarrhoeas which is a complete reversal of the situation a few years ago when 80 per cent of the cases remained undiagnosed. The discovery of these new agents d understanding of their mode of transmission and of pathogenesis have opened up new portunities for research for development of specific vaccines and drugs. In addition, a great deal of new information about gut-associated immunity has been accumulated.

Recognizing the magnitude of the problem caused by acute diarrhoea and importance of the new knowledge, a high priority has been given to the activities of the organization in the field of acute diarrhoeal diseases in the Sixth General Programme of Work for e period 1978-1983 and to research in this area by the Global and Regional Committees on Medical Research. The Member States in various Regional Committee meetings as well as in the World Health Assembly in 1978 have urged WHO, UNICEF and other international and tional organizations to give high priority to diarrhoeal diseases control and have opted resolutions to that effect. In May 1978 a Global Advisory Committee on Programme Development for Diarrhoeal Diseases Control met to review the current problems and recent owledge on the subject and to recommend appropriate strategies. The Group felt that e programme should be multi-disciplinary and should be coordinated with other related WHO programmes in the fields of maternal and child health, nutrition, environmental health appropriate technology, communicable diseases control and health education, and should be veloped in the overall context of primary health care programmes. The Group also animously agreed that the strategy that can be applied now with available means and which will have the greatest immediate impact on a global basis is wide implementation of al rehydration therapy. While the long term objective is to prevent and control rrhoeal diseases by ensuring adequate pure water supply and sanitation, the programme has the immediate objective of reducing mortality and diarrhoea-related malnutrition by implementing oral rehydration therapy and improved child care practices. It will be plemented in cooperation with UNICEF.

The programme also includes promotion of research activities to improve and develnew and better strategies for diarrhoeal diseases control and training of health sonnel both for implementation of the strategies and for research. All the six regional offices of the Organization are working in continuous partnership with UNICEF in devping mechanisms for implementation of these activities.

Though the programme is relatively young, considerable information and experience have been gathered during the last 6 years of continuous efforts to promote oral rehydrain in various countries. Of the several constraints which have impeded wide application this simple form of treatment, difficulty in maintaining a continuous supply of the prepackaged ingredients in a stable form for oral rehydration has been repeatedly identid as being the most serious one. The extent of frustration of the motivated health kers and mothers in such situations is not difficult to comprehend. Shortage of supplies is obliging health workers to recommend rehydration only with a home-made brew a "pinch of salt and a scoop of sugar", the value of which is not yet proven and is ely to be less than adequate to provide the full therapeutic benefit expected from the of complete formula.

Therefore, the need for establishing national or regional facilities to produce packaged ingredients as a prerequisite for implementation of national programmes cannot be over-emphasized.

3. Country Reports (Agenda Item No.5)

The country reports are given in extenso in Annex 3 as it is felt that they vide important information for the preparation of the guidelines. The contribution

the participant from the Philippines, who was unable to attend, is also included.

Each presentation was followed by a discussion and the following paragraphs attempt to recapitulate the highlights of these presentations particularly as they relate to the problems of production and distribution, it being understood that diarrhoeal diseases are a priority problem in all the countries considered.

The first constraint encountered by countries having embarked on ORS production, or wishing to start the process, related to the non-availability of ingredients and packaging material. The situation varied greatly in the nine participating countries ranging from those importing all ingredients, as in Bangladesh, Egypt, Indonesia; those importing only certain ingredients, as in Thailand, where suitable grades of sodium chloride and glucose are locally produced; to those having all ingredients available locally as in India or the Philippines. The question of quality control becomes very important in order to obtain a product of an acceptable standard, particularly when local ingredients are used. The packaging material, which very much influences the stability and shelf life of the final product, was not available locally most of the time, particularly the aluminium foil. — Dolphins? SEVA?

Different levels of technology used in the production of ORS could be identified as follows:

(1) The complete mixture in one sachet (Bangladesh, Egypt, Pakistan).

(2) The various ingredients in separate sachets or in two sachets separating the sodium bicarbonate from the others (India, Indonesia).

(3) Provision of ingredients to health facilities that will prepare packets for their own use. This last method was used in Indonesia for a short period where it was found that ingredients quickly deteriorated and the method was discontinued. However, local preparation in bulk was being done for short periods, such as in Egypt, at each Governorate level.

In techniques (1) and (2) the packaging is a determining factor in the conservation of the product.

The country reports also showed large disparity in the producers of ORS. In some countries ORS was manufactured only by the government, while in others it was entirely by private pharmaceutical manufacturers. In Bangladesh, for example, there was at present a hand-packed sucrose-based ORS produced by the local Cholera Research Laboratory in addition to the occasional provision of UNICEF sachets, while the private sector was not yet involved. In Egypt, too, UNICEF sachets are available in limited quantity apart from the locally-made sachets produced by the Chemical Industries Development Company, a local state firm.

In India, in addition to the UNICEF sachets occasionally supplied, the cottage industry type of production in the Cholera Research Centre in Calcutta and the ORS production going to be established in Madras with UNICEF assistance, there were several private commercial units producing ORS under different brand names, which was very confusing for the consumers. This was also the problem in Indonesia where, due to the existing commercial system, the product is mainly available through private pharmaceutical companies. The supplies through the health services facilities do not reach very far and are not very regular.

In the Philippines, manual production is undertaken by government services in the Bureau of Research and Laboratories of the Ministry of Health and in Thailand, the Government Pharmaceutical Organization is producing packages on a large commercial scale.

Pakistan is setting up production facilities in the National Public Health Laboratory with UNICEF assistance.

Another issue which varied according to country was the quantity produced. In most of the cases it can be said that the quantity at present produced in the countries does not meet their requirements and that even if the beginning had been made in the form of manual production on a small scale, increase in quantity would require a certain level of mechanisation. In Thailand, for instance, the quantity produced was to meet the requirements of UNICEF alone but is now extended to meet the needs of the Department of Communicable Diseases Control and of the Department for rural health centres.

UNICEF assists in the supply and/or local production of ORS and should continue to provide ORS sachets in sufficient quantities where local production is not established or not sufficient. The quantity to be produced is also linked with the utilization of the ORS, not only by the providers of services but also by the consumers, and for this all countries have plans for training health workers and educating the communities.

The size of the packets also differed: In Egypt the local production was for 200 ml, in Indonesia for 200 ml and 1 litre and in the Philippines sachets for half a litre were produced. Generally, the packets for 1 litre were the most popular size, though it is obvious that each country may decide to produce in sizes corresponding to easily recognizable container sizes for self-medication or to distribute standardized containers along with the packages.

Labelling did not seem to present a problem, although it was advocated that it should be in appropriate national/local languages which might be difficult - or even impossible - at least initially, in big countries with a multiplicity of vernacular languages. Inclusion of proper instructions for self-medication in the packets was also recommended.

Quality control seemed to be one of the most important aspects of all countries considered. The recognition of the product as a drug was considered essential for assuring the quality of the raw material and the finished product, which can be a determining factor. In Indonesia, for instance, all ingredients have to meet the national pharmacopoeia requirements, while in the manual or cottage industry type of production these requirements were not being met.

Stability of the product is one of the most crucial factors in local production, particularly in hard climatic conditions. Shelf life is linked with the choice of packaging, sealing and appropriate storage conditions. Lumping of the powder, discoloration of product and inflation of packages often occured and these had to be thoroughly studied in order to improve the quality of the product. For those embarking on local production, attention should be given to the labour intensive or semi-automatic equipment particularly where the educational level of workers is low.

The description of distribution channels showed that ORS was usually being distributed through the existing network of health services as applicable to each country situation. In several countries it is included in existing health care workers' kits, as in Bangladesh where it is part of the Drug and Dietary supplement kits supplied to rural areas; in India it is likely to be included in the medicine kit of community health workers serving villages and in Indonesia it will be a standard drug in the primary health care kit. UNICEF also supplies limited quantities for the WHO or UNICEF-assisted programmes. Apart from the usual channels of the health delivery systems, other existing channels could be used such as envisaged in Mozambique, through people's organizations or commercial routes. When the product is made available through shops and drugstores,

other problems might also occur apart from stability of the product and its proper conservation. Quality control at different levels of distribution, acceptability of the product as a drug, possible competition with antidiarrhoeal drugs, costs, would be important factors in large scale commercialization. The Costa Rica country report considered it important to educate the mothers who may not be in a position to prepare and administer the solution properly.

The cost of the product also varied enormously - the most expensive being the product in Egypt and Indonesia. The cost is very much influenced by the availability of the ingredients, by the quality of the product (the higher the specification, the higher the cost) and by the packaging material. In Pakistan the supply of ORS will be on a non-profit production cost basis, as is being done for vaccines/sera.

Last but not least is the problem of acceptability of the product. All countries considered that training and health education was an integral part of the oral rehydration therapy as lack of knowledge of the benefits of ORS existed, even amongst the medical profession. They all felt that ORS should not be treated as a minor domestic remedy but recognized as an essential drug, not necessarily under prescription control. Training was already effective in most countries, started or planned in others, for all levels of health workers. Manuals for use by different categories of health workers, leaflets, etc., were being produced for the training activities as well as for the sensitization of the community, particularly the mothers. Utilization of all available mass media, particularly the radio, which is currently available in most rural areas, was urged strongly.

During the presentation of the country reports and the ensuing discussion, several issues were identified, which contributed to clarifying the main problems that were to be solved before and during the production process.

4. Formulation

The present WHO recommended formulation has been found therapeutically to be the most acceptable. However, when examined closely it is seen that the ingredients are not fully specified as to their quality and standard. Further, it is not specified whether glucose is dextrose anhydrous or monohydrate. The latter contains 10 per cent of water of crystalization and therefore 22 g of glucose per litre would yield the desired concentration of 111 mmol. The use of dextrose monohydrate also poses problems of stability and shelf life. WHO is requested to investigate the stability of the mixture containing the monohydrate.

In addition, the participants were of the opinion that an appropriate generic name should be given to the product. Several suggestions were considered in addition to ORS, such as ORP (oral rehydration powder), ORE (oral rehydration electrolytes), CORE (combined oral rehydration electrolytes), and GEM (glucose electrolyte mixture).

5. Packaging (Agenda Item No.6)

No recommendation could be made as to an international standardization of the packet size. However, the discussions centred on weighing the respective advantages and disadvantages of the different sizes of packaging as used in certain countries and compared to those used in others.

The following table recapitulates the discussion on this issue:

SIZES	ADVANTAGES	DISADVANTAGES
200 millilitre	Often corresponds to a currently available container. Reduces wastage. Dosage more easily understood by mother (1 glass for one loose stool). Avoids left overs and contamination.	More costly. May be dangerous as mother may stop after one or two packages and the child will not get the necessary quantity. Area for instructions reduced on the package.
500 millilitres	reduces wastage and leftovers	More costly.
1 litre	Less expensive (even with eventual wastage). The usual requirement is one litre or more per episode.	Some wastage may occur, particularly with infants; however under normal conditions, 1 litre should be given within 12 hours. CONTAM.
5 x 200 millilitres	reduces wastage and leftovers	Too expensive, more complicated for mother to understand

From the above discussions, the participants recommended flexibility according to the specific requirements and conditions of the country, while emphasizing the necessity of national standardization of size and type of packaging. The 1 litre package was generally considered to be the most acceptable presentation.

Another point for discussion was whether or not the ingredients should all be packaged in one single sachet, or in two sachets, separating sodium bicarbonate from the other ingredients. In this respect, it was noted that the quality of raw materials, their moisture content and also the packaging material are the determining factors for stability. Some time was spent in determining what would be the most reliable specification for aluminium foil versus other packaging items. Marking requirements and related instructions to the user were also discussed at great length as reflected in the "Recommendations".

6. Storage and distribution channels and management
(Agenda Items No.7 and No.8)

Storage conditions are very much dependent upon the climatic conditions of the

country and special care may be required to protect the product from high temperature, humidity, and all types of pests. The distribution should take into account a continuous sustenance of replenishment, according to consumption, taking seasonal demands into consideration. All existing transportation and distribution channels should be taken advantage of, so as to ensure an adequate replenishment of stocks. Special reserves for emergencies, natural disasters and epidemics should be maintained and be periodically renewed.

7. Quality control and evaluation (Agenda Items No.9 and No.10)

Quality control must be ensured at all stages of the process. Analysis of raw material (whether imported or locally produced) should be the first step in quality control to ensure conformity with nationally recognized pharmacopoeial specifications. Quality control will have to include, besides chemical identifications, the determination of an acceptable degree of moisture content in the product, and adequacy of sealing. All these aspects were discussed at length and it was recognized that standards should be determined on an international basis. It was pointed out that over-refinement of quality will be reflected in the price of the product, and therefore a certain tolerance would be desirable in the quality of the product, without sacrificing efficacy or safety. However, it was agreed that financial considerations should not be allowed to impair the basic quality of ORS. Emphasis was also put on the importance of continuous monitoring of the quality of the product during storage and distribution in order to determine its stability and shelf-life.

8. Costing

Costing was mentioned on several occasions during the discussions on other agenda items. The range of prices in the different countries represented was significantly wide (from US Cents 6 to 45 for a one liter sachet) and could be explained by the presentation and size of package, availability or not of locally-produced raw materials, quality standard of the ingredients, etc. The higher the quality specifications, the higher the cost will be. Also, volume turned out will reduce the cost. There was a concensus of opinion regarding the inclusion in the costing of items such as depreciation of buildings and equipment, maintenance and repair, salaries, but excluding profit. Consideration was given in certain circumstances to substituting sucrose for glucose when the former ingredient was locally available at a lower cost. It should, however, be kept in mind that a double quantity of sucrose is required. In some countries glucose is listed as a drug, differently taxed than sucrose, and therefore is actually cheaper.

9. Development of Guidelines

The following recommendations constitute the basis for the further formulation of guidelines for the national production and distribution of oral rehydration salts (ORS) packages. These and the material extracted from the country reports and related discussions will provide the elements required to assist those wishing to embark on the production of ORS. For convenience, these recommendations have been grouped under nine main headings:

1. Production

1.1 National or Regional production of Oral Rehydration Salts should be encouraged for supporting a national programme of diarrhoeal diseases control and should form an integral part of the programme along with training. It is felt that UNICEF can play a very important role in the establishment of production plants.

1.2 The local availability of raw material for the production of ORS should be investigated and, if available, national or regional manufacturing should be encouraged in accordance with the principles of TCDC, ensuring that the products are of acceptable standards. WHICH DOCUMENT?

1.3 Whenever a country embarks on local production of ORS, the product should be manufactured in accordance with "Good practices for the manufacture and quality control of drugs" as adopted by the Twenty-eighth World Health Assembly.[1]

1.4 A generally-accepted name is recommended to alleviate the confusion created by the proliferation of brand names. It is recommended that this problem be studied by an international forum in order to define the minimum standards to be entered in the International Pharmacopoeia and to establish the minimum requirements. A monograph should be prepared by the same forum describing the preparation and its quality specifications, thus bringing global recognition to the product. PLANS?

1.5 While these international standards are being developed, the ingredients used should be of acceptable pharmaceutical standards in the country.

1.6 The following steps are recommended for the production of ORS:

(a) Quality control of raw materials. Tests should include moisture content and particle size variation so that the raw materials may be dried or milled as necessary to meet quality specifications.

(b) Weighing, mixing and filling, packaging. All steps should be under in-process control to maintain low moisture content such as avoiding delay between steps with minimum exposure to the atmosphere during processing, (in a dehumidified or air-conditioned closed room where needed). The unpacked mixture should not be left unprotected. If the ingredients do pick up moisture during the process, they should be dried again before packaging.

(c) Quality assurance of the final product by statistical sampling and inspection for moisture content, stability, identification, assay, weight of sachets, sealing, and labelling before release.

2. Quality Control

2.1 Quality control should be carried out at all levels during the production process in accordance with WHO recommended good practices for the manufacture and quality control of drugs, to include:

(a) control of raw materials, including that of packages
(b) control of weight and moisture variations
(c) stability and shelf life, under actual shelf conditions and environmental conditions (accelerated stability test).

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[1] Resolution WHA 28.65, Official Records No.226, Annex 12. Technical Report Series 567, 1975.

2.2 Visual inspections in accordance with an established schedule should be carried out by the monitoring services at all points in the distribution line.

2.3 Certificates of analysis by the manufacturers of raw materials for each batch should be procured from all the suppliers (WHO Certification Scheme[1]) on the quality of pharmaceutical products moving in international commerce.

3. Packaging

3.1 Package size should be according to the local requirements in each country. The size and type of the package should preferably be standardized within the country.

3.2 The packages could either be in aluminium foil, small glass containers, polyethylene, or other material which adequately protects the product against moisture, the main purpose being the impermeability to moisture and the strength of the packaging material. Among all the possibilities, it was agreed that aluminium foil represents the most convenient packaging. A double-side coated foil of 15-18 micrometers aluminium (inside layer polyethylene for sealing, and outside coat of polyester, PVC) may be the most suitable. The size of the sachets should be as small as possible but large enough to guarantee proper sealing.

3.3 For hospitals and large health facilities, larger volumes of solution for daily consumption can be prepared providing a pharmacist is available. Ideally, ingredients should be delivered to hospitals in separate containers although, in certain circumstances, it would be safer to deliver a premixed powder in minimum 2 packages separating the sodium bicarbonate from the other ingredients. Bulk packed mixtures should, in any case, be thoroughly remixed before preparing the solution, as the ingredients may separate during transport.

3.4 Labelling should conform with national drug regulations; the composition of the ORS should be declared on the label. The batch number of the product and the manufacturing date when required should be printed on the label so that any product in the store can be traced to the reference sample kept in the production laboratory and to the production records of that batch.

3.5 Instructions for consumers should be printed on the package in the national language. Each country should carefully study the possibility of providing instructions to consumers in vernacular languages more currently used in the country. Pictorial instructions for the consumers may be enclosed with the package. These instructions must make clear that once the solution is made it should not be kept more than 12 hours and not be boiled. It was also suggested that negative instructions should be printed in a different colour; red, for example.

3.6 Instructions to health staff should be provided about storage of the product, avoiding exposure to moisture and high temperatures.

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[1] WHO Technical Report Series No.567, 1975, Annex IB

3.7 The ORS should be considered as a pharmaceutical product and be presented attractively to the consumer.

4. Distribution

4.1 ORS should be distributed through primary health care workers rather than by promoting it only as a domestic remedy to be purchased by the consumers.

4.2 Distribution to the medical facilities at all levels and to the consumers should be ensured through all available transportation channels, i.e. not limited to health services channels only.

4.3 Due account should be taken of the needs for ORS packages in accordance with the epidemiological and seasonal changes.

4.4 The ORS should preferably be considered as a drug available for self medication and not as far as possible be put under strict prescription control.

5. Storage and Replenishment

5.1 As much as possible, ORS should be protected from heat, humidity and pests. Controlled stock rotation should be applied for normal storage as well as for relief supplies for epidemics and disasters.

5.2 Replenishment should be ensured through an adequate and appropriate system, in accordance with consumption.

5.3 For countries that cannot now embark on national production of ORS UNICEF should continue to maintain the supply of oral rehydration salts packages to support the national programme.

6. Costing

6.1 It is recommended that WHO and UNICEF should make a list of sources of raw materials of an acceptable quality.

6.2 Whether produced by the government or the private sector, the cost should be kept minimal.

6.3 When government is producing, the costs should be at direct cost price including ingredients, packaging, depreciation of equipment, manpower and other related costs.

6.4 It is recommended that reduction in production cost should not be at the expense of quality.

6.5 It was recommended that the decision-makers be made aware that the cost of oral rehydration treatment may be more than recovered in terms of benefits derived by underserved populations and will always be less than the cost of other forms of treatment.

7. Training

7.1 Training (including practical demonstrations) must take place at all levels of health services: physicians, nurses, auxilliary health personnel and mothers.

7.2 As far as possible, practical instructions to the mothers should be given verbally and should include nutritional and personal hygiene advice. This should be made by health professionals and community development groups, such as voluntary organizations, women's clubs, etc.

TOO MUCH?

7.3 The product should be promoted among medical and paramedical personnel, as well as consumers. Use should be made of all available mass media. Its promotion should also take into account the shortcomings of other products claiming to combat diarrhoea.

7.4 The health personnel should ensure that the mother understands how to prevent dehydration, by recognizing its initial symptoms.

7.5 It is recommended that each country prepares training manuals, particularly for primary health care workers, and also for all other professional levels. WHO/UNICEF guidelines will be available for this purpose to be adapted to differing national requirements.

AVAIL? FEES?

8. Research

Research on oral rehydration has recently been reviewed in document WHO/DDC/79.3. However research in the following areas was emphasized:

8.1 Research should be carried out on physico-chemical characteristics of the ingredients and their effects on the stability of the mixture, especially in relation to moisture content, and means of preserving it.

8.2 Operational research should be directed towards studying "ways and means" of implementation of oral rehydration treatment through mothers and other village-based workers.

NOT GHANA!

8.3 Feasibility studies should be undertaken to determine more accurately the quantity of production required, and distribution.

— ATERM

8.4 Comparative studies of the complete formula with the incomplete formula (household sugar and salt only) should be carried out.

9. Evaluation

9.1 Evaluation should be on two levels:

(a) Evaluation of the product (quality control).

(b) Evaluation of the impact of the national programme on the health of the population using the ORS.

ZONAL SYSTEM?

nthesis of Conclusions and Recommendations

1. The discussions and recommendations of the participants representing their parate situations become even more valuable to other countries by being synthesized.

2. The major form of presentation of packages for oral rehydration therapy should as a drug item recognized as such by the drug supply systems of the country. The pearance and packaging of the product should inspire the confidence of both the health professional and the individual consumer, and encourage its proper use.

SAME PKG?

Essential quality standards should be established identically as for any other pharmaceutical item, covering basic raw materials, formulation, and the finished product. The product should comply with all national requirements for registration, labelling, orage and shelf life instructions, and other drug information. Manufacturing practices nd quality control should be adequate in measuring both physical and functional attributes.

OIC

Bulk units of the ingredients in the proper proportions do offer an economic advantage for use in large treatment facilities. In this instance, incompatible substances can be kept apart until weighing into a final solution under competent supervision.

5. All means of distribution should be given to making both the drug and instructions on its use available to people in remote areas. Methods of packaging should be explored lengthen shelf life and protect the product against damage from common hazards. direct costs should preferably, if necessary, be accounted for elsewhere, leaving only direct costs to be supplied within the drug supply system.

Accurate and substantiated information on the pharmacology and therapeutic use should be made available to encourage acceptance by the professional health worker. Informational materials should also be developed for motivating consumers and promoting s proper use. Appropriate health education and drug information should be disseminated to assist in community education and sensitization, and for training local health aides.

A system of operational research and evaluation should be established assessing the effectiveness of the oral rehydration programme at several levels, from product ailability and usefulness up to the impact of the strategy on mortality. A central nitoring committee should be set up to coordinate research and development of programme operations, improvement of product supplies, or the adaptation of methodologies generally in the effective application of technology for improving child growth and development.

HQ?

The consultation provided definite directions that can be formed into guidelines for national production, supporting the major strategy of a diarrhoeal diseases control ogramme.

10. Visit to the Government Pharmaceutical Organization (GPO) Bangkok
(Afternoon of 25 January 1979)

Thanks to the courtesy of the Ministry of Health and the good offices of the Chairman of the Consultation, a visit was organized for the participants to the Government Pharmaceutical Organization where the group was greeted by the Deputy Managing rector, Mr Bunlu Sangsingkeo. He and his staff kindly briefed the group on the activities of the plant which were illustrated by a film. The group then visited several ectors of the drug production area and spent some time in the section devoted to the oduction of ORP and the quality control laboratory. The visit constituted an excellent llustration of the discussions during the previous days.

AVAIL?

11. Closure of the Meeting

After approval by the participants of the list of recommendations, the meeting came to an end and was closed by the Chairman in the presence of UNICEF's Regional Director for East Asia and Pakistan and the WHO Programme Coordinator for Thailand.

12. Acknowledgements

The secretariat of WHO and UNICEF would like to express its deep appreciation to the Government of Thailand, the Ministry of Public Health and the Government Pharmaceutical Organization in Bangkok for their readiness and support given to the Consultation. The secretariat would also like to extend its sincere thanks to the staff of the UNICEF Regional Office in Bangkok and to the WHO Programme Coordinator for the effective services so willingly provided by them.

Agenda

1. Opening of meeting

2. Election of Chairman

3. Approval of provisional agenda

4. General background information on the diarrhoeal diseases problem - importance of oral rehydration salts in treatment and management.

5. Local production conditions, problems and constraints based on the availability of ingredients.

   Discussion of national experiences.

6. Packaging of ORS - various possibilities based on national experiences, including possibilities of national standardization of solutions and containers.

7. Storage, distribution channels, and additional costing for transport.

8. Management of distribution, i.e., stock keeping, replenishment (including related forms), procedures/channels of distribution of ORS, training of distributors, instructions for consumers and distributors.

9. Quality control of oral rehydration salts.

10. Evaluation of the production and distribution scheme.

11. Costing

12. Outline of guidelines for the production and distribution of ORS, for use by Governments.

13. Any other items

14. Closure of the meeting

One afternoon to be devoted to the visit of the national plant producing ORS in Bangkok.

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Country Reports

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1. Report from Bangladesh

The scale of the problem of diarrhoeal diseases in Bangladesh is enormous. Diarrhoeal diseases have been identified as one of the major causes of death in the rural community and as such are considered as number one among the priority health problems of the country.

The national health services have not yet reached and benefited a large majority of the people, particularly in rural areas. Not only are available health resources and manpower inadequate and inequitable but also the non-availability of essential drugs at a reasonable cost thwarts all efforts at rapid improvement of health conditions. However, national policy has identified and taken the remedial steps for provision of at least a minimum of health care to all citizens as a matter of primary concern in the health sector.

Since there are very effective and inexpensive ways of treating diarrhoea and preventing most of the death and disability due to these diseases, therapy with Oral Rehydration Salts (ORS) has already attained the focus of attention as a priority component of primary health care programmes. ORS in sachet form has been selected as one of the 21 essential drugs for primary health care in Bangladesh.

Sufficient epidemiological evidence is available to convince that a single formulation of ORP can be safely used for all diarrhoeal patients with dehydration and that it simplifies management of supply and distribution, particularly during epidemics.

To reap the best advantage, the formulation should be of low cost, easily available, of uniform standard of quality and sufficiently stable in the hot and humid climate of Bangladesh.

For the last few years UNICEF has supplied ORP in sachets at the rate of about 0.5 million sachets per year. These have been supplied to rural areas as part of the drug and dietary supplement kits (D & DS kits) containing other simple but essential drugs. Besides this, the local Cholera Research Laboratories (CRS) are also using and distributing extensively a hand-packed, sucrose-based ORS product having identical composition. These are mostly used and distributed through the organized health services in cholera research areas. ORS is neither extensively used nor easily available in the private sector, which constitutes the majority of health care services in Bangladesh.

The present supply position of ORS is precarious. It does not meet even one tenth of the immediate need for the primary health care services. It has been estimated by a World Bank Study Team that the immediate annual need of ORS (in sachets) is about 8 million sachets for supply to the 249 Thana Health Complexes and about 1,400 Union

sub-centres functioning, this need will increase to 28 million sachets.

In view of the above situation, the Government requested UNICEF's assistance in developing the existing Government Pharmaceutical Production Unit, so that it could manufacture some essential drugs locally, including ORS sachets for the primary health care programmes. It is expected that by the end of the current year, this unit will be able to manufacture about 4 million sachets of ORS along with 21 other simple essential drugs. All the ingredients for manufacture of ORS have to be imported. Since we have not yet become familiar with the problem of production quality control for the product, stability studies, full costing and logistics of supply and distribution will be taken into consideration in determining the packaging and process of production. As raw materials are not manufactured in the country, their constant availability will pose a problem as a constraint. Information and experience of other countries in this field will be extremely useful in this regard.

The basis of our distribution programme for ORS preparations is not to treat it as a minor domestic remedy but to make it a part and parcel of the primary health care delivery system, for which it is planned to utilize the same distribution channels as for other primary health care programme drugs. The training of medical and paramedical personnel has already started. Medical officers at Thana Health Complex are being trained in groups on "management of diarrhoea" and they in turn will train the paramedical personnel. Extensive health education of the mother will be given by family welfare workers and community health workers on the use of ORS as a treatment for diarrhoeal diseases. Budget allocation to the Ministry of Health for the purchase of drugs is one of the major constraints in the expansion of health care facilities.

Report from Costa Rica

The picture for diarrhoeal diseases in Costa Rica has changed dramatically in the last ten years. In 1975 diarrhoea showed a mortality rate of 3 per cent in the statistics of the National Children's Hospital in San José (HNN) being the leading cause of death in children. In 1978, out of 4,000 cases of diarrhoea discharged, only 10 deaths were recorded for this cause, accounting for a mortality rate of 0.25 per cent. It is interesting to note that most of the deaths (8) occurred in the first half of the year. This phenomenon could very well be related to intervention made during this particular year. Early in January, a well-controlled study was carried out at the HNN, in which children with diarrhoea and 5-10% dehydration were successfully treated with a glucose electrolyte oral solution. After this encouraging outcome, a similar study was made at the emergency ward with the intervention of the mothers and with no laboratory assistance at all. The spread of oral therapy and the use of fast (7 hours) intra-venous therapy are, with all probability, the reason for the reduced mortality rate.

It is also important to note that the deaths recorded in 1978 occurred in children between 3 days and 6 months of age. Notwithstanding this good result, it is possible to reduce the number of children coming to the hospital considerably through a well-designed National Programme in the field.

The next step is obviously to conduct such a programme on a home basis. As expected, the mothers were usually able to learn and manage properly the administration of the oral solution as prepared at the hospital's pharmacy. Nothing, however, is known about the mother's ability to prepare the solution.

A well planned educational campaign is ready to start at the national level. Well illustrated audio-visual materials are already printed.

A recent field study in the location of San Ramon in Costa Rica, showed that baby bottles are widespread, and for that reason, a package of 8 oz. (240 ml) should be optimal. Currently, packages of ORS for 1 L. in polyethylene bags are being hand-made at the Ministry of Health and distributed to health centers. It is necessary to change the size of the package to make 8 oz. water and switch to aluminium foil.

A nationwide production of the 8 oz. package is currently considered at the commercial and governmental level.

Accordingly, I would make the following recommendations for such a programme:

1. The proposed intervention should take place through a National Programme involving UNICEF/WHO assistance initially, but continued by well-trained local personnel.

2. Preparation of the mixture and strict quality control needs to take place locally. Provision of the basic materials and equipment may be a limiting factor, so the help of international organizations in this connection is essential.

3. Since the proper concentration of the solution is critical in the prevention of untoward effects of oral therapy at home, there should be a standardized method of preparation.

4. The container for proper preparation must deliver as accurate a volume as possible.

5. Simple methods such as taking "pinches" of salt and sugar have to be discouraged.

6. The powder has to be made available to mothers through organized health centres and at drugstores. The mother must be told that the solution is a medicine that will arrest diarrhoea in her child.

3. Report from Egypt

The total approximate number of deaths at all ages in the country is half a million per year. Half of these deaths occur in children before reaching their sixth birthday and 40 per cent of these children die from diarrhoeal diseases between the ages 0-6 years, i.e. we have approximately 100,000 deaths under the age of six and one fifth of all deaths are due to diarrhoeal diseases which tops the list of causes of death in the 0-6 years age group.

The main cause of death from diarrhoeal diseases is severe dehydration. Therefore dehydration was considered as the main killer of children in Egypt and rehydration was considered as the main killer of children in Egypt and rehydration was considered as a life-saving emergency first priority measure in the plan for MCH services.

In a pilot project carried out in Egypt with the aid of UNICEF and WHO in 1977, it was found that 97.5 per cent of dehydrated children attending MCH units were of mild to moderate degrees and could be effectively managed with oral rehydration. The other 2.5 per cent of cases were severe and needed intravenous fluid therapy. It was also found that the average diarrhoeal case incidence is four episodes per child per year. The criteria for the effectiveness of ORS was the duration of the disease: in the experimental group the duration was three days only in comparison with a week or more in the controlled group. The rate of referral to hospital and the death rate were also considered. It was also felt that health education (the five educational points in the WHO manual concerning Oral Rehydration Management) is a very important component in the success of Oral Rehydration Therapy. It was noted that after 6 months children in the

experimental group weighed more than those in the controlled group.

Oral rehydration programme, nation-wide, Egypt 1978 It was decided to launch a nation-wide programme for Oral Rehydration in Egypt during 1978. In Egypt there is a good network of primary health services throughout the country (both rural and urban). There are more than 2,500 such units and the rural health unit serves from 5-15 thousand population. The urban MCH centres serve about 50 thousand population.

The main objectives of this nation-wide programme were:

1. Provision of ORS

(a) UNICEF aid of half a million ORS sachets imported into the country and distributed at a rate of 200 sachets per health unit.

(b) CID (a local state firm) produced oral rehydration sachets under a trade name (Dehydran). This Dehydran sachet is the same UNICEF formula but in a smaller package (1/5) for 200 cc solution.

(c) Local preparation of OR sachets at the level of each governorate. The ingredients were provided at the health unit level where the doctor or pharmacist could prepare the sachets in ordinary or cellophane paper. The preparation was done in accordance with consumption at unit level because of the low shelf life of such sachets (not more than one week).

Training

A two-day training course was carried out for both doctors and nurses, by the paediatrician in the local hospital. One day was devoted to theoretical study and the other to clinical material where the doctor or nurse was trained in the degree of dehydration and how to prepare OR solutions to be administered to the child at the clinic.

Three manuals were issued: one in English for the doctors, one in Arabic for nurses, and one in Arabic as a message to mothers as well as nurses. The content resembles the WHO Manual on oral rehydration and each doctor or nurse was provided with a copy of this Manual.

3. Health education

Health education has been carried out by all methods available: mass media (TV, radio, Newspapers, etc.), group meetings and person-to-person.

4. Evaluation

Comparison of the age-specific death rates in children during 1977 as compared to 1978 is being made.

The Main Constraints as experienced during implementation were as follows:

1. At first it was felt that paediatricians should participate in the OR concept. Therefore, before the pilot project was implemented, the top-level professors of paediatrics in the country were consulted. Much discussion resulted on the effectiveness of ORS and the formula and it was agreed that it should be tested. After the study they were convinced and are now supporting the programme. They take the lead in its implementation especially with regard to training.

2. The absence of a central responsible officer or committee for execution of programmes and liaison with international agencies was felt to be a drawback. A committee was therefore formed by ministerial instruction (Director of MCH, Director of Rural

Services).

3. Provision of OR sachets to cover needs. It was calculated that at least five million sachets are required annually to cover the needs of the children that can be reached. To solve this problem, UNICEF is trying to implement a production line in CID to cope with the production of this five million. It is expected that production will begin in early 1979. UNICEF assistance was requested to import five million sachets for the year 1978.

4. Smaller packages versus one litre packages. It was felt that there is a need for standardization of one package at the national level. Mothers might confuse the smaller one for the larger one. Also, a poor mother will try to buy the smaller one and no more. Health personnel may try to give less sachets in the smaller size because of shortages.

5. Some mothers were not so patient or so alert in giving the child a glass per hour. On the next day's visit they would say that the child only drank one cup, although the child might have been only moderately dehydrated and able to drink well. Such children were considered for intravenous rehydration even though they were only mildly or moderately dehydrated.

6. It was felt that participation of nurses as well as the doctors is very important.

Manufacture of OR packages:

1. Specification of raw materials

- particle size 100-120 mcm
- Moisture content not more than 1 per cent. It is better to have the raw materials in the specified particle size and having the required moisture content in tight sealed containers which can withstand the drastic climatic conditions during transport and storage.
- The raw materials must be stored in a cool place (dehumidified if possible).
- The raw materials have to be analyzed to test conformity with specifications.

2. Milling

If the raw materials are not supplied in the specified particle size they must be milled and samples examined.

3. Drying

In case the raw materials are supplied with higher content of moisture than 1 per cent, they must be dried at low temperature (35-40°C), which is mainly suitable for dextrose. Samples of the dried materials must be examined by analysis.

4. Mixing

By a mixer using the hurling and whirling principles to produce a homogenous mixture. Samples of each batch of the mixed materials must be analysed to detect the conformity of the percentage of each component.

Feeder to transfer the mixed powders

Bulk feeder elevator with drums is used The automatic feeding of the mixed powder to the packaging machine has the following advantages:

Keeps the filling area clean and free of dust which, if accumulated on the sealable side of the aluminium foil will prevent perfect sealing.

Avoids loss in handling the powders from containers to the feeding hopper of the filling machine.

Prevention of cross-contamination.

6. Packaging in Sachets

An automatic dosing and packaging machine is recommended because of the huge uantities of sachets required and also to produce the exact amount in each sachet. Samples of the produced sachets have to be weighed every quarter of an hour to detect heir conformity with the required dose.

7. Packaging Foil

Aluminium foil (12 microns), one side kraft (40 gms/m^2), other side extruded ith polyethylene (20 microns).

8. Shrink Wrapping

The shrink wrapping of the carton boxes containing the sachets protects them from oisture during storage and transport.

9. Storage

This must be in a dry cool place and, if possible, airconditioned and dehumidified.

0. Production Area

It is recommended that the production area, particularly for mixing and packing, be airconditioned and dehumidified. This will protect the dried materials from being ehumidified during handling and packing.

4. Report from India

(a) Production of Oral Rehydration Salts (ORS)

Production of ORS is possible at:

(1) Medical Stores Depots of the Government of India.

(2) Pharmaceutical manufacturing units, which are Government undertakings but operating on a commercial basis under Government supervision in respect of costing.

(3) Non-governmental (private) pharmaceutical industry. Commercial organizations and therefore having a profit element in the costing.

Ingredients of ORS, and also packaging materials, are available within the ountry. The Medical Store Depot at Madras makes ORS to order. A Quality Control Laboratory is also available. The product can be distributed at minimal cost. Certain non-governmental (commercial) units are also producing ORS. However, the overall roduction is inadequate at the present time.

(b) Distribution of ORS

(1) Medical Stores Depots (MSD) can supply ORS to Government health care delivery points, and therefore ORS can be available right up to the Health Sub-centres, which by 1987 are targeted to serve at one sub-centre per 5,000 population. Although health care delivery is implemented mostly by State Governments, the State Health Authorities are very familiar with the procurement of medical supplies from the MSDs of the Central Government. The ORP can also be included in the "medicine kit" of the Community Health Worker, serving particularly in villages, and each worker covering 1,000 population or a village/cluster of villages.

(2) For patients not availing themselves of official health services, the supply to the medical profession (non-official) will depend on the enthusiasm and interest of the private industry in popularizing ORS therapy.

For the "common people", health care delivery is primarily the official agency. Hence the importance of an official agency such as the MSDs of the Central Government to manufacture and distribute ORS. Use of ORS by the Government health care delivery system, at all levels, may also influence the private medical practitioner to adopt ORS therapy because of the obvious beneficial results.

(c) Steps taken to popularize ORS therapy

(1) Workshops and training courses held at National and State levels.
(2) Bringing out and distribution of booklets for the medical profession, perhaps implemented on a limited scale.
(3) ORS therapy included in the manual prepared for the Community Health Worker.

(d) Further steps being taken

(1) Material regarding ORS therapy has been prepared in simple language for the lay person for large-scale distribution through the Health Education Bureaux.

(2) Continue holding workshops on ORS for medical personnel in different states with higher number of cholera cases due to the receptiveness of the participants. This needs to be expanded to cover all the states in the country.

(e) Problems encountered

(1) Lack of knowledge of the benefits of ORS therapy, even among the medical profession. Benefits need to be stressed at the undergraduate medical training level.

(2) Creating awareness and enthusiasm among senior professional health officials (Directors of Health Services, Civil Surgeons, District Medical Officers, for example) to introduce ORS therapy in the health centres under their charge.

(3) Overcoming "competition" with antidiarrhoeal drugs such as antibiotics, and/or sulpha drugs, in various combinations, as promoted by the commercial pharmaceutical industry.

(4) Impressing on the parent that ORS is a medicine, not only for the sake of better acceptability, but also to use the opportunity to impress the need for dietary supplementation upon the parent.

(5) Overcoming the problem of stability of the packaged product by the MSD of the Central Government, so that the product will have a longer shelf life and the cost of the finished product can compete with that produced by commercial units. For this purpose, effective manufacturing machines for producing well-sealed ORS need to be installed at the Central Government MSDs.

(6) As a long-term requirement of manufacture, particularly by Government units, assessment of the "off-take" of ORS packages has to be made. A rough estimate can be obtained from the knowledge that in India at least 25 million are born each year, and at least 50 per cent suffer from one episode of diarrhoeal disorder each year, requiring ORS therapy. This data is only a rough estimate without any basis of studies undertaken throughout India.

The above are mentioned to stress the necessity of a packaged ORS with comparatively long shelf life, to avoid overproduction of a product which deteriorates quickly.

5. Report from Indonesia

Diarrhoea is one of the most important public health problems in Indonesia because it is one of the leading causes of disease and death. Longitudinal surveys reveal that the episodes of diarrhoea in a community were 40 per 100 population and most occurred in children under 5 years (70%). About 4% of the children under five with diarrhoea became dehydrated and, if not treated, 60% of them died. Forty per cent of death under 2 years was due to diarrhoea. The etiology of diarrhoea could be identified in only 20% of cases.

It is estimated that, in Indonesia, if no measures are taken, no less than 600,000 children under five will die from diarrhoea annually. About 1,500 persons older than 5 years die from cholera epidemics each year.

A programme to control diarrhoea began in 1969 and was intensified as a rehydration programme from 1974. The distribution and use of ORS is the most important strategy in the programme.

Production and Distribution of Oralite

In the early 1970's, the central government provided ingredients to the health centres. The health centres were expected to prepare the packet of Oralite for their purposes. After one or two months the salts and glucose became wet and spoiled. Since then, the central government has purchased only the pre-packaged Oralite.

There are two types of package, mixed package where all ingredients are mixed together and separated package, where the glucose and salts are put into separate smaller packets. The mixed ingredients type is usually made from aluminium foil and the separate ingredients type is made from polyethylene. There are 200 ml packets and 1 liter packets.

The smaller one is more popular, the larger one usually being used in hospitals when there is an outbreak of diarrhoeal disease.

Since Oralite is considered as being a drug, the ingredients used have to meet Indonesian Pharmacopoeia requirements. This means the ingredients must be of high quality. All ingredients are imported.

The net price of 200 ml Oralite is US $0.07 and of 1 liter US $ 0.15. In the free market the price could be 150-200 per cent of the net price. The FDA of the Ministry of Health and the association of the pharmaceutical companies determine only the highest net price. Through the nutrition programme, UNICEF also provides oralyte, but the total number of aid is still limited. Purchase of the product by the government has been increasing year by year.

Distribution is mainly through the existing health delivery system. After purchase by the central government, it is distributed to the province, which allocates it to the regencies.

The regency is an important place for storing Oralite. It provides rural hospitals and health centres. Where there is primary health care activity, the health centre provides this.

The Regency Health Service usually keeps the product in a store with room temperature and high enough humidity (70-80%). It is usually kept for 3-4 months.

The time span from producer to consumer (Health Centres) is estimated at 6 months. This is very important, because the produce has to be produced with a shelf life of not less than this period.

ORS will be one of the standard drugs in the primary health care kit. It is also available in dispensaries or drug stores for direct purchase by the people. In some places, it is also distributed to village organizations for welfare. Distribution to small shops and stalls is also being considered, along with traditional medicine.

Constraints

Constraints can be divided into technical and management.

Technical:
(a) Stability
(b) Taste (there has been rejection due to the taste)
(c) Packaging (improper or poor sealing)
(d) Psychology (ORS does not stop diarrhoea)

Management:
(a) All ingredients are imported
(b) High price - Indonesia probably has the highest price in the region
(c) Many brand names confuse the people
(d) Existing commercial system - government has to purchase all drugs from the market
(e) Very large area of Indonesia - distribution difficulties increase.

6. Report from Mozambique

Mozambique is in the general situation of the sub-developed countries of Africa. The population is estimated at about 12 millions with a mean density of 14 inhabitants per square kilometre. The population is quite widely spread and big health problems

still exist in the fields of environmental sanitation, safe water supply, the quality and quantity of nutrition, and illiteracy.

A way to resolve these problems and to carry out effective programmes is regrouping of the people. Mozambique is therefore currently promoting development of communal villages, and ways to diminish the differences between cities and rural areas are being considered.

Primary health care is the fundamental preoccupation. Health centres are disseminated throughout the territory. However, the poor economic situation and the few available human and material resources mean that sometimes one centre has responsibility for a very large area. In addition, transport and communications are not good. To solve these problems, 10 centres in rural areas (one by province) have been established to form the Elementary Polivalent Agents (APE).

These are persons from rural areas with four years of primary school, elected and respected by the village people. In the training centre they have six months to learn the basic principles of preventive care, first aid, and primary care for the three or four most frequent diseases (diarrhoea included). The coordination and orientation of the activities of these persons is made by the health centre.

The APE are also the best way to give people health education. They guarantee that information reaches the most remote areas, but the Ministry of Health has, in addition, the facility of a great popular mobilization made by the FRELIMO and the Mass Democratic Organizations (women's organizations, principally). This mobilization was proved to have resulted in the excellent results of the National Vaccination (95% in WHO report) and the increment of latrine use.

We think that we are at the right stage to begin the fight against dehydration deaths with the technical opportunities given by oral rehydration salts. With current conditions in Mozambique it is fundamental that the dehydration treatment be put at the primary health care level.

Our preoccupations are not with technical problems - these can be resolved with more-or-less money. The first consideration is the development of a good programme, giving guaranteed implementation of the generalized use of ORS. This is more difficult since it depends on the programme's capacity to cover all the people; but it is hoped that good conditions exist at the moment for achieving this. This is the reason that Mozambique has requested UNICEF assistance in beginning production of oral rehydration salts.

The ingredients can be available in Mozambique, but a good study of the necessary equipment is essential, bearing in mind the low educational level of the workers.

Mozambique is a great producer of salt and sugar. The plastic packaging would also be possible locally, but, in spite of the extensive bauxite reserves, production of aluminium foil is in doubt.

It is hoped to begin production of ORS in 1981 with the introduction of the pharmaceutical industry localized in the central province of the country. More than one distribution possibility is available. Distribution can be made throughout the country by the Ministry of Health and also the People's Shops Organization and commercial trade.

Concerning health education on the use of ORS, people can be instructed by the APE and the Mozambican Women's Organization under the coordination of the Health Education

Centre of the Ministry of Health. With regard to mass media, only the radio would be effective. However, since the paediatric wards are prepared to admit mothers with their children, the hospitals and health centres will play a big part in health education also.

7. Report from Pakistan

Pakistan has an estimated population of 76,967 million with a birth rate of 42.6 per 1,000. Infants and children up to 5 years of age roughly constitute 18 per cent of the population, i.e., nearly 13.86 million. After eradication of smallpox and near eradication of malaria, diarrhoeal diseases are one of the most important diseases causing morbidity and mortality in the child population.

Recently, the Government of Pakistan undertook local production of ORS with generous assistance from UNICEF. In this connection, a workshop was held on 4 October 1978 at the National Health Laboratories, Islamabad, in which Directors of Health Services of the Provinces, Paediatricians, Officers of the Federal Health Organization and representatives of international agencies such as WHO and UNICEF participated. Their recommendations, briefly, were:

1. National Health Laboratories, Islamabad, would undertake production of ORS with UNICEF assistance for two years. In the first year the production would be 1 million packets, reaching an annual target of 6 millions by the fourth year.

2. Initial production, promotion and distribution will be through the network of the Health Services.

3. Before completion of 2 years' production at the National Health Laboratories, the situation will be reviewed as to whether the Laboratories should have sole responsibility for production and distribution, or whether the private pharmaceutical industry should step in partly or wholly.

4. Orientation courses for doctors, lady health visitors and all other such personnel involved in dispensing ORS to consumers will be held.

5. National Health Laboratories should devise self-explanatory labels on the packets in appropriate national/local languages.

Plans to undertake production by April/May 1979 are proceeding. Necessary machinery, equipment and chemicals, together with auxilliary supplies such as packing material, are being procured through the generous assistance of UNICEF. Machinery and equipment being procured has the capacity to produce 5 million bags per year.

Pharmacists and other auxilliary personnel are being recruited. The pharmacist would be responsible for production and quality control and the product would be subjected to further control tests in the Drugs Control and Research Division of the Laboratories and biological control at the Biological Production Division to check cross-contamination.

Pharmacists and other auxilliary personnel are being recruited. The pharmacist would be responsible for production and quality control and the product would be subjected to further control tests in the Drugs Control and Research Division of the Laboratories and biological control at the Biological Production Division to check cross-contamination.

For promotion of the use of ORS, Provincial Health Directorates and their Health Education Organizations will issue necessary directives to their District Health Officers Health Centers, etc. Full coverage will be given in the mass media such as newspapers, radio, television and cinema slides. This will be done mostly by the Provincial Health Organizations, preferably in their local languages.

Distribution will be the responsibility of the manufacturing unit, i.e., the Biological Production Division in the manner it is done for supply of vaccine therapeutic hyperimmune sera.

There are 53 District Health Officers at each district level which control rural centres, (289) sub-centres of rural health, basic health units, dispensaries, maternity and child health centres (5,850). Besides District Health Officers at each district there is a District Headquarters Hospital headed by a medical superintendent or civil surgeon of the status of a District Health Officer. In cities like Karachi, Lahore, Peshawaré, Rawalpindi, etc., there are many large hospitals which have separate paediatric wards.

The ORS packets will be dispatched to the District Health Officers for further distribution to Rural Health Centres, Sub-Centres of Rural Health, basic health units/dispensaries/MCH centres, lady health visitors and rural health workers and also to medical superintendents of hospitals and civil surgeons of district hospitals.

Pakistan is making a beginning and has to proceed slowly, step-by-step. It is likely that once the benefits of ORS are realized, the private industry will also step in with production, advertisements and marketing practices. However, our supplies will be on a non-profit production cost basis as is being done for vaccines/sera.

8. Report from the Philippines

The efficacy and practicability of the use of oral rehydration salts (ORS) has been extensively discussed. However, the local formulation, manufacture, packaging and distribution of ORS has not been presented. In this regard, factual information collected and based on Philippine conditions follows. It is not impossible to adapt the same technology elsewhere provided utmost care is taken to suit the prevailing conditions.

Production and Packaging

There are different levels of technology in the production of oral rehydration solutions with an indication of the special advantages or disadvantages of each. The two main techniques are:

1. The complete formulation (4 ingredients), contents of the package to be mixed with a measured amount of water.

2. The incomplete formulation (2 ingredients). This is not packaged and the basic ingredients are usually available in the home. This style uses a plastic measuring spoon for sugar and a teaspoon for salt dissolved in a given volume of drinking water.

In the Philippines, the Bureau of Research and Laboratories of the Ministry of Health is the sole producer and distributor of oral rehydration solution which is available by the trade name of ORESOL. It is a complete formulation (4 ingredients) and the package contains the following formula:

Sodium chloride	1.75 g	Sodium bicarbonate	1.25 g
Potassium chloride	0.75 g	Glucose	10.00 g

Each packet has to be dissolved in a half litre of drinking water.

The production unit occupies a small room with seven employees, one of them acting as a supervisor.

The bulk ingredients of salts and sugar are thoroughly mixed manually. These are weighed and finally dispensed into their foil packets.

The average output of the team as of now is about 1500 packets a day and a total of about 250,000 packets were distributed to different health agencies in the Ministry of Health from January to December 1978. Should the demand increase, there is a good potential for increasing the output by mechanizing the mixing, weighing and packaging process. The number of personnel involved could also be increased.

It has been noted that this style of production has its advantages and disadvantages.

Advantages:

1. Availability of ingredients in the country.
2. Easy formulation from bulk mixed or individual ingredient.
3. Flexibility of production for immediate use.
4. Provision of employment.
5. No sophisticated machinery needed.
6. Acceptable to people as the packets give an "aura of medicine".
7. Long and safe shelf life.

Disadvantages:

1. The current tin foil packets being used are not compartmentalized, one compartment for sugar and the other compartment for the salt components. Studies on shelf life conducted by the office have shown that glucose mixed with the salt components causes early brownish discolouration of the mixture while the packets where the glucose is separated improve the keeping quality of the mixture.
2. It is relatively more expensive especially because of the cost of the tin foil packet.
3. There is a need for quality control testing for all lots produced.
4. The output is low as production is done manually; this can be remedied by the employment of automation which is used by some commercial drug manufacturing companies.

Distribution

The Oresol packets are packed in separate plastic bags of 500 packets and each placed in a carton box for storage. The distribution is made through the different regional health offices of the Ministry of Health which in turn issue them to the provincial health officers. The latter take care of the distribution to the rural health physicians and down the line to the local Oresol distributors who may be a midwife, a barangay chief, or a local (sari-sari) store owner for the locality who gives them out to the end-users.

Current knowledge and practice indicate that a number of important factors are necessary if oral rehydration fluid is to achieve its popularity and effectiveness.

These factors can be summarized as follows:

Availability: The packaged preparation should be available at the community level at all times.

Acceptability: A product is only as good as when it is readily acceptable to the community. Hence, it is very important that health education be extensively used to promote ORS and thereby secure its acceptability.

Economical: The ORS packet should be cheap and within the means of everyone.

Long shelf life: The formulation should be stable and should have a long storage life without losing its effectiveness.

Report from Thailand

Production: The Government Pharmaceutical Organization began producing Oral Rehydration Salts according to UNICEF requirements since 1977 by using the formula per sachet as follows:

Sodium chloride	3.5 g	Sodium Bicarbonate	2.5 g
Potassium chloride	1.5 g	Glucose	20.0 g*
Total Weight	27.5 g		

*Dextrose Monohydrate

Packed in aluminium foil - one sachet per 1 liter of drinking water

Availability of Ingredients: Sodium chloride can be produced by the Government Pharmaceutical Organization (GPO) and glucose by local manufacturers. All ingredients have British Pharmacopoeia standards. Potassium chloride and sodium bicarbonate are imported.

Quality control = of raw material, in-process and of finished product
Price = US $ 0.10 per sachet

ORS is only produced locally by the government. There is no private manufacture.

The sachets of thick aluminium foil are produced locally and the capacity of the GPO to produce is 5,000 sachets per day. The pharmacists are in charge of production, control and packing.

Supply: The GPO meets the ORS requirements of UNICEF and the Department of Communicable Diseases Control of the Ministry of Public Health. Annual distribution is 250,000 sachets

Distribution:

1.	GPO	to UNICEF
2.	Health Department	to Rural Health Centres
3.	Communicable Disease Control	to village health volunteers in each village

Packing: GPO uses aluminium foil for packing using a machine for adjusted weight.

Constraint: Shelf life; some batches change colour or bags inflate.

National Public Health Programme: The Ministry of Public Health of Thailand has planned that rehydration treatment in diarrhoeal diseases control should be one of the most important projects in primary health care, with the following objectives:

1. To reduce the morbidity and mortality from diarrhoeal diseases in the remote areas.

2. To promote the policy of stimulating people in rural areas to cooperate with the government health care services by using volunteers in each village. The operation of this project started by training public health volunteers in 20 Thailand provinces in the knowledge of how to present the ORP and then their use for people in remote areas of their provinces.

Proposed strategy for the delivery of ORS by the Ministry of Public Health:

1. Supply ORS to Government Hospitals, Health Centres (3,000 throughout the Kingdom).

2. Train village health volunteers and health communicators in the knowledge of how to present ORS and use them.

3. Production of simple handbook giving instructions on the use of ORS.

4. Changing the unit responsible for the control of cholera into a unit for the control of diarrhoeal diseases.

5. Training doctors, especially in remote areas, in the use of ORS.

6. Providing health education to the people.

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ANNEX M

COST EFFECTIVENESS OF PROGRAMS TO COMBAT COMMUNICABLE CHILDHOOD DISEASES IN KENYA

BY

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INTRODUCTION AND SUMMARY

This report gives a comparison of the estimated cost per case and death prevented for several alternative programs, either existing or hypothetical, to combat communicable childhood diseases in Kenya. While there are other interventions that might be considered that are potentially effective in reducing morbidity and fatality from contagious diseases the report concentrates on immunization, oral rehydration and low technology water programs because previous experience with these programs has indicated that they are either low in unit cost or potentially highly effective means of reducing the impact of communicable diseases. The report is intended to provide a representative analysis of programs in a specific sub-Saharan country as an aid in the formulation of a larger project for sub-Saharan Africa. It is, however, obvious that the diversity of Africa prevents unrestrained extrapolation from experience in a specific country and the results of this study must be used cautiously to draw parallels for all of sub-Saharan Africa. Kenya was chosen for the analysis because several published studies give epidemiological information related to the incidence of immunizable childhood diseases and diarrhea in rural Kenya. Also, the Kenyan ministry of Health and DANIDA have completed a report[1] outlining the design of the ongoing childhood

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1 Republic of Kenya, Ministry of Health and DANIDA, Appraisal Report on The Expanded Programme on Immunization (EPI), November 1978.

immunization program for Kenya and giving details of donor costs.

Several caveats must be made. First, to enable the estimation of cases and deaths prevented it was necessary to extrapolate from studies for specific regions in Kenya (or, in some cases, from studies for other countries) to the entire country. Second, although donor costs for immunization were available in detail, domestic costs had to be estimated by anology with other programs. Third, the cost of the low technology water program was estimated on the basis of a study made in Tanzania and is, therefore, only an approximation of the cost of implementing a comparable program in Kenya. Fourth, because there are no large scale operational programs to provide background data, the cost and impact of an oral rehydration program are based on tenuous assumptions concerning the required frequency of treatment, cost of materials and effectiveness of treatment. For all of these reasons the results of the study are speculative and must be applied cautiously.

The first section of the report estimates the impact and costs of the ongoing MOH/DANIDA program of immunization against childhood diseases. This section is intended to provide information that allows not only a comparison of the cost effectiveness of immunization with alternative interventions but also answers questions about the organization of the immunization program itself, such as: "Is it cost effective to immunize the backlog of non-vaccinated children during the beginning stages of an immunization program or would it be more efficient to limit the program to chil-

dren in the first year of life?" and "Given the low incidence of paralytic polio, is it cost effective to include polio immunization in the program?" The second section gives estimates of the cost and effects on childhood diarrhea of a low technology water program. The third section discusses a potential oral rehydration program. The final section of the report compares the cost effectiveness of the interventions discussed in the preceeding sections and draws tentative conclusions.

The report finds that polio immunization is highly cost ineffective (given the estimated level of incidence) in comparison with other immunizations and oral rehydration. It is also estimated that oral rehydration is more cost effective than the DPT and BCG immunizations of the backlog of previously unimmunized children over one (1) year in the initial stages of the immunization program. Oral rehydration is especially cost effective when considered as added to an ongoing program of child health services. These findings are tempered by the knowledge that estimates of the cost effectiveness of immunizations are based on more firmly established assumed levels of effectiveness than are the alternative non immunization programs.

I. IMMUNIZATION

The immunization program for Kenya involves the delivery of BCG vaccination at birth or first contact with the child, DPT and

oral polio in three visits during the first year, measles vaccination after eight months of age and tetanus toxoid for pregnant women in two shots, four weeks apart, early in the pregnancy. Access[1] to the program is limited during the first years of the program but the number of districts in the program is to be expanded rapidly over the planning period, 1979 to 1985, to include the entire population by the final year. Coverage[2] in the included districts is planned to increase from 75% in the first three program years to 80% thereafter. Table 1 summarizes the expansion of the program over the seven year planning period. The table distinguishes between the coverage of the backlog of unimmunized children in the 0-4 year age group during the implementation period and the coverage of new births in the programs maintenance phase. During the early years of the program the preponderance of children are covered in the implementation phase but towards the end of the program the majority of immunizations are carried out in the maintenance phase of the program.

A. Effectiveness of Immunization

An estimate of the number of cases and deaths prevented by the immunization program is made by following immunized

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1 Access refers to population living within a reasonable distance of a point of delivery of the program service.

2 Coverage refers to population with access actually receiving the program service.

population cohorts over the life of the vaccine under consideration. After adjusting for attrition to the population cohort through other causes, the number of cases and deaths that would have occurred in the absence of the vaccine and attributable to the disease in question is calculated from the estimates of the disease incidence and case fatality rates given in table 2. The estimated cases and deaths prevented are based only on the direct effects of the vaccine and omit the effects of extended community protection as a result of reduced transmission. The estimates assume that the trends of disease are constant. Also, no adjustment has been made for a possible decrease in vaccine efficacy due to malnutrition. The estimates are conservative because the effects of protection beyond the early childhood years has not been calculated; nor has the effect of tetanus toxoid on maternal mortality been included.

The estimate of the effect of the total immunization program, given in table 3, is that the program will prevent a total of 205874 deaths. Broken into program components it is estimated that 73943 deaths are prevented by the implementation (children less than five not previously immunized) phase and 131931 deaths by the maintenance (new births) phase of the program.[1] Also, 45559 deaths are predicted to

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1 The number of deaths prevented by DPT, BCG immunizations in the maintenance phase is 13925.

be prevented by the tetanus toxoid, BCG and DPT components; 158702 deaths are predicted to be prevented by the measles immunizations and 1613 deaths prevented from polio immuni zation.

B. Program Costs

Program costs, broken down by type of immunization and implementation and maintenance phases of the project, are given in table 4. The costs for the total program, given in the MOH/DANIDA report, were used to construct the hypothetical costs if the various immunizations were delivered in independent projects. To do this, the costs of operating independent programs were obtained by estimating the proportion of total expenditures in each of the expenditure categories in table 4 that would be needed for the separate programs. Thus, the entire costs of the cold chain is included in all separate programs but vaccine costs, syringes and needles are broken into components directly related to the number of immunizations in each of the individual programs.

Of the cost information in the eight expenditure categories, the first six are taken from the donor cost projections for DANIDA and UNICEF given in the MOH/DANIDA report. The capitol costs (primarily vehicles and cold chain) represent annual depreciation assuming a life of seven years. The final two cost categories, which constitute the domestic

recurrent costs of the program, are rough approximations and depend on the assumption that the ministry of health domestic costs for personnel, overhead and other health delivery expenditures will be 21.2 K.shs. per fully immunized child.[1] Of this, twenty percent is assumed to be required for administrative overhead. The apportionment of domestic recurrent costs over the program categories is made on the basis of the number of visits required and arbitrary assumptions about the relative amount of time needed to deliver the service in each type of program.[2]

The total estimated cost of the entire program is 132 million K.sh. ($17.6 million) of which 35 million K.sh. ($4.7 million dollars) is the value of donor supplied inputs after subtracting the residual value of capital at the end of the seven year period. The cost per fully immunized child is 29 K.sh. ($3.87).

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1 Calculated by implication from an MOH/DANIDA estimate of the unit cost of immunization. MOH/DANIDA Report, Op. cit.

2 It is assumed that DPT, TT, BCG and Polio together require three times the number of visits needed for measles vaccination alone and involve 75% of the total domestic variable expenses (or 57,914,000 K.sh). Of this amount 10% (5,792,000 K.sh) is the marginal costs of adding polio. However, if polio were to be delivered separately, the three needed visits would require 80% of the recurrent domestic costs needed for delivering DPT,TT, BCG and Polio in the larger program. Similar assumptions were used to apportion the contingency category.

C. Cost Effectiveness of Alternative Immunization Programs

The costs per case and death prevented for the alternative programs singled out for analysis are given in table 5. The values in the table were obtained by dividing the costs for each program, as given in table 4, by the appropriate number of cases and deaths calculated from the results given in table 3.

The analysis reveals that the cost per case and death prevented by the entire program is $85. It is also estimated that the cost per death prevented by adding the immunization of children over one year of age in the implementation phase is 60 percent greater than the cost per death prevented from the immunization of new births only. While the absolute difference in cost is not great (the cost per death prevented for a new birth program only is $70; the cost per death prevented by adding the implementation phase to a new birth program is $113) the cost differential does imply that, if financial restraints limited the adoption of the entire program it would be more cost effective to concentrate on immunization of newborns for a larger area rather than the addition of an immunization program for older children to an existing newborn program for a smaller area. This result is attributable to the higher attack rates and case fatality rates, for many of the diseases, in the first year of life.

Looking at the separate immunizations it can be seen that the measles immunization is the most significant component of the total program and, at $50 per death prevented would be highly cost effective even if it were necessary to carry it out as a separate program. DPT, TT and BCG[1] together are somewhat costly (at $274 per death prevented) as a separate program but are highly cost effective (at $69 per death prevented) as a component of the total program.

In contrast polio immunization, even when considered as marginal (that is, as an added program) cost almost twenty times more ($114) per case prevented and seven times more ($568) per death prevented than the overall program. It should be noted that this result is highly dependent on the low attack rate for polio and the arbitrary assignment of domestic recurrent cost in table 4. If the true attack rate is significantly underestimated or the additional personnel time and other recurrent costs are greatly overestimated the actual cost effectiveness of polio immunization would be greater. But, as calculated, the high cost of polio immunization per unit of effectiveness encourages a search

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1 Given the assumed low attack rate for tuberculosis it is possible that the BCG component is relatively expensive per unit of effect. In addition a recent article reports new information that throws doubt on the efficacy of BCG in the prevention of tuberculosis. However, the especially poor quality of the information on the costs and attack and case fatality rates associated with the BCG immunization precluded a separate analysis.

for alternative, more cost effective interventions.

II. COMMUNITY WATER PROJECT

In this section the hypothetical cost effectiveness of a low technology water supply project is estimated for a community of 10000.

A. Costs

The cost estimates are based on a 1975 study carried out in the Lushoto district of Tanzania.[1] The project chosen is apt to be fairly typical of a project for a rural population in areas of Kenya. Previous to the project the water supply was a river downstream from other nearby towns. The new water supply source relies on boreholes. The capital costs of the project include the costs of the boreholes, pipe, tanks and one tap per 200 population. Other costs include transportation, the value of self help labor and outside labor. Correcting for differences in exchange rates and changes in the level of prices[2] the total annual cost[3] of

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1 G. Tschannerl and M.R. Mujwahuz: Impact of Rural Water Supply: Eight Self Help Schemes, University of Dar es Salaam, Bureau of Land Use Planning, Research Paper No. 37, May 1975.

2 The price indices are taken from, Bank of Tanzania, Economic Bulletin, Vol. X, No. 3, December 1978.

3 The total initial expenditure including the costs of capital is estimated to be $33204. Using an interest rate of .15 and an assumed life of seven years, the annualized cost is $6973.

providing public fountains within a short walk of each household in a community of 10000 is estimated to be $7000.

B. Effects

The projected effects of the water project are based on the case incidence and case fatality rates given in table 6. The effect of public water taps and an adequate quantity of water in a community previously lacking an adequate source of water is estimated to be a fifteen percent reduction in diarrhea in all age groups from birth through five years. This estimate is based on the concensus of opinion among a small group of international health experts.[1] The estimate is not based on objective evidence and, therefore, the estimates of cases and deaths prevented by the provision of a public water supply are made with less confidence than in the estimation of vaccine effects.

Multiplying the population in each age group times the case incidence rate times the expected percentage reduction gives an estimate of the number of cases prevented in children less than five in a community of 10000 people. The case fatality rate can then be applied to get an estimate of the number of deaths prevented. Using this procedure,

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1 See, H. Barnum, R. Barlow, L. Fajardo and A. Praddilla, A Resource Allocation Model for Childhood Survival, report to USAID/Office of Health, June 1979, Chapter V.

it is estimated that the total number of cases prevented in a community of 10000 among children 0-5 is 544 per year (table 7). The number of child deaths prevented is estimated to be, approximately, five per year.

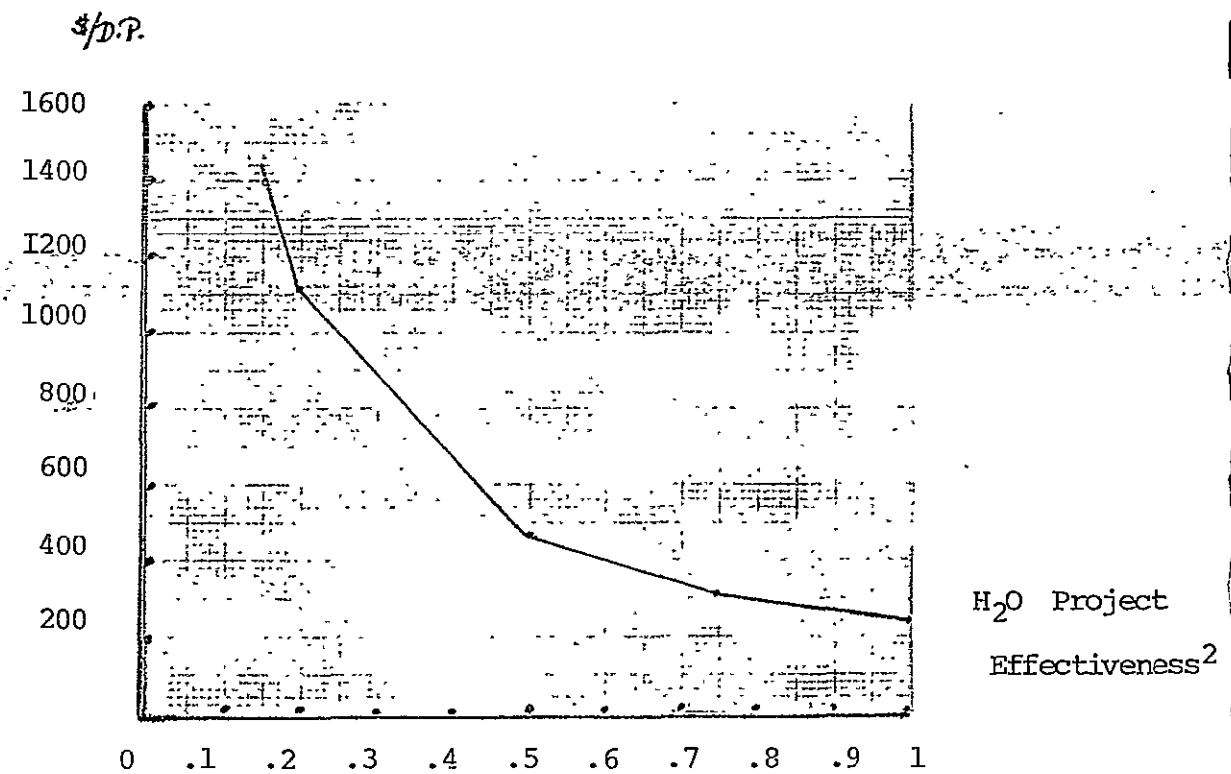
C. Cost Effectiveness of the Hypothetical Water Supply Project

Based on the costs and effects calculated above the cost per case prevented in children 0-5 is $13 and the cost per child death prevented is $1400. Because the assumed level of effectiveness was determined subjectively and may be unrealistically low it is useful to calculate the cost per death prevented for other levels of effectiveness. Figure one given the cost per death prevented (on the vertical axis) by a low technology water supply project as a function of the level of effectiveness (on the horizontal axis). The graph shows, for example, that the cost effectiveness of the water intervention would increase to $475 per death prevented if the effectiveness of the intervention in reducing diarrhea were fifty percent.

Although the cost per death prevented, at reasonable levels of effectiveness, appears high it should be noted that the provision of adequate water would have effects on morbidity and mortality in older age groups as well as children. Thus, assigning all of the project costs to the effects

FIGURE ONE

COSTS PER DEATH PREVENTED[1] BY A HYPOTHETICAL WATER PROJECT AS A FUNCTION OF THE LEVEL OF EFFECTIVENESS



1 In children 0-4 years of age.

2 Effectiveness is measured as the proportional reduction in the incidence of diarrhea.

on children alone underestimates the program's overall cost effectiveness.

III. ORAL REHYDRATION (HOME THERAPY)

This section considers the cost effectiveness of a program of oral rehydration for children suffering from diarrhea. Several studies have shown that a glucose electrolyte solution can be taken orally and absorbed by children threatened with dehydration from diarrhea. Many of the studies were carried out in clinical trials but the evidence is growing that the solution is effective when administered by the mother in home therapy. There is, however, experience to date with large scale rehydration programs and there is no reliable data on the cost and effects of a large scale home therapy program in rural Africa. The estimates for the hypothetical program for Kenya considered here are conjectural.

The estimates are made under the assumption that the program would grow, in terms of the proportion of total children having access to the service, at the same rate as planned for the Kenyan immunization program. (See column 1 of table 1).

A. Costs

Two alternative estimates of costs are made. The first estimate gives the cost of mounting a separate, independent, rehydration program not drawing on personnel time or admini-

strative expenses of the immunization program. The second estimate gives the cost of adding oral rehydration as part of an integrated child health program including immunization. In this case the instruction and motivation of the mother in the use of oral rehydration therapy would be given at the same time as a visit for immunization.

Table 8 gives the estimates of the cost of an oral rehydration program under the two alternatives. The costs are approximated in each expenditure category by comparing the probable requirements of the hypothetical oral rehydration program with the requirements for the immunization program. It is assumed that the personnel time required for explanation of the use of the electrolyte solution in the home, motivation of the mother and distribution of the packets would approximately equal the time required for an independent measles program. The footnotes to table 8 explain the estimates in the individual categories.

B. Effects

Calculation of the number of deaths prevented by an oral rehydration program is based on the case incidence and case fatality rates listed in table 6. The program would cover eighty percent of children between birth and four years of age in districts with access to the program. The effectiveness of home administered oral rehydration is difficult to predict

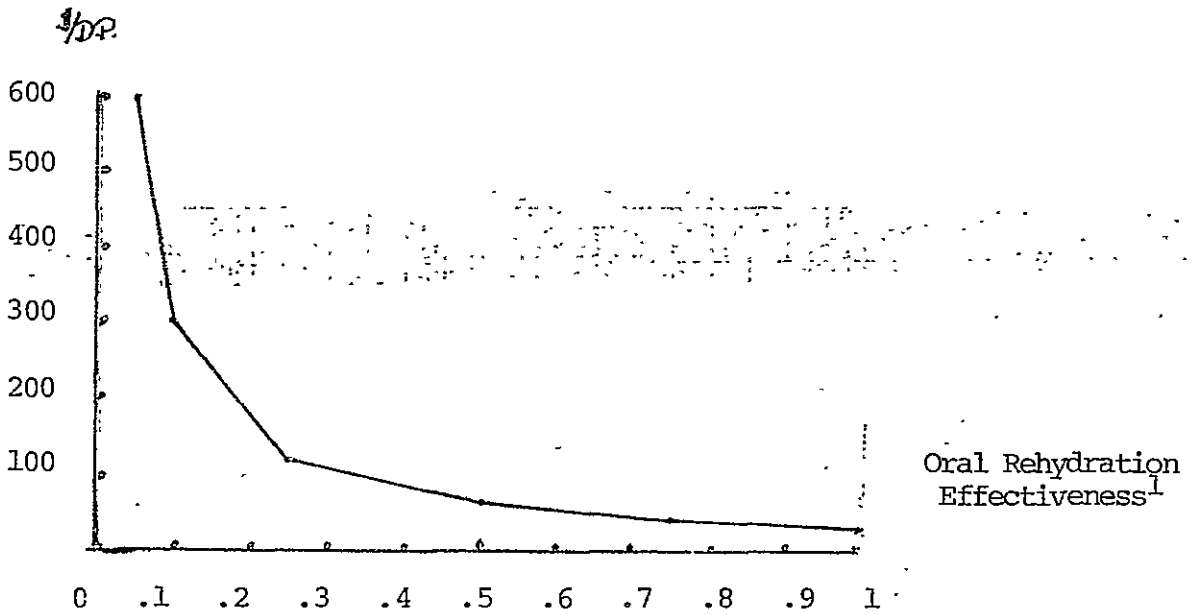
because of the many factors, such as water quality and the timing and control of quantities administered, that, in home therapy, may vary greatly from clinic conditions. However, taking twenty five percent as a conservative estimate of the reduction in the case fatality rate for children receiving home therapy versus no therapy at all, then 37928 deaths would be prevented by the hypothetical oral rehydration program over the first seven project years.

C. Cost Effectiveness of Oral Rehydration in Home Therapy

Given the costs and effects estimated above it can be calculated that with an effectiveness of .25 the cost per death prevented by an independent oral rehydration would be ($147) and for the "added" program the cost per death prevented would be ($122). Because .25 is not a well established figure - in clinical tests the indicated effectiveness is much higher and in home therapy under adverse conditions the effectiveness may be lower - the cost effectiveness of oral rehydration under alternative degrees of effectiveness is given in the form of a graph in figure 2. The cost per death prevented by the oral rehydration program can be read off of the vertical axis for a chosen level of effectiveness indicated on the horizontal axis.

FIGURE TWO

COSTS PER DEATH PREVENTED BY A HYPOTHETICAL HOME THERAPY ORAL REHYDRATION PROJECT AS A FUNCTION OF EFFECTIVENESS



1 Effectiveness is measured as the proportional reduction in the case fatality rate versus no treatment.

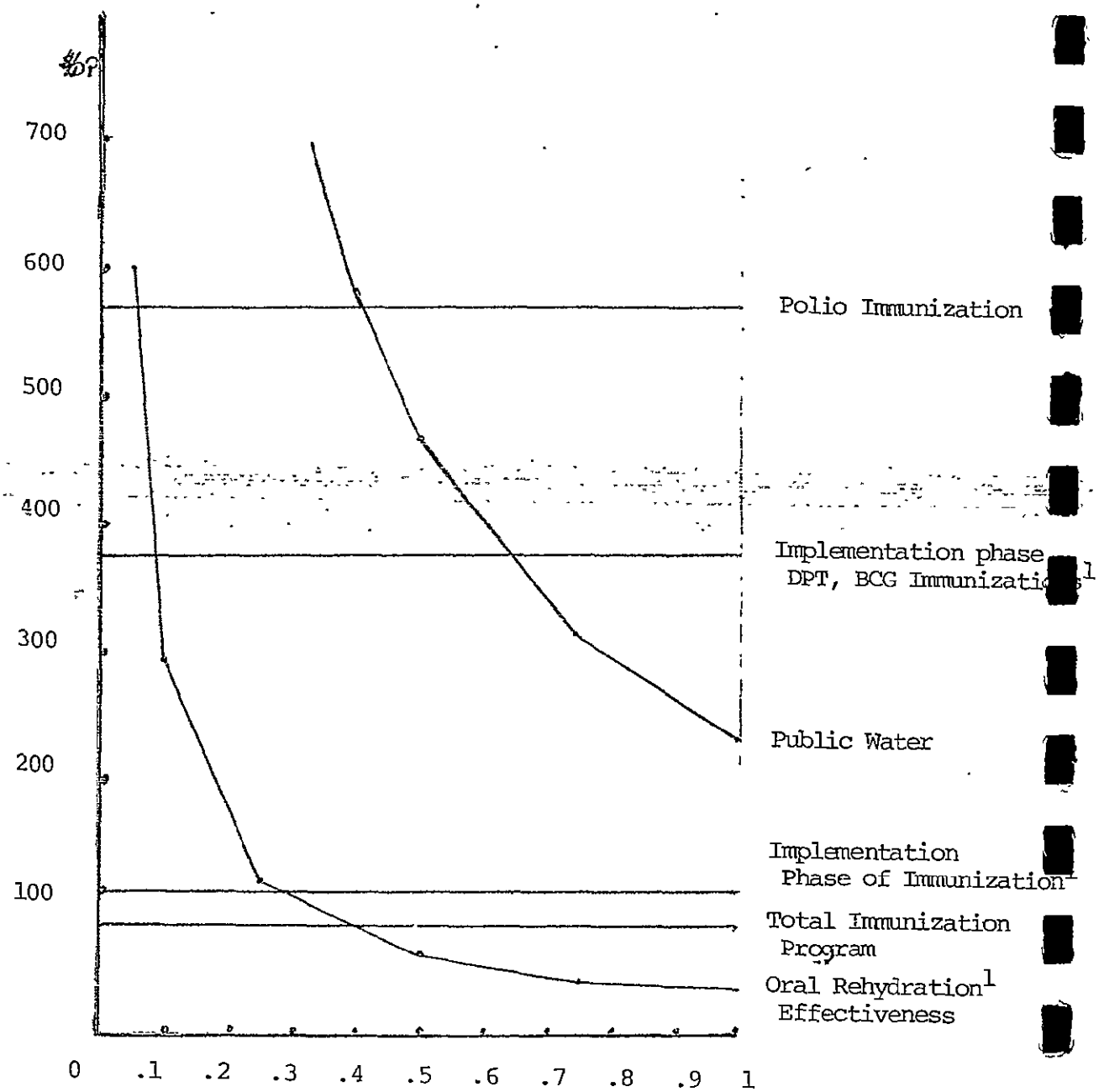
IV. COST EFFECTIVENESS COMPARISON

To allow a comparison of the alternative programs figure 3 provides, graphically, a summary of the calculations of the cost per death prevented in the previous three sections of the report. Because the efficacy of the program is not well established the cost effectiveness of the oral rehydration and the community water project are presented as functions of their respective levels of effectiveness. The efficacy of immunizations is more firmly established and the costs per death prevented are given as calculated at the fixed levels of effectiveness used in section 1 above.

Both polio immunizations and community water projects are much less cost effective, as measures to reduce child mortality, then are the other immunizations or oral rehydration. At a .25 level of effectiveness oral rehydration is a more efficient use of funds to reduce child deaths than water projects at any level of effectiveness and is approximately $500 less per child death prevented than polio immunization. At a level of effectiveness above .1 the addition of oral rehydration to an immunization project is more efficient than the DPT, BCG immunization of children 1-4 in the implementation phase of the project (measle immunization is highly cost effective in both program phases); and, if the level of effectiveness of oral rehydration in home therapy is greater than .4 the cost per death prevented through the integrated pro-

FIGURE THREE

COMPARISON OF THE COST EFFECTIVENESS OF A PUBLIC WATER PROJECT AND ORAL REHYDRATION PROGRAM WITH SELECTED IMMUNIZATIONS



1 Considered as added to an ongoing immunization program.

gram (immunization plus oral rehydration) will be less than for the total immunization program separately.

An implication of the above analysis is that a careful study needs to be made of the incidence of polio before including as a program component. A second implication is that oral rehydration administered in home therapy may be a justifiable alternative use of funds to polio immunization or, if the effectiveness of oral rehydration is high enough, to the immunization of children over one year of age with DPT, BCG in the implementation phase of the program.

These results should be taken as provocative rather than as definitive. If the case incidence of polio has been underestimated or the marginal cost of adding polio, overestimated, than polio immunization may be more competitive. Also, it should be noted that there is more uncertainty in the calculation of the effects of the non immunization programs. Until the effectiveness of oral rehydration in home therapy is known with more certainty it may be rational to allocate funds first to immunizations, including the implementation phase with DPT, because of the more certain outcome.

TABLE 1

ESTIMATED COVERAGE OF THE IMMUNIZATION PROGRAM IN KENYA
(1979 - 1984)
(000's)

YEAR	Proportion of Total Population Living in Included Districts[1]	Number of children Living in Included Districts[2]		Children to be covered during implementation phase[3] (Age 0-4)	Children to be covered during maintenance phase[3] (Newborn)	Total Children Covered
		Age 0-4 Not pre Immunized	Newborn			
1979	.02	60	0	45	0	45
1980	.10	251	16	188	12	200
1981	.34	764	80	573	60	633
1982	.56	701	265	563	212	775
1983	.75	641	460	513	368	881
1984	.98	800	655	640	524	1164
1985	1.00	170	900	136	719	855
	TOTAL	3390	2376	2658	1895	4553

1 Derived by comparing Table 7 of the MOH/DANIDA report (cited earlier) with projected population for Kenya 1979-1985 (assuming a 2.8% population growth rate).

2 By implication from Table 8, MOH/DANIDA report.

3 Assumes .75 coverage during the first three program years and .80 thereafter.

TABLE 2

SUMMARY OF ASSUMPTIONS USED IN THE CALCULATION OF CASES AND DEATHS PREVENTED

AGE	Probability of Surviving One Year	ATTACK RATE						CASE FATALITY RATE					
		D.[1]	P.[2]	T.[3]	BCG[4]	PO.[5]	ME.[6]	D.[1]	P.[2]	T.[3]	BCG[4]	PO.[5]	ME.[6]
0	.880	.0005	.158	.012	.0015	.00061	.147	.2	.032	.6	.2	.101	.064
1	.976	.002	.097	.003	.0015	.00066	.255	.2	.014	.2	.2	.183	.118
2	.976	.001	.139	.003	.0015	.00065	.156	.2	.016	.2	.2	.224	.064
3	.976	.001	.152	.002	.0015	.00067	.152	.1	.008	.2	.2	.224	.042
4	.976	.001	.137	.002	.0015	.00043	.090	.1	.018	.2	.2	.224	.073

TABLE 2 (continued)

FOOTNOTES

1 Data for Kenya were not available. These estimates are roughly consistent with Bassett and Hadler (Sudan), Diop Mar, Sow and Rey (Senegal) and the assumptions used in Barnum, Tarantola and Setiady (Indonesia).

2 J.M. Mahieu, A.S. Muller, A.M. Voorhoeve and H. Dikken (Kenya).

3 Based on Bassett and Hadler (Sudan), Case fatality rates are as used in Barnum, Tarantola, Setiady (Indonesia).

4 Estimated from a statement in the MOH/DANIDA report (Kenya) that .03 of children aged 0-4 are tuberculin positive. It is assumed that .05 of children who are positive develop the disease. This is an especially weak estimate and for this reason the cost and effect of BCG immunization has not been broken out for separate analysis in the text. The case fatality fate is as used in a WHO report for Rwanda.

5 B.K. Nottay and D. Metselaar estimate that the attack rate per 100,000 in Kenya is approximately 12. Information in Nottay and Metselaar together with data in Bassett and Hadler (Sudan) permitted the construction of a hypothetical distribution of polio over age groups 0 through 4. (.23, .22, .21, .21 and .13 respectively). Assuming that all of the 12 cases per 100,000 occur at less than five years and deriving the population age distribution for Kenya from a model life table it is possible to estimate the attack rate. Case fatality rates are based on data in Bassett and Hadler (Sudan).

6 The estimates are based on the age distribution of measles cases given in Voorhoeve et al (Kenya) and the assumption that .80 of all children will have measles by the end of the 5th year. The estimates in Voorhoeve et al show approximately 50% of all children having measles by the end of year five. This estimate was felt to be conservative and the attack rates in Voorhoeve were adjusted upward to give the 80% figure. The case fatality rates are as given in Voorhoeve.

TABLE 2 (continued)

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TABLE 3.

POTENTIAL NUMBER OF CASES AND DEATHS PREVENTED BY THE IMMUNIZATION PROGRAM

YEAR	DIPHTHERIA		PERTUSSIS		TETANUS		TUBERCULOSIS		POLIO		MEASLES		TOTAL	
	C	D	C	D	C	D	C	D	C	D	C	D	C	D
1979-80	43	7	3780	52	86	17	34	7	21	4	6979	567	10943	654
1980-81	209	33	19490	281	527	149	175	35	107	22	35139	2727	55647	3247
1981-82	705	111	66435	972	1938	606	603	121	366	75	119702	9191	189749	11076
1982-83	1253	195	124268	1959	4795	1926	1019	204	704	138	195374	14261	327413	18683
1983-84	1817	288	173201	2812	7471	3172	1393	279	1011	192	272166	20568	457059	27311
1984-85	2555	416	236910	3916	10570	4503	1880	376	1406	265	375427	29299	628748	38775
1985-86	2688	445	252803	4325	12912	5865	2029	406	1549	283	408563	31453	680544	42777
1986-87	2588	425	215511	2974	5033	1006	1568	314	1206	254	337471	28684	563377	33657
1987-88	1495	209	179056	2512	3577	715	1180	236	879	198	201068	11740	387255	15610
1988-89	1011	101	123884	1496	2022	404	798	159	572	128	126542	6536	254829	8824
1989-90	560	56	64562	1162	1119	223	442	89	241	54	50365	3676	117289	5260
TOTAL	14924	2286	1459900	22461	50050	18586	11121	2226	8062	1613	2128796	158702	3672853	205874
TOTAL (only newbirth)	8536	1411	787633	13051	36697	15919	6252	1253	4760	889	1272432	99408	2116310	131931
TOTAL (only implementation)	6388	875	672267	9410	13353	2667	4869	973	3302	724	856364	59294	1556543	73943

(TOTAL - DPT, BCG in implementation phase 696877 cases, 13925 deaths)

TABLE 4

COST BREAKDOWN BY TYPE OF IMMUNIZATION PROGRAM
(000's of K. sh.)

COST CATEGORY	TOTAL PROGRAM (Col.1)	DPT, TT, & BCG Only (Col.2)	MEASLES Only (Col.3)	POLIO Only (Col.4)	DPT, TT, & BCG Marginal (Col.5)	MEASLES Marginal (Col.6)	POLIO Marginal (Col.7)	NEW BIRTHS Only (Col.8)	IMPLEMENTATION IMMUNIZATION Marginal (Col.9)	IMPLEMENTATION IMMUNIZATION Marginal (DPT, BCG) (Col.10)
DANIDA, UNICEF										
Dep. on Vehicles, Transportation	3141	3141	1571	3141	-	-	-	3141	-	-
Dep. on Other capital exp.	1047	1047	1047	1047	-	-	-	1047	-	-
Syringes, Needles	2030	2030	-	-	2030	-	-	792	1238	1238
Vaccine	19538	8590	10653	295	8590	10653	295	7620	11918	5240
Contingencies	3719	1525	1413	781	1525	1413	781	1450	2269	930
Other Equip. & Sup.	6000	6000	6000	6000	-	-	-	6000	-	-
MOH/KENYA										
Adm. Overhead	19305	19305	19305	19305	-	-	-	19305	-	-
Other variable exp. (personnel)	77219	52125	19302	46333	11584	19302	5792	30115	47104	31797
TOTAL	131999	93763	59291	76902	23729	31368	6868	69470	62529	39205

$$\text{Col.10} = \frac{\text{Col.2}}{\text{Col.1}} \times \text{Col.9}$$

TABLE 5

COST EFFECTIVENESS OF POSSIBLE IMMUNIZATION PROGRAMS FOR KENYA

PROGRAM DESCRIPTION	COST 000's of K. sh.	COST PER CASE PREVENTED K.sh. ($)	COST PER DEATH PREVENTED K. sh. ($)
1. Total Program	131999	36 ($4.8)	641 ($85)
2. DPT, TT, BCG only	93763	61 ($8.1)	2058 ($274)
3. Measles only	59291	28 ($3.7)	374 ($50)
4. Polio only	76902	9539 ($1272)	47676 ($6357)
5. DPT, TT, BCG as marginal program	23729	15 ($2)	521 ($69)
6. Measles as marginal program	31368	15 ($2)	198 ($26)
7. Polio as marginal program	6868	852 ($114)	4258 ($568)
8. New Births only	69470	33 ($4.4)	527 ($70)
9. Implementation marginal (ALL IMMUNIZATIONS)	62529	40 ($5.3)	846 ($113)
10. Implementation marginal (DPT,BCG, Polio)	39205	56 ($7.5)	2815 ($375)

TABLE 6

SUMMARY OF INFORMATION NEEDED TO CALCULATE CASES AND DEATHS PREVENTED FROM DIARRHEA CONTROL

AGE	Number of children per 10000 total pop. (Col.1)	Mortality Rate from All Causes[1] (Col.2)	Proportion of Mortality Attributable to Diarrhea[2] (Col.3)	Mortality Rate Attributable to Diarrhea[3] (Col.4)	Cases per Year per Person[4] (Col.5)	Implied Case Fatality Rate[5] (Col.6)
0	453	.120	.33	.03	4.2	.01
1	398	.030	.40	.012	1.8	.007
2	386	.024	.25	.0075	.9	.006
3	376	.024	.25	.0075	.9	.006
4	367	.024	.25	.005	.9	.006

TABLE 6 (continued)

FOOTNOTES

1 By assumption based on reported infant mortality rate and life table; U.S. Department of Commerce, Country Demographic Profiles, KENYA, January 1978.

2 Approximated by reference to data in Puffer and Serrano, Patterns of Mortality in Childhood, PAHO, 1973. Although the Puffer and Serrano study was of Western Hemisphere countries, the importance of diarrhea as a leading cause of death was consistent over a large number of countries throughout South America. Their findings are also consistent with less comprehensive studies of the causes of childhood mortality in Africa and are likely to be valid for any communities with high levels of infant and child mortality and limited water and sanitation facilities.

3 Col.4 = Col.2 X Col.3

4 From an extrapolation of the case rates per 2 week interval as reported in J. Leeuwenburg et al, 1978, "Machakos Project Studies: Agents affecting health of mother and child in a rural area of Kenya: The incidence of diarrhoeal disease in the under-five population." Tropical and Geographical Medicine. 30:3, p383-391.

5 Col.6 = Col.4 ÷ Col.5

TABLE 7

COST EFFECTIVENESS OF A HYPOTHETICAL WATER PROJECT IN THE PREVENTION OF CHILDHOOD DIARRHEA

1. Cost for a community of 10000.	$ 7000
2. Number of Cases Prevented per Year.[1]	544
3. Number of Deaths Prevented per Year.[1]	5
4. Cost per Case Prevented	$ 13
5. Cost per Death Prevented	$ 1400

[1] In children 0-4 years of age. Assuming an efficacy of .15.

TABLE 8

THE COST OF A HYPOTHETICAL ORAL REHYDRATION PROGRAM FOR KENYA

000's K.sh. (000's $)

COST CATEGORY	Independent Program	The Program Considered as "added" or marginal
Vehicles[1]	1600	-
Packets[2]	14000	14000
Other Equipment and Training[3]	1500	1500
Contingencies[4]	1700	1400
Administrative Expenses[5]	5000	-
Personnel[6]	18000	18000
TOTAL COSTS	41800 ($5573)	34900 ($4653)

TABLE 8 (continued)

FOOTNOTES

1 Assumed the same as the transportation cost for an independent measles program.

2 The cost of a packet is $.10. Two packets are needed per episode. The cost per episode is $.20.

Based on the case incidence estimates for diarrhea in table it is estimate that there will be 18,290,000 cases over the seven years of the project life. It is assumed that half of the cases will require treatment. Therefore the total cost of the required packets is :

$.20 X 18,290,000 X .5 = $1,820,000

Using an exchange rate of 7.5 K.sh. = $1 the cost of packets is 13,718,000 K.sh.

Packet cost and frequency of cases requiring treatment are taken from: R.E. Black, "Mass Media and Health Practices Project, Report on Visit to Tanzania", September 1979.

3 Estimated at roughly 25% of the cost of training, manuals and technical assistance for the immunization program.

4 10% of the total of the three items above.

5 Estimated at 25% of the cost for the immunization program.

6 Estimated as roughly equivalent to the independent measles program. Personnel time is required for explanation of the use of the electrolyte solution in the home, motivation and distribution of the packets.

ANNEX N

BACKGROUND INFORMATION

FOR THE

FORMULATION OF A POLICY TO

COMBAT CHILDHOOD COMMUNICABLE DISEASES

IN SUB-SAHARAN AFRICA

BY

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SUMMARY

The goal of this report is to provide answers, primarily highly tentative, to questions of economics that may arise in the formulation of a program to combat communicable childhood diseases in sub-Saharan Africa. In an attempt to ascertain if a sufficient economic base exists to finance the domestic recurrent costs of a large scale program it is estimated that feasible increases in central government commitments to health together with potential growth in the national output of African countries will be adequate to finance the programs under consideration. It is also observed that there is considerable bilateral and multilateral donor interest in health programs in Africa and any African-wide program would involve the coordinated technical and financial effort on the part of international agencies.

The communicable diseases that are demonstrably the most significant[1] in determining the high level of morbidity and mortality among African children are the childhood diseases, for which vaccines exist, and diarrhea. Based on alternative estimates of population growth and time horizons to achieve 100 percent

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1 See A.S. McCook, Report on Child Health in Sub-Saharan Africa, With Particular Reference to EPI and Diarrheal Diseases, for USAID (contract AID/SOD/PDC-C-0201), November 1979.

program access, cost estimates are made for potential immunization and diarrheal control programs. Using the medium population growth variant and assuming WHO's 1990 target date for full access, the projected total cost for the first five years of a sub-Saharan immunization program covering the six EPI target diseases is $84.9 million Of this total $43.7 million is for recurrent domestic costs and $41.2 million is for imported capital equipment, supplies and technical assistance. Rough cost projections are also made for a diarrheal control (oral rehydration) program delivered as an integrated service with an immunization program. The cost for the first five years is estimated to be $39.8 million of which approximately 40 percent would require foreign exchange.

It is noted that the estimates in the report are highly approximate and subject to revision based on the actual costing of individual program components in specific countries. It is also important to note that increasing costs may be encountered as the program is extended to increasingly less accessible populations. For this reason the cost estimates should be regarded as a minimum.

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INTRODUCTION

This report provides economic information to be used in the formulation of a proposed program to reduce morbidity and mortality from childhood communicable diseases in sub-Saharan Africa. The first section gives demographic projections, for the years 1980 through 1994, to be used in estimating the scales of the program. The second section presents information on the extent of current health sector resources. This section discusses the capacity of sub-Saharan countries to finance the domestic costs of expanded health activities. This section also discusses the proportion of population having access to the present health delivery systems. The third section approximates the cost of a potential program of immunization against childhood diseases based on available information. The fourth section discusses a program of oral rehydration to reduce childhood mortality from diarrhea. Finally, an appendix presents information on health sector activities by foreign donors.

It is noted that a general survey of health-related data for sub-Saharan Africa is of only limited usefulness. Data are fragmentary and inconsistent from country to country; as a result, it is extremely difficult to compare health budgets, health system access and services among countries. The tremendous geographic, political and social diversity among the countries also precludes

cursory generalizations. For these reasons, although several tables giving available numerical information are presented in the body of the report, the conclusions drawn are qualitative and tentative.

I. POPULATION PROJECTIONS

The projection of births to be expected in sub-Saharan Africa between 1980 and 1994 (See Table I-A) were generated under alternative variants of low, medium and high population growth. These in turn are based on assumptions, outlined in a United Nations document,[1] concerning the course that fertility and mortality are likely to take in Africa in the event that the region parallels the earlier experience of other countries. (See Table I-B).

II. PRESENT HEALTH SECTOR RESOURCES

A. Central Government Health Expenditures

1. Capacity versus commitment

As would be expected from the scarcity of economic resources in Africa, the per capita level of government expenditures on health is low. Tables II-A and II-B provide

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1 United Nations. 1977. World Population Prospects as Assessed in 1973. Population Studies No. 60.

approximations of central government expenditures for all sub-Saharan countries.[1] Estimated for 1975, the per capita health expenditures of the average sub-Saharan country is $3.30; weighted by population size, the average per capita government health expenditure is $2.21. Approximately one-third of sub-Saharan countries have a per capita expenditure of less than $1.50. Both capacity, measures in terms of aggregate national product per person, and commitment determine the extent of government resources used for health services. The considerable variation in expenditures per capita (column 1) among countries is largely attributable to variation in per capita GNP (column 4), but differences in national commitment or effort in the health sector also play a role. Variations in effort are reflected in the data for government health expenditures as a percent of GNP, which range from .3 percent to 2.9 percent and have a mean value of .9 percent.

Greater per capita GNP makes it possible to allocate a larger share of GNP to health; thus in this sense "effort" or "commitment" is related to capacity; however, an estimate of the relationship between percent of GNP allocated to

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1 The data were obtained from several different sources, and in some cases missing ovservations were estimated by extrapolation from previous years. For this reason the table is sufficient to provide an overall description of the extent of government resources used for health; the table should, however, be applied cautiously to an analysis of individual countries.

health (column 2) and GNP per capita (column 4) shows that the relationship is not close.[1] If a country behaves as the average for Table II-A, a $100 increase in income will lead to an increase of .1 in the percent of GNP devoted to central government health expenditures. But this estimate is not very precise, and would be expected to vary greatly over countries.

A stronger relationship exists between income and per capita health expenditures. The relationship of per capita health expenditures to GNP per capita is depicted in Figure One, which presents a plot of the information in columns 1 and 4 of Table II-A. The lower dashed line in the figure (labeled AA) is the straight line that most closely represents the scatter of points in the diagram.[2] It is estimated that, on average, a $100 increase in per capita income will lead to a $1.80 increase in government health expenditures per capita. Expressed alternatively, a 10 percent increase in

---

1 The relationship is estimated by linear regression on the data in Table A with the omission of Mauritania, Chad, Guinea, Gabon, Rhodesia and South Africa. The estimated line is,

$$(\text{Health Exp./GNP}) = \underset{(17.0)}{.909} + \underset{(2.0)}{.001}\ (\text{GNP/POP.}) \qquad R^2 = .11$$

2 The estimated line is,

$$(\text{Health Exp./POP}) = \underset{(15.5)}{-1.16} + \underset{(10.0)}{.018}\ (\text{GNP/POP.}) \qquad R^2 = .75$$

(t statistics are in parentheses beneath the coefficients)

per capita income will lead to a 14 percent increase in per capita health expenditures for the average country in Table II-A.

The sharp increase in government health expenditures with income indicates that, as development proceeds, governments can be expected to cover an increasing proportion of the financial costs of health programs started with foreign funds. But the converse is also apparent, that is, the poorest countries cannot be expected to cover a large proportion of recurrent costs in the initial stages of major new donor projects.

One possible interpretation of the scatter of points in Figure One can be made with reference to the lower straight line as an expenditure norm representing average effort at each level of capacity. The line then divides countries into two groups: those above the line might be termed "high-commitment" countries and those below the line "low commitment" countries. The higher dashed line (labeled HH) represents the higher commitment countries.[1] The vertical difference between the two lines in the diagram represents the difference

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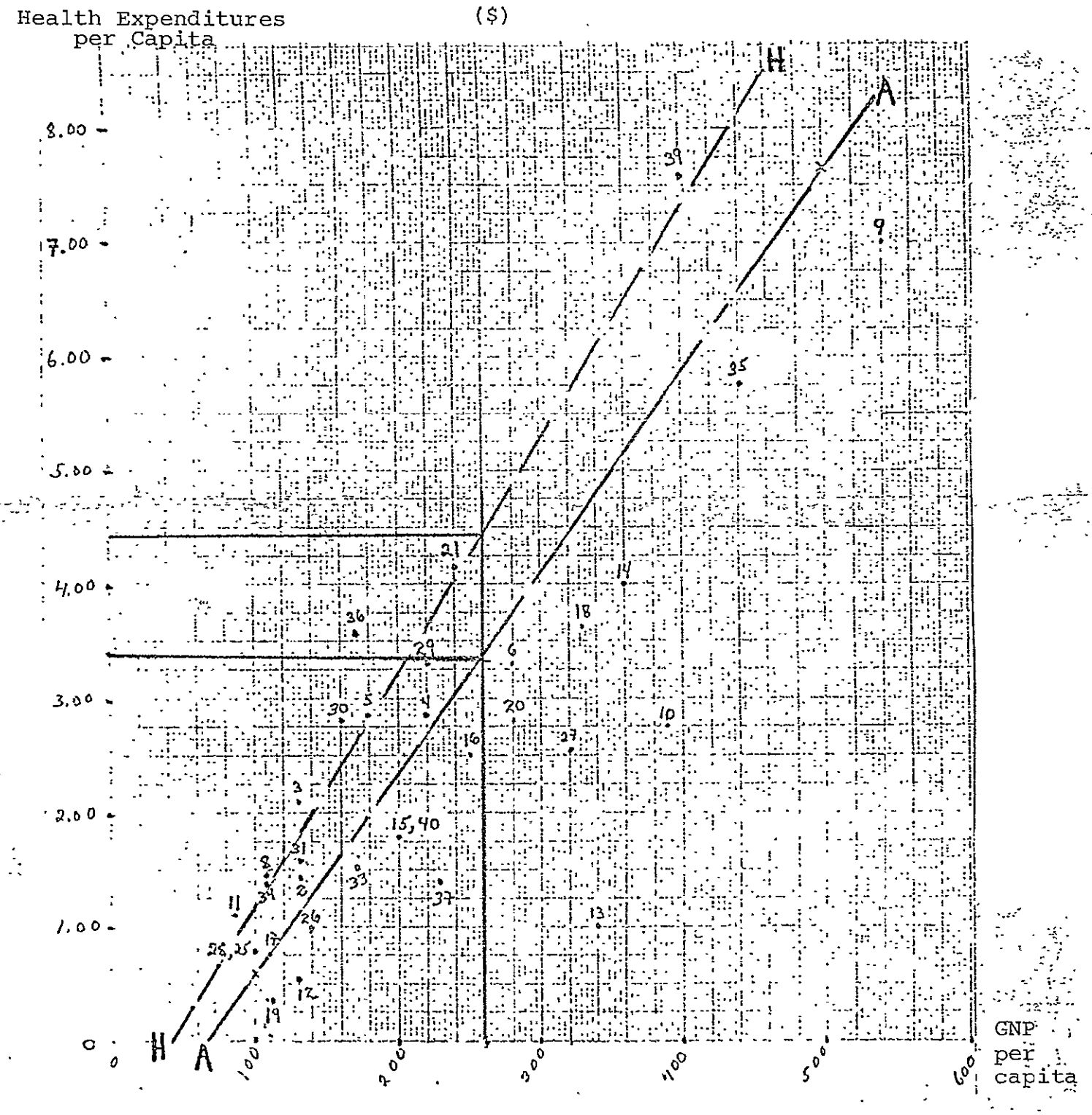
1 The line is estimated using countries 2,3,4,5,8,11,17,21,23, 25,28,29,30,31,34,36 and 39. The estimated line is,

$$\text{(Health Exp./POP.)} = \underset{(19.4)}{-.9} + \underset{(18.1)}{.02}\ \text{(GNP/POP.)} \qquad R^2 = .96$$

Figure One

RELATIONSHIP OF HEALTH EXPENDITURES PER CAPITA
TO GNP PER CAPITA.*



* Numbers in the diagram identify countries in Table II-B.

Line AA is drawn with reference to all sub-Saharan countries.

Line HH is drawn with reference to 17 "high commitment" countries.

between high-commitment and average-commitment central government health expenditures for given levels of per capita GNP. For example, with a per capita GNP of $250, the per capita central government health expenditure for the average-commitment country is estimated to be $3.30; the expenditure for a "high-commitment" country would be $4.35 or roughly one-third greater.

Interpreted in this manner, the lines AA and HH can be used to obtain estimates of the level of health expenditures that might be expected by a donor before funding part of recurrent program costs. An expenditure near the norm might be considered a minimum required amount; it might be expected that major new donor programs would be accompanied by increased efforts by recipients to place their respective central governments' contributions nearer the "high-commitment" line.

Caution should be exercised when this interpretation is applied to individual countries. Although a location below the line may result from a lack of political or social commitment, it may also be attributable to other factors -- for example, the difficulty of developing a tax structure which would allow a larger percentage of government expenditure as a percent of GNP. Conversely, locations above the line may represent greater political or social commitment; they may also, however, be the result of domestic counterpart

expenditures related to present programs that are partly financed and stimulated by foreign donors. Further, in many countries large health expenditures per capita may only reflect large past investment in government hospital-based medical care services primarily serving urban populations. Thus, although the diagram does provide a useful reference point in assessing collective national effort, the diagram gives no indication of the distribution of resources over the population and the factors determining the location for any given country shoudl be considered carefully before using the table or diagram to make a statement about the potential for central government health expenditures in a specific country.

Applying the diagram cautiously, an estimate of the aggregate amount of new funds which might be supplied locally for a sub-Saharan immunization program can be obtained. At a per capita income of $250 for the average sub-Saharan country, approximately $1.00 per capita additional central government health expenditures would be made available by moving from an average to a high commitment status. If 50 percent of the $1.00 gap between the present average and a high commitment could be closed and 20 percent of the new funds used for a childhood communicable disease program, then a potential $35 million dollars a year (350 million population x .20 x .10 . $1.00 x .5) would be available to

cover domestic program costs without reducing central government expenditures on existing health programs.

Further increases in health expenditures would be made possible by growth in per capita income. If per capita income grows at 1.5 percent per year, then additional central government health expenditures of $.97 per person could be expected even without a change in commitment.[1] And if 20 percent of this amount is used for a childhood communicable disease program an additional $5 million dollars (350 x $.07 x .2) would be available each year to cover the growth of the program.

2. An estimate of the total government health expenditures

The total central government health expenditures can be estimated for each country under the assumption that the percentage of GNP devoted to health expenditures remains as given in Table II-A for 1975.[2] Given the estimates of per capita GNP reported in column 2 of Table II-B, the government

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1 Using the slope (.018) of the line AA in Figure One, an estimate of the increase in per capita health expenditures accompanying a .015 increase in the present $260 per capita income in, .018 x .015 x $260 = $.07.

2 An alternative procedure would be to predict the percentage of GNP used for central government health expenditures through the use of the estimated relationship discussed earlier. The basic data are too weak, however, to justify this procedure.

health expenditure for each country was estimated as reported in column 5. The total annual government health expenditure for sub-Saharan Africa in 1975 was approximately $706 million. Using the same procedure, total central government health expenditures for 1976 are estimated to have been, roughly, $760 million.

B. Foreign Donor Activity

In 1975, the total volume of external aid committed to the health sector in sub-Saharan Africa is estimated to have been approximately $360 million.[1] This estimate omits private projects and the health component of multisectoral projects, as well as a Soviet or Chinese aid. A careful survey of the amoung and location of foreign donor health activity has not, to our knowledge, been made and, although potentially feasible, would require considerable time and effort to complete because of the large number of donors involved, their dispersal around the globe and the multisectoral nature of many projects.[2] The appendix presents information on foreign donor activity

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1 USDHEW, Office of International Health, Inter-Agency Working Group on African Health Strategy. 1979. Developing a U.S. Health Strategy for subSaharan Africa. Vol. 2 -- Annex c.

2 A regular periodic accounting of foreign donor activity would, however, be valuable in coordinating international efforts in the health sector.

(including USAID activities) that illustrates that any African-wide health program would involve the coordinated financial and technical cooperation of other bilateral donors and international agencies.

1. Growth of foreign donor activity

Until the last decade, foreign donor participation in the health sector in Africa had been modest; much of the foreign activity in health occurred through the efforts of private and church-related charitable organizations. Over the last few years, both multilateral and bilateral aid to the health sector has, however, increased markedly -- and the foreign health aid commitments for the future indicate that this trend will continue. The increase is sharp enough that it raises the question of the capacity of many African countries to absorb the influx of funds. However, absorptive capacity does not at present appear to provide an impediment to the continued expansion of the type of health projects now being implemented by most donor agencies. Although both the existing administrative capacity on both a local and national level in many countries, and the large ratio of population to doctors and other health personnel impede the absorption of health capital and hich technology projects, it is not likely to provide a restriction on the use of funds for well designed low technology health projects.

Many current foreign donor-sponsored health projects involve the use of low level health technology in the provision of primary health services and basic health care. The programs commonly have a training component, for both administrative and service delivery personnel, specifically intended to increase absorptive capacity and phased with the expansion of program coverage. For many types of programs, especially for low-cost delivery systems and immunization, there is considerable donor experience in other parts of the world which is transferable to African projects. Thus, although donors should remain aware of the problem of absorptive capacity and care should be taken to coordinate donor efforts, absorptive capacity does not presently appear to place a restriction on the continued expansion of preventative care health projects as long as the projects provide for training and are designed in the context of the limited extent of existing delivery system.

C. The Access to Health Services

A systematic appraisal of the extent of population having access to[1] a health delivery system in Africa has not been

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1 The concept of coverage used here is that of access. It is most simply measured as the population living within a "reasonable" distance of health services. The percentage of population actually receiving services will, in most cases, be less than the percentage with access.

made, and no central source of data is readily available. Nevertheless, this information is important to the formulation of a strategy for combatting communicable diseases, because the cost of interventions designed to be carried out over a sustained period as part of an integrated package of health services will differ considerably, depending on the available meand of deliver

Access varies among the sub-Saharan countries from as high as ninety percent in Tanzania[1] to below ten to fifteen percent in parts of the Sahel. Informal statements in several documents point out the low percentage of population living within a reasonable distance of health facilities. In a SHDS document[2] the belief is stated that in areas of Central and West Africa, close to sixty percent of the population is not given access to modren health care. One study[3] states that, in 1966 in Swaziland, sixty percent of the population lived within five miles of a health facility; another study[4] mentions that in 1966, twenty-five percent of the Ghanaian population

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1 R.N. Grosse, et al. 1979. Some notes on the Costs and Coverage of Low-Cost Integrative Health Services. American Public Health Association: Washington, D.C. Mimeo.

2 No Author. 1977. Project proposal, Phase II, Strengthening Health Delivery Systesm. AID 625-11-509-904.

3 USDHEW, Office of International Health. 1975. Syncrisis: The Dynamics of Health. Vol. XII -- Botswana, Lesotho & Swaziland.

4 USDHEW, Office of International Health. 1975. Syncrisis: The Dynamics of Health. Vol. X -- Ghana.

had access to some kind of health care; a similar study for Senegal[1] states, that in 1974, twenty percent of the population could be reached by the health post network.

Some impression of the variations in access is given by Table II-C, which lists the population/health personnel ratios for several categories of health workers. Although the ratios cannot be used directly as indications of access, they are, to a certain extent, proxies for the presence of other resources. In interpreting the table it should be born in mind that most physicians and facilities using physicians are located in urban areas, while there is some possibility that a greater proportion of auxiliary workers will be located in rural areas. Thus, where the ratio of population to health auxiliaries is low, there is more likelihood of a high proportion of the population having access to a health delivery system. But it is not possible from the data in the table to estimate the actual percentage of the population.

To obtain an approximation of the proportion of the population with access to health services it can be assumed that all urban populations are served by health facilities, but that health resources are highly unevenly distributed in rural areas. Several studies by the USAID Office of Foreign Disaster Assistance give regional data on health facilities

which would support this assumption.[1] The comparison of the urban/rural population distribution with the distribution of health expenditures for the sample of countries in Table II-D also emphasizes the uneven access to health services. Given that twenty percent of the population are urban, and assuming that eighty percent of urban areas have access to health services but that less than ten percent of rural areas have access, it can be estimated that less than twenty-five percent (.8 x .2 + .1 x .8) of the population in sub-Saharan Africa have access to an existing health delivery system.

An example of the importance of assessing the extent of the delivery system prior to the design of a health intervention program is given by the Expanded Program on Immunization. WHO has distinguished among three potential modes of delivery:

(1). the use of existing delivery systems

(2). the use of the existing delivery system plus outreach

(3). the use of mobile units.

With the first mode, only that population with a reasonable distance allowing access would receive the service; with the second mode, access to the service would be extended by the use of non-motorized transport; and, with the third mode, the remainder of the population would be given access through

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1 USAID, Office of Foreign Disaster Assistance. Various dates. Country Profiles (for Africa).

the use of motorized vehicles and the transport of self-contained vaccination units.

The cost of an immunization increases considerably as delivery is changed from mode one, to mode two, and then to mode three. In addition, within each mode the cost of an immunization increases as additional funds are spent to increase the number of users of the health centers or to transport the services into increasingly inaccessible areas. With increasing costs such as this, a simple rule can act as a guide to the economically efficient allocation of funds. The rule states that, to obtain maximum effect, the funds should be distributed among the alternatives so that the additional effect from the last dollar spent on each alternative is equal. For immunization, where the alternatives involve a distribution of funds among countries or among regions within a given country, this rule results in the following use of funds: immunization is provided for that part of the population accessible by present delivery systems in all countries or regions within a country before the program is extended within a given country or region by using more expensive delivery modes.

Although the example refers to the EPI program, the principle is of general application and will lead to similar conclusions for other maternal-child health programs. If

efficiency is measured in cost per unit delivered, the intervention will be most efficiently allocated to a population living within an area where the intervention can be added to an existing delivery system.

While economic efficiency is an important criterion and should receive substantial weight in planning decisions, there are some important qualifications to the application of the efficiency rule described above. First, it may not be politically feasible for a government to set up a program which ignores certain geographical areas and favors others. (Similarly, it may not be feasible for a donor agency to allocate funds in a piecemeal fashion across countries covering only areas where delivery systems presently exist.) A second, and perhaps more important, qualification is that, applied automatically, the principle would lead to an uneven distribution of benefits. Because urban areas have the greatest access to existing delivery systems, the allocation rule will result in a disproportionate share of benefits accruing to urban populations and groups with relatively high per capita income.

Combined with unevenly distributed social benefits of other kinds, the restriction of interventions to the use of existing delivery systems would encourage continued rural-urban migration and have adverse distributional consequences.

On the other hand, the extension of services to additional populations through the use of outreach and mobile units prior to optimum utilization of the existing delivery system would imply the inefficient allocation of funds. The trade-off, and unavoidable choice, is between economic efficiency, measured as a technical effect per dollar spent, and equity, measured as equal access across income and regional groups.

D. Vaccine Sources in sub-Saharan Africa

At the present time there are no facilities in sub-Saharan Africa with the technological requirements for the production of DPT or measles or polio vaccines.[1] Experimental programs for the production of other vaccines have, however, taken place in several countries. Yellow fever vaccine has been produced at the Institute Pasteur in Dakar (Senegal) and Abidjan (Ivory Coast), while smallpox vaccine conforming to WHO standards has been produced in Tanzania. Although the first batches of experimental BCG production at the vaccine institute in Dar es Salaam did not meet WHO requirements, more recent batches (produced after 1978) may conform to the standard. The experimental production of smallpox vaccine in Nigeria has not been successful.

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1 Based on interviews with officials at the Center for Disease Control, Atlanta, Georgia.

With the phasing out of the production of smallpox vaccine and the introduction of the EPI programs, the interest of officials in the Tanzanian ministry of health and elsewhere has turned to the production of other vaccines. A report on the Expanded Program of Immunization in Tanzania[1] states that although diphtheria, tetanus and pertussis vaccines would be the easiest with which to begin, the necessary technical knowledge and equipment are lacking; training and capital would be required before experimental production could be undertaken. Interest has also been shown in measles vaccine, which is somewhat more technically difficult; polio vaccine would impose even greater technical difficulties. The conclusion of the report is that "whereas it may be feasible to produce a certain vaccine in Tanzania it may not be the most economic way of using national resources."[2] As an alternative the report suggests the possibility of establishing a facility for diluting vaccines imported in bulk and for filling ampoules, and developing quality control facilities.

A logical conclusion from the balanced, well-reasoned report cited above is that it is not feasible to consider

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1 Tanzanian Ministry of Health and DANIDA/WHO/UNICEF. 1978. An Evaluation Report of the Expanded Programs on Immunization.

2 Ibid., p. 61.

the use of locally produces vaccines for a large scale EPI program in Africa over the next five years. But the argument for starting to develop the capacity for vaccine production in the future should not be overlooked. The training and capital investment in a technical area often have "spill out" or "external" effects which provide benefits to other areas and sectors not considered in the original program area. Vaccine production could have such benefits and in the long run reduce the technical dependency of sub-Saharan countries. These benefits might well offset the start-up costs for immunization production projects of a modest size in Dar es Salaam, Abidjan, or Dakar.

III. PROJECTED COST ON AN IMMUNIZATION PROGRAM FOR SUB-SAHARAN AFRICA

A. Estimates of the Cost per Fully Immunized Child[1]

The cost of immunizing a child will vary by delivery mode. To obtain estimates of the cost of immunization using alternative fixed, outreach and mobile programs, we first examine a number of immunization programs for which information is available and attempt to disaggregate the cost per fully immunized child by expenditure categories as given in Table III-A and III-B. The unit costs for each category vary con-

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1 The cost estimates in this section are in terms of 1978/79 U.S. dollars and do not include an allowance for inflation.

siderably among the programs and give only rough guidance in the construction of the hypothetical costs, presented in Table III-D, which are the basis for the projections presented below.

Some rationale can be given for the component cost in each category. Vaccine costs are, roughly, the average of the Kenya, Yaounde, Sudan and Somalia program costs and include the cost of tetanus vaccine for pregnant women.[1] It is assumed that the additional handling of vaccines needed by the outreach and mobile program will entail about 5 percent additional spoilage. The cold chain costs for the fixed program are based on the examples from the Sudan and Yaounde with the addition of 50 percent for the outreach and mobile programs. The transportation cost for the fixed and outreach program are based on the programs in Yaounde, the Sudan and Indonesia. Table III-C describes the derivation of the transportation cost for the mobile program. Salaries vary with wage levels, and often differ considerably from country to country. The salary component was arbitrarily set at $2.00. The final cost category, "other", consists

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1 Several studies have demonstrated that the immunization of all women of child bearing age is more effective at reducing neonatal tetanus than the immunization of pregnant women only. (For example, Warren L. Berggren, "Administration and Evaluation of Rural Health Services: A Tetanus Control Program", Am. Jour. Trop. Med. and Hyg., Vol 23, No. 5. (September, 1974) pp. 936-949.) The logistic problems and costs, however, of including all women are much greater than a more limited program for pregnant women. It is assumed that, during the early years of an immunization program the target population for immunization to reduce neonatal tetanus will primarily be pregnant women.

largely of surveillance, evaluation and research -- and is assumed to be slightly greater for the mobile program.

The final estimates per fully immunized child are $3.65 for a fixed delivery, $4.00 for outreach, and $8.90 for a mobile delivery. Roughly 60 percent of the cost of a fixed delivery, 55 percent of the cost of an outreach delivery, and 30 percent of the cost of a mobile delivery are for domestic expenses -- personnel, local facilities, and operating costs. The remaining percentage is for expenditures requiring foreign exchange -- vaccines, cold chain equipment, vehicles, parts and fuel.

B. Projected Growth of the Fixed Delivery System

It was estimated above (Section II-C) that less than 25 percent of the population has access to the present fixed delivery system. If we assume that the number of households having access can be doubled by the use of outreach services, then at present only 50 percent of the population can be immunized without the use of mobile delivery teams. Table III-E projects the potential proportion of the population having access to health services through each of the delivery modes. The projection assumes that the growth of the fixed delivery system will be sufficient to stay abreast of the growth in population plus an additional 1 percent per year

increase. This implies that the absolute number of people reached by the fixed delivery system will grow an average of approximately 5 percent per year. Given the recent emphasis on extending the delivery of low-cost health services to rural populations, this estimate may be conservative. If the fixed delivery system expands more rapidly, the cost of immunization programs will fall accordingly.

The projected access through fixed and outreach services in Table III-E is used in the cost projections that follow, to provide an upper limit on the rate of expansion of the number of children immunized by means of the cheaper delivery modes

C. Cost Projections

Tables III-F through III-K present cost projections under alternative delivery strategies, rates of program expansion, and population projections. The costs are for a program consisting of tetamus immunization of pregnant women and DPT, measles and polio immunization of infants and including all of Africa except South Africa and the countries bordering the Mediterranean.

The first two tables compare the cost of two programs providing 100 percent access by the WHO target date of 1989. In the first projection, the program is designed to use

existing fixed delivery where possible before expanding through the use of outreach and then, finally, mobile delivery systems. In the second projection, an attempt to provide the service equitably to both urban and rural populations is made through a faster expansion of the outreach and mobile programs.[1] Most of the difference in cost of the efficient versus the equitable program occurs during the first five years. The five year cost of the equitable program is estimated to be 28 percent greater than the efficient program.

The next two projections given in Tables III-H and III-I give the costs of programs under the pessimistic view that 100 percent access cannot be achieved until 1995. Under this assumption, the first five-year cost of the equitable program is 39 percent greater than the efficient program. For either fifteen-year program, the cost for the first five years is, of course, approximately one-third less than the corresponding ten-year programs.

Tables III-F, J and K can be compared in order to obtain an indication of the sensitivity of the cost estimate to the alternative UN population projections discussed in section II-A. The five-year cost of the low-growth variant

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1 In the early years of the program there is a practical restriction on the rate at which the outreach and mobile programs may be expanded. This is reflected in the lag before outreach and mobile delivery begin.

is 73.8 million, while the five-year cost of the high-growth variant is 78.3 million -- or a difference of only 6 percent. Over the full ten year period, the difference becomes more substantial and is 8 percent of the total low-variant cost. Thus, over the short run, the accuracy of the population projections is not a significant factor in the cost projections. The small differences in cost associated with the alternative projections are apt to be obscured by the sketchy nature of the unit cost estimates and the lack of information concerning the percentage of population which can be reached by means of the existing fixed delivery system.

D. Cost of Technical Advisors

The cost of technical advisors is not included in the estimates in Tables III-F through III-K. It is difficult to project the cost of advisors over a ten year period because the rate at which advisors could be removed from the program would depend on the success of the program in the early years and the practicality of finding domestic replacements in the program countries in the later years of the project. Ideally, one medical officer, epidemiologist, would be needed per 3-5 countries in the program; in addition one operations office per country would be required in the early

years of the program.[1] However, it is unrealistic to project that the requisite 7-8 medical officers and 3-5 operations officers would be available to the program, although these numbers might be reached with a total effort of cooperating bilateral and multilateral organizations. The rough estimate of the cost of advisors given in Table III-L is made under the more conservative assumption that as a minimum, by spreading the responsibilities of technical officers over several country programs, the project could be carried out with as few as five medical officers and ten operations officers. Including the costs of transportation, housing, salary and indirect cost the amount per person is estimated at $120,000.[2] The total cost of advisors for the first five years of the program is $8.8 million. The cost for the full ten years, assuming a reduction in the number of advisors in the last five years is $14.6 million.

E. Foreign Exchange Requirements and Domestic Costs

Estimating that personnel, local facilities and operating costs are 60 percent of fixed delivery costs, 55 percent of outreach delivery costs, and 30 percent of mobile delivery

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1 The discussion in this paragraph is based on conversations with CDC/SMALLPOX officials.

2 Calculated at the rate for U.S. personnel.

costs, the projected domestic costs for the ten year, medium growth variant are given in Table III-L. The residual costs are for imported equipment and vaccine. Excluding the costs of technical advisors, the total costs requiring foreign exchange over the first five years of the program are $32.4 million. The total foreign exchange costs for the first five years including technical assistance is $41.2 million.

The total domestic costs for a five-year period are $44 million and, in the average country, are potentially covered by additional health expenditures accompanying growth in per capita income and the feasible increase in the central government's commitment to health. However, in the poorest countries which have relatively high current expenditures on health, additional donor support may be necessary in order to cover a part of domestic costs.

The cost estimates in Tables III-F through III-L are intended as a first attempt to approximate the cost of an immunization program based on available information. The estimates are regarded as the minimum expenditure that may be required. Although it is not feasible to predict the extent to which cost may increase, it is plausible that the cost per fully immunized child may increase significantly within all three delivery modes as the project is extended to an increasingly greater percentage of population.

IV. COMBATTING MORTALITY FROM DIARRHEA

A. Integration of diarrheal control and immunization programs

An important aspect of the EPI program is that it is designed to be delivered as part of an integrated set of services for maternal and child health. After the initial program investment for EPI has been made and as the scope of the program expands, oral rehydration[1] and maternal hygienic education programs to control diarrhea may be cost effective measures to provide in tandem with immunization. At the time of immunization, mothers can be motivated and instructed in the use of prepackaged electrolyte solutions and the handling of water and encouraged to sustain breast feeding.

A major difference between immunization and rehydration programs is that the timing of visits for immunization can occur at prearranged periodic intervals while the need for oral rehydration cannot be predicted. For this reason the conditions under which the therapy would be administered

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1 For a clear description of oral rehydration see, N.F. Pierce and N. Hirschhorn, "Oral Fluid - A Simple Weapon Against Dehydration in Diarrhoea: How it Works and How to Use it." WHO Chronicle 1: 31; 87-93 (1977). Also see, WHO, Clinical Management of Diarrhoea, Report of a Scientific Working Group, WHO/DDC/79.3 (1978).

cannot be predicted accurately. Part of the population reached by outreach or mobile teams for immunization will have access to health posts or clinics that may lack refrigeration facilities for storing vaccines but have adequate facilities for oral rehydration. But a significant part of the population visited by outreach or mobile teams will have to rely on local dispensaries for the dsitribution of oral rehydration packets and on home administration of the therapy. Several studies have demonstrated the dramatic effectiveness of oral rehydration in controlled clinical therapy. While less well established, evidence is also accumulating that home administered oral therapy can be effective.[1] However, given the potential variability of the conditions under which home therapy would be carried out the effectiveness cannot be predicted accurately.

B. Cost of Oral Rehydration

The costs of oral rehydration are the cost of the electrolyte packets (about 10¢ per packet, two packets per episode), the cost of booklets or cards illustrating use, the cost of training health workers, the cost of personnel

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1 For instance, Mahalanabis, D. et al. Oral Fluid Therapy Among Bangladesh Refugees. Johns Hopking Medical Journal 132: 197-205. (1973).

time needed to motivate and instruct in the use of the solution, administrative costs and transportation costs. In the cost effectiveness analysis contained in the second part of this report[1] it is estimated (a very rough estimate) that the cost of adding an oral rehydration program to an immunization program would be .45 per child covered by the program.

The cost of an oral rehydration program for sub-Saharan Africa starting in 1980 and reaching the same populations as the immunization program are given in Table A-4.[2] The five year cost (1980-1984) is $39.8 million. The ten year cost is $160.5 million. Forty percent of the cost (rehydration packets, equipment) require foreign exchanges, the remaining sixty percent are domestic costs.

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1 H.N. Barnum, Cost Effectiveness of Programs to Combat Communicable Childhood Diseases in Kenya, for USAID (Contract AID/SOD/PDC-C-0201 One America, Inc.), January, 1980.

2 The table is based on the medium population growth, ten year variant.

TABLE I-A

ESTIMATES OF THE ANNUAL NUMBER OF BIRTHS IN SUBSAHARAN AFRICA, 1980-1994, UNDER ALTERNATIVE POPULATION PROJECTIONS [1]

YEAR	NUMBER OF BIRTHS[2] (000,000's)		
	LOW VARIANT	MEDIUM VARIANT	HIGH VARIANT
1980	15.3	15.7	16.1
1981	15.7	16.1	16.6
1982	16.1	16.6	17.0
1983	16.6	17.1	17.6
1984	17.0	17.6	18.1
1985	17.4	18.1	18.6
1986	17.9	18.6	19.2
1987	18.4	19.1	19.8
1988	18.8	19.7	20.4
1989	19.3	20.2	21.0
1990	19.8	20.8	21.7
1991	20.3	21.4	22.4
1992	20.7	22.0	23.1
1993	21.2	22.7	23.8
1994	21.8	23.2	24.5

1 Based on high, medium and low variant population projections in United Nations. 1977. World Population Prospects as Assessed in 1973. Population Studies no. 60.

2 Starting from 350.2 million total population in 1980. This figure is based on a 1979 extimate of 340.5 million for all of Africa except Morocco, Algeria, Tunisia, Egypt, Libya and South Africa. Source: Population Reference Bureau. 1979. 1979 World Population Data Sheet.

TABLE I-B

DEMOGRAPHIC ASSUMPTIONS UNDERLYING
ESTIMATES OF NUMBER OF BIRTHS IN AFRICA FOR 1980-1995

PARAMETER	YEAR			VARIANT[1]
	1980-85	1985-90	1990-95	
Rate of	2.86	2.88	2.86	Medium
Natural	2.98	3.07	3.12	High
Increase	2.67	2.59	2.40	Low
Crude	44.8	43.3	41.5	Medium
Birth	45.9	44.6	43.4	High
Rate	43.7	41.3	37.9	Low
Crude	16.2	14.5	12.9	Medium
Death	15.8	13.9	12.2	High
Rate	17.0	15.4	13.8	Low

1 See United Nations. Op. cit.

TABLE II-A

CENTRAL GOVERNMENT HEALTH EXPENDITURES IN SUBSAHARAN AFRICA

NO.	COUNTRY	YEAR	CENTRAL GOVERNMENT HEALTH EXPENDITURES[a]			GNP[c]		TOTAL GOVERNMENT EXPENDITURES AS % OF GNP
			Per Capita Col 1	% of GNP Col 2	% of Total Budget Col 3	Per Capita ($) Col 4	Annual % Growth Rate 1960 - 1976 Col 5 %	Col 6
	SAHEL and WEST							
1	Mauritania	1975	4.16[e]	1.3[e]	5.2[e]	320	3.7	24.6
2	Sudan	1973	1.43	1.1[a]	4.8	130	0.4	22.9
3	Benin	1975	2.08	1.6	10.7	130	0.1	14.9
4	Cape Verde	1972	2.86	1.3	2.7	220[d]	...	49.4
5	Gambia	1975	2.68	1.6	8.6	180	1.1[b]	18.7
6	Ghana	1973	3.30	1.1	6.2	300[d]	-0.1	17.9
7	Guinea	1971	1.32[e]	1.1[e]	2.4[e]	120[d]	-0.4	45.5
8	Guinea-Bissau	1972	1.43	1.3	7.3	110[d]	...	17.8
9	Ivory Coast	1975	7.02	1.3	5.9	540	3.4	22.2
10	Liberia	1973	2.73	.7	3.7	390[d]	2.0	19.1
11	Mali	1970	1.11	1.3	11.0	85[d]	0.9	11.8
12	Niger	1975	.39	.3	1.3	130	-1.1	23.1
13	Nigeria	1975	1.02	.3	1.3	340	3.5	23.1
14	Senegal	1975	3.96	1.1	5.8	360	-0.7	19.1
15	Sierra Leone	1975	1.80	.9	6.1	200	1.1	14.7
16	Togo	1975	2.50[b]	1.0[b]	6.5[b]	250	4.1	15.4
17	Upper Volta	1975	.77[b]	.7[b]	4.8[b]	110	0.8	14.5
	CENTRAL AFRICA							
18	Angola	1973	3.63	1.1	5.0	330[d]	3.0	21.9
19	Burundi	1975	.55	.5	6.2	110	2.3	8.1
20	Cameroon	1975	2.80[b]	1.0[b]	7.8[b]	280	2.8	12.8
21	Central Africa Rep.	1975	4.18[b]	1.9[b]	8.4[b]	220	0.3	22.6
22	Chad	1975	1.32[e]	1.1[e]	6.5[e]	120	-1.1	16.7
23	Congo-Rep.	1975	9.18[b]	1.8[b]	6.1[b]	510	2.8	29.5
24	Gabon	1975	15.24	.6	1.8	2540	...	34.5
25	Rwanda	1973	.70	.7	5.5	100[c]	0.8	12.7
26	Zaire	1975	.98	.7	2.3	140	1.4	30.8

TABLE II-A
(continued)
CENTRAL GOVERNMENT HEALTH EXPENDITURES IN SUBSAHARAN AFRICA

NO.	COUNTRY	YEAR	CENTRAL GOVERNMENT HEALTH EXPENDITURES			GNP c/		TOTAL GOVERNMENT EXPENDITURE AS % OF GNP a/
			Per Capita Col 1	% of GNP Col 2	% of Total Budget Col 3	Per Capita ($) Col 4	Annual % Growth Rate 1960 – 1976 Col 5 %	Col 6
	EAST AFRICA							
27	Botswana	1974	2.56	.8	3.3	320 d/	10.2	24.4
28	Ethiopia	1975	.80	.8	5.6	100	1.9	14.2
29	Kenya	1975	3.30	1.5	6.4	220	2.6	23.3
30	Lesotho	1975	2.88	1.8	5.3	160	4.6	33.9
31	Malawi	1975	1.55	1.2	6.7	130	4.1	17.9
32	Mauritius	1975	14.58	1.8	6.2	810	1.2	29.0
33	Mozambique	1973	1.53 b/	.9 b/	4.8 b/	170 d/	1.4	18.8
34	Somalia	1975	1.43	1.3	5.7	110	0.3	22.7
35	Swaziland	1975	5.72	1.3	5.4	440	4.2	23.9
36	Tanzania	1975	3.57	2.1	6.4	170	2.6	32.6
37	Uganda	1975	1.38	.6	5.2	230	1.0	11.6
38	Zambia	1975	12.18	2.9	5.5	420	1.7	52.6
39	Sao Tome and Phillipe	1973	7.60	1.9	7.8	400 d/	...	24.3
40	Madagascar	1972	1.80	.9	4.7	200 d/	-0.1	19.2
41	S. Rhodesia	1974	7.15	1.3	5.1	550 d/	2.2	25.5
42	S. Africa	1975	3.81	.3	1.8 b/	1270	3.0	21.4

FOOTNOTES FOR TABLE II-A

a Based on United Nations. n.d. Statistical Information Bulletin for Africa. No. 11 E/CN.14/S1B/22, except where indicated.

b Based on USDHEW, Office of International Health. Inter-Agency Group on African Health Strategy, which was, in turn, taken from World Bank. 1975. Health Sector Policy Paper. Annex 3. Washington, D.C. The per capita figure is from GNP estimates in col. 4.

c World Bank development report, 1978 and 1976, except where indicated.

d Estimated by extrapolation from another date.

e Interpolated from linear regression of col. 2 on col. 4 for existing data.

TABLE II-B

ESTIMATED CENTRAL GOVERNMENT HEALTH EXPENDITURES FOR 1975

COUNTRY	POPULATION[a] (000's) Col. 1	GNP per capita[b] ($) Col. 2	CENTRAL GOVERNMENT HEALTH EXPENDITURES		
			% of GNP[c] Col. 3	per capita ($) Col. 4	TOTAL (000's of $) Col. 5
SAHEL and WEST AFRICA					
Mauritania	1322	320	1.3	4.16	5500
Sudan	15550	270	1.1	2.97	46184
Benin	3110	130	1.6	2.08	6469
Cape Verde	285[d]	260[d]	1.3	3.38	963
Gambia	519	180	1.6	2.88	1495
Ghana	9870	590	1.1	6.49	64056
Guinea	5540	130	1.1	1.43	7922
Guinea Bissau	530	120	1.3	1.56	827
Ivory Coast	6700	540	1.3	7.02	47034
Liberia	1549	410	.7	2.87	4446
Mali	5697	90	1.3	1.17	6665
Niger	4592	130	.3	.39	1791
Nigeria	75023	340	.3	1.02	76523
Senegal	5000	360	1.1	3.96	19800
Sierra Leone	2982	200	.9	1.80	5368
Togo	2220	250	1.0	2.50	5550
Upper Volta	6032	110	.7	.77	4645
REGIONAL TOTAL	146521	316	.7	2.08	305237
CENTRAL AFRICA					
Angola	5470	370	1.1	4.07	22263
Burundi	3732	110	.5	.55	2053

TABLE II-B (continued)

COUNTRY	POPULATION[a] (000's) Col.5	GNP per capita[b] ($) Col.2	CENTRAL GOVERNMENT HEALTH EXPENDITURES		
			% of GNP[c] Col.3	per capita ($) Col.4	TOTAL (000's of $) Col.5
CENTRAL AFRICA (cont'd)					
Cameroon	7435	280	1.0	2.80	20818
Central Africa Republic	1787	220	1.9	4.18	7470
Chad	4035	120	1.1	1.32	5326
Congo-Rep.	1329	510	1.8	9.18	12200
Gabon	536	2540	.6	15.24	8169
Rwanda	4137	100	.7	.70	2896
Zaire	24721	140	.7	.98	24227
REGIONAL TOTAL	53182	213	.9	1.98	105421
EAST AFRICA					
Botswana	666	350	.8	2.80	1865
Ethiopia	27950	100	.8	.80	22360
Kenya	13350	220	1.5	3.30	44055
Lesotho	1217	160	1.8	2.88	3505
Malawi	5044	130	1.2	1.56	7869
Mauritius	883	810	1.8	14.58	12874
Mozambique	9240	180	.9	1.62	14969
Somalia	3180	110	1.3	1.43	4547
Swaziland	494	440	1.3	5.72	2826
Tanzania	14738	170	2.1	3.57	52615
Uganda	11556	230	.6	1.38	15947

TABLE II-B (continued)

COUNTRY	POPULATION[a] (000's) Col. 1	GNP per capita[b] ($) Col. 2	CENTRAL GOVERNMENT HEALTH EXPENDITURES		
			% of GNP[c] Col. 3	per capita ($) Col. 4	TOTAL (000's of $) Col. 5
EAST AFRICA (cont'd)					
Zambia	4920	420	2.9	12.18	59926
REGIONAL TOTAL	93238	182	1.4	2.61	243357
Rhodesia	6310	550	1.3	7.15	45116
Sao Tome and Phillipe	80	460	1.9	8.74	699
Madagascar	8833	200	.9	1.80	15899
GRAND TOTAL	308164	259	.9	2.29	806472

a World Bank Atlas, 1978

b World Bank Atlas, 1978

c See Table III-A

d USAID, Office of Foreign Disaster Assistance. 1979a. Cape Verde: A Country Profile.

TABLE II-C

CATEGORIES OF HEALTH PERSONNEL BY RATIO (population/category of personnel)

Date	Country	Physicians	Dentists	Pharmacists	Medical Assistants	Nursing Personnel	Nursing and Midwifery Personnel	Multi-Purpose Health Auxiliary
1973	Angola	15,170	--	66,800	15,060	1,870	1,710	17,453
1974	Benin	36,060	378,630	77,670	--	3,220	2,580	--
1975	Botswana	9,580	115,000	69,000	4,130	1,270	1,440	4,481
1972	Burundi	45,990	1,134,330	261,770	--	7,090	6,570	--
1972	Cape Verde	12,950	285,000	147,500	--	3,900	3,750	--
1973	CAE	27,970	330,000	150,000	6,110	2,260	2,070	6,904
1974	Chad	44,370	1,974,500	789,800	136,170	6,990	5,560	--
1973	Comoros	15,320	145,500	145,500	--	2,020	1,760	--
1973	Congo	6,160	100,400	31,380	59,060	640	600	--
1971	Eq. Guinea	11,560	--	72,250	15,210	72,250	26,270	--
1971	Gabon	4,210	125,000	33,330	--	610	540	--
1969	Gambia	18,950	360,000	180,000	3,750	15,000	1,950	--
1974	Ghana	11,220	218,340	21,640	53,970	870	630	--
1973	Guinea	22,380	233,780	131,500	5,980	6,230	3,880	4,263
1971	Guin-Bissau	10,240	--	563,000	--	4,580	2,960	563,000
1974G	Ivory Coast	15,270	226,900	91,630	--	2,220	1,890	--
1973	Kenya	16,300	192,630	76,580	10,520	3,360	2,470	3,339
1973	La Reunion	1,950	6,320	6,080	--	270	260	--
1974	Lesotho	20,320	338,670	203,200	--	19,170	3,380	--
1973	Liberia	12,570	127,620	237,000	42,640	1,200	1,030	--
1973	Madagascar	11,610	99,700	82,230	--	3,580	2,530	--
1971X	Malawi	85,030	649,860	303,270	10,340	6,550	5,210	--
1972G	Mali	33,330	777,670	466,600	1,166,500	2,480	2,170	--
1973	Maurit.	17,700	251,400	179,570	--	3,790	3,600	5,792
1974G	Mauritius	3,710	62,290	218,000	--	900	630	--
1971	Mozambique	16,680	531,750	60,770	--	4,790	3,799	26,504
1974	Niger	41,060	746,000	639,430	--	4,970	4,710	95,234
1973	Nigeria	25,440	578,710	119,450	--	6,230	4,370	--
1974	Rwanda	53,550	2,061,500	1,374,330	23,700	11,480	5,930	95,884
1974	Senegal	15,360	148,790	--	--	1,920	1,630	--
1970	S. Leone	17,110	212,500	364,290	--	3,600	2,590	2,140
1973	Somolia	15,560	750,750	143,000	--	--	--	--
1974	Sudan	12,370	116,270	55,530	10,530	1,550	970	--
1974	Swaziland	8,850	79,670	59,750	478,000	990	560	--
1973	Togo	22,280	529,250	88,210	19,790	2,490	1,550	19,785
1974	Uganda	20,690	508,000	399,000	19,840	6,870	3,100	16,309
1971	Un. Rep. of Cam.	26,220	590,000	96,720	--	2,270	--	22,544
1973	U.R. of Tanz.	20,800	177,000	118,000	13,650	3,180	580	--
1974	Upper Volta	59,570	655,220	393,000	5,897,000	4,520	4,240	--
1972	Zaire	27,950	714,300	174,500	245,810	11,700	7,170	19,555
1971	Zambia	8,110	122,140	62,780	4,660	2,430	1,710	4,262

X - Coverage of these data unknown.
G - Personnel in Government Services

Source: World Health Organization 1976. World Health Statistics Annual. Vol. III.

TABLE II-D

A COMPARISON OF ESTIMATED URBAN AND RURAL HEALTH EXPENDITURES AND POPULATION

COUNTRY	ESTIMATED PERCENT OF TOTAL EXPENDITURE [1]		ESTIMATED PERCENT OF TOTAL POPULATION [2]	
	URBAN	RURAL	URBAN	RURAL
Benin	71	29	14	86
Cameroon (East)	81	19	29	71
Chad	68	32	14	86
Gabon	46	54	32	68
Guinea	73	17	20	80
Liberia	75	25	29	71
Mali	85	15	17	83
Mauritania	55	45	44	66
Niger	61	39	9	91
Nigeria	65	35	18	82
Senegal	84	16	32	68
Sierra Leone	79	21	15	85
Upper Volta	16	84	4	96

1 Reported in (no author) n.d. Strengthening Health Delivery Systems. Project Proposal, Phase II. Reported to American Public Health Association. AID 625-11-509-904. p. 103.

2 Population Reference Bureau. Op. cit.

TABLE III-A

COMPOSITION OF TOTAL PROGRAM COST PER FULLY IMMUNIZED CHILD FOR VARIOUS PROGRAMS (BY PERCENT)

PROGRAM[e]	VACCINE & SUPPLIES (SYRINGES, etc.) (%)	COLD CHAIN EQUIP. & OTHER (%)	TRANS-PORTATION (%)	SALARIES & TRAINING (%)	EVALUATION SURVEIL-LANCE, RESEARCH, OTHER (%)	TOTAL COST FULLY IMMUNIZED CHILD (%)
Kenya[h]	22	3	6	66	3	3.90
Somalia[g]	19	9	43	29	-	7.04
Sudan[f]	5	2	4	89	-	9.25
Yaounde, Cameroon[f]	47	10[b]	10[b]	25	7	1.90
Indonesia[h]	36	10	11	34	9	5.10[d]
Cali, Colombia[g]	19	3	-	74	4	6.10
Hypothetical Example (Crease)	16	12[a]	14[a]	58	-	3.54

a Includes reallocation of "maintenance" category to cold chain and transportation.

b Arbitrary division of "material and transportation" category.

c Includes "promotion" (3% of total cost)

d With addition of costs associated with measles vaccination not originally included in the project paper.

e See references following Table III-B.

f Does not include maternal immunization with tetanus antitoxin.

g Includes cost of tetanus immunization of women of child bearing age.

h Includes cost of tetanus immunization of pregnant women.

TABLE III-B

COMPOSITION OF TOTAL COST PER FULLY IMMUNIZED CHILD FOR VARIOUS IMMUNIZATION PROGRAMS ($)

COUNTRY[b]	DESCRIPTION	COST PER FULLY IMMUNIZED CHILD BY EXPENDITURE CATEGORY [a]					TOTAL COST/ F.I.C.
		VACCINE & SUPPLIES	COLD CHAIN	TRANS-PORTATION	SALARIES &TRAINING	OTHER	
Kenya	primarily fixed and outreach	.86	.12	.24	2.57	.11	3.90
Somalia	primarily mobile	1.34	.63	3.03	2.04	-	7.04
Sudan[c]	fixed and outreach	.46	.19	.37	8.23	-	9.25
Yaounde, Cameroon	primarily fixed	.89	.19	.20	.49	.13	1.90
Indonesia	fixed, outreach, some mobile	1.84	.51	.56	1.73	.46	5.10
Cali, Colombia	fixed	1.16	.18	-	4.52	.24	6.10
Hypothetical Example (Crease)	fixed	.57	.42	.49	2.06	-	3.54

a Derived by implication from Table III-A.

b References follow table.

c Does not include maternal immunization with tetanus antitoxin.

References for Tables III-A and III-B

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Bassett, David C. and Stephen C. Hadler. 1979. Capability Assessment of Sudan EPI. CDC/USAID.

Guyer, Bernard and Simon Atangana. 1977. A Programme of Multiple-Antigen childhood immunization in Yaounde, Cameroon: First-Year evaluation, 1975-76. Bulletin of the World Health Organization. 55:5, 633-642.

USAID. 1978. Expanded Programme of Immunization - Indonesia, 1979-1984. Project Paper.

Correa, Bernardo. 1978. Unpublished budget information on the child immunization programme for a five barrio area in Cali, Colombia.

Kenya, Ministry of Health/DANIDA, Appraisal Report on the Expanded Programme on Immunization, November 1978.

TABLE III-C

ESTIMATION OF VEHICLE COST FOR MOBILE PROGRAM[1]

1). Vehicle Costs

Cost of Vehicle	=	$ 15,000	(Land Rover)
Spare Parts (25%)	=	3,750	(Assumption used by Bassett and Hadler)
		$ 18,750	
Life of vehicle	=	5 years	
Cost per year	=	$ 3,750	

2). Annual Operating Costs

Gasoline and Oil	=	$ 2,200	(Approximately 20,000 miles per year, 12 miles per gallon $1.25 per gallon, $100 oil/year)
Maintenance	=	2,000	
		$ 4,200	

3). Total Cost Per Vehicle Per Year = $3,750 + $4,200 = $7,950

4). Number Of Children Immunized Per Year Per Vehicle

Assuming:
1). a new location every other day
2). 50 immunization contacts per location
3). 280 working days per year
4). four contacts per fully immunized child, then each vehicle will account for 1,750 (50 x 140 ÷ 4 = 1,750 fully immunized children per year.)

5). Vehicle and Maintenance Cost Per Fully Immunized Child

Equals total vehicle costs per year divided by the number of children fully immunized per year, or $4.54 (7,950/1,750). Adding an additional .20 for the transportation cost to service the central fixed facility gives a total transportation cost of $4.74 (approximately $4.75) per fully immunized child for the mobile program.

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1 This cost has been revised upward by 100% over the estimates given in the first draft of the report. The increase is due to a revised estimate of the number of immunization contacts per location. The new estimate is 50; the old estimate was 100.

TABLE III-D

HYPOTHETICAL COSTS PER FULLY IMMUNIZED CHILD
USING ALTERNATIVE DELIVERY MODES
$

DELIVERY MODE	COST PER FULLY IMMUNIZED CHILD BY EXPENDITURE CATEGORY					TOTAL[c] COST/ F.I.C.	TOTAL[b] DOMESTIC COST/ F.I.C.
	VACCINE SUPPLIES	COLD CHAIN	TRANS-PORTATION	SALARIES TRAINING	OTHER		
FIXED	1.00	.20	.20	2.00	.25	3.65	2.20
OUTREACH	1.05	.30	.40	2.00	.25	4.00	2.20
MOBILE	1.05	.30	4.75[a]	2.50	.30	8.90	2.75

a See Table III-C

b Salaries plus a part of "other." "Other" is composed largely of surveillance.

c Includes cost of maternal immunization against tetanus.

TABLE III-E

PROJECTED PERCENTAGE OF POPULATION
WITH ACCESS THROUGH
FIXED AND OUTREACH DELIVERY

YEAR	Projected Growth of fixed delivery system	Total potential access including outreach	Excess reachable only by mobile units
1980	25	50	50
1981	25.5	51	49
1982	26	52	48
1983	26.5	53	47
1984	27	54	46
1985	27.5	55	45
1986	28	56	44
1987	28.5	57	43
1988	29	58	42
1989	29.5	59	41
1990	30	60	40
1991	30.5	61	39
1992	31	62	38
1993	31.5	63	37
1994	32	64	36

TABLE III-F

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #1 (DELIVERY ALTERNATIVE NO. 1
MOST EFFICIENT USE OF EXISTING DELIVERY SYSTEM,
FULL ACCESS BY 1990, MEDIUM VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY:			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	15.7	10	10	-	-	4.6
1981	16.1	20	20	-	-	9.4
1982	16.6	30	26	4	-	14.7
1983	17.1	40	27	13	-	20.6
1984	17.6	50	27	23	-	26.8
1985	18.1	60	28	28	4	36.2
1986	18.6	70	28	28	14	50.4
1987	19.1	80	29	29	22	63.8
1988	19.7	90	30	29	32	80.4
1989	20.2	100	30	30	40	94.6

TOTAL COST FOR FIRST FIVE YEARS: 76.1
TOTAL COST FOR TEN YEARS: 401.6

1 Projection assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-G

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #2 (DELIVERY ALTERNATIVE NO. 2
EQUITABLE USE OF LESS EFFICIENT DELIVERY MODES,
FULL ACCESS BY 1990, MEDIUM VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY:			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	15.7	10	10	-	-	4.6
1981	16.1	20	15	5	-	9.6
1982	16.6	30	15	10	5	18.5
1983	17.1	40	15	15	10	27.9
1984	17.6	50	18	18	14	36.9
1985	18.1	60	20	20	20	47.9
1986	18.6	70	24	23	23	57.2
1987	19.1	80	27	27	26	66.9
1988	19.7	90	29	29	32	79.8
1989	20.2	100	30	30	40	94.6

TOTAL COST FOR FIRST FIVE YEARS: 97.5
TOTAL COST FOR TEN YEARS: 444.0

1 Projection assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-H

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #3 (DELIVERY ALTERNATIVE NO. 3
MOST EFFICIENT USE OF EXISTING DELIVERY SYSTEM,
FULL ACCESS BY 1995, MEDIUM VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	15.7	7	7	-	-	3.2
1981	16.1	13	13	-	-	6.1
1982	16.6	20	20	-	-	9.7
1983	17.1	27	27	-	-	13.5
1984	17.6	33	27	6	-	17.3
1985	18.1	40	28	12	-	21.7
1986	18.6	47	28	19	-	26.5
1987	19.1	53	29	24	-	30.8
1988	19.7	60	29	29	2	37.8
1989	20.2	67	30	30	7	47.2
1990	20.8	73	30	30	13	57.4
1991	21.4	80	31	31	18	68.0
1992	22.0	87	31	31	25	80.9
1993	22.7	93	32	32	29	91.3
1994	23.3	100	32	32	36	105.4

TOTAL COST FOR FIRST FIVE YEARS: 49.8
TOTAL COST FOR FIRST TEN YEARS: 213.8
TOTAL COST FOR FIFTEEN YEARS: 616.8

1 Projection assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-I

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #4 (DELIVERY ALTERNATIVE NO. 2
EQUITABLE USE OF LESS EFFICIENT DELIVERY MODES,
FULL ACCESS BY 1995, MEDIUM VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	15.7	7	7	-	-	3.2
1981	16.1	13	8	5	-	6.3
1982	16.6	20	8	7	5	13.5
1983	17.1	27	9	9	9	20.4
1984	17.6	33	11	11	11	25.6
1985	18.1	40	14	13	13	31.7
1986	18.6	47	16	16	15	38.1
1987	19.1	53	18	18	17	44.2
1988	19.7	60	20	20	20	52.2
1989	20.2	67	23	22	22	59.4
1990	20.8	73	25	24	24	66.7
1991	21.4	80	27	27	26	75.0
1992	22.9	87	29	29	29	84.5
1993	22.7	93	31	31	31	93.2
1994	23.3	100	32	32	36	105.4

TOTAL COST FOR FIRST FIVE YEARS: 69.0
TOTAL COST FOR FIRST TEN YEARS: 294.6
TOTAL COST FOR FIFTEEN YEARS: 719.2

1 Projection assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-J

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #5 (DELIVERY ALTERNATIVE NO. 1
EFFICIENT USE OF EXISTING DELIVERY SYSTEM,
FULL ACCESS BY 1990, LOW VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	15.3	10	10	-	-	4.5
1981	15.7	20	20	-	-	9.2
1982	16.1	30	26	4	-	14.3
1983	16.6	40	27	13	-	20.0
1984	17.0	50	27	23	-	25.9
1985	17.4	60	28	28	4	34.8
1986	17.9	70	28	28	14	48.5
1987	18.4	80	29	29	22	61.5
1988	18.8	90	29	29	32	76.2
1989	19.3	100	30	30	40	90.4

TOTAL COST FOR FIRST FIVE YEARS: 73.8
TOTAL COST FOR TEN YEARS: 385.2

1 Projections assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-K

PROJECTED COST OF IMMUNIZATION PROGRAM:
PROJECTION #6 (DELIVERY ALTERNATIVE NO. 1
EFFICIENT USE OF EXISTING FACILITIES,
FULL ACCESS BY 1990, HIGH VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF BIRTHS (000'000's)	TOTAL PROGRAM ACCESS (%)	PERCENT OF COVERED[1] BIRTHS REACHED BY			TOTAL PROGRAM COST (000'000's of $)
			FIXED	OUTREACH	MOBILE	
1980	16.1	10	10	-	-	4.7
1981	16.6	20	20	-	-	9.7
1982	17.0	30	26	4	-	15.0
1983	17.6	40	27	13	-	21.2
1984	18.1	50	27	23	-	27.6
1985	18.6	60	28	28	4	37.2
1986	19.2	70	28	28	12	52.0
1987	19.8	80	29	29	22	66.2
1988	20.4	90	29	29	32	82.7
1989	21.0	100	30	30	40	98.4

TOTAL COST FOR FIRST FIVE YEARS: 78.3
TOTAL COST FOR TEN YEARS: 414.7

[1] Projection assumes 80% of births with access to immunization services will actually be covered by the program.

TABLE III-L

THE COST OF TECHNICAL ADVISORS[a]

YEAR	NUMBER OF MEDICAL ADVISORS	NUMBER OF OPERATIONS OFFICERS	TOTAL NUMBER OF TECHNICAL ADVISORS	COST (000,000) of $
1980	5	10	15	1.8
1981	5	10	15	1.8
1982	5	10	15	1.8
1983	5	10	15	1.8
1984	4	9	13	1.6
1985	4	8	12	1.4
1986	4	7	11	1.3
1987	3	6	9	1.1
1988	3	5	8	1.0
1989	3	5	8	1.0

FIVE YEAR TOTAL: 8.8
TEN YEAR TOTAL 14.6

1 The cost per man is assumed to be $120,000 per year.

TABLE III-M

FOREIGN EXCHANGE COSTS FOR COST PROJECTION #1
(000'000's of $)

YEAR	TOTAL PROGRAM COSTS[a]	TOTAL DOMESTIC COSTS[b]	TOTAL FOREIGN COSTS	TOTAL FOREIGN COSTS INCLUDING TECHNICAL ADVISORS[c]
1980	4.6	2.7	1.9	3.7
1981	9.4	5.5	3.9	5.7
1982	14.7	8.6	6.1	7.9
1983	20.6	11.8	8.8	10.6
1984	26.8	15.1	11.7	13.3
1985	36.2	18.9	17.3	18.7
1986	50.4	23.0	27.4	28.7
1987	63.8	27.1	36.7	37.8
1988	80.4	32.2	48.2	49.2
1989	94.6	36.3	58.3	59.3
Five Year Total	76.1	43.7	32.4	41.2
Ten Year Total	401.6	181.3	220.3	234.9

a Excluding the cost of technical advisors. Including technical advisors the five year total is $84.9 million and the ten year total is $416.2 million.

b Assumes domestic costs are 60 percent of fixed mode costs, 55 percent of outreach, and 30 percent of mobile costs.

c See Table III-L.

TABLE IV-A

PROJECTED COST OF ORAL REHYDRATION ADDED TO AN IMMUNIZATION PROGRAM (ASSUMING FULL ACCESS BY 1990, MEDIUM VARIANT POPULATION PROJECTION)

YEAR	TOTAL NUMBER OF CHILDREN 0-4	TOTAL PROGRAM ACCESS	TOTAL PROGRAM COSTS[a] (000'000) of $
1980	68.3	10	2.5
1981	70.0	20	5.0
1982	72.2	30	7.8
1983	74.4	40	10.7
1984	76.6	50	13.8
1985	78.7	60	17.0
1986	80.9	70	20.4
1987	83.1	80	23.9
1988	85.7	90	27.8
1989	87.9	100	31.6

TOTAL COST FOR FIRST FIVE YEARS: 39.8
TOTAL COST FOR TEN YEARS: 160.5

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a Cost per child per year is $.45. It is assumed that actual coverage is 80 percent of access. The estimate also depends crucially on the assumption that (1). the average number of cases of diarrhea per year is 4.2 for children 0-1 years of age, 1.8 for children 1-2 and .9 for ages 2-5 and (2). the proportion of cases requiring treatment is .5. (See Cost Effectiveness of Programs to Combat Childhood Communicable Diseases in Kenya, Part II of this report)

APPENDIX

FOREIGN DONOR HEALTH ACTIVITY

This appendix presents material that illustrates the extent of foreign donor health activities in Africa. The size of the activity indicates that any Africa -wide health program will be carried out with the extensive cooperation of both bilateral and multilateral donors. The cooperation would include technical, as well as financial, assistance. While it is difficult to provide specific information on the scope of foreign donor activity some general statements, based on documents and interviews with officials at several donor agencies, are possible. Annex C of the USAID/HEW Health Strategy ... report[1] also contains a discussion of external health aid to Africa.

1. Bilateral donors

The roles and programs sponsores by donor agencies differ considerably.

For example, Belgium's health aid is used primarily for the development of basic health services. Projects funded by Belgium include:[2]

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1 USDHEW, Office of International Health, Inter-Agency Working Group on African Health Strategy. Op. cit., pp. C-1 to C-11.

2 Ibid., pp. C-7 to C-8.

Burundi and Zaire	-	tuberculosis control
Cameroon and Zaire	-	paramedical manpower training
Ivory Coast	--	nutrition, health education and social medicine
Niger	-	preventative and curative health care system
Rwanda and Sudan	-	trypanosomiasis and leprosy control
Zambia and Zaire	-	pilot rural health projects

French health aid is primarily allocated to francophone African countries. The majority of the aid, seventy-four percent in 1977, provides French medical personnel -- medical officers, pharmacists and dentists -- in the support of local health services. Nine percent of the aid was spent on construction, renovation, equipment, and logistic support for health units. French health programs also include the training of Africans, both in France and Africa. Total French health assistance in 1977 amounted to $35 million dollars.[1]

The largest part of British aid to Africa (totalling approximately $6 million in 1976) is allocated to capital development, primarily to Malawi, the Seychelles, Mali and Lesotho.[2] Other donors with sizable programs in Africa are West Germany, Canada, Sweden, Netherlands and Denmark. Table A-1, which surveys donor activities for a random selection of ten African countries, is taken from Annex C to the USAID/HEW report cited above.

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1 Ibid., pp. C-8 to C-9.

2 Ibid., pp. C-9 to C-10.

2. Multilateral donors

The World Health Organization provides technical and organizational assistance as well as funds for the development of primary health care, basic health services and the training of health personnel. Many of the WHO activities involve the provision of technical assistance and guidance in cooperative efforts where a sizable proportion of financial support is provided by other donors; approximately forty percent of total WHO funds come from collaborating donors such as the World Bank, UNDP, and private organizations.

Table A-2 gives the distribution of multilateral USAID health project funds among African countries. The table does not include regional projects such as the onchocerciasis control program for the Voltaic River basin area.

The World Bank's activities in health have increased over the last three to four years. Table A-3 gives a breakdown of the expenditures in Africa for FY 1971 - FY 1979. The total expenditure on health over the eight-year interval was $44 million. Most World Bank health funds are components of larger rural development projects affecting more than one sector. The largest percentage of health component functions (See Table A-4) are for sector control, primarily for the control of the fly in Western Africa that transmits onchocerciasis, but also for malaria and schistosomiasis control.

These programs are often part of irrigation or resettlement schemes which open new agricultural land. A part of the functions designated as preventative services, maternal services and child care services are for immunization, but the exact allocation of funds by country and size is not available.

3. AID Programs for the delivery of low-cost health services

Table A-5 summarized thirteen integrated low-cost health projects in Africa, current in 1978, funded by USAID.[1] Many of the projects are regional rather than national in scope and have rural as well as urban poyulations as the target group. The projects are, therefore, involved with the distribution of basic maternal and child health services to a broad population base. The components of the projects are given in Table A-6. Disease control and immunization are involved in approximately 40% of the thirteen projects listed.

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1 See Baumslag, N.; C. Roessel and E. Sabin. 1978. A.I.D. Integrated Low-Cost Health Projects. Two volumes. USDHEW, Office of International Health.

Appendix

TABLE A-1

SURVEY OF BILATERAL HEALTH PROGRAMMING IN SUB-SAHARAN AFRICA (U.S.$) a/

BILATERAL PROGRAM	CAPE VERDE	CENTRAL AFRICAN EMPIRE	GABON	GAMBIA	LIBERIA	MALI	MAURITANIA	MOZAMBIQUE	SENEGAL	ZAMBIA
	$	$	$	$	$	$	$	$	$	$
Belgium - 1976									137,400	
- 1977										57,200
Canada - 1976									1,000,000	1,000,000
Denmark - 1977										229,168
Egypt - 1977		62,400								
Finland - 1977										72,000
France - 1977		2,360,867	14,800				91,300			
Germany - 1977			1,750,000		135,730					
Italy - 1977		61,600			85,000	11,000		650,000		15,000
Japan - 1977		30,440								
Korea - 1977		70,000			28,200					
Malta - 1977					51,000					
Netherlands - 1977			500,000	15,600	829,000				600,000	719,770
Norway - 1977										135,784
Sweden - 1977					29,400					844,000
United Kingdom - 1977				232,980	35,000					

a/ Source: USDHEW, Office of International Health, Inter-Agency Working Group on African Health Strategy. Op. cit.

APPENDIX
TABLE A-2

MULTILATERAL DONOR AND USAID HEALTH PROGRAMS IN SUBSAHARAN AFRICA[a]
(See footnotes for dates)

COUNTRY	WHO and UNDP[b] (000's & $)	WORLD BANK[c] (# of projects)	USAID[d] (000's & $)
SAHEL AND WEST			
Benin	108		9,128
Cape Verde	75		7,000
Gambia	137	1	
Ghana	1,579		16,241
Guinea	645		
Guinea Bissau	314		
Ivory Coast	61	1	
Liberia	53	2	15,357
Mali	420	1	3,890
Mauritania		1	2,450
Niger	575		17,002
Nigeria	4,383		
Senegal	3,364	2	5,019
Sierra Leone	221		
Sudan	2,077		34,063
Togo	505	1	8,000
Upper Volta	858	1	14,453
CENTRAL AFRICA			
Angola			
Burundi	3,148		
Cameroon	2,117	4	32,224

APPENDIX
TABLE A-2 (continued)

COUNTRY	WHO and UNDP[b] (000's & $)	WORLD BANK[c] (# of projects)	USAID[d] (000's & $)
CENTRAL AFRICA (continued)			
Central Africa Republic	732		1,693
Chad	364		9,101
Congo			
Gabon	750		
Rwanda	402	3	11,320
Zaire	107		12,002
EAST AFRICA			
Botswana	818		6,430
Ethiopia	1,845	2	
Kenya		2	23,689
Lesotho	299		9.551
Malawi	469	6	1,020
Mauritius	15	2	
Mozambique	1,084		
Somalia	888	1	23,200
Swaziland		1	7,500
Tanzania	733	4	21,948
Uganda	355	1	
Zambia	828	2	
Sao Tome Phillipe	2		
Madagascar	1,006	2	
South Rhodesia	73		
	31,410		

FOOTNOTES FOR TABLE A-2

a This is a summary of the information discussed in the text. The table should be regarded as incomplete, as donors may have activities not indicated, and some donor agencies are omitted.

b These are not annual expenditures. Dollar amounts are for projects with estimated completion dates between 1977 and 1982. Water and sanitation projects are included.

c From computer printout provided by Susan Ueber Raymond, Office of Environmental and Health Affairs, World Bank. The numbers in the table represent the number of World Bank projects in each country with health sector components. The data cover fiscal years 1971 to 1979.

d These are not annual expenditures. Dollar amounts include some projects under design and are for projects with estimated completion dates between 1977 and 1982. The data are taken from a list compiled by T. Schroedel (summer intern) for USAID/DS/Office of Health. Regional projects totaling $107 million are omitted. Water and sanitation projects are included. For additional detail see Table A-IV.

APPENDIX
TABLE A-3

WORLD BANK HEALTH PROGRAMS IN AFRICA
(Fiscal Year 1971 to Fiscal Year 1979)

I. World Bank health expenditures are components of multisectoral projects. The total number of components in Africa is 38, with an approximate component expenditure of $44 million (including contingencies). The total health component expenditure is 3.8 percent of total World Bank project costs in Africa.

II. Breakdown of Components by Project Sector

Rural Development	22%
Irrigation	3%
Education	6%
Urban	5%
Other	2%

III. Component Functions (Total greater than 100% due to multifunctional nature of components)

Vector Control	38%
Preventative Services	31%
Material Services	25%
Childcare Services	20%
Health Education	25%
Other	25%

APPENDIX
TABLE A-4

SUMMARY OF AID INTEGRATED LOW-COST HEALTH, NUTRITION AND POPULATION PROJECTS IN AFRICA

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
CAMEROON PID MEDCAM	14.9 (grant)	1979 to 1983	*ne	National	Extension of rural health services through three tiered workers to be trained in two centers (Yaounde & Douala).	Middle level health workers will be trained to provide basic nutrition services.
CAPE VERDE ISLAND BASIC RURAL HEALTH SERVICES	1.5 (grant)	1979 to 1981	240,000	National	Expand and improve capability to deliver basic health services.	Health Educators in the basic rural health centers initiate, within the community, nutrition education (trained by UNICEF and chosen by the community).

* Not estimatable

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
CENTRAL AFRICA AFRICAN EMPIRE (OUHAM PROVINCE) RURAL HEALTH	1.7 (grant)	1977 to	350,000	Regional	Health Management and Training Village health edu - cation rural sanitation and basic village Level Health Care Agency. (VLUCA). These workers are chosen by the village. Prefectural Base Health Office (PHBO) uses data collection and analysis as an evaluation tech- nique for health education.	VLUCA provides MCH and nutrition services. Agriculture extension agents and community development agents promote nutrition and agriculture programs. PHBO develop fish and poultry programs.
GHANA DANFA RURAL HEALTH/ FAMILY PLANNING	3.03 (grant)	1976 to	*ne	Regional	Investigate factors associated with health and family planning. Train health workers. Demonstrate cost effectiveness of the health care programs. (integrated family health planning.)	Project III Outputs Methods for improvement of nutritional status in rural communities.

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
LESOTHO RURAL HEALTH DEVELOPMENT (MEDEX)	3.2 (grant)	1977 to	1.1	National	To upgrade management competence, planning and administration and set the stage for new health workers. (Medex and Village health workers)	VHW trained in basic MCH tasks such as: 1. Weighing of of children. 2. Methods of safe food storage. 3. Nurse clinician will be able to gather baseline nutrition data from community health education duties. 4. Stress of the development of: Kitchen gardens, proper weaning diets, use of wild foods, diets for pregnant and lactating mothers and pre-school children.

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
LIBERIA PID INTEGRATED NATIONAL HEALTH SYSTEMS	4.1 (grant)	1978 to 1982	*ne	National	Establish a rural integrated national health system assisted by linkage with a U.S. medical center and the John F. Kennedy National Medical Center in Liberia.	Special health manpower training project output did not define nutrition activities.
LIBERIA LOFA COUNTY RURAL HEALTH	1.5 (grant)	1975	155,000	Regional	Develop test and institutionalize a network of health post centers and hospitals through trained paramedical personnel to deliver improved health services.	Not stated.

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
MALI RURAL HEALTH SERVICES DEVELOPMENT	4	1977 to 1980	3/6	*one arrondissement in each of the three (3) selected regions.	1. Bring health service to village level. Emphasize health promotion and disease prevention.	1. Birth weight census. 2. Weight and arm circumference of infants and young children. 3. Diagnosis and evaluation of feeding and weaning practices. 4. Iron supplements in pregnancy. 5. Diagnosis and referral of malnutrition.

* arrondissement = 20-40 villages.

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
NIGER IMPROVEMENT RURAL HEALTH	13.3 (grant)	1978 to 1982	3,500 villages	Regional	Establish rural health delivery system through volunteer village health team (VHT) with two (2) health matrons (mid-wives), village leaders and an administrative committee. Provide training and institution support.	VHT will do nutrition education.
SENEGAL RURAL HEALTH SERVICE DEVELOPMENT	3.3 (grant)	1977 to 1980	2,884 (Sine-Saluom	Regional	Create staffed village health posts through a village Hut network. VHW community involvement (major) (emphasis is training).	Simple nutrition education by VHW. Monthly supervision through an "Itinerant Agent".
SUDAN HEALTH SERVICE DELIVERY PID STAGE	21.8 (grant)	1978 to 1983	*ne	Rural Nationwide	Improved Rural Health Delivery. Provide basic health care. Improve nutritional status of mothers, infants and preschool children.	Not defined.

APPENDIX
TABLE A-4 (continued)

	COSTS MILLION $	PROJECT LIFE (FISCAL YEARS)	TARGET GROUP	COVERAGE	PURPOSE	NUTRITION COMPONENT
TANZANIA MANPOWER TRAINING PROGRAM FOR MATERNAL & CHILD HEALTH AIDES	10.8 (grant)	1973 to 1982	13 million (90% of rural population)	National	Train maternal child health aides (MCHAS) capable of providing comprehensive MCH and spacing services to the rural population.	MCHAS provide MCH services and nutrition education.
ZAIRE BASIC FAMILY HEALTH SERVICES	2.6 (grant)	1979 to 1981	Fertile women and children under 5 years.	1.2 million	Develop basic family health services.	Not defined.

APPENDIX
TABLE A-5

NUTRITION AND NUTRITION-RELATED COMPONENTS
IN USAID INTEGRATED HEALTH PROJECTS

AFRICA	Mali	Lesotho	Ghana	Liberia I	Sudan	Cape Verde Islands	C.A. Empire	Liberia II	Niger	Senegal	Zaire	Tanzania	Cameroon
BREAST-FEEDING	X												
WEANING		X	X										
NUTRITION EDUCATION	X	X	X	X	X			X	X	X			
WEIGHT CHARTS	X	X											
MATERNAL SUPPLEMENTATION	Fe												
INFANT SUPPLEMENTS													
DEVELOP WEANING FOODS	X	X	X										
DIETARY FORTIFICATION													
FOOD PRODUCTION		G			X		F						
IMMUNIZATION	X			X		X			X				
DISEASE CONTROL	D,W				M								
WATER SUPPLY	X			X			X						
SANITATION	X		X	X	X	X	X	X	X	X			
FAMILY PLANNING	X	X	X	X				X			X		
COMMUNITY PARTICIPATION		X											
MASS MEDIA													

(S) Small Animals (D) Antidiarrheal (W) Deworming (M) Malaria
(Fe) Iron (G) Family Gardens (F) Fish Ponds

APPENDIX
TABLE A-5

NUTRITION AND NUTRITION-RELATED COMPONENTS
IN USAID INTEGRATED HEALTH PROJECTS

AFRICA	Mali	Lesotho	Ghana	Liberia I	Sudan	Cape Verde Islands	C.A. Empire	Liberia II	Niger	Senegal	Zaire	Tanzania	Cameroon
BREAST-FEEDING	X												
WEANING		X	X										
NUTRITION EDUCATION	X	X	X	X	X			X	X	X			
WEIGHT CHARTS	X	X											
MATERNAL SUPPLEMENTATION	Fe												
INFANT SUPPLEMENTS													
DEVELOP WEANING FOODS	X	X	X										
DIETARY FORTIFICATION													
FOOD PRODUCTION		G			X		F						
IMMUNIZATION	X			X		X			X				
DISEASE CONTROL	D,W				M								
WATER SUPPLY	X			X			X						
SANITATION	X		X	X	X	X	X	X	X	X			
FAMILY PLANNING	X	X	X	X				X			X		
COMMUNITY PARTICIPATION		X											
MASS MEDIA													

(S) Small Animals (D) Antidiarrheal (W) Deworming (M) Malaria
(Fe) Iron (G) Family Gardens (F) Fish Ponds

ANNEX O

REPORT ON CHILD HEALTH IN SUB-SAHARAN AFRICA, WITH PARTICULAR REFERENCE TO EPI AND DIARRHEAL DISEASES

BY

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2. Pertussis
3. Tetanus
4. Measles
5. Polio
6. Tuberculosis
7. Diarrheal Diseases

BIBLIOGRAPHY

I. INTRODUCTION

The following report gives demographic and health data to be used with economic information in the formulation of a proposed program to reduce morbidity and mortality from childhood communicable diseases in sub-Saharan Africa. It is intended as background material for the selection of targeted diseases and for the identification of the scale of the proposed program of health activities. Two brief sections give demographic projections for sub-Saharan Africa during the next fifteen years and an overview of the general health situation there. There follows a presentation and discussion of reported and estimated morbidity and mortality rates for six EPI diseases as well as for some diarrheal diseases. The concluding section describes some of the interactions between these disorders and the nutritional status of African children.

II. POPULATION PROJECTIONS

The estimates of births to be expected in Africa between 1980 and 1994 (Table A) were generated under alternative variants of low, medium and high population growth. These in turn are based on assumptions (outlined in a United Nations document[1])

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1 United Nations. 1977. World Population Prospects as Assessed in 1973. Population Studies No. 60.

concerning the course which fertility and mortality in Africa are likely to take in the event that the region parallels the earlier experience of other countries. (See Table B.)

III. GENERAL INDICATORS OF HEALTH

Two readily available measures of current health conditions in Africa (Table C) are the infant mortality rate (number of deaths to those under one year per 1,000 live births), and the average life expectancy at birth (average number of years a new-born child could be expected to live if current mortality conditions were to continue through his or her lifetime). With respect to both indicators, all regions on the continent except southern Africa are inferior to the average for the developing world. African countries with the lowest infant mortality rates are the islands of Reunion (41); the Seychelles (43); Mauritius (46); and Sao Tome and Principe (75). In contrast not only to these rates but also to the developing world's average of 107 are such countries in the Sahel and western and central Africa as Guinea-Bissau (208); Niger (200); Central African Republic (190); Mauritania (187); and Upper Volta (182).

Life expectancy at birth shows a near-identical pattern. Again, countries with a high life expectancy include the islands of Cape Verde (58); Mauritius (63); and Reunion and the Seychelles (65). Conversely, a number of western, central, eastern and Sahelian countries show a very low life expectancy: Guinea-

Bissau and Angola (39); and Ethiopia, Mali, Mauritania, Niger and Upper Volta (40). The average for the entire developing world is 56.

Table D gives the five leading infectious diseases in 36 African countries for which annual cases during 1973-76 were made available to the World Health Organization.[1] Disorders most commonly listed are malaria, measles, various diarrheal diseases, influenza and venereal disease. The five leading causes of death among the general population in 20 countries between 1971 and 1977 are presented in Table E.[2] There is a noticeable difference between the majority of the countries, where communicable diseases are accountable, and a small number (Mauritius, Lesotho, Rhodesia, Swaziland), which list such disorders characteristic of the developed world as accidents, cerebrovascular and heart disease, and cancer. Based on the data from Tables D and E, Table F is a distribution of the six EPI and diarrheal diseases by countries in which each is a leading infectious disease and/or a cause of death. Table G ranks them according to the total number of countries for which

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1 World Health Organization. 1977. World Health Statistics Annual 1977. Vol. II--Infectious Diseases: Cases and Deaths.

World Health Organization. 1978b. World Health Statistics Annual 1978. Vol. II--Infectious Diseases: Cases and Deaths.

2 Only those countries for which data since 1970 were available are included. If more than one source was identified for a country, the source listing all causes of death was chosen rather than a source with only infectious diseases. A country was excluded from the table if the only source gave very few reported deaths (an average of under 50 per cause), or if any of the causes included "miscellaneous diseases."

they were found to be such a principal disease. Additional information on the diseases follows.

IV. EPI DISEASES

The following section, which describes the extent and location of the six communicable diseases in question, analyzes the data obtained from an extensive review of the available literature, consisting of hospital studies and community-based surveys published since 1970. Table H, I and J reveal major differences, both by country and communicable diseases, in the nature and amount of morbidity (prevalence and/or incidence) and mortality data for Africa. By far the most data exist for measles; the least for diphtheria, pertussis and polio. Although there is little information on the incidence of tetanus, much is known about its fatality -- particularly that of neonatal tetanus. Numerous village-level surveys and retrospective analyses of hospitalized cases have been conducted in east Africa (Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda). Among the Sahelian countries, a good deal of information exists for Senegal, but relatively little for others in that region. In western, central and southern Africa, the only country with substantial data on communicable diseases is Nigeria, with Ghana, Zaire and Zambia a distant second.

The available data reveal that diphtheria and polio have the lowest incidence among the six diseases. Despite suggestions from some sources that its incidence is declining, measles still remains

the most extensive, followed by pertussis. Measles and tuberculosis appear to be on the rise in many of Africa's cities. Data by age and nutritional status reveal that those most vulnerable to contracting, and suffering serious complications from, these communicable diseases are the very young and the malnourished.

A. Diphtheria

Table H shows the dearth of surveys or studies of the extent or severity of diphtheria in sub-Saharan Africa. Among all countries whose incidence figures on infectious diseases were recently recorded by the World Health Organization, only Lesotho, Madagascar, Mauritius, Rwanda, Senegal and the Sudan listed diphtheria.[1] In none of these countries was it among the five major communicable diseases (Tables D and F); it is likely that there is much underreporting, a result of the rarity with which it is diagnosed, except where medical care is available.[2] Even in such areas, diagnosis is usually made from clinical findings without bacteriological confirmation, despite the numerous etiological agents which can cause its principal symptoms.[3]

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1 World Health Organization. 1978b. Op. cit.

2 See, for example, Bassett, David C. and Stephen C. Hadler. 1979. Capability Assessment of Sudan EPI. Report on a visit to Sudan (Draft). CDC/USAID. P.6.

3 Cruickshank, Robert; Kenneth Standard; and Hugh Russell (eds.). 1976. Epidemiology and Community Health in Warm Climate Countries Churchill Livingstone, Longman Group, Ltd. London. P. 81.

It has been reported[1] that in the lowlands of Lesotho, diphtheria has been almost entirely eradicated; in Senegal, although it remains a health problem, its incidence is generally limited to periodic outbreaks.[2] A retrospective study of cases of diphtheria treated at a pediatric clinic in Ethiopia[3] found that all were presented during the rainy season. Although no age-specific incidence data have been obtained, reports from the countries giving its number of cases show that diphtheria is most often found among those children between the ages of 1 and 4; the Ethiopian study cited above found the median age to be 18 months.

Mortality due to diphtheria is often high, particularly in the event of delays in hospitalization and treatment:[4] reports from the Sudan[5] and Zambia[6] give overall case-fatality rates of 52% (58% among infants) and 41%, respectively, with

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1 USDHEW, Office of International Health. 1975. Syncrisis: The Dynamics of Health. Vol. XIII--Botswana, Lesotho and Swaziland. P. 55.

2 USAID, Office of Foreign Disaster Assistance. 1979c. Senegal: A Country Profile. P. 22.

3 Green-Abate, Carmela. 1977. Diphtheria: First report from Ethiopia. Ethiopian Medical Journal. 15:3, 91-93.

4 Diop Mar, I.; A. Sow; and M. Rey. 1971. La diphtérie en Afrique tropicale. Afrique Médicale. 10:93, 749-756.

5 Bassett and Hadler. Op. cit. P. 6.

6 Chintu, C.; N. Bathirunathan; and J.M. Patel. 1978. Diphtheria at the University Teaching Hospital, Lusaka. East African Medical Journal. 55:1, 36-38.

lower rates in Rwanda,[1] Gambia[2] and urban Senegal[3] (Table J.1). Among the 19 countries reviewed (Tables E and F), in only Madagascar is it listed as one of the five leading causes of death.

B. Pertussis (Whooping Cough)

Because of limited information on the incidence of pertussis, statements about its extent throughout Africa are tentative. It is, however, second only to measles with respect to the percentage (47%) of countries studied in which it is one of the five leading infectious diseases (Tables D and F). An analysis of cases seen at a pediatric clinic in Addis Ababa[4] found that it was the third most commonly diagnosed infectious disease. One source[5] reports it to be the most common in the western African countries of Ghana, Guinea, Ivory Coast, Mali and Nigeria. An EPI study

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1 World Health Organization. 1978a. Plan du Programme Elargi de Vaccination pour 1979 /Rwanda/. RWA/HSD/001 -- EPI.

2 Heyworth, B. and M. Ropp. 1973. Diphtheria in the Gambia. Journal of Tropical Medicine and Hygiene. 76:3, 61-64.

3 Diop Mar, I.; A. Samb; and A. Sow. 1973. L'infection diphtérique. Son incidence au Sénégal. Bulletin de la Société Medicale d'Afrique Noire de Langue Française. 18:3, 245-254.

4 Tafesse, Belachew. 1973. Analysis of admissions of the Ethio-Swedish Paedriatric Clinic (1970-71). Ethiopian Medical Journal. 11:1, 3-12.

5 USDHEW, Office of International Health. Inter-Agency Working Group on African Health Strategy. 1979. Developing a U.S. Health Strategy for SubSaharan Africa. Vol. 2 (Technical Annexes), P. B-68.

conducted in Rwanda[1] gives an incidence rate of 800 per 1,000; a comparable study in the Sudan, 36.3;[2] a pertussis surveillance in rural Kenya, 81 (children 5 and under, 105-159)[3]. (See Table J.2.) The median age is reported to be 2-3 years in Africa (in contrast to an average of 4-5 in the developed world), a factor, it is contended,[4] effecting high case-fatality rates.

Still, pertussis was found to be among the five leading causes of death in only 5 of 19 countries for which this information is available (Tables E and F); interviews with mothers at an antenatal clinic in Victoria Province, Kenya[5] revealed that only 2.2% of all the deaths occurring to infants and children were attributable to the disease. With a higher rate from Dakar[6] the exception, case-fatality rates (Table J.2) are in the vicinity of 1 to 3% (Kenya,[7] the Sudan[8] and

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1 World Health Organization. 1978a. Op. cit.

2 Bassett and Hadler. Op. cit. Table 8.

3 Voorhoeve, A.M. et al. 1978. Machakos Project studies: Agents affecting health of mother and child in a rural area of Kenya. IV. The epidemiology of pertussis. Tropical and Geographical Medicine. 30:1, 125-139.

4 Cruickshank, Standard and Russell. Op. cit. P. 72.

5 Stoughton, Richard R. 1975. Childhood survival in the Bikita Tribal Trust Land. Central African Journal of Medicine. 21:1, 10-11.

6 Diop Mar, I.; A. Samb; and A. Sow. Op. cit.

7 Stoughton. Op. cit.

8 Bassett and Hadler. Op. cit. P. 5.

Rwanda[1]). Among infants the rate is higher[2] -- at least in part a consequence of the frequency with which it goes unrecognized among this age group.[3] One source reports greater case-fatality rates among girls than boys[4] -- and notes that this is an exception to the usual pattern of greater vulnerability of boys when contracting common childhood communicable diseases.

C. Tetanus

Very little incidence data on tetanus are to be found in the literature for sub-Saharan Africa, as most of the epidemiological research on this endemic infection is concerned with its severity. In many instances it is recognized only where medical care is readily available, that is, in cities.[5] The previously cited EPI study in the Sudan[6] gives an incidence of .13 per 1,000 (.33 for smaller towns); a similar survey in Rwanda[7] found the incidence per 1,000 to be 1.9 for non-

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1 World Health Organization. 1978a. Op. cit.

2 Bwibo, Nimrod O. 1971. Whooping cough in Uganda. Scandinavian Journal of Infectious Diseases. 3:1, 41-43.

3 USDHEW, Office of International Health. 1979. Op. cit. Vol. 2 (Technical Annexes), P. B-69.

4 Morley, David. 1973. Paediatric Priorities in the Developing World. Butterworth and Co., Ltd.: London. Pp. 233-234.

5 Bassett and Hadler. Op. cit. P. 6.

6 Ibid.

7 World Health Organization. 1978a. Op. cit.

neonatal tetanus, and 52.2 for neonatal. Although in none of the reporting countries was it among the five leading infectious diseases (Tables D and F), it is reported to have remained widespread in Cape Verde.[1] Around 10-30% of all tetanus cases are found among the newborn;[2] it should be noted, though, that at least in the Sudan, reporting of the disease among this age group is particularly deficient.[3]

Tetanus is a leading cause of death among 8 of the 19 countries reviewed (Tables D and F). Its case-fatality rates, highest in tropical and subtropical countries,[4] range from 38% (Senegal)[5] to 61% (inpatients in Ethiopia).[6] Its severity during the neonatal period is revealed by the occurrence of 80% of all tetanus deaths during that time,[7] as well as its primacy among causes of death to infants (accounting for 47% of those in Liberia during 1966-67,[8] and 43% of cases of hos-

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1 USAID, Office of Foreign Disaster Assistance. 1979a. Cape Verde: A Country Profile. P. 18.

2 Cruickshank, Standard and Russell. Op. cit. P. 78.

3 Bassett and Hadler. Op. cit. P. 77.

4 Cruickshank, Standard and Russell. Op. cit. P. 77.

5 USDHEW, Office of International Health. 1976. Syncrisis: The Dynamics of Health. Vol. XIX--Senegal. P. 35.

6 Habte-Gabr, Eyassu and Mulugetta Mengistu. 1978. Tetanus in Gondar Public Health College Hospital, Ethiopia: A review of 72 cases. Ethiopian Medical Journal. 16:2, 53-61.

7 Cruickshank, Standard and Russell. Op. cit. P. 78.

8 USDHEW, Office of International Health. 1973. Syncrisis: The Dynamics of Health. Vol. VII--Liberia.

pitalized infants studied in Kampala[1]). The range of case-fatality rates for this age group recorded by special studies is from 58% (Accra)[2] to 88% (Ethiopia)[3].

D. Measles

Most young children in sub-Saharan Africa contract measles at some point in their lives. Measles was among the five leading infectious diseases in 16 of 19 countries reviewed (Tables D and F). Around 5% of the population of Kinshasa is infected each year.[4] A study in Nairobi[5] found that nearly all 4-year-olds had had measles, and well over half of these by age 2. In countries reporting cases of measles, usually about 50% occur to children 1-4, with remaining cases evenly distributed between infants and older children.

Evidence of the observation that in urban areas measles is most often found among young children[6] comes from an analysis

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1 Bwibo, N.O. 1970a. Common causes of death in children at Mulago Hospital, Kampala, Uganda. Clinical Pediatrics. 9:11, 691-694.

2 Nkrumah, F.K. and A. Verma. 1971. Neonatal tetanus: Analysis of 161 cases from Accra. Ghana Medical Journal. 10:4, 280-282.

3 Habte-Gabr and Mengistu. Op. cit.

4 USDHEW, Office of International Health. Op. cit. Vol.2 (Technical Annexes), B-62.

5 Hayden, R.J. 1974. The epidemiology and nature of measles in Nairobi before the impact of measles immunization. East African Medical Journal. 51:2, 199-205.

6 Ngandu-Kabeya, Gilbert. 1972. Concerning 101 deaths from measles in African children in Lubumbashi. Materia Medica Polona. 4:2, 89-93.

of the epidemiology of the disease in Western Nigeria,[1] where children under two years were found to be particularly susceptible if they lived in an urban or semi-urban area. The data concerning the seasonality of measles are inconsistent: while one source states that the dry season is noted for a high incidence of the disease,[2] analyses of hospitalized cases in Uganda (Kampala[3] and the Ankole district[4]) revealed no seasonal variations. Furthermore, a study of hospitalized cases in Mbale (also Uganda)[5] discovered a particularly high incidence during the rainy season.

There is much geographic variation in the level of reported mortality from measles: one author,[6] for example, notes the higher case-fatality rates recorded for West than East Africa. Rates are universally high among malnourished children. (See Section VI, Nutrition, below.) For outpatients, overall

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1 Grigsby, Margaret E. and Joseph I.A. Adetosoye. 1973. Measles epidemiology and control in Western Nigeria. Journal of the National Medical Association. 65:5, 278-385.

2 USDHEW, Office of International Health. 1979. Op. cit. Vol. 2 (Technical Annexes), P. B-61.

3 Bwibo. 1970a. Op. cit.

4 Cardozo, L.J. 1973. Paediatric survey at a district hospital in Uganda. Tropical and Geographical Medicine. 25:1, 59-64.

5 Swift, P.N. and P.J.S. Hamilton. 1973. Evaluation of paediatric care from routine hospital records: Report of a study at Mbale, Uganda. Journal of Tropical Medicine and Hygiene. 76:12, 300-315.

6 Morley. Op. cit. P. 211.

case-fatality rates range from 1% (Nairobi)[1] to 28% (Dakar)[2]. The EPI study in the Sudan which was cited above[3] found that measles accounted for 71% of all deaths due to immunizable diseases. In 15 of 19 countries for which this information was obtained, measles was among the five leading causes of death during 1971-77 (Tables E and F).

A three-year measles surveillance in rural Kenya[4] yielded data demonstrating the seriousness of the disease in Africa: 13% of all confirmed cases were hospitalized. A good deal of data exist for such severe cases (Table J.4). Among in-patients under 5, the case-fatality rates range from 3% (age 2, rural Tanzania)[5] to 72% (ages 0-4, Ibadan)[6]. In most cases, increased age is associated with a greater chance of survival: a study of hospitalized children who died of measles in Lubumbashi, Zaire[7] disclosed that 93% were under 2 years; among hospitalized

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1 Hayden. Op. cit.

2 Diop Mar, Samb and Sow. Op. cit.

3 Bassett and Hadler. Op. cit. P. 13.

4 Voorhoeve, A.M. et al. 1977. Machakos Project studies: Agents affecting health of mother and child in a rural area of Kenya. III. The epidemiology of measles. Tropical and Geographical Medicine. 29:4, 428-440.

5 Gupta, B.M. and M. Singh. 1975. Mortality and morbidity pattern in measles in Tanga district, Tanzania. Tropical and Geographical Medicine. 27:4, 383-386.

6 Grigsby and Adetosoye. Op. cit.

7 Ngandu-Kabeya. Op. cit.

cases in Uganda,[1] 55% of those who died were aged 6-18 months. While measles mortality in Upper Volta is higher in cities than elsewhere,[2] the selected nature of cases in, and the more accurate reporting by, hospitals may account for these differentials as much as the crowding and malnutrition found in urban areas.

E. Poliomyelitis

In none of the 19 countries studied was polio found to be a leading infectious disease (Tables D and F). Yet the reported cases often seriously understate its extent. As recently as 1975 it was, for example, still a major illness in Cape Verde;[3] in Senegal, while limited to cyclical outbreaks, it is considered a chronic health problem.[4] And two related surveys in Ghana[5] confirmed its endemicity in that

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1 DeBuse, P.J.; M.G. Lewis; and J.W. Mugerwa. 1970. Pulmonary complications of measles in Uganda. Journal of Tropical Pediatrics. 16:4, 197-203.

2 USAID, Office of Foreign Disaster Assistance. 1979d. Upper Volta: A Country Profile. P. 23.

3 USAID, Office of Foreign Disaster Assistance. 1979a. Op. cit. P. 18.

4 USAID, Office of Foreign Disaster Assistance. 1979c. Senegal: A Country Profile. P. 22.

5 Ofosu-Amaah, Samuel; James H. Kratzer; and David D. Nicholas. 1977. Is poliomyelitis a serious problem in developing countries?--Lameness in Ghanaian schools. British Medical Journal. 1:6067, 1012-1014.

Nicholas, David D. et al. 1977. Is poliomyelitis a serious problem in developing countries?--The Danfa experience. British Medical Journal. 1:6067, 1009-1012.

country (contrasting with its more customary appearance in the form of an epidemic[1]), estimating its total incidence -- 23 per 100,000 total population nationally and 28 in a rural district (Tables J.5) -- to be much higher than the officially reported rates. One source[2] even reports that the incidence of polio increased significantly in 17 sub-Saharan African countries between 1951 and 1970. The highest concentration of cases revealed by a report from Mali[3] was among those between the age of 5 to 6 months and 2 years. Among children under 3 in that country, incidence rates for boys were higher than for girls.[4]

Polio was not a leading cause of death among the 19 countries cited above (Tables E and F), and in the Sudan it accounted for only 1.9% of all deaths due to immunizable diseases.[5] Overall case-fatality rates range from 4% (Mombasa, Kenya)[6] to 22% (Dakar).[7]

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1 Nathwani, U.K. and A.W. Mugenya. 1975. Survey of poliomyelitis in Mombasa: 12 year review (1962-73). Community Health. 7:2, 94-100.

2 Cruickshank, Standard and Russell. Op. cit. Pp. 136-137.

3 Pervikov, J. et al. 1978. Les aspects épidémiologiques de la poliomyélite au Mali. Médecine Tropicale. 38:1, 00-103.

4 Ibid.

5 Bassett and Hadler. Op. cit. P. 7.

6 Nathwani and Mugenya. Op. cit.

7 Diop Mar, Samb and Sow. Op. cit.

F. Tuberculosis

Two sources[1] report evidence of a rise in the incidence of tuberculosis in urban sub-Saharan Africa, paralleling the existing urban-rural differentials; the causes most often cited are overcrowding and poor ventilation, hygiene and nutrition. It is also noted, however, that the overall prevalence of and death rates attributable to this disease have been declining in recent years.[2] One national survey (for Kenya)[3] which found this to be the case between 1964 and 1974 revealed that the greatest declines occurred among children and females. It may be, though, that for some countries such a decline stems from inactive and/or incomplete case reporting.[4] The difficulties to which such underreporting can be attributed include the lack of uniform criteria for the diagnosis and reporting of tuberculosis, expecially its bacteriological confirmation.[5]

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1 USDHEW, Office of International Health. 1979. Op. cit. Vol. 2 (Technical Annexes), P. B-66.

USDHEW, Office of International Health. 1973. Op. cit. P. 25.

2 USDHEW, Office of International Health. 1979. Loc. cit.

3 East African and British Medical Research Council. 1978. Tuberculosis in Kenya: A second national sampling survey of drug resistance and other factors, and a comparison with prevalence data from the first national sampling survey. Tubercule. 59:3, 155-177.

4 USAID, Office of Foreign Disaster Assistance. 1979c. Op. cit.

5 Bulla, A. 1977. Global review of tuberculosis morbidity and mortality in the world. (1961-1971). World Health Statistics Report. 30:1, 2-38.

In only three of the 19 countries for which this information was obtained for 1974-76 was tuberculosis among the five leading infectious diseases (Tables D and F). Among children, the range of prevalence rates per 1,000 population is from 26 (age 0-4, Chad)[1] to 690 (age 5-14, Somalia, reportedly the highest in the world)[2]. (See Table J.6.) Although there appears to be an increase in prevalence with age,[3] the Kenyan national survey cited above[4] reports that nearly one-fourth of all pulmonary and extra-pulmonary cases occurred to those under five years. Hospitalized children in Ibadan with the highest incidence rates were those aged 1-2 and 4-5.[5]

Regardless of its level of incidence, tuberculosis is reported to be particularly serious in several eastern and southern African countries (Table J.6). It is the foremost public health problem in Djibouti,[6] and the second most serious

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1 Ibid.

2 Ibid.

3 Pust, R.E.; S.E. Onejeme; and S.N. Okafor. 1974. Tuberculosis survey in East Central State, Nigeria: Implications for tuberculosis programme development. Tropical and Geographical Medicine. 26:1, 51-57.

4 East African and British Medical Research Council. Op. cit.

5 Aderele, W.I. 1979. Pulmonary tuberculosis in children: An analysis of 263 cases seen at Ibadan, Nigeria. Tropical and Geographical Medicine. 31:1, 41-51.

6 USAID, Office of Foreign Disaster Assistance. 1979b. Djibouti: A Country Profile. P. 18.

in Ethiopia.[1] In Botswana it is both a major cause of hospitalization and a leading cause of death;[2] in Mozambique, it accounted for 43% of all deaths from infectious and parasitic diseases in 1970.[3] Estimated and reported case-fatality rates range from 9% (Ibadan)[4] to 31% (Dakar)[5]. For 1971-77, tuberculosis was one of the five leading causes of death in 11 of 19 countries reviewed above (Tables E and F).

V. DIARRHEAL DISEASES

Since there is much variation in the literature regarding not only the reporting but also the definition of diarrheal diseases, the statements made about their extent and severity in sub-Saharan Africa are particularly tentative. Most of the incidence and case-fatality data given in Table J.7 refer to diarrhea as a symptom of gastroenteritis, or as a result of infection with such bacteria as salmonella and E. coli, or with rotavirus; a few studies analyze cases of bacillary dysentery or cholera. The determination of the extent to which diarrhea is a leading infectious disease and a cause of death (Tables D, E and F) relies on a broader definition,

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1 USAID, Office of Foreign Disaster Assistance. 1978a. Op. cit. P. 21.

2 USDHEW, Office of International Health. 1975. Op. cit. P. 7.

3 USDHEW, Center for Disease Control. 1976. Tuberculosis in the World: 1976. HEW Pub. No. CDC 76-8317. P. 238. Cited in USDHEW 1979. Op. cit. Vol.2 (Technical Annexes), P. B-65.

4 Aderele. Op. cit.

5 Diop Mar, Samb and Sow. Op. cit.

including not only the above disorders but also amebiasis and "intestinal parasitism" (see note c, Table F). As so defined, it is among the five major infectious diseases in ten of 19 countries providing this information. Diarrhea was the third most common cause of pediatric hospital admissions in Ankole District, Uganda,[1] and the principal cause of admissions studied in Ibadan.[2]

The prevalence of diarrhea varies both by age and season. With respect to the former, a surveillance in rural Kenya[3] found weanling diarrhea to be a common phenomenon, with the highest incidence rates per two-week period (245 per 1,000) occurring among infants aged 6-11 months. (In this study the far-greater incidence of diarrhea among all children than among those reported and/or observed to be ill led the authors to conclude that mothers there do not necessarily consider diarrhea to be an illness.) A study of acute diarrhea among children in Kinshasa revealed that 80% of all cases were under three years.[4] A study of hospitalized

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1 Cardozo. Op. cit.

2 Obi, J.O. 1979. Morbidity and mortality of children under five years old in a Nigerian hospital. Journal of the National Medical Association. 71:3, 245-247.

3 Leeuwenburg, J. et al. 1978. Machakos Project studies: Agents affecting health of mother and child in a rural area of Kenya. VII. The incidence of diarrhoeal disease in the under-five population. Tropical and Geographical Medicine. 30:3, 383-391.

4 Omanga, M. et al. 1973. Etude de 242 cas de diarrhées aigues de l'enfant à Kinshasa. Annales de la Société Belge de Médecine Tropicale. 53:2, 77-87.

cases of cholera in the Ivory Coast[1] revealed that, among children, the group with the most cases were those aged 5-9.

At least in part because of the confounding effect of seasonal fluctuations (rainfall, harvests) and of environmental factors (sanitation, and the quantity and quality of water), the exact workings of the malnutrition/gastroenteritis complex are not well understood.[2] One recent report,[3] emphasizing the importance of examining diarrheal disease data an a country-by-country basis, notes that tropical countries may see a high incidence of diarrhea (particularly among infants) during the rainy season; in temperate countries, during both the hot season (with bacteria as the agent) and the cool season (rotavirus the agent). Examples of high morbidity during the rainy season come from the Gambia,[4] Uganda,[5] the

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1 Bourgeade, A. et al. 1973. Etude clinique du cholera. Médecine d'Afrique Noire. 20:3, 189-197.

2 /Editorial/. 1978. Child mortality-nutrition-gastroenteritis-water contamination. Lancet. 2:8090, 616. See also Section VI, Nutrition, below.

3 Levine, Myron M. 1979. Infant diarrhea in the less developed world: Epidemiology and control. Presentation to the American Public Health Association: New York City.

4 Rowland, M.G.M.; T.J. Cole; and R.G. Whitehead. 1977. A quantitative study into the role of infection in determining nutritional status in Gambian village children. British Journal of Nutrition. Vol. 37, 441-450.

5 Poskitt, E.M.E. 1972. Seasonal variation in infection and malnutrition at a rural paediatric clinic in Uganda. Transactions of the Royal Society of Tropical Medicine and Hygiene. 66:6, 931-936.

Ivory Coast[1] and Ethiopia.[2] The authors of the latter study found the rainy season to be associated with the frequency of rotavirus isolation but not that of bacterial pathogens or intestinal parasites, underscoring the importance of the etiology of diarrhea. And a review of hospitalized cases of gastroenteritis in Salisbury[3] disclosed a noticeable peak during the coldest period of the Rhodesian winter; here, too, the percentage of patients from whom bacterial pathogens was isolated was less than during the warmer months. An exception to these patterns is a study of hospitalized cases of severe diarrhea in the Ivory Coast,[4] from which no seasonal variation of any kind was discerned.

Diarrheal diseases constitute one of the five leading causes of death in ten of 19 countries studied (Tables E and F). With in-patient case-fatality rates among all infants and children ranging from 3% (Salisbury)[5] to 20% (Tanzania)[6], not only the

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1 Le Noc, P.; J. Orio; and A. Bourgeade. 1974. Les infections à shigella en Côte d'Ivoire. Revue d'Epidémiologie Médecine Sociale et de Santé Publique. 22:7, 557-565.

2 Stintzing, Gudmund et al. 1977. Aetiology of acute diarrheal disease in infancy and childhood, during the peak season Addis Ababa 1977: A preliminary report. Ethiopian Medical Journal. 15:4, 141-146.

3 Zilberg, B. 1976. A clinical and epidemiological study of gastro-enteritis. South African Medical Journal. 50:51, 2038-2040.

4 Bourgeade, A. et al. 1974. Diarrhées aiguës en Côte d'Ivoire; place et aspect clinique des salmonelloses et des shigelloses. Bulletin de la Société Médicale d'Afrique Noire de Langue Française. 19:3, 281-286.

5 Zilberg. Op. cit.

6 Brookfield, D.S. and M. Kigadye. 1978. Electrolyte studies in gastroenteritis in children in Dar es Salaam. East African Medical Journal. 55:3, 98-102.

morbidity but also the mortality of the diarrheal disease varies--again, by age, season and etiology. Diarrhea appears to be most life-threatening among the very young, whose deaths may also be the most underreported. It accounts for 40% of all infant deaths in Cape Verde;[1] a similar figure was disclosed by a study of infants and children whose mothers were interviewed in Victoria Province, Kenya.[2] It was the second leading cause of death among hospitalized children in the Nigerian study cited above[3] and among a similar group in Ndola, Zambia.[4] A study of children reared in institutions[5] found diarrhea to be the principal cause of death -- the result, posits the author, of the absence of breast-feeding and concomitant protection from gastroenteritis.

Looking at age-specific mortality data even more closely (Table J.7), one observes that in some countries, perhaps because of the precarious nutritional state during the weaning period, case-fatality rates are higher among older infants and young children than among very young infants; this finding obtains in Uganda[6]

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1 USAID, Office of Foreign Disaster Assistance. 1979a. Op. cit. P. 18.

2 Stoughton. Op. cit.

3 Obi. Op. cit.

4 Balint, O. and K. Anand. 1978. Analysis of admissions to the Arthur Davidson Children's Hospital, Ndola. Medical Journal of Zambia. 12:2, 33-37.

5 Oyemade, Adefunke. 1973. Mortality among motherless babies in Nigeria. Tropical and Geographical Medicine. 25:4, 397-401.

6 Bwibo. 1970a. Op. cit.

and Senegal.[1] A study of hospitalized cholera cases in Ibadan[2] disclosed a direct association between age and case-fatality, a finding not readily explained. In Liberia during the late 1960's, gastro-intestinal/diarrheal diseases accounted for 17% of all deaths among the newborn but 33% for the group aged 2-12 months.[3] The influence of the rainy season on mortality is demonstrated by a clustering of deaths during a five-month period revealed by the diarrhea surveillance in Kenya.[4]

VI. THE ROLE OF NUTRITION

Numerous references discussed above identify some association between malnutrition (taking the form of marasmus, kwashiorkor, or anemia) and four of the seven childhood diseases. The sequence frequently seen in sub-Saharan Africa is the tendency of parasitic infestation and infectious diseases to excerbate malnutrition, which at the same time aggravates the effect of these disorders.[5]

A study of children hospitalized for tuberculosis in Ibadan[6] revealed that all 24 who died were malnourished. Regarding diarrhea

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1 USDHEW, Office of International Health. 1976. Op. cit. P. 30.

2 Lewis, E. et al. 1972. Cholera in Ibadan, 1971. American Journal of Tropical Medicine and Hygiene. 21:3, 307-314.

3 USDHEW, Office of International Health. 1973. Op. cit. P. 24.

4 Leeuwenburg et al. Op. cit.

5 USDHEW, Office of International Health, Op. cit. Vol. 1 (Main Report), P. 72.

6 Aderele. Op. cit.

mortality, the finding that the highest case-fatality rates in Kinshasa (10%) occurred to those aged 1 is related, say the authors,[1] to the vulnerable nutritional state at that age; in Mbale, Uganda,[2] the mortality from gastroenteritis among those also suffering from anemia was more than twice as high as those without anemia (Table J.7). Implying the same association, the authors of the report on pertussis surveillance in rural Kenya[3] attribute the low mortality (an overall case-fatality rate of less than 2%) to the adequate nutritional status among the population studied. Furthermore, the lowest degree of malnutrition was found among infants (who are the most susceptible to severe pertussis), acknowledged to be an effect of the widespread practice of breastfeeding there.

Measles has been referred to as "the outstanding example of the interaction of malnutrition and infection"[4]. Its severity[5] and fatality[6] are much greater among the malnourished than the adequately nourished. Conversely, perhaps one-half of all cases of severe malnutrition in Africa are a consequence of measles;[7]

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1 Omanga et al. Op. cit.

2 Swift and Hamilton. Op. cit.

3 Voorhoeve et al. 1978. Op. cit.

4 Cruickshank, Standard and Russell. Op. cit. P. 62.

5 Sheifele, D.W. and C.E. Forbes. 1972. Prolonged giant cell excretion in severe measles. Pediatrics. 50:6, 867-873.

6 Morley. Op. cit. P. 207.

7 USDHEW, Office of International Health. Op. cit. Vol. 2 (Technical Annexes), P. B-61.

it is noted that a common symptom of measles, soreness of the mouth, often reduces the amount of breastfeeding.[1] In Tanzania, 80% of severe hospital cases analyzed were malnourished;[2] the study of hospitalized children in Lubumbashi, Zaire found that all 101 who died of measles were underweight.[3]

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1 Guillozet, Noël. 1979. Measles in Africa: A deadly disease. Clinical Pediatrics. 18:2, 95-100.

2 Kimati, V.P. and B. Lyaruu. 1976. Measles complications as seen at Mwanza Regional Consultant and Teaching Hospital in 1973. East African Medical Journal. 53:6, 332-340.

3 Ngandu-Kabeya. Op. cit.

TABLE A

ESTIMATES OF THE ANNUAL NUMBER OF BIRTHS IN SUB-SAHARAN AFRICA, 1980-1994, UNDER THREE ALTERNATIVE POPULATION PROJECTIONS [1]

YEAR	NUMBER OF BIRTHS[2] (000,000's)		
	LOW VARIANT	MEDIUM VARIANT	HIGH VARIANT
1980	15.3	15.7	16.1
1981	15.7	16.1	16.6
1982	16.1	16.6	17.0
1983	16.6	17.1	17.6
1984	17.0	17.6	18.1
1985	17.4	18.1	18.6
1986	17.9	18.6	19.2
1987	18.4	19.1	19.8
1988	18.8	19.7	20.4
1989	19.3	20.2	21.0
1990	19.8	20.8	21.7
1991	20.3	21.4	22.4
1992	20.7	22.0	23.1
1993	21.2	22.7	23.8
1994	21.8	23.3	24.5

1 Based on high, medium and low variant population projections, in United Nations. 1977. World Population Prospects as Assessed in 1973. Population Studies No. 60.

2 Starting from 350.2 million total population in 1980. This figure is based on a 1979 estimate of 340.5 million for all of Africa except Morocco, Algeria, Tunisia, Egypt, Libya and South Africa. Source: Population Reference Bureau. 1979. 1979 World Population Data Sheet.

TABLE B

DEMOGRAPHIC ASSUMPTIONS UNDERLYING
ESTIMATES OF NUMBER OF BIRTHS IN AFRICA FOR 1980 - 1994

PARAMETER	YEAR			VARIANT[1]
	1980-85	1985-90	1990-94	
Rate of Natural Increase	2.86 2.98 2.67	2.88 3.07 2.59	2.86 3.12 2.40	Medium High Low
Crude Birth Rate	44.8 45.9 43.7	43.3 44.6 41.3	41.5 43.4 37.9	Medium High Low
Crude Death Rate	16.2 15.8 17.0	14.5 13.9 15.4	12.9 12.2 13.8	Medium High Low

1 See United Nations. Op. cit.

TABLE C

GENERAL INDICATORS OF HEALTH FOR 46 SUB-SAHARAN AFRICAN COUNTRIES

Country	Infant Mortality Rate	Life Expectancy at Birth (years)
SAHEL		
Cape Verde	105	58
Chad	165	41
Gambia	165	41
Mali	190	40
Mauritania	187	40
Niger	200	40
Senegal	159	42
Upper Volta	182	40
WEST		
Benin	149	43
Ghana	115	49
Guinea	175	41
Guinea-Bissau	208	39
Ivory Coast	154	46
Liberia	148	48
Nigeria	157	45
Sierra Leone	136	46
Togo	163	43
CENTRAL		
Angola	203	39
Cameroon	137	44
Central African Republic	190	44
Congo	180	44
Equatorial Guinea	165	44
Gabon	178	41
Sao Tome and Principe	75	--
Zaire	160	44

TABLE C (continued)

Country	Infant Mortality Rate	Life Expectancy at Birth (years)
EAST		
Burundi	140	42
Comoros	160	46
Ethiopia	162	40
Kenya	119	53
Madagascar	102	46
Mauritius	46	63
Mozambique	140	44
Reunion	41	65
Rwanda	127	43
Seychelles	43	65
Somalia	177	41
Sudan	141	46
Tanzania	125	47
Uganda	136	50
SOUTH		
Botswana	97	56
Lesotho	111	50
Malawi	142	43
Namibia	142	49
Rhodesia	121	52
Swaziland	168	44
Zambia	144	46
World	95	60
More Developed	28	71
Less Developed	107	56

Source: Population Reference Bureau. Op. cit.

TABLE D

THE FIVE LEADING INFECTIOUS DISEASES AMONG THE GENERAL POPULATION, 1973 - 1976, FOR 36 AFRICAN COUNTRIES

COUNTRY	YEAR	WHO REFERENCE	INFECTIOUS DISEASE 1	2	3	4	5
SAHEL							
Chad	1976	1978b	diarrheal disease	amebiasis	bacillary dysentery	schistosomiasis [a]	gonococcal infections [a]
Gambia [c]	1974	1977	dysentery	measles	chickenpox	pertussis	influenza
Mali	1976	1978b	malaria [a]	measles	amebiasis	syphilis	influenza
Niger	1973	1977	malaria	measles	chickenpox	influenza	pertussis
Mauritania [d]	1975	1978b	malaria [b]	bacillary dysentery	influenza	syphilis & sequelae [b]	gonococcal infections [b]
Senegal	1975	1978b	malaria [b]	influenza	measles	pertussis	syphilis [b]
Upper Volta	1975	1978b	leprosy [b]	amebiasis	measles	trachoma	pertussis
WEST							
Benin	1976	1978b	malaria [a]	measles	bacillary dysentery	chickenpox	amebiasis
Ghana	1976	1978b	malaria [a]	measles	chickenpox	intestinal parasitism, unspecified	pertussis
Guinea [c]	1974	1977	malaria	influenza	gonococcal infections	measles	chickenpox
Guinea-Bissau [c]	1974	1977	gonococcal infections	amebiasis	tuberculosis	measles	leprosy
Liberia	1975	1978b	bacillary dysentery	malaria [b]	measles	cholera	pertussis

TABLE D (continued)

COUNTRY	YEAR	WHO REFERENCE	INFECTIOUS DISEASE 1	2	3	4	5
WEST (continued)							
Nigeria	1975	1978b	malaria [b]	measles	gonococcal infections	bacillary dysentery	chickenpox
Sierra Leone [c]	1973	1977	measles	chickenpox	bacillary dysentery & amebiasis	meningo-coccal infections	typhoid & paratyphoid fevers
Togo	1976	1978b	malaria [a]	diarrheal disease	measles	anclyosto-miasis	influenza
CENTRAL							
Angola	1974	1977	malaria	influenza	measles	gonococcal infections	pertussis
Cameroon	1974	1977	malaria	influenza	measles	amebiasis	bacillary dysentery
Central African Republic	1976	1978b	malaria	intestinal parasitism, unspecified	diarrheal disease	schistoso-miasis [a]	gonococcal infections [a]
Congo	1976	1978b	malaria [a]	influenza	diarrheal disease	measles	gonococcal infections [a]
Equatorial Guinea	1975	1978b	malaria [b]	bacillary dysentery	pertussis	infectious hepatitis	gonococcal infections [a]
Gabon	1974	1977	malaria	influenza	gonococcal infections	pertussis	chickenpox
Zaire [c]	1974	1977	influenza	measles	pertussis	chickenpox	mumps

TABLE D (continued)

COUNTRY	YEAR	WHO REFERENCE	INFECTIOUS DISEASE 1	2	3	4	5
EAST							
Burundi [c]	1975	1977	influenza	measles	pertussis	typhus	chickenpox
Kenya	1973	1977	dysentery	infectious hepatitis	cholera	anthrax	leprosy
Madagascar [c]	1975	1978b	influenza	measles	gonococcal infections [b]	pertussis	syphilis & sequelae [b]
Mauritius	1975	1978b	gonococcal infections [a]	tubercu-losis [a]	syphilis & sequelae [a]	typhoid fever	malaria [a]
Mozambique [c]	1974	1977	measles	tubercu-losis	infectious hepatitis	leprosy	cholera
Rwanda [d]	1976	1978b	helmin-thiasis	malaria [a]	measles	influenza	anclyosto-miasis
Sudan	1976	1978b	malaria [a]	schistoso-miasis	gonococcal infections [a]	trachoma	pertussis
Tanzania [c]	1974	1977	trypano-somiasis	meningo-coccal infections	cholera	poliomye-litis	influenza
Uganda [e]	1975	1978b	malaria [b]	measles	tubercu-losis	pertussis [b]	gonococcal infections [b]
SOUTH							
Botswana [d]	1975	1977	gonococcal infections	influenza	syphilis & sequelae	measles	streptococcal sore throat & scarlet fever
Lesotho [f]	1976	1978b	gonococcal infections [a]	enteritis	syphilis	measles	pertussis

TABLE D (continued)

COUNTRY	YEAR	WHO REFERENCE	INFECTIOUS DISEASE 1	2	3	4	5
SOUTH (cont'd)							
Southern Rhodesia	1974	1977	malaria	trachoma	tuberculosis	typhoid fever	cholera
Swaziland	1976	1978b	measles	influenza	tuberculosis	schistosomiasis [a]	malaria [a]
Zambia [e]	1975	1977	measles	infectious hepatitis	pertussis	influenza	bacillary dysentery

[a] Incidence.

[b] Prevalence.

[c] Preliminary, approximate or estimated.

[d] In- and out-patients.

[e] In-patients.

[f] Out-patients.

Sources: World Health Organization. 1977. World Health Statistics Annual 1977. Vol. II -- Infectious Diseases: Cases and Deaths.

World Health Organization. 1978b. World Health Statistics Annual 1978. Vol. II -- Infectious Diseases: Cases and Deaths.

TABLE E

THE FIVE LEADING CAUSES OF DEATH AMONG THE GENERAL POPULATION (EXCEPT WHERE NOTED), 1971 - 1976, FOR 20 AFRICAN COUNTRIES

COUNTRY	YEAR	REFERENCE	CAUSE OF DEATH 1	2	3	4	5
SAHEL							
Chad [a,b]	1975	WHO 1977	tetanus	malaria	infectious hepatitis	meningo-coccal infections	amebiasis
Mali	N.G.	UNFPA	malaria	measles	meningitis	pneumonia	tubercu-losis
Senegal [a]	1971	USDHEW 1976	malaria	measles	leprosy	tetanus	tubercu-losis
Upper Volta	1973-1974	Foege, Hogan & Newton	enteric disease	malaria	pneumonia/ bronchitis	degenera-tive diseases	measles
WEST							
Benin [a]	1975	WHO 1977	tetanus	malaria	meningo-coccal infections	measles	tubercu-losis
Ghana [a]	1975	WHO 1977	measles	infectious hepatitis	typhoid fever	tubercu-losis	meningo-coccal infections
Liberia [c]	N.G.	USDHEW 1973	prematur-ity	respiratory infections	gastro-intestinal diseases	tetanus	measles
Nigeria [a,b]	1974	WHO 1977	measles	malaria	cholera	infectious hepatitis	pertussis

TABLE E (continued)

COUNTRY	YEAR	REFERENCE	CAUSE OF DEATH 1	2	3	4	5
CENTRAL							
Angola [a]	1974	WHO 1977	tuberculosis	measles	tetanus	meningococcal infections	cholera
Cameroon [c]	1976	USDHEW 1979	malnutrition	dysentery	respiratory infections	measles	intestinal parasites
Congo [a,b]	1975	WHO 1977	leprosy	measles	tuberculosis	tetanus	malaria
Zaire [a,b]	1974	WHO 1977	measles	influenza	pertussis	meningococcal infections	chickenpox
EAST							
Burundi [a,b]	1975	WHO 1977	measles	typhus	pertussis	tetanus	tuberculosis
Madagascar [a,d]	1973	WHO 1977	measles	pertussis	malaria	tuberculosis	diphtheria
Mauritius	1977	WHO 1979	heart disease	cerebrovascular disease	accidents, poisoning, violence	senility	bronchitis, emphysema, asthma
SOUTH							
Botswana [a,d]	1975	UN 1977	tuberculosis	measles	tetanus	malaria	pertussis/ bacillary dysentery

TABLE E (continued)

COUNTRY	YEAR	REFERENCE	CAUSE OF DEATH 1	2	3	4	5
SOUTH (continued)							
Lesotho	1973	USDHEW 1975	tuberculosis	heart disease/ hypertension	acute respiratory infections	typhoid fever	gastro-intestinal diseases
Malawi	1977	USAID 1977	pneumonia	malaria	gastro-intestinal diseases	tuberculosis	anemia
Southern Rhodesia	1972	USDHEW 1979	non-viral pneumonia	enteritis, other diarrheal diseases	measles	nutritional deficiencies	cancer
Swaziland	1971	USDHEW 1975	gastro-enteric diseases	respiratory infection	accidents	nutritional + parasitic diseases	tuberculosis

a Among infectious diseases only.

b Preliminary, approximate or estimated.

c Among children.

d In- and out-patients.

TABLE E (continued)

Sources: Rhodesia Secretary for Health. 1973. Report of the Rhodesia Secretary for Health. Cited in USDHEW 1979. Vol. 2 (Technical Annexes), P. A-13.

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TABLE F

SIX EPI DISEASES AND DIARRHEAL DISEASES[a]
AS ONE OF FIVE LEADING INFECTIOUS DISEASES AMONG THE GENERAL POPULATION,
AND ONE OF FIVE LEADING CAUSES OF DEATH (EXCEPT WHERE NOTED),
FOR 19 AFRICAN COUNTRIES FOR WHICH BOTH DATA AVAILABLE SINCE 1970

			DIPHTHERIA		PERTUSSIS		TETANUS		MEASLES		POLIO		TUBER-CULOSIS		DIARRHEAL DISEASE	
COUNTRY	DATE MORBIDITY	DATE MORTALITY	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH	INF. DIS.	CAUSE OF DEATH
SAHEL																
Chad	1976	1975[b]						X							X	X
Mali	1976	N.G.							X	X				X	X	
Senegal	1975	1971[b]			X			X	X	X				X		
Upper Volta	1975	1973-74			X				X	X					X	X
WEST																
Benin	1976	1975[b]						X	X	X				X	X	
Ghana	1976	1975[b]			X				X	X				X	X	
Liberia	1975	N.G.[c]			X			X	X	X					X	X
Nigeria	1975	1974				X			X	X					X	X

TABLE F (continued)

COUNTRY	DATE MORBIDITY	DATE MORTALITY	DIPHTHERIA INF. DIS.	DIPHTHERIA CAUSE OF DEATH	PERTUSSIS INF. DIS.	PERTUSSIS CAUSE OF DEATH	TETANUS INF. DIS.	TETANUS CAUSE OF DEATH	MEASLES INF. DIS.	MEASLES CAUSE OF DEATH	POLIO INF. DIS.	POLIO CAUSE OF DEATH	TUBER-CULOSIS INF. DIS.	TUBER-CULOSIS CAUSE OF DEATH	DIARRHEAL DISEASE INF. DIS.	DIARRHEAL DISEASE CAUSE OF DEATH
CENTRAL																
Angola	1974	1974			X			X	X	X				X		X
Cameroon	1974	1976[c]							X	X					X	X
Congo	1976	1975[b]						X	X	X				X	X	
Zaire	1974	1974[b]			X	X			X	X						
EAST																
Burundi	1975	1975[b]			X	X		X	X	X				X		
Madagascar	1975	1973		X	X	X			X	X				X		
Mauritius	1975	1977											X			

TABLE F (continued)

COUNTRY	DATE MORBIDITY	DATE MORTALITY	DIPHTHERIA INF. DIS.	DIPHTHERIA CAUSE OF DEATH	PERTUSSIS INF. DIS.	PERTUSSIS CAUSE OF DEATH	TETANUS INF. DIS.	TETANUS CAUSE OF DEATH	MEASLES INF. DIS.	MEASLES CAUSE OF DEATH	POLIO INF. DIS.	POLIO CAUSE OF DEATH	TUBER-CULOSIS INF. DIS.	TUBER-CULOSIS CAUSE OF DEATH	DIARRHEAL DISEASE INF. DIS.	DIARRHEAL DISEASE CAUSE OF DEATH
SOUTH																
Botswana	1975	1975				X		X	X	X				X		X
Lesotho	1976	1973			X				X					X	X	X
South Rhodesia	1974	1972								X			X			X
Swaziland	1976	1971							X				X	X		X

a "Diarrheal diseases" include the following: Amebiasis, Enteric Diseases, Gastro-Intestinal Diseases, Cholera, Dysentery, Intestinal Parasitism, and Enteritis.

b Among infectious diseases only.

c Among children only.

Sources: See Tables D and E.

TABLE G

RANKING OF SIX EPI DISEASES AND DIARRHEAL DISEASES
BY NUMBER OF AFRICAN COUNTRIES (TOTAL: 19)
IN WHICH THEY WERE A LEADING INFECTIOUS DISEASE (1974-76)
AND A LEADING CAUSE OF DEATH (1971-76)

Leading Infectious Disease	Leading Cause of Death
1. Measles	1. Measles
2. Diarrheal Diseases	2. Tuberculosis
3. Pertussis	3. Diarrheal Diseases
4. Tuberculosis	4. Tetanus
5. Diphtheria	5. Pertussis
Tetanus	6. Diphtheria
Polio	7. Polio

Sources: See Tables D and E.

TABLE H

FORTY-FOUR AFRICAN COUNTRIES,
BY AVAILABILITY OF CHILDREN'S INCIDENCE/PREVALENCE AND/OR CASE-FATALITY RATES
FOR EPI DISEASES AND DIARRHEAL DISEASES

COUNTRY	DIPHTHERIA	PERTUSSIS	TETANUS	MEASLES	POLIO	TUBER-CULOSIS	DIARRHEAL DISEASES
SAHEL							
Cape Verde							
Chad						X	
Gambia	X						X
Mali					X		
Mauritania				X			
Niger						X	
Senegal	X	X	X	X	X	X	
Upper Volta				X			X

TABLE H (continued)

COUNTRY	DIPHTHERIA	PERTUSSIS	TETANUS	MEASLES	POLIO	TUBER-CULOSIS	DIARRHEAL DISEASES
WEST							
Benin							
Ghana			X	X	X		
Guinea						X	
Guinea-Bissau							
Ivory Coast						X	X
Liberia							
Nigeria			X	X		X	X
Sierra Leone							
Togo							

TABLE H (continued)

COUNTRY	DIPHTHERIA	PERTUSSIS	TETANUS	MEASLES	POLIO	TUBER-CULOSIS	DIARRHEAL DISEASES
CENTRAL							
Angola						X	
Cameroon							
Central African Republic							
Congo						X	
Equatorial Guinea							
Gabon							
Principe						X	
Sao Tome						X	
Zaire				X		X	X

TABLE H (continued)

COUNTRY	DIPHTHERIA	PERTUSSIS	TETANUS	MEASLES	POLIO	TUBER-CULOSIS	DIARRHEAL DISEASES
EAST							
Comoros						X	
Djibouti						X	
Ethiopia			X	X		X	X
Kenya		X		X	X	X	X
Madagascar						X	
Mauritius						X	
Reunion						X	
Rwanda	X	X	X	X	X	X	
Seychelles							
Somalia						X	X

TABLE H (continued)

COUNTRY	DIPHTHERIA	PERTUSSIS	TETANUS	MEASLES	POLIO	TUBER-CULOSIS	DIARRHEAL DISEASES
EAST (continued)							
Sudan	X	X	X	X	X		
Tanzania				X		X	X
Uganda		X		X		X	X
SOUTH							
Botswana						X	
Lesotho						X	
Malawi						X	
Mozambique							
Rhodesia						X	X
Swaziland						X	
Zambia	X	X	X	X	X	X	

TABLE I

SIX EPI DISEASES AND DIARRHEAL DISEASES, BY COUNTRIES FOR WHICH CHILDREN'S INCIDENCE/PREVALENCE AND/OR CASE-FATALITY RATES OBTAINED, DATES, SOURCES OF INFORMATION, AND REFERENCE

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
DIPHTHERIA	SAHEL		
	Gambia	N.G.	Analysis of clinic and hospital cases (Heyworth and Ropp)
	Senegal	1961-70	Analysis of hospital cases, Dakar (Diop Mar, Sow and Rey)
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)
	EAST		
	Rwanda	N.G.	EPI survey (WHO 1978a)
	Sudan	1979	EPI survey, 11 towns (Bassett and Hadler)
	SOUTH		
	Zambia	1974-75	Analysis of hospital cases, Lusaka (Chintu, Bathirunathan and Patel)
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balint and Anand)
PERTUSSIS	SAHEL		
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
PERTUSSIS (continued)	EAST		
	Kenya	1974-77	Surveillance, rural area (Voorhoeve et al 1978)
	Rwanda	N.G.	EPI survey (WHO 1978a)
	Sudan	1979	EPI survey, 11 towns (Bassett and Hadler)
	Uganda	1967-68	Analysis of hospital cases, Mulago (Bwibo 1971)
	SOUTH		
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balint and Anand)
TETANUS	SAHEL		
	Senegal	N.G.	GOS statistics (USDHEW, OIH 1976)
	Senegal	1964-65	Analysis of hospital cases, rural area (Dan)
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)
	Senegal	1965-72	Analysis of hospital cases, Dakar (Diop Mar, Durieux and Badiane)
	WEST		
	Ghana	1970	Analysis of hospital cases, Accra (Nkrumah and Verma)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
TETANUS (continued)	WEST (continued)		
	Ghana	1971-74	Analysis of hospital cases, Accra (Blankson 1977)
	Nigeria	1967-70	Analysis of hospital cases, Lagos (Afonja, Jaiyeola and Tunwashe)
	EAST		
	Ethiopia	1975-76	Analysis of hospital cases (Habte-Gabr and Mengistu)
	Rwanda	N.G.	EPI survey (WHO 1978a)
	Sudan	1979	EPI survey, 11 towns (Bassett and Hadler)
	SOUTH		
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balint and Anand)
MEASLES	SAHEL		
	Mauritania	N.G.	CDC/Peace Corps summary (USAID, OFDA 1978b)
	Senegal	N.G.	GOS statistics (USAID, OFDA 1979c)
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)
	Upper Volta	N.G.	USAID, OFDA (1979d)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
MEASLES (continued)	WEST		
	Ghana	1970-72	Analysis of hospital cases, Accra (Blankson 1975)
	Nigeria	1967-68	Analysis of hospital deaths, Ibadan (Grigsby and Adetosoye)
	Nigeria	1972	Analysis of hospital cases, Ibadan (Efflong)
	Nigeria	1972-73	Analysis of hospital cases, Benin City (Obi)
	EAST		
	Ethiopia	1970	Analysis of severe hospital cases (Freij, Krishnaswamy and Sterky)
	Ethiopia	1970-71	Analysis of hospital cases, Addis Ababa (Tafesse)
	Kenya	1968-70	Analysis of hospital cases, Nairobi (O'Donovan)
	Kenya	1970	Analysis of outpatient cases, Nairobi (Hayden)
	Kenya	1974-76	Surveillance, rural area (Voorhoeve et al 1977)
	Kenya	1974-77	Surveillance, rural area (Muller)
	Rwanda	N.G.	EPI survey (1978a)
	Sudan	1979	EPI survey, 11 towns (Bassett and Hadler)
	Tanzania	1973	Analysis of severe hospital cases, Mwanza (Kimati and Lyaruu)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
MEASLES (continued)	EAST (continued)		
	Tanzania	1972;76	Nationwide EPI survey (United Republic of Tanzania)
	Tanzania	1974-75	Analysis of hospital cases, Tanga district (Gupta and Singh)
	Uganda	1963-68	Analysis of hospital cases, Kampala (Bwibo 1970a)
	Uganda	1967-68	Analysis of hospital cases, Mulago (DeBuse, Lewis and Mugerwa)
	Uganda	1969-71	Analysis of hospital cases, Mbale (Swift and Hamilton)
	CENTRAL		
	Zaire	N.G.	CDC memorandum (USDHEW, OIH 1979)
	Zaire	1968	Analysis of hospital cases, Lubumbashi (Ngandu-Kabeya)
	SOUTH		
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balint and Anand)
POLIO	SAHEL		
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
POLIO (continued)	WEST		
	Ghana	N.G.	Nationwide school survey (Ofosu-Amaah, Kratzer and Nicholas)
	Ghana	1974	Prevalence study, rural area (Nicholas et al)
	EAST		
	Kenya	1962-73	Survey of reported cases, Mombasa (Nathwani and Mugenya)
	Kenya	1969-71	Analysis of acute hospital cases (Ayim)
	Rwanda	N.G.	EPI survey (WHO 1978a)
	Sudan	1979	EPI survey, 11 towns (Bassett and Hadler)
	SOUTH		
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balint and Anand)
TUBER-CULOSIS	SAHEL		
	Chad	1970	Reports to, estimates by, WHO (Bulla)
	Senegal	1965-69	Analysis of clinic cases, Dakar (Diop Mar, Samb and Sow)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
TUBER-CULOSIS (continued)	WEST		
	Nigeria	1971	Surveillance, rural area (Pust, Onejeme and Okafor)
	Nigeria	1972-76	Analysis of hospital cases (Aderele)
	EAST		
	Djibouti	1976	CDC estimate (USAID, OFDA 1979b)
	Kenya	1974	National survey (East African and British Medical Research Council)
	Mauritius	1973	CDC report (USDHEW, OIH 1979)
	Rwanda	N.G.	EPI survey (WHO 1978a)
	Somalia	1970-71	Reports to, estimates by, WHO (Bulla)
	Tanzania	1969	Nationwide surveillance (Kent)
	Tanzania	1971	Surveillance, Dar es Salaam (Vennema)
	CENTRAL		
	Zaire	N.G.	Estimate (USAID 1979e)
	SOUTH		
	Botswana	N.G.	National Plan (USDHEW, OIH 1975)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
TUBER-CULOSIS (continued)	SOUTH (continued)		
	Swaziland	1970	Reports to, estimates by, WHO (Bulla)
	Zambia	1974-75	Analysis of hospital cases, Ndola (Balind and Anand)
DIARRHEAL DISEASES	SAHEL		
	Gambia	1974-75	Village survey (Rowland, Cole and Whitehead)
	Upper Volta	1973-74	Nationwide surveillance (Foege, Hogan and Newton)
	WEST		
	Ivory Coast	1970-72	Analysis of hospitalized cholera cases, Treichville (Bourgeade et al 1973)
	Nigeria	1971	Analysis of hospitalized cholera cases, Ibadan (Lewis et al)
	Nigeria	1972-73	Analysis of hospital cases, Benin City (Obi)
	EAST		
	Ethiopia	1970-71	Analysis of hospital cases, Addis Ababa (Tafesse)
	Kenya	1974-77	Surveillance in rural area (Leeuwenberg et al)
	Somalia	1973	Analysis of hospital cases, Mogadishu (Abbas)

TABLE I (continued)

DISEASE	REGION, COUNTRY	DATE(S)	SOURCE (REFERENCE)
DIARRHEAL DISEASES (continued)	EAST (continued)		
	Uganda	1969-71	Analysis of hospital cases, Mbale (Swift and Hamilton)
	CENTRAL		
	Zaire	1969-70	Analysis of hospital cases, Kinshasa (Omanga et al)
	SOUTH		
	Rhodesia	1970-73	Analysis of hospital cases, Salisbury (Zilberg)

TABLE J. 1.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

DIPHTHERIA

		LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
INFANTS AND CHILDREN	0	X							58.1	1979	Sudan	Bassett and Hadler
	1	X							56.0	1979	Sudan	Bassett and Hadler
	0-5	X					24.2			1961-70	Senegal	Diop Mar, Sow and Rey
	2-5	X							48.0	1979	Sudan	Bassett and Hadler
	All Infants & Children	X			.3 [b]					1961-70	Senegal	Diop Mar, Sow and Rey
		X					9.1			1974-75	Zambia	Balint and Anand
				X	.2				11.0	N.G.	Rwanda	WHO 1978a
				X					11.1	N.G.	Gambia	Heyworth and Ropp
		X			.4	2.8			52.0	1979	Sudan	Bassett and Hadler
	ALL AGES	X						25.2		1965-69	Senegal	Diop Mar, Samb and Sow
		X					40.9			1974-75	Zambia	Chintu, Bathirunathan and Patel

TABLE J. 1. (continued)

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

[b] Estimate.

TABLE J. 2.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN RURAL LOCATION, AND INPATIENT OUTPATIENT STATUS

PERTUSSIS

		LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
INFANTS AND CHILDREN	0		X		159				3.2	1974-77	Kenya	Voorhoeve et al 1978
		X							5.1	1979	Sudan	Bassett and Hadler
	1		X		105				1.3	1974-77	Kenya	Voorhoeve et al 1978
		X							2.4	1979	Sudan	Bassett and Hadler
	2		X		134				1.5	1974-77	Kenya	Voorhoeve et al 1978
	3		X		167				0.8	1974-77	Kenya	Voorhoeve et al 1978
	4		X		137				1.7	1974-77	Kenya	Voorhoeve et al 1978
	5		X		124					1974-77	Kenya	Voorhoeve et al 1978
	5+		X						< .1	1974-77	Kenya	Voorhoeve et al 1978
	2-15	X							1.0	1979	Sudan	Bassett and Hadler
	7-14		X		23					1974-77	Kenya	Voorhoeve et al 1978

TABLE J. 2. (continued)

PERTUSSIS

	AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
INFANTS AND CHILDREN	All Infants and Children			X			13.7			1967-68	Uganda	Bwibo 1971
		X					3.6			1974-75	Zambia	Balint and Anand
			X		81.0				1.2	1974-77	Kenya	Voorhoeve et al 1978
				X	800.0				3.1	N.G.	Rwanda	WHO 1978a
		X			36.3	201.0			2.0	1979	Sudan	Bassett and Hadler
	ALL AGES	X						30.0		1965-69	Senegal	Diop Mar, Samb and Sow
			X		38.0					1974-77	Kenya	Voorhoeve et al 1978

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

TABLE J. 3.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

TETANUS

		LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
INFANTS AND CHILDREN	Infants/ Neonates		X						73.0	1964-65	Senegal	Dan
				X					>90.0	N.G.	Senegal	USDHEW 1976
		X					57.7			1970	Ghana	Nkrumah and Verma
		X					64.0			1971-74	Ghana	Blankson 1977
				X	52.2				85.0	N.G.	Rwanda	WHO 1978a
				X			87.5			1975-76	Ethiopia	Habte-Gabr and Mengistu
		X					73.1			1974-75	Zambia	Balint and Anand
		X							72.2	1979	Sudan	Bassett and Hadler
	0-9			X			63.6			1975-76	Ethiopia	Habte-Gabr and Mengistu
	2-15	X							48.0	1979	Sudan	Bassett and Hadler

TABLE J. 3. (continued)

TETANUS

	AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
INFANTS AND CHILDREN	10/11-19	X					17.8			1967-70	Nigeria	Afonja, Jaiyeola and Tunwashe
				X			60.0			1975-76	Ethiopia	Habte-Gabr and Mengistu
	All Children			X	1.9				40.0	N.G.	Rwanda	WHO 1978a
	All Infants & Children	X			.1	.8			63.0	1979	Sudan	Bassett and Hadler
	ALL AGES	X						38.6		1965-69	Senegal	Diop Mar, Samb and Sow
		X					37.2			1965-72	Senegal	Diop Mar, Durieux and Badiene
				X					38.0	N.G.	Senegal	USDHEW 1976
				X			61.0			1975-76	Ethiopia	Habte-Gabr and Mengistu

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

TABLE J. 4.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

MEASLES

		LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
CHILDREN AND INFANTS	0	X					18.0			1967-68	Uganda	DeBuse, Lewis and Mugerwa
		X					9.7			1968-70	Kenya	O'Donovan
			X		64.0				6.4	1974-76	Kenya	Voorhoeve et al 1977
			X		60.0				3.7	1974-77	Kenya	Muller
		X					14.6			1972	Nigeria	Efflong
			X				7.0			1974-75	Tanzania	Gupta and Singh
		X							5.8	1979	Sudan	Bassett and Hadler
	1	X					14.0			1967-68	Uganda	DeBuse, Lewis and Mugerwa
		X					11.7			1968-70	Kenya	O'Donovan
			X		111.0				11.8	1974-76	Kenya	Voorhoeve et al 1977
			X		76.0				2.9	1974-77	Kenya	Muller

TABLE J. 4. (continued)

MEASLES

	AGE GROUP	LOCATION a			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
CHILDREN AND INFANTS (continued)	1 (Continued)	X					25.4			1972	Nigeria	Efflong
			X				15.0			1974-75	Tanzania	Gupta and Singh
	2	X					20.0			1967-68	Uganda	DeBuse, Lewis and Mugerwa
		X					9.9			1968-70	Kenya	O'Donovan
			X		68.0				6.4	1974-76	Kenya	Voorhoeve et al 1977
			X		57.0				3.4	1974-77	Kenya	Muller
		X					14.2			1972	Nigeria	Efflong
			X				3.0			1974-75	Tanzania	Gupta and Singh
	0-2	X					72.0			1967-68	Nigeria	Grigsbye and Aletosoye
	3	X					8.5			1968-70	Kenya	O'Donovan
			X		66.0				4.2	1974-76	Kenya	Voorhoeve et al 1977
			X		33.0				0.0	1974-77	Kenya	Muller

TABLE J. 4. (continued)

MEASLES

	AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevelence	In-Patients	Out-Patients	All/ N.G.			
CHILDREN AND INFANTS (continued)	3 (Continued)	X					21.4			1972	Nigeria	Efflong
			X				4.0			1974-75	Tanzania	Gupta and Singh
	3+	X					31.0			1967-68	Uganda	DeRuse, Lewis and Mugerwa
	4	X					8.0			1968-70	Kenya	O'Donovan
			X		39.0				7.3	1974-76	Kenya	Voorhoeve et al 1977
			X		47.0				0.0	1974-77	Kenya	Muller
		X					50.0			1972	Nigeria	Efflong
	0-4	X					3.3			1972-73	Nigeria	Obi
	5		X		28.0					1974-76	Kenya	Voorhoeve et al 1977
			X		27.0					1974-77	Kenya	Muller
		X					0.0			1972	Nigeria	Efflong
	0-5	X					4.5			1969-71	Uganda	Swift and Hamilton

TABLE J. 4. (continued)

MEASLES

	AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
(continued)	5+		X						1.1	1974-76	Kenya	Voorhoeve et al 1977
			X						0.0	1974-77	Kenya	Muller
	2-15	X							2.2	1979	Sudan	Bassett and Hadler
	7-14		X		9.7					1974-76	Kenya	Voorhoeve et al 1977
			X		6.9					1974-77	Kenya	Muller
INFANTS AND CHILDREN	All Infants and Children			X			11.5			1963-68	Uganda	Bwibo 1970b
		X					13.6			1968	Zaire	Ngandu-Kabeya
		X					27.5			1970-71	Ethiopia	Tafesse
			X		37.7				6.5	1974-76	Kenya	Voorhoeve et al 1977
			X		30.9				1.7	1974-77	Kenya	Muller
		X					18.9			1972	Nigeria	Efflong
				X	1.000.0				8.1	N.G.	Rwanda	WHO 1978a

TABLE J. 4. (continued)

MEASLES

	AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
INFANTS & CHILDREN	(cont'd) All Infants and Children	X			85.9	551.0			3.4	1979	Sudan	Bassett and Hadler
	ALL AGES	X						26.7		1975-69	Senegal	Diop Mar, Samb and Sow
				X					13.0	N.G.	Senegal	USAID 1979c
		X					10.1			1968-70	Kenya	O'Donovan
		X					10.0			1970	Kenya	Hayden
		X						1.0		1970	Kenya	Hayden
			X		17.4					1974-76	Kenya	Voorhoeve et al 1977
			X		14.6					1974-77	Kenya	Muller
		X					30.0			1970	Ethiopia	Friej, Krishnaswamy and Sterky
		X						19.2		1970	Ethiopia	Friej, Krishnaswamy and Sterky
				X					5.6	1972	Tanzania	United Republic of Tanzania
			X				10.0			1973	Tanzania	Kimati and Lyaruu

TABLE J. 4. (continued)

MEASLES

AGE GROUP	LOCATION [a]			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
ALL AGES		X						5.0[b]	1973	Tanzania	Kimati and Lyaruu
			X					2.5	1976	Tanzania	United Republic of Tanzania
	X					12.8			1970-72	Ghana	Blankson 1975
	X					15.6			1974-75	Zambia	Balint and Anand
		X[c]						30.0	N.G.	Mauritania	USAID 1978b
	X							19.0	N.G.	Upper Volta	USAID 1979d
		X						5.5	N.G.	Upper Volta	USAID 1979d
	X			50.0					N.G.	Zaire	USDHEW 1979

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

[b] Estimate.

[c] Nomads.

TABLE J. 5.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

POLIO

		LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	ALL GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
CHILDREN	0	X							11.1	1979	Sudan	Bassett and Hadler
	1	X							20.0	1979	Sudan	Bassett and Hadler
	0-4		X		1.4	3.4				1974	Ghana	Nicholas et al
	2-15	X							23.0	1979	Sudan	Bassett and Hadler
	6-15			X		5.8				N.G.	Ghana	Ofosu-Amah, Kratzer and Nicholas
			X			7.5				1974	Ghana	Nicholas et al
INFANTS AND	All Infants and Children	X					14.3			1969-71	Kenya	Ayim
			X			5.7				1974	Ghana	Nicholas et al
				X	22.2				15.0	N.G.	Rwanda	WHO 1978a
		X					5.0			1974-75	Zambia	Balint and Anand
		X			.3	1.6			19.0	1979	Sudan	Bassett and Hadler

TABLE J. 5. (continued)

POLIO

AGE GROUP	LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
ALL AGES	X						21.8		1965-69	Senegal	Diop Mar, Samb and Sow
			X		.2				N.G.	Ghana	Ofosu-Amaah, Kratzer and Nicholas
		X			.3				1974	Ghana	Nicholas et al
	X			< .1					1972	Kenya	Nathwani and Mugenya
	X			.2[b]					1973	Kenya	Nathwani and Mugenya
	X							4.2	1962-73	Kenya	Nathwani and Mugenya

a Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

b Epidemic year.

TABLE J. 6.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

TUBERCULOSIS

		LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
CHILDREN AND INFANTS	0-4			X		26				1970	Chad	Bulla
			X			48				1971	Nigeria	Pust, Onejeme and Okafor
		X				45				1971	Tanzania	Vennema
				X	< .01					1974	Kenya	East African and British Medical Research Council
	0-9		X		16.4					1971	Nigeria	Pust, Onejeme and Okafor
	5-9			X		240				1970	Swaziland	Bulla
			X			116				1971	Nigeria	Pust, Onejeme and Okafor
				X	< .1					1974	Kenya	East African and British Medical Research Council
	5-14			X		690				1970-71	Somalia	Bulla
	10-14			X		450				1970	Swaziland	Bulla
			X			225				1971	Nigeria	Pust, Onejeme and Okafor

TABLE J.6. (continued)

TUBERCULOSIS

	AGE GROUP	LOCATION: Urban	LOCATION: Rural	LOCATION: Both/ N.G.	MORBIDITY (PER 1,000): Incidence	MORBIDITY (PER 1,000): Prevalence	CASE-FATALITY RATE (%): In-Patients	CASE-FATALITY RATE (%): Out-Patients	CASE-FATALITY RATE (%): All/ N.G.	DATE (S)	COUNTRY	REFERENCE
INFANTS & CHILDREN (cont'd)	10-14 (Continued)			X	.1					1974	Kenya	East African and British Medical Research Council
	All Children	X					9.1			1972-76	Nigeria	Aderele
		X					10.6			1974-75	Zambia	Balint and Anand
				X	27.8				20.0	N.G.	Rwanda	WHO 1978a
	ALL AGES	X						31.2		1965-69	Senegal	Diop Mar, Samb and Sow
				X	.7					1971	Senegal	Bulla
		X			1.8					1969	Tanzania	Kent
			X		.8					1969	Tanzania	Kent
		X				13				1971	Tanzania	Vennema
				X	.3					1971	Nigeria	Bulla
			X			274				1971	Nigeria	Pust, Onejame and Okafor
				X	.5					1971	Angola	Bulla

TABLE J. 6. (continued)

TUBERCULOSIS

AGE GROUP	LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
ALL AGES			X	.2					1971	Benin	Bulla
			X	1.7					1971	Comoros	Bulla
			X	.7					1971	Congo	Bulla
			X	.6					1971	Ghana	Bulla
			X		9.0				N.G.	Ghana	USDHEW 1974
			X	.5					1971	Guinea	Bulla
			X	1.6					1971	Lesotho	Bulla
			X	.7					1971	Madagascar	Bulla
			X	.8					1971	Malawi	Bulla
			X	.2					1971	Niger	Bulla
			X	1.1					1971	Reunion	Bulla
			X	.4					1971	Rwanda	Bulla

TABLE J. 6. (continued)

TUBERCULOSIS

AGE GROUP	LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
ALL AGES			X	.8					1971	Sao Tome & Principe	Bulla
			X	1.5					1971	Somalia	Bulla
			X	.7					1971	South Rhodesia	Bulla
			X	2.5					1971	Swaziland	Bulla
			X	.9					1971	Uganda	Bulla
			X	1.1					1971	Zaire	Bulla
			X					10.0	N.G.	Zaire	USAID 1979c
			X		.4				1973	Mauritius	USDHEW 1979
			X	.3					1974	Kenya	East African and British Medical Research Council
			X	5.4					1976	Djibouti	USAID 1979b
			X	5.0					N.G.	Botswana	USDHEW 1975
			X	40.0	350.0				N.G.	Ethiopia	USAID 1978a

TABLE J. 6. (continued)

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

TABLE J. 7.

MORBIDITY, MORTALITY RATES FOR EPI AND DIARRHEAL DISEASES, BY AGE, URBAN/RURAL LOCATION, AND INPATIENT/OUTPATIENT STATUS

DIARRHEAL DISSEASES

		LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)					
	AGE GROUP	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.	DATE (S)	COUNTRY	REFERENCE
CHILDREN AND INFANTS	0	X					1.5			1969-70	Zaire	Omanga et al
		X					13.0			1973	Somalia	Abbas
			X		158-245[b]					1974-77	Kenya	Leeuwenburg et al
	1	X					10.0			1969-70	Zaire	Omanga et al
			X		159.0[b]					1974-77	Kenya	Leeuwenburg et al
	0-1	X					0.0			1971	Nigeria	Lewis et al
	1-2	X					8.0			1973	Somalia	Abbas
	2	X					3.4			1969-70	Zaire	Omanga et al
			X		74.0[b]					1974-77	Kenya	Leeuwenburg et al
	0-2		X			137.0				1974-75	Gambia	Rowland, Cole and Whitehead
	0-3			X.			6.6			1970-72	Ivory Coast	Bourgeade et al 1973

TABLE J. 7. (continued)

DIARRHEAL DISEASES

	AGE GROUP	LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
		Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
CHILDREN (continued)	0-4	X					16.4			1972-73	Nigeria	Obi
		X					11.4			1973	Somalia	Abbas
	0-5	X					5.2			1969-71	Uganda	Swift and Hamilton
		X					12.8[c]			1969-71	Uganda	Swift and Hamilton
	3-4	X					0.0			1973	Somalia	Abbas
			X		37.0[b]					1974-77	Kenya	Leeuwenburg et al
	3-10	X					1.5			1971	Nigeria	Lewis et al
	11+	X					3.3			1971	Nigeria	Lewis et al
INFANTS AND	All Infants And Children	X					3.1			1960-73	Rhodesia	Zilberg
		X					5.4			1969-70	Zaire	Omanga et al
		X					14.0			1970-71	Ethiopia	Tafesse
			X		105.0[b]					1974-77	Kenya	Leeuwenburg et al

TABLE J. 7. (continued)

DIARRHEAL DISEASES

AGE GROUP	LOCATION			MORBIDITY (PER 1,000)		CASE-FATALITY RATE (%)			DATE (S)	COUNTRY	REFERENCE
	Urban	Rural	Both/ N.G.	Incidence	Prevalence	In-Patients	Out-Patients	All/ N.G.			
All Infants and children	X					20.0 [d]			1976-77	Tanzania	Brookfield and Kigadye
ALL			X			4.1			1970-72	Ivory Coast	Bourgeade et al 1973
	X					4.8			1971	Nigeria	Lewis et al
AGES			X	3.0 [e]					1973-74	Upper Volta	Foege, Hogan and Newton

[a] Where the reference is to an analysis of hospitalized cases of a disease or diseases, location refers to the area (usually a city) where the study occurred, not to the area of residence.

[b] Per 2-week period.

[c] With anemia.

[d] With complications.

[e] Per month.

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ANNEX P

REFERENCE LIST OF CDC

COUNTRY ASSESSMENT STUDIES

(EPI/YAWS)

1. Tanzania Review of EPI, August 1979.

2. Somalia EPI Assessment, July 1979.

3. Liberia Immediate Impact Proposal for EPI, August 1979.

4. Sudan Draft Outline for National EPI Plan of Operations, August 1979.

5. Yaws Assessment, Ghana, Togo, Ivory Coast, Mali, March - April 1979.

6. Togo Yaws Survey Report, May 1979.

7. Ivory Coast Yaws Survey Report, May 1979.

8. Mali Yaws Survey Report, May 1979.

9. Rwanda Report on EPI, November 1979.

10. Burundi Report on EPI, November - December 1979.

ANNEX Q

PROJECT DESIGN TEAM - MEETINGS AND INTERVIEWS

I. DATES AND PLACES VISITED:

A. Washington, D.C. - Feb. 19-20 (Team)

B. Geneva, Switzerland - Feb. 21-27 (Team)

C. Abidjan, Ivory Coast - Feb. 28-29 (Team)

D. Ouagadougou, Upper Volta - Mar. 1-4 (Agle, Chin, Rutherford)

E. Gabarone, Botswana - Mar. 3-6 (Weisfeld)

F. Brazzaville, Congo - Mar. 5-7 (Agle, Chin, Rutherford, Ware)

G. Nairobi, Kenya - Mar. 8-13 (Chin, Rutherford, Ware, Weisfeld)

H. Mogadishu, Somalia - Mar. 13-16 (Ware, Weisfeld)

I. Dakar, Senegal - Mar. 14-17 (Chin, Rutherford)

J. New York, New York - Mar. 18-19 (Chin, Rutherford, Weisfeld)

K. Washington, D.C. - Mar. 20 (Chin, Rutherford, Weisfeld)
Apr. 2-4 (Riegleman, Rutherford, Ware)

II. PERSONS CONTACTED:

A. Washington, D.C.

1. Mr. Jay Ruoff, Deputy Director, AFR/RA, USAID/W

2. Mr. Jim Cummiskey, Public Health Advisor, AFR/RA, USAID/W

3. Mr. Earl Yates, Administrative Officer AFR/RA, USAID/W

4. Mrs. Julia Robinson, Team Contractor, One America, Inc

5. Mr. Dennis Conroy, Director, AFR/RA, USAID/W

6. Dr. Charles DeBose, Medical Officer Africa Bureau, USAID/W

B. Geneva, Switzerland

1. Dr. Ralph Henderson, Director, Expanded Program on Immunizations (EPI), WHO

2. Dr. Ko Keja, Medical Officer, EPI, WHO

3. Dr. Ablerta Zahre, Director, Communicable Disease Division, WHO

4. Dr. Faquiry Assad, Medical Officer, Viral Diseases, WHO

5. Dr. Thomas Kereseudse, Medical Officer, Bacterial Diseases, WHO

6. Dr. Michael Merson, Medical Officer, Diarrheal Disease Control Program, WHO

7. Dr. Deeman Barua, Program Manager, Diarrheal Disease Control Program, WHO

8. Dr. E. Tarino, Director, Strengthening Health Services, WHO

9. Mr. James Hill, USAID Liaison, US Mission to the UN

10. Dr. Robert Fortuine, HEW Liaison, US Mission to the UN, Geneva

11. Dr. Antal, Medical Officer, Bacterial and Venereal Disease Unit, CDS, WHO

12. Dr. Causse, Director, BVY, WHO

13. Dr. Algan, Medical Officer, Communicable Diseases, AFRO

14. Dr. Arevshetian, Medical Officer, Communicable Diseases, AFRO

15. Dr. G. Starky, Director, Maternal and Child Health Unit, Family Health Division, WHO

16. Dr. K. Erdstrom, Medical Officer, MCH, WHO

17. Dr. Dilip Mahalanabis, Medical Officer, CDD, WHO

18. Dr. Bannerman, Director, Traditional Medicine, WHO

19. Mr. S. Bach, Supply Division, UNICEF

20. Mr. H. Imer, Supply Division, UNICEF

C. Abidjan, Ivory Coast

1. Mr. Harry Godfrey, Public Health Advisor, EPI, Ivory Coast

2. Mr. Gordon Evans, Director, USAID, REDSO/WA, Abidjan

3. Dr. Isaiah Jackson, Medical Officer, REDSO/WA

4. Ms. Mellan Duffy, Nutritionist, REDSO/WA

5. Mr. D. Dibble, Design Officer, REDSO/WA

6. Dr. David French, Director, SHDS

7. Mrs. Mary Harvey, Deputy Director, SHDS

8. Mr. Saul Helfenbein, Deputy Director, SHDS

9. Mr. Hadley Smith, FADS, REDSO/WA

10. Mr. Larry Dash, Director, SDPT, Bamako

11. Dr. Sylvio Berthoud, Health Advisor, African Development Bank, Abidjan

12. Mr. Richard Greene, Peace Corps Volunteer, EPI, Ivory Coast

13. Ms. Maryanne Johnson, Peace Corps Volunteer, EPI Ivory Coast

14. Ms. Mary Maloney, Peace Corps Volunteer, EPI, Ivory Coast

15. Dr. Judith Brown, Consulting Anthropologist, Cameroon EPI project

D. Ouagadougou, Upper Volta

1. Dr. Michael K. White, Physician and Public Health Advisor, CILSS

2. Mr. Bram Hirsch, Program Officer, AID

3. Mr. Richard Meyer, AID Mission Director

4. Dr. Albert Sales, Epidemiologist, Onchoceriasis Project

5. Dr. Pie Masaumbuko, Onchocerciasis Project

6. Mr. M. March Bazin, Director, Onchocerciasis Project

7. Dr. Bern Lisse, Onchocerciasis Project

E. Gaborene, Botswana

1. Mr. Charles Gordon, Project Officer, USAID, Botswana

2. Dr. A. Suade, Principal Medical Officer, MOH, Botswana

3. Mr. Michael Mills, Planning Unit, MOH

4. Dr. Jack Finlay, Health Education Unit, MOH

5. Mrs. Terrasita Finlay, Nursing Education Office, MOH

6. Mrs. M. Swartlend, State Registered Nurse, Tlokweng Health Center

7. Dr. N. Mashalaba, Principal Medical Officer, MCH/FP, MOH

8. Dr. J. Kraysler, WHO Nutrition Advisor, Botswana

9. Ms. Carol Pass, Nutrition Planner, Botswana

10. Ms. Sven Fjeland, Planning Unit, MOH, Botswana

11. Mr. V. Chinien, WHO Technical Officer, EPI Unit, MOH, Botswana

12. Mr. Mosiieman, Chief Pharmacist, Central Medical Stores, CMS, MOH

13. Mr. Molefa, Officer-in-charge, Central Vaccine Stores, MOH

14. Mr. Nair, WHO Statistician, Medical Statistics Unit, Central Statistics Office, Ministry of Finance and Economic Development

15. Mr. Rayamajhi, UN Volunteer, Medical Statistics Unit, CSO, MFED

16. Dr. J.S. Moati, Chief Medical Officer, MOH

17. Mr. James C. Stanford, Controller, USAID

18. Mrs. Nancy Pielemaier, Chief of Party, USAID Health Services Development Project, MSC, Inc.

F. Brazzaville, Congo

1. Mr. William Swing, US Ambassador to the Congo
2. Dr. Comlan A.A. Quenum, WHO Regional Director for Afri
3. Mr. Sam Perry, EPI Operations Officer, Zaire
4. Dr. S.H. Sibale, Director, Program Management, AFRO
5. Dr. A. Gellier, Director, Program Promotion, AFRO
6. Dr. A.F. Abou-Gareeb, Director, Disease Prevention
7. Mr. K. Saita, Director, Support Program, AFRO
8. Dr. J.P. Jardel, Regional Officer, Program Development and Evaluation, AFRO
9. Dr. C. Gantin, Regional Officer, Family Health/ Child Health, AFRO
10. Dr. A.E. Delas, Regional Officer, EPI, AFRO
11. Mr. I. Ujoodha, Technical Officer, EPI, AFRO
12. Dr. K.V. Bailey, Regional Officer, Nutrition, AFRO
13. Dr. A.E. Abdou, Regional Officer, Bacterial, Viral and Mycotic Diseases, AFRO
14. Mr. M. Ben Aziza, Regional Officer, Health Education, AFRO
15. Dr. V.M. Eyakuze, Regional Officer, Research and Promotion, AFRO
16. Dr. D.L. Tembo, Regional Officer, Health Services Development - Primary Health Care, AFRO
17. Mr. A. Agbeviade, Regional Officer, Administrative Services, AFRO
18. Dr. Emou, Director of Institute of Hygiene, and Director of EPI, Ivory Coast

G. Nairobi, Kenya

1. Dr. Ned Grealey, Anthropologist, HNP, REDSO/EA, Nairobi

2. Dr. Harrison Spencer, CDC Medical Officer, Kenya Institute for Medical Research, University of Nairobi, Nairobi

3. Dr. Anita Macke, Health/Agriculture Officer, REDSO/EA Nairobi

4. Dr. Zia Islam, Regional Epidemiologist, WHO, Nairobi

5. Mr. G.L. ChristoDoulou, Technical Officer, WHO, Nairobi

6. Dr. K. Koinange, Director of Medical SErvices, MOH, Kenya

7. Dr. Z Onyango, National Program Coordinator, WHO, Kenya

8. Dr. Mansur, WHO Microbiologist, Nairobi

9. Dr. T.K. Arap Isiongok, Director, Division of Disease Control and Research (DDCR), MOH, Kenya

10. Dr. J. Otete, Director, Division of Health Education, Health Information System, and Non-communicable Diseases, MOH, Kenya

11. Mr. Alexander Ray Love, Director, REDSO/EA, USAID

12. Mr. Olesen, EPI Operations Officer, Danida, Kenya

13. Dr. Munuve, Program Manager, KEPI, MOH, Kenya

14. Dr. Norman Scotney, Head, Health Behaviour and Health Education Department, African Medical and Research Foundation (AMREF), Nairobi

15. Mr. Dwuor (Lucas) Omondi, Sociologist, AMREF, Nairobi

16. Mr. David White, Head, Manuals Section, AMREF, Nairobi

H. Mogadishu, Somalia

1. Mr. Arjuna Abayoni, Cole, Health Development Officer, USAID, Somalia

2. Mr. Kurt Shafer, Refugee Officer, USAID

3. Mr. Dick Ducley, Acting Director, USAID

4. Dr. P.M. Shah, WHO Medical Officer, EPI, Somalia

5. Dr. Shah, UNFPA Medical Officer, MCH Unit, MOH, Somalia

6. Dr. Faduma Haji, Acting Program Manager, EPI, MOH, Somalia

7. Mr. Frank Rauser, WHO Operations Officer, EPI, Somalia

8. Mr. Ahmed Saleh, Operations Officer, EPI, MOH

9. Ms. Jane Cole, Programme Officer, UNICEF, Somalia

10. Mrs. Norine Mariano, Assistant Program Officer, UNICEF, Somalia

11. Mr. Arild Vollan, Communications Officer, UNICEF, Nairobi

12. Mr. Olavi Elo, WHO Medical Officer, Primary Health Care and Refugee Health, Somalia

13. Dr. Said Hassan Muse, Coordinator, Refugee Health Unit, MOH

14. Mr. Jiddo Van Drunen, Assistant Program Officer, UNHCR, Somalia

15. Dr. Abdulshi Deria, Director, Department of Public Health, MOH

16. Mr. Yassin Farah Ismael, Director, Department of Planning, MOH

17. Dr. Abdulshi Hassan Farah, Director, Epidemiological Surveillance and Communicable Disease Unit, MOH

18. Dr. Mohammed Al-Aghbari, WHO Program Coordinator, Somalia

19. Dr. Mahamud A. Guulee, Director, Primary Health Care, MOH, Somalia

I. Dakar, Senegal

1. Mrs. Mary Diop, USAID Health Officer

2. Dr. James D. Shepperd, SHDS Evaluation Team

3. Dr. Franz Rosa, SHDS Evaluation Team

4. Dr. Abraham Kidane, SHDS Evaluation Team

5. Ms. Terry Dupuis, SHDS Evaluation Team

6. Dr. Henri Elias, Advisor, Communicable Diseases, MOH, Senegal

7. Dr. D. Badarou, Coordinator, AFRO, Health Planning Training Program

J. New York, New York

1. Mr. Louis Shapiro, Director, Supply Division, UNICEF, NY

2. Mrs. Nancy S. Cain, Deputy Director, Supply Division UNICEF, NY

3. Mr. Newton Bowles, Advisor on Primary Health Care, UNICEF

4. Mr. Iskander, Director, Bureau for Africa, UNICEF

5. Mr. O. Olcese, Deputy Director, Bureau for Africa, UNDP, NY

K. Washington, D.C.

1. Mr. Dennis Conroy, Director, Regional Affairs, Bureau for Africa, USAID

2. Mr. Jay Ruoff, Deputy Director, Regional Affairs, Bureau for Africa, USAID

3. Mrs. Julia Robinson, One America, Inc., Washington, D.C.

4. Dr. Al Henn, Health and Nutrition Advisor, USAID, Dar Es Salaam

5. Dr. Ngeliwa, MCH Director, Ministry of Health, Tanzania

6. Dr. Michael Merson, Medical Officer, Diarrheal Disease Program, WHO, Geneva

7. Mr. Michael McQuestrin, Technical Officer, Diarrheal Disease Control Program, PAHO, Washington, D.C.

8. Dr. Ciro da Quadros, Regional Advisor, EPI, PAHO

9. Mr. Peter Carrasco, Administrative Officer, EPI, PAHO

10. Mr. Karl Back, Coordinator, Somali Refugee Working Group, Department of State

11. Mr. Dick Hines, East African Desk Officer, USAID

12. Mr. Stephen Dennis, Country Program Division, IBRD

13. Dr. Aubrey Williams, Population, Health and Nutrition Division, IBRD

14. Dr. John Evans, Director, Health Division, IBRD

15. Ms. Susan Weintraub, Information Utilization and Distribution, AID

ANNEX R

PROJECTED CCCD TRAINING SCHEDULE
FY1981 - FY1985

	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	TOTAL
TRAINING COURSES[1/]						
EPI:						
Management I (English/French)	1	2	2	2	2	9
Management II (English/French)	2	4	8	8	8	30
Cold Chain Utilization (Repair/Maintenance)	1	2	5	8	8	24
CDD:						
Management I (English/French)	1	2	2	2	2	9
Management II (English/French)			2	6	6	14
OTHER:						
Divers (Miscellaneous)	1	2	4	6	6	19
TOTAL	6	12	23	32	32	105

1/ Management I/II training courses comprise 40 participants in 5 groups each led by two trainers = 10 x 3 weeks - 30 weeks or 7.5 p/m per course. Cold chain courses will be individual and bilateral and average 1 p/m per course.