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FINAL REPORT

EXPANDED PROGRAM ON IMMUNIZATION
Project No. 698-0410.26
Contract No. AFR-0410-S-00-1002-02

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I. SUMMARY

In 1978 the Ministry of Health and Social Welfare of Liberia launched the Expanded Program on Immunization (EPI) to reduce morbidity and mortality resulting from six vaccine preventable diseases. Based upon the assessment by the U.S. Centers for Disease Control in 1979, USAID designed an Accelerated Impact Project to provide technical assistance and limited commodity support for the expansion and improvement of the EPI Program.

EPI Project activities were initiated with the arrival of the Project Technician in October 1980. Shortly thereafter, it was realized that, given the available resources, a completely mobile effort for delivering immunizations was no longer economically feasible nor practical. Consequently, the Program and the Project redirected efforts towards utilizing the existing network of static health facilities to increase immunization coverage. This change in strategy required considerable planning at central and local levels, and produced a great deal of training activity for static health facilities.

Adequate data retrospective to the Project are lacking, thus it is difficult to accurately measure the impact of the Project which continued through March 1984. Since the Project began, however, there have been several immunization coverage surveys to collect reliable data for assessing the Program. These data indicate that two counties, Bong and upper Lofa, are capable in the near future of attaining the coverage objectives established in 1978. Analogous to their higher coverage, these two counties have well established community health departments, and they have demonstrated greater interest towards planning and implementing immunization activity according to their resources.

During the course of the Project the EPI Program was adequately supplied with essential equipment and supplies. There were no major interruptions of operations owing to critical shortages of vaccines and vaccination equipment or to the power outages in Monrovia. However, operations upcountry continue to be hampered primarily because of an insufficient supply of kerosene for maintaining refrigerators, and a lack of supervision by both central and county personnel.

To further strengthen the Program, efforts must continue towards improving the management, planning, and problem solving capabilities of mid-level personnel. Alternative, area-specific strategies are needed to increase immunization coverage given the problems of communications and logistics, as well as the limited financial support. More importantly, health workers must actively communicate with their communities and encourage their participation in the immunization effort.

USAID can assist in sustaining the efforts of the EPI program by continuing to supplement essential supplies such as vaccines, needles/syringes, record cards, and kerosene refrigerator parts. Furthermore, the Agency will be most beneficial by promoting and supporting operational research to develop indigenous and economical strategies for delivering immunizations, as well as research to improve the immunogenicity and heat stability of EPI vaccines.

II. INTRODUCTION

Following the initiative of the World Health Organization (WHO) to expand immunization activity worldwide, the Ministry of Health and Social Welfare (MH&SW) of the Republic of Liberia launched the Expanded Program on Immunization (EPI) in July 1978. The goal established for the Program was an 80% reduction in morbidity and mortality resulting from six childhood vaccine-preventable diseases: measles, polio, neonatal tetanus, pertussis, diphtheria, and tuberculosis. To achieve this goal, coverage objectives were established for the following vaccines: measles 75%, BCG* 75%, polio (three doses) 50%, and DPT** (three doses) 50% for children less than two years, and tetanus toxoid (two doses) 50% for women of child-bearing age (see Table 1). These objectives were expected to be accomplished throughout the country during the next five years. Operations were to begin in Bong, Lofa, Grand Cape Mount, and Nimba Counties with expansion into the remaining five counties after the first year of operation.[1]

Table 1

ESTIMATED TARGET POPULATIONS FOR THE FIVE EPI VACCINES IN LIBERIA, 1984.

Antigen	Age Group	Est. Population In Age Group	Target	Target Population
measles	9 mos. - 2 years	156,000	75%	117,000
$Polio_3$	3 mos. - 1 year	104,000	50%	52,000
DPT_3	3 mos. - 1 year	104,000	50%	52,000
BCG	Birth - 5 years	254,000	75%	265,000
TT_2	Childbearing women	520,000	50%	260,000

Note: Populations are based upon 1984 projection with a 3.3% growth rate per annum.

Day to day management of Program operations was delegated to the Director and Manager of the Program. Overall management was placed under the direction of a multidisciplinary Board consisting of representatives from the MH&SW, other government ministries, concessions, and the private sector, with the Chief Medical Officer (MH&SW) as the Chairman. Although EPI activities are related to the activities of the Bureau of Preventive Services (BPS), the EPI Board was directly responsible for Program affairs; consequently, the EPI Director was responsible to the Board Chairman, rather than the BPS Director. In order to circumvent the lengthy delay of receiving MH&SW funds for Program operations, the EPI Program was provided an autonomous budget.

Based upon the infrastructure developed by the Smallpox/measles program of the 70's, a mobile strategy utilizing 15 mobile teams in 11 operational zones was adopted as the primary mode for delivering vaccinations.

* Bacille Calmette-Guérin vaccine to prevent tuberculosis
**Diphtheria Pertussis Tetanus

Long-range plans called for a gradual shift towards a static approach (i.e. services provided at hospitals, clinics, health posts) to maintain coverage. To assist in establishing the Program, the MH&SW received support from the Baptist World Alliance, the Brother's Brother Foundation, UNICEF, and WHO. This support consisted mainly of vaccines, vehicles, refrigerators (kerosene and electric), and consultations.

At the request of the MH&SW the U.S. Public Health Service, Centers for Disease Control (CDC), conducted an assessment of the Program in August 1979. The CDC team noted that EPI had done well in managing the central office, deploying vehicles and refrigerators, and developing a training manual; however, major deficiencies were seen in the supervision of the mobile teams, training of static unit health workers, the cold chain beyond Monrovia, and the procurement of measles vaccine. Based upon the CDC report, USAID/Liberia proposed an Accelerated Impact Program (AIP) to provide technical assistance and limited commodity support for the expansion and improvement of EPI.[2]

III. PROJECT DESCRIPTION

In June 1980 an A.I.D. grant of $498,000 was authorized for the Government of Liberia (GOL) under project No. 698-0410.26. The grant, referred to as the EPI Project and herein as the Project, was designed to assist the EPI staff with solving the problems of supervision, cold chain control, and training. This was to be accomplished through technical assistance and the provision of various commodities. Activities were to be carried out over a two year period after which the MH&SW was expected to provide continuing support to the Project efforts and recurrent costs. Additionally, the Project was to serve as a transition to a proposed USAID Primary Health Care project, which has subsequently been approved. Goals and Objectives of the Project were consistent with those of the Program, and the Project also favored a mobile strategy for delivering immunizations.

According to the Project Paper, the primary contribution of the AIP was the provision of a technician to be designated as the 'Operations Officer'. Responsibilities for the Operations Officer involved three areas: (1) development and coordination of an on-going training program for EPI personnel, (2) development and application of a method to assess and evaluate immunization activities and (3) improvement of the cold chain. Specifically, these responsibilities called for the following:

- training health workers on immunization techniques and vaccine storage and handling;
- establishing two mobile assessment teams to assess the immunization coverage of the mobile vaccination teams;
- improving disease surveillance and reporting in close collaboration with the Division of Health and Vital Statistics;
- establishing personnel evaluation procedures for the staff of mobile teams and static health units;

- conducting refrigerator maintenance training;

- establishing uniform recording of refrigerator temperatures;

- establishing a system to spot check maintenance of vaccines at all levels;

- strengthening vaccine distribution; and

- enforcing the destruction of vaccines that had been improperly handled or that had exceeded the manufacturers expiration date.[2]

These responsibilities were to be undertaken by the Operations Officer in collaboration with the EPI Director and two operational counterparts. The goal of the technical assistance was to improve the administrative and managerial skills in order to enhance the EPI staff capabilities to manage program operations. Although a PASA agreement with CDC was originally proposed, technical assistance was actually provided through a USAID Personal Services Contract.

The second component of the Project included training to strengthen supervision and maintenance of the cold chain. In addition to inservice training and workshops for health workers, the Project was to provide special training for the EPI auto mechanics and refrigerator technicians. Funding for travel, per diem, supplies and materials to support such activities amounted to $7,000 for Project Year (PY) I and $8,000 for PY II.

The third component of the grant involved commodity support for promoting improved managment, logistics, and cold chain maintenance. Commodities originally intended to be procured were eight vehicles (including one for the Operations Officer), a central cold storage facility, a back-up generator, mechanical injectors (Ped-O-Jets), disposable needles and syringes, camping and radio equipment, and measles vaccine. Except for measles vaccine, funding for these commodities was allocated only during the first year of the project. Total funding for commodities was estimated to be $216,800.

IV. PROJECT ACTIVITIES

A. Background

After the CDC assessment and before Project implementation, EPI experienced several major setbacks. Although the Plan of Work had outlined a gradual expansion of immunization activity, EPI was compelled to initiate operations throughout the country. This rapid expansion was not only unplanned, but also was beyond the financial capabilities of the Program. Another setback occurred in 1980 when political events halted field operations for nearly five months. Compounding these problems, personnel costs increased by 40% and the cost of gasoline and kerosene increased nearly 50%. Despite the additional financial strain, the Program did not receive a proportionally increased budget. Consequently, per diems for field work by mobile vaccination teams were no longer affordable,

nor was a supply of gasoline sufficient to maintain consistent mobile operations.

As it was apparent that mobile operations ultimately were not economically feasible nor practical for sustaining the multiple contacts necessary to fully immunize children and women, EPI adopted a different strategy in February 1981. This strategy, which has been promoted elsewhere, calls for a more integrated approach requiring a greater utilization of the existing network of static health facilities and the elimination of mobile vaccination teams.[3,4] To support this new initiative, Project technical assistance, training, and commodity support were modified accordingly. These modifications will be discussed throughout this report.

Implementation of the Project began with the arrival of the Operations Officer in October 1980. The following discussion summarizes the activities of the EPI program that occurred during the life of the Project. Although designed to end after two years, the Project was extended through March 1984 to provide continuity with the forthcoming AID assisted Primary Health Care (PHC) Project (669-0165) and Combatting Childhood Communicable Diseases (CCCD) Project (698-0421.03). It must be emphasized that the activities discussed in this report resulted from the combined efforts of EPI, the Bureau of Preventive Services, the Inservice Education Division (IED), the Division of Health and Vital Statistics as well as, UNICEF, WHO, and the Christian Health Association of Liberia (CHAL); and not solely from the Project. A chronological summary of these principal activities is illustrated in Appendix A.

B. Technical Assistance

1. Management

Technical assistance was directed at both central and county levels, and jointly applied over a period of 41 months through the EPI Director, Mr. James S. Goaneh; the Manager, Mr. Jack N. Berrian; and the Physician/Training Officer, Dr. Wilhelmina V. Holder; and the relevant mid-level personnel (e.g., stock room clerk, county supervisors). The primary intent of this assistance was to further strengthen the management of overall operations and to develop a supervisory component for immunization activities in the clinics.

The first step for strengthening management at the central level was to define the lines of authority and the policies and operational procedures of the Program. The Program produced organizational charts to delineate the lines of supervision and communication both within EPI and in relation to the MH&SW (See Appendixes B and C). Also, job descriptions were revised in more detail for all categories of EPI personnel to provide a reference regarding duties and supervision. To clarify the existing confusion over certain policies such as disciplinary actions, and the procedures for reporting and ordering supplies, the senior staff* compiled

*senior staff includes the following: Director, Manager, Physician/ Training Officer, and Operations Officer.

a manual documenting Program policies and procedures (See Appendix D). These activities were completed by November 1981.

Considerable attention was directed toward improving Program planning at the central level. This was particularly important because of the new Program strategy and the financial difficulties which necessitated more efficient operations. As previously mentioned, the new strategy oriented the Program towards reducing costs by phasing out mobile vaccination teams and by placing emphasis upon utilizing existing resources to improve immunization coverage. The senior staff, in collaboration with the IED, also developed a training strategy to support the new approach (see C. below). Routine planning sessions and planning calendars were used to facilitate the organization and implementation of Program activities.

Efforts focused on financial management as well, since appropriate planning was dependent upon available funding and a readily available accounting of Program expenditures. By the second year of the Project the EPI Finance Officer was producing quarterly financial reports outlining expenses. An example of expenditures for the period October 1982 - September 1983 is illustrated in Appendix E .

To further enhance the efficient utilization of resources, greater control over supply management was promoted. Inventories of Program equipment and supplies were performed each year of the Project. As certain supplies had been issued without adequate control and record-keeping, stricter supervision over the stockroom was instituted by requiring approval by a senior staff member for all supply requests, and by initiating an exchange mechanism for spare parts.

As the first step towards establishing a supervisory component upcountry, county/district EPI supervisors were appointed by County Medical Directors in March 1981. To promote the integration of 'EPI' with other clinic activities, these supervisors were intended to be Physician Assistants (PA) who had been supervising other clinic activities. In most counties such a level of health worker was appointed; however, EPI mobile team Leaders were selected in Nimba, Grand Gedeh, and Sinoe Counties.

During the third year of the Project, most of the technical assistance was directed towards improving the planning, problem solving, and management capabilities of the county/district supervisors in Bong, Lofa (upper), and Maryland Counties. Supervisors were encouraged to develop strategies to deliver immunizations with the existing resources and with less dependency upon Monrovia for logistical and financial support. It was further stressed that immunization was not an autonomous activity, but rather the responsibility of all health workers, and that coordination among other health care activities was essential to effectively immunize the women and children in their areas.

Additional assistance for improving the management skills of the county/district supervisors was obtained through the U.S. Peace Corps. In February 1983 five Volunteers were assigned to work as Co-Supervisors in Bassa, Cape Mount, Maryland, and Nimba Counties, and Voinjama District, Lofa County. However, after one year only the Volunteer in Cape Mount County remained with the Program. Reasons for early departures varied. For example, one felt that the assistance was not necessary since the supervisor was already capable of managing operations; whereas another believed that there was little chance for improvement.

2. Evaluation Systems

Two approaches were used to promote program evaluation: the collection of data through immunization coverage surveys, immunization reports, disease reporting, and surveillance; and internal and external reviews. Although the Project Paper called for the development of two mobile assessment teams, this activity was not pursued due to the change of strategy for delivering immunizations (i.e. mobile to static), and also because it was financially infeasible to maintain additional mobile teams. Futhermore, the size of the country did not warrant the use of multiple assessment teams since evaluation activity can be adequately supervised from Monrovia.

The immunization coverage survey, as designed by WHO/EPI, was chosen as the primary method for measuring the effectiveness of the Program. The first such survey was performed in February 1981 in Monrovia. In 1983 five surveys were conducted, representing a considerable increase in efforts towards collecting reliable data for evaluation. Results of these surveys will be discussed later in Section V, PROJECT IMPACT.

Other sources of evaluation data sought included morbidity and mortality data from the Division of Health and Vital Statistics, and both sentinel and static surveillance. Sentinel surveillance at two major hospitals, JFK in Monrovia and Phebe in Bong County, was not actively pursued after 18 months since it was apparent that hospital admissions were not correlating with the actual incidence of diseases. For example, fewer measles cases might be reported during an epidemic than during a non-epidemic because of the unavailability of beds or the routine established from seeing so many cases. A second approach, which involved surveillance through clinics, was attempted in order to collect more timely and reliable morbidity and mortality data. Although a surveillance form has been produced, data have not yet been generated by this method (See Appendix F).

In April 1982 EPI underwent an extensive evaluation sponsored by WHO. The evaluation team was composed of representatives of the MH&SW, WHO, USAID, CDC, and Strengthening Health Delivery Systems (SHDS). The team noted that the Program was following an appropriate strategy; however, there were several problem

areas impeding progress. These included insufficient funding, inadequate supervision at the clinic level, less than adequate performance of the cold chain upcountry owing to shortages of kerosene, and minimal outreach activity from the clinics owing to a lack of understanding about catchment areas and a lack of transport.[5]

The following year the EPI senior staff conducted an internal review of all aspects of operations (e.g., inventory, supervision, coverage, finances). This review revealed that vaccination coverage objectives were attainable in the near future in Bong and upper Lofa Counties. However, it also demonstrated that the number of field days by senior staff remained less than adequate. Such reviews are now scheduled to be held in December of each year.

3. Cold Chain

In 1980 few refrigerators in clinics were functioning due to a lack of parts, insufficient kerosene, and a lack of knowledge regarding maintenance. Consequently, Project funds for the building of a central cold storage facility were diverted to to revive the cold chain upcountry. It was the opinion of the Operations Officer that the existing central cold storage facility was adequate for the Program. This opinion was supported by the April 1982 external evaluation. Additional modifications were made with the Project commodities to further improve the cold chain in the counties (See D. below).

Other major problem areas regarding the cold chain upcountry included the absence of temperature monitoring and a lack of understanding by clinic staff of refrigerator maintenance. Training, both classroom and on-the-job, was the primary approach to address these problems (see C. below). In addition to training a form was produced to facilitate temperature recording. This form also contained a check list for refrigerator maintenance procedures (see Appendix G).

To reduce the numerous interruptions of vaccination activity resulting from a break in the cold chain because of equipment failure, shortages of kerosene, and insufficient funding, health workers were encouraged to seek alternative storage and distribution sources such as missionaries, concessions, and other governmental projects. Also, the counties were urged to develop strategies to operate their cold chains through a better allocation of resources, periodic planned usage, and more strategic placement of refrigerators.

Rather than a 'routine system of spot checking vaccines for potency' as called for in the Project Paper, temperature monitoring, training, and the destruction of any vaccine in question were emphasized as a method of quality control. Although laboratory testing would have been preferred, such a system was not

economically feasible as there is no such facility for testing vaccines in Liberia.

C. Training

Considerable effort was directed towards training activities for the static unit health workers during the first and second years of the Project. Project training consisted of four components: (1) a national course for mid-level personnel (2) a series of workshops and inservice programs in the counties for health workers in the static units (3) production of a revised edition of EPI Handbook for Health Workers and (4) incorporation of the principles of immunization into the curricula at health training institutions. Training for the auto mechanics as proposed in the Project Paper was not undertaken since the mechanics already possessed acceptable skill and because funding was not sufficient for such an undertaking. Training for the refrigerator technician was obtained through WHO.

In June 1981 EPI and IED held a one week training course for the newly appointed county EPI supervisors and mid-level IED staff. The purpose of the course was twofold: (1) to teach the principles of immunization inorder to provide a foundation for supervisors of immunization activities in the static units and (2) to train health workers in the principles and methods of planning and conducting workshops so that they could return to their respective areas and carry out training activities for their co-workers. Forty-eight health workers attended this training course which cost $5,043.

Subsequent to the national EPI course, nine local workshops were financed through the Project. The cost of these workshops, $6,564, varied according to the number of clinics in the county or district, ranging from $430 to $1,488 with an average cost of $870. Four additional workshops were sponsored without Project funding by either EPI or UNICEF. All local EPI training activities were planned, implemented, and taught by local staff with assistance from central EPI and IED staff. Subjects covered included: immunization techniques, cold chain, planning of vaccination activities and sessions, reporting and record keeping, and evaluation at the local level. Although basic refrigerator maintenance procedures were discussed, long range plans called for 'hands-on' training. However, funding for this activity was never obtained. Approximately 450 health workers received EPI training during the life of the Project (see Table 2).

To provide a reference manual for training activities, Project training funds ($1,740) were used for printing a revised edition of the EPI Handbook for Health Workers which was produced in Liberia by CHAL, EPI, IED, and a United Nations Volunteer. This handbook, which has received international acclaim, was distributed to all health facilities and training institutions.

For the promotion of a continued cadre of trained health workers, efforts were made to incorporate the EPI principles into the curricula

Table 2

SUMMARY OF EPI TRAINING ACTIVITIES AND COSTS, 1981-1984

Event	Date	Cost	No. of Participants
Materials			
Handbook, 1st Edition	1/81	$ 672	-
National Workshop	5/81	455	-
Handbook, 2nd Edition	2/82	1,740	-
Workshops			
National	6/81	$4,588	48
Cape Mount County	11/81	476*	25
Careysburg District	2/82	430	30
Nimba County	2/82	1,080	38
Bomi Hills Territory	5/82	500	25
Gibi Territory	5/82	600	23
Zorzor District	6/82	510	32
Kolahun District	7/82	810	35
Voinjama District	7/82	670	35
Bong County	7/82	1,488	45
Maryland County	3/81	n/c	32
Maryland County	8/83	n/c	(30)
Grand Gedeh County	9/81	n/c	30
Bassa County	2/83	n/c	31
Monrovia	12/82	n/c	30
National, WHO Mid-level Management	3/84	n/c	(34)
Total		$14,019	459

* Additional funds obtained from another source.

n/c Source of funding other than the Project.

( ) Received prior EPI training; not included in total

at TNIMA and the Doglioti Medical College. By January 1983, immunization had become routine subject material in the relevant courses at these institutions.

In additional to local and national training, EPI staff took advantage of international training activities sponsored by SHDS, WHO, and CCCD/USAID. These activities provided training on refrigerator maintenance, epidemiology, surveillance, mid-level management, and the principles and methods of training of trainers.

D. Commodities

Several modifications were made to the commodities proposed in the Project Paper. As the cold chain upcountry was nearly nonoperational, funds for a central cold room were redirected to purchase spare parts for kerosene refrigerators, vaccine transport equipment, and ice packs. The central cold room was strengthened by purchasing a back-up generator, two replacement air conditioners, four replacement refrigerators, two replacement freezers, and two air conditioner compressors to repair existing equipment. Also funds for thermometers, which were in ample supply, camping equipment, and miscellaneous items were diverted to purchase Road to Health cards because the Program had been without immunization record cards for nearly a year.

The Project provided 80,000 doses of measles vaccine, 40,000 of which were obtained through the CCCD Project at no cost to the EPI Project.

Seven AMC Jeeps and one Chevrolet Blazer were purchased. Six of the Jeeps were distributed as follows: Bong, Bomi, Grand Gedeh, Cape Mount, and Maryland Counties, and Voinjama District, Lofa County. One Jeep was used centrally for assessment but later transferred to St. Paul River District when a Toyota pickup was obtained through UNICEF for the central office. The Blazer was used by the Operations Officer. At the writing of this report 7 of the 8 vehicles are operational. The Maryland County Jeep was destroyed by fire a few months after deployment.

Funds remaining after the purchase of the initial commondities, together with funds transferred from the support of the Project Technician, were used to purchase additional, urgently needed commodities. These consisted of cold chain equipment, reuseable needles/ syringes, and immunization record cards (including Tetanus Toxoid cards for pregnant women).

Total cost of the Project commodities amounted to approximately $240,000, excluding about $10,000 through the CCCD Project for measles vaccine (see Table 3). In addition to the Project, the EPI Program received commodity support from WHO, UNICEF, and the Brother's Brother Foundation. These are illustrated below in Table 4.

Table 3

EPI PROJECT COMMODITIES, DATES REQUESTED AND RECEIVED, COST

Item	Date[a] Req.	Date[b] Rcvd.	Lag[c] Time	Cost[d]
Vaccine				
1. Measles (40,000 Doses)	5/81	8/81	3	$ 9,826
2. Measles (40,000 Doses)	n/r	10/83	-	(10,000)[e,f]
Logistics/Communication				
1. Vehicle (7 Jeeps & 1 Blazer)	1/81	7/81	6	78,171
2. Vehicle Spare Parts	1/81	4/82	15	8,000[e]
3. Tyres (24)	7/82	5/83	10	3,100[e]
4. Mobile Radio w/antennae	4/81	10/81	6 L	1,520
Cold Chain Equipment				
1. Generator w/installation (25 kva)	1/81	11/81	10 L	14,112
2. Air Conditioner (2)	1/81	10/81	9	2,148
3. Cold Boxes, Electrolux (16)	7/81	2/82	7	4,381
4. Vaccine Cariers, Thermos (100)	7/81	2/82	7	2,956
5. Vaccine Carriers, Thermos (100)	4/82	11/82	7	2,956[e]
6. Refrigerator Spare Parts, Electrolux	7/81	3/82	8	3,479
7. Refrigerator Spare Parts, Electrolux	7/82	5/83	10	4,800[e]
8. Refrigerator Spare Parts, GE	7/81	3/82	8 L	10,614
9. Ice Packs, Thermos (400)	7/81	3/82	8	500[e]
10. Ice Packs, Thermos (720)	1/83	9/83	8	726[e]
11. Air Conditioner Compressor (2)	1/83	8/83	7 L	700
12. Electric Refrigerator, GE (4)	1/83	9/83	8	3,580[e]
13. Electric Freezer, GE (2)	1/83	9/83	8	1,878[e]
14. Ice Chest, Thermsafe (16)	1/83	11/83	10	3,000[e]
15. Variable Output Transformer (10)	7/82	2/83	7	1,370[e]
Vaccination Equipment				
1. Ped-O-Jet Injectors (11), w/spares	5/81	9/81	4	21,699
2. Needles/Syringes, Disposable (80,000)	1/81	9/81	8	16,528
3. Needles/Syringes, Reuseable 160 dz./120 gr.)	4/82	11/82	7	15,800
Record Keeping				
1. Road to Health Cards (96,000)	4/81	1/82	9	6,700[e]
2. Road to Health Cards (85,000)	7/82	4/83	9	6,000[e]
3. Road to Health Cards (100,000)	7/83	11/83	4	7,000[e]
4. TT Vaccination Cards (250,000)	5/83	7/83	2 L	6,250
5. Printing Materials (Forms)	1/83	7/83	6 L	450
Total			7.5 (avg.)	$238,134[e]

n/r - no official request
a - Date of request by MH&SW
b - Date received by EPI
c - No. of months between dates requested and received
d - Includes freight
e - estimated cost
f - Received through CCCD at no cost to Project
L - Local Purchase

Table 4

EPI COMMODITIES DONATED BY OTHER DONORS, 1981-1983.

Donor	1981 Item	1981 Cost[1]	1982 Item	1982 Cost	1983 Item	1983 Cost
UNICEF	Vaccines	$55200	Vaccines	$56900	Vaccines	$57500
	Landrover	9200	Refrig.(10)	5750	Frig. Parts	6000
	VW Pickup	8050	Frig. Parts	5980	Need./Syr.(TB)	4000
	5 Motorcycles	3450			Toyota	6400
WHO	n/a		Frig. Parts	$ 2500	Vaccines	6000
			Refrig.(2)	1800		
BBF[2]	Hino Truck	$15000[e]	-	-	-	-

1-Cost according to Donor
2-Brother's Brother Foundation, USA
e-estimated local cost
n/a- not available

V. PROJECT IMPACT

In some respects the EPI Program was just beginning when the Project began in October 1980. The Program had a new Director, many operations had ceased due to political and economic events, and a different strategy for delivering immunizations was being pursued. Unfortunately, retrospective data are lacking, making it difficult to measure the impact of the Project. Nethertheless, some information is available during the life of the Project from which one can make inferences as to the effect of the Project in strengthening EPI.

A. Operations

Perhaps the greatest impact of the Project has been the redirection in the strategy for delivering immunizations which places emphasis upon cost saving by integrating EPI into the health care system. While it is too early to have effectively implemented such a strategy nationwide, EPI senior staff continue to plan and promote more locally oriented approaches for increasing coverage with the existing resources.

Senior staff have increased efforts to collect reliable data for program evaluation. This is evident by the five immunization coverage surveys performed in 1983, by the request for an external evaluation which occurred in April 1982, and by the internal review in 1983. Supervision by senior staff, however, did not increase appreciably during the past three years. During 1983, for example, national senior staff were in the field only 48 out of 951 possible person days.

All operational areas, except Nimba County, had a working vehicle

throughout most of the life of the Project. However, logistics were constantly interrupted by erratic and insufficient GOL funding for fuel and maintenance expenses. Coordination among the various health activities and non-governmental sources was encouraged to overcome these difficulties. Bong and Lofa Counties appear to be following this approach.

The cold chain has been strengthened by the acquisition of spare parts for kerosene refrigerators and vaccine transport equipment. The central cold storage facility is adequately protected from the frequent black-outs in Monrovia by the back-up generator. Unfortunately, the cold chain at the clinic level remains less than satisfactory. This is primarily due to lack of a sufficient and timely supply of kerosene, as well as poor accountability in certain counties. Other factors preventing improvement of the county cold chains are a lack of adherence to recording of temperatures for clinic based refrigerators, inadequate understanding of kerosene refrigerator operation and maintenance procedures by clinic staff, and insufficient supervision by the county/district supervisors. Although formal data are not available, one can conservatively estimate that no more than one-fourth of the 115 kerosene refrigerators are operational.

After the first year of the Project, there were none of the previously experienced major interruptions of immunization activity owing to supply shortages. In most cases essential supplies such as vaccines, needles/syringes, and vaccination cards were available. Additionally, supply management was reinforced by instituting the approval of all supply requests by a senior staff member, thus preventing supply shortages due to maldistribution. To facilitate the ordering of supplies, a monthly report/order form was adopted (see Appendix H). Supply distribution from central to county proved satisfactory; however, distribution from county to clinic level remains a problem due to inadequate mid-level management and a lack of coordination of transportation.

B. Immunizations

Immunizations reported in Liberia from January 1978 through December 1983 for the five EPI vaccines are illustrated in Table 5. While there has been a general decline in reported immunizations, it had been noted in the 1979 assessment that some counties were reporting greater than 100% coverage according to immunization reports. This was probably reflective of vaccinations being given outside the target age groups, such as school children, and falsified reports. Thus, the decline of reported immunizations probably is more indicative of improved reporting and closer adherance to vaccinating within the recommended age groups, both of which have been emphasized during training activities. Other factors influencing decline in the number of reported immunizations are the reduction in the upper age limit for BCG vaccine from 15 to 5 years and the decrease in the number of recommended doses for TT vaccine from 3 to 2 doses. These modifications were recommended by the external evaluation team in May 1982.

Table 5

IMMUNIZATIONS REPORTED IN LIBERIA BY ANTIGEN AND YEAR, 1978-1983.

Antigen	1978[a]	1979	1980	1981	1982[b]	1983[c]
Measles	37,878	51,916	79,516	66,868	63,143	65,443
BCG*	92,335	134,883	113,382	100,791	85,627	75,368
DPT**	61,485	97,397	111,324	112,511	100,524	104,591
Polio	27,348	55,184	96,196	82,437	93,791	93,686
Tetanus Toxoid	46,946	100,445	159,735	156,450	117,475	100,869

* Bacille Calmette-Guérin
** Diphtheria Pertussis Tetanus
a- EPI began July 1978
b- In May 1982 target age group for BCG vaccine was lowered from 15 to 5 years; recommended number of doses for TT vaccine reduced from three to two doses.
c- Data are incomplete for November and December

C. Immunization Coverage

Prior to 1981, immunization coverage was based upon scar (Smallpox or BCG) surveys, an unreliable method. Since 1981 eight immunization coverage surveys have been performed according to WHO/EPI protocol. Data from these surveys not only provide a more accurate assessment of the Program with respect to coverage objectives, but also represent the establishment of a more credible evaluation system.

Immunization coverage based upon surveys in Nimba, Cape Mount, Maryland Counties, and Monrovia since 1981 is considerably below the expectations of 1978. However, Bong and upper Lofa Counties have demonstrated that effective coverage is attainable. The highest coverage to date has been found in upper Lofa County, which has nearly reached the objective for BCG vaccine with 73% coverage, and has vaccinated nearly 50% of the target population against measles. Drop-out rates between first and second doses of DPT and polio vaccines are excessive in all areas (average 63%). Immunization coverage data for 1982 and 1983 are summarized in Table 6.

It should be noted that Liberia follows strict criteria in collecting data through coverage surveys. Unlike some countries, EPI/Liberia will only accept a written record as proof of an immunization, with the exception of a BCG scar for a BCG vaccination. Consequently, the data may tend to underestimate actual coverage and should not be compared with that from countries accepting verbal information.

Table 6

SUMMARY OF IMMUNIZATION COVERAGE SURVEYS IN LIBERIA, 1982 - 1983.

	MONROVIA		BONG CO.	CAPE MOUNT CO.	MARYLAND	UPPER LOFA CO.
PERCENTAGE WITH:	2/82	3/83	2/82	5/83	8/83*	12/83
Vaccination Card	17%	31%	62%	58%	30%	83%
BCG (Card or Scar)	38%	43%	50%	61%	40%	73%
Measles	6%	9%	25%	18%	9%	42%
Polio I	14%	19%	37%	31%	25%	66%
Polio II	6%	13%	18%	13%	8%	39%
Polio III	3%	10%	11%	9%	5%	23%
(Drop-out Rate I-III)	(78%)	(47%)	(70%)	(71%)	(80%)	(65%)
DPT I	14%	20%	41%	31%	25%	67%
DPT II	5%	13%	22%	13%	8%	40%
DPT III	3%	9%	16%	9%	5%	25%
(Drop-out Rate I-III)	(79%)	(55%)	(61%)	(71%)	(80%)	(63%)
Complete Immunization	2%	5%	6%	6%	3%	16%

Note: The above surveys were performed according to WHO protocol for immunization coverage surveys, i.e. 30 randomly selected clusters, 7 children ages 12-23 months per cluster. Except for a BCG scar, only a written record such as a Road to Health Card is accepted as proof of an immunization.

* Maryland County survey data are incomplete (18/30 clusters); and therefore, are not statistically valid.

D. Disease Incidence

With the possible exception of reported measles cases, statistics collected through the Division of Health and Vital Statistics are not reliable indicators of morbidity and mortality for the EPI related diseases. For example, only two cases of polio were reported in Liberia during 1981 while anecdotal reports suggest that at least two cases are seen at JFK Hospital each month. Likewise, pertussis is reported at extremely low levels. Inferences regarding neonatal tetanus are difficult as there is no distinction in reporting between neonatal and other tetanus (see Table 7).

Measles, however, may provide the best available indicator of disease incidence as it is easily diagnosed. Although anecdotal reports of outbreaks indicate considerable underreporting, reported measles cases are consistent with annual and long term trends reported worldwide. As illustrated in Figure 1, reported measles cases decreased considerably during the period January-October 1983 in comparison with the same period in 1981 and 1982 . This 52% reduction must be interpreted with caution, however, since factors other than immunization probably contributed to the decrease. Epidemics during the previous two years may have reduced the number of susceptibles for 1983 through natural immunity. Also, the Division of Health & Vital Statistics believes that there has been an overall decline in reporting since the lack of transportation now prevents their following up on delinquent reports.

Table 7

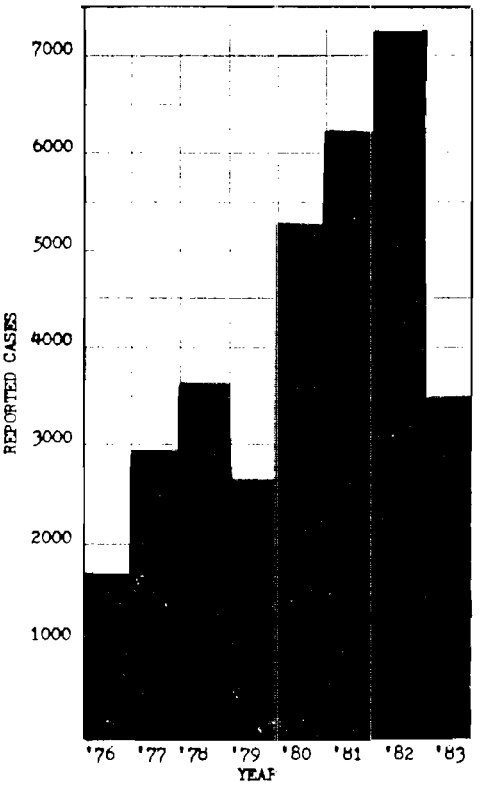
MORBIDITY/MORTALITY REPORT OF EPI TARGET DISEASES, BY YEAR, 1976 - June 1983.

	MEASLES		TUBERCULOSIS		TETANUS		PERTUSSIS		POLIO	
YEAR	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1976	2,183	63	1,454	31	639	71	2,764	1	2	0
1977	3,588	117	1,366	23	670	88	2,405	0	8	0
1978	3,705	125	1,390	43	373	108	1,279	3	181	3
1979	3,243	96	597	80	384	94	100	3	67	6
1980	6,167	162	774	78	307	136	62	2	98	0
1981	7,990	182	1.068	105	312	125	65	8	3	0
1982	7,601	180	930	87	335	114	152	4	2	0
Jan.-Jun. 1983	2,076	42	542	86	112	47	11	0	1	0

Data Source: Bulletin of Notified Epidemic Diseases, Division of Health and Vital Statistics, Ministry of Health and Social Welfare, September 1983.

FIGURE 1

REPORTED MEASLES CASES FOR THE PERIOD:
JANUARY-OCTOBER, 1976-1983, LIBERIA



* The January - October period was used because of the lack of completed data for November and December in 1983. November and December are normally months of low incidence for measles.

VI. DISCUSSION

A. Problems Encountered

Besides the everpresent operational obstacles resulting from inadequate and erratic government funding, and the well known difficulties of logistics and communication in a developing country, several major problems were encountered. Only those more amendable to resolution will be discussed in this report.

Considerable effort was expended by the Project Technician on USAID administrative matters. While the Technician diverted time from Project activity to insure that USAID staff carried out the necessary procedures (e.g. PIO/C's, purchase orders) to procure Project commodities, such activities were not in accordance with his contract. Futhermore, the Technician was never briefed on USAID/Liberia administrative procedures.

There were several instances of extreme delays in receiving Project Commodities. For example, from the time of request by the MH&SW for spare parts for Project vehicles to receipt by EPI took 15 months. Ten months were required to obtain the back-up generator, a local purchase. It took three months for the Mission to issue a purchase order after the PIO/C had been signed for this generator. Nonetheless, certain commodities, such as measles vaccine and Tetanus Toxoid vaccination cards were received within three months, thus demonstrating that commodities can be procured in a timely manner.

Early in the Project there was a misunderstanding by EPI as to the role of the Technician. It appeared that EPI perceived the role of the Technician primarily as an independent supervisor for upcountry activities. Also, the designation of a counterpart(s) was not clearly established by either the EPI Director or the Project Paper. In fact the title 'Operations Officer' was misleading, as this title is used by EPI/WHO to connote the person directing overall program operations, a position normally held by a national. These difficulties, however, were mutually resolved and did not impede Project activities.

Throughout the life of the Project, supervision over field operations by EPI senior staff was less than adequate. While government funding constraints preclude optimal field activity, available funding should have resulted in more supervisory activity than occurred, particularily for immunization activity in the Monrovia area. Because of this lack of field work, certain senior staff did not have a proper perspective of the needs and status of the Program; nor did they promote the motivation and supervision that are essential for strengthening the Program.

B. Conclusions

When one considers that the goal of reducing morbidity and mortality by 80% through immunization has only recently been attained in the United States and that some European countries have immunization coverage lower than certain areas in Liberia, such an achievement for a developing country after only five years is highly ambitious.[6] Similiarly, coverage objectives were established in Liberia before the parameters of developing an effective immunization program in Africa were fully understood. Only through experience can one begin to appreciate the difficulties of storing and transporting vaccines with specific temperature requirements and of maintaining a network of kerosene refrigerators in rural areas. Compounding these technical difficulties are the ever-present logistical and communications problems, and the rising cost for petroleum products.

Besides the technical problems, social factors have influenced attempts to establish EPI. Prevention of disease is a relatively

new concept. Most families do not think about measles until the disease is present; thus making the motivation of the community for immunizing during a non-epidemic period very difficult. Futhermore, to appropriately immunize a child depends upon the family's awareness of essential information such as the age a child must be vaccinated and the time to return for subsequent doses.

Now that the parameters are better understood and EPI has adjusted its strategy accordingly, it is feasible to achieve effective levels of immunization coverage, and subsequently control child morbidity and mortality. In place of traditional approaches, such as a totally mobile effort or maintaining a refrigerator in every clinic, emphasis must continue towards developing alternative, area-specific strategies to deliver immunizations through existing resources. This will require greater efforts at the local level in planning, coordinating resources, and strengthening management.

Such efforts in upper Lofa County have resulted in immunization coverage that is well above coverage in other areas (see Table 6). Through careful planning of vaccination sessions and coordination among the community health departments, the religious missions, and an agricultural project, the three districts of upper Lofa County have been able to conduct periodic mobile outreach sessions while maintaining immunization activity at certain clinics with high attendance. These efforts have resulted in 42% coverage for measles vaccinations in the target age group.

In sharp contrast with upper Lofa County, Monrovia has achieved only 9% coverage with measles vaccine despite the advantages of electricity, good roads, and being the site of the headquarters of EPI. Although there are many reasons for the low coverage in Monrovia, probably the two most important are the lack of supervision and the lack of an organizational structure through which to plan, coordinate, and promote immunization activity. Whereas several rural counties have active community health departments, there is not even a Medical Director for Montserrado County through whom one can pursue the planning, supervision, and coordination necessary to increase immunization coverage. The idea that 'Monrovia can take care of itself' is clearly inappropriate when one reviews the immunization coverage data.

A second component essential for improving immunization coverage is awareness and involvement of the community. To effectively immunize a child, the mother must know where to go and when her child should be immunized; and she should know what side effects can be expected. Mothers, fathers, chiefs, and others in the community must also participate in organizing vaccination sessions so that the villages can be completely and efficiently vaccinated. This was demonstrated in Zorzor District by Buhr in her study which revealed increased vaccination coverage in a village whose chief was concerned about immunizing the local children.[7]

Community awareness and interest will be generated, however, only when health workers at all levels actively and consistently communicate with their communities. In Harper, Maryland County, the hospital outpatient department experienced a three fold increase in vaccinations after teams had visited various areas informing people about immunization and checking vaccination cards. In Monrovia the number of children vaccinated at the EPI headquarters recently increased from a daily average of 10 to more than 50 after a news media broadcast of several measles deaths in nearby Johnsonville.

In addition to increasing coverage, community participation will promote a more economical delivery system. Villages can be vaccinated without a refrigerator if health workers plan with their communities to assemble on a specified date. By coordinating with the nearest cold storage facility, vaccines can be transported by public transport, motorcycle, or foot in the durable, inexpensive, and efficient Vaccine Carrier® which is capable of maintaining vaccines at an appropriate temperature for as long as two days.[8]

In order to sustain local efforts, U.S.A.I.D. needs to continue to assist EPI by supplementing essential supplies such as vaccines, needles/syringes, record cards, and spare parts for refrigerators. More importantly, it should devote greater attention towards encouraging and supporting research to accelerate the development of more appropriate vaccines and refrigeration equipment. Vaccines that are more immunogenic and more heat stable are necessary to reduce dependency upon costly refrigeration equipment and to decrease the number of contacts necessary to fully immunize a child; thereby reducing operational expenses. One wonders if smallpox would have been eradicated without a vaccine that could be kept at ambient temperatures for three months or with a vaccine that required multiple doses. To further combat the ever increasing cost of operations, more fuel efficient and durable refrigerators must be available for deployment as well.

Although it is possible to effectively immunize the women and children of Liberia, such an achievement will not occur in the immediate future. Many years are needed to develop and implement locally specific strategies for delivering immunizations with the existing resource constraints and logistical obstacles, and to further develop management at the county level. Improved technology must accompany these efforts, however, to keep operational expenses within the financial capabilities of the GOL. Finally and most importantly, local initiative and involvement are essential for sustaining the high levels of coverage that are necessary to ultimately reduce vaccine-preventable morbidity and mortality.

C. Recommendations

The following recommendations are directed to EPI.

1. Allocate resources to permit more field activity by senior

staff and refrigerator technicians to improve management and supervision in the counties and to strengthen the cold chain.
2. Redirect training efforts from workshops to on-the-job reinforcement of the knowledge gained through previous training activities (this does not preclude promoting EPI topics in routine inservice programs).
3. Stress greater accountability of supervisory activities and finances for the county/district supervisors.
4. Promote community participation by the health workers, the media, and the members of the community to increase immunization coverage and to decrease drop-out rates.
5. Continue to promote alternative strategies, such as intermittent usage of refrigerators and outreach, for delivering immunizations with existing resources.

The following recommendations are directed towards USAID, both in Liberia and Washington.

1. Continue to support EPI by supplementing essential vaccination equipment and supplies.
2. Promote and encourage research towards improving vaccines and refrigeration equipment.
3. Promote and support operational research on alternative and cost efficient strategies for delivering immunizations.
4. Develop a more efficient project commodity procurement system.

VII ACKNOWLEDGEMENTS

The individuals who assisted the Project and the Project Technician are too numerous to list; therefore, acknowledgements will be restricted generally to division, bureau, or program directors.

At the USAID mission I am most grateful to Mr. John Richardson and his staff in the Personnel Office for their efficient and pleasant processing of travel arrangements for my family and myself, both routine and during two unanticipated medevacs. I would also like to thank Mr. Freddy Pappo and his maintenance crew for providing most suitable living accomodations for my family during our stay in Liberia. Also, I thank Mr. Harry Harris whose dedication resulted in improved security at mission residences. Finally, I am most grateful to Dr. Glen Post and the staff of the Health Office for their assistance with and interest in the Project. Special thanks are directed towards Mr. Alan Foose who provided much needed back-up for Project related activities as well as personal matters.

The quality and quantity of Project training activities would not have been possible without the dedication and expertise of the staffs of the Inservice Education Division and the Christian Health Association of Liberia.

Several persons in the MH&SW gave direction as to the appropriate role for an expatriate serving with the Ministry and also provided much

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I am very grateful to the numerous Ministry personnel, Peace Corps Volunteers and Missionaries who provided most comfortable accomodations during my travels upcountry.

At EPI I am most appreciative of the efforts by Miss Lovette Anderson who, despite being the only secretary, typed my correspondence and reports in a timely and pleasant manner. I shall always be grateful to Mr. James S. Goaneh and the entire EPI staff who, from the moment of my arrival, treated me as a member of the family and provided a very pleasant working environment.

Finally, and most importantly, I wish to acknowledge those health workers who, despite low pay, delayed salaries, and minimal opportunity for professional advancement, continue to work towards EPI Program goals by immunizing the women and children of Liberia.

VIII

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APPENDIX A

CHRONOLOGICAL SUMMARY OF EPI PROJECT ACTIVITIES,
OCTOBER 1980 - MARCH 1984.

	Date	Event
1980	October	- Arrival of Operations Officer
	November	- Arrival of Project Commodity: Blazer
1981	February	- Operations Committee Adopts Strategy to Phase out Mobile Teams In Favor Of Static Unit Delivery
		- Liberia's First Immunization Coverage Survey (Monrovia)
		- Training Strategy Developed In Collaboration With The Inservice Education Division
	March	- Appointment of County/District Supervisors For Immunization Activities In The Clinics
		- Workshop, Maryland County
		- Physician/Training Officer Joins EPI Staff
	April	- Countrywide Inventory of Program Equipment
	May	- Immunization Coverage Survey, Nimba County
	June	- National Workshop for County/District Supervisors and Inservice Education Staff
		- Initiated Sentinel Disease Surveillance at Phebe and JFK Hospitals
	July	- Arrival of Project Commodities: Vehicles (7)
	August	- Efforts Initiated to Develop County Specific Strategies To Increase Immunization Coverage
		- Arrival of Project Commodity: Measles Vaccine
	September	- Arrival of Project Commodities: Needles/ Syringes, Ped-O-Jets
		- Workshop, Grand Gedeh County

APPENDIX A
(cont.)

	Date	Event
1981	October	- Annual Project Review: USAID, MH&SW
	November	- Revision of Job Descriptions and Documentation of Program Policies and Procedures
		- Workshop, Cape Mount County
1982	January	- Arrival of Project Commodity: Road to Health Cards
	February	- Immunization Coverage Survey: Monrovia
		- Arrival of Project Commodities: Cold Boxes, Vaccine Carriers
		- Workshops: Careysburg District and Nimba County
	March	- Developed Check Sheet for County Supervisors and Simplified Monthly Vaccination Report Form
		- Back-up Generator Installed for Central Vaccine Storage Unit
		- Arrival of Project Commodity: Refrigerator Spare Parts
	April	- Program Evaluation: WHO, USAID, SHDS, CDC, MH&SW
	May	- Workshops: Bomi and Gibi Territories
	June	- Assignment of Counties to Senior Staff for Supervision
		- Second Edition, EPI HANDBOOK FOR HEALTH WORKERS
		- Workshop: Zorzor District
	July	- Workshops: Voinjama and Kolahun Districts, Gibi and Bomi Hills Territories, Bong County
		- Arrival of Project Commodity: GE Kerosene Refrigerator Parts
	August	- CDC/CCCD Assessment

APPENDIX A
(cont.)

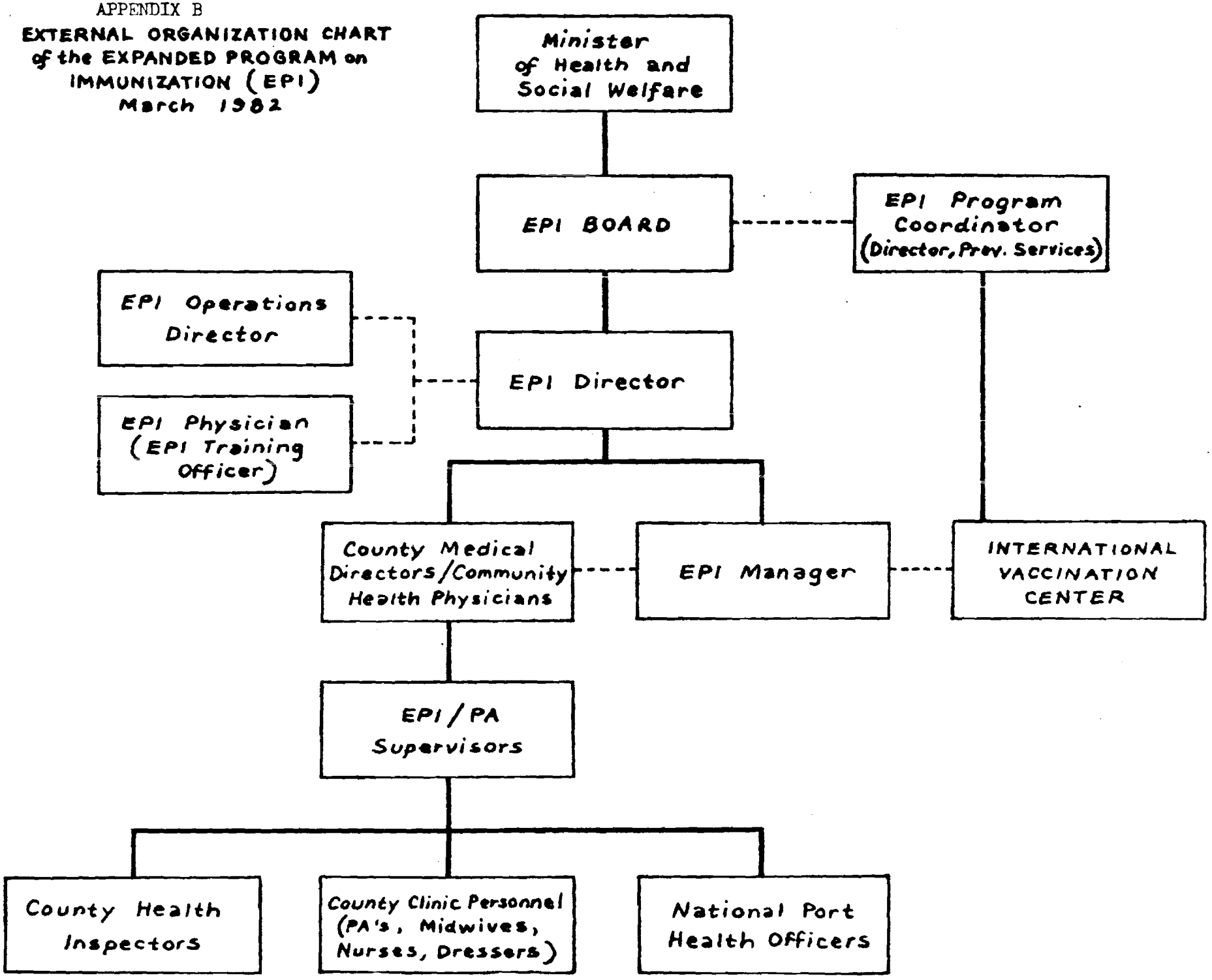
	Date	Event
1982	September	- First Issue of EPI Newsletter
		- Arrival of Project Commodity, Reuseable Needles/Syringes
		- Project and Contract Extended Through Oct. '83
	November	- Operations Officer Places Greater Emphasis Towards Improving Operations In Bong, Upper Lofa, and Maryland Counties
	December	- Workshop, Monrovia
1983	January	- EPI Principles Added to Curricula at TNIMA and Dogliotti Medical College
	February	- Immunization Coverage Survey, Bong County
		- Five U.S. Peace Corps Volunteers Assigned to EPI to Work As 'Co-Supervisors' and Improve Mid-Level Management in the Counties
		- Workshop: Bassa County
	March	- Field Test of CCCD Training Course for Instructors
		- Arrival of Project Commodity: Variable Output Transformers
	April	- Immunization Coverage Survey: Monrovia
		- Arrival of Project Commodity: Road to Health Cards
	May	- Immunization Coverage Survey: Cape Mounty County
		- Clinic Surveillance Form Designed
		- Arrival of Project Commodities: Tyres (24), Electrolux Kerosene Refrigerator Parts
	June	- MH&SW Team Revises CCCD Project Agreement
	July	- Arrival of Project Commodity: TT Cards
	August	- Immunization Coverage Survey: Maryland County
		- Workshop: Maryland County

APPENDIX A
(cont.)

	Date	Event
1983	September	- Arrival of Project Commodities: Freezers (2), Refrigerators (4)
	October	- Project and Contract Extended Through Dec. '83
		- Arrival of Project Commodity: Measles Vaccine
	November	- Program Review, EPI Staff
		- Arrival of Project Commodities: Ice Chests, Road to Health Cards
	December	- Immunization Coverage Survey: Upper Lofa County
		- Project and Contract Extended Through March '84
1984	February	- Workshop for Supervisors: WHO Mid-Level Management Course

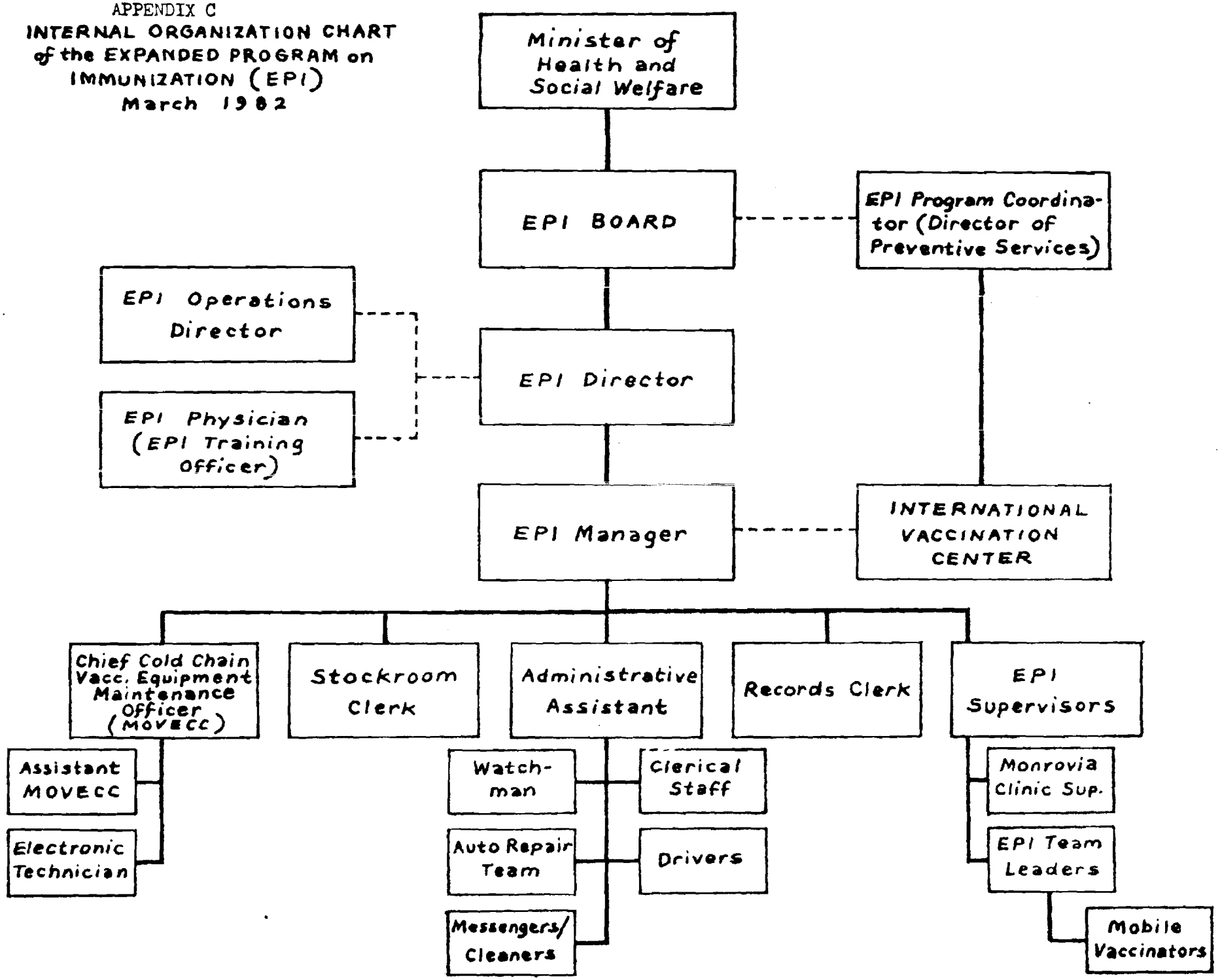
APPENDIX B

EXTERNAL ORGANIZATION CHART of the EXPANDED PROGRAM on IMMUNIZATION (EPI) March 1982



APPENDIX C

INTERNAL ORGANIZATION CHART of the EXPANDED PROGRAM on IMMUNIZATION (EPI) March 1982



APPENDIX E

QUARTERLY EXPENDITURES, EPI/GOL, OCTOBER 1982 - SEPTEMBER 1983.

No.	EXPENDITURE	Oct.-Dec. '82	Jan.-Mar. '83	Apr.-Jun. '83	Jul.-Sep. '83	TOTAL
1.	Personnel Services	$ 95,745	$ 60,470	$ 59,844	$ 62,527	$278,586
2.	Per Diem	315	1,390	1,461	361	3,527
3.	Gasoline & Oil	11,132	10,457	9,600	8,139	39,328
4.	Kerosene	4,015	5,052	4,350	5,400	18,817
5.	Fuel oil & Lubricants	960	820	-0-	1,564	3,344
6.	Oxygen & Carbide	-0-	-0-	72	72	144
7.	Vehicle Repairs	3,240	10,003	2,841	2,191	18,275
8.	Cold Chain Repairs	-0-	-0-	2,046	1,610	3,656
9.	Generator Repairs	-0-	-0-	167	-0-	167
10.	Electrical Supplies	-0-	473	-0-	-0-	473
11.	Mechanical Supplies	-0-	785	1,128	2,682	4,595
12.	Household Supplies	398	566	456	400	1,820
13.	Building Supplies	-0-	880	-0-	-0-	880
14.	Stationary	1,108	1,328	802	849	4,087
15.	Printing	1,138	40	792	-0-	1,970
16.	Utilities	2,747	1,238	990	-0-	4,975
17.	Training	310	388	-0-	-0-	698
18.	Air Freight	143	-0-	130	74	347
19.	Petty Cash & Miscellaneous	-0-	416	726	700	1,842
20.	Rent	-0-	6,050	6,030	-0-	12,080
21.	Vehicle Plates	-0-	-0-	-0-	514	514
22.	Uniforms	-0-	-0-	-0-	395	395
23.	Bank Service Charge	-0-	-0-	60	-0-	60
	TOTALS	$121,251	$100,356	$ 91,495	$ 87,478	$400,580

Note: Expenditures rounded to nearest dollar.

11/83

APPENDIX F

EPI Disease Surveillance

Clinic: _____

Dates: _____

Measles

Name	Village	Age in Months	Was Child Vaccinated? Date Known?

Neonatal Tetanus

Name	Village	Days Old	Was Mother Vaccinated Two Times?

Tetanus (Older Child/Adult)

Name	Village	Age	Was This Person Vaccinated?

Refrigerator Record

month:

EPI Liberia

location:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
morning TEMPERATURE:																															
ICE SOLID IN FREEZER ? :																															
FLAME:																															
evening TEMPERATURE :																															
ICE SOLID IN FREEZER? :																															
FLAME:																															
refuel TOP UP TANK :																															
CLEAN & FILL:																															
KEROSINE USED:																															
maintain TRIM WICK :																															
CLEAN CHIMNEY:																															
DEFROST :																															
replace WICK :																															
GLASS:																															
BURNER:																															
out of use CROSS ANY DAY THE BOX IS NOT IN USE																															

APPENDIX H

EPI Monthly Clinic Report

Expanded Program on Immunization
Ministry of Health and Social Welfare
Republic of Liberia

County:	
Clinic:	
Month:	

Reporting Vaccine	Measles	BCG		DPT			TT			Polio			Other: _____
		under 1	1-5 years	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	
1. Number Vaccinated													
2. Doses Wasted (Include Expired Vaccine)													
3. Total Doses Used (Number 1 plus number 2)													
4. Doses Remaining (End of Month)													
5. Expiration Date(s)													
Ordering													
6. Doses Needed													
7. Date Needed													

Ordering	Amount
1. Needles / Syringes	
2. Road to Health Cards	
3. Vaccination Tally Sheets	
4. Refrigerator Maintenance Logs	
5. EPI Monthly Clinic Reports	
6. Wick for Refrigerator	
7. Burner for Refrigerator	
8.	
9.	
10.	

Remarks:

Reporting Officer:

Date:

APPENDIX I

EPI CLINIC CHECK SHEET

COUNTY (Territory or District) ______________ NAME OF SUPERVISOR ______________ 5/83

INSTRUCTIONS: If ok put ✓ If not put 0		CLINIC						REFRIGERATOR										SUPPLIES								OTHER			
NAME OF CLINIC/POST	DATE OF VISIT	1. VACC. AT TIME OF VISIT	2. VACC. SESSIONS PLANNED	3. INVENTORY OF VACCINES	4. MO. RECORD OF VACCINATIONS	5. VACCINE CARRIER	6. EPI HANDBOOK	7. WORKING PROPERLY	8. BLUE FLAME	9. LEVEL	10. MAINTENANCE RECORDED	11. TEMP. RECORDED 2x DAILEY	12. TEMP. BETWEEN 4 & 8 DEGREES	13. ICE SOLID IN FREEZER	14. VACCINES STORED PROPERLY	15. VACCINES ONLY INSIDE	16. COLD DOGS IN FREEZER	17. VACCINES (CHECK EXP. DATES)	18. ROAD TO HEALTH CARDS	19. REFRIGERATOR RECORD FORM	20. MONTHLY CLINIC REPORT FORM	21. TALLY SHEETS	22. NEEDLES & SYRINGES	23. KEROSENE	24. WICK (CHECK BURNER #)	25.	26.	27.	28.

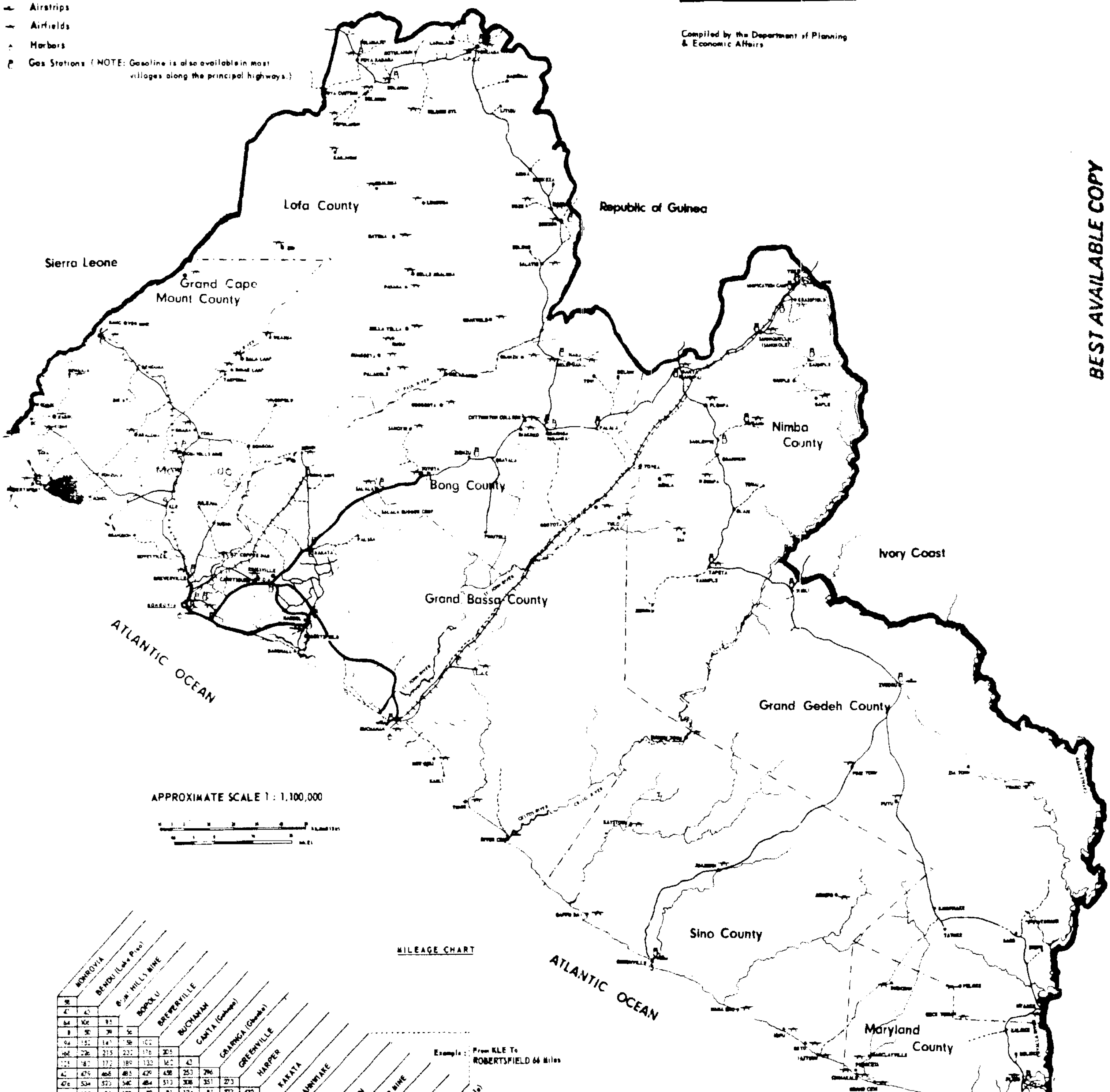
APPENDIX J

Transportation Map of LIBERIA

Compiled by the Department of Planning & Economic Affairs

LEGEND

- International Borders
- County Borders
- Paved Highways
- All Weather Roads
- Dry Weather Roads (not passable by all vehicles in all weather)
- Roads Under Construction
- Railways
- International Airfield
- Airstrips
- Airfields
- Harbors
- Gas Stations (NOTE: Gasoline is also available in most villages along the principal highways.)



APPROXIMATE SCALE 1 : 1,100,000

MILEAGE CHART

Example: From KLE To ROBERTSFIELD 66 Miles

	MONROVIA	BENDU (Lake Piso)	BOMI HILLS MINE	BOPOLU	BREWERVILLE	BUCHANAN	GANTA (Gahnpa)	GBARNGA (Gbanka)	GREENVILLE	HARPER	KAKATA	KAHNWIAKE	KLE	KOLAHUN	MANO RIVER MINE	PLIBO	ROBERTSFIELD	SANNIQUELLIE (Sanokole)	TAPETA	TOTOTA	VOINJAMA	YEKEPA (Lamco Mine)	ZORZOR
BENDU (Lake Piso)	58																						
BOMI HILLS MINE	40	42																					
BOPOLU	64	10[illegible]	95																				
BREWERVILLE	8	50	39	56																			
BUCHANAN	94	152	14[illegible]	158	102																		
GANTA (Gahnpa)	162	22[illegible]	215	23[illegible]	176	205																	
GBARNGA (Gbanka)	125	18[illegible]	172	189	132	140	43																
GREENVILLE	42[illegible]	479	466	485	429	458	253	296															
HARPER	47[illegible]	534	573	540	484	513	308	351	273														
KAKATA	44	10[illegible]	9[illegible]	108	52	81	124	81	377	432													
KAHNWIAKE	37[illegible]	434	423	440	384	413	208	251	173	100	33[illegible]												
KLE	[illegible]	2[illegible]	16	19	2[illegible]	125	199	156	452	50[illegible]	75	407											
KOLAHUN	27[illegible]	333	34[illegible]	33[illegible]	26[illegible]	[illegible]	193	15[illegible]	446	50[illegible]	23[illegible]	401	306										
MANO RIVER MINE	9[illegible]	95	5[illegible]	14[illegible]	91	193	26[illegible]	224	520	575	143	475	68	374									
PLIBO	45[illegible]	515	504	[illegible]	5[illegible]5	494	289	332	245	19	413	81	486	482	556								
ROBERTSFIELD	[illegible]	93	8[illegible]	99	43	59	157	114	410	485	33	365	66	264	134	446							
SANNIQUELLIE (Sanokole)	19[illegible]	25[illegible]	240	25[illegible]	2[illegible]	23[illegible]	25	68	278	33[illegible]	149	233	224	218	392	314	182						
TAPETA	230	288	27[illegible]	294	238	26[illegible]	62	105	19[illegible]	246	186	146	261	255	329	227	219	87					
TOTOTA	83	141	130	14[illegible]	9	120	85	42	238	393	59	193	114	192	182	374	72	110	147				
VOINJAMA	24[illegible]	301	294	3[illegible]1	255	284	165	122	418	473	203	373	278	28[illegible]	346	454	236	190	227	164			
YEKEPA (Lamco Mine)	[illegible]	[illegible]	26[illegible]	[illegible]	22[illegible]	23[illegible]	46	89	29[illegible]	154	170	254	245	239	313	335	203	21	108	131	213		
ZORZOR	18[illegible]	24	2[illegible]	[illegible]	[illegible]	72[illegible]	[illegible]	64	365	415	145	315	220	86	286	396	176	13[illegible]	169	106	58	153	
ZWEDRU	302	36[illegible]	349	36[illegible]	310	335	134	17[illegible]	119	174	258	74	333	327	401	155	291	159	72	219	299	180	241

(Note: mileages are for the shortest routes on the best available road)

NOTE: International boundary located according to the best available information and should not be accepted as legally defined.

LAMCO LITHO